Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- ☐ Coloured covers/ Couverture de couleur
- ☐ Covers damaged/ Couverture endommagée
- ☐ Covers restored and/or laminated/ Couverture restaurée et/ou pelliculée
- ☐ Cover title missing/ Le titre de couverture manque
- ☐ Coloured maps/ Cartes géographiques en couleur
- ☐ Coloured ink (i.e. other than blue or black)/ Encre de couleur (i.e. autre que bleue ou noire)
- ☐ Coloured plates and/or illustrations/ Planches et/ou illustrations en couleur
- ☑ Bound with other material/ Relié avec d'autres documents
- ☐ Tight binding may cause shadows or distortion along interior margin/ La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure
- ☐ Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/ Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.

- ☐ Coloured pages/ Pages de couleur
- ☐ Pages damaged/ Pages endommagées
- ☐ Pages restored and/or laminated/ Pages restaurées et/ou pelliculées
- ☑ Pages discoloured, stained or foxed/ Pages décolorées, tachetées ou piquées
- ☐ Pages detached/ Pages détachées
- ☐ Showthrough/ Transparence
- ☑ Quality of print varies/ Qualité inégale de l'impression
- ☑ Continuous pagination/ Pagination continue
- ☐ Includes index(es)/ Comprend un (des) index

Title on header taken from:/ Le titre de l'en-tête provient:

- ☐ Title page of issue/ Page de titre de la livraison
- ☐ Caption of issue/ Titre de départ de la livraison
- ☐ Masthead/ Générique (périodiques) de la livraison

☐ Additional comments:/ Commentaires supplémentaires:

This item is filmed at the reduction ratio checked below/ Ce document est filmé au taux de réduction indiqué ci-dessous.

10X 12X 14X 16X 18X 20X 22X 24X 26X 28X 30X 32X

THE CANADIAN JOURNAL.

NEW SERIES.

No. XX.—MARCH, 1859.

THE PRESIDENT'S ADDRESS.

AY THE HON. G. W. ALLAN, M.L.C.

Read before the Canadian Institute, January 8th, 1859.

Gentlemen of the Canadian Institute,—After an absence of more than two years from Canada, I find myself again placed, by your kindness, in the office which I had the honor of filling when last among you. In resuming the Chair as your President, permit me to express the very great gratification which I feel at being thus assured, by your choice, of your continued confidence in the earnestness and sincerity of my desires for the advancement and prosperity of the Institute.

I rejoice to have it in my power to congratulate my brother Members on the continued success which has marked the Society's career, and the increasing support which it attracts year by year, as evinced by the large accession of new Members, and the many valuable additions to the Library and Museum.

I had indeed hoped, that on my return to Canada I should have found the Institute installed in a permanent home of its own, in a building worthy of the high objects of the Society, with suitable accommodation for its library and increasing collections in natural history, geology, and other departments of science.

But the commercial difficulties of the past two years, and the general depression in the monetary affairs of the Province, sufficiently account for these pleasant anticipations not having been realized; and the Council have doubtless exercised a wise discretion in refraining from any attempts to force on the erection of the building under circumstances which might perhaps have occasioned serious embarrassment to the Institute.

I may be permitted, however, to express the hope, that with the improvement in the financial condition of the country, which I trust we are justified in anticipating, the means at our disposal will also be so far increased as to allow of our setting about the work in earnest. We should bear in mind that one of the principal objects which the founders of this Society proposed to themselves, was "the formation of a museum for collections of models and drawings of machines and constructions, new inventions and improvements, geological, mineralogical, and zoological specimens, and whatever may be calculated, either as natural productions or specimens of art, to promote the purposes of science and the general interests of society." I need scarcely say that the very limited accommodation afforded us by our present rooms almost forbids anything like a satisfactory arrangement of the specimens and models we already possess, and is certainly a very serious hindrance to the enlargement and extension of our collections.

But although we cannot as yet point to spacious halls and handsome lecture rooms as material evidences of the Society's prosperity, we can with confidence refer to these *sure* tests of its growth and vigor, the number and character of the original papers and communications read at our weekly meetings, as well as of those which have appeared from time to time in the pages of the *Journal* of the Institute.

In congratulating you, however, as I justly may, on these evidences of the general progress and satisfactory condition of the Institute, I would at the same time avail myself of this opportunity to urge upon the attention of the members of the Society at large the complaint which has so repeatedly been made by former Councils, and which has been reiterated again in the Report submitted at our last annual meeting—that it is still a matter of regret that so large a share of the business of the Institute, so far as regards the contributions to the *Journal*, should continue to fall upon a few individuals. To the conductors of the *Journal* the members of this Society are under very large obligations. The high character which it has obtained under the

able management of the editor and the editing committee, has reflected honor upon the Institute, and has been one of the chief means of making the society known beyond the limits of the Province, and of establishing for it something more than a mere local reputation. I think therefore that a sense of gratitude to those who have labored so zealously and effectively, should incite us each in our several degrees to assist in the work, and I would join with the Council in earnestly inviting a more active co-operation on the part of the members generally, both in contributing to the *Journal*, and to the subjects for discussion at the weekly meetings.

I may fairly presume that it is the earnest desire of every Canadian that his country should at least keep pace in its intellectual progress with its growth in wealth and advancement in material prosperity; and we can doubtless point to our colleges and universities to prove that we have not been unmindful of the claims of letters, and that the generation, not yet passed away, which found Upper Canada a wilderness, and by their energy and industry converted it into a thriving and populous Province, were not so absorbed in the mere material interests of the day, as to preclude their taking thought for the higher interests of learning and science. But, admitting all this, it can scarcely be denied that the study of the physical sciences has, until very lately, made but comparatively little progress in Canada, and if we would establish for our country an honourable standing in the world of science, it behooves us to use our best exertions to aid and foster those associations which tend to encourage a spirit of enquiry, awaken a taste for scientific pursuits and investigations, and assist in promoting those observations and experiments which but for some such organization would perhaps never be made. Now in this Institute we possess just such *an organization* as we require—*a centre* into which the treasures gleaned by the experience, the observation, and the discoveries of active and intelligent minds amongst us, should naturally flow, to be there digested and arranged, and thence again diffused throughout the length and breadth of the land.

In this wondrous age of mental activity and scientific research, we need to task all our energies to keep pace with the progress of discovery. Every year new fields are thrown open for the researches of the geographer, the naturalist, and the geologist. Countries hitherto almost inaccessible, either from the natural obstacles which interposed themselves to their exploration, or rendered so by the jealous restric-

tions imposed by their governments, are, one by one, yielding to the perseverance of explorers, or the skill of diplomacy.

That great empire whose rulers have for ages jealously and systematically excluded every "outside barbarian" from all but the very threshold of its dominions, has at length been thrown open to the nations of the West; and China, with its immense territories stretching from the centre to the eastern extremities of Asia, is now accessible to the researches and investigations of those whose love of science or desire for adventure may prompt them to turn their steps thitherward.

The past year has witnessed, too, the landing of a British admiral and British ambassador at the capital of another country, for many ages almost a sealed book to the nations of Europe. The island empire of Japan—"the Zipangu" of whose wealth and civilization Marco Polo wrote in such glowing terms more than five centuries ago—has once more opened her ports, and allowed the adventurous Englishman to enter.

In Central Africa and Australia our explorers are continuing their researches with unabated vigor, and while gaining fresh laurels for geographical science, we may trust that by their discoveries they are gradually preparing the way for the introduction into the dark regions of the earth of the inestimable blessings of Christianity and civilization.

If we turn now to the progress of discovery in the regions of science, what vast results have followed the researches of those who have been laboring in fields hitherto unexplored or but imperfectly known. During the last few years physical science in all its branches has been advancing with gigantic steps, and enlarging its domain, not only by the discovery of much that is new, both in facts and in the laws which govern them, but by the correction of former errors, and the unceasing improvements in the methods and instruments of enquiry; and science is now made to yield practical results to the uses of man much more largely than heretofore. The development and progress of chemistry, geology, palæontology; the inventions and practical applications of photography and telegraphy—how marvellously have they increased, and to what perfection have they been carried!

Few amongst these inventions have made more rapid strides, or achieved results more interesting, even to the non-scientific portion of the community, than photography. During my late visit to England and the continent, I had frequent opportunities of examining and collecting specimens of this most beautiful art; and of the various exhibi-

tions and galleries which annually open their doors and display their treasures for the improvement and delight of the thousands who throng to the great metropolis of England, I know of none more interesting than the Photographic Exhibition, which has now become an annual one, and 'aken rank as such among the regular exhibitions of the year.

But photography does not content itself with ministering to the pleasure of the lovers of art; it has become the active handmaid of science,—giving to the astronomer faithful portraits of the heavenly bodies—to the zoologist and botanist the most accurate representations of the most complex subjects in their various departments—representations such as the ablest draughtsman could not furnish them with, in which the most minute peculiarities of form and structure are so wonderfully reproduced, that, as has been observed, "naturalists might even make discoveries upon these faithful images of nature, as they could have done upon nature itself." Nay, to such perfection has this art been brought, that the most transitory objects, even to the portrait of a shell while in full flight from a mortar, has been faithfully registered: the photographic eye being "more sensitive than the living one, and registering impressions too fine for human vision!"

Of that most wonderful of all the modern applications of science, the electric Telegraph, I am sure I shall be excused for quoting the remarks made by Professor Owen, in reference to it, in the course of his admirable address to the British Association. After referring to the discoveries in electro-magnetism, the Professor says: "Remote as such profound conceptions and subtle trains of thought seem to be from the needs of every-day life, the most astounding of the practical augmentations of man's power has sprung out of them. Nothing might seem less promising of profit than Oersted's painfully pursued experiments with his little magnets, voltaic piles, and bits of copper wire;—yet out of these has sprung the electric cable! Oersted himself saw such an application of his convertibility of electricity into magnetism, and made arrangements for testing that application to the instantaneous communication of signs through distances of a few miles. The resources of inventive genius have made it practicable for all distances, as we have lately seen in the submergence and working of the electro-magnetic cord connecting the old and the new world. On the 6th of August, 1858, the laying down of upwards of 2,000 nautical miles of the telegraph cords connecting Newfoundland and Ireland was successfully completed,

and on that day a message of 31 words was transmitted in 36 minutes along the sinuosities of the submerged hills and valleys forming the bed of the great Atlantic. This first message expressed 'Glory to God in the highest; on earth peace, good will towards men.' Never, since the foundations of the world were laid, could it more truly be said, 'The depths of the sea praise him!' "

Since these eloquent lines were penned this great triumph of modern science has received a check in the temporary failure of the cable, but the scientific problem has been satisfactorily solved, and the practicability of the scheme established beyond all doubt. Even we in Canada have had proof of the successful working of this wondrous agency; for among the messages transmitted during the too brief period of the Company's operations, was one countermanding the order for the embarkation of troops from Canada for India, upon the receipt of the intelligence at home that a great check had been given to the Indian Rebellion.

For the ultimate success, then, of this great enterprise, we need have no fear; the perseverance and energy of its promoters must overcome all obstacles, and, with the Divine blessing on their labors, we may hope, ere this year is out, to see the electric chain once more uniting the old and the new world.

Let us turn now to our own country, and see what progress we in Canada have been making during the past year; how far we have borne a part in advancing the outposts of science, or added in any way to the general stock of knowledge: and, first, I would call your attention to the contributions which have lately been made to our knowledge of the geography and natural characteristics of a part of North America hitherto but very imperfectly known. For some time past the attention of the people of this country has been drawn to the consideration of the practicability of establishing a direct communication between Canada, the Red River settlement, the valley of the Assiniboine, the Saskatchewan, and the British possessions on the Pacific; and a Company has already been chartered with very extensive powers, under an Act of the Provincial Legislature, for the purpose of opening up this communication. The route which I believe it has been *proposed* to follow, would lead from the shores of Lake Superior to Red River, from Red River to Carleton House on the Saskatchewan, from Carleton House to Edmonton House at the head of navigation on the Saskatchewan, and thence across the Rocky Mountains to the

head waters of Fraser River, and down it to the gold fields of British Columbia. This project is unquestionably one of great national interest, not only as respects Canada, but the whole British empire;—for should its feasibility be thoroughly established, and it be found practicable to form a communication by Railway and Steamer between the head waters of Lake Superior and the shores of the Pacific, it would make Canada the highway to India and China, give to Britain the shortest route, and that within her own territories, to her possessions on the Pacific and her vast dominions in India, and open a highway for her commerce with the far East, with which no hostile power could interfere.

Meanwhile the government of Canada have, as you are all aware, taken steps to obtain reliable information as to the nature and capabilities of the country between Lake Superior and Red River, and there has lately been printed, by order of the Legislative Assembly, a very full and interesting Report of the exploration of that country, drawn up by the gentlemen who composed the expedition sent out for that purpose. The primary object of the expedition, as set forth in the instructions given to the party, was to make a thorough examination of the tract of country between Lake Superior and Red River, by which might be determined the best route for opening a facile communication through British territory from that Lake to the Red River settlement, and ultimately to the great tracts of cultivable land beyond them. The gentlemen to whom the task of exploration was committed appear to have done their work thoroughly, and to one among them, more especially, are we indebted for a large amount of most valuable and interesting information in respect to the soil, climate, geological formation, and natural history, both of the tract of country intervening between Lake Superior and Fort Garry, and the valleys of the Red River and the Assiniboine. I need scarcely say that the gentleman to whom I allude is Professor Hind of Trinity College, the geologist and naturalist to the expedition, whose connexion with the Institute, of which he has so long been a most valuable and efficient member, must increase the interest which all of us feel in his labors and researches.

Nothing, I think, shows more strongly the value of careful systematic observation, when conducted by properly qualified persons, than the statements contained in Professor Hind's Report with respect to the soil and climate of the valleys of the Red River and

the Assiniboine, as compared with the popular ideas on tehse subjects.

Hitherto these districts have been regarded, by the majority of the people of Canada, at all events, as most uninviting to settlers, not merely by reason of their distance from civilized life, but from the inhospitable nature ascribed to the climate, and the difficulty of raising the roots and cereals grown in our more favored country.

Even to the better informed amongst us, I think it will be a matter of surprise to learn that the summer of Red River is nearly four degrees warmer than the summer at Toronto, as ascertained by a comparison of corsesponding observations; and that in the district of Assiniboia, wheat, oats, barley, Indian corn, hops, flax, hemp, potatoes, and all kinds of garden vegetables, succeed admirably; and Professor Hind asserts that the potatoes, cauliflowers, and onions, he has not seen surpassed at any of the Provincial Fairs. From the statistics furnished by Professor Hind, there appears to be no doubt of the perfect adaptation of the climate of the valley of the Red River to the ordinary purposes of husbandry.

It is true that the prevailing characteristic of the winter months is long continued, intense cold, the temperature being 26 degrees lower than the temperature of Toronto; but, on the other hand, the temperature in spring is only 2° 83 lower than with us; that of the autumn, 6° 94; while the summer, as I before stated, shows an excess of 3° 78; so that the mean of the spring and summer months at Red River is nearly one degree higher than the corresponding months at Toronto. Added to this, the much greater rain fall, being 27° 74 inches more during the summer months than at Toronto, produces a wonderful richness in the vegetation, and, combined with the absence of late spring or early autumn frosts, renders the whole district peculiarly favorable for agricultural operations.

Now that the practicability of establishing a direct communication between Toronto and the Red River has been proved, the tide of emigration must soon be directed to those vast regions, even should the more magnificent scheme of Railway and Steamer communication to the Pacific and the rich gold fields of British Columbia be much longer in realization.

In the meanwhile, we in Canada are under no small obligations to those gentlemen whose explorations have already furnished us with so much valuable information, and I believe I am correct in stating

that a still fuller and more interesting report, embracing an account of his exploration of the valley of the Saskatchewan, may soon be looked for from the pen of Professor Hind.

In connection with this subject I may be permitted to allude for a moment to a forthcoming work from the pen and pencil of a Canadian artist and a member of the Institute, Mr. Paul Kane, which promises to afford much new and interesting information with regard to the countries between this and the Pacific. During his travels through these countries, Mr. Kane amassed not only a great deal of valuable information relative to the customs, manners, and habits of the various Indian tribes, but made also a vast number of most interesting sketches; and I have lately had the pleasure of seeing some of the chromo-lithographic drawings taken from these sketches, and intended to illustrate the letter-press of his work, which will shortly be brought out in London. I am sure I may safely say that the book will be hailed by both the Canadian and English public, as a most timely addition to the scanty knowledge we as yet possess of a quarter of North America which is now beginning to awaken so much interest in the minds of all.

In geological science, Canada, thanks to the labours of Sir William Logan and his able coadjutors, must always hold a place of honor. Indeed it may safely be asserted that the geological survey has done more for the reputation of Canada among intelligent and scientific men abroad and in England, than anything else connected with the country. The Report of the survey published last year is full of most interesting matter, and includes the Report of Sir William Logan on the distribution of the crystalline limestones in the Laurentian rocks of Grenville, Harrington, and the adjacent Townships in Eastern Canada; Mr. Murray's Report of his explorations in the country lying between Lake Huron and the Ottawa River; four Reports by Professor Sterry Hunt of his investigations of the lime-feldspar rocks, and their associated minerals of the Laurentian formation; Researches on the composition of the waters of the Ottawa and St. Lawrence; Examinations of the serpentines and other metamorphic rocks of the Eastern Townships, and of a series of traps and intrusive rocks. Mr. Richardson's Report relates to an exploration of the Island of Anticosti; and a Review of the palæontological relations of the Anticosti rocks, with a descriptive list of various new species of organic remains, constitute the subjects treated of in the Report of Mr. Billings.

There has also just been issued a separate and very interesting volume, containing figures and descriptions of Canadian organic remains. The descriptive part is by Mr. Billings, the palæontologist of the Geological Survey of Canada; Mr. J. W. Salter, one of the palæontologists of the Geological Survey of the United Kingdom; and Mr. T. R. Jones, Assistant Secretary of the Geological Society of London. The plates, which are beautifully executed, are all the works of first-rate artists, and the whole work will prove a most valuable addition to the scientific information which the geological survey has been the means of furnishing in relation to the palæontology of Canada.

In the departments of zoology and botany, the Natural History Society of Montreal continues, as in former years, to labor zealously and effectively, and in the pages of the Magazine, edited by a Committee of that Society, the Canadian student will find much valuable information relating to the zoology and botany of his country.

And here I cannot refrain from alluding to some remarks which I recollect having met with in the September number of our own *Journal*, upon the very great desirableness of having a zoologist and botanist attached to our geological survey. With the writer's suggestions I most heartily agree. Both the flora and fauna of this country have as yet received but little attention from scientific men as compared with the research and labor which have been so well bestowed upon its geological features.

The destruction of our forests, and the rapidly progressing settlement of the country, will soon render it difficult to obtain specimens, or to observe the habits of many of the wilder and rarer species of our quadrupeds and birds. With the former more especially, the destruction of their usual haunts in the depths of the forests will soon be followed in many cases by the almost total extinction of the species, and when perhaps, at a later day, this deficiency in our scientific staff has been filled up, the golden opportunity will have passed away.

I trust therefore that the members of the Institute will permit me to urge these considerations upon their attention, and that some steps will be taken by the Society with the view of bringing the matter at some future day under the notice of the Provincial Government.

Passing from this subject, I am naturally led to the consideration of our own position in respect to the aid which we receive in the shape of pecuniary support from the Provincial Government; and while I would record the grateful sense which I, in common, I am sure, with

all my fellow-members, entertain of the long continued liberality of the Government towards us, I cannot help expressing my regret that it has been deemed advisable to withdraw the grant formerly made to the Toronto Athenæum, and which we have enjoyed since the amalgamation of the two institutions. The depressed state of the financial affairs of the country, and the consequent necessity for a strict economy in the expenditure of the public moneys, induced the Government, I suppose, to limit their liberality last year to the grant of £250, but I hope that it will not be found necessary to confine it to that amount hereafter.

I cannot but regard a liberal appropriation from the public funds for the purpose of aiding and supporting societies having for their objects the advancement of science and the spread of knowledge, as a wise and judicious act on the part of any government, and with reference to this point I trust you will pardon my again quoting from the excellent address of Professor Owen, to which I have already alluded. In that part of it in which he alludes to the aid and countenance which the British Government had always given to science and scientific institutions, he proceeds to show how science makes *return* to governments for fostering and aiding her endeavours for the public weal:

"Every practical application of the discoveries of science," says the Professor, "tends to the same end as that which the enlightened statesman has in view. The steam engine in its manifold application, the crime-decreasing gas lamp, the lightning conductors, the electric telegraph, the law of storms, and rules for the mariner's guidance in them, the power of rendering surgical operation painless, the measures for preserving public health, and for preventing or mitigating epidemics—such are among the more important practical results of pure scientific research, with which mankind have been blessed, and states enriched. They are evidence unmistakeable of the close affinity between the aims and tendencies of science, and those of true state policy. In proportion to the activity, productivity, and prosperity of a community, is its power of *responding to the calls of the Finance Minister*. By a far seeing one, the man of science will be regarded with a favorable eye, not less for unlooked for streams of wealth that have already flowed, but for those that may in future arise out of the application of the abstract truths, to the discovery of which he devotes himself."

I think, then, it will be readily conceded, that to maintain and advance the interests of associations formed for the promotion and encouragement of scientific pursuits, and the spread of general knowledge, is clearly an act of enlightened patriotism on the part both of the government and the people. It behooves us, therefore, while looking for a continuance of that fostering aid which has hitherto been liberally accorded to us by the government of the country, to take good heed that we are faithful to the trust committed to us, and labor, each of us according to our ability and opportunity, to promote the ends for which this Institute was established.

In every association of this kind there must always be a large class of members who have neither time nor opportunity for contributing much information on scientific or literary subjects, and who have joined the society more, perhaps, for the sake of aiding and encouraging an institution which they believe to be both a desirable and useful one for the country, than with any idea of ever taking an active part in its proceedings. But even these persons, at the cost of but little personal exertion, can render many important services. Every one has it in his power to observe; and would we but make good use of the faculties with which God has blessed us, we should find that each could contribute something to the general stock of knowledge.

And, lastly, the objects of our weekly meetings, be it remembered, will be very inadequately fulfilled, if they simply afford to our members an agreeable and intellectual mode of passing an evening. We seek, by the papers which are there read, and by the discussions which are invited, to awaken a spirit of enquiry, to excite and encourage the desire for the acquisition of knowledge; and, by the influence of mind upon mind, to awaken those tastes and aspirations which may lead us in *some degree* to aim at being fellow laborers with those great men who, while they are advancing the triumphs of scientific discovery, and enlarging the boundaries of knowledge, are conducing at the same time to the progress and the happiness of mankind.

ON THE FOSSIL CORALS OF THE DEVONIAN ROCKS OF CANADA WEST.

BY E. BILLINGS, F. G. S.

Read before the Canadian Institute, February 26th, 1859.

The following paper contains notices of forty-three species of corals collected in the Devonian rocks of Canada West, being all that I have seen that are sufficiently well preserved to admit of description. Besides these there are in the large collection of the Geological Survey a great many specimens in a fragmentary condition which appear to belong to eight or ten other species. The total number of Devonian corals known in Canada may be estimated at about fifty. It is highly probable that a few more may be discovered, but I do not think the total will ever much exceed sixty species.

Of the forty-three species described in this paper, the following six occur in the Devonian formation in Europe:—*Favosites Gothlandica, F. hemispherica, F. basaltica, F. cervicornis, F. polymorpha,* and *Heliophyllum Halli. Favosites Gothlandica* is the only species that occurs in both Silurian and Devonian rocks.

It is worthy of particular notice that no species of *Cyathophyllum* have yet been found in Canada, while the genus *Heliophyllum* affords six species. My own impression is that this latter genus is only a section of *Cyathophyllum,* although in deference to the opinions of others I have recognized it as distinct.

In designating the formations I have used the term "CORNIFEROUS" as including both the Onondaga and Corniferous limestones of the New York Survey. All the species, except two, occur in this group of rocks. Only a few fossils have been collected in the Hamilton group, in Canada; and if any increase should hereafter be made in the number of species of Devonian corals, it is from these rocks they will most probably be procured.

Genus FISTULIPORA (McCoy).

(McCoy. *British Palæozoic Fossils,* p. 11.)

Generic Characters.—"Corallum incrusting, or forming large masses, composed of long, simple, cylindrical, thick-walled tubes, the

mouths of which open as simple, equal, circular, smooth-edged cells on the surface, and have numerous transverse diaphragms at variable distances; intervals between the tubes occupied by a cellular network of small vesicular plates, or capillary tubules traversed by diaphragms."

This genus has no radiating lamellæ, a character which constitutes the only difference between it and *Heliolites* (Dana).

Fistulipora Canadensis (Billings).

Fistulipora Canadensis. Billings. *Geo. Sur. Canada, Rep. for* 1857, p. 165; *Can. Nat. and Geologist*, Vol. III. p. 420.

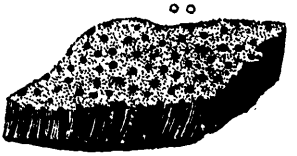


Fig. 1. *Fistulipora Canadensis.*

Corallum forming sub-pyriform, irregular, contorted masses, or wide, flat, undulating expansions or layers, from one-half of an inch to one inch in thickness, which are based upon a thin, concentrically wrinkled epitheca. Cell-tubes half a line or less in diameter, and about one line distant from each other; the mouths of the tubes protruding a little above the general surface. Transverse diaphragms thin, horizontal or flexuous, and sometimes very numerous, there being in some of the tubes three or four in half a line of the length of the tube. The intercellular tubules are polygonal, and about four in the diameter of one of the principal cells; their transverse diaphragms are well developed, usually four or five to one line of the length.

F. Canadensis differs from the other described species in the following respects:—From *F. decipiens* (McCoy) in having the cell-tubes more distant and the diaphragms more numerous, and from *F. minor* (McCoy) in the same particulars, the cell-tubes of the latter species being still smaller and closer together than in *F. decipiens*.

This coral much resembles *Heliolites porosa* (Goldfuss), but can be readily distinguished by the absence of the radiating septa.

Locality and Formation.—Devonian; Corniferous or Onondaga limestone; lot 6, con. 1, Township of Wainfleet; at the east end of Lake Erie.

Genus Favosites (Lamarck).

Generic Characters.—Corallum dendroid, or forming pyriform convex or depressed hemispherical masses, composed of polygonal slender corallites, which are divided transversely into numerous compartments by complete or incomplete diaphragms. Walls, with one or more rows of circular pores forming communications between contiguous cells. Radiating septa, represented by series of small tubercles or short spines.

The genera *Emmonsia*, of Edwards and Haime, and *Astrocerium*, Hall, appear to be identical with *Favosites*.

Favosites Gothlandica (Lamarck).

This species, which no doubt should be regarded as the type of the genus *Favosites*, was established, as its name implies, upon specimens procured from the island of Gothland, in the Baltic Sea, where it occurs in a coralline limestone, that is known to be the equivalent of the Wenlock rocks of England, and of the Niagara group on this continent. Although more abundant, and more often quoted by geologists, than any other species, yet we know of no palæozoic coral concerning which there exists so great a diversity of opinion. Indeed, so variously has it been defined by the best authors, that, without much comparison and fusing of differences, it is hardly possible to show that it includes any of our Devonian specimens. The following are the descriptions of several of the leading palæontologists:

1st. Goldfuss. *Petrefacta Germaniæ*, Vol. I., p. 78; Pl. 26, Fig. 3 *a*, 3 *b*, 3 *c*, 3 *d*, 3 *e*, 4 *d*, 4 *c*.

This distinguished author describes the species as being globular or placentiform, with prismatic tubes either sub-equal or with smaller ones interposed; transverse diaphragms flat; communicating pores in two rows.

He does not give any measurements, and we are therefore obliged to rely upon his figures for the dimensions of the tubes. They are as follows:—In fig 3 *a*, which is generally admitted to be a very characteristic form of the species, the tubes are, upon an average, one and a half lines in diameter, some of them being two lines and others only one line. This is important, because, as we shall see hereafter, the species is described by several palæontologists as having the cells only one line wide, upon an average. In this figure two rows of pores are represented, those of the same series being distant from each other

about half a line. In general they are opposite, but in some places those of one row alternate with those of the other. In fig. 3 *e*, which represents a portion of the specimen a little enlarged, the pores are placed alternately, and surrounded by a narrow elevated rim. The faces of the tubes exhibit a few scattered tubercles, which, according to Edwards and Haime, represent the radiating lamellæ in a rudimentary state. In fig. 3 *c*, the average width of the tubes is about one and a quarter lines, and in 3 *d*, the same. In 4 *c*, which Goldfuss refers to *F. basaltica*, most of the tubes are one and a half lines in diameter, with a few very small ones interposed. In 4 *d*, which is an enlargement of a portion of 4 *c*, two of the faces exhibit a single row of pores, but upon a third face there appear to be two series, one of which however is but imperfectly shown, as it is much obscured by the shading of the drawing. Specimens agreeing well with this figure, are common in the Devonian of Canada West. The other figures given by Goldfuss exhibit tubes one and a half lines in diameter on an average. He also states that one of his specimens came from Drummond Island. (*Ferner kommt sie auch, nach einem Exemplar der Akademischen Sammlung auf Drummond-Island vor.*) The specimen must have been therefore collected from the Niagara limestone, which we know to be the most recent rock of that locality.

2. Edwards and Haime. *Polypiers fossiles des Terrains Palæozoiques.* p. 233.

These authors describe *F. Gothlandica* as consisting of convex somewhat elevated masses, with tubes a little unequal in size, each having ten or twelve radiating septa, represented by spiniform tubercles. On each face of the tubes two series of pores, each pore surrounded by a small elevated border; the pores of the same series a little more distant than is represented in the figures of Goldfuss.—They alternate a little with those of the neighboring series, and the spiniform tubercles representing the radiating septa more numerous and prominent than they are shewn to be by the same author. Diameter of the large tubes, three millemeters, or one line and a half.

In another work, British Fossil Corals, Palæontographical Society's publications, Edwards and Haime describe the species in the same general terms, but state that the breadth of the calices is "somewhat more than one line." They consider *F. Niagarensis*, Hall, to be *F. Gothlandica*, and also deny that this latter species occurs in the Devonian.

3. Prof. McCoy, *British Palæozoic Fossils*, p. 20.

Pofessor McCo thus describes *F. Gothlandica*,—"Corallum forming irregularly pyriform or very large circular, slightly convex masses, with concentrically wrinkled base, composed of polygonal tubes, averaging one line in diameter when adult, (but with occasional large irregular spaces, in which the diameter is only half a line,) with very numerous young smaller interpolated columns, of smaller diameter, and fewer angles; transverse diaphragms flat, about three in the space of one diameter; external walls as exposed in rough vertical fracture, slightly roughened by small transverse wrinkles, which obscurely crenulate the edges, sides with one or two rows of large round communicating pores.

"I agree with Mr. Lonsdale, in thinking that the *Favosites absaltica*, (Goldf. Sp.) characterised by having but one row of pores on each face of the tubes, should be viewed as only a variety of this species; as I think I have seen from one to three rows in portions of a single mass.

"Specimens from Gerolstein, in the Eifel, seemed to agree (on the most careful comparison of good specimens) perfectly with the silurian ones from Wenlock, and the carboniferous ones from Derbyshire. The great number of the young tubes gives a peculiar irregularity of aspect to the surface of this species."

It will be perceived by the above how widely the best palæontologists differ in their descriptions of *F. Gothlandica* upon the same very important point, the width of the corallites or tubes. According to Professor McCoy, they are upon the whole less than one line in diameter; the adult cells, or the largest, only reaching that size, while there are a great many much smaller. From Edwards and Haime we learn that they are over one line, while by the figures of Goldfuss they are shewn to be full one line and a half, the tubes above that size being more numerous than those below. This diversity might not appear to be of much consequence, and yet those geologists who have had occasion to work a good deal among rocks abounding with these corals know that the difference of half a line in the average size of the tubes in two specimens of *Favosites* gives to them a very dissimilar aspect, and strongly suggests the idea of two species. The more, however, we examine into the subject the more evident does it become that mere difference in size is not sufficient to separate species unless the internal structure also differs. At all events the above comparison

demonstrates to us the very weighty fact that in Europe *F. Gothlandica* is found to be variable in the character that is most generally relied upon as a means of identifying the species.

In order to ascertain whether or not our Canadian forms could be divided into several species, I undertook to write out a detailed description of each specimen in the large collection of the Geological Survey, noting the following characteristics:—1st, the diameter of the tubes. 2nd, the form of the diaphragm, and their structure, whether complete or incomplete. 3rd, the presence or absence of the spiniform tubercles. 4th, the number of rows of pores. 5th, the distance of the pores from each other. 6th, the presence or absence of the elevated border around the pores. 7th, the presence or absence of longitudinal lines or striæ on the faces of the tubes. The specimens were from Anticosti, Cape Gaspé, the coast of the Bay of Chaleurs, the Eastern Townships, the head of Lake Temiscamangue, the Niagara ridge, Drummond Island, and various localities of Devonian rocks in Canada West. It would be too much to give even a small portion of the details in this paper, and I shall therefore state briefly the principal results.

1st. The size of the tubes in all those specimens which have the internal characters of *F. Gothlandica* is variable, and ranges from three fourths of a line to a little more than two lines.

2nd. The greater number have the tubes between one line and one line and a half in width.

3rd. There are more specimens above one line and a half in the Devonian than in the Silurian.

4th. The diaphragms may be complete or incomplete in the same specimen, or in different parts of the same tube. This character is more common in Devonian than in Silurian specimens, and more so in the lower than the upper Silurian.

5th. The spiniform rays exist in both upper Silurian and Devonian specimens, but have not been observed in the lower Silurian.

6th. The pores are usually in two series, but specimens with one, two, or three rows, are not uncommon in both the upper Silurian and Devonian rocks. I have seen no pores in the lower Silurian specimens.

7th. The elevated border around the pores occurs in both Silurian and Devonian forms, and in the same specimen may be absent from one part and present in another.

8th. The pores are usually distant half a line from each other, but sometimes either less or more than that distance.

9th. The longitudinal lines on the faces of the tube may be either present or absent, in different parts of the same specimen, and it is in general much more strongly developed in the Devonian than in the Silurian rocks. I have seen it on European specimens.

If the observer, while examining any large collection of specimens from the upper Silurian or Devonian rocks of Canada, keep in mind and direct his attention to the investigation of the above characters, he will find innumerable shades of difference which will soon convince him that if they are to be regarded as of specific value, it would require nearly fifty specific definitions to give them all expression. It is scarcely necessary to state that a division to one-fourth of that extent would be absurd, and injurious to science. The species which I believe to have been too unguardedly set apart from *F. Gothlandica* are *F. Goldfussi, F. Troosti, F. Niagarensis, Astrocerium parasiticum,* and *A. pyriforme.*

The first of these, *F. Goldfussi,* (Edwards and Haime), was supposed to be different from *F. Gothlandica,* because although there were in general two rows of pores, yet some of the sides of the tubes exhibit one, and others three rows, and further that the pores are nearer together than in the typical species. I am perfectly satisfied that neither of these characters are sufficient.

F. Troosti, (Edwards and Haime.) Founded on the presence of the longitudinal lines on the faces of the tubes, is also not distinct, as that character occurs throughout the series.

F. Niagarensis, (Hall,) is thus described :—"Spheroidal or irregular in form, rapidly increasing by interstitial cells; walls of cells usually thin, pierced by two rows of minute pores; transverse septa thin, often oblique, or bent downwards." Professor Hall further states that it "differs from the *F. Gothlandica* in forming more usually small spheroidal masses, and in the rapid increase of cells almost entirely by interstitial growths, the base continuing small. The size of the cells is always less than in that species, and from this character alone it may be distinguished."

I think that this species consists of young pyriform or spheroidical colonies of *F. Gothlandica* or *F. basaltica,* and also that the other two *A. parasiticum* and *A. pyriforme* are the same. Wherever *F. Gothlandica* and *F. basaltica* occur, these small specimens are more or less common.

It may be that *F. Gothlandica* is capable of subdivision into the above and perhaps many more species. I think it highly probable that species may be so closely allied that the boundary lines between them are not perceptible to our senses, and in such cases, although we may strongly suspect that they are distinct, yet it is not philosophical to proceed by giving them names before we have observed the natural limits by which they are separated.

In conclusion, therefore, I would propose to refer all the above mentioned species back to *F. Gothlandica*, there to remain until they are shewn by good persistent characters, actually observed and pointed out to be different. The description of the species should perhaps be as follows:

Description. — Corallum forming spheroidal, pyriform, or large hemispheric or flattened masses; corallites in general between one line and one and a half lines wide, sometimes less or more, often two lines; transverse diaphragms usually complete, rarely incomplete; mural pores in one, two or three series, usually two, those of the same series about half a line distant, sometimes less; pores surrounded by an elevated margin; faces of tubes with one or two longitudinal striæ, more or less distinctly developed; radiating septa represented by series of small spines, often in the rudimentary form of tubercles.

In general, the condition in which the specimens have been fossilized is such that the pores, the border round the pores, the longitudinal lines and septal spines have disappeared. Even in well preserved specimens these characters will often be absent from particular portions. The following figures are taken from a specimen in the cabinet of the Canadian Institute.

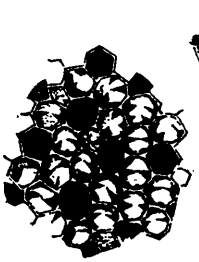


Fig. 4.

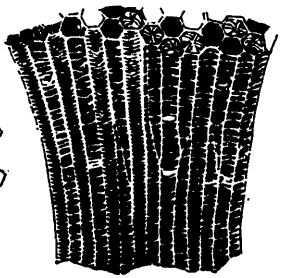


Fig. 2.

Fig. 3.

Fig. 2 exhibits several tubes, some of which have complete diaphragms, and others incomplete. In figure 3 the ends of the tubes of

a portion are represented, some of them with the septal spines fully developed, and extending nearly to the centre. If we are to adopt the several generic and specific names proposed for *F. Gothlandica*, the tubes with the radiating spines would belong to the genus *Astrocerium* of Hall, those with incomplete diaphragms to the genus *Emmonsia* of Edwards and Haime; the others with complete diaphragms would be referred to *Favosites*. We thus have all the characters of three genera in the same specimen. Fig. 4 represents part of a specimen in which the diaphragms are deeply indented in several places around the margin. This character has been relied upon as of specific importance, but as in this specimen there are numerous diaphragms perfectly flat, I do not think it belongs to a different species.

Locality and formation.—F. Gothlandica occurs abundantly in almost every large exposure of the corniferous limestone in Canada West. Fine specimens may be procured at the large quarry belonging to Mr. Savage, lot 6, con. 1, Wainfleet.

FAVOSITES HEMISPHERICA.—(Yandell and Shumard.)

FAVOSITES ALVEOLARIS. Hall. *Geol. of New York*, p. 157, No. 31, fig. 1, 1 *a*.

FAVOSITES HEMISPHERICA. Yandell and Shumard, *Contrib. to Geol. of Kentucky*, p. 7, 1857.

EMMONSIA HEMISPHERICA. Milne Edwards and Jules Haime. *Polypiers Fossiles*, p. 247, 1851.

Corallum forming large hemispheric or subspherical masses, sometimes two or three feet in diameter. Calyces irregular polygonal, and varying in size from half a line to a little more than one line.—Transverse diaphragms closely set, incomplete, or extending only half way across the tube, usually flexuous and irregularly interlocked along the centre of the corallite. Mural pores in one, two or three series, and when there are three the central row is usually the most conspicuous. Distance of pores from each other about one quarter of a line.

The only difference that exists between *F. hemispherica* and *F. Gothlandica* is, that in the one the diaphragms are always imperfect, and in the other nearly always complete.

This species occurs abundantly in the corniferous limestone in

many localities in Canada West. Very fine specimens may be collected at a quarry on lot No. 6, con. 1, in the Township of Wainfleet, about three miles from Port Colborne. The cells of the specimens are empty, and display all the characters of the interior as perfectly as could be desired. Near Woodstock it is found converted into a white crystalline limestone. The specimens are here also very good ones, but in order to observe the distinguishing peculiarity of the species, (the incomplete septa,) it is necessary to grind down the surface, so as to expose the inside of the tubes.

In England, *F. hemispherica* is found in the Devonian formation at Torquay; and in Spain at Contejo de Castrillon, near Aviles.

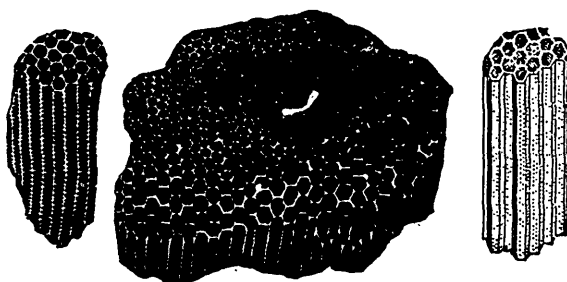


Fig. 6. Fig. 5. Fig. 7.

FIG. 5.—A fragment, selected to show the variation in the size of the tubes in different parts of the same specimen.

FIG. 6.—Shows the incomplete septa.

FIG. 7.—Specimen from near Woodstock, showing the pores.

FAVOSITES BASALTICA.—(Goldfuss.)

Corallum forming convex, subspherical or pyriform masses; corallites variable in size, and either all of nearly an equal width in the same specimen, or with many very small ones interspersed between the larger; transverse diaphragms thin, flexuous or flat, complete or incomplete; mural pores usually in one series. The width of the tubes varies from less than one line to two lines.

The specimens generally referred to this species have a pyriform or hemispherical shape, and small well defined polygonal curved tubes with one row of pores, rarely two. I think, however, that others with a very different shape should be added, for the following reasons:

In the original description given by Goldfuss he first states that the corallites are prismatic, but in the conclusion qualifies this char-

acter by observing, that in some instances, the transition from the angular form to the circular or cylindrical form, is so gradual, that it is difficult to detect the line of demarcation. One of his figured specimens was collected on the shores of Lake Erie; and as we have many from the same locality which are unquestionably of the same species as that represented by his figure 4 *a*, we have the means of knowing with all desirable certainty precisely what form he had in view when he prepared his description. Several of the specimens in the collection of the geological survey from lot No. 6, con. 1, Wainfleet, are small pyriform masses three inches in height, and gradually enlarging from a small base to the width of two inches in the upper part. The cells open out on the surface obliquely, in an upward direction, and, in fractured specimens, are seen to curve from the vertical central axis of the mass outwards. The large cells are one line or a little more in diameter, and the small ones of all sizes down to one fourth of a line. The inner surfaces of the cells are roughened by very numerous short projecting lamellæ, which appear to be the remains of the transverse diaphragms which have been destroyed along the central part of the cavity. This character, of course, can only be observed where the tubes are empty. The large tubes are often perfectly circular, but in general they are more or less polygonal, and surrounded by from five to nine smaller ones. On each face of the small tubes, there is a single row of pores. When the tubes are nearly equal, there are occasionally two rows of pores. I have not yet seen a border round the pores as in *F. Gothlandica*. In some of the tubes there are faint indications of longitudinal striæ. The figure 4 *a* given by Goldfuss does not exhibit the pores, but the roughened interior of the cells and aspect of our specimens is so perfectly represented, that there cannot be the least doubt as to the identity of the species.

Granting, therefore, that the small pyriform masses from Wainfleet are of the species intended by Goldfuss, and taking our departure from them as a starting point, there is, in the Museum of the Geological Survey, a perfect transitional series, from specimens two or three inches to large pyriform masses eight inches in height and six inches in diameter on the top. The cells in these large specimens are always large, and very unequal in size at the smaller or basal extremity of the mass, while above and on the top they become nearly equal, and are upon an average smaller than they are below. When such speci-

mens are broken to pieces, a fragment from the upper part has a very dissimilar aspect from another taken from the base, on account of the difference in the size of the tubes. The top of one of these large colonies would furnish specimens exactly like Goldfuss's figure 4 *c*, with cells of the same size, the same curve, and also with in general only one row of pores, while the upper surface unbroken would give 4 *b*. Thus, according to my view all three of Goldfuss's figures represent colonies of a single species. Edwards and Haime, however, have divided the species; referring specimens in which the cells are exceedingly unequal to *F. Forbesi*, and those wherein there is no great inequality to *F. basaltica*. Their description does not differ materially from that of Goldfuss, and it would be the better course not to separate the species until a distinction can be pointed out.

Returning to the small pyriform specimens, they can be traced in another direction through a gradually changing series to elongated cylindrical forms from one to two inches in diameter, and more than one foot in length. These transitions can only be proved by a good collection of such beautifully preserved specimens as are now in the Museum of the Geological Survey. Fig. 8 represents the first step in the passage from the cylindrical to the globose forms.

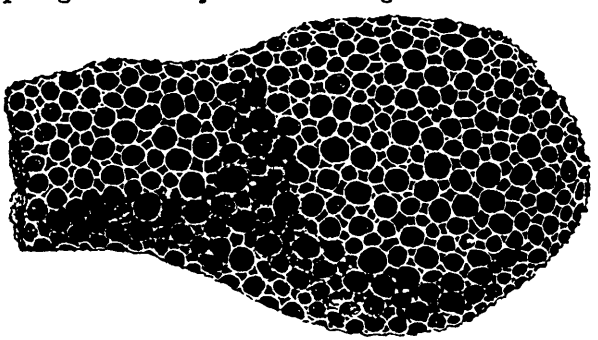


Fig. 8.

As I have already stated, it is in these small specimens that we observe in the extreme the inequality in the size of the corallites. In the large masses, the cells are more nearly equal, and smaller upon an average than the large cells in the smaller.

Notwithstanding all the above, I should not be at all surprised if evidence should be procured hereafter to prove that both *F. basaltica* and *F. hemispherica* are inseparable from *F. Gothlandica*. The

roughness of the inner faces of the tubes of *F. basaltica* above alluded to, may be the effect of some peculiar mode of fossilization, and should not be relied upon as a specific character; and I have seen some fragments which appear to be portions of large dome-shaped masses, that I could not distinguish from *F. Gothlandica* on the one hand, nor from the summit of a large specimen of *F. basaltica* on the other.

Locality and formation.—Rama's farm, near Port Colborne; near Woodstock; lot 6, con. 1, Wainfleet.

FAVOSITES TURBINATA.—(Billings.)

Corallum forming elongate turbinate masses, sometimes two feet in length and six inches in diameter, often curved at the base. Corallites nearly of an uniform size, usually somewhat less than a line in width; transverse diaphragms thin, flat, flexuous, complete or incomplete. Only one row of pores have been observed. Whole surface, except the upper part, covered by a strong epitheca which closes the mouths of the cells.

The distinguishing peculiarities of this species are:

1. The form of the colonies—which often resemble a huge, elongated straight or curved *Cyathophyllum*. Very small ones about the size and shape of *Zaphrentis prolifica* (see fig. 22, page 121) are not uncommon, but they are found of all dimensions up to two feet in length, and six inches in diameter. Some of them are straight and very obtuse, or suddenly enlarging at the base, becoming cylindrical above.

2. The cells are all closed, except on the top of the colony. It appears that the corallites had an average duration of vitality, at the end of which the polyp died, and the epitheca extended itself over and into the aperture, and completely closed it. In many specimens the edges of the disc which fills the mouth of the cell, retains the impressions of the radiating septal spines.

The above two characters appear to me so remarkable that I think this species new.

Locality and formation.—Rama's farm, near Port Colborne; lot 19, con. 3, Walpole; lot 30, con. 4, Cayuga. Corniferous limestone.

FAVOSITES CERVICORNIS.—(De Blainville.)

This species is one of those included by Goldfuss in his *Favosites polymorpha.* The specimen represented by fig. 9 agrees very well

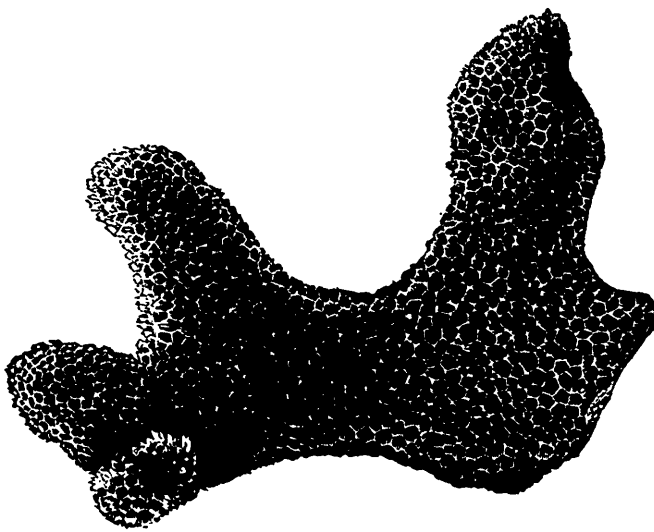


Fig. 9.—*F. cervicornis* from Wainfleet, C. W.

with those figured in the *Petrifacta Germaniæ*, pl. 27, and also with that of Edwards and Haime, *British Fossil Corals*, pl. 48, fig. 2. We have other specimens in which the cells are on an average from half a line to one line in width, which cannot be separated from the one I have figured. In some, the branches are nearly two inches in diameter, and in consequence of the thickening of the walls, the apertures of the cells are often perfectly circular.

Locality and formation.—Rama's farm, lot 6, con. 1, Wainfleet, and near Cayuga, C. W.

FAVOSITES POLYMORPHA.—(Goldfuss.)

These small branching corals have been referred to several species supposed to be distinct by some authors, while according to Mr. Lonsdale and Professor McCoy, they all belong to one natural group, of which the proper appellation is *F. polymorpha*, Goldfuss. In their description of *F. reticulata*, *British Fossil Corals*, p. 216, Edwards and Haime, also have the following remarks:

"We have provisionally admitted as forming distinct species, various ramose Favosites which have previously been described as such by Blainville, but which may probably, when better known, be found to be only varieties of the same species. Such are *F. reticulata*, *F. cervicornis*, and *F. dubia*. The latter differs, however, from the first, by its branches not being coalescent, nor so closely set, and by the calices being rounded and obliquely placed on the surface of the branches. *F. cervicornis* has its calices more unequal in size, its walls thinner, and its branches longer and more irregular. All these have only a single line of pores on each side of the walls, and these pores are large, and placed at a distance from each other."

These authors have recognised *F. dubia* among specimens from Ohio; and in Canada all the forms represented in the European books occur. The branches occur of all sizes from four lines to one inch and a half in diameter. The walls of the corallites are often so greatly thickened that the apertures are distant from each other as in figures 11 and 12, which resembles *F. dubia* of Blainville, and the

10 11 12

Figs. 10, 11, 12.—Three forms of *F. polymorpha* from the corniferous limestone, Canada West.

variety *F. gracilis* of Goldfuss. Fine reticulated masses may be procured along the shores of Lake Erie near Port Colborne. The other forms are not uncommon wherever there is a large exposure of the corniferous limestone in Canada West. Although I have placed *F. cervicornis* separately, yet I am not satisfied that it is a distinct species.

Genus MICHELINIA.—(De Koninck.)

Generic Characters.—"Corallum compound, forming rounded, or conoidal masses of inseparably united, thick-walled, polygonal tubes

of large size, marked internally with numerous vertical lamellar striæ, and communicating pores; base of cells filled up by very irregular, numerous, highly inclined vesicular plates, not forming distinct horizontal diaphragms; external or basal epitheca of the general mass, strong, concentrically wrinkled, and sometimes spinose."—*McCoy, British Palæozoic Fossils, page* 80.

This genus differs from Favosites in the vesicular character of the transverse diaphragms, and in the radiating lamellæ being represented by vertical striæ on the inner surface of the cells, instead of series of minute spines. The cells are usually much larger than in Favosites. The genus appears to be confined to the Devonian and carboniferous formations.

MICHELINIA CONVEXA.—(D'Orbigny).

(*Prodr. de Paleont.*, t. 1, p. 107, 1850.)

Corallum forming hemispherical, or erect rudely cylindrical masses, several inches in diameter; the base covered by a strong wrinkled epitheca. Adult calices from four to five lines in diameter; about forty septal striæ in each; pores small, arranged in several vertical series in some of the tubes, irregularly distributed in others; distant from half a line to more than one line. Diaphragms very convex in the centre of the tubes, and usually with three or four smaller rounded prominences on their surface; a vertical section shews that

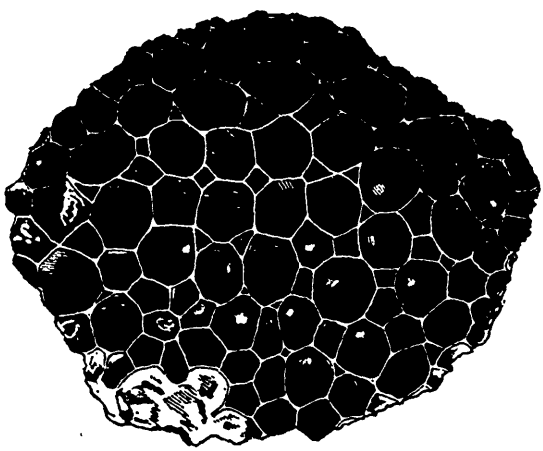


Fig. 13. *Michelinia convexa.* Specimen from Rama's farm, near Port Colborne.

they are more vesicular at the sides of the cells than in the centre, where they are from half a line to one line and a half distant.

MM. Edwards and Haime in their description of this species say that there are two vertical series of powers on the larger plane sides of the cells and one on the smaller. Our specimen, however, shew that this is not a constant character.*

Locality and Formation.—Devonian; Onondaga and Corniferous limestones. Rama's farm, Port Colborne. Savage's quarry, lot 6, con. 1, Wainfleet. Oxford, near Woodstock, and in numerous other localities in Western Canada. This species occurs in Michigan and in Preston County, Virginia.

MICHELINIA INTERMITTENS.—(Billings.)

Corallum forming large hemispherical masses; calices nearly equal in diameter, with periodical constrictions within the distance of half a line to one line and a-half. Diaphragms numerous, thin, slightly convex, sometimes shewing four or five vesicular swellings upon a single surface. The septal striæ are but slightly developed, about fifty to the inner circumference of the cell. Pores only visible in the intervals between the constrictions where the walls are thin, three or four series on each plane side of the tube. The cells are from three to four lines in diameter.

The constrictions give to the cells of this species a circular aspect, whereas they are in fact polygonal. I am not certain that this fossil is different from the species described by Edwards and Haime (op. cit. p. 299,) under the name of *Chonostegites Clappi*. If so it should I think be called *Michelinia Clappi*, as it exhibits all the characters of Michelinia. The constrictions appear to be occasioned only by the periodical thickening of the walls of the cells. Where not constricted the cells have the usual prismatic shape, with pores and septal striæ.

Locality and Formation.—The only specimen I have seen was collected by Mr. Murray, near Woodstock, C. W. It was found loose, but in lithologieal characters, it resembles the other species from the Corniferous limestone of that region.

* See Polypiers Fossiles des Terrains Palæozoiques, page 251.

MICHELINIA FAVOSOIDEA (Billings.)

Corallum forming large hemispheric or flattened masses; cells unequal in size, adult diameter about two lines and a-half; diaphragms, flat, horizontal, with small vesicular swellings, usually around the margins of the upper surface; septal striæ very obscure, six to eight on each plane side of the cells; pores, very small, irregularly distributed, sometimes in rows of five or six across the cell, about one-sixth of a line distant from each other in some places, and sometimes absent in spaces of half a line in width. This species has much of the aspect of *Favosites favosa*, Goldfuss, but is notwithstanding very clearly a true Michelinia.

Locality and Formation.—Corniferous. Rama's farm, Port Colborne.

Genus ALVEOLITES.—(Lamarck.)

Generic characters.—Corallum dendroid or in convex masses. Calices oblique, subtriangular or irregularly ovoid, presenting within three small longitudinal projections representing the radiating septa. A few communicating pores in the walls of the corallites. Transverse diaphragms complete.

The following species appear to belong to this genus:

ALVEOLITES LABIOSA.—(Billings.)

Branching, sometimes sub-palmate, stems, about two lines in thickness; cells small, oval or sub-triangular, the lower lip, when perfect, strongly projecting; width of each cell, one fifth of a line; distance of cells from each other, half a line.

14 15 16

Figs. 14 and 15. *A. labiosa.* Fig. 16. *A. cryptodens.*

The cells exhibit several different forms, according as they are more or less worn. When perfect, they are transversely oval, and formed

on the lower side by a thin projecting lip, but when this lip is a little worn, the aperture assumes a triangular form, one of the acute angles pointing downwards. It is in this condition that the specimens are usually found. This appears also to be a reticulating species.

Locality and formation.—Rama's farm, and near Cayuga. Corniferous limestone.

ALVEOLITES CRYPTODENS.—(Billings.)

The only specimen of this species that I have seen is dendroid, the stems three lines in diameter, and the bifurcations making an angle of about seventy-five degrees. The cells open out very obliquely to the surface, and are about one line distant, measuring from the centre in a direction across the stem, but rather more than a line in the longitudinal direction. In a transverse section of the branch of the corallites, the tubes in or near the centre are not more than one-fourth of a line in width, but they are twice that size at the mouth. Two small tooth-like ridges occupy the inner surface on the side towards the exterior, apparently half a line from the mouth or lower lip of the cell. In some of the cells I think I can see a corresponding projection on the other side. The pores are also some distance within the tubes, but are distinctly visible in two of the corallites.

Locality and formation.—Rama's farm, near Port Colborne.

Genus SYRINGOPORA.—(Goldfuss.)

Generic characters.—The fossils of this genus are fasiculated or composed of large aggregations of long cylindrical corallites somewhat parallel to each other and connected by numerous smaller transverse tubes. The exterior walls consist of a well developed solid epitheca; the cells circular; radiating septa rudimentary; transverse diaphragms infundibuliform or placed one within another like a series of funnels.

About twenty species of this genus are known, and these are found in the Upper Silurian, Devonian and Carboniferous formations.

SYRINGOPORA TUBIPOROIDES.—(Yandell and Shumard.)

(*Contributions to the Geology of Kentucky*, page 8; 1847.)

(M. Edwards and L. Haime, *Polypiers fossiles des terrains palæozoiques*, p. 292.)

This species is found in large masses of long slightly flexuous corallites. These have a diameter of about one line and a-half, and

owing to their flexuosity, are at times in contact, and often two, three or four lines apart. In large colonies which have grown luxuriantly without the interference of disturbing causes, the corallites are more regular than in the smaller or stunted groups, in which the corallites are much bent and confused. The connecting processes are very short and distant, and appear to be sometimes mere inosculations of the stems. The corallites, after growing separately for a short distance, approach each other and seem to grow together or adhere to each other for the space of a line and a-half or more, they then diverge and again unite. These points of contact occur at distances varying from three lines to six, nine, or even twelve lines. Externally they exhibit numerous other indistinct annulations, and also faint indications of longitudinal striæ.

Locality and Formation.—Devonian; abundant in the Corniferous limestone of Canada West.

Fig. 17. *S. tubiporoides.*

Fig. 18. *S. Hisingeri.*

Fig. 19. *S. elegans.*

SYRINGOPORA HISINGERI.—(Billings.)

This species forms large masses of very long, nearly parallel or slightly varying, slender corallites, which are closely aggregated, and present a rugged or knobby appearance from the great number of the connecting tubes. The diameter of the corallites is one-third of a line, or a little more. The tubes of connexion are distant from two-thirds of a line to one line and a-half. The distance between the corallites is for the greater part less than their diameter. The young corallites branch from the sides of the adult individuals, and immediately become parallel with the parent, and connected with it again by the usual tubes of connexion.

Formation and Locality.—Devonian; Corniferous limestone, Canada West. (common.)

Affinities of S. Hisingeri.—Edwards and Haime have described two species from Ohio, collected in rocks of the age of the Onondaga and Corniferous limestones, which appear to be closely allied to this; the following are their descriptions:

"SYRINGOPORA VERNEUILLI.—Corallites long, distance between them twice or thrice their diameter, sub-flexuous and angular at the points of the origin of the tubes of connexion; these are distant two or three millimetres; diameter of the corallites two-thirds of a millimetre."—Devonian: Columbus, Ohio. (*Polypiers Fossiles*, p. 289.)

"SYRINGOPORA CLEVIANA.—Corallites slightly flexuous, distant once or twice their diameter, which is two-thirds of a millimetre."—Devonian: Carolton and Dayton, Ohio. (*Polypiers Fossiles*, p. 295.)

The first of these species is different from S. Hisingeri in the greater distance of the corallites. The description of the second is too incomplete to enable us to decide whether it refers to the same species or not. The authors state that their specimen was imperfect, and they were not certain it had not been previously described.

SYRINGOPORA PERELEGANS.*—(Billings.)

Description.—Corallites, one line in diameter, sometimes a little more or less, distant a little less than one line; connecting tubes half a line in diameter, and distant from one line to one line and a-half, usually projecting at right angles, but sometimes a little oblique. Epitheca with numerous annulations, generally indistinct, but under certain circumstances of growth sharply defined and deep, so much so as to give to the corallites the appearance of the jointed stalk of a crinoid. The young individuals are produced by lateral budding, and in one specimen the whole colony appears to be based upon a broad lamellar foot secretion like that which forms the base of a Favosite.

The distance of the corallites is usually about a line, but, like all the other species, this one varies a good deal in this respect. When some cause has intervened to prevent their regular growth, they are much flexed and consequently at times more distant than when they have been disturbed. The connecting tubes on the same side of the corallite are three or four lines distant, but generally on the other sides one or two others in the same space occur, making the average distance one line or one line and a-half.

* Since the publication of the Geol. Reports of last year, I have ascertained that one of Eichwold's species is called *S. elegans*, and have therefore changed the name of ours.

Locality and formation.—Devonian; Corniferous limestone, near Woodstock, Canada West.

SYRINGOPORA LAXATA.—(Billings.)

This species occurs in large colonies which appear to be founded upon a common base, but with no lateral processes between the corallites; these latter are usually two lines or a little more in diameter, the distance between them being from three to eight lines. Individuals are occasionally found single or separated from the parent group.

Locality and formation.—Near Woodstock. Corniferous.

SYRINGOPORA NOBILIS.—(Billings.)

This species is distinguished from all others of the *genus* by the great size of the corallites, which sometimes attain the diameter of five lines. In the young state the form is that of an *Aulopora*, but the adult specimens have branches three or more inches in length, with an internal arrangement of infundibuliform diaphragms, which are so blended together as to produce a structure somewhat similar to the vesicular tissue of the *genus Cystiphyllum*. The external wall is thick and rather strongly annulated.

Locality and formation.—Lot 5, Concession 13, Walpole. Corniferous.

Genus AULOPORA.—(Goldfuss).

Generic Characters.—Corallum fixed, creeping, increasing by lateral gemmation; corallites hollow, cylindrical, or trumpet-shaped, the visceral cavity of the young communicating with that of the parent; radiating septa represented by minute spines or striæ.

Fig. 20. *Aulopora cornuta.*

AULOPORA CORNUTA.—(Billings.)

In this species, the creeping stolons are about one line in diameter, and the mouths of the cells two lines. The young are produced at intervals of from one to six lines.

It closely resembles the figures of *A. tubæformis*, given by Goldfuss, but is always much larger.

Locality and formation.—Lot 6, con. 1, Wainfleet. Corniferous.

AULOPORA FILIFORMIS.—(Billings.)

This species occurs in somewhat confused groups, or encrusting reticulating masses, composed of tubes about one third of a line in diameter, and branching at intervals which vary in length, from less than one to three or four lines.

Locality and formation.—Occurs at Rama's farm, near Port Colborne. Corniferous. I have seen only one specimen.

Fig. 21. *Aulopora umbellifera.*

AULOPORA UMBELLIFERA.—(Billings).

The mode of growth of this remarkable species is sufficient to distinguish it at once from all other described forms of the *genus*. The parent stems are about one line in diameter, and remain single and straight for the distance of one fourth, or half an inch, when they give off branches in all directions, sometimes ten or twelve at once. These are at first oblique or somewhat parallel with the main tube, and are connected laterally; they then radiate like the spokes of a wheel, at right angles to the parent corallites, each soon giving birth to a similar circlet of new tubes.

It may be that this species should constitute a new *genus*; but as I have not been able to ascertain wherein its internal structure differs from *Aulopora*, I have disposed of it as above provisionally.

Locality and formation.—Lot 6, con. 1, Wainfleet. Corniferous.

Genus ZAPHRENTIS.—(Rafinesque.)

Generic characters.—Corallum simple, turbinate, elongated, free, enveloped in a thin, solid epitheca; radiating septa extending nearly or quite to the centre; transverse diaphragms well developed; a

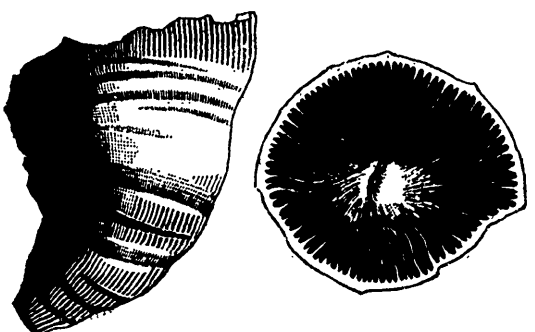
single septal fossette on one side; columella either absent or rudimentary.

The most simple, or in fact, the primitive type of corals of the order *Zoantharia Rugosa* appears to be a hollow cone, with the inner surface striated vertically by numerous thin elevated ridges, which, commencing at the bottom, ascend in a straight line to the margin of the cup. This type made its appearance during the period in which the Black River limestone was deposited. I am not aware that any species of the order have ever been found in older rocks. In a beautiful specimen of *Petraia profunda* in the collection of the Geological Survey, the conical cup is empty nearly to the bottom, and the vertical ridges or radiating septa, are seen to consist of four groups, each originating in a point at the very apex of the cone.—Three of the divisional lines between these groups are marked by a ridge or septum much stronger than the others. On the exterior of the cup there are three lines exactly corresponding in position to the three large radiating septa within. In all corals of this order belonging to the *Cyathophyllidæ* that I have seen, where there is a septal fossette, its position is indicated by the central one of the three external lines. I have examined a great many specimens of different genera and species from the rocks of this and other countries: and in every instance this rule held good. We can therefore always point out the position of the septal fosette, even when we cannot see the inside of the cup. In *Petraia* no transverse diaphragms have been observed, but there is unquestionably a septal fossette, which in the bottom is divided into two compartments by the central primary septum. In the genus *Zaphrentis* we observe another step forward in the complexity of the internal organization. The cone is not only divided into vertical or longitudinal compartments by the radiating septa, but also into horizontal chambers by the transverse diaphragms; these latter being strongly indented in one spot at their margins to form the septal fossette. Out of the various combinations of these four elements—1st, the epitheca, or thin external wall of the cone; 2nd, the radiating septa, extending from the inside of the epitheca towards the centre; 3rd, the transverse diaphragms; and 4th, the septal fossette—many genera have been formed, some of which no doubt must be referred back to Zaphrentis.

ZAPHRENTIS GIGANTEA.—(Lesueur.)

Two feet or more in length, sometimes three inches in diameter; surface with shallow rounded undulations of growth; from seventy to eighty radiating lamellæ, which upon the upper surface of the transverse diaphragms extend nearly to the centre, where they are somewhat flexuous; a single septal fossette near the margin; transverse diaphragms well developed, and extending between the radiating lamellæ, quite to the outer wall, upon approaching which they appear to be curved downwards.

Locality and Formation.—Corniferous limestone. Rama's farm, Cayuga; and numerous other localities in Canada West.



22 23

Fig. 22. *Zaphrentis prolifica*, Side view.
Fig. 23. " " Bottom of cup, shewing the septal fossette, and smooth space, with an elongated ridge-like pseudo-columella in the centre.

ZAPHRENTIS PROLIFICA.—(Billings.)

Description.—Corallum simple, turbinate, curved, with a few broad shallow encircling folds. Septal fossette of a pyriform shape, gradually enlarging from the margin towards but not quite reaching the centre, variable in its position in relation to the curvature of the fossil. Radiating septa in the adult specimens between sixty and seventy-five of the larger size, alternating with a like number of smaller ones, the former in some of the individuals extending to the centre on the bottom of the cup, where they are spirally twisted or irregularly contorted, in other specimens not reaching the centre, which is then occupied by a smooth space or often with a columella elongated in a direction from the septal fossette towards the

opposite side. The septa are also sharp-edged for about half the distance from the bottom of the cup to the margin, then become gradually less projecting until at the edge of the cup they are reduced to mere flat rounded ridges. Length from four to five inches or a little more. Width of cup from two inches to two inches and a half. Depth of cup about one inch.

Very numerous specimens of young individuals of this species, one inch and a-half and upwards in length, and with fifty or more principal radiating septa, occur along with those full grown. These small ones might perhaps be regarded as constituting distinct species, but when good specimens can be observed they all exhibit the characters which are persistent in the large individuals.

The presence of the columella seems at first sight to be a sufficient ground for placing the individuals in which it occurs in the genus *Lophophyllum* (Edwards and Haime). I have, however, examined a great number of specimens and have found every gradation between the following characteristics.

1st. Specimens with a perfectly smooth space in the bottom of the cup, no columella.

nd. With a columella slightly developed.

3rd. Columella large and prominent, with a smooth space all round.

4th. Columella well developed, but with a number of irregular often elongated tubercles in the surrounding smooth space.

5th. The septa reaching the columella, no smooth space.

6th. Septa covering the columella.

7th. Septa reaching the centre, with the columella either prominently, slightly, or not at all indicated beneath.

This last mentioned form must certainly be regarded as a true *Zaphrentis*, all other characters of the genus being present, and from it there is a regular series of forms leading in the seven directions above indicated or more. It appears to me, therefore, that so far from these specimens being divisible into several genera they only constitute one species.

The most persistent characters are the rounded edges of the septa near the margin of the cup, and the oval shape of the septal fossette, in the bottom of which where it reaches the side of the cup is a single septum which projects a little and partially divides the fossette.

This species somewhat resembles *Z. cornicula* (Lesueur), but,

differs in the edges of the septa, which are not dentated as in that species.

Locality and formation.—Devonian; Corniferous limestone. Extremely abundant at Rama's Farm near Port Colborne, Canada West.

ZAPHRENTIS SPATIOSA—(Billings).

Description.—Corallum short, turbinate, moderately curved and very broadly expanding. At the margin of the cup about ninety radiating septa alternately a little unequal and with their edges broadly rounded as in *Z. prolifica*. Length measured on the side of the greater curvature, about three inches, width of cup two inches and a half. Septal fossette unknown.

This species is closely related to *Z. prolifica*, and may perhaps be united with it when its characters become more fully known.

Locality and formation.—Devonian, Onondaga and Corniferous limestone, Rama's Farm, near Port Colborne, Canada West.

Genus AMPLEXUS.—(Sowerby.)

Generic characters.—Same as *Zaphrentis*, but with the radiating septa rudimentary, and extending but a short distance from the outer wall.

AMPLEXUS YANDELLI.—(Edwards and Haime.)

AMPLEXUS YANDELLI. Edwards and Haime. *Polypiers Fossiles*, p. 344, pl. 3, fig. 2, 2 *a*.

Corallum long, cylindrical, curved, gradually enlarging from the small pointed base to the cup, which has a variable diameter of from three fourths of an inch to one inch and a half, at a length of six inches. Surface strongly marked with from forty-five to sixty-five angular septal ridges, which are crossed by numerous small encircling striæ, and larger grooves or folds of growth. Of the smaller striæ there are four or five in one line, and they are often sufficiently strong to give the surface a sub-reticular appearance. The septa extend from about half a line to two lines from the outer wall; they are alternately large and small. The transverse diaphragms are either flat or flexuous. Edwards and Haime have figured a well developed septal fossette.

Locality and formation.—Near Woodstock, Corniferous limestone; also at the falls of the Ohio.

Genus HELIOPHYLLUM.—(Hall.)

Generic characters.—Corallum simple or aggregate; radiating septa well developed, obliquely striated on their sides by thin elevated ridges, which extend from the outer wall in an upward curved course towards the centre. These ridges are connected by numerous thin laminæ which divide the spaces between the septa into small sub-lenticular cells. The transverse diaphragms are thin, flexuous and confined to the central portion of the coral.

The only difference between this genus and *Cyathophyllum* is the absence of the curved striæ from the septa of the latter.

HELIOPHYLLUM ERIENSE.—(Billings.)

Very large, elongate, turbinate, straight or curved; length, from two inches to more than one foot; diameter, one inch and a half to three inches and a half; radiating septa, about one hundred and fifty in a specimen nine inches in circumference. The free edges of the septa in the cup minutely denticulated with from five to seven short spines in the length of one line; the same number of arched striæ on the sides of the septa.

None of the specimens that I have seen are perfect, and the external characters, such as the form of the surface, whether smooth or annulated, have not therefore been ascertained. The cup appears to be deep, and to have an obscure fossette on one side. A specimen one inch and a half in diameter seems to be, without much doubt, referable to this species, and as there are others three inches and a half in thickness, the size must be very variable. The small specimen has only seventy-four radiating septa, or about half the number of the large individuals.

The distinguishing character of the species is the closeness of the arched striæ on the sides of the septa, and the minute denticulation on their free edges.

Locality and formation.—Lot 19, con. 3, Walpole; and Rama's farm.

HELIOPHYLLUM CAYUGAENSE.—(Billings).

Very large, elongate, turbinate, straight, or curved, sometimes in more than one direction; cup deep, with a smooth space in the bottom, and a septal fossette on one side; free edges of septa, with the

spines nearly one line distant from each other. Radiating septa, ninety, at a diameter of two inches; one hundred and eighty, at a diameter of three inches and a half.

This species is clearly distinguished from *H. Eriensé*, by the greater distance between the arched ridges and spines on the edges of the septa. Judging from some of the fragments, the adult individuals were more than one foot in length, and three inches and a half in diameter.

HELIOPHYLLUM CANADENSE.—(Billings.)

Simple, turbinate; surface smooth or annulated, with sharp edged folds; eighty-five radiating septa at a diameter of one inch and three-fourths. In the bottom of the cup the septa reach the centre and are there twisted together so as to form a somewhat solid elevated pseudo-columella, around which there is a deep space occupied only by the septa. The spines and arched striæ are distant about two-thirds of a line from each other. Depth of cup, in a specimen two inches and a half in length, fifteen lines. The adult individuals were probably more than six inches in length.

This species differs from *H. Cayugaense* in having no smooth space in the bottom of the cup, and from *H. Eriensé* in the greater distance of the spines and arched striæ from each other.

When the specimens are perfect, the central boss in the bottom of the cup cannot be seen, as the cavity surrounding it is then occupied by the septa, which extend quite to the centre. But when the cup is much weathered, then the septa are usually absent from this cavity, and the central elevation is exposed. There appears to be a septal fossette.

This also seems to be a large species. One specimen, commencing with a small pointed base, suddenly expands to a diameter of three inches at the length of two inches and a half, and then remains cylindrical to the cup; the whole length being six inches. In this specimen there are about ninety principal septa, with an immature series which, when a little more developed, would double the number. Another specimen, eight inches in length, is much curved, and suddenly constricted in several places.

The external characters are so nearly like those of *H. Cayugaense*, that it will be found extremely difficult to distinguish the one from the other when the cup is not preserved.

Locality and formation.—Lot 19, con. 3, Walpole and Rama's farm. Corniferous.

HELIOPHYLLUM HALLI.—(Edwards and Haime).

H. HALLI.—Edwards and Haime, *Polypiers Fossiles*, p. 408, pl. 7, Fig. 6, 6 *a*, 6 *b*.

Corallum, turbinate or cylindro-conic, in general somewhat elongated and curved at the base, surrounded by an epitheca and some folds of growth. Cup circular moderately deep; a small septal fossette; radiating septa about eighty; arched ridges and septal spines half a line distant from each other. Length from one to five inches; diameter of cup in large specimen, two inches and a half.

This species is closely allied to *H. Canadense*, but differs in having the septal spines closer together, and the cup more shallow. The specimens are often abruptly bent, and annulated with deep sharp folds of growth.

Locality.—Lot 25, con. 3, Bosanquet, Hamilton group. It is said to occur in the Devonian limestone of Torquay, England.

HELIOPHYLLUM TENUISEPTATUM.—(Billings.)

Simple, turbinate, curved, strongly annulated; radiating septa thin, and very numerous in proportion to the size, there being one hundred and fifty in a specimen a little less than an inch in diameter; cup moderately deep bell-shaped; free edges of septa minutely denticulated, with about seven very short spines in one line.

The only specimen seen is one inch and one-fourth in length, and eleven lines in diameter at the margin. The cup is five lines deep.

This species differs from all the others above described, in the greater number of the septa in proportion to the size.

Locality and formation.—Lot 25, con. 3, Bosanquet, Hamilton Group.

HELIOPHYLLUM COLLIGATUM.—(Billings).

Corallum forming large masses of long slender corallites, which are connected together at intervals of from two to four lines, by periodic expansions of the cup; radiating septa about fifty-two; diameter of corallites where constricted five lines; and of the expanded cup six to ten lines. Among the full grown there are interspersed some that are immature and of a smaller size. The cup is shallow, the

sides of the septa striated with from six to eight arched ridges in one line, and their free edges denticulated with the same number of minute spines. In the central area the transverse diaphragms are well developed, and sometimes constitute a pseudo-collumella, which exhibits itself in the shape of a small elevated boss in the centre of the cup.

This species is found in large densely aggregated masses, which have much the external aspect of certain species of the genus *Acervularia*, but with an internal structure identical with that of *Heliophyllum*. It constituted a passage between the latter and *Phillipsastrea*, the only difference between the two being that in the one the corallites are either simple or partially connected laterally, while in the other they are so intimately united that the septa of the contiguous cells are confluent.

Locality.—Rama's Farm, near Port Colborne.

Genus PHILLIPSASTREA.—(Edwards and Haime).

Generic Characters.—This genus, as above stated, does not differ from Heliophyllum, except in having the corallites united laterally throughout their whole length so that the septa of the contiguous cells are confluent.

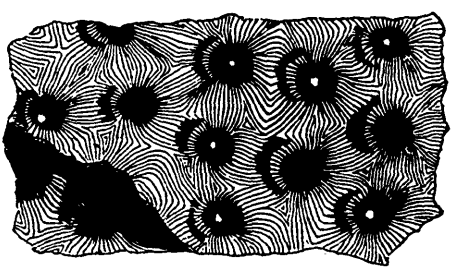


Fig. 24. · *Phillipsastrea Verneuili.*

PHILLIPSASTREA VERNEUILI.—(Edwards and Haime).

PHILLIPSASTREA VERNEUILLI.—Edwards and Haime, Polypiers Fossiles, p. 446, pl. 10, fig. 5, 1851.

This species forms large flat masses, with the surface covered with stars about half an inch in diameter. The cup is usually three lines wide, with a rounded margin from which the surface slopes in all

directions to the contiguous corallites. There are between thirty-five and forty-five radiating septa minutely denticulated or striated on their edges, with from six to ten ridges or spines in one line. When the cup is empty the inner surface is nearly perpendicular, and vertically striated by the free edges of the radiating septa. It is often filled by the rough projecting termination of the pseudo-columella.

Localities.—Lot 2, con. 4, Rainham, Corniferous. It occurs also in the same formation in the State of Wisconsin.

PHILLIPSASTREA GIGAS.—(Dale Owen, sp.

ASTREA GIGAS.—D. D. Owen, geological survey of Iowa, &c., 1844. p. 70, pl. 14, Fig. 7.

This species is in all respects the same as *P. Verneuili*, except that the corallites are much larger and the arched ridges on the sides of the septa more distant. The average diameter of the stars is one inch in most specimens, but I have seen some that were nearly two inches wide. It is not improbable that materials may yet be procured to connect the two species.

Locality.—Lots 5 and 6, in the 14th Concession of Walpole.

Genus CLISIOPHYLLUM.—(Dana.)

Generic characters.—The corals of this genus have the same general external form as those of the genus *Zaphrentis*, and their internal structure is also the same, except that the transverse diaphragms are elevated in the centre so as to form a small conical protuberance in the bottom of the cup, and further, they are enveloped in an outer area composed of vesicular tissue. The septal fossette is small, and in worn specimens its place is often indicated by the prominence of one of the septa on the outside, which, being stronger than the others, forms a longitudinal angular ridge. The cells of the tissue which fills the outer area, slope upwards and outwards.

CLISIOPHYLLUM ONEIDAENSIE.—(Billings.)

This species is from six inches to one foot or more in length, and from one inch and a half to two inches and a half in diameter, often curved more or less abruptly and in more than one direction. The surface is strongly annulated, the ridges being in general sharp-

edged and sometimes imbricating or folding over in an upward direction. The septal striæ on the exterior are very numerous, there being six in the width of two lines, where the diameter is an inch and a-half, and five in the same width, where the diameter is two inches. The cup, in a specimen one inch and a-half in diameter, is three-fourths of an inch in depth, and exhibits the free edges of eighty-two radiating septa; the cone is one-fourth of an inch in height, but appears to have been higher. Another specimen, two inches in diameter, has eighty-four septa; and a third, two inches and a-half in thickness, exhibits ninety-seven: the septa, therefore, appear to vary in number between eighty and one hundred. There is a septal fossette, the place of which is usually indicated in worn specimens by an obscure angular longitudinal ridge. The longitudinal septal striæ on the surface are double the number of the principal septa. The external area is only about one or two lines in thickness, and composed of cells which in worn specimens have a rectangular opening on the surface, and are either of the width of the spaces between the principal septa, or only half that size when they are subdivided by the thin rudimentary septa.

Small specimens of all sizes, up to five inches in length, which appear to be the young, are common; the very large ones, of one foot or more, being not so plentiful. The species is closely allied to *C. coniseptum*, which occurs in the mountain limestone in England, but is more strongly annulated and the septa more numerous. Some of the specimens are nearly straight, but in general they are much twisted in different directions and occasionally subject to rather abrupt diminutions in the diameter.

Locality.—Rama's Farm, and in many places in the County of Haldimand; Corniferous limestone.

Genus BLOTHROPHYLLUM.—(Billings.)

Generic characters.—Corallum, simple, turbinate or cylindrical. Internal structure, consisting of a central area occupied by flat, transverse diaphragms, an intermediate area with strong radiating septa, and an outer area in which there is a set of imperfect diaphragms projecting upwards, and bearing on their upper surfaces rudimentary radiating septa. A thin complete epitheca and a septal fossette. Generic name from Greek Βλωθρός.

This genus differs from *Cliniophyllum* in having the diaphragms flat.

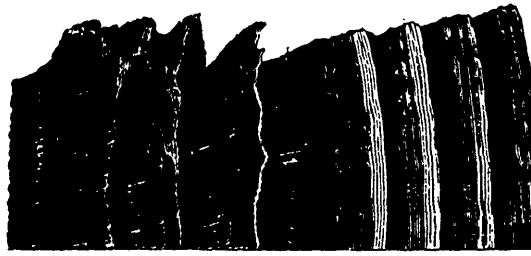


Fig. 25.—*Blothrophyllum decorticatum.*
(One-half of a side view of a fragment. The left hand end of the figure shews the condition in which the specimens usually occur.)

BLOTHROPHYLLUM DECORTICATUM.—(Billings.)

Adult specimens two feet in length and three inches in diameter dimensions of the immature individuals variable, usually slender and irregularly curved, outer area consisting of rather strong rudimentary transverse diaphragms, curving upwards and outwards, distant from two to eight lines, bearing upon their upper surfaces imperfect radiating septa, which do not extend from one diaphragm to another. These septa are half a line distant at the margin of a specimen three inches in diameter. When the epitheca is preserved, the surface of this species is marked by numerous deep annulations and sharp encircling folds, their edges being always on the upper side. The transverse diaphragms in the central area are nearly flat, but have a strong septal fossette upon one side.

In the Corniferous limestone of Canada West, very numerous silicified specimens of this species occur with the outer wall totally removed, leaving nothing but the core of the central area with the partly destroyed curved rudimentary diaphragms attached, presenting an appearance of exfoliation exhibited by no other species in that formation.

Locality and Formation.—Abundant in the Corniferous limestone at nearly all the localities in the County of Haldimand.

Genus ERIDOPHYLLUM (Edwards and Haime.)

ERIDOPHYLLUM.—(Milne Edwards and J. Haime.) *British Fossil Corals.* Introduction, p. 71, and in *Polypiers Fossils,* p. 423.

The genus *Eridophyllum* of Edwards and Haime differs from *Diphyphyllum* only in having the stems connected by lateral processes

somewhat similar to those of the genus *Syringopora*. These processes may be observed in every stage of development upon the sides of the corallites. Some are just elevated above the surface, while others project more or less, but terminate in sharp points before reaching the neighbouring stem. Those which are sufficiently extended to come in contact with a contiguous corallite have their extremities sometimes forked, the branches clasping round the trunk, but often they are perfectly united or incorporated with the epitheca directly, and without bifurcation. It is a remarkable character that in most of the specimens they are nearly all turned in the same direction or towards the same side of the whole group. It may be that this peculiar mode of growth was induced by the currents of the ocean, the processes growing either against or with the stream. Occasionally we find a specimen in which they radiate in all directions, and it is probable that these may have grown in places where there was still water. When the stems are very flexuous, they sometimes touch each other, and in such instances they grow together for a short distance, and then separate.

The fossils on which the genus was founded were collected by De Verneuil at the falls of the Ohio, in strata which are no doubt of the same age as the Corniferous limestone of Canada and New York.—Two of the Canadian species are identical with two of those described by Edwards and Haime; and I should not be surprised if the third should yet turn out to be *E. rugosum* of the same authors.

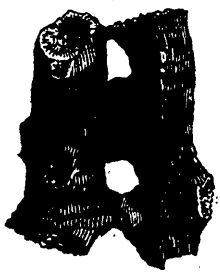


Fig. 26. *Eridophyllum Verneuilanum.*

Fig. 27. *Eridophyllum Simcoense.*

ERIDOPHYLLUM VERNEUILANUM.—(Edwards and Haime.)

ERIDOPHYLLUM VERNEUILANUM. Edw. & Haime, *Polypiers Fossiles*, p. 424, pl. 8, fig. 6, 6 *a*.

Corallites half an inch or a little less in diameter, aggregated in large masses, sometimes two or three feet in width; surface strongly

marked with the longitudinal septal striæ; connecting processes from half an inch to one inch and a half distant from each other; radiating septa about forty-five, and when perfect, extending nearly to the centre; central area varying from one to three lines in width; transverse diaphragms, thin, flat, two to five in one line. The corallites are usually half an inch or a little more separate, but often they are nearly in contact, and even grow together for a distance of one inch or more.

According to Edwards and Haime there are, in the specimen figured by them, only twenty-two radiating septa. It must be borne in mind, however, that in corals of this order very frequently many of the septa are totally destroyed during the process of fossilization. It will be seen by referring to their figure 6 *a*, that twenty-three well-developed septa are represented, and that in seven of the interseptal loculi, remains of the intermediate lamellæ are clearly indicated, and the total number must therefore have been originally forty-six. Our specimens agree so nearly with their figures that there can be little doubt of their identity. Some of the corallites exhibit more than forty-five septa, and in fact, in most of the *Zoantharia rugosa*, the number is variable within certain limits.

Locality and Formation.—Rama's farm, near Port Colborne; lot 19, con. 3, Walpole; and near Woodstock.

ERIDOPHYLLUM SIMCOENSE.—(Billings.)

In this species, the corallites are two or three lines in diameter, and usually straight, in which case they are parallel; distant from one to three lines, and connected by short, conical, sharp pointed processes, at intervals of once or twice the thickness of the stems.—The surface is annulated, with more or less strongly developed rings, which are generally oblique, and sometimes consist of sharp-edged folds of the epitheca. There are between forty and fifty radiating septa; transverse diaphragms well developed.

Some of the colonies have the corallites very crooked, and connected at greatly varying distances. Such masses can only be regarded as groups in which the growth was disturbed, not as distinct species.

Locality and Formation.—Rama's farm; and near the town of Simcoe.

ERIDOPHYLLUM STRICTUM.—(Edwards and Haime).

ERIDOPHYLLUM STRICTUM.—(Edwards and Haime,) *Polypiers Fossiles*, p. 424, pl. 8, fig. 7.

Corallites elongated, cylindro-turbinate, connected by processes, moderately developed, and at variable distances. Gemmation calicinal; three or four young springing at the same time from the same cup. Diameter of the large corallites four to five lines.

Of this species we have only a fragment, which appears not to differ from the figure given by the French authors. The gemmation appears to be lateral as well as calycinal, and the corallites are strongly annulated.

Locality and Formation.—Near Woodstock. Corniferous.

Genus DIPHYPHYLLUM.—(Lonsdale.)

DIPHYPHYLLUM.—(Lonsdale.) In *The Geology of Russia*, p. 622. 1845.
" —(McCoy.) *British Palæozaic Fossils*, p. 87. 1851.
DIPLOPHYLLUM.—(Hall.) *Palæontology of New York*, Vol. 2., p. 115. 1852.

Generic Characters.—Corallum simple, or often forming large masses of long slender cylindrical stems, more or less distant from each other, and sometimes in contact; internal structure biareal; no central axis; the large central area occupied by transverse diaphragms; outer vesicular area variable in its dimensions, in some species very slightly developed; radiating septa numerous, rarely extending to the centre.

Although there has been some difference of opinion among palæontologists as to the correct definition of this genus, yet all appear to understand clearly what group of fossils Lonsdale had in view when he published his description, and therefore his name must be retained, even if he were in error when he supposed that the addition of the young corallites was affected by the fission of the parent polyp. Edwards and Haime believed that the genus was founded upon specimens of a species of Lithostrotion, in which the columella had not been preserved, while at the same time they thus explain the appearance of dichotomous division so often exhibited by the corallites. The following are their remarks upon *D. concinnum*: "All the fossils of this species that we have examined were in a bad state of preservation, and the genus *Diphyphyllum* established for them by Mr. Lonsdale, does not appear to us sufficiently characterised, for it differs from

Lithostrotion only by the absence of the columella, and we have much reason to think that the non-existence of that organ is here merely accidental, and due to the process of fossilisation. The considerations which induced Mr. Lonsdale to form this new generic division, were founded upon the supposed fissiparous mode of multiplication of these corals; but after close examination of their structure, we are fully convinced that they are not in reality fissiparous, and that the appearance which at first sight may be taken for a fissiparous division of the calice, is due to the rapid lateral coalescence of the young individual produced by gemmiparity and the parental corallite."*

The first of the two reasons given in this quotation for uniting *Diphyphyllum* with *Lithostrotion* is sufficiently answered by the fact that there are several species agreeing precisely with Lonsdale's figures and descriptions in every other respect, which in numerous well preserved specimens exhibit no trace of a columella or central axis. The second is well explained by the observations of Edwards and Haime, who are of opinion that what appears to be a fissiparous gemmation is in fact a species of calicinal budding. Upon this point our specimens throw much additional light. In the same group some of the corallites have young ones budding from their sides, while others bifurcate, the two branches being equal in size to each other and to the parent stem. The statement, therefore, of Lonsdale, that the species examined by him appeared to be renewed by fission, is not sufficient to warrant the suppression of the genus, it being in substance only an erroneous view of one of the characters.

The name of *Diplophyllum* was proposed by Professor Hall, in 1852, for some corals of the Niagara limestone, which have all the characters of *Diphyphyllum*. Figures 1 *m* and 1 *n* Plat. 33, Pale. N. Y., vol. 2, may be referred to as good representations of lateral budding and fissiparous gemmation exhibited in the same corallites.

Diphyphyllum arundinaceum.—(Billings.)

Description.—Corallum forming large masses of long, cylindrical, straight or flexuous stems, from three to four lines in diameter, sometimes in contact but usually distant from one to three lines from each other; radiating septa thin, between forty and fifty in number, rarely

*Edwards and Haime. *British Fossil Corals*, published by the Palæontographical Society, p. 145.

reaching the centre; transverse diaphragms turning downwards on approaching the margin; two to four in one line. In some of the corallites the walls are so thin and closely united that no separation can be observed, but in others of the same cluster an outer area is distinctly visible. There is usually a circular space in the centre of the corallites, half a line or a little more wide, into which the radiating septa do not penetrate, often, however, they reach the centre. The young corallites sometimes spring from the side of the parent with a slender base, and curving upwards immediately become parallel with those of the whole group. In large colonies frequent instances may be seen where instead of this lateral budding a bifurcation takes place, both branches being of the same size. In large groups, owing to the numerous additions of young, the corallites diverge slightly, as if radiating from a point. The colonies are from six inches to several feet in diameter, and large blocks of stone are of frequent occurrence, which are penetrated at right angles to the stratification by the closely crowded stems.

Locality and Formation.—Rama's farm, near Port Colborne, and in various localities in the townships of Walpole, Oneida, Cayuga, and Wainfleet, in the Corniferous limestone.

Collectors.—A. Murray, E. Billings, T. De Cew.

Several specimens in the Cabinet of the Canadian Institute at Toronto.

DIPHYPHYLLUM STRAMINEUM.—(Billings.)

Description.—Corallum forming large masses of cylindrical tubes averaging two lines in diameter, and either so closely aggregated as to be nearly in contact, or separated from each other by intervals of from one to five lines, the distance varying in different clusters and in different parts of the same. Sometimes numerous single tubes occur scattered through the rock, which were probably derived from some disintegrated group. The tubes are either straight or flexuous, smooth, or annulated by short encircling folds of growth, the surface striated longitudinally by the outer edges of the septa. These latter are about forty in number, and do not reach the centre. The transverse diaphragms are well developed, slightly convex in the centre, and appear to be suddenly turned down on approaching the margin. The outer vesicular area is thin, seldom exceeding one-sixth of the whole diameter. The central area altogether occupied

by the transverse diaphragms; sometimes in well preserved specimens the septa may be seen extending about half way to the centre upon the surface of some of the diaphragms, but in general they are confined to the outer area. In the more dense colonies the corallites often inosculate, and are sometimes connected by lateral processes, as in species of the sub-genus *Eriodophyllum*.

This species is almost identical with *D. Gracile*, McCoy (op. cit. p. 88,) but differs in the following respect: *D. Gracile* has about forty septa, one half of which are very minute or greatly less than the others, but in *D. stramineum* the septa, about forty in number, are all nearly equal.

Locality and Formation.—Common in the Corniferous limestone, lot 6, con. 1, Wainfleet. There is a specimen in the Cabinet of the Canadian Institute at Toronto from near Simcoe.

Genus CYSTIPHYLLUM.—(Lonsdale).

Generic Characters.—Corallum simple or aggregate, entirely filled with vesicular tissue; radiating septa, rudimentary or obsolete.

CYSTIPHYLLUM SULCATUM.—(Billings).

Description.—Short, turbinate, much curved, expanding at the rate of between forty and forty-five degrees from the minute sharp curved point upwards; cup oblique, the lower margin being on the side of the lesser curvature, moderately deep, and nearly regularly concave, the bottom covered with obscure coarse rounded radiating ridges; a shallow rounded groove or fossette extending from the centre to the higher margin, and in some specimens two others much less distinct, radiating to the sides at right angles to the main groove. Exterior encircled by obscure undulations, and longitudinally striated by the rudimentary radiating septa. The vesicular structure consists of irregular sub-lenticular cells, from half a line to two lines in width; length of the convex side, from one inch and a half to three inches, the usual length appears to be about two inches or a little more; width of cup from one inch to one inch and a half; depth about half an inch.

This species, when the interior cannot be seen, might be mistaken, upon a superficial examination, for a small curved *Cyathophyllum* or *Zaphrentis*. It is about the size and shape of the curved specimens of *Petraia cornicula*.

Locality and Formation.—Rather common in the Corniferous or Onondaga limestone on Rama's farm, Port Colborne.

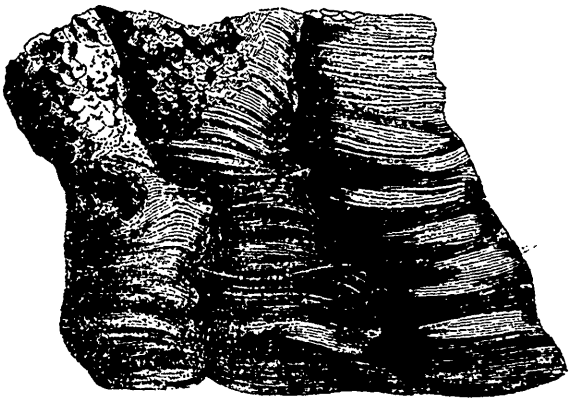


Fig. 28.—*Cystiphyllum aggregatum.*
(View of part of the specimen in the cabinet of the Canadian Institute.)

CYSTIPHYLLUM AGGREGATUM.—(Billings.)

The only specimen of this very distinct species that has come under my observation is in the cabinet of the Canadian Institute. It consists of a mass of cylindrical corallites closely aggregated and in places united by projecting folds of the outer wall, as in the genus *Eridophyllum*. The individuals are completely enveloped in a thin epitheca which is obliquely wrinkled and filled with small sub-lenticular cells; one or two lines in width. Diameter of longest corallite in the group, one inch, and of the smallest, five-eighths of an inch.

I believe that this is the first aggregated *Cystiphyllum* yet discovered, and one of its characters, that is to say the manner in which the corallites are connected, seems to shew that the distinction between *Eridophyllum* and *Diphyphyllum* is not of generic importance. The difference between the genera consists in the presence or absence of the processes that unite the individuals of the colony, and as this is of specific value and no more in *Cystiphyllum*, it may be so in the others.

Locality and formation.—Near Simcoe.

CYSTIPHYLLUM SENECAENSE.—(Billings.)

This species is elongate, slender, straight, or variously curved. Cup deep and sometimes vertically striated on the inside, with from sixty

to one hundred obscure sulci indicating the rudimentary radiating septa. Surface with a very thin epitheca, which is seldom preserved. Interior completely filled with vesicular cells, those near the centre being the largest. These cells are sometimes arranged in funnel-shaped layers, and thus many of the specimens appear to be composed of a series of hollow cones fitting into each other. Length, from three inches to two feet; diameter, three-fourths of an inch to one inch and a half.

The long, slender specimens are often very much and irregularly curved.

Locality and formation.—Abundant in the corniferous limestone in the Townships of Seneca, Cayuga, Oneida, Walpole, Wainfleet, and Humberstone.

Cystiphyllum grandis?—(Billings).

This species is very large, turbinate, more or less curved, and enveloped in a thin wrinkled epitheca. Cup deep bell-shaped, either striated with the rudimentary radiating septa, or consisting of an uniform surface of the small depressed convex cellular elevations. The growth appears to have been intermittent, or by the formation of successive layers of cells upon the inner surface of the cup, and consequently in longitudinal sections the substance of the whole mass is seen to be arranged in a series of funnel shaped strata, placed one within another. The separation between the layers is much more distinct in some specimens than in others.

There are fragments of this species in the collection of the Geological Survey of Canada, five inches in diameter; and one specimen, still lying in the rock, is known which is three feet long.

This species has been referred to *C. vesiculosum*, (Goldfuss,) but is a much larger form. I do not feel satisfied that it is distinct from *C. Senecaense*. In structure it closely resembles that species; but, on the other hand, the young specimens suddenly expand to a diameter of from two to three inches or more, at a length of three or four inches, while the young of the former, of the same length, are not more than one fourth that thickness. It may be that materials can be procured to connect all the forms into one very variable species.

Locality and Formation.—Lot No. 6, con. 1, Wainfleet.

CYSTIPHYLLUM AMERICANUM.—(Edwards and Haime).

C. AMERICANUM.—(Edwards and Haime,) *Polypiers Fossiles*, p. 464.

C. CYLINDRICUM.—(Hall,) *Geology of New York*, part 4, p. 209, No. 48, fig. 1, 2.

Elongated, straight, or curved, enveloped in a thin epitheca; surface usually with numerous sharp and prominent folds, sometimes smooth. Cup moderately deep, and in the large specimens rounded in the bottom, feebly marked on the sides with the septal furrows; internal structure uniformly vesicular, the cells near the outside being from half a line to one line and a half wide, and somewhat larger in the centre. Length from one to six inches; diameter from three-fourths of an inch to three inches.

This species is exceedingly variable in form. The specimens are straight, gently or abruptly curved.

Genus HAIMEOPHYLLUM.—(Billings.)

Corallum aggregate, consisting of colonies of long slender subparallel corallites, united laterally by periodical expansions of the cup. Internal structure of vesicular diaphragms, as in the genus *Michelinia;* radiating septa rudimentary.

This genus differs from *Michelinia* in having no pores in the outer walls; and from *Cystiphyllum* in having the interior filled with cells, which are most prominent in the centre of the tubes, and curve downwards as they reach the margin.

It is dedicated to the late Jules Haime, one of the authors of that excellent work, *Polypiers Fossiles des Terrains Palæoziques.*

HAIMEOPHYLLUM ORDINATUM.—(Billings.)

Corallum forming large sub-globular or flat hemispheric masses; average diameter of the corallites in the constricted portions one line and a half to two lines, and of the expansions two and a half to three and a half lines. The epitheca, where it can be seen between the expansions, is more or less distinctly marked with the longitudinal septal striæ. There appears to be about forty internal striæ. The expansions which connect the corallites are periodical, or occur at the same level in all the individuals at distances of from one to three lines.

There are some specimens in which the expansions occur at intervals of less than one line, and they are even so close together that

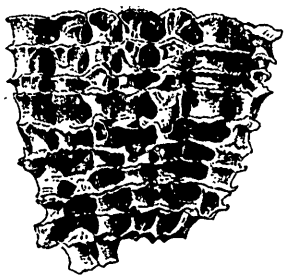


Fig. 29. *Haimeophyllum ordinatum.*

the coral appears at first sight to be a large sub-globular mass of concentric laminæ. I do not at present think these can be separated as a distinct species from those with expansions one or two lines distant.

Locality and Formation.—Township of Walpole. Corniferous limestone.

NOTE ON THE OCCURRENCE OF ASAPHUS MEGISTOS IN CANADIAN ROCKS, WITH ADDITIONAL REMARKS ON ASAPHUS HINCKSII.

BY E. J. CHAPMAN,
PROFESSOR OF MINERALOGY AND GEOLOGY, UNIVERSITY COLLEGE, TORONTO.

In the last No. of the *Canadian Journal* we published a brief description of a new species of Asaphus, *A. Hincksii*—the fourth species of that genus recognised in the Lower Silurian rocks of Canada. Mr. Billings, of the Geological Survey, has subsequently had the kindness to place in our hands, for examination, a specimen of a trilobite discovered some time ago in the Trenton Limestone of Cobourg, C.W., by Mr. J. F. Smith of Toronto. This species, as suggested by Mr. Billings, proves to be identical with the *A. megistos* (of Prof. Locke) from the Trenton Limestone of Ohio. Still more recently, Sir William Logan has kindly lent us a second example of the same species, discovered at Cobourg, and presented to him by — Blackwell, Esq. These examples differ from the figure given by Prof. Locke

(Transactions of the Association of American Geologists and Naturalists: Boston, 1843), chiefly in the more acute outline of the head-shield, and in the development of the glabella. The latter character, however, in the genus Asaphus, is so indefinite and irregular as to be of little importance; and the agreement between the two forms, in all essential characters, is too close to admit of their separation. On comparing these examples with various fragmentary specimens in our possession, we have reason to believe that *A. megistos* occurs in the Trenton Limestone of other parts of Canada, as well as in that of Cobourg. As we propose shortly to publish a figure and revised description of this species in a detailed Monograph on the genus Asaphus as occurring in Canada, we will merely state, at present, that *A. megistos* is distinguished from other species, by the possession of a smooth pygidium, coupled with the presence of short narrow horns at the posterior angles of its head-shield. Apart from the horns, it much resembles in its general aspect the well known *Asaphus platycephalus*. The branches of the facial suture, as in the latter form and other species of the same type, meet in a well defined point close to the anterior margin of the head-shield.

In the specimen discovered by Mr. Blackwell, we find some of the pleuræ broken away, and the stone retaining a sharp impression of the under side of these. In this impression there occurs on each pleura, near the end and close to the upper margin (exactly as in *A. Hincksii: Canadian Journal*, vol. iv., page 3), a single deep and oblique pit, somewhat triangular in form, and with the deeper part towards the posterior extremity of the body. These peculiar cavities are situated just where the under part of the shell or its incurved portion terminates. This we have verified by actual observation. One would naturally expect to find a projecting point or tubercle at the spots in question, but we have failed to detect anything of the kind. On the contrary, there appears to be a hollow space or cavity at these places, filled with the substance of the enclosing rock. Hence the pits or indentations must have been made by (or moulded upon) some soft or perishable organ; and this seems the more probable, as the pleuræ have anteriorly a broad and flattened surface, admitting—as shown by one of the specimens which is partially rolled up—of very complete imbrication, and yet no trace of a cavity or corresponding mark of any kind is to be seen on these surfaces. At the same time, it must be observed that similar cavities occur in the impression of the head-shield, one on each side, near the posterior angles; and in the specimen

discovered by Mr. Blackwell, a small spine of a somewhat lighter color than the other portions of the shell, is seen to pass into these. The faculty of imbrication seems, however, to be incompatible with the existence of hard spines on the under sides of the pleuræ; more especially as no trace of a short longitudinal groove or other depression occurs on their upper surfaces, against which, during imbrication, the spines must have been pressed. As the peculiar pit-marks here described, do not appear to have been previously noticed on any example of a trilobite, we are induced to call attention to them in the hope that further light may be thrown upon their occurrence by the observations of other palæontologists.

We have arranged in the following table the five Canadian species of Asaphus discovered up to this time. Only two forms, it will be observed, occupy the same division; and, in these, the opposite characters of the pleuræ are alone sufficient to establish a distinction of species.

	Pygidium smooth:	Pygidium furrowed:
Head-angles more or less rounded.	*A. platycephalus*, Stokes. *A. Hincksii*, Chapman.	*A. Halli*, Chapman.
Head-angles terminating in horns.	*A. megistos*, Locke.	*A. Canadensis*, Chapman.

The horned species of the genus Asaphus fall naturally into two groups: in one of which, the horns are broad and flat; and, in the other, thin and cylindrical. The recognised Canadian examples belong to the latter type—a type apparently unknown amongst the European species. Hall's *Asaphus Barrandi*, on the other hand, is an American example of the first type.

REVIEWS.

CRANIA BRITANNICA; *Delineations and descriptions of the skulls of the early inhabitants of the British Islands, together with notices of their other remains.* By JOSEPH BARNARD DAVIS, M. R. C. S. E., and JOHN THURNAM, M. D. Decade III. London: Taylor & Francis, 1858.

Another fasiculus of this important contribution to the physical ethnology of the British Islands, has come to hand; and amply sus-

tains the character established by the previous decades. Any critical analysis even of the separate sections of the work, however, must be reserved till its completion; as, owing to the simultaneous issue of the chapters or sections devoted to the several divisions of the subject, no part of it is yet presented in such a form as fully to develope the authors' views. This is the more apparent from the fact that they have to collect their data as the work proceeds; and, in the fasiculus just issued, "assistance in the way of additional specimens is still particularly desired—a number of both ancient and modern skulls being of the utmost importance for study and selection." The authors are, in truth, confessedly even now accumulating the requisite materials, and the trustworthy evidence, on which any final opinion is to be based, either by themselves or others; and they not only withhold their verdict, but delay even the process of induction, until all the proofs are before them. It might, indeed, be a matter of no little interest could we ascertain all the varied phases of opinion through which their minds have passed, since a work was begun which, to them, as well as to their readers, gradually discloses such selected evidence in relation to the physical ethnology of the British Isles. Writing in 1856, Mr. Davis remarks, in the address to the subscribers appended to the first Decade: "To give worth to any deductions which may arise from a general survey of the series of Crania submitted to examination, or to any dissertational matter connected with the inquiry, or growing out of it, a necessity exists for first allowing the greater part of the evidence to be unfolded before both writer and reader. Probably such deductive matter may never be very elaborate, although as precise and complete as the light to be derived from the tomb admits; still its proper place will be at the approaching termination of the work, to accompany the fifth and sixth Decades." This was written in March, 1856, at which date it was further stated that: "Such arrangements have been made, as, it is expected, will lead to the issue of a Decade every six months till the work is finished." Had such proved to be the case, we should now have the sixth instead of the third Decade; but the delays in such a work are equally unforeseen and inevitable, and it can scarcely admit of question that the materials accumulated during the period thus extended will amply atone for the slow progress of the work towards completion. To the subscribers this will be an unalloyed gain, but to one of the authors, Joseph Barnard

Davis, on whom we believe the entire risk and cost of the work devolves, it will be a source of considerable additional expenditure, as he finds himself necessitated, in his enthusiastic development of the subject, to be more copious in the text, and more profuse in the illustrations, than was at first contemplated, or than economic considerations will very well justify.

Meanwhile we extract, from the present Decade, some incidental remarks on the artificial modifications of cranial development, both in American, and in the primitive British races, suggested—in part at least,—by a paper previously published in this Journal.

"Among the American races in general," says Mr. Davis, "there is so marked a flatness in the occipital region, that Professor Morton was induced to regard it as one of the few typical characters of the skull belonging to the American nations, and spreading from one end of the continent to the other. This position, which is no doubt founded in truth, must be allowed to be liable to numerous exceptions. Yet the crania of Americans figured by Sandifort (*Cranium Americani Septentrionalis,*) and by Milne Edwards, the latter given as a typical skull (*Cuvier's Règne Animal, Race Americaine,*) are both distinguished by a considerable occipital projection. Professor Daniel Wilson of Toronto, in an able paper (*Canadian Journal*, vol. ii., p. 406), has expressed a reasonable doubt whether this occipital flatness, or great vertical diameter, be properly a universal character of the American races, and has supported his argument by observations made upon crania disinterred in Canada, and considered to have belonged to the Iriquois and Hurons. He has also given expression to a query, which the examination of skulls remarkable for vertical diameter and flatness of occiput naturally induces, whether the American races may not owe these cranial characters, in some measure at least, to artificial distortion. That nature has accorded to many of them a brachycephalic skull, and also that this feature is so marked as to be regarded as a typical character among the western races may be admitted. Still art has been frequently, almost generally, called in to heighten this conformation, in a smaller or greater degree. And it is by no means improbable that its influence may be perceived among the aboriginal crania of the British Isles, especially in this greater or less occipital flatness, which is frequently unsymmetrical."

In Mr. Davis's latter remark on aboriginal British crania, he adopts

suggestive observations on the same subject, which occur in the article in this Journal, above referred to. The remarks are thus introduced, in commenting on a passage in Dr. Morton's "*Crania Americana*," on forms peculiar to American skulls: "Dr. Morton adds, in describing an unsymmetrical skull, 'I had almost omitted the remark that this irregularity of form is common in, and *peculiar to, American crania.*' The latter remark, however, is far too wide a generalization. I have repeatedly noted the like unsymmetrical characteristics in the Brachycephalic crania of the Scottish Barrows, and it has occurred to my mind, on more than one occasion, whether such may not furnish an indication of some partial compression, dependent, it may be, on the mode of nurture in infancy, having tended, in their case also, if not to produce, to exaggerate the short longitudinal diameter, which constitutes one of their most remarkable characteristics."—*Canadian Journal*, vol ii. p. 426.

It cannot be viewed otherwise than with interest, by the readers of the *Canadian Journal*, thus to find observations made on crania dug up from the Indian graves of our Canadian clearings, reflecting light on characteristics of the aboriginal Briton, it may be, of many centuries prior to the Christian era. D. W.

How Plants Grow: A simple Introduction to Structural Botany, with a popular Flora; or, An Arrangement and Description of common Plants, both Wild and Cultivated. By Asa Gray, M.D. New York: Ivison and Phinney. 1858.

If Botany is not as much taught in our schools for the young of both sexes, as we might expect from its attractions, and might desire from its lasting and untiring interest, the practical usefulness of many of its facts, and its valuable effect on the mind, regarded as a means of cultivating the faculties, the deficiency can no longer be ascribed to the want of excellent books suited to every stage in the student's progress, and even especially adapted in their choice of illustrations to the country in which we dwell. Besides the various excellent introductory works of some of the leading British Botanists, as Lindley, Balfour, Henslow, and Henfrey, not here to refer to those produced in other countries, we have from the pen of Professor Gray of Harvard University, a series of books of very remarkable merit, their characteristics being a thorough knowledge of the subject in all its aspects; judgment

and skill in the selection and arrangement of materials; a clear, correct and very pleasing style, and an abundance of useful illustrations not repeated or imitated from other works, but drawn generally from nature by a master hand. The highest work in Dr. Gray's series has been longest before the public—has passed through several editions, and has been highly appreciated in Europe as well as in America—contributing its full share, with his labours of another kind, to the establishment of the author's world-wide reputation as a Botanist of the first class. Two years ago this was followed by First Lessons in Botany and Vegetable Physiology, a work intended as a school book, and as an introduction to the use of the author's Manual of the Botany of the Northern United States, and which in our higher schools would be found most valuable, but which, from the fulness, accuracy and judicious arrangement of its materials, its convenient size, and moderate price, is well fitted for a text-book for a junior college class. No sooner was this work issued than the author appears to have turned his thoughts to completing his series of Botanical instruction by a still more elementary volume.—This he has given us in the work now under our consideration—and it is little to say that it is worthy of its predecessors. The dryness and repulsiveness of elementary treatises often arises from their being compiled by those who have not acquaintance with the subject, or strong interest in it, whilst the most extensive knowledge and warmest love of any science are the very qualifications for attracting the mere beginner and offering what is suitable to his wants and capacities. In this little book Dr. Gray seems to have brought together just what is adapted to its object—as much structural botany as is necessary to right ideas of the nature of plants, and the foundations of classification, as much physiology as will be immediately useful, and will create a taste for further knowledge—and as much of system as will render its use familiar, and its utility obvious, leaving difficulties and minute subdivision for a more advanced stage of progress. The object proposed is to give knowledge, which every one needs, and open the way to botanical studies. The object has been accomplished at once effectively and pleasingly. We are persuaded that all real lovers of botanical science, especially on this continent, will feel grateful to the learned professor, for assisting to bring its truths within reach of all, and to render the approach so easy and pleasant to that temple of science, which in his other works he has contributed to strengthen and adorn.

W. H.

MISCELLANEOUS.

TESTIMONIAL TO SIR WILLIAM LOGAN.

The citizens of Montreal, soon after Sir William Logan's return from the Great Paris Exhibition of 1855, resolved to present to him some enduring mark of their estimation for the services rendered by him to the Province, by his valuable labors in connexion with the Exhibition in the Crystal Palace, London, in 1851 and in that more recently held at Paris. In both of these, it is well known that the productions and industrial resources of Canada were brought into notice in a way which materially contributed to the best interests of Canada; and among the wealthy citizens of Montreal no difficulty was experienced in raising the requisite funds. Happily, in giving permanent form to this token of esteem, the distinguished rank attained by Sir William Logan as a man of science, and his valuable services as the Provincial Geologist of Canada, have not been overlooked. The testimonial consists of a massive silver fountain, designed to illustrate the palæontology of the carboniferous era; and to symbolise Sir William's discoveries among the coal formations. This beautiful and appropriate design rests on a pedestal of ebony, intended to represent the bed of coal; and on one of its faces is a plate with the following inscription:

In commemoration of
His long and useful services
as Provincial Geologist in Canada,
and especially his valuable services in connexion
with the Exhibition of all Nations in
London in 1851, and in Paris
in 1855,
by which he not only obtained for himself higher
honor and
more extended reputation, but largely
contributed in making known
the natural resources of his native country
This Testimonial was presented to
SIR WILLIAM E. LOGAN, Knight, F.R.S., F.G.S., LL.D.,
by many of the inhabitants of Montreal,
desirous of marking their respect and regard for
one of the most distinguished of their
fellow-citizens.
Montreal, July, 1856.

On the other sides of the pedestal are designs representing the various modes of vegetable existence from which the deposits of coal have been derived.

The presentation of this beautiful and costly testimonial took place in the Hall of the Natural History Society of Montreal. The Hon. George Moffat presided on the occasion, and the Right Rev. the Lord Bishop of Montreal acted as the

representative of the Committee of the subscribers, and, in the name of the citizens, presented their gift to Sir William Logan, in graceful terms of congratulation and high respect.

Sir William Logan replied:—It is a great satisfaction to me that I should receive from so many of the inhabitants of my native city so distinguished a mark of their regard and approbation, and that it should come through the hands of so eminent and respected a citizen as your Lordship, and in the Hall of the Natural History Society, whose members have already bestowed on me the highest honor within their power. If in the Exhibitions of London and Paris, I was any way instrumental in extending a knowledge of the material resources of Canada, it was chiefly of those more immediately connected with the geological investigation with which I am charged. In respect to other materials, my exertions I fear would have been of little avail, without the practical experience of those associated with me in the management of the Canadian contributions. Those exhibitions involved a very practical purpose, and seeing that what may be called mineral manufactures had extended but little in this country, I rejoiced in the opportunity offered of placing before the eyes of European judges some of the results of the Geological Survey, persuaded that although we could not show that we possessed the skill requisite to give to all our metallic ores and useful rocks the various ultimate forms of which they were capable, we should at least convince the world that Canada contained in her subsoil vast stores of mineral materials that would hereafter become available for the support of native industry. The mere specimens exhibited, however, would have been an ineffectual means of attaining the object, had they not been accompanied by a geological map, showing that geographical distribution of the formations from which the minerals were derived—thus making at once intelligible the position and abundance of those things of which the specimens merely displayed the nature. Successful, however, as our geological contribution proved to be, there was one branch of the subject in which we were deficient: our fossils had not been arranged or described; and it was, in consequence, impossible for us to prove the sequence of our rocks from their position, except by an assertion that was not disputed. I am not myself a naturalist, to describe fossils. For many years of my life engaged in the active pursuits of a practical miner for coal, and a practical smelter of copper from its ores, my connection with geology relates more to the application of materials. But I well know the value of fossils as an indispensable means of research, and unless Canadian fossils are properly described, Canadians will never thoroughly understand their own economic minerals, or even sufficiently know them to protect themselves from imposition; nor will the study of Canadian minerals enter into the educational systems of the country. In the form given to the testimonial which you do me the honor to present to me, it is gratifying to me to observe typified a discovery which, in my pursuits as practical collier, I was so fortunate as to make, by which coal and its associated fossils were drawn into closer relation than had ever been known before. By it the practical researches for coal were greatly facilitated; and, as a practical collier, I can assure you that it is only in a knowlege of the differences that exist between such kind of fossils as this testimonial indicates, and others of a distinct description of organisms, that

you have the most certain means of discriminating between the coal of Newcastle and that of Bowmanville. One pleasing circumstance that attaches to this testimonial is, that amongst those presenting it there are so many engaged in the practical business pursuits of life. It gives me an assurance that they are convinced of the usefulness of geological investigations; and I beg to assure you that, as marking the good will of so many of my fellow-citizens, I shall always regard it with feelings of satisfaction and pride.

CANADIAN INSTITUTE.

SESSION—1858-59.

FIRST ORDINARY MEETING—*4th December*, 1858.

JOHN LANGTON, Esq., Vice-President, in the Chair.

I. *The following Gentlemen, provisionally elected by the Council during the recess, were balloted for and declared duly elected Members:*

T. REYNOLDS, Esq., M.D., Brockville, C.W.
J. J. BURROWS, Esq., Kingston, C.W.
Rev. J. WHYTE, Osgoode, C.W.
Rev. W. J. MACKENZIE, Baltimore, C.W.
J. H. DUMBLE, Esq., C.E., Cobourg, C.W.

Junior Members:

C. J. BETHUNE, Esq., Trinity College, Toronto.
G. T. CARRUTHERS, Esq., " "

II. The Donations to the Library and Museum received since the last Ordinary Meeting were announced. The thanks of the Institute were voted to the donors, and detailed lists, with the donors' names, were ordered to be inserted in the Annual Report.

III. *The following Papers were read:*

1. By Prof. E. J. Chapman:
"On the alleged discovery of a *Conus* in the drift of Western Canada."

2. By Prof. D. Wilson, LL.D.:
"On ancient notices of the Beaver in Europe."

SECOND ORDINARY MEETING—*11th December*, 1858.

JOHN LANGTON, Esq., Vice-President, in the Chair.

I. *The following Gentlemen were elected Members:*

R. S. BOUCHETTE, Esq., Toronto.
G. R. R. COCKBURN, Esq., M.A., "
C. W. CONNON, LL.D., "
SIMON J. DAWSON, Esq., Three Rivers.
JAMES DORLAND, Esq., Toronto.
JOSEPH HORROCKS, Esq., "

II. *The following Donations for the Library were announced, and the thanks of the Institute voted to the donors:*

From Hon. G. Brown, M.P.P.:

Report on the Exploration of the Country between Lake Superior and the Red River Settlement 1. vol.

From the United States Patent Office, Washington:

United States Patent Office Reports, 1856.

Report on Agriculture. 1. vol.

Reports on Mechanics. 3. vols.

From Prof. A. D. Bache, Superintendent United States Coast Survey:

Report of the United States Coast Survey for 1856. I. Vol.

III. *The following Papers were read:*

1. By the Rev. Prof. W. Hincks, F.L.S.:

"On Canadian Ornithology."

2. By F. Assickinack, Esq.:

"On the Grammatical construction of the Odahwah language."

IV. The requisite nominations for the election of Office Bearers for the ensuing year were made, and the Vice-President announced the Annual General Meeting to be held on the 18th inst., to receive the Report of the Council, to elect the Office Bearers and Members of Council for the ensuing year, and for other business.

A. H. Armour, Esq., gave notice of a motion to take into consideration the propriety of changing the night of meeting from Saturday to some other evening.

ANNUAL GENERAL MEETING—*18th December*, 1858.

JOHN LANGTON, Esq., Vice-President, in the Chair.

I. *The following Gentlemen were elected Members:*

Admiral BAYFIELD, Royal Navy, *Honorary Member.*
J. F. SMITH, Esq., Jun., Toronto.
W. G. BELLAIRS, Esq., C.E., "
JAMES THORBURN, Esq., M.D., "

II. On the motion of A. H. Armour, Esq., it was ordered that a circular be sent to each member of the Institute residing in Toronto, intimating that the proposal to change the night of meeting from Saturday to another evening will be discussed at the meeting on the 8th January, 1859.

III. *A ballot having been taken for Officers of the Institute for the ensuing year, the following Gentlemen were duly declared elected, viz.:*

President,.....Hon. G. W. ALLAN, M.L.C.,
1st. Vice-President,.....JOHN LANGTON, M.A.,
2nd. Vice-President,.....Prof. D. WILSON, LL.D.,
3rd. Vice-President,.....Rev. Prof. W. HINCKS, F.L.S.,
Treasurer,.....D. CRAWFORD, Esq.,
Corresponding Secretary,.....Prof. J. B. CHERRIMAN, M.A.,
Recording Secretary.....THOMAS HENNING., Esq.,

Curator, ...J. F. Smith, Esq.,
Librarian, ...Prof. H. H. Croft, D.C.L.,
Council, ...Prof. E. J. Chapman,
" .....Prof. G. T. Kingston, M.A.,
" .....William Hay, Esq.,
" .....Patrick Freeland, Esq.,
" .....Andrew Russell, Esq.,
" .....Sandford Fleming, Esq.

IV. It was moved by F. W. Cumberland, Esq., seconded by A. H. Armour, Esq., and unanimously adopted:

That the thanks of the Institute be tendered to the President and Vice-Presidents, and members of the Council for their valuable services during the past year.

V. The Report of the Council for the year 1857–58, was then read and adopted:

ANNUAL REPORT OF THE COUNCIL, FOR 1858.

The Council of the Canadian Institute, at the expiration of their term of office have the honor to present the following Report upon the progress of the Institute during the past year.

The number of members has gone on steadily increasing, the total number on the books on the 30th of November being 650.

Total number of Members at commencement of Session 1857–8		614
New Members elected during Session 1857–8	45	52
" " by Council during recess	7	
		666
Deduct left the Province or withdrawn		16
Total, 30th November, 1858		650

Composed of—Honorary Members	4	
Life Members	36	
Corresponding Members	5	
Junior Members	24	
Members	581	
		650

The following is a list of the various books added to the Library by purchase or otherwise, during the year:

BOOKS PURCHASED:

Books marked (*) are in parts, or unbound.

	Vols.
Tredgold's Tracts on Hydraulics	1
Tredgold on Carpentry	1
Nicholson's Operative Mechanic. Vols. 1 and 2	2
Turnbull's Strength of Timber	1
Smeaton's Civil Engineering	1

	Vols.
History of the Indian Tribes of North America; with Biographical Sketches and Anecdotes of the principal Chiefs. By Thomas L. McKenny and James Hall	3
Descriptive Catalogue of the Osteological Series contained in the Museum of the Royal College of Surgeons of England. Vols. 1 and 2	2
Siluria. By Sir Roderick Impey Murchison, &c., &c. Vol. 1	1
Collected Works of Dugald Stewart. Vol. 10	1
Encyclopædia Britannica. Eighth Edition. Vols. 14–16	3
Herodotus. By G. Rawlinson. Vols. 1 and 2	2
Carlyle's Frederick the Great. Vols. 1 and 2	2
Westminster Review, 1856 and 1857	2
Edinburgh Review, 1856 and 1857	2
London Quarterly Review, 1857	1
Blackwood's Magazine, 1857	2
North British Review, 1856 and 1856–7	2
Journal of Education for Upper Canada, 1857	1
Journal de l' Instruction Publique. Vol. 1. 1857	1
Hunt's Merchants' Magazine. July—Dec, 1857: Jan.—June, 1852	2
Journal of the Franklin Institute. July—December, 1857	1
Canadian Merchants' Magazine. Vol. 1	1
Silliman's Journal. Vol. 24; July—November, 1857. Vol. 25; January—June, 1858	2
Journal of the Society of Arts. Vol. 5	1
Civil Engineers' and Architects' Journal. Vol. 20. 1857	1
The Art Journal, 1857	1
The Athenæum, 1855 and 1857; and 1st Vol, 1858	3
The Builder. Vols. 11 and 15	2
Illustrated London News. July—Dec., 1857; Jan.—June, 1858	2
Mining Journal, 1857	1
Artizan, 1857	1
	49

DONATIONS OF BOOKS TO THE LIBRARY.

From the Hon. J. M. Brodhead, *Washington, per A. H Armour, Esq.*

Patent Office Reports, 1856. Mechanics. Vols. 1, 2, and 3	3
——— Agriculture	1
Report of the Commercial Relations of the United States with all Foreign Nations. Vol. 4	1
Commercial Relations. Part II. Tariffs. Vol. 2	1
——— Part III. Returns. Vol. 4	1
Explorations for a Railroad Route from the Mississippi River to the Pacific Ocean. Vols. 2, 3, 4, 5 [two], 6 [two], and 7	8
Reports of the United States and Mexican Boundary Survey. Vol. 1	1
Report of the Military Commissioners to the European Seat of War, in 1855 and 1856. By Capt. G. B. McClellan, U.S.A.	1

	Vols
Navy Register, United States, 1858	1*
Army Register, " 1858	1*

From the Hon. Sir J. B. Robinson, Bart., *Chief Justice of Upper Canada.*

Agassiz's Contributions to the Natural History of the United States. Vols. 1 and 2	2

From the Clerk of the House of Assembly.

Maps appended to the Report of the Commissioners of Crown Lands, included in Appendix No. 25. Vol. 15. No. 5, 1857. Appendices 1, 7, 8, 9, 10; 1857	6
Trade and Navigation, 1857	1
Plans appended to the Geological Reports, 1857	1
Journals of the Legislative Assembly. Vol. 16. Part I. 1858	1
" Part II. 1858	1
Statutes of Canada, 1858	1

From Crosby, Nichols & Co., *Publishers, Boston.*

American Almanac for 1858	1
Mabel Vaughan	1

From J. F. Smith, *Esq., Jun., Toronto.*

Descriptive Guide to the Museum of Practical Geology, London	1*
The Hindostanee Interpreter	1*

From Regents *of University of the State of New York.*

Documents relative to the Colonial History of the State, &c. Vol. 10	1
Census of the State of New York, 1855	1

From the Provincial Secretary.

Relations des Jésuites contenant ce qui s'est passé de plus remarquable dans les Missions des Pères de la Compagnie de Jésus	3*

From the University of Michigan.

Catalogue of Students and Officers of the University of Michigan, 1858	1*

From The Hon. George Brown, M.P.P.

Logan's Geological Survey, 1853—1856	1*
Plans of various Lakes and Rivers, between Lake Huron and the River Ottawa, to accompany above Reports	1

From A. Russell, Esq., *Assistant Commissioner Crown Land Department.*

Do. do. as presented by Mr. Brown	2

From H. G. Bohn, Esq., *London, per A. H. Armour, Esq.*

England under the Stuarts. Vols. 1, 2, and 3	Historical Library 3
Burke's Speeches. Vols. 1 and 2	British Classics 2
De Foe's Works; Duncan Campbell; Voyage round the World	" 1
Wright's Provincial Dictionary. Vol. 1, A—F; Vol. 2, G—Z.	Philological Library 2
Lamartine's Restoration of the French Monarchy. Vols. 1, 2, 3, and 4.	Standard Library 4

		Vols.
Foster's Critical Essays. Vol. 2	"	1
Fosteriana; Thoughts; &c.	"	1
Luther's Table-Talk; by A. Chalmers	"	1
Sturm's Morning Communings	"	1
Charles II. and James II. Carrel, Fox, and Lonsdale	"	2
Mantell's Wonders of Geology, &c. Vols. 1 and 2	Scientific Library	2
Carpenter's Zoology. Vols. 1 and 2	"	2
Manual of Technical Analysis. Bolley and Paul	"	1
Index of Dates. A—J. Vol. 1. By J. W. Rosse	"	1
Pliny's Natural History. Vol. 6	Classical Library	1
Strabo. By Falconer and Hamilton. Vol. 3	"	1
Aristotle's Metaphysics, with Analysis, &c.	"	1
Pettigrew's Collection of Epitaphs	Antiquarian Lib.	1
Polyglot of Foreign Proverbs	"	1
Hegel's Philosophy of History	Philosophical Lib.	1
Stuart's Antiquities of Athens	Illustrated Library	1
Pope's Homer's Odyssey. Designs by Flaxman	"	1
——— Iliad. " "	"	1
——— Life and Letters. Carruthers	"	1
The Holy Land. Lord Lindsay	"	1
Tales of the Genii. Illustrated	"	1
Nineveh and its Palaces. Bonomi	"	1
Pottery and Porcelain. Bohn	"	1
The Bibliographer's Manual of English Literature. By W. T. Lowndes. Part I.		1
Lion Hunting and Sporting Life in Algeria. By Jules Gerard		1
Washington Irving's Life of G. Washington. Vol. 4		1
Philosophy of Temperance and Total Abstinence. By W. B. Carpenter, M.D.		1*

From LEONARD SCOTT & Co., *New York, per A. H. Armour, Esq.*

Edinburgh, Westminster, North British, and Quarterly Reviews for 1858.*
Blackwood's Magazine for 1858.*

From G. D. GIBB, ESQ., M.D., *London, England.*

Presidents' Anniversary Addresses delivered before the Geological Society of London, from 1846 to 1857 (the years 1847 and 1851 excepted) 9*

From the Author, A MEMBER OF THE PRESS.

The Hand-Book of Toronto, 1858 1

From HON. EAST INDIA COMPANY, *London.*

Magnetical and Meteorological Observations, Bombay. Years 1854, '55, '56. 3

From A. & C. BLACK, *Publishers, per J. C. Geikie, Esq.*

The Student's Manual of Geology. Jukes 1
Elements of Mineralogy. Nicol 1
Review of the Progress of Mathematical Science in more recent times. Forbes 1

From the Societies.

Transactions of the Royal Society of Edinburgh. Vol. XXI, Part 4, Session 1856–7 1*

	Vols.
Proceedings of the Royal Society of Edinburgh. Session 1856–7	1*
Transactions of the Academy of Science of St. Louis, 1858. Vol. I. No. 2	1*
Proceedings of the Essex Institute, Salem, Massachusetts. Vol. I. 1848 to 1856; and Vol. II. Part 1, 1856 to 1857	2*
Proceedings of the Society of Antiquaries of Scotland. 76th Session, 1855–'56. Vol. II. Part 2	1*
Catalogue of the Antiquities of Stone, Earthen, and Vegetable Materials in the museum of the Royal Irish Academy. By W. R. Wilde, M.R.I.A., Secretary of Foreign Correspondence	1*
Bulletin de la Société Géologique de France. Tome treizième. Feuilles, 37–49 (21 Avril, 16 Juin, 1856)	1*
Do. Feuilles, 19–23 (15 Déc, 1856, 19 Janv, 1857)	1*
Do. " 50–56 (7–14 Sept. 1856)	1*
Report General Committee of Mechanics' Institute, Toronto, ending May 3rd, 1858	1*
Catalogue of Books in Library of ditto	1*
Address to Co. of Simcoe Mechanics' Institute, Barrie, by J. Ardagh, M.D.	1*
Report, 4th Annual, Trinity College Literary Institute	1*
Report on the Sewerage of Chicago, from the Board of Commissioners	1*
Dynamics of the Mississippi, from the New Orleans Academy of Sciences	1*
Annual Address, 1856, New Orleans Academy of Sciences	1*
Report of Special Committee, on the subject of a Geological and Scientific Survey of the State of Louisiana	1*
Sketch of General Jackson, by himself	1*
Journal of the Franklin Institute	12*
Artizan	12*
Journal of the Society of Arts. 2 sets	*
Silliman's American Journal	6*
Canadian Naturalist and Geologist	6*
Queen's Bench Reports	10*
Upper Canada Reports, No. 7. Vol. VI	1*
Boston Natural History Society. Pages 273 to 400	In sheets
The Atlantis. Nos. 1 and 2, January and July, 1858	2*
Journal of the Geological Society of Dublin. Vol. VII. Part 5	1*
Plates 8 and 9	2 plates.
Do. Vol. VIII. Part 1	1*
Proceedings of the Dublin Natural History Society. Session 1855–6	1*
The Geologist, a Monthly Magazine. J. S. Mackay, F.G.S.	1*

From SUPERINTENDENT OF EDUCATION, *Upper Canada.*

Journal of Education. Two sets	24*

From Publisher, JOHN LOVELL, ESQ., *Montreal.*

Nova Britannica, or British North America. A Lecture by A. Morris, M.A., Advocate	1*
Prof. Henry Y. Hind's Maps of Valley of Red River, North of 49th parallel, to accompany the Report of the Exploring Expedition, 1857	2

	Vols.
From Mr. B. Quaritch, *London, England.*	
Catalogue Raisonné	2*
Unknown.	
Proceedings of the Dedication of Plummer Hall, Salem	1*
Report of Public Meeting of Delegates, Toronto, 14th April, 1858. Protection of Canadian Industry	1*
From Thomas Brett, Esq.	
A Treatise on Light, Vision and Colours	1*
From Superintendent of Education, *Lower Canada.*	
Report on Education, Year 1856	1*
Mémoire sur la Plante Gin-Seng de Tartarie	1*
Journal of Education, Lower Canada	12*
Journal de l'Instruction Publique, Bas Canada	12*

DONATIONS TO THE MUSEUM.

From a Member Anonymous.	
A Curious Bird's Nest, from Neighbourhood of Calcutta	1
From C. Rankin, Esq., *per A. Russell, Esq., A.C.C.L.D.*	
A piece of Elastic Sandstone from Delhi	1
From Major Lachlan, *Cincinnati, Ohio.*	
Horned Frog from California	1
Box of Minerals, and other objects, with descriptive Catalogue	60 parcels
From J. F. Smith, Esq., Jr., *of Toronto.*	
Piece of Fossil Bone, from the Collection of the late Dr. Buckland	1
A piece of the Atlantic Cable. Newell & Co., Manufacturers, Birkenhead	1
Eighteen Specimens of Shells from the Chalk of Kent and Sussex, England	18
From A. McDonald, Esq., *Glengarry, C. W.*	
Copper Penny Piece, with Globe on Reverse	1
From A. H. Armour, Esq., *Toronto.*	
Several Geological Specimens from shores of Lakes Superior and Huron, in all	10
From J. Davidson, Esq., *per A. H. Armour, Esq.*	
Several Specimens of Copper Ore and other Minerals from Bruce Mines, in all	30
From C. Unwin, Esq., *Toronto.*	
Loon's Eggs, Two, from Gull Lake, Canada West	2

COMMUNICATIONS.

The subjoined list contains the titles of the various Papers read at the ordinary meetings of the Session, 1857-8:

Sir W. Logan, F.R.S.—"On the Relative Dates of various Intrusive Rocks cutting the Laurentine Series in Canada West." 5th Dec., 1857.

B. O'Hara, Esq.—"On a new form of Propelling Power for Steamships." 5th Dec., 1857.

Prof. Wilson, LL.D.—"On some Ethnographic Phases of Conchology." 5th Dec., 1857.

Rev. Prof. W. Hincks, F.L.S.—"Notices respecting the Flora of Western Canada, especially the Neighbourhood of Toronto." 12th Dec., 1857.

Rev. J. McCaul, LL.D.—"Notes on Ancient Inscriptions found in Britain." 12th Dec., 1857.

Prof. J. B. Cherriman, M.A.—"On the Pythagorean Proposition." 19th Dec., 1857.

Prof. Kingston, M.A.—"On Reducing Mean Temperatures." 19th Dec., 1857.

The Hon. The Chief Justice Draper, C.B.—Annual Address. 9th Jan., 1858.

Prof. Croft, D.C.L.—"On the Oxidation of Arsenious Acid." 9th Jan., 1858.

F. Assickenack.—"On the Legends of the Ottawa Indians." 9th January, 1858.

Prof. Kingston, M.A.—"Meteorology." 9th January, 1858.

Prof. Chapman.—"On the Assaying of Coals by the Blow Pipe, with remarks on Blow Pipe Examinations in General." 16th January, 1858.

Rev. Prof. Hincks, F.L.S.—"Notice respecting a Collection of Mazatlan Shells recently obtained by the University of Toronto." 16th January, 1858.

Prof. Wilson, LL.D.—"Notes on the American Cranial Type." 23rd Jan., 1858.

Prof Kingston, M.A.—"Annual Meteorological Report." 23rd January, 1858.

Thos. Hector, C.E.—"Scale for Computation of Areas of Irregular Figures," 30th January, 1858.

Col. Baron de Rottenburg, C.B.—"Observations made at Toronto on Solar Spots in the month of January, 1858." 30th January, 1858.

Prof. Croft, D.C.L.—"On the Purification of Sulphuric Acid for Toxicological Investigations." 30th January, 1858.

S. Fleming, C.E.—"On a Method of Launching Large Vessels." 30th January, 1858.

Rev. J. McCaul, LL.D.—On Latin Inscriptions found in Great Britain." 6th February, 1858.

S. Fleming, C.E.—"Note on an improved kind of Rail. 13th February, 1858.

Prof. Henry, LL.D.—"Application of Acoustics to Public Buildings, as illustrated in the Lecture Room of the Smithsonian Institution at Washington." 13th February, 1858.

Prof. J. B. Cherriman, M.A.—Description of the Observatory at St. Martin's." By Dr. Smallwood. 20th February, 1858.

Col. Baron de Rottenburg, C.B.—"Some Astronomical Notes." 20th Feb., 1858.

Rev. Prof. Kendall, B.A.—"Geometrical Notes." 20th February, 1858.

A. Coulon, C.E.—"Road and Railway Calculations." 27th February, 1858

Prof. J. B. Cherriman, M.A.—"On Climatology." By Prof. Henry. 27th February, 1858.

J. Hudson, Esq.—"A Plan for Laying down the Atlantic Cable by means of a Buoy." 27th February, 1858.

Prof. Wilson, LL.D.—"On the True Value of the Colon as a Mark of Punctuation." 27th February, 1858.

Rev. D. Inglis, M.A.—"On the Relation of Quantity to the Æsthetic Sentiment." 6th March, 1858.

Rev. Prof. Hincks, F.L.S.—"Considerations respecting Anomalies of Vegetable Structure, their causes, scientific importance, proper arrangement, and some of the conclusions derived from them, or supported by them." 6th March, 1858.

Prof. Hind, M.A.—"On Ancient Lake Ridges and Beaches in the Valley of the Red River." 13th March, 1858.

Prof. T. Sterry Hunt.—"Considerations on the Theory of Igneous Rocks and Volcanoes." 12th March, 1858.

Col. Baron de Rottenburg, C.B.—"Remarks on the Spots now visible on the Sun's Disc." 13th March, 1858.

Rev. Prof. Hincks, F.L.S.—"On the Classification of Mammalia." 20th March, 1858.

Prof. Chapman.—"On a New Trilobite from Canadian Rocks, with some additional Remarks on Asaphus Canadensis." 20th March, 1858.

Prof. Croft, D.C.L.—"On some Compounds of Palladium." 20th March, 1858.

Rev. J. McCaul, LL.D.—"On Roman Military and Naval Epitaphs." 27th March, 1858.

T. Henning, Esq.—"Inquiry into the means of rendering our Educational System applicable to the social condition of large Cities. 27th March, 1858.

Rev. Prof. Young, M.A.—"On the Impossibility of Representing by Algebraical Functions the Roots of Equations of a higher order than the fourth." 10th April, 1858.

F. W. Cumberland, C.E.—"Some Notes on the Paper read by Mr. Henning on our Educational System." 10th April, 1858.

F. W. Cumberland, C.E.—"Notes on the Course of the Western Trade Eastward, to the Atlantic." 17th April, 1858.

The Council submit the Reports laid before them by the Editing Committee, and the Treasurer and Auditors:

REPORT OF THE EDITING COMMITTEE.

The Editing Committee beg to Report the completion of the third volume of the Canadian Journal, in accordance with the principles adopted by the Council of the Canadian Institute, after mature consideration, when it was resolved to bring the former series to a close. The continued success of the Journal is such, they believe, as amply to justify the decision of the Council, presented in their Annual Report for 1855, in accordance with which it has since been conducted, in its new form, as a Provincial medium for original Scientific and Literary Articles, and an embodiment of the proceedings of the Institute. The instructions originally reported by the Council, for the guidance of the Editing Committee in conducting the New Series, have required no modification during the past year; and the original Articles and Reviews have been continued as in former years, so as to give a distinctive character to the Journal as a Canadian Periodical, furnishing to the Students of Science, and the Literary Men of the Province, a medium for the interchange of communications among themselves, as well as for opening up an intercourse between them and the Scientific Men of Europe and America.

In furtherance of the objects referred to, and in accordance with the resolution of the Council relative to the gratuitous distribution of the Journal, the Editing Committee have added the following Societies and learned bodies to the free list furnished in last report:

Linnæan Society, London.
Royal College of Surgeons, London.

Athenæum Club, London.
The Academy of Sciences, St. Louis, Missouri.
Essex Institute, Salem, Massachusetts.
Historical Society, Chicago, Illinois.

Owing to the absence of three of the Members of the Editing Committee in Europe, for some months during the past summer, and the departure of another as a member of the Commission appointed by the Provincial Government to Survey and report on the means of access and settlement at the Red River, it has been impossible to hold the regular meetings of the Editing Committee, as in former years, but only a slight interruption has been thereby occasioned to the regular issue of the Journal.

During the past year the sum of £36 15s. has been expended on illustrations for the Journal, and the entire cost of its publication for the year amounts to £266 17s. 5d., a sum very slightly in advance of the outlay of former years.

In the numbers now completed, forming the third volume of the New Series, 26 original papers have been printed, 22 of which have been selected from those communicated to the Institute during the meetings of the Session of 1857–8. Twenty-four articles, in the form of Reviews, have also furnished an amount of original material, in some cases not inferior in value to any of the papers in the department of Communications. For valuable contributions to this department, the Editing Committee have to record their obligations to Dr. Wm. Sutherland, of Montreal, the Rev. Professor Young, Professor Kingston, Professor Buckland and the Rev. Dr. O'Meara.

The Scientific and Literary Notes have been continued, as in former years, and embrace contributions fully equal to those included under the same head in previous volumes. The Committee have only to regret that in this, as in all other departments of the Journal, they continue to receive so few additions, in the form of contributions, from the members at large. Such communications they would once more earnestly invite from the Members, and other intelligent observers, as welcome additions to the Journal which represents, for Upper Canada at least, the scientific industry and research of the Province.

Toronto, 9th December, 1858. DAN. WILSON, *Convener.*

TREASURER'S REPORT, 1858.

Statement of the Canadian Institute General Account for 1858.

Dr.

Cash, balance from last year	£178	12	10
" received from Members	289	12	0
" for sale of Journal	54	1	0
" Parliamentary Grant for 1858	250	0	0
" Athenæum Grant for 1855	100	0	0
" Mrs. Blunt's Readings	20	15	0
Arrears due by Members of the Institute	406	7	6
" for sale of Journal—old series	24	15	0
" " new series	52	17	6
		£1377	0 10

Cr.

Cash paid on account of publication of the Journal—					
1857 .... £44 4 6½					
1858 .... 196 17 5					
	241	1	11½		
Cash paid on account of Library and Museum.....	133	9	1		
" paid on account of Sundries.....	342	13	2½		
" paid to Mrs. Blunt	25	0	0		
" due on account of publication of the Journal....	70	0	0		
" due on account of sundries—estimated.....	15	0	0		
Estimated balance in favour of the Institute	549	16	7		
				£1377	0 10

Statement of the Building Fund.

Cash, balance from last year	1568	9	10		
" received for Interest on loans	94	19	5		
" due for Interest on loans	83	17	6		
" on Subscription list	534	15	0		
				2282	1 9

The Treasurer in account with the Canadian Institute.

Dr.

Cash, balance from last year	178	12	10		
" Securities	1600	0	0		
" received from Members	289	12	0		
" received for sale of Journal	54	1	0		
" Parliamentary Grant for 1858	250	0	0		
" Athenæum Grant for 1855.....	100	0	0		
" Mrs. Blunt's Readings	20	15	0		
" Interest on Investments.....	94	19	5		
				2588	0 3

Cr.

Cash paid on account of the publication of the Journal	241	1	11½		
" paid on account of Library and Museum.....	133	9	1		
" paid on account of sundries	342	13	2½		
" paid to Mrs. Blunt	25	0	0		
Securities	1425	0	0		
Balance	420	16	0		
				£2588	0 3

From the estimated balance of £549 16s. 7d. in favour of the General Account of the Institute, a liberal margin must be allowed for the non-payment of subscriptions due by Members, and cash due on account of the Journal. The sum of £406 7s. 6d. in arrear of Members' subscriptions, has been accumulating since 1852; but the larger portion of that amount is due for the past three years, and may still be collected. £24 15s. not paid, on account of the old series of the Journal, has been outstanding a considerable time, and will probably not be paid. In the Building Fund Account, credit is taken for £534 15s. on a subscription list now of an old date, and unless soon called in, cannot be relied on as an asset. This fund has increased since the last Annual Meeting by interest on investments only.

December 1st, 1858. D. Crawford, *Treasurer.*

AUDITORS' REPORT, 1858.

The undersigned Auditors have to Report that they have examined the Vouchers with the Cash Book, and find them correct. Balance in the hands of the Treasurer, £420 16s.; and the sum of £1,425 invested on Securities, shewn to us.

Toronto, Dec. 9th, 1858. SAMUEL SPREULL, ROBERT SPRATT, } *Auditors.*

Referring to the details above given, the Council believe that they may report satisfactorily upon the general progress and condition of the Institute. The accession of new Members has kept pace with that which has formed a subject of congratulation in former years; and with it the means at the disposal of the Institute have received a corresponding increase, although not equal to the loss which has been sustained by the withdrawal of the Government Grant formerly made to the Toronto Athenæum, which we have enjoyed since the amalgamation of the two Institutions. The Library is annually becoming a more important feature of the Institute, numbering at present upwards of 2,000 volumes, which since the publication of the Catalogue have become more generally accessible. The Journal, under the zealous editorship of Dr. Wilson and his colleagues, has maintained the reputation which it had previously established; and the papers which have been read at the ordinary meetings will compare favourably with those of former years. The list of papers also exhibits some indications of an advance in the direction to which successive Councils have endeavoured to guide the development of increasing activity in the Institute, inasmuch as a larger proportion of the names of contributors belong to members unconnected with the management of the Journal. It is still, however, a matter of regret that so large a share of the business of the Institute in this respect falls upon a few individuals, and that the original communications read at the ordinary meetings would fail to supply the requisite amount of matter for the Journal of the Institute without a very considerable addition of articles by members of the Editing Committee.

JOHN LANGTON,
Toronto, December 4th, 1858. *Vice-President.*

VI. *The following Papers were read:*

1. By Prof. E. J. Chapman:
"On a new species of Asaphus," to which he has given the name of "Asaphus Hincksii."
2. By W. Weir, Esq.:
"On the manufactures of Canada."

METEOROLOGY.

MEAN METEOROLIGICAL RESULTS.—TORONTO—FOR THE YEAR 1858.

The mean temperature of the year 1858 was 44.74°, being 2.01° higher than that of the preceding year, and 0.64° above the average of 19 years.

The mean temperature of the four seasons was as follows:

For the Winter, including Dec., 1857, 26.29° which is 4.90° higher than that of the preceding Winter, and 2.06° above the average.

For Spring, 39.60° which is 2.25° higher than that of the preceding Spring, and 1.07° below the average.

For Summer, 67.21° which is 3.88° higher than that of the preceding Summer, and 2.34° above the average.

For Autumn, 47.35° which is 1.48° higher than that of the preceding Autumn and 0.68° above the average.

The mean temperatures of the several months were in eight instances above and and in four below the averages for those months. July and February were as usual the warmest and coldest months as compared with other months in the year, but estimated by the deviation of their temperatures from their respective averages, January was the warmest month and February the coldest.

The mean temperature of the warmest day, which was 79.98°, exceeded the nineteen years average by 2.56°. It occurred on June 26, which is 24 days earlier than the *average* date of the warmest day, but 32 days earlier than its *normal* date, or date derived from the *normal* curve of temperature for Toronto, a curve in which by the employment of five day groups accidental irregularities are eliminated. The mean temperature of the coldest day, which was + 1.60°, exceeded the average by 1.8°. It occurred on Feb. 17, which is 22 days later than the *average* date of the coldest day, and 3 days later than the *normal* date of the coldest day.

The highest temperature of the year was 90.2°, or 0.5° lower than the average maximum of 19 years. It occurred on June 26, already mentioned as the warmest day, and 30 days earlier than the average date of its occurrence. The minimum temperature of the year was —7.3° or 3.8° higher than the average minimum. It occurred on Feb. 17, already mentioned as the coldest day, or 24 days later than the date at which, on the average, the absolutely lowest temperature has occurred. The range of temperature for the whole year, 97.5°, was less than the average by 4.2°.

Humidity.—The mean humidity of the year was 0.73, the greatest monthly humidity being in December, and the least in April, facts which conform very nearly to the experience of the past eighteen years, which give January and May as the dampest and driest months as regards the vapour suspended in the atmosphere. There were but three instances of perfect saturation, one in November and two in December, and the day when on the whole the atmosphere was most damp was March 15, when the mean humidity was .96. The instance of greatest atmospheric dryness was .08, at 4 p. m. of April 16; and the dryest day on the whole was May 3, with a mean humidity of .39.

Clouds.—The extent of sky clouded was on the average ⅗ of the whole hemisphere, and for nine months the sky was on the average at least half over-cast December was the most cloudy month, and September the month most free from clouds. This harmonises with experience as regards December, but the month in hich on the whole clouds usually prevail least is July. Considered with refer-

ence to the different hours of the day, 2 p. m. and midnight were the hours at which the extent of sky clouded was greatest and least.

Wind.—The resultant direction of the wind for the year was considerably more from the west, and the resultant velocity as well as the mean velocity was much less than in the preceding three years. The most windy month was April, with a mean velocity 9.57 miles per hour, and the least windy month was June, with a mean velocity 5.38. The most windy day was 21st March, with a mean velocity of 23.62 miles, and the most windy hour absolutely was from 3 to 4 p. m. on the same day, when the velocity was 35.4 miles. The most windy hour on the average of the year was from 2 p. m. to 3 p. m., with a mean velocity of 10.51 miles, and the least windy hour from midnight to 1 a. m., with a mean velocity of 5.88 miles.

Rain and Snow.—The depth of rain, 28.051 inches was 2.674 inches below the average, and the depth of snow 45.4 inches or 16·2 less than the average. The total depth of rain and melted snow thus fell short of the average by nearly 4.3 inches.

May was the most rainy month, estimated by the quantity of rain that fell, but considered with reference to the number of rainy days, October and May were equally rainy. February was in both respects the least rainy month. The most rainy day was May 11, when the depth of rain was 1.590 inches, and the days on which the heaviest fall of snow occurred were February 1 and 13, on each of which days it fell to the depth of 6 inches.

The fall of rain was distributed over 131 days, and the fall of snow over 67 days, including some days enumerated as days of rain; and there were 178 days without either rain or snow. The rain occupied about 584 hours, and the snow about 277 hours in its fall, giving thus a total of 861 hours, or nearly 36 days, or nearly one-tenth of the year when either rain or snow was actually falling.

The hour when rain was most frequent through the year was 1 p. m. to 2 p. m., the hours at which snow was most frequent were from 10 a. m. to 11 a. m., and from 1 p. m. to 2 p. m.; and the hour most subject either to rain or snow was from 1 p. m. to 2 p. m.

The hours most free from rain and snow considered separately, were from 10 a. m. to 11 a. m,, and from 6 p. m. to 7 p. m. for rain, and from midnight to 1 a. m. for snow; and the hour most free from rain and snow taken collectively was from midnight to 1 a. m.

Thunderstorms.—There were but 19 thunderstorms, reckoning as such those cases in which thunder or lightning occurred accompanied by rain or hail; but there were besides 31 instances in which thunder and lightning occurred separately or together, but unaccompanied by either rain or hail.

Auroras.—Auroras were more frequent than during the preceding five years, and that of Oct. 27 exceeded in brilliancy any that were observed within that period.

From the foregoing statements, as well as from the accompanying table, it would appear that 1858 may on the whole be characterized as a moderate and average year, the most marked exception being the early date of the maximum of summer heat, the somewhat scanty supply of rain and snow, taking one month with the other, and its unusually large amount in the month of May.

G. T. K.

GENERAL METEOROLOGICAL

Provincial Magnetical Observatory,

LATITUDE, 43° 39' 4" North. LONGITUDE, 5 h. 17 m. 33 s. West. ELEVATION ABOVE

	Jany.	Feby.	March.	April.	May.	June.
	°	°	°	°	°	°
Mean Temperature	30.03	16.98	28.44	41.40	48.90	66.15
Difference from average (19 years)	+ 6.45	— 5.68	— 1.31	+ 0.38	— 2.28	+ 4.72
Thermic Anomaly (Lat. 43° 40' N.)	— 2.77	—17.72	—11.66	— 8.74	— 9.20	+ 1.55
Highest Temperature	47.4	42.4	55.4	65.2	69.8	90.2
Lowest Temperature	6.5	— 7.3	— 5.5	21.8	31.0	42.5
Monthly and Annual Ranges	40.9	49.7	60.9	43.4	38.8	47.7
Mean Maximum Temperature	35.27	24.11	37.01	48.32	55.74	73.94
Mean Minimum Temperature	23.73	10.85	21.93	34.15	41.68	56.41
Mean Daily Range	11.54	13.26	15.08	14.16	14.06	17.54
Greatest Daily Range	25.5	25.6	25.4	24.8	25.0	26.4
Mean Height of Barometer	29.6753	29.6603	29.6197	29.4987	29.5838	29.6057
Difference from average (12 years)	+.0455	+.0478	—.0117	—.1084	+.0003	+.0239
Highest Barometer	30.408	30.060	30.159	30.006	30.198	29.891
Lowest Barometer	28.973	28.940	28.849	29.011	29.032	29.147
Monthly and Annual Ranges	1.435	1.120	1.310	0.995	1.166	0.744
Mean Humidity	.78	.77	.69	.66	.69	.69
Mean Elasticity of Aqueous Vapour	0.134	0.080	0.119	0.176	0.239	0.465
Mean of Cloudiness	0.61	0.60	0.50	0.65	0.69	0.48
Resultant Direction of the Wind	N 71 W	N 72 W	N 58 W	N 14 W	N 42 E	S 20 E
Resultant Velocity of the Wind	2.33	3.22	5 45	1.64	3.33	0.25
Mean Velocity (Miles per hour)	7.40	9.12	8.56	9.57	9.30	5.53
Difference from average (11 years)	—0.14	+1.37	+0.66	+2.28	+2.88	+0.73
Total Amount of Rain (in inches)	1.152	Inapp.	0.917	1.642	6.367	2.943
Difference from average (18 or 19 years)	—0.329	—1.076	—0.497	—0.849	+3.067	—0.208
Number of Days Rain	6	1	10	13	17	12
Total Amount of Snow (in inches)	4.0	26.7	0.2	0.1	.....	.....
Difference from average (16 years)	—9.32	+8.84	—9.56	—2.35	—0.09	.....
Number of Days Snow	11	16	6	2	.....	.....
Number of Fair Days	15	12	16	15	14	18
Number of Auroras observed	3	6	4	4	5	4
Possible to see Aurora (No. of Nights)	17	11	19	17	27	20
Number of Thunderstorms	0	0	0	1	2	7

REGISTER FOR THE YEAR 1858.

Toronto, Canada West.

LAKE ONTARIO, 108 feet. APPROXIMATE ELEVATION ABOVE THE SEA, 342 feet.

July.	August.	Sept.	Oct.	Nov.	Dec.	Year 1858.	Year 1857.	Year 1856.	Year 1855.	Year 1854.	Year 1853.
°	°	°	°	°	°	°	°	°	°	°	°
67.86	67.61	59.11	48.79	34.16	27.40	44.74	42.73	42.16	43.98	45.21	44.78
+ 0.79	+ 1.51	+ 0.98	+ 3.40	— 2.33	+ 1.01	+ 0.64	— 1.34	— 1.99	— 0.29	+ 0.87	+ 0.44
— 0.84	— 0.89	— 2.39	— 5.01	— 9.04	— 8.60	— 6.26	— 8.27	— 8.84	— 7.02	— 5.79	— 6.22
85.0	84.0	81.4	76.3	53.0	45.4	90.2	88.2	96.6	92.8	99.2	94.9
52.0	44.0	35.6	31.5	15.3	4.2	— 7.3	—20.1	—18.7	—25.4	—10.8	— 9.7
33.0	40.0	45.8	44.8	37.7	37.7	97.5	108.3	115.3	118.2	110.0	104.6
75.44	75.38	67.52	55.79	37.90	33.19	.....	.....	.....	.....	.....	.....
59.98	59.21	50.79	43.41	30.03	21.37	.....	.....	.....	.....	.....	.....
15.45	16.17	16.73	12.37	7.87	11.82	13.84	16.38	18.29	18.19	19.77	16.89
24.6	31.2	29.0	24.0	17.3	27.3	31.2	37.0	44.2	39.4	44.5	40.9
29.6052	29.6194	29.6499	29.6813	29.6267	29.6943	26.6267	29.6054	29.5999	29.6249	29.6077	29.6299
—.0079	—.0167	—.0042	+.0415	+.0079	+.0480	+.0068	—.0145	—.0200	+.0050	—.0122	+.0100
29.915	29.939	30.098	30.042	29.970	30.351	30.408	30.361	30.480	30.552	30.245	30.315
29.290	29.231	29.167	29.000	29.190	29.008	28.849	28.452	28.459	28.459	28.685	28.653
0.625	0.708	0.931	1.042	0.780	1.343	1.559	1.909	2.021	2.093	1.560	1.662
.70	.70	.74	.72	.79	.81	.73	.79	.75	.77	.79	.79
0.481	0.478	0.384	0.256	0.162	0.128	0.259	0.25.	0.244	0.263	0.279	0.271
0.50	0.42	0.41	0.[illegible]	0.81	0.83	0.60	0.60	0.57	0.60	0.59	0.57
N 15 E	N 60 W	S 74 W	N 34 W	N 25 W	N 18 W	N 41 W	N 74 W	N 71 W	N 62 W	N 43 W	N 38 W
1.13	1.57	1.53	0.36	3.14	3.66	1.50	2.54	3.03	2.51	1.37	1.17
5.76	6.50	5.69	5.96	3.87	9.36	7.64	7.99	8.31	8.18	6.02	5.08
+1.10	+1.36	+0.34	+0.41	+1.88	+1.56	+1.21	+1.68	+2.19	+2.33	+0.53	—0.33
3.072	3.890	0.735	1.797	3.879	1.657	28.051	33.205	21.505	31.650	27.765	23.550
—0.464	+1.023	—3.355	—0.850	+0.886	+0.019	—2.674	+2.223	—9.329	+0.286	—3.576	—8.076
13	11	8	17	12	11	131	[illegible]	99	103	114	109
.....	.....	.....	Inapp.	4.0	10.4	45.4	73.8	65.5	99.0	49.5	53.2
.....	.....	.....	—0.99	+0.68	—3.41	—16.2	+11.1	+ 3.6	+37.4	— 8.9	— 6.1
.....	.....	.....	1	13	18	67	79	69	64	52	52
18	20	22	14	7	7	178	171	198	198	199	204
5	6	8	10	3	2	59	96	35	46	52	57
19	22	23	15	10	8	198	189	212	204	203	233
4	2	1	2	0	0	19	28	25	38	58	34

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST—DECEMBER, 1858.

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 min. 33 sec. West. Elevation above Lake Ontario, 108 feet.

Days.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Average	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resultant Direction.	Velocity of Wind.					Rain in Inches.	Snow in Inches.
	6 A.M.	2 P.M.	10 P.M.	MEAN.	6 A.M	2 P.M	10PM	ME'N		6 A.M	2 P.M	10 P.M	M'N	6 A.M	2 P.M	10 P.M	M'N	6 A.M.	2 P.M.	10 P. M.		6 A.M	2 P.M	10PM	Result.	ME'N		
					°	°	°	°																				
1	30.095	30.002	29.830	29.9633	13.6	26.5	32.1	24.20	— 6.58	.072	.110	.142	.110	.91	.76	.78	.80	N E b N	S E b E	E b S	S 79 E	4.3	12.4	9.8	7.62	9.06	.....	...
2	29.631	29.678	.754	.6952	37.1	38.9	36.0	37.13	+ 6.65	.147	.143	.170	.153	.97	.60	.80	.69	S S E	W S W	W S W	S 66 W	4.8	5.8	2.5	3.88	4.42	.....	0.5
3	.746	.764	.836	.7048	31.0	26.6	23.4	26.93	— 3.15	.167	.119	.108	.129	.92	.82	.86	.87	W N W	N W b N	N N E	N 0 W	6.8	10.5	0.4	5.61	6.55	.....	1.5
4	.775	.695	.705	.6975	21.2	22.3	22.5	21.67	— 8.22	.105	.103	.093	.097	.92	.86	.77	.84	N E b N	N E b E	N E	N 44 E	9.6	15.6	8.4	10.97	11.35	.....	1.2
5	.361	.143	—	—	27.4	41.5	—	—	—	.146	.212	—	—	.68	.80	—	—	E N E	S W b S	W S W	S 62 W	17.2	8.4	18.5	7.09	16 23	0.440	0.1
6	.797	.884	.861	.8493	32.1	34.2	27.7	31.03	+ 1.07	.113	.131	.139	.131	.61	.66	.92	.76	W	W	Calm.	N 29 E	9.6	4.8	0.0	1.03	7.18	.....	...
7	.678	.442	.376	.5022	33.0	39.7	40.4	37.33	+ 8.67	.145	.193	.170	.161	.74	.78	.67	.71	E	S E b E	W b S	S 70 W	10.2	4.5	15.0	4.30	9.76	.....	...
8	.556	.634	.708	.6852	25.9	23.8	16.2	20.93	— 7.53	.125	.050	.067	.082	.89	.39	.74	.71	W b N	W	W	S 86 W	13.8	22.4	23.4	19.36	19.54	.....	Inap
9	.969	30.035	30.146	30.0567	13.3	20.5	15.3	16.53	—11.62	.053	.068	.068	.066	.64	.61	.79	.71	W S W	W b S	W b S	S 77 W	20.6	19.4	13.5	15.08	15.12	.....	...
10	30.034	29.744	29.708	29.8170	16.0	29.4	33.2	26.55	— 1.30	.070	.100	.169	.114	.77	.62	.89	.76	W b S	S W b S	W b S	S 56 W	3.6	24.6	13.7	14.14	14.80	.....	...
11	29.764	.840	.965	.8695	28.8	32.1	18.2	25.62	— 2.03	.121	.082	.081	.101	.76	.45	.82	.74	W S W	W b N	Calm.	N 20 W	5.2	9.0	0.0	5.07	6.92	.....	...
12	30.002	.955	—	—	21.2	20.6	—	—	—	.105	.116	—	—	.92	.80	—	—	N E b N	E N E	E b N	N 75 E	10.0	21.5	19.0	16.46	17.02	0.015	Inap
13	29.504	.416	.526	.4847	38.6	41.5	39.1	40.08	+12.93	.215	.244	.239	.236	.92	.93	1.00	.95	E	S S W	S W b W	S 6 E	9.5	6.6	1.0	2.71	4.54	0.260	...
14	.378	.264	.282	.3075	41.8	43.6	37.1	40.63	+13.67	.245	.266	.200	.236	.92	.94	.90	.92	E	S E b S	N W b N	N 21 W	2 8	2.2	10.4	3.90	4.65	0.245	...
15	.348	.455	.640	.4958	33.9	33.9	28.1	31.58	+ 4.82	.180	.174	.116	.150	.92	.89	.75	.83	N W b N	N W	Calm.	N 33 W	3.8	9.5	0.0	4.08	4.17	.....	0.2
16	.720	.707	.725	.7172	24.8	31.5	31.0	29.32	+ 2.75	.120	.142	.126	.134	.90	.79	.72	.82	N W	W S W	W S W	S 87 W	2.0	13.4	6.8	6.33	8.68	.....	0.5
17	.865	.981	30.008	.9632	19.8	21.8	16.5	19.10	— 7.27	.095	.073	.069	.081	.89	.62	.77	.78	N W b N	N	N b E	N 9 E	10.4	2.0	8.0	4.91	5.12	.....	Inap
18	30.085	30.115	30.063	30.0898	10.0	12.6	14.4	11.98	—14.18	.057	.066	.077	.067	.82	.86	.92	.89	N E	N E b E	N E b N	N 58 E	7.2	11.8	9.6	8.97	10.27	.....	0.2
19	29.813	29.528	—	—	25.2	34.2	—	—	—	.115	.160	—	—	.85	.81	—	—	E b S	S E b S	S W b W	S 30 W	4.8	0.2	9.2	2.33	5.87	0.050	...
20	.588	.578	29.452	29.5317	33.2	34.6	34.2	33.88	+ 8.00	.166	.142	.168	.158	.87	.71	.85	.81	N b W	E b N	E N E	N 59 E	3.8	3.4	12.2	7.67	8.17	0.110	Inap
21	.155	.008	.204	.1380	35.5	32.8	31.3	33.05	+ 7.27	.179	.160	.152	.164	.93	.85	.86	.87	N E b E	N b W	N W b W	N 34 W	13.4	13.3	2.0	11.17	13.76	0.080	...
22	.423	.627	.761	.6272	29.2	30.1	21.6	26.23	+ 0.55	.116	.110	.097	.109	.72	.66	.84	.76	W N W	W N W	N b W	N 56 W	23.6	23.4	2.0	10.19	14.82	.....	Inap
23	.514	.445	.678	.5237	27.7	17.6	11.1	19.98	— 5.58	.121	.076	.082	.092	.80	.79	.86	.84	E b S.	N E	N E	N 39 E	12.5	10.5	4.4	7.58	8.95	Inap	1.0
24	.894	30.115	30.250	30.1108	12.9	15.5	6.2	11.27	—14.22	.069	.076	.047	.061	.89	.76	.80	.81	N .	N W b N	Calm.	N 26 W	11.6	6.6	0.0	3.65	3.71	.....	Inap
25	30.319	30.238	—	—	13.6	25.2	—	—	—	.072	.122	—	—	.91	.90	—	—	N b W	Calm.	Calm.	N 30 W	1.6	0.0	0.0	0.31	0.31	.....	...
26	29.878	29.668	—	—	28.1	36.0	—	—	—	.130	.153	—	—	.84	.73	—	—	Calm.	S E b S	W S W	S 58 W	0.0	1.8	9.5	5.69	6.50	0.057	...
27	.679	.693	29.797	29.7323	35.7	36.8	35.3	35.25	+ 9.97	.159	.170	.146	.151	.76	.77	.71	.73	W b N	W b S	W b N	N 83 W	9.4	5.2	2.4	3.55	3.59	.....	Inap
28	.850	.816	.764	.8088	33.2	39.5	25.7	29.12	+ 3.97	.166	.117	.088	.123	.87	.72	.62	.75	W b N	N E b N	N E b E	N 51 E	2.2	2.8	8.2	6.66	7.36	.....	0.2
29	.712	.602	.654	.6505	18.7	18.0	19.1	19.13	— 6.03	.082	.084	.083	.088	.81	.86	.81	.85	N E b E	N E b E	E N E	N 62 E	14.2	15.4	16.8	17.17	17.26	.....	3 0
30	.643	.567	.463	.5477	22.0	30.3	32.8	28.45	+ 3.27	.110	.164	.172	.147	.93	.98	.91	.93	E N E	E	E b N	N 88 E	20.8	20.6	16.2	15.80	16.81	0.370	2.0
31	.349	.347	.484	.3947	36.4	37.5	33.8	35.43	+10.25	.192	.186	.166	.176	.89	.83	.85	.85	S b E	S W	W b S	S 54 W	13.6	15.2	10.5	6.62	7.75	0.030	...
	29.6828	29.6078	29.7180	29.6943	27.12	29.29	26.47	27.40	+ 0.31	.130	.129	.124	.128	.83	.75	.82	.81					9.13	10.41	8.17	.....	9.36	1.657	10.4

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR DECEMBER.

Highest Barometer..... 30.351 at 7 a. m., on 25th } Monthly range=
Lowest Barometer ..... [illegible]8 at 2 p. m., on 21st } 1.343 inches

Self-registering Thermom.
Maximum Temperature..... 4[illegible]4 on 14th at p.m. } Monthly range=
Minimum Temperature..... 4°2 on 25th at a.m. } 41°2

Mean maximum Temperature ..... 33°19 } Mean daily range=
Mean minimum Temperature ..... 21°37 } 11°82

Greatest daily range ..... 27°3 from p. m. of 1st to a. m. of 2nd.
Least daily range..... 1°8 from a. m. to p. m. of 21st.

Warmest day..... 14th ... Mean temperature..... 40.63 } Difference = 29°36.
Coldest day..... 24th ... Mean temperature..... 11°27 }

Maximum { Solar..... 55°8 on p. m. of 5th } Monthly range=
Radiation. { Terrestrial ..... —7°0 on a. m. of 25th } 62°8.

Aurora observed on 2 nights, viz., on 22nd and 24th.

Possible to see Aurora on 8 nights; impossible on 23 nights.

Snowing on 18 days,—depth. 10.4 inches; duration of fall 74.4 hours.

Raining on 11 days,—depth 1.657 inches; duration of fall 44.0 hours.

Mean of cloudiness = 0.83.

Most cloudy hour observed, 2 p. m., mean = 0.87; least cloudy hour observed 10 p. m., mean, = 0.79.

Sums of the components of the Atmospheric Current, expressed in miles.

Nerth.	South.	East.	West.
2182.31	1009.04	2586.33	2962.27

Resultant direction N. 18° W.; Resultant Velocity 1.66 miles per hour.

Mean velocity..... 9.36 miles per hour.
Maximum velocity ..... 30.0 miles from 9 to 10 a. m. on 22nd.

Most windy day..... 8th...Mean velocity 19.54 miles per hour.
Least windy day ..... 25th...Mean velocity 0.31 ditto.

Most windy hour ..... 10 to 11 a. m...Mean velocity 11.09 ditto. } Difference
Least windy hour ..... 9 to 10 p. m...Mean velocity 7.52 ditto. } 3.57 miles.

4th—Slight showers of Snow and Hail most of the day.
9th—A considerable number of Meteors observed from 9 to 11 p. m.
13th—Corona round the Moon from 5 p. m.
13th—Very mild day. Dense Fog, commencing at noon.
14th—Dense Fog, continuing till 6 p. m. Very mild day.
16th—Perfect Halo round the Moon, 6 to 8 p. m.
17th—Corona round the moon at 10 p. m.
24th—Toronto Bay frozen over during the night.
25th—Several skaters crossed the Bay to the Island during the course of the day.
29th—Very stormy day, Snowing and drifting heavily.
30th—Very stormy day; Rain, Sleet and Snow with little intermission all day.

The Resultant Direction and Velocity of the Wind for the month of December from 1848 to 1858 inclusive, were respectively N 73° W and 1.55 miles.

December, 1858, was mild and cloudy; the amount of Rain received was about the average, but the depth of snow was 3.4 inches less than the mean of 16 years.

COMPARATIVE TABLE FOR DECEMBER.

Year.	Temperature. M'n.	Diff. from Aver.	Max ob'd.	Min. ob'd.	Range.	Rain. No. of days.	Rain. Inch's.	Snow. No. of days.	Snow. Inch's.	Wind. Resultant Direction.	Wind. Resultant V'y.	Wind. Mean Force or Velocity.
	°	°	°	°	°							
1840	24.3	—2.1	41.0	—4.4	45.4	3	inapp.	18	...	...	...	.....
1841	28.7	+2.3	45.5	+2.4	43.1	7	0.600	5	...	...	...	1.33 lbs.
1842	24.7	—1.7	40.3	+3.8	36.5	3	0.880	17	...	...	...	0.61
1843	30.0	+3.6	41.1	+2.7	38.4	6	1.040	8	8.1	...	...	0.53
1844	28.2	+1.8	48.9	—0.8	49.7	6	impft.	6	4.2	...	...	0.40
1845	21.1	—5.3	37.6	—2.7	40.3	2	inapp.	12	4.7	...	...	0.70
1846	27.5	+1.1	49.2	+3.7	45.5	5	1.215	9	6.0	...	...	0.57
1847	30.1	+3.7	50.0	+6.6	43.4	7	1 185	8	6.8	...	...	0.35
1848	29.1	+2.7	49.1	+0.6	48.5	7	2.750	7	16 5	S 83° W	1.12	5.44 mls.
1849	26.5	+0.1	41.3	—5.2	46.5	5	0.840	12	9.6	N 82° W	2.56	6.23
1850	21.7	—4.7	48.3	—9.7	58.0	2	0.190	18	29.5	N 44° W	2.93	7.40
1851	21.5	—4.9	43.8	—10.5	54.3	6	1.075	15	10.7	N 82° W	4.00	7.37
1852	31.9	+5.5	51.0	+13.9	37.1	7	3.995	10	20.1	S 69° W	1.03	6.54
1853	25.3	—1.1	42.2	—5.2	47.4	4	0.625	13	22.3	N 35° W	2.39	4.98
1854	21.9	—4.5	41.8	—5.9	47.7	5	0.590	12	17.2	N 47° W	4.18	8.66
1855	26.8	+0.4	45.9	—2.1	48.0	6	1.845	10	29 5	S 88° W	5.29	11.38
1856	22.9	—3.5	41.2	—9.1	50.3	6	1.790	20	16.3	S 87° W	4.62	11.56
1857	31.9	+5.5	45.6	+5.7	39.9	7	3.205	14	9.0	N 89° W	2.51	6.84
1858	27.4	+1.0	43.6	+5.0	38.6	11	1.657	18	10.4	N 18° W	1.66	9 36
M	26.39	...	44.60	—0.59	45.19	5.5	1.638	12.2	13.84	.....	...	7.80 Mls.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—JANUARY, 1859.

Latitude—43 *deg.* 39.4 *min. North. Longitude*—5 *h.* 17 *m.* 33 *s. West. Elevation above Lake Ontario*, 108 *feet.*

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Average	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resul't. Direction.	Velocity of Wind.					Rain in inches.	Snow in inches.
	6 A.M.	2 P.M.	10 P.M.	Mean.	6 A.M.	2 P.M.	10 P.M.	M'E'N		6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.	M'N	6 A. M.	2 P. M.	10 P. M.		6 AM.	2 P.M.	10 P.M.	Result.	M'E'N		
					°	°	°	°	°												°							
1	29.523	29.599	29.827	29.6638	32.5	36.0	27.0	31.52	+ 6.30	.164	.170	.129	.152	.88	.80	.88	.85	s b w	W	NW b N	N 62 W	6.2	11.5	3.8	5.57	6.48	...	inap.
2	.933	.940	—	—	26.7	26.7	—	—	—	.140	.125	—	—	.96	.86	—	—	Calm.	N E b E	N E	N 63 E	0.0	6.8	4.5	5.78	6.52	...	inap.
3	.912	.767	.690	.7802	31.4	34.8	35.3	33.73	+ 8.58	.162	.146	.150	.150	.91	.72	.73	.78	E S E	S b E	S b E	S 23 E	9.2	6.2	10.2	7.54	8.20	...	0.1
4	.606	.616	.674	.6380	33.5	34.7	31.2	32.63	+ 7.50	.186	.117	.145	.150	.97	.58	.82	.81	Calm.	w b N	w b s	S 83 W	0.0	10.0	11.5	8.96	9.27	...	0.2
5	.593	.488	.606	.5705	29.9	40.1	33.7	34.47	+ 9.33	.161	.143	.167	.153	.57	.86	.78	.78	s w b s	W S W	w s w	S 62 W	12.2	9.8	4.0	7.70	7.85	...	...
6	.756	.799	.558	.6057	29.7	30.3	29.9	29.83	+ 4.70	.148	.141	.153	.143	.89	.83	.92	.86	W	N W b W	E N E	N 52 E	5.2	1.8	13.6	2.96	5.58	...	2.0
7	.230	28.974	.301	.1753	33.3	27.4	14.4	24.90	— 1.14	.179	.138	.064	.122	.95	.93	.76	.88	E	N b W	N W b W	N 52 W	0.8	11.6	14.8	14.06	15.29	inap.	2.9
8	.504	29.574	.603	.5708	5.5	7.1	6.4	6.13	—19.00	.052	.042	.050	.045	.92	.68	.85	.77	N W	N W b W	s w b W	N 60 W	17.2	6.2	15.2	8.48	11.46	...	0.5
9	.732	.884	—	—	—9.4	—10.2	—	—	—	.022	.021	—	—	.79	.78	—	—	N	N	N b E	N 4 E	12.4	9.8	5.0	7.66	7.78	...	0.3
10	30.285	30.236	30.035	30.1735	—26.5	—6.2	4.4	—8.65	—33.70	.008	.032	.039	.028	.59	.96	.73	.79	E b N	N b E	S E	N 83 E	9.4	1.0	8.4	3.67	7.08	...	0.5
11	29.757	29.584	29.645	29.6547	13.3	14.2	14.4	14.45	—10.60	.070	.063	.076	.072	.89	.76	.91	.85	E S E	N E b N	N E b N	N 50 E	7.4	9.0	3.2	5.65	6.12	...	4.5
12	.600	.537	.515	.5427	15.8	19.4	22.7	19.67	— 5.42	.072	.080	.117	.093	.80	.70	.96	.86	N E b E	N E	N E b E	N 51 E	8.5	4.8	2.4	3.43	5.24	inap.	0.1
13	.486	.530	.573	.5388	25.6	36.5	34.1	33.15	+ 8.07	.131	.191	.178	.171	.95	.88	.90	.90	s w b s	s w b w	Calm.	S 42 W	10.2	0.2	0.0	2.12	2.18	...	...
14	.455	.238	.065	.2333	34.2	35.8	34.6	34.95	+ 9.85	.185	.207	.190	.192	.93	.98	.95	.95	S S E	E N E	N E b E	N 68 E	5.2	11.0	10.5	7.57	8.76	0.655	...
15	28.943	28.992	.323	.1098	35.3	32.1	27.7	31.14	+ 6.03	.198	.134	.135	.153	.99	.74	.89	.86	s w b s	N W	W N W	N 68 W	7.4	23.4	19.2	14.41	16.26	0.017	0.4
16	29.540	29.523	—	—	26.3	31.0	—	—	—	.130	.145	—	—	.91	.89	—	—	W	S W	s b W	s 45 W	17.0	6.5	8.5	5.67	6.31	...	2.2
17	.511	.773	30.058	.8057	31.4	24.1	8.6	20.47	— 4.55	.165	.103	.055	.106	.93	.79	.86	.89	w b s	N W b N	N W b N	N 24 W	0.4	14.5	0.5	6.14	6.34	...	0.1
18	30.136	30.043	29.831	.9933	3.2	19.1	27.0	17.17	— 7.80	.048	.084	.107	.080	.95	.81	.73	.80	N W b N	S W b W	S W	S 50 W	3.0	10.8	15.8	8.79	9.40	...	inap.
19	29.833	29.722	.675	.7432	25.9	35.7	36.0	32.67	+ 7.78	.128	.145	.190	.155	.91	.69	.93	.83	s w b w	S S W	S W b S	S 21 W	0.2	12.5	7.5	5.58	5.63	...	...
20	.607	.553	.394	.4780	32.8	41.5	38.9	37.98	+13.13	.171	.182	.228	.194	.91	.68	.96	.84	S S W	S W b S	S W b S	S 39 W	3.5	16.0	3.0	7.52	7.98	0.185	...
21	.458	.430	.578	.5020	36.8	36.0	25.0	31.95	+ 7.17	.203	.145	.092	.135	.93	.68	.68	.72	w b s	W S W	N W b N	N 64 W	3.5	10.6	12.2	6.30	9.39	...	0.2
22	.658	.856	30.053	.8813	16.2	14.0	10.0	13.02	—11.75	.087	.044	.048	.060	.95	.53	.69	.75	N N E	N W b N	W S W	N 70 W	5.0	12.2	13.5	8.76	12.01	...	0.2
23	30.112	30.101	—	—	11.1	15.8	—	—	—	.060	.061	—	—	.83	.66	—	—	S W	W S W	S W	S 52 W	12.2	12.6	19.0	13.88	14.17	...	...
24	30.042	29.957	29.937	.9765	22.7	29.9	31.9	28.23	+ 3.67	.110	.090	.137	.111	.90	.53	.75	.71	s w b s	S S W	S S W	S 30 W	16.3	19.5	14.5	15.08	15.13	...	...
25	29.899	.820	.842	.8578	28.8	36.4	34.2	32.72	+ 8.13	.144	.124	.125	.135	.90	.58	.63	.74	s w b W	S S W	S W b W	S 40 W	5.5	10.5	11.8	8.81	9.08	...	...
26	.954	.944	30.026	.9867	31.7	36.0	29.9	32.18	+ 7.70	.147	.147	.124	.134	.32	.69	.74	.73	s w b W	S S W	S W	S 42 E	6.0	14.5	3.0	6.51	8.04	...	...
27	30.084	.879	29.572	.8063	26.6	30.6	32.8	30.33	+ 5.98	.119	.149	.171	.145	.82	.87	.91	.85	N b E	E b N	E b N	N 77 E	6.8	19.0	18.0	15.69	15.92	0.592	3.0
28	29.363	.466	.630	.5012	37.5	38.9	33.5	36.37	+12.07	.221	.152	.122	.164	.98	.93	.63	.75	E b N	w b s	W S W	S 63 W	5.8	15.0	5.8	6.84	7.67	...	...
29	.638	.670	.834	.7287	20.2	32.6	29.5	30.20	+ 6.00	.147	.124	.114	.125	.90	.66	.69	.74	s w.bw	W b s	W	N 87 W	5.6	10.2	13.0	9.05	9.75	...	...
30	.962	.988	—	—	20.9	28.5	—	—	—	.079	.083	—	—	.70	.52	—	—	Calm.	W S W	W	S 83 W	0.0	10.2	6.2	6.10	6.20	...	0.1
31	30.035	.987	.926	.9960	22.0	30.6	28.1	27.20	+ 3.22	.104	.093	.123	.106	.87	.54	.80	.72	Calm.	S W	W S W	S 43 W	0.0	8.0	2.2	4.21	4.32	...	...
M	29.6892	29.6520	29.6835	29.6770	24.54	28.75	26.20	26.44	+ 1.64	.135	.123	.124	.126	.90	.73	.81	.81					6.52	10.51	9.06		8.76	1.449	16.4

Highest Barometer . . . . . 30.311 at 11 a.m. on 10th, } Monthly range=
Lowest Barometer . . . . . 28.934 at 8 a.m. on 15th, } 1.377 inches.

Solar-reading Ther.
- Maximum temperature . . . . 43°2 on p.m. of 20th } Monthly range=
- Minimum temperature . . . . —26°5 on a. m. of 10th } 69°7
- Mean maximum temperature . . 30°46 } Mean daily range = 11°91.
- Mean minimum temperature . . 18°55 }
- Greatest daily range . . . . . 36°8 from 6 a.m. of 10th to 6 a.m. of 11th.
- Least daily range . . . . . 2.3 from 20th to 21st.

Warmest day . . 20th ... Mean Temperature . . . 37°98 } Difference=46°63.
Coldest day. . . . 10th ... Mean Temperature . . . 8°65 }

Maximum { Solar . . . . . 56°0 on p. m. of 20th } Monthly range=
Radiation { Terrestrial . . . . . —38.2 on a. m. of 10th } 94°2.

Aurora observed on ....., viz.: .....; possible to see Aurora on 13 nights; impossible on 18 nights.

Snowing on 19 days; depth, 16.4 inches; duration of fall 95.9 hours.

Raining on 6 days; depth, 1.449 inches; duration of fall, 39.5 hours.

Mean of cloudiness=0.72; most cloudy hour observed, 4 p. m., mean=0.86: least cloudy hour observed, midnight, mean=0.59.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
1728.89	2103.03	1148.10	3477.55

Resultant direction, S 81° W; Resultant Velocity, 3.17 miles per hour.
Mean velocity of the wind 8.76 miles per hour.
Maximum velocity . . . 27.3 miles per hour, from 3 to 4 p.m. on 22nd.
Most windy day . . . . . 15th—Mean velocity, 16.26 miles per hour.
Least windy day . . . . . 13th—Mean velocity, 2.18 do
Most windy hour, 1 to 2 p. m.—Mean velocity, 11·11 do } Difference
Least windy hour, 7 to 8 a. m.—Mean velocity, 6.17 do } 4.94 miles.

5th. Halo round the sun from 9 to 11 a. m.
6th. Halo round the sun from 10 a. m.
7th. Foggy and mild during the forenoon.
9th. Very cold day; wind remarkably keen.
10th. Extremely cold morning, the temperature at 6 a. m. (—26°5) was the lowest yet recorded at this Observatory.
13th. Foggy and mild at 10 p. m. and midnight.
14th. Dense fog all day.
18th. Corona round the moon from 11 p. m.
20th. Foggy and very mild at 10 p. m. and midnight.
26th. Solar Halo and faint Parhelion at 4 p. m.
28th. Very dense Fog from 7 to 10 a. m.
31st. Halo round the sun from noon to 1.30 p. m.

The Resultant Direction and Velocity of the Wind for the month of January, from 1848 to 1859 inclusive, were respectively N 74° W, and 2.74 miles.

The month of January, 1859, was Foggy, Mild and Cloudy; the Mean Temperature was 2°78 above the average of the last 20 years, and the monthly range (69°7) was the greatest yet recorded.

COMPARATIVE TABLE FOR JANUARY.

YEAR.	TEMPERATURE. Mean.	Difference from Average.	Maximum observed.	Minimum observed.	Range.	RAIN. No. of da	Inches.	SNOW. No. of days.	Inches.	WIND. Resultant. Direction.	Velocity.	Mean Velocity
	°	°	°	°	°							
1840	17.0	— 6.7	40.6	—13.8	54.4	4	1.395	11	...	...	...	...
1841	25.6	+ 1.9	41.7	— 4.1	45.8	2	2.150	14	...	...	...	0.361bs
1842	27.9	+ 4.2	45.8	1.3	44.5	5	2.170	9	...	...	...	0.78 "
1843	28.7	+ 5.0	54.4	1.5	52.9	6	4.295	12	14.2	...	...	0.69 "
1844	20.2	— 3.5	44.6	— 7.7	52.3	7	3.005	11	24.9	...	...	0.70 "
1845	26.5	+ 2.8	43.0	— 3.4	46.4	5	Imp't	9	22.7	...	...	0.70 "
1846	26.7	+ 3.0	41.2	0.3	40.9	5	2.335	10	6.0	...	...	0.55 "
1847	23.3	— 0.4	42.6	— 2.2	44.8	7	2.135	5	7.5	...	...	1.09 "
1848	28.7	+ 5.0	51.5	—12.0	63.5	7	2.245	8	7.1	N 82 W	2.03	5.82ms.
1849	18.5	— 5.2	40.1	—15.2	55.3	4	1.175	10	9.2	N 63 W	3.06	6.71 "
1850	29.7	+ 6.0	46.3	10.6	35.7	5	1.250	8	5.2	N 37 W	0.69	5.80 "
1851	25.5	+ 1.8	43.2	—12.8	56.0	4	1.275	10	7.8	S 77 W	3.26	7.69 "
1852	18.4	— 5.3	37.3	— 7.0	. 3	0	0.000	19	30.9	N 68 W	3.14	7.67 "
1853	23.0	— 0.7	40.9	— 6.6	47.5	1	0.290	6	7.5	N 27 W	2.52	6.34 "
1854	23.6	— 0.1	45.2	— 4.3	49.5	7	1.270	11	7.5	N 77 W	2.44	6.86 "
1855	25.9	+ 2.2	48.2	— 1.7	52.9	5	0.525	13	23.3	N 80 W	1.86	7.67 "
1856	16.0	— 7.7	33.1	—12.1	45.2	0	0.000	14	13.6	N 75 W	5.24	10.69 "
1857	12.8	—10.9	34.6	—20.1	54.7	3	Inapp	16	21.8	N 70 W	4.96	10.31 "
1858	30.0	+ 6.3	45.8	7.5	38.3	6	1.152	11	4.0	N 71 W	2.33	7.40 "
1859	26.4	+ 2.7	41.5	—26.5	68.0	6	1.449	19	16.4	S 81 W	3.17	8.76 "
Mean	23.72	...	43.08	—6.56	49.64	4.4	1.480	11.3	13.51	...	...	7.64

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—OCTOBER, 1858.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL.D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32°			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	Rain in Inches.	Snow in Inches.	WEATHER, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.				6 A. M.	2 P. M.	10 P. M.
1	29.607	29.612	29.700	43.6	62.7	45.9	.209	.422	.221	.75	.75	.72	N E b E	N E b E	N w b N	0.00	0.32	5.70	...	...	...	C. Str. 9.	C. St. 10.	C. St. 4.
2	.815	.734	.779	36.0	57.2	41.8	.177	.216	.206	.85	.46	.78	N W	W S W	S W b S	9.40	11.43	3.06	...	...	...	Clear.	Clear.	Clear.
3	.519	.453	.314	41.2	56.0	48.2	.212	.363	.310	.82	.81	.92	E S E	S E	S E	1.73	2.30	0.22	...	0.200	...	C. St. 10.	Do.	C. St. Th. & L.
4	.419	.461	.597	50.6	57.9	50.4	.200	.238	.283	.82	.61	.78	W S W	W	W	12.51	22.82	11.06	...	...	...	Do. 6.	Ci. Str. 9.	St. 4.
5	.694	.800	.947	44.9	56.8	38.3	.218	.179	.186	.76	.40	.81	W S W	W	W b N	6.03	18.41	9.10	...	...	...	Clear.	Clear.	Clear.
6	.998	.914	.901	36.6	57.2	41.0	.191	.216	.197	.90	.46	.78	W S W	W S W	W S W	3.57	7.81	2.15	...	...	...	Do.	Do.	Do.
7	.619	.322	.361	30.2	45.5	45.0	.140	.275	.282	.90	.92	.96	E N E	N E b E	S	0.09	2.08	3.40	...	0.770	...	St. 8.	Rain.	Rain.
8	.211	.219	.270	37.2	44.6	40.4	.178	.218	.182	.81	.76	.73	S w b W	W S W	S W b S	10.96	14.67	4.40	...	0.173	...	Rain.	Cir. Str. 6.	C. St. 6.
9	.247	.371	.626	39.0	45.1	43.7	.223	.204	.224	.96	.68	.79	S W b W	W b N	W	8.71	27.43	2.85	...	0.400	...	Do.	Do. 10.	Do. 6.
10	.819	.879	30.005	40.2	53.2	42.1	.183	.219	.222	.73	.54	.83	W	W	W S W	11.05	13.32	1.80	...	...	...	C. Str. 2.	Do. 4.	Clear. Au. B.
11	30.014	39.099	.118	34.0	57.2	39.6	.175	.316	.188	.80	.67	.77	N W	S W	N E b E	0.21	1.11	2.90	...	...	...	C. C. St. 6.	Clear.	C. St. 10.
12	.010	.060	29.990	31.1	55.8	45.7	.149	.236	.286	.84	.53	.92	E N E	E N E	S E b E	4.47	4.23	1.75	...	...	...	Clear.	C. C. St. 4.	Do. 6 Au. Bor.
13	29.903	29.800	.699	42.7	49.7	57.6	.237	.322	.436	.87	.92	.94	S E	S E b E	S S E	0.00	11.95	6.77	...	1.040	...	Rain.	Rain.	Do. 10.
14	.616	.573	.713	49.0	54.5	46.2	.329	.243	.264	.95	.56	.84	W S W	S W b S	S S W	7.80	9.50	0.75	...	0.103	...	C. St. 10.	Cir. Str. 8.	Clear.
15	.756	.908	30.018	42.4	51.7	42.5	.244	.269	.237	.91	.69	.87	W b S	W	W	3.97	2.32	14.26	...	...	...	Cir. C. 6.	Do. 6.	C. Str. 4.
16	30.252	30.252	.276	30.5	51.4	42.0	.142	.243	.235	.84	.65	.91	S W b W	S b W	S E	2.27	0.49	0.00	...	...	...	Clo.	C. C. Str. 8.	Do. 6.
17	.238	.193	.201	40.2	49.6	44.2	.210	.297	.256	.86	.85	.89	N E b E	N E b E	N N E	2.27	5.71	5.31	...	0.110	...	C. St. 7.	Cir. Str. 6.	C. C. St. 6.
18	.243	.063	.050	35.8	70.6	56.0	.197	.482	.398	.95	.66	.90	S	S W	S S W	0.11	0.73	4.22	...	...	...	Fog.	Do. 4.	Clear. Au. B.
19	.001	.010	.017	47.1	64.0	60.2	.298	.373	.433	.92	.62	.85	S S E	S S E	W S W	1.42	1.10	2.22	...	...	...	Clear.	Clear.	C. C. 4.
20	.036	.100	.116	52.0	63.0	41.0	.328	.256	.219	.83	.62	.87	W S W	E S E	E S E	0.12	3 71	6.43	...	...	...	C. Str. 2.	C. St. 6.	Clear.
21	.242	.124	.080	35.0	56.0	43.6	.160	.288	.231	.84	.65	.83	N E	E N E	E N E	5.75	9.36	5.40	...	...	...	Clear.	Clear.	Do.
22	.004	29.910	29.898	43.7	59.0	51.0	.265	.242	.348	.92	.48	.93	E b S	S E	W	0.13	3 81	0.05	...	Inp.	...	C. St. 10.	C. St. 6.	C. Str. 10.
23	29.852	.805	.910	42 7	54.0	48.2	.244	.355	.310	.91	.84	.92	N b E	N b E	N b E	0.33	0.63	10.00	...	Inp.	...	Do. 6.	Do. 10.	Rain.
24	.932	.987	30.121	41.0	45.0	37.0	.241	.198	.178	.95	.65	.81	N E b E	N E b E	N E b E	23.33	19.00	7.12	...	2.530	...	Rain.	Do. 4.	Clear.
25	30.204	30.200	.242	30.0	43.0	31.0	.136	.127	.161	.83	.47	.95	N E b E	E N E	N E b E	9.02	8.32	2.87	...	...	...	Clear.	C. St. 2.	Do.
26	.234	.214	.197	24.2	53.2	36.0	.111	.269	.170	.86	.67	.80	N E	S W b S	S W b S	0.46	1.22	0.00	...	...	...	St. 2.	St. 4.	Do.
27	.159	.154	.146	29.0	59.1	41.5	.147	.323	.235	.94	.65	.91	W	W	W	0.14	0.51	0.11	...	...	...	Clear.	Clear.	Do, Au. B.
28	.167	.210	.283	32.0	53.0	34.3	.168	.116	.162	.95	.43	.84	W b S	N E b E	E S E	0 00	4.09	0.73	...	...	...	Light Cirr.	Do.	Do. Do.
29	.231	.001	29.994	28.9	43.0	44.7	.147	.237	.280	.94	.87	.90	N E b E	E N E	S E b S	7.90	6.00	4.01	...	0.200	...	St. 4.	C. St. 6.	C. St. 10.
30	29.810	29.712	.738	40.6	68.9	49.6	.241	.356	.329	.95	.53	.96	S S E	S E b S	N E	4.40	5.01	0.11	...	0.103	...	C. St. 6.	Do. 8.	Do. 8.
31	.770	.690	.953	47.9	58.1	47.0	.310	.282	.232	.94	.58	.73	S W	W b S	N E b E	0.73	5.86	1.52	...	...	...	Do. 10.	C. C. St. 6.	Do. 10.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—NOVEMBER, 1858.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL. D.

Latitude—45 deg. 32 min. North. Longitude—73 deg, 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32° Fahr.			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	Rain in Inches.	Snow in Inches.	Weather, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A. M.	2 P. M.	10 P. M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.				6 A.M.	2 P.M.	10 P.M.
1	29.963	30.126	30.259	44.1	45.8	38.1	.282	.182	.157	.96	.61	.71	NE b E	NE b E	N N E	5.30	6.52	6.81	...	Inp.	...	Slight Rain.	C. St. 2.	Str. 2.
2	30.305	.254	.201	30.0	43.1	34.0	.137	.171	.155	.74	.62	.79	NE b E	NE b E	NE b E	3.25	8.27	6.56	...	...	...	Clear.	Light Cir. 2.	Clear.
3	.231	.114	29.929	29.9	40.1	38.0	.142	.130	.186	.88	.56	.81	NE b E	NE b E	NE b E	8.27	5.61	1.55	...	...	...	Do.	Cir. St. 4.	C. St. 6.
4	29.871	29.954	.932	36.4	36.1	35.2	.206	.191	.183	.95	.90	.90	NE b E	E S E	NE b E	9.09	1.19	2.83	...	0.541	Inp.	C. St. 10.	Sleet & Sw.	Rain.
5	.900	.852	.883	34.0	44.0	41.0	.162	.248	.219	.84	.88	.87	NE b E	W b N	N N W	0.47	2.00	0.22	...	...	...	Do. 6.	Cir. St, 10.	C. St. 10.
6	.848	.828	.681	36.0	41.0	36.8	.191	.190	.170	.90	.74	.80	N N E	NE b E	NE b E	2.30	8.76	12.20	...	Ip.	...	Do. 9.	Do. 9.	Do. 10.
7	.570	.520	.600	33.5	35.6	32.7	.175	.183	.173	.94	.90	.94	N E b E	NE b E	N N W	18.13	7.37	1.06	...	2.550	0.40	Sleet & Rn.	Rain.	Snow.
8	.550	.497	.720	32.5	40.5	29.0	.178	.146	.174	.94	.60	.94	W S W	W	W N W	0.00	1.40	5.40	...	Inp.	...	C. St. 10.	C. St. 10.	St. 4.
9	.746	.761	.770	33.0	38.2	31.0	.175	.195	.155	.94	82	.89	N b W	S	S	1.83	0.00	0.00	...	...	...	Do. 9.	Do. 8.	Do. 10.
10	.761	.740	.924	26.3	3[illegible]	24.5	.128	.124	.111	.87	.73	.86	N N E	W N W	W N W	2.26	6.78	9.96	...	...	0.40	Snow.	Do. 9.	C. St. 9.
11	30.004	30.002	30.007	20.8	25.0	26.1	.085	.108	.094	.78	.80	.68	W N W	W S W	S W	17.62	5.83	1.13	...	...	...	C. St. 8.	Do. 10.	Do. 10.
12	29.970	29.892	29.927	19.1	32.2	25.0	.077	.137	.117	.76	.74	.87	E b S	S E	S E	0.02	0.02	0.22	...	...	...	Do. 8.	Do. 4.	Cir. St. 2.
13	.871	.530	.520	26.1	30.7	30.0	.128	.142	.148	.87	.85	.89	E N E	E S E	E	1.73	7.17	2.10	...	...	2.55	Do. 10.	Snow.	Snow,
14	.752	.770	.829	13.3	31.7	16.0	.057	.149	.076	.72	.84	.83	W	W b N	N W	28.65	14.00	8.62	...	...	0.70	Clear.	C. St. 4.	Clear.
15	.792	.700	.691	6.0	25.0	18.6	.043	.100	.077	.75	.74	.76	W S W	W	W b N	1.90	1.19	3.70	...	...	...	C. St. 10.	Do. 8.	Do.
16	.449	.450	.512	16.0	26.7	25.1	.074	.117	.117	.82	.80	.86	W	N E	N N E	12.83	16.00	15.44	...	...	Inp.	Do. 8.	Snow.	C. St. 10.
17	.517	.597	.714	23.1	30.9	29.0	.106	.142	.128	.86	.84	.77	N W	W	W	29.75	25.02	12.20	...	...	...	Do. 8.	Cir. St. 6.	Clear.
18	.624	.519	.670	31.5	38.1	36.0	.149	.165	.191	.84	.73	.90	W S W	W S W	W S W	7.01	11.13	8.33	...	...	...	Do. 10.	Do. 6.	C. St. 8.
19	.677	.736	.852	26.5	21.4	18.9	.117	.058	.071	.82	.50	.70	N E b N	W N W	W	19.90	22.22	14.22	...	...	Inp.	Do. 8.	Do. 10.	Cir. St. 8.
20	.832	.747	.801	19.2	36.4	27.3	.077	.107	.128	.71	.80	.82	W	W S W	W S W	9.35	3.90	8.42	...	...	...	Do. 6.	Do. 6.	C. St. 6.
21	.757	.761	.782	22.4	37.4	26.2	.095	.193	.123	.79	.80	.87	S E	S E	N E b E	0.01	0.00	0.35	...	...	...	Cirr. 2.	Clear.	Cir. St. 2.
22	.893	.890	.980	19.1	35.2	28.6	.072	.162	.135	.75	.80	.88	N b E	E	E N E	0.07	0.12	1.33	...	...	...	C. St. 10.	C. St. 10.	C. St. 9.
23	.681	.578	.562	20.1	27.0	26.2	.081	.129	.135	.79	.83	.93	N E b E	N E b E	N E b E	3.75	18.63	9.61	...	...	0.90	Do. 10.	Snow.	Snow.
24	.867	.550	.627	27.2	34.9	22.3	.129	.155	.095	.88	.70	.79	N E b E	N	W b N	24.81	7.63	0.42	...	...	0.56	C. St. 10.	C. St. 4.	C. St. 2,
25	.681	.640	.716	19.1	29.0	28.1	.087	.129	.128	.84	.82	.82	W	W N W	W S W	11.10	10.90	10.50	...	...	...	Do. 10.	Do, 10.	Do. 10.
26	.761	.800	.914	26.0	28.0	26.7	.128	.117	.117	.87	.76	.82	W	W N W	W N W	7.77	9.43	9.85	...	...	...	Do. 10.	Do. 9.	Do. 10.
27	.952	.910	.[illegible]	25.1	30.0	28.2	.111	.130	.129	.86	.78	.84	W N W	S W	S W	10.83	3.45	2.70	...	...	...	Do. 9.	Do. 9.	Do. 10.
28	.670	.681	.687	20.4	29.2	21.9	.085	.123	.088	.78	.77	.78	W	S S W	S E b E	5.92	0.08	0.01	...	...	...	Do. 9.	C. C. St. 8.	Do, 6.
29	.644	.660	.677	18.1	26.2	20.9	.081	.111	.085	.83	.80	.78	N E b E	S E	S b W	1.11	1.77	0.00	...	...	...	Do. 8.	C. St. 10.	Do. 8.
30	.424	.475	.914	18.7	29.0	12.6	.077	.128	.054	.76	.77	.71	S E b S	W	W N W	1.20	5.95	19.18	...	...	1.10	Do. 10.	Snow.	Clear.
																			...					

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR OCTOBER.

Barometer	Highest, the 18th day	30.276
	Lowest, the 8th day	29.211
	Monthly Mean	29.982
	Monthly Range	1.065
Thermometer	Highest, the 18th day	70°6
	Lowest, the 26th day	24°2
	Monthly Mean	46°48
	Monthly Range	46°4
Greatest Intensity of the Sun's Rays		81°4
Lowest point of Terrestrial Radiation		24°0
Amount of Evaporation in inches		1.67
Mean of Humidity		.792

Rain fell on 12 days, amounting to 5.629 inches; it was raining 53 hours 10 minutes and was accompanied by thunder and lightning on 1 day.
The most prevalent wind the N.E. by E.
The least prevalent wind was S.
The most windy day was the 24th; mean miles per hour, 16.48.
The least windy day was the 1st; mean miles per hour, 2.00.
Aurora Borealis visible on five nights.
The electrical state of the atmosphere has indicated moderate intensity.
Ozone was present in large quantity.
Snow Birds, *Plectrophanes nivalis*, first seen on the 26th day.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR NOVEMBER.

Barometer	Highest, the 2nd day	30.305
	Lowest, the 16th day	29.449
	Monthly Mean	29.779
	Monthly Range	0.856
Thermometer	Highest, the 1st day	46°.2
	Lowest, the 15th day	4°.8
	Monthly Mean	26°78
	Monthly Range	41°4
Greatest intensity of the Sun's Rays		58°.9
Lowest point of Terrestrial Radiation		4.8
Mean of Humidity		.809

Rain fell on 6 days amounting to 3.090 inches; it was raining 31 hours 9 minutes.
Snow fell on 10 days amounting to 6.41 inches; it was snowing 46 hours 35 minutes.
The most prevalent wind was N. E. b E.
The least prevalent wind E.
The most windy day the 17th; mean miles per hour 22.49.
Least windy day the 21st; mean miles per hour 0.11.
Lunar Halo visible on 1 night.
First Snow fell on the 4th day.
The electrical state of the Atmosphere has indicated moderate intensity.
Ozone was present in large quantity.