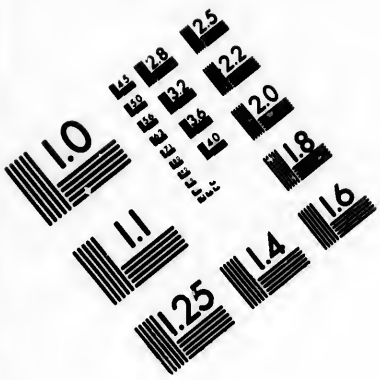

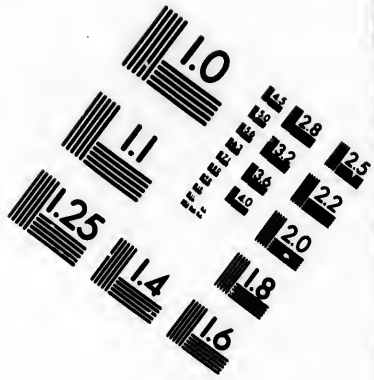

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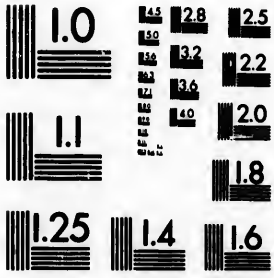

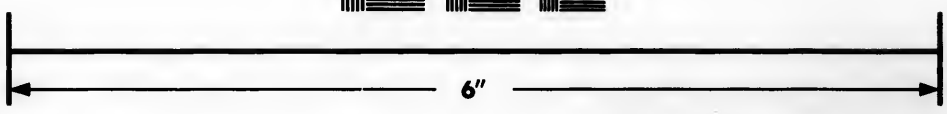

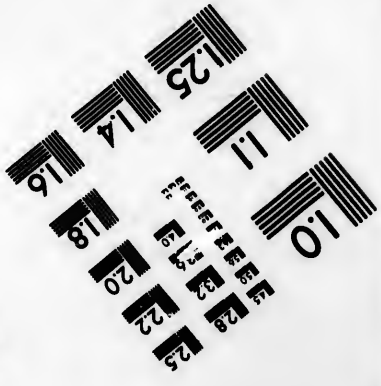

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LETTER

TO

M. JOACHIM BARRANDE,

ON THE

TACONIC ROCKS OF VERMONT AND CANADA.

BY (1)

JULES MARCOU.

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CAMBRIDGE:
WELCH, BIGELOW, AND COMPANY,
PRINTERS TO THE UNIVERSITY.
1862. (5)

LETTER

TO

M. JOACHIM BARRANDE,

ON THE

TACONIC ROCKS OF VERMONT AND CANADA.

CAMBRIDGE, MASSACHUSETTS, *August* 2, 1862.

MY DEAR M. BARRANDE:--

Having just returned from a third exploration of the vicinity of Quebec, and a second visit to Georgia, I shall send you in a few days by express two boxes, containing all the Taconic fossils that I have been able to collect during the two last years, and which form a part of the palcontological collection of the Museum of Comparative Zoölogy at Cambridge.

You may keep for yourself a specimen of each species when there are duplicates, and when you have studied them, please return the collection, labelled by you, with your remarks and descriptions of new species; it will be carefully preserved here, as the most precious collection for reference and comparison in the future study of the Taconic System of North America. I will put in the boxes all the specimens of *Paradoxides* and other Trilobites found by me at Braintree; also the best specimen of *P. Harlani* ever found there; it belongs to my honored friend, Dr. C. T. Jackson, who very kindly consents to send, not only that specimen for your inspection, but all others in his possession relating to the Taconic, including a specimen of *P. Bennettii* of Newfoundand, and a cast of the same from a more complete specimen. Dr. G. M. Hall, and Rev. J. B. Perry of Swanton, sent me last winter a valuable collection of primordial fossils from that vicinity, and, lastly, Colonel E. Jewett of Albany contributes a rare collection of fossils from some lenticular masses of limestone enclosed in the Taconic slates

near Troy (New York). I should have been delighted to send you some specimens from the author of the *Taconic System*, Dr. Emmons, but I have not heard from him since February, 1861; he resides at Raleigh in North Carolina, and no communication is allowed or possible with him at present.

The Geological Survey of Canada possesses a large collection of Taconic fossils, and I tried to obtain for you, and in your name, a single specimen of a pygidium of *Dikelocephalus magnificus*, not having been successful in my search for it at Point Lévis, although I found a large number of the glabellæ; but I received so neat a refusal, that I did not dare to ask anything else. I have already told you that we must not expect any aid, material or intellectual, from that quarter.

I shall now be able to finish promptly the memoir with geological maps and sections which I have had in preparation since last year, and I trust it will reach you before the first meeting of the Geological Society in November next; so that, as you will have the fossils previously, you will be able, on presenting my memoir for publication in the *Bulletin de la Société Géologique de France*, to give at the same time your views and remarks upon the paleontology of the Taconic rocks. In order to enable you to understand the stratigraphical order, I send you now a very short *Résumé*, with two theoretical sections, containing the corrections and important additions which I have made since the publication, in November, 1861, of my first *Résumé*, entitled *The Taconic and Lower Silurian Rocks of Vermont and Canada.* (Proceed. of the Boston Soc. of Nat. Hist.)

Explanation of Fig. I. — *Abstract section for the vicinity of Georgia, St. Albans, Swanton, and Philipsburg.* I have comprised Philipsburg (Canada East) in the same section with Swanton and Georgia, because the physical geology of these different places is so connected and similar that it is impossible to describe the northwest corner of Vermont without referring to Philipsburg, St. Armand, and Frelighsburg; and, on the other hand, Canada East cannot well be understood without reference to the discoveries made in Vermont.

St. Albans Group. — The granular quartz and quartzite found in semi-stratified lenticular masses at the base of the St. Albans group ought to be included in it, so that the Lower Taconic begins with the Talcose slates so well developed east of St. Albans on the

Fairfield road. This may increase the thickness of the St. Albans group one thousand or fifteen hundred feet, but I will retain the number of 3,000 feet as the minimum thickness of the group. The lower part, with quartz veins and quartz masses, may be well observed near the Georgia railroad station. *The Roofing Slates* are above, and can be seen on the line of railroad between St. Albans and Georgia.

Another fragment of a Trilobite, similar to the one found east of St. Albans, and related to the genus *Olenus*, but not well enough preserved for determination, has been found in this group near Franklin, by Mr. Perry. But the most important discovery in this group was made by Dr. Hall, who found, in one of the lenticular masses of hard blue limestone at Highgate Falls, the pygidium of a small *Bathyurus*, different from any one yet described. We must look for further discoveries in that lenticular mass of limestone at Highgate Falls.

Georgia Slates. — I have studied with the greatest pleasure, under the guidance of Messrs. Perry and Hall, the new locality of *Olenellus Thompsoni* Hall, *Ol. Vermontana* Hall, *Conocephalites Teucer* Bil., *Obolella cingulata* Bil., *Orthisina festinata* Bil., and *Camerella antiquata* Bil., found by them, shortly after my visit last year, a mile and a half east of the village of Swanton, on a farm belonging to Dr. Hall, and which I will call *Dr. Hall's farm*. The rocks are the same as on the farm of Mr. Parker, at West Georgia, and the fossils, though not abundant, are found in fragments. I observed here a new feature in this group, which led me to remove higher up in the series the lenticular mass of the Redoute at Point Lévis. Two lenticular masses, separated by fifty feet of slates and sandstones, and composed of very hard blue, gray, and white limestone, are found on Dr. Hall's farm, near the middle and upper part of the group. Fossils are common in them, and I collected quite a number of *Obolella cingulata, Orthisina festinata, Conocephalites Teucer?*, and a *Lingula;* and I am almost certain that *Olenellus Thompsoni* and *O. Vermontana* will be found there, just as they were found in a white limestone on the Labrador coast last year, by Mr. Richardson. These two masses, which I call *Lenticular primordials*, because they contain only primordial fossils, are not large, one being 40 feet in diameter, and the other less wide, but more elongated. The last year's estimate of 500 to 600 feet for the thickness was too high, and I now reduce it to 300, as being nearer the truth for the Georgia group.

Philipsburg Group. — The Georgia slates are followed in regular order by at least 1,400 feet of light black slates, containing, now and then, large lenticular masses of limestone, often called in Vermont *Dove Marble* or *Eolian Limestone* of Hitchcock. In some places, as at St. Albans Bay, Smith Kiln, and Swanton, the lenticular masses are isolated, and form small domes or isolated hills in the middle of the slates; while at Highgate and Philipsburg, the slates, on the contrary, are almost lost in the middle of numerous very large lenticular masses of limestone closely packed together, with only a sort of network of slates enclosing them, and forming, as it were, a frame or border.

From the mouth of Rock Creek near Highgate Spring, as far as Bedford, that is, for a distance of ten miles, and two miles in width, from the lake shore to Four Corners on Moore's Corner, we have an accumulation of lenticular masses originating most probably from mineral springs charged with abundance of carbonate of lime, carbonate of magnesia, and oxide of iron. This locality presents a most interesting study to the geologist and zoölogist, and is, perhaps, with Point Lévis on this continent, and Bruska, Gross-Kuchel, near Prague, in Bohemia, one of the few favored spots for the study of that vexed question, so often talked of, yet so little understood, *the origin of species.* Yes, my dear M. Barrande, we have here at Philipsburg that curious phenomenon which you were the first to discover in Bohemia sixteen years ago, and which you are at present engaged in defending against the attacks of the official geologists of the Austrian Geological Survey. We have what you will call *Colonies of the Second Fauna* enclosed in the strata containing the *Primordial Fauna;* and what I propose to call *Precursory Centres of Creation;* that is to say, centres in which the Creator has made to appear *forerunners* (*avant-coureurs*), species, or generic types, which obtain their full development only during the following great period. Hitherto the study of these lenticular masses near the boundary-line of Canada and the United States has been limited to the immediate vicinity of Philipsburg and Four Corners; future researches will no doubt disclose other localities both in Canada and Vermont. For the present, I have tried to give on the *abstract section* the part of the country between Philipsburg and Four Corners, in following the road to Frelighsburg or exploring the different paths which lead to Eaton's barn and Blanchard's farm. At Four Corners the

bluffs of limestone overlooking the houses contain a quantity of Gasteropoda, mostly *Murchisonia Hyale* Bil., *Metoptoma Eubule* Bil., and *Maclurea;* they are enclosed in a hard limestone and very difficult to obtain, but are very abundant and easily seen on the polished surface of the limestone. Ascending the series, we come to other lenticular masses near Blanchard's farm containing *Maclurea, Ecculiomphalus,* and *Orthis;* then on reaching the main middle ridge about half-way between Four Corners and Philipsburg, we meet first on the surface of the bluish-gray limestone well-preserved sections of large *Lituites* and *Orthoceratites.* The *Lituites Imperator* Bil., and *L. Farnsworthii* Bil., are quite common here, but can only be obtained by the laborious process of the stone-cutter. A peculiarity in the rocks, which break in a sort of slaty way, is, that you cannot see the *Lituites* in the limestone, but only on the polished surface. Fifty feet farther west we meet a layer of hard gray limestone, eight or ten inches thick, passing into a magnesian limestone charged with a quantity of oxide of iron, which is easily decomposed by atmospheric agency. This layer, which is only known for a space of one hundred to one hundred and fifty feet, is very remarkable, because it contains an immense quantity of fossils; in fact, it is a true lumachella of *Bathyurus Saffordi* Bil., *Amphyon Salteri* Bil., two new species of *Dikelocephalus,* one *Asaphus, Nautilus Pomponius* Bil., *Cyrtoceras, Orthoceras, Metoptoma Niobe* Bil., *M. Orithyia* Bil., *Holopea Proserpina* Bil., *Murchisonia Vesta* Bil., *Pleurotomaria Portunica* Bil., *Ecculiomphalus Canadensis* Bil., *E. intortus* Bil., *E. spiralis* Bil., *Ophileta complanata* Van., *Maclurea matutina* Hall, *Orthis Hyppolyte* Bil., *Camerella calcifera* Bil., crinoides, and one or two very rare corals. Farther west, near Eaton's barn, the *Camerella calcifera* is quite abundant. Indistinct fossil shells have been indicated on other points near the village of Philipsburg, but no other rich localities for fossils have been found in the Philipsburg group except those indicated above. Several species, such as *Camerella calcifera, Murchisonia Vesta, Maclurea matutina,* and *Ophileta complanata,* seem to appear in every lenticular mass, and to range all over the Philipsburg group; while others, such as *Bathyurus Saffordi, Amphion Salteri, Dikelocephalus, Asaphus,* are not only confined to a single one of the lenticular masses, but are even there found in a sort of nest, or more probably a true centre of creation. Mr. Billings has already described or identified about

twenty species from the vicinity of Philipsburg, and from twenty to thirty remain undescribed, so that we may assume fifty species as the number of fossils already found in the different lenticular masses of Philipsburg. Of these, — two *Dikelocephali* and one *Menocephalus* belong to the primordial fauna; the two *Bathyuri* may be considered as belonging to a genus which is common to the first and second fauna, and all the other fossils belong to the second fauna; several, such as *Camerella calcifera*, *Maclurea matutina*, *Ophileta complanata*, and *Ecculiomphalus intortus*, pass into the lower part of the Champlain formation or Calciferous sandrock. Thus we have here lenticular masses of limestone enclosed in the Upper Taconic, and containing precursory or forerunning species and genera of the second fauna. These rocks dip to the east at an average angle of about 25°, varying from 15° to 35°. There are no faults, no foldings, no repetitions of strata; and the Philipsburg group of rocks, instead of belonging to the upper part of the Calciferous sandrock, and even to the Chazy limestone, which it has been referred to by Mr. Billings in his memoir entitled, "*On some of the Rocks and Fossils occurring near Philipsburg, C. E.*" (see *Canadian Geologist*, August, 1861, p. 310), is far below the Potsdam sandstone, and in the middle of the Upper Taconic.

Last year my observations in Vermont were more especially directed toward the St. Albans group, the Georgia slates, and the Red sandrock, or Potsdam sandstone, which were then called by Messrs. Logan, Hall, Rogers, and others, Hudson River group, Oneida conglomerate, Medina sandstone, and metamorphic Devonian; and, as I remained only a few hours at Philipsburg, I adopted without examination the opinions expressed by Mr. Billings, in his memoir above quoted; but a careful survey this year has convinced me that at Philipsburg, as well as at Point Lévis, Mr. Billings has been misled in giving explanations, and arriving at conclusions, in his paleontological researches, which are entirely at variance with what exists in nature, — an error that would not have occurred if the paleontologist of the Canada Survey, who does not pretend to be a stratigraphical observer, had been better seconded by the other members of the Survey.

Swanton Slates. — The Swanton slates, so well developed all round the village of Swanton, are composed of black slates, interstratified, now and then, with thin layers of a marly limestone from

two to six inches in thickness. The color varies, and in some places they become brownish and gray. Their thickness cannot be less than two thousand feet. Mr. Perry has found two *Graptolites* in them on the shore of the lake at Philipsburg; and Dr. Hall gave me specimens of *Graptolites pristis* His, collected by him at the fall of the river in the middle of the village of Swanton, where they are quite numerous. This discovery is important, because, as we have also the *G. pristis* from the Utica slates, it proves that species to be a precursor common to the primordial and the second faunæ; consequently it is insufficient alone to determine the horizon of a system of rocks. Until now, no lenticular masses of limestone have been found in the Swanton slates of Vermont; but I am inclined to believe that there are such masses in the State of New York. For instance, at Troy, near Albany, there are lenticular masses of blue limestone enclosed in the Swanton slates, and which contain sporadic types or precursory species of the second fauna, as you will see from the collection made in one of them by Colonel Jewett.

Potsdam Sandstone. — I have little to add to what I said last year of this group. As I told you, being the capping group in the overturn of the Taconic system, where it found a point of resistance, such as all along the *terra firma* of the Adirondack Mountains, it broke into narrow, parallel bands, which have rested *en échelons* upon the different groups of the Upper Taconic. The Potsdam sandstone enters Canada, and crosses the Frelighsburg road at Krantz's mill, but does not appear north of Missisquoi County.

As regards what I called last year the Utica slate of Highgate Springs, I am inclined now to think that those slates do not belong to the Utica slate, but are included in the Chazy and Black River formation. I should say the same of a part of what I then called *Lingula flags* at Highgate Springs. Since my visit of last year, Dr. Hall has found in them *Ampyx Halli* Bil.; and, from their association at Highgate and St. Albans Bay, I think, with Dr. Hall, that they belong also to the Chazy and Black River formation, — that is, instead of being contemporaneous with the *Lingula flags* of England, they are of the age of the *Llandeilo flags*.

Explanation of Fig. II. — *Abstract Section for the vicinity of Point Lévis, Chaudière, and Quebec.*

Chaudière and Sillery Group. — The inferior part of the Upper Taconic in the District of Quebec is formed of red shales, some-

times brown, olive, or even black, passing now and then into beds of red sandstone one or two feet thick, and which is entirely cut up and crossed in all directions by dikes of trap greenstone, containing sometimes crystals of feldspath, and being then a true porphyry.

There are numerous instances of a sort of semi-stratification in this trap; but generally they are in dome-shaped dikes or masses. Only one fossil has been found, as yet, in the slates near Chaudière Falls by Mr. Richardson; it is a small *Obolella*, described by Mr. Billings under the name of *O. pretiosa*. The thickness of the whole group is at least three thousand feet. It corresponds entirely to the St. Albans group of Vermont, the trap replacing the injection of granular quartz.

Redoute and Gilmour Group. — At Gilmour's Wharf, and on the road to Arlaka, near the Redoute or Lime-kiln (*four à chaux*) of Point Lévis, there are about four hundred feet of green and black slates, containing layers of magnesian conglomerates, yellow sandstones, and finally a large, lenticular mass of very hard, white limestone, which I called last year the *Redoute*, or quarries of the Notary Guay. The fossils found at the Redoute are all primordial, and many of them new, as you will see in my collection; and I consider it as a *lenticular primordial*, of almost the same age, or very little younger than the two lenticular primordials of Dr. Hall's farm in the Georgia slates of Swanton. Then, instead of placing the slates, limestones, and magnesian conglomerates of Gilmour's Wharf and the Redoute in the St. Albans group, as I did last year, I am led to remove them a little higher up in the series, considering now that group as the equivalent of, and contemporaneous with, the Georgia slates of Vermont. The principal fossils found at the Redoute are, *Dikelocephalus magnificus* Bil., *D. planifrons* Bil., *D. megalops* Bil., *Conocephalites Zenkeri* Bil., *Bathyurus capax* Bil., *Monocephalus Sedgewicki* Bil., &c.

Point Lévis Group. — With the help of two good maps, the *Plan of the Harbor of Quebec*, by A. Wallace, 1861, and the *Plan de la Ville d'Aubigny dans la Seigneurie de Lauzon*, department of Crown Lands, 1862, I was able this year to follow out and trace every bed and layer, on the whole contour of Point Lévis, from the Grand Trunk Railroad Terminus to Indian Cove; and as Point Lévis is a point of land surrounded by high cliffs, I feel satisfied that there is no repetition of beds, and no synclinal axis, and that the few foldings in the strata of the Ferry's Cliff are mere acci-

dents, confined to a distance of a few feet, and are without any effect upon the whole mass of strata, but are what we call in French *structure ployée* (contorted beds). You will ask, what becomes of the discordance of stratification that I indicated last year, as existing between the Redoute and the *Strata de la terre du Curé*. There is, in truth, here, as well as at Philipsburg and St. Albans, a difference of direction between the masses of slates and the limestones near the contact of the two rocks; but I feel assured now that this difference is due to the globular form of some of the lenticular masses of limestone enclosed in the slates, the slates following the direction of the globular mass, instead of running in a straight line, which gives to the whole, at first view, a sort of discordance of stratification that in truth does not exist.

Between the Redoute and the *Strata de la terre du Curé*, there are about one hundred or one hundred and fifty feet of black slates; then we have three lenticular masses of limestone, separated by about thirty feet of slates interstratified with some beds of magnesian conglomerate and yellow sandstone. These masses are almond-shaped and quite flat, from ten to twenty feet broad, and one hundred to one hundred and fifty feet long, and the limestone, although quite hard, is less so than at the Redoute. In order to understand the localities, I shall call the first almond, that is the most easterly and the nearest to the Redoute, *Parochial Hill*, because it is the only one crossed by the Parochial boundary-line between the parishes of Notre Dame and St. Joseph. The second shall be called *Middle Hill*, while the third, which is the broadest, and close by the houses of the village, shall be called *Cross Hill*, because a conspicuous Temperance Cross has been erected on it.

The limestone of Parochial Hill contains numerous fossils, especially *Bathyurus Saffordi* Bil., *B. Cordai* Bil., *B. bituberculatus* Bil., *B. oblongus* Bil.; *Arionellus*, n. sp.; *Ecculiomphalus Canadensis* Bil., *E. intortus* Bil.; *Pleurotomaria vagrans* Bil.; *T. Postumia* Bil.; *Metoptoma Hyrie* Bil., *M. Augusta* Bil.; *Camerella calcifera* Bil., *Leptæna sordida* Bil., *L. decipiens* Bil.; *Orthis gemmicula* Bil., *O. Tritonia* Bil., *O. Electra* Bil., *O. Hippalyte* Bil., *O. Eudoria* Bil.; *Stricklandia? Arachne* Bil., which indicates a centre of creation or *Lenticular precursors* of species of the second fauna enclosed in the primordial zone, analogous and most certainly contemporaneous with the lenticular precursors of the Philipsburg group.

The limestone of the Middle Hill contains also numerous fossils, some identical with those found at Parochial Hill, such as *Bathyurus Saffordi* and *Camerella calcifera*, and some new species, such as *Cheirurus Apollo*, *Illænus*, *Asaphus*, and several *Orthoceratites* undescribed. The whole indicates a centre of creation, or colony containing precursory species and prophetic types and genera of the second fauna. At Cross Hill I found only *Camerella calcifera*, but probably other species will be found there also.

I have taken the greatest care to ascertain that these three hills are really lenticular masses, and are not a repetition of each other; that they are independent, although belonging to the same subdivision of the Point Lévis group, which I shall continue to call *Strata de la terre du Curé*. We have here, as at Philipsburg, about fifty species, and several of them are identical with those of the latter locality. Two or three of the *Terre du Curé* species are primordial, while all the others belong specifically or generically to the second fauna. When you have received the boxes of fossils, you will be better able than I am to give a correct list of them for each of the different lenticular masses.

The strata of the *Terre du Curé* are about five hundred feet thick. Succeeding them is a group of slates containing numerous layers of marly limestone and conglomerate. In the cliff near the Ferry are found, besides numerous compound *Graptolidæ*, the following fossils: *Obolella desiderata* Bil.; *Lingula Irene* Bil., *L. Quebecensis* Bil., and *Shumardia granulosa* Bil.; an ensemble more nearly related to the primordial than to the second fauna. These rocks have a thickness of about five hundred feet; they form the most northern part of the cliff of Point Lévis opposite Quebec, and are seen with their *Graptolidæ* on the island of Orleans, near the village Montcalm. I shall call them *Strata of the Ferry's Cliff*, and consider them with the *Strata of the Terre du Curé* as forming the *Point Lévis group*, and the whole as contemporaneous with the *Philipsburg group* of Vermont and Missisquoi county.

Quebec Group. — The city and citadel of Quebec, and the plain extending between the city, Beauport, Charlesbourg, and Indian Lorette, is formed by a great group of black slates, sometimes gray and even reddish, containing now and then, but more especially at the base, numerous layers of blue limestone. Boulders of limestone of quite a large size may be seen in the slates, as at Mountain Street, in the interior of Quebec. These rocks are almost destitute

of fossil remains; but Mr. Richardson has found at the Isle of Orleans *Graptolites pristis* His.; the same that has been found at Swanton Falls, which is common also in the Utica slates. I regard the Quebec group as contemporaneous, and representing at Quebec the Swanton slates of Vermont; although they appear to be more developed, having at least a thickness of 2,400 feet.

Potsdam Sandstone. — The Potsdam Sandstone does not exist in the District of Quebec, and I did not see a single trace of it north of the Grand Trunk Railroad from Richmond to Montreal. Probably, if these rocks were ever deposited in that region, not finding any point of resistance close by, as in the Adirondack country, they slipped under all the other strata in the overturn of the Taconic, and have been entirely concealed from view by the succeeding groups.

My first impression, published from my old manuscript notes of 1849, in our memoir *On the Primordial Fauna and the Taconic System*, with regard to the Champlain or Lower Silurian rocks found northwest of Quebec, which form a narrow band running from St. Anne to Montmorency, Beauport, Charlesbourg, and Indian Lorette, is the right one. These rocks have been deposited horizontally upon the very much inclined Upper Taconic strata, as can be seen in several places at Beauport, Charlesbourg, and Petit Ruisseau; the subsequent denudation and upheaval has formed chasms in the soft gray shales of the Quebec group, more especially near their contact with the quartzite, as at Montmorency Falls and Indian Lorette, into which the Lower Silurian strata have slipped and been in this manner, as it were, boxed up and preserved from the following great denudations which have swept away a great part of that formation in the valley of the St. Lawrence.

The section of Montmorency Falls shows a fine example of this slipping of the Silurian rocks, but the denudation caused by the fall has already reached the contact of the Silurian strata with the Taconic slates, and the water at the foot of the fall passes now under the Trenton limestone.

As you may see from what precedes, I consider the second view taken by the Geological Survey of Canada to be as erroneous as the first one, and entirely at variance with the facts as they exist at Quebec. Obliged to reply to the publication of your letter of August 14, 1860, and my additional notes upon the vicinity of Quebec, Mr. Logan endeavored to throw all the blame upon the

paleontological views of Mr. James Hall; and in his incomprehensible letter to you, written December 31, 1860, ten days after his reception of our memoir, to which he carefully avoids any allusion, in order to shield the blunder of Hudson River group and metamorphic Upper Silurian and Devonian, he has recourse to a break with an overlap, complicated with fault, synclinal and anticlinal axis, unintelligible lettered outcrops or so-called outcrops, diving apparatus to explore the bottom of the St. Lawrence, — in fact, he calls to his aid all the most complicated phenomena of disturbance preserved in the arsenal of dynamic geology, candidly believing that an official geologist may reconcile incorrect observations and false theories by using big words and technical expressions.

I should not have recalled the mistakes of Mr. Logan, if that geologist had not published a sort of contradiction of my observations, in a little memoir, entitled "*Considerations relating to the Quebec Group*," &c., (see *Canadian Geologist*, May, 1861,) in which he gives two most fantastic sections, — calling quartzite, gneiss; a slip, a fault; a regular superposition, an overlap; the Swanton slates, Hudson River shales; sandstone of the Champlain group, Potsdam sandstone, &c. Besides, in a new paleontological memoir just published (June 6, 1862) under his direction as Superintendent of the Geological Survey of Canada, Mr. Billings has taken pains to give new lists of fossils from what he calls limestone No. 1 and No. 3 of Point Lévis, in which he gives names of species common to Nos. 1 and 3, contrary to my conclusions of last year, that *I found no mixture whatever of fossils of the second fauna in the lenticular primordials of the Redoute.*

Mr. Billings says: "I have never visited the locality of the limestones at Point Lévis but once, and that was a few days after the Trilobites were collected. On that occasion I found very few fossils, and made no attempt to study the stratigraphy of the place, which is much complicated." Notwithstanding that declaration, Mr. Billings maintains his imaginary divisions of limestone, Nos. 1, 2, 3, and 4, and proceeds at length, drawing conclusions for the synchronism of the Point Lévis limestones. Fearing that my first unsuccessful attempt last year to understand the explanations of Messrs. Logan and Billings might be my own fault, I tried very hard this year again when at Point Lévis, but with no letter success; and I left Point Lévis fully convinced that the fossils described by Mr. Billings, and the so-called outcrops A_2, A_3, A_4, etc.

of Mr. Logan, were collected and observed in a very careless way, without regard to stratigraphy, by irresponsible collectors, or by unskilful practical geologists.

In passing through Montreal I visited the public Museum of the Geological Survey, and saw the specimens called Limestone Nos. 1, 2, 3, and outcrops A_2, A_3, A_4, etc. After a careful examination of the specimens, and more especially of those cited by Mr. Billings as containing species common to Nos. 1 and 3, I saw that a mixture of specimens had been made, and on closely interrogating a member of the Survey, with a sketch of the contested ground in hand, I finally obtained the answer, that the Redoute was not known as containing fossils *until after* my exploration and publications of last year; that Limestone No. 1, or outcrop A_2, was only a *boulder*, two feet in diameter, found lying on the superficial soil between the Redoute and the *Terre du Curé*, not far from the Lime-kiln. That boulder is very rich in Trilobites, as it is almost a complete mass of them. It came without doubt from the Redoute, and I can almost point out the exact spot from which it came. Every fragment of it has been carefully collected, and the whole is preserved in the Museum, with the exception of a few specimens, which have been distributed in the United States and in England, to more favored geologists than ourselves. But we have not done with boulders; the Limestone No. 3, or outcrop A_3, was also found in *boulders* or *loose pieces* scattered over the *Terre du Curé*, and I do not doubt that No. 3 as well as No. 1 came from the Redoute; which explains very naturally the so-called mixture of species between Nos. 1 and 3. Thus you see the way in which the exploration of Point Lévis was conducted by the official geologists of Canada, and it is not strange that we could not understand their explanations.

I hope this statement will be of some practical use, and that in future more care and application will be bestowed upon the geology of Canada, by those intrusted by the government of that colony with the duty of exploring and reporting upon its geological structure and its mineral wealth.

Very truly, your friend,

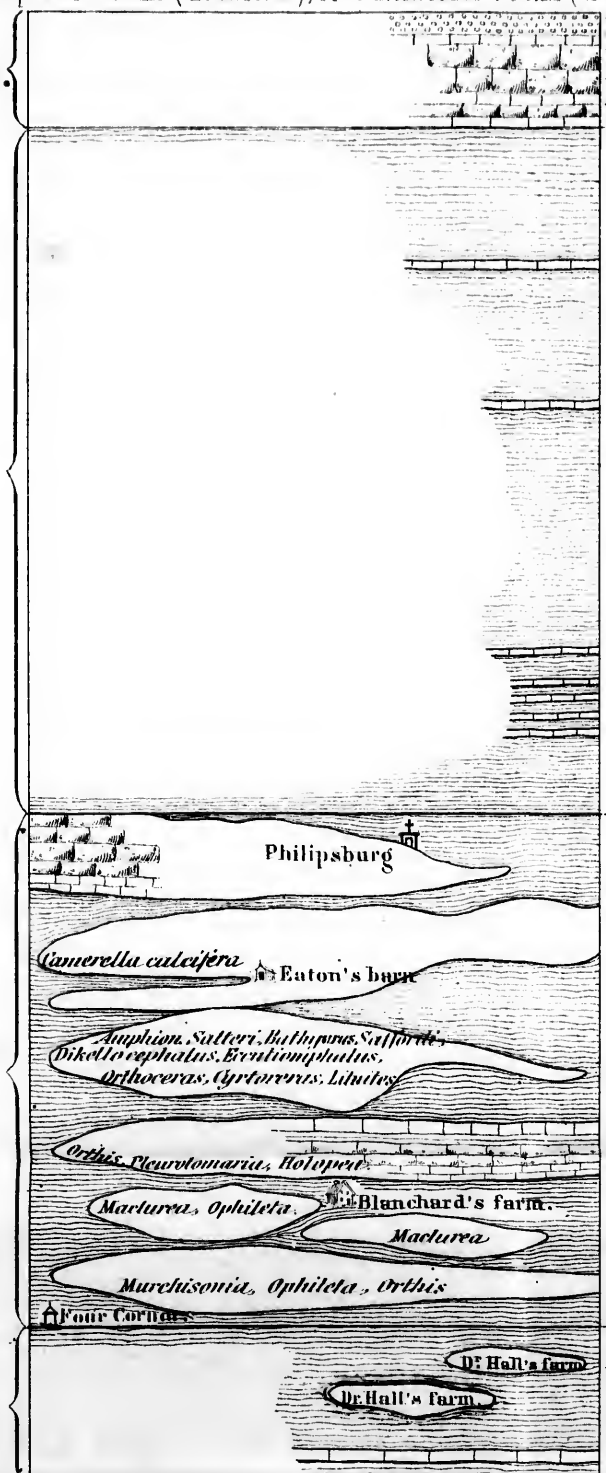
JULES MARCOU.

COMPARATIVE TABULAR SECTIONS OF
IN VERMONT AND LOW

By Jules Marcou.
Cambridge, August 2d 1862.

Fig. 1. Abstract Section for the vicinity of Georgia, St Albans, Swanton and Philipsburg.

The Champlain rocks (Emmons), or Cambrian rocks (Sedgwick), or Lower Silurian rocks (Mu



TIONS OF THE UPPER TACONIC ROCKS
AND LOWER CANADA,

y Jules Marcou.

Cambridge, August 2d 1862.

Fig. 2. Abstract Section for the vicinity of Pointe Lévis, Chaudière falls and Québec.

ower Silurian rocks (Murchison), overlie the Taconic strata in discordance of stratification.

nerate

with *Conocephalites*

POTSDAM SANDSTONE

Not seen North of Missisquoi County

QUEBEC GROUP. *2400 ft.*

tolithus pristis
) Precursor!

hilipsburg's shore.)

Graptolithus pristis ?
(North Western shore of Orleans Island)
Precursor!

Boulder Slates
(Mountain street in the City of Quebec)

rsors.

urrsors.

rsors.

cursors.

ursors.

PRECURSORY CENTERS OR BARRANDE'S COLONIES.

POINTE LÉVIS GROUP.

STRATA OF THE FERRY'S CLIFF. *300 ft.*

STRATA DE LA FERRE DU CURÉ. *300 ft.*

Conglomerate
Obolella desiderata.
Compound *Graptolidae*.
(Pointe Lévis and Orleans island.)
Shumardia.

Colonies or Precursory Centers. *Camerella calcifera. Ballyurus saffordi. Bucaniomphalus. Cyrtoceras. Arimeltus, Holopea, etc.*

Magnesian conglomerate
Cross hill. (Lenticular Precursors)
Middle hill. (Lenticular Precursors)
Sandstone.
Parochial hill. (Lentic. Precursors)

ordials..... *Conocephalites. Obolella. Orthisina.*
soni, etc.
rdials.
mia radiata.
e with *obolella*.

REDOUTE & GILMOUR GROUP. *400 ft.*

Lenticular Primordials.

Redoute

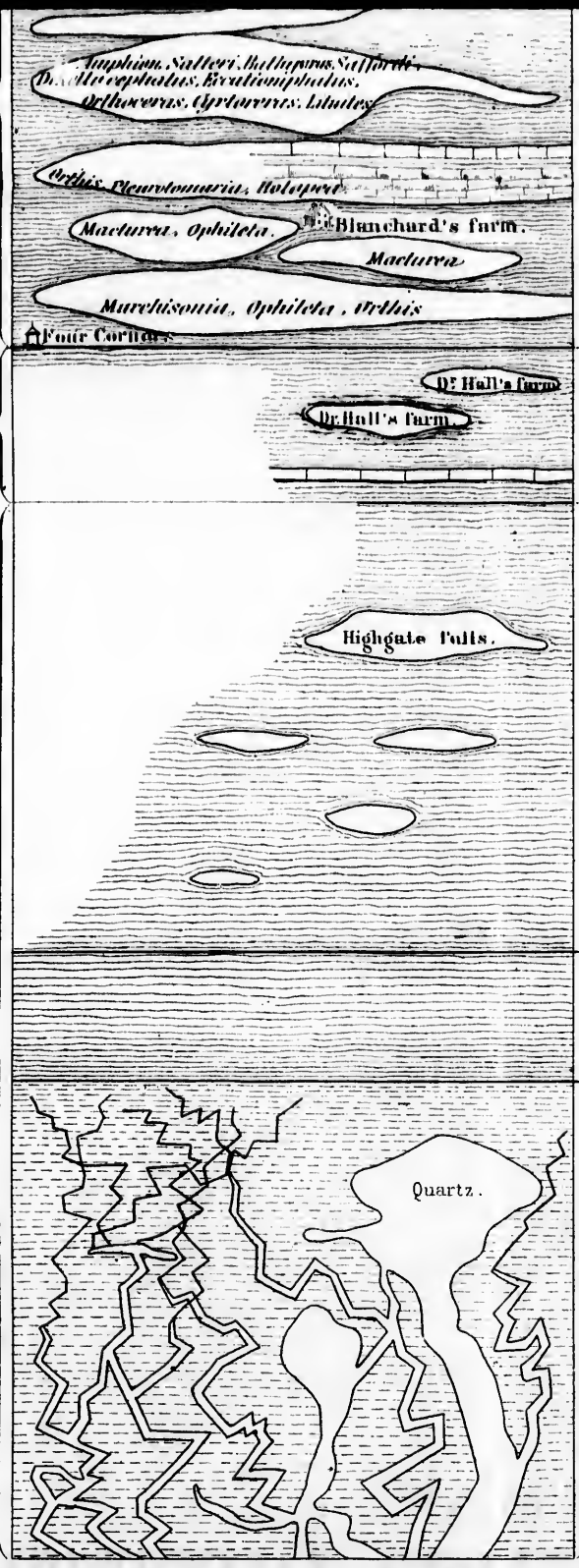
Conocephalites, Dikellocephalus, Menocephalus, Ballyurus, etc.
Sandstone.
Dolomitic conglomerate.

Chromidites (Gilmour's warf)

PHILIPSBURG GROUP.
1400 ft.

GEORGIA SLATES.
400 ft.

St ALBANS GROUP.
3000 ft.



Lenticular Precursors.

Lenticular Precursors.

Lenticular Precursors.

Lenticular Precursors.

Lenticular Primordials..... *Conocephalites.* *Obolella.* *Orthisina.*
Olenellus Thompsoni, etc.
Lenticular Primordials.
Chrondites, Olenoides radiata:
Yellow sandstone with *obolella.*
and *Conocella antiquata.*

Lenticular mass of very hard blue limestone containing *Bathyurus*, n. sp.

Olenus (St. Albans and Franklin.)

Roofing Slates.

Slates with quartz veins and semi-stratified masses of quartz.

PRECURSORY CENTER
BARRANDE'S COLON

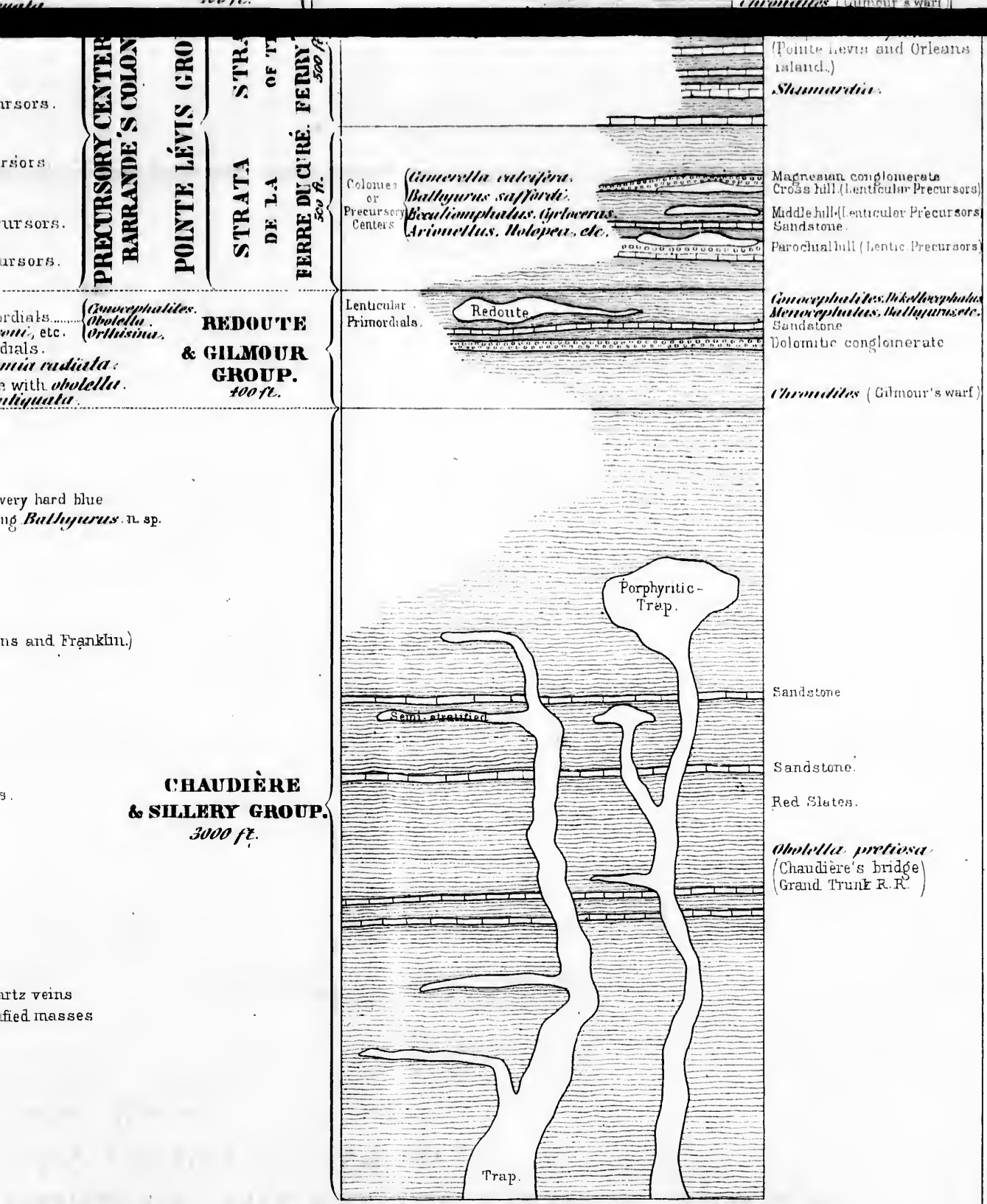
POINTE LÉVIS GRO

R
& G

CHAU
& SILLER
300

Semi-stratified mass of Quartz, Quartzite, conglomerate, Talcose slates, Cristalline Limestone, Slates, etc. of the Lower Taconic.

J. Marcou. del.



Cristalline limestone, Slates, Quartzite, Copper pyrites of Acton vale, conglomerate, etc. of the Lower Taconic.

J. Mayer & Co's Lith. Boston.

BY THE SAME AUTHOR.

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