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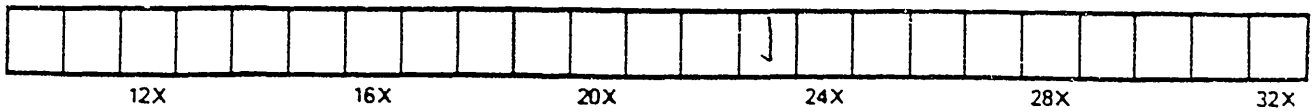
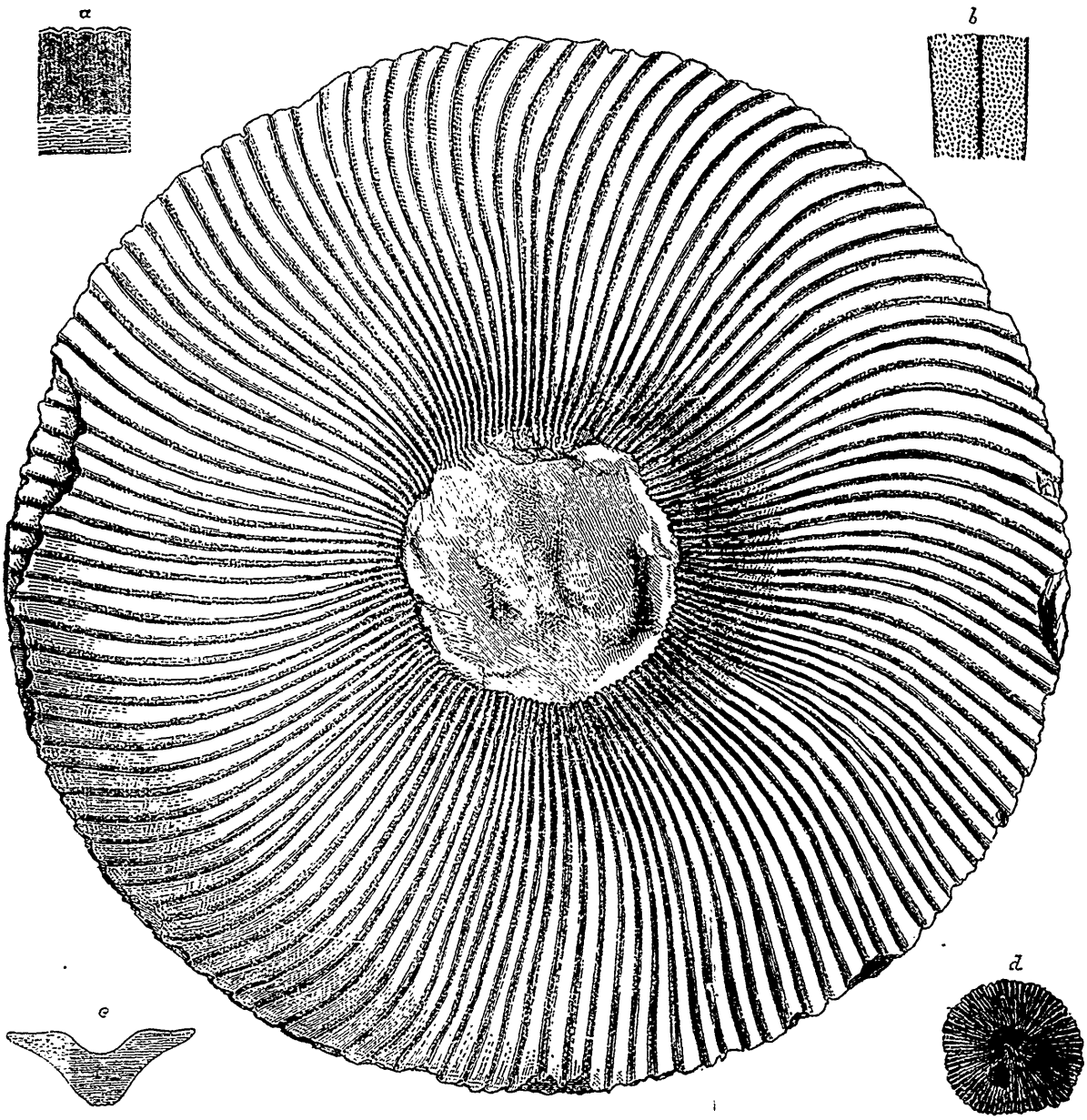


PLATE I.



CHONOPHYLLUM MAGNIFICUM.—*(See page 264.)*

The large figure is a view of the cup. Fig. *a*, vertical section of a portion near the side. Fig. *b*, portion of the surface of two of the rays a little enlarged. Fig. *c*, vertical section reduced to one-sixth natural size. Fig. *d*, Transverse section near the base.

THE CANADIAN JOURNAL.

NEW SERIES.

No. XXVII.—MAY, 1860.

ON THE DEVONIAN FOSSILS OF CANADA WEST.

BY E. BILLINGS, F.G.S.

Extracted from the Report of the Geological Survey of Canada for 1860,—*in preparation.*

THE Devonian Rocks of Canada West consist of portions of the Oriskany Sandstone, Schoharie Grit, Onondaga Limestone, Corniferous Limestone, Hamilton, Portage, and Chemung Groups. The fossils of the first of these formations are about to be published by Professor Hall, in his forthcoming third volume of the *Palæontology of New York;* and I shall therefore postpone the examination of such as we have from that rock until after the appearance of that work. Under the term Corniferous Limestone, as it will be used hereafter throughout this paper, are included all those rocks which would probably in the State of New York be divided into three groups,—the Schoharie Grit, Onondaga Limestone, and Corniferous Limestone. At any rate, the two latter seem to be in Canada united by their palæontological characters. The Hamilton Shales we classify as a separate formation immediately overlying the Corniferous Limestone. The Portage and Chemung Groups are also distinct; but I shall leave the examination of their fossils for some future occasion.

These rocks are, in Canada West, highly fossiliferous, and in some places even densely crowded with the remains of extinct species of corals, encrinites, molluscs, trilobites, and large fishes. The fossils, however, are for the greater part in so imperfect a condition, that few of the species can be well defined from the collections made thus far, and, on account of the scarcity of good specimens, many years must elapse before anything approaching to a complete description of the whole fauna of the period can be produced. To accomplish this within a reasonable time, will require the co-operation of many local observers, each devoting his leisure hours to the minute examination of all the rocks in the neighbourhood of his residence, and each influenced to do so by the desire of promoting the cultivation of the sciences in this Province. With a number of such men distributed throughout the fossiliferous regions of Canada, the work will advance rapidly. Without some voluntary assistance of this kind, the progress must be extremely gradual, so difficult is it to procure good specimens of most of the species. Few are aware of the importance of long-continued researches in a single locality, or even in a single quarry. I devoted the greater part of the spare time of seven years to the examination of an area of which all the exposed patches of rock, if put together, would not make a superficies of one square mile, and yet its treasures were not exhausted. Since I left, others have entered the same field, and have been rewarded by the discovery of many interesting new facts. There are hundreds of such localities in Canada yet to be explored; and if there were a good observer in or near each of them, and if all would freely communicate the fruits of their labours, the combined results could not be otherwise than important to science, and highly creditable to the country.

In making collections, the mode of procedure is exceedingly simple. All that is to be done is to examine the rocks, and if they contain fossils, collect them. The specimens should then be sent where the species can be determined. Unless the observer publishes some account of his facts, or (in case he does not feel competent to do so himself) communicates them to some other person who can and will give them publicity, the labour is lost. In the following and other articles to be published in this Journal hereafter, I intend to give figures and descriptions of many of our Devonian Fossils, and hope that they may be, to some extent, useful in assisting the local observer to name his specimens. That he can name all that he may

find, by comparing them with the figures and descriptions, I am well aware, from my own experience, is impossible. There are numerous species concerning which the most experienced practical naturalists would remain in doubt, although assisted in the examination by all the aids that can be drawn from extensive libraries of scientific works. Let no beginner, therefore, feel disappointed or discouraged should he fail to satisfy himself that he has succeeded in naming his specimens correctly from books. These papers will be of some service; but I shall also be most happy to examine and name (so far as I can) collections from any part of the Province, on condition that I shall be permitted to describe the new forms, and retain, for the Provincial Collection, a specimen of each species of which we have not already examples in the Museum. This would be beneficial to all parties, and greatly promote the advance of science in this country. I earnestly hope, that at least a few of those who reside in the vicinity of fossiliferous Devonian rocks in Canada West, may be induced to render me their assistance in this way. The specimens should be carefully wrapped up in paper and packed in a strong box, and sent to the Geological Survey at Montreal. Delicate fossils should be protected, by being placed in a separate box, otherwise they will be crushed by the others. When a fine fossil, such as a well preserved trilobite, encrinite, or othoceratite, is imbedded in a piece of stone, no attempt should be made to chisel it out. Unless the operation is performed by a most experienced hand, in nine cases out of ten the specimen will be greatly injured, if not totally destroyed. The locality of each specimen should be given. I am particularly desirous of procuring specimens of fossil shells which exhibit the inner surface, since it is from such that the characters of the genera can be best worked out. As soon as they are examined, the specimens will be sent back, free of expense.

ZOOPHYTA.

In a paper published in the *Canadian Journal* for March, 1859, I gave an account of forty-three species of corals from the Devonian rocks of Canada West. In the following article I shall describe eleven new species; and there are from ten to fifteen others which must remain until better specimens can be procured. I think it probable that altogether there are eighty species of corals in these rocks in Canada, and many of them were so prolific, that the zoophyta

must have constituted four-fifths in bulk of the whole fauna of the period. In England and in Germany, the grand coralline horizon of the Devonian era lies in the middle of the series. The fauna of the Corniferous Limestone and Hamilton Shales would therefore appear to be more nearly related to the middle than to the lower Devonian of Europe. Such is the position assigned to them in the third edition of Sir Roderick Murchison's noble work, *Siluria*. But if it can be shewn that the coralline beds of Canada include the Schoharie Grit of New York (as I strongly suspect they do), then this latter formation must also be added to the middle Devonian. On this latter point, however, I can give no positive opinion, as the fossils of the Schoharie Grit of New York are totally unknown to the scientific world.

The following may be given as a table shewing approximately the position of the different American sub-divisions of the Devonian system, as indicated by the evidence of the fossil corals:

Old Red Sandstone, or Catskill Group	Upper Devonian.
Chemung Group	
Portage Group	
Genesee Slate	Middle Devonian.
Tully Limestone	
Hamilton Group	
Marcellus Shale	
Corniferous Limestone	
Onondaga Limestone	
Schoharie Grit	
Cauda-galli Grit	Lower Devonian.
Oriskany Sandstone	

It is important to observe, that in Gaspé we find some of the characteristic fossils of the Oriskany Sandstone intermingled in the same beds with those of the Upper Pentamerus Limestone, and therefore it may be that when these Gaspé rocks are studied, we shall find it difficult to draw the line between the Lower Devonian and the Lower Helderberg.

Genus STRIATOPORA.—(Hall.)

Fig. 1. Fig. 2. Fig. 3. Fig. 4.

Fig. 1. *Striatopora Linneana.*

Figs. 2, 3, 4. *Trachypora elegantula.*—Fig. 4 is a portion enlarged: the upper figure a longitudinal section.

Generic characters.—"Ramose, coralla solid; stems composed of angular cells; apertures of cells opening upon the surface into expanded angular cup-like depressions; interior of the cell rayed or striated, striæ extending beyond the aperture of the cell."—(HALL. *Palæontology of New York, vol. 2, page* 156.)

STRIATOPORA LINNEANA.—*N. Sp.*

Description.—Stems two or three lines in diameter, branching at an angle of from 75° to 80°; cells variable in size, the greater number with the expanded mouth one line wide, and the circular cavity at the bottom from one-third to one-half of a line; the smaller or younger cells, of all sizes, are somewhat uniformly distributed among the larger. In the perfect specimens the mouths of the cells are everywhere in contact with each other, the edges of the walls between them sharp, and the form more or less polygonal, generally five or six sided. In worn specimens the cells are more nearly circular, and the walls obtusely rounded on the edge. The striæ in the cell mouths not observed. I have seen only two specimens of this species, and am unable, therefore, to state to what extent the stems may vary in thickness. In *S. rugosa* (Hall),* Hamilton Group, Iowa, the cells are distant from each other nearly their own diameter, and the stem is branched at an angle of about 55° (in the specimen figured). In *S. flexuosa* (Hall),† Niagara Group, the cells are, upon an average, more than one line and a half wide, and many of them two lines. Our species, therefore, must be regarded as distinct from either.

* *Geology of Iowa.* Vol. 1, Part 2, page 479, Pl. 1, fig. 6.
† *Palæontology of New York.* Vol. 2, page 156, pl. 40 B, fig. 1*a*.

Locality and formation.—Township of Bosanquet, lot 25, con. 5. Shales of the Hamilton Group.

Collectors.—A. Murray, J. Richardson.

STRIATOPORA FORMOSA.—*N. Sp.*

Description.—Stems from one line and a half to three lines in thickness; cells of an uniform size or very nearly so, three-fourths of a line in width, opening out on the surface at an angle of about 45° with the longitudinal axis of the stem, the cell mouths very gradually expanded, apparently fifteen fine obscure striæ occupying the whole surface of the upper lip.

This species differs from *S. Linneana* in having the cells smaller and of an uniform size. The cell mouths are as wide in stems, one and a half lines in thickness, as they are in the largest specimens seen. I have not ascertained the angle at which the stems bifurcate. In perfect specimens, where the cells are empty, on looking into them obliquely downwards, they are seen to become circular just below the edge of the lower lip, their diameter there being a little less than half the transverse width of the mouth.

Locality and formation.—Corniferous Limestone, near Woodstock.

Collector.—A. Murray.

Genus TRACHYPORA.—(Edwards and Haime.)

Generic characters.—"Corallum dendroid, the branches presenting calyces which are only slightly salient, and in which there are no radiating septa; cœnenchyme very abundant, solid, and with the surface marked by strong, irregular, vermicular, and sub-echinulated striæ."—(EDWARDS and HAIME. *Polypiers Fossiles des Terrains Palæozoiques.* Page 305.)

The only species of this genus heretofore known, is *T. Davidsoni* (E. and H.), which occurs in the Devonian Rocks at Ferques, in France.

TRACHYPORA ELEGANTULA.—*N. Sp.*
(*See Figs.* 2, 3, 4.)

Description.—Stems (in the specimens examined) from two to two and a half lines in diameter, branching at an angle of about 75°. Cells arranged in four or five rows, parallel with the axis of the stem; they are oval, about one line in length and two-thirds of a line wide, with an elevated margin at the sides, in general effuse above, rarely

effuse below. The space between the cells is marked with irregular, flexuous, broken striæ, four or five in the width of one line; the elevated margin at the sides of the cells exhibits from seven to nine short oblique ridges or tubercles. In the longitudinal rows, the cells are sometimes in contact with each other, and often separated by distances equal to half their own length, or a little more. In *T. Davidsoni*, the cells are not arranged in linear series, and the striæ are of a different form.

Locality and formation.—Lot 25, con. 5, Bosanquet.

Collectors.—A. Murray and J. Richardson.

Genus ALVEOLITES.—(Lamarck.)

The following three species appear to belong to this genus:

ALVEOLITES ROEMERI.—*N. Sp.*

Description.—Stems from two to three lines in diameter, usually cylindrical, but sometimes sub-palmate, branching. Cells transversely oval, about half a line wide and one-fourth of a line in length; in general distant from each other from half a line to two-thirds of a line in the longitudinal direction of the stem, and half that distance in the transverse direction.

In some specimens the cells are not quite so distant as above stated, and it may be that these should constitute a distinct species. In *A. labiosa* (*Canadian Journal*, March, 1859), the cells, when perfect, are scarcely one-fourth of a line wide; *A. cryptodens* (*Loc cit*), is, upon the whole, a larger species, with the cells about a line distant.

The stems appear to bifurcate at an angle of from 50° to 60°; but the specimens are not sufficiently perfect to determine this character with certainty.

Locality and formation.—Lot 25, con. 5, Bosanquet. Hamilton Shales.

Collectors.—A. Murray, J. Richardson.

ALVEOLITES GOLDFUSSI.—*N. Sp.*

Description.—This species occurs in irregularly circular depressed masses, several inches wide and one or two inches in height. The corallites radiate from a point in the bottom, and the mass, rapidly increasing in width, has a very obtusely turbinate form, flattened and undulated on the top, and apparently composed of horizontal super-

imposed layers. The cells are transversely sub-oval or sub-triangular, usually with one curved side and two straight sides. In some parts of the mass, especially on the edges, they approach the sub-circular polygonal form, but usually they are wider in the one direction than in the other. The width is in general three-fourths of a line (sometimes one line), and the height half a line. The bottom of the mass is either in part or wholly covered by a thin, smooth, but concentrically undulated epitheca.

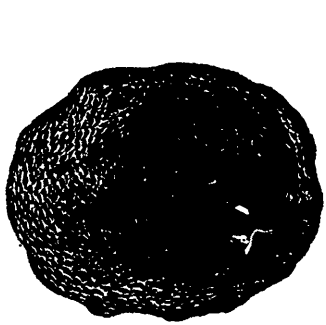


Fig. 5.

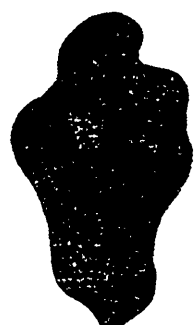


Fig. 6.

Fig. 5. *Alveolites Goldfussi.*—Upper side of a small specimen.
Fig. 6. *Alveolites Fischeri.*—One side of a frond.

This species resembles *A. suborbicularis* (Lamarck) of the Devonian Rocks of England, France, and Germany; but in that species there is a groove on one side of the cell, and a corresponding ridge on the side opposite. I have not been able to detect these characters in very well preserved specimens of *A. Goldfussi*, and feel satisfied that it is therefore a distinct species.

Locality and formation.—Lot 25, con. 5, Bosanquet. Hamilton Shales.

Collectors.—A Murray, J. Richardson.

Alveolites Fischeri.—*N. Sp.*
(*See Fig.* 6.)

Description.—This species is found in the shape of flattened, palmate, obscurely branching fronds, celluliferous on both sides. Some of the fragments appear to be portions of undulated expansions, two to four lines in thickness, and several inches wide. The majority of the specimens, however, indicate a palmated form, two to four inches

in length, from half an inch to more than one inch wide, and from one to three lines in thickness. The cells, when perfect, are transversely sub-oval or sub-triangular, usually with one curved and two straight sides, from half a line to two-thirds of a line wide; distant from each other about two-thirds of a line in the vertical, and a little less in the transverse direction of the frond. When well preserved, the lower lip, or edge of the cell, is thin, sharp, and uniformly arched. In the very thin fronds (one line in thickness), the cells open out on the surface at a very acute angle, apparently 15° to 20°; but in the thicker specimens the angle is greater—sometimes 45°.

Locality and formation.—Bosanquet. Shales of the Hamilton Group.

Collectors.—A. Murray, J. Richardson.

ALVEOLITES SQUAMOSA.—*N. Sp.*

Description.—This species is found in wide, flat, irregular expansions, sometimes six or seven inches in breadth, and from half an inch to one inch and a half in thickness; composed of successive, and often much distorted, layers; the cells opening out upon the surface very obliquely, and separated from each other by exceedingly thin partitions, which, when silicified and well brought out by the action of the weather, present a peculiarly rough squamose appearance. The cells are linear, in general about half a line in length, and apparently one-tenth of a line in width. One of the specimens examined exhibits two spots, one-fourth of an inch wide each, where the cells are less than half the average size. There are obscure indications of a central ridge on one side of the cell in this species, as there is in *A. suborbicularis.*

This species differs from *A. Goldfussi* in having much smaller and more compressed cells. In a space one-fourth of an inch square, I have counted ninety-seven cells; and the average appears to be from seventy-five to one hundred, with here and there spots holding double that number. In *A. Goldfussi* there are from sixteen to thirty in the same area. On comparing the figures of *A. suborbicularis* in the works of GOLDFUSS, SANDBERGER, and BRONN, it will be seen that in that species there are about fifty cells in one-fourth of an inch square. The difference in the size (great though it be) might not be sufficient to separate these three species, but the form of the cells appears to be also different. *A. Goldfussi* has not the groove on the

outer lip, nor the ridge on the inner, that is exhibited by *A. suborbicularis;* while *A. squamosa,* although possessing the ridge, does not seem to have the groove; and besides, the cells are in general linear, instead of sub-oval or sub-polygonal.

Locality and formation.—Township of Cayuga. Corniferous Limestone.

Collector.—*J. De Cew.*

SYRINGOPORA MACLUREI.—(Billings.)

SYRINGOPORA TUBIPOROIDES.—(Billings.) *Canadian Journal,* Vol. IV. page 115. March, 1859.

Not *S. tubiporoides* (Yandell and Shumard), nor of M. Edwards and J. Haime. *Polypiers fossiles des terrains palæozoiques,* p. 292.

Since the publication of this species in the *Canadian Journal* in March last, Professor Dana, of New Haven, has informed me that the true *S. tubiporoides* is a much larger form, and is supposed to be an *Eridophyllum.* I thought I could identify ours by the description given in the work of Edwards and Haime, but it now appears quite certain that it is not the same; and also that their fossil cannot be the *S. tubiporoides* of Yandell and Shumard. In order, therefore, to avoid confusion, I propose to change the name of this species to *S. Maclurei.*

In my description, the corallites are said to have a diameter of about one line and a half; but, after examining other specimens, I find that in the greater number it is more nearly one line. In some of the colonies, many of the tubes are full one line and one-third in thickness, and it was upon these my first statement was founded.

Sometimes the groups are exceedingly irregular, the corallites widely separated and straggling through the rock.

FAVOSITES TURBINATA.

FAVOSITES TURBINATA (Billings.) *Canadian Journal,* March, 1859.

The description of this species was published in the *Canadian Journal* for March, 1859. At that time the only specimens I had seen were from the Corniferous Limestone, but we have now several from the Hamilton Group. The species differs from all other *Favosites* known, in its peculiar mode of growth. The form resembles that of a large cyathophylloid coral,—turbinate, the base or smaller

pointed extremity usually curved, but occasionally straight; more or less rapidly expanding upwards; sometimes so much elongated as to become irregularly cylindrical; several inches in diameter, and (though rarely) two feet in length. The more common length is from two to six inches. But the most remarkable character is, that

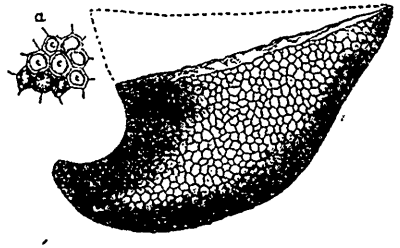


Fig. 7.

Fig. 7. *Favosites turbinata.*—A small curved specimen. *a*, exhibits the different appearances of the cells.

the whole surface, except the larger end, is covered with a thick epitheca, which completely cl ·es all the tubes. In general, the substance of the epitheca onl]s the mouth of the tube, but leaves the walls so far visible that th·)lygonal form of the cells can be distinctly seen. In such speci.. .s, the disc which closes the mouth of the corallites sometimes retains the impressions of the radiating septa, and thus presents an obscurely stellate appearance. There are some with an epitheca so thick, that it not only fills the cells but also entirely conceals the walls, so that the whole mass exhibits an uniformly smooth surfrace.

In the original description, the corallites are said to be "usually somewhat less than a line in width." In one of the specimens from the Hamilton Group, the cells are, upon an average, full one line in diameter, with here and there one nearly a line and a half wide; and no doubt others will be found still larger, for in all the species of Favosites this character is somewhat variable. The description, therefore, should state that the cells are about one line in width, a little more or less. This species is now known to occur in the Oriskany Sandstone, the Corniferous Limestone, and in the Hamilton Shales. I have ascertained that there are one, two, or three rows of pores; usually two.

F. GOTHLANDICA and F. HEMISPHERICA.

Both of these species occur in the Hamilton Group, at Bosanquet; the former in dome-shaped masses, from three inches to a yard in diameter, with cells about one line and a half wide: the latter in somewhat flat, undulating expansions, from three inches to one foot or more in width, and from less than one to three inches in thickness. In some specimens of the latter, the cells are half a line wide, or thereabouts, and of an uniform size all over the whole surface; but in others there are numerous spots where the cells are only one-fourth of a line in width. In this respect the specimens from the Hamilton Group agree exactly with those of the Corniferous Limestone.

DIPHYPHYLLUM ARCHIACI.—*N. Sp.*

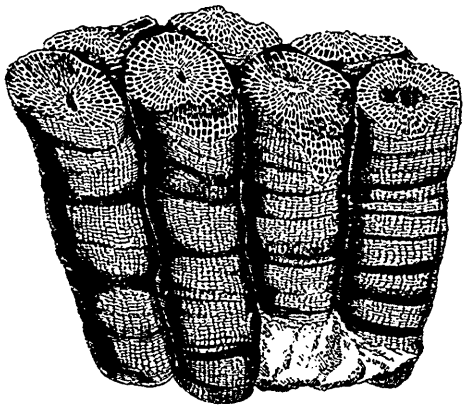


Fig. 8.

Fig. 8. *Diphyphyllum Archiaci.*

Description.—Corallum forming large masses of parallel nearly straight cylindrical stems, in contact with each other, or nearly so, and which, when full grown, are from six to eight lines in diameter. The young stems are added by lateral or marginal gemmation, and are at first two or three lines in diameter, their adult size being attained at the length of two or three inches. At the diameter of four or five lines, there are between thirty and thirty-five radiating septa; at six or eight lines, usually about fifty; but occasionally in those of the larger size, from seventy-five to eighty may be seen.

Fifty appears to be the common number. There are two or three transverse diaphragms in one line. In most of the corallites there is a central area, one line or a little less in diameter, into which the radiating septa do not penetrate. Others in the same mass seem to be without this central area Surface with a somewhat thick epitheca, which, where perfectly preserved, is beautifully ornamented with fine crowded, encircling striæ, from fifteen to twenty in the width of one line. In addition to these fine striæ, there are numerous usually sharp-edged annulations, varying from less than one-fourth of a line in width and depth, to one or two lines. Some of the corallites exhibit sudden constrictions of growth, which give to them the appearance of a series of short turbinate stems inserted into each other.

The epitheca is often entirely or partially worn away, and the fine striæ can only be seen when the surface is in a very perfect state of preservation.

It is probable this coral occurs simple as well as aggregate.

Variety.—A fragment from Lot No. 2, Con. 4, Townsend, three inches and a half in length and seven lines in diameter, and with about fifty radiating septa, appears to belong to this species, but differs in having the surface with only five encircling striæ to one line. Resembles *Cyathophyllum cæspitosum* (Goldfuss); but that is a smoother species, and, according to McCoy, only four or five lines in diameter.

Locality and formation.—Lot 25, Con. 5, Bosanquet. Hamilton Shales.

Collectors.—A. Murray, J. Richardson.

HELIOPHYLLUM EXIGUUM.—*N. Sp.*

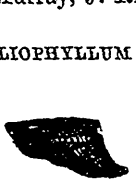


Fig. 9.

Fig. 10.

Fig. 9. *Heliophyllum exiguum.*—Side view. Fig. 10. The same.—View of the cup.

Description.—Small, turbinate, more or less curved, often flattened on the side of the convex curvature, radiating septa between sixty and eighty; about six obscure arched striæ to one line on their flat sides, and the same number of spines on their edges. The depth of

the cup is equal to one-fourth or one-third of the whole length of the coral. In small specimens, the margin of the cup is thin and sharp; but in the large ones rounded, and one line or a little more in thickness. About one-half of the radiating septa reach the centre, and form a small rounded elevation on the bottom of the cup. There is a septal fossette on one side, which, in all the specimens I have seen, reaches the centre. The surface exhibits a few sharp constrictions of growth, with rounded annulations between them, the latter often abruptly terminated on their upper sides. In very perfect specimens, fine encircling striæ of variable size, apparently from eight to fifteen in the width of one line. The horizontal striæ, which indicate the number of the septa, are distinctly visible, but not strongly marked. The position of the septal fossette is indicated on the outside of the cup by two septal ridges, which extend the whole length of the coral, and constitute one of the lines along which the younger septa were added from time to time.

The greater number of the specimens are from six to nine lines in length, but some are full one inch. The width of the cup is always a little less than the length of the entire fossil. The most common number of septa is sixty. The arched striæ and spines are not often preserved.

Locality and formation.—Rama's Farm, near Port Colborne. Corniferous Limestone.

Collector.—E. Billings.

CYATHOPHYLLUM ZENKERI.—*N. Sp.*

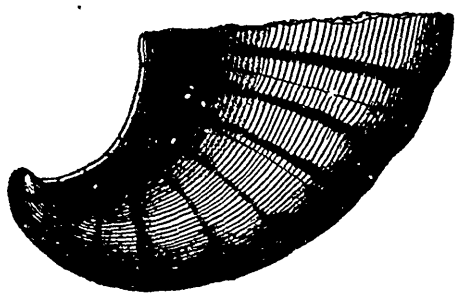


Fig. 11.

Fig. 11. *Cyathophyllum Zenkeri.*—Side view of a large specimen.

Description.—Corallum simple, turbinate, strongly curved at the pointed base, gently and uniformly arched above, gradually enlarging

to the diameter of one inch and a half at a length of two inches and a half. Cup about three-fourths of an inch in depth, the form of the bottom variable, either with a smooth space or a small pit in the centre, or covered with the prolonged radiating septa; these latter about one hundred and fifty in number; the interseptal spaces filled for a short distance from the outer surface with small sub-lenticular cells, of which there are about four in one line; a small space beneath the bottom of the cup in full-grown specimens, with flexuous transverse diaphragms. Surface, when perfect, with sometimes a few inconspicuous encircling annulations of growth, but often with a somewhat smooth aspect, longitudinally marked with the septal striæ, of which there are, on an average, five or six in the width of two lines; when partially decorticated, the interseptal spaces roughened with small subimbricating projections or notches, with their sharper edges usually turned upwards—about four of these in one line. The largest specimen that I have seen is three inches and one-fourth in length, measured along the surface of the side with the larger or convex curve, and one inch and a half on the lesser curve. The diameter of the cup, in the same specimen, is one inch and a half. Several others that I have seen are from one to two inches and a half in length.

The arrangement of the septa in the bottom of the cup appears to vary a good deal in different individuals. In one specimen two inches in length, there is a deep septal fossette on one side, and a pit in the centre of the cup. The septa branch off, as it were, on each side of a depressed line, extending from the central pit to the fossette. In another, about the same size, the septa all reach the centre in the bottom of the cup, and are there somewhat twisted together. There is a septal fossette in this specimen also. In a third individual, with a cup one inch in diameter, there is a smooth space two lines wide in the centre, with an obscurely indicated septal fossette. I think it probable that most of the large individuals will be found to have the bottom smooth.

The form of the walls of the cup also varies according to the age of the individual. In the immature it is thin, and the septa alternate somewhat in size. But in the large ones (three inches in length) the interseptal spaces are filled with the cellular tissue nearly to the free edges of the septa, and the wall of the cup is thus rendered solid for the thickness of two lines, or a little more.

In those large ones, also, it is to be observed that the septa are of a nearly uniform size when seen in the upper part of the wall of the cup.

There are several species of fossil corals in the Corniferous Limestone, which resemble this one in external appearance:

1. *Zaphrentis prolifica.*—The greater number of the specimens are about the same size as those of *C. Zenkeri*, but are more slender towards the base, seldom uniformly curved, the septa alternating in size in the walls of the cup, and the septal striæ four in two lines. The worn specimens do not exhibit the roughened nodulose exterior presented by *C. Zenkeri* when partially decorticated.

2. *Cyathophyllum Lesueuri.*—This is a somewhat larger species, with the septa (just within the margin of the cup) distant nearly one line from each other, but with the septal striæ as closely arranged as they are in *C. Zenkeri;* and further, under certain conditions, exhibiting ten striæ to two lines.

3. *Zaphrentis cornicula.*—(Edwards & Haime.) This species has not been found to my knowledge in Canada, but I have before me two specimens from Ohio (from Dr. Shumard.) The surface resembles *C. Zenkeri*, but then the septa inside of the cup are denticulated on their edges and, besides, are large and small alternately. *Z. cornicula* appears to be a *Heliophyllum*.

4. *Clisiophyllum Oneidaense.*—The perfect specimens are marked with numerous sharp annulations, but when the outer surface has been worn away, the interseptal spaces exhibit either transverse diaphragms, nearly a line distant from each other, and turned upwards, or small projections similar to those of *C. Zenkeri*, but two or three times more distant.

Locality and formation.—Rama's Farm, near Port Colborne.
Collector.—E. Billings.

CHONOPHYLLUM MAGNIFICUM.—*N. Sp.*

(*See Plate* I.)

Description.—Short, turbinate, expanding to the width of six or seven inches at a height of four inches and a half; upper surface constituting a nearly flat circular disc, with a rounded cavity in the middle, one inch and a half wide, from which radiate one hundred and twenty-five depressed convex ridges; the grooves between them

narrow, and somewhat angular in the bottom. These ridges are gently curved in crossing the broad flat margin of the cup. The depth of the central cavity is about one inch. A transverse or horizontal section shows that many of the septa (probably one-half of them) reach the centre. In a vertical section, extending downwards, so as to cut off the outer extremities of a few of the radiating ridges, it is shewn that the grooves on the floor of the cup indicate the position of the septa, and that the ridges are the interseptal spaces. The structure, as exhibited in this section, consists of excessively thin, parallel, horizontal laminæ (apparently from thirty to forty in the thickness of one line.) These laminæ are arched upwards between the septa, the curve corresponding with the convexity of the radiating ridges. In the lower part of the corallite, the interseptal tissue is much coarser. The surfaces of the radiating ridges appear to be covered with small tubercles. (See Pl. I. *b*.)

The only specimen of this truly magnificent coral that I have seen, is imbedded in an upright position in the rock, the broad circular disc of the cup (with the greater number of the rays well exposed by the action of the weather) being just on a level with the surface of the stratum. The width of the disc or cup in this individual is six and a half inches ; and it exhibits one hundred and twenty-five radiating ridges, which attain a breadth of about two lines at the margin. It is highly probable that in other specimens the number of rays may be a little less or greater than it is in this one. The thickness of the piece of rock in which it is imbedded is *three inches; and on the under surface a transverse section of the* coral is exhibited, with a diameter of one inch and a half, and consequently it expands from that size to a width of more than six inches in the length of three inches. At this rate of tapering, the total length of the perfect fossil must be about four inches and a half. Most probably a small portion of the pointed base is more or less curved. I have not seen the surface below the edge of the disc.

This species resembles *Chonophyllum perfoliatum* (Goldfuss), but is much larger, and has double the number of radiating septa.

Locality and formation.—Lot No. 1, con. 14, Township of Walpole.

Collector.—J. De Cew.

Brachiopoda.

Genus Lingula.—(*Bruguière.*)

Of this genus, only one species has been found in the Devonian rocks of Canada West. The specimens are too imperfect for description.

Streptorhyncus Pandora.—*N. Sp.*

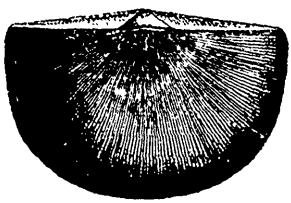


Fig. 12.

Fig. 13.

Fig. 12. *Streptorhyncus Pandora.*—View of the dorsal valve.
Fig. 13.—Longitudinal section.

Description.—Shell semioval, or sub-quadrate; length about three-fourths the width, hinge line equal to the greatest width of the shell, sometimes a little less, usually forming a right angle with the sides of the cardinal extremities; front margin broadly rounded. Ventral valve depressed semiconical, most elevated at the beak, thence descending with a slightly concave or nearly flat slope in all directions, to the margin. Area of ventral valve, large triangular, extending the whole length of the hinge line, sloping outwards at an angle of about 100°, with the plane of the lateral margin; foramen triangular, very conspicuous, its width at base nearly twice the height, nearly or altogether closed by a convex deltidium. Dorsal valve moderately convex, gently compressed towards the cardinal angles. Surface with very narrow, strongly elevated, radiating ridges, of which there are from four to six in the width of one line; the increase appears to be both by bifurcation and interstitial addition, the latter mode being the most common.

Width of a specimen of medium size, sixteen lines; length of same, from the beak of the ventral valve to the front margin, twelve lines; height of area of ventral valve at the beak, two lines and three-fourths; width of foramen at base, four lines and a half. Another specimen is twenty lines wide and sixteen in length. Besides these,

there are other imperfect specimens from two inches to two inches and a half in width, which I have no doubt belong to the species.

The inclination of the area of the ventral valve, judging from several fragments that I have examined, appears to vary considerably.

This species belongs to that group of the genus of which *O. umbraculum* (Schlotheim) is a characteristic form. Mr. Davidson has recently placed the species of this type in the gems *Streptorhyncus* (King) with the following remark: "The shells composing this sub-genus, are closely related to *Strophomena;* they are usually semicircular, convex or concavo-convex, and externally striated; the ventral valve possessing a prolonged and oftentimes bent or twisted beak."—(GEOLOGIST, March, 1860.) The species vary greatly in size and form, and Mr. Davidson has, therefore, united under one name (*S. crenistria*) no less than twelve varieties, which have all been considered to be distinct by various authors. Our fossil closely resembles *S. crenistria* in external form, but differs in not having the radiating striæ crenulated, and further in the form of the occlusor muscular impressions in the dorsal valve. According to Davidson's figure, there is a small process between the two branches of the cardinal process of the dorsal valve, which does not exist in ours. I shall give some further illustrations of this species hereafter. It is only since this article was sent to the press that I have procured specimens which exhibit the interior of both valves.

Locality and formation.—Lot No. 6, Con. 4, Townsend. Also at Rama's farm, near Port Colborne, and near Woodstock.

Collectors.—A. Murray, E. Billings and J. De Cew.

ORTHIS LIVIA.—*N. Sp*

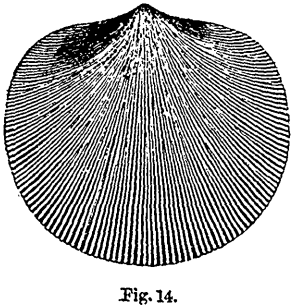


Fig. 14.

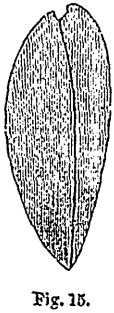


Fig. 15.

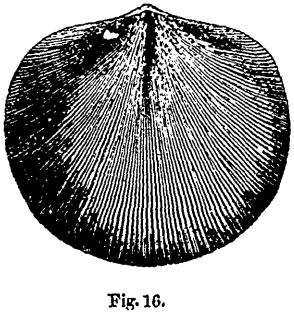


Fig. 16.

Fig. 14. *Orthis Livia.*—Ventral valve. Fig. 15.—Longitudinal section of the same. Fig. 16.—Dorsal valve.

Description.—Sub-orbicular or sub-quadrate; length about eight-ninths of the width; greatest width, usually a little in front of the middle; length of hinge line, one half to two-thirds the width of the shell; cardinal extremities rounded; sides in most specimens somewhat straight, often sufficiently curved to give a circular aspect to the shell; front angles obtusely rounded; front margin in general broadly convex, *sometimes with a small space in the middle nearly straight.* Dorsal valve of a medium convexity, most elevated about the middle; the outline forming a uniform arch from the depressed beak to the front margin; the slope from the umbo towards the cardinal angles, gently concave; sometimes a barely perceptible mesial depression, commencing in a point at the beak, and becoming obsolete at one half or two-thirds the length; area small, lying in the plane of the lateral margins; beak minute, forming a small triangular projection, rising scarcely one-fourth of a line above the edge of the area, the point not incurved over, but situated in the plane of the area. Ventral valve moderately convex, most elevated at between one-fourth and one-third the length from the beak, thence descending with a somewhat flat or gently convex slope, to the front and sides, and with a more sudden and somewhat concave slope to the hinge line and cardinal angles; the umbo small, prominent, neatly defined, terminating in a small rounded beak, which is incurved so as to overhang the edge of the area, either not at all or scarcely one-tenth of a line; area triangular, about one-fourth larger than that of the dorsal valve, forming an angle of about 105° with the plane of the lateral margin. The foramen not observed, but appears to be wider than high. On looking at the dorsal valve in a direction perpendicular to the plane of the shell, the small rounded umbo of the ventral valve can be seen rising about one-third of a line above the dorsal beak.

Surface with small sub-angular radiating ridges, of nearly a uniform size, from eight to ten in the width of three lines, increasing by bifurcation, strongly curved outwards to the upper part of the sides and cardinal angles, the intervening grooves sub-angular in the bottom, and equal to the ridges in width. In very perfect specimens, very fine concentric sub-lamellar concentric striæ are visible, seven or eight to one line. In certain conditions of preservation also, the radiating ridges are seen to be sub-tubular, and exhibit numerous small oval or circular openings on their edges, each about the eighth or tenth of a line in width, and from one-fourth to two-thirds of a line distant from each other.

Width of largest specimen examined, eighteen lines; length, sixteen lines; thickness or depth of both valves, seven lines; height of area of ventral valve at the beak, one line; area of dorsal valve, four-fifths of a line; distance between the beaks, one line; length of hinge-line, ten lines. The most common size appears to be one inch in width. The beak of the ventral valve is incurved, so that it would touch a plane projected horizontally through the valve, at one-half the depth of the cavity.

In some specimens the ventral valve has a faint, barely perceptible mesial fold, extending from the umbo towards the front.

This species is allied to *O. Vanuxemi*, but is more coarsely striated. It may be identical with one of the other species described in the Report of the Regents of the New York University, but as it is impossible to identify it with any of the descriptions, I propose to name it as above.

Locality and formation.—Township of Walpole. Corniferous Limestone.

Collector.—J. De Cew.

ORTHIS VANUXEMI.—(Hall.)

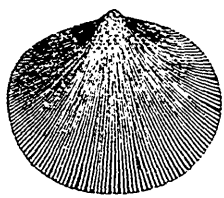


Fig. 17.

Fig. 18.

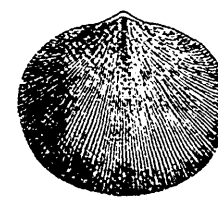


Fig. 19.

Fig. 17. *Orthis Vanuxemi.*—Ventral valve. Fig. 18.—Longitudinal section of the same. Fig. 19.—Dorsal aspect.

ORTHIS VANUXEMI.—Hall. *Tenth Annual Report of the Regents of the University of the State of New York*, p. 135, 1857.

This species is closely allied to *O. Livia*, but is more nearly a perfect ellipse, or more nearly circular, and has about fifteen radiating striæ in the width of three lines. Its width is from nine to eighteen lines, and its length about one-sixth or one-seventh less than its width.

It occurs in the Hamilton Shales, in the Township of Bosanquet.

RHYNCONELLA TETHYS.—*N. Sp.*

Fig. 20.

Fig. 21.

Fig. 22.

Figs. 20, 21.—Side views of the specimens of *R. Tethys.*

Fig. 22.—Front view.

Description.—In this species the body of the shell, excluding the beaks, is transversely sub-oval; from the beaks the sides diverge at an angle of about 110°, and are nearly straight, or gently concave, for about one-third the length of the shell, below which they are regularly rounded; front margin broadly rounded, nearly straight in the middle for the width of the mesial fold. On a side view the outline is obliquely sub-conical, the base obtusely rounded, the lower three-fourths of the ventral valve straight, forming an angle of about 100° with the ventral half of the base; the dorsal contour gently arched, and the dorsal half of the base rounded. The mesial sinus of the ventral valve commences at about mid-length, and increases only slightly in depth, until the front margin is reached, when the middle portion of the shell, for the width of the sinus, is rather suddenly bent towards the dorsal valve, with an abruptly rounded curve, and forms about three-fourths of the depth of the base. There are five angular ribs in the sinus, their extremities deeply forked to receive the projecting points of the grooves between the ribs of the dorsal valve; on each side of the sinus there are six principal ribs, their extremities a little turned upwards; above these, three or four smaller ones. The upper part of this valve is narrowly convex, with a prominent umbo, and incurved beak; in the lower half, a little concave towards the lateral margins, owing to the elevation of the extremities of the ribs. Dorsal valve with all the central region depressed convex, the margin of the shell on each side of the mesial fold in front abruptly bent towards the ventral valve; the umbo obtuse, divided along the middle for a short distance by a narrow, barely perceptible depression, the beak strongly incurved under that of the ventral valve. The mesial fold dies out at two-thirds the length, the shell (of the fold) at the lower extremity bent towards the ventral valve at an obtuse rounded angle, and extending about one-fourth across the base. On the mesial fold there are six ribs, the middle four most

prominent; on each side of the fold there are also six, their extremities strongly curved towards the ventral valve.

I have seen no specimens with the true surface of the shell preserved.

Length of specimen upon which the above description is founded, nine lines, greatest width at about one-third the length from the front, ten lines; depth of both valves at the front, six lines; width of mesial fold at front, five lines, and of the sinus, five lines and a half.

Judging from the appearance of several imperfect specimens, the depth of both valves at the front must be very variable.

I have seen some small specimens from four to six lines in length, with a beak nearly erect. These, I think, are the young of *R. Tethys*.

Locality and formation.—County of Haldimand. Corniferous Limestone.

Collector.—J. De Cew.

Rhynconella Medea.—*N. Sp.*

Description.—Oval or sub-triangular, body of shell, excluding the beaks, transversely sub-elliptical; greatest width a little below the middle; apical angle, about 100°; both valves rather convex. Ventral valve with a neatly defined, rounded umbo, and closely incurved beak; a wide, shallow, concave, mesial sinus, which becomes obsolete at about two-thirds the length from the front. Dorsal valve, with a broad, depressed, convex, mesial fold, extending two-thirds the length of the shell, umbo rather prominent, obtusely rounded, beak incurved beneath that of the ventral valve. Surface with between thirty and thirty-five small sub-angular ribs on each valve; ten on the mesial fold, and nine in the sinus.

Length, eleven lines. Width, twelve lines. Depth, seven lines; width of sinus at front margin, six lines.

The specimen is a little distorted towards the front, so that all the details of the outline cannot be given. The sides diverge from the beak at an angle of about 100°, and are straight for half the length of the shell. They then appear to be somewhat narrowly, but regularly, curved round to the front, which is also, I think, broadly rounded.

Locality and formation.—Township of Rainham, Concession 3, Lot No. 2.

Collector.—J. De Cew.

RHYNCONELLA THALIA.—*N. Sp.*

Fig. 23. Fig. 24. Fig. 25.

Fig. 23. *Rhynconella Thalia.*—Dorsal view. Fig. 24.—Front view. Fig. 25.—Side view.

Description.—Shell small, apical angle varying from about 70°, in very small specimens, to 105° in the large ones; sides straight in the upper half, regularly curved in the lower half; front broadly rounded with usually a portion in the middle straight, or even slightly concave; valves about equally convex. Ventral valve with a sinus which gradually dies out at one half, or a little more, of the length from the front; beak acute, much elevated, slightly incurved; three simple acutely angular ribs in the mesial sinus, and six or seven on each side. Dorsal valve a little more strongly convex than the ventral valve; the front of the mesial fold elevated so that on the side view the base of the shell is a nearly straight line almost at a right angle with the lower part of the outline of the valve; umbo rounded with a faint mesial depression; beak incurved into the cavity of the ventral valve; surface with four ribs on the fold, and six or seven on each side.

Length of the largest specimen examined, four lines; width, four and one-fourth lines; depth, two and a half lines; width of the sinus, nearly two lines; apical angle, 102°.

Another specimen is four lines wide, three and a half in length, two in depth, sinus, two lines, and apical angle 105°.

A third is two lines and three-fourths in length, and the same in breadth; depth, one line and three-fourths; apical angle, 88°. The sinus is distinct but not deep.

Specimens less than two lines in length exhibit scarcely a trace of a sinus, and have the apex more acute than any of the above-mentioned.

This species closely resembles the ordinary Lower Silurian forms, such as *R. plena,* and young individuals of *R. increbescens.*

Locality and formation.—Near Woodstock. Corniferous Limestone.

Collector.—A. Murray.

RHYNCONELLA (?) LAURA.—*N. Sp.*

Fig. 26.

Fig. 27.

Fig. 28.

Fig. 27. *Rhynconella Laura.*—Dorsal aspect. Fig. 27. The same; ventral aspect.
Fig. 28. Side view.

Description.—Ovate; greatest width at about one-third of the length from the front; sides gently arched from the beak to the line of the greatest width; front angles narrowly rounded; both valves convex, sometimes rather gibbous. Ventral valve most elevated a little above the middle; umbo rather obtusely rounded, not very prominent; beak short, obtuse, closely incurved, in contact with the umbo of dorsal valve; a broad mesial sinus which usually becomes obsolete at one half the length, but can be sometimes traced nearly to the beak. Dorsal valve with a mesial fold, corresponding with the sinus of the ventral valve in length.

Surface with about seventeen rather large rounded obscure slightly elevated ribs, of which there are four or five in the mesial sinus, and five or six on the mesial fold. A few squamose rings of growth.

Length of large specimen twelve lines; width eleven lines. Another individual from the same locality is nine lines long and ten wide.

Locality and formation.—Bosanquet. Hamilton Shales.

Collectors.—T. Richardson, A. Murray.

Genus ATHYRIS.—McCoy.

There is much difference of opinion as to the propriety of retaining this generic name. It implies that the shells have no foramen in the ventral valve, and yet many species are placed in the genus which have the beak distinctly perforated. Some palæontologists are, therefore, in favor of using De Orbigny's appellation *Spirigera*, instead of *Athyris*. Nearly all of the Silurian species, and some of those from the Devonian rocks, have the beak so strongly incurved, that no foramen can be seen. For such, at least, the name *Athyris* does not appear to be very inappropriate. Mr. Davidson still retains it, not

only for those which have the foramen concealed, but also for those with it open. It appears probable that the genus will sooner or later be sub-divided, and in that case *Athyris* might be retained for the species with closely incurved beak, and *Spiriyera* for some of the others. I shall give some account of the generic characters of this group of shells in another article. The following species are placed in the genus provisionally.

ATHYRIS CLARA.—*N. Sp.*

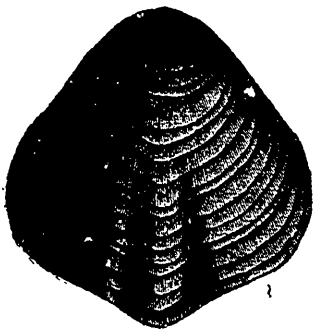


Fig. 29.

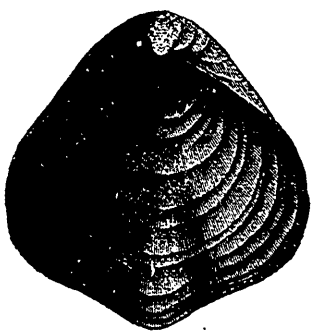


Fig. 30.

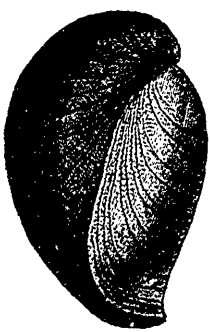


Fig. 31.

Fig. 32.

Fig. 29. *Athyris Clara.*—Ventral view of large specimen.
Fig. 30.—Dorsal view of the same.
Fig. 31.—Side view.
Fig. 32.—Dorsal view of a smaller specimen.

Description.—Nearly smooth, ovate or sub-rhomboidal, greatest width, about the middle, a short linguiform projection in the middle of the front margin, both valves convex, ventral valve the larger, with

its beak strongly incurved. Length from one to two inches; width equal to, a little less or a little greater than the length. The ordinary size is about one inch and a half in length.

The ventral valve is strongly and smoothly convex, the outline evenly arched from beak to front, more abruptly curved above than below, the umbo prominent, the beak rather small, neatly rounded at the sides, and closely incurved. The linguiform projection in the middle of the front margin, is often a simple extension of a portion of the shell, without a sinus, but occasionally there is either a short, shallow depression, or a narrow rounded mesial fold, which seldom, however, extends towards the beak more than three or four lines. The upper half of the dorsal valve is sometimes evenly convex, but in general an indistinct, more or less broadly rounded carination, can be traced from the umbo along the middle to the front, where it becomes abruptly elevated into a short, prominent, rounded fold, which extends into the linguiform projection. On each side of the median line, this valve is gently convex, and often exhibits a rather flat slope to the lateral margins. The beak is strongly incurved, and appears to be deeply buried in the cavity beneath the umbo of the ventral valve.

If a line be drawn across the shell at mid-length, and another at one-fourth the length from the front, the greatest width will be found to range between the two. Many of the specimens are obtusely angular at the sides, and in such the margins above and below the angles are somewhat straight, the upper two sides converging to the beak, and the lower two to the linguiform extension in front, giving to the shell a rhomboidal instead of an ovate outline.

At first sight, the surface appears to be smooth, with a few concentric squamose lines of growth. On closer examination, numerous indistinct, radiating lines, may be seen. Of these, there are from two to four in the width of one line, and they sometimes appear to lie beneath the surface of the shell. In very perfect specimens, the surface exhibits fine concentric striæ, from ten to fifteen in the width of one line, and these are most distinct towards the front margin.

Beneath the beak of the detached ventral valves, there is a wide, triangular foramen, not visible when the valves are united. The inside of the beak is entirely hollowed out into a deep pit or channel, which opens directly into the cavity of the shell. The impressions of the divaricator muscles occupy part of a sub-triangular space, the upper angle of which is situated just where the excavation beneath the beak

opens out into the visceral cavity. The lower side of this space is nearly straight, and the two lower angles rounded. The lateral margins of the space are usually sub-parallel in the lower half, while in the upper half they approach each other, and meet above to form the upper angle. In some specimens the space is more nearly triangular, and it would appear, therefore, that its form is a little variable. The length of the space is about one-third the whole length of the ventral valve, and its width at the lower margin a little less than its length. The lower margin is situated a little above a line drawn across the shell at mid-length. The lower three-fourths of the space is striated longitudinally, and divided into two equal portions by an obscure median groove.

On each side, at the base of the foramen, there is a short, stout tooth. The dental plates below the teeth extend but a short distance into the visceral cavity, when, becoming suddenly much diminished in height, they form a low ridge along the upper margin of the muscular space. The upper part of the muscular space is deeply excavated into the substance of the shell, which is very thick and solid in the rostral half.

I have not seen the interior o the dorsal valve.

Externally this species resembles *A. tumida* (Dalman,) but the muscular impressions in the interior of the ventral valve are widely different in the two species.

Locality and formation.—Rama's farm, near Port Colborne, and at many places in the County of Haldimand. Corniferous Limestone. Specimens, with the valves united, are rare, but the upper part of the ventral valve, with the umbo and beak preserved, is not uncommon.

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

Athyris Maia.—*N. Sp.*

Description.—Smooth, ovate, or sub-rhomboidal. Ventral valve strongly convex, most gibbous in the upper half; umbo prominent, large, giving to the shell, on a side view, somewhat of the aspect of a *Pentamerus;* beak strongly incurved, but not touching the surface of the dorsal valve; a shallow, concave mesial sinus, extending from the front all the way to the beak. Dorsal valve moderately convex, with a convex mesial fold, which becomes obsolete near the beak. Length, from one inch to one inch and a half. The proportional width is variable. In some specimens it is exactly equal to the length, but in

others it is either a little greater or a little less. Greatest width, about the middle, or a little in front of the middle, at which point the rhomboidal specimens are angular, but in the more oval forms, gently convex.

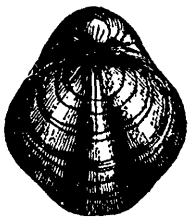


Fig. 33.

Fig. 33. *Athyris Maia.*—Dorsal aspect.

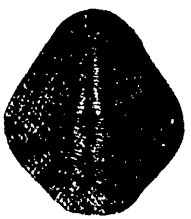


Fig. 34.

Fig. 34.—The same; ventral aspect.

The following characters may be more particularly noted:

The umbo of the ventral valve is rather large and prominent, the beak well defined, strongly incurved, but in general not in contact with the umbo of the dorsal valve; a short false area beneath the beak. The mesial sinus is shallow, evenly rounded in the bottom, or sometimes with an indistinct fold along the middle. Its width at the front margin is somewhat variable, but is usually about five lines, and it becomes gradually narrower and shallower upwards, but is more or less distinctly visible quite to the beak. On a side view, the outline of this valve presents a continuous curve, most abrupt in the upper half, the greatest elevation being at about one-third the distance from the beak to the extremity of the linguiform extension in front.

The dorsal valve has a smooth, rounded fold, extending almost to the beak, but is otherwise pretty evenly convex. It appears to possess a straight hinge-line, the length of which is greater than half the whole width of the shell; the beak small, not much incurved. The greatest convexity of this valve is about the middle, and on a side view the outline, in consequence of the elevation of the mesial fold, continues at the same height, and somewhat parallel to the lateral margin until it reaches the front.

The linguiform projection is sometimes considerably extended, and the shell has then a rounded, rhomboidal form, but in other specimens this part of the shell is truncated, and a fifth side, situated in the front margin, is thus formed.

The specimens that have come under my observation have in general the same amount of convexity, the depth of both valves being in all about two-thirds the greatest width.

The surface is nearly smooth; a few obscure concentric undulations of growth and fine striæ,—of the latter, twelve to fifteen in the width of one line are visible on well preserved shells. There are also faint indications of longitudinal radiating lines. A fragment of one individual of this species exhibits a surface uniformly marked with fine rounded concentric undulations (not striæ), of which there are four of five in the width of one line.

This species has, to some extent, the aspect of a *Pentamerus;* but its internal structure, as exhibited in the numerous broken specimens that I have examined, shews it to be congeneric with *A. Clara.* It differs from that species in having the mesial fold and sinus extending the whole length of the shell, and the beak of the ventral valve not touching the umbo of the dorsal valve.

Locality and formation.—St. Mary's, Township of Blanshard. Corniferous.

Collectors.—Mr. W. G. Tomkins, C. E., St. Mary's, C. W.; A. Murray; J. Richardson.

Athyris (?) Scitula.—(Hall.)

Atrypa scitula.—Hall. *Geology of the Fourth District of the State of New York,* p. 171, fig. 1.

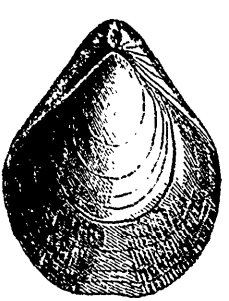


Fig. 35.

Fig. 36.

Fig. 37.

Fig. 38.

Figs. 35 to 38.—Different views of a small and large specimen of *A. scitula.*

The above figures represent different views of two specimens of a species which appears to me to be identical with that figured in the work above cited. It varies greatly in size. The length of the

largest specimen that I have seen is seventeen lines, the greatest width fourteen lines, depth eight lines. The smallest is about two lines in length, and many of intermediate sizes have been observed to make out the series. It is not certain that this species belongs to the genus *Athyris*.

Locality and formation.—County of Haldimand. Corniferous Limestone.

Collectors.—J. De Cew, E. De Cew.

Athyris (?) Clusia.—*N. Sp.*

Description.—Elongate oval; greatest width at about one-fourth the length from the front margin; sides diverging at an angle of about 75° and somewhat straight, or gently convex, for rather more than half the length; front angles rounded; front margin nearly straight, or gently convex. Both valves depressed convex, smooth in the upper half, the front margin with four or five wide shallow concave indistinct folds or grooves which become obsolete at less than half the length. Beak of ventral valve erect, apparently a little incurved at the tip.

Length five lines; greatest width at one-fourth the length from the front margin, three lines; depth of both valves at one-third the length from the beak, one line and one-fourth.

The above description is founded on a single small specimen. I have seen a fragment of another that must have been, when perfect, seven lines in length, and I am inclined to think that the one described is a young individual of the species.

This species differs from *A. scitula*, principally in being proportionally much flatter, and in having the front margin undulated by several obscure folds.

Locality and formation.—Lot No. 45, Con. 1, Cayuga. Corniferous.

Collector.—J. De Cew.

Athyris (?) unisulcata.—(Conrad.)

Atrypa unisulcata.—Conrad. *Annual Report Geological Survey, New York.* 1841, p. 56.

Rhynconella unisulcata.—Hall. Tenth Annual Report of the Regents of the University of the State of New York. 1857, p. 125.

Fig. 39.

Fig. 40.

Fig. 41.

Fig. 42.

Fig. 39. *Athyris unisulcata*.—Ventral view.
Fig. 41.—View of front margin.

Fig. 40.—The same; dorsal aspect.
Fig. 42.—Side view.*

Description.—Shell quadrilateral or sub-triangular; greatest width near the front margin; sides nearly straight from the beak to the line of the greatest width, where there is a prominent angle on each side of the shell, thence converging and nearly straight to the middle of the front margin. Dorsal valve with a mesial fold which occupies the whole of the shell except a small portion on each side in the upper half; the slope from the ridge of the fold to the sides usually gently concave. In some specimens a single strongly impressed groove along the ridge of the mesial fold. The ventral valve has a deep mesial sinus equal to its whole width; a small strip of the margin between the beaks and the point of the greatest width inflected at a right angle or thereabout towards the dorsal valve. The beak is incurved over the umbo of the dorsal valve, but its tip not quite in contact with the surface of the dorsal shell. The surface is nearly smooth, a few obscure concentric undulations, and, in some specimens, indications of fine radiating striæ visible.

Length of large specimen, nine lines; width, eleven lines.

This species varies greatly in form. Some have the front margin nearly straight, and are thus almost triangular. Others are quadrangular or rhomboidal from the great projection in the middle of the front margin. The sinus of the dorsal valve is sometimes so shallow

* These figures are not very good, but as they will serve to give an approximate idea of the form of one of the varieties, I have thought it best to use them.

that the valve has the appearance of a flat space along the middle. The groove on the ridge of the dorsal valve either extends to the front margin of the shell, or dies out at a greater or less distance from the beak.

The length of the shell ranges from two to nine lines, and is always a little less than the width.

Locality and formation.—County of Haldimand. Corniferous Limestone. Not common.

Collectors.—J. De Cew, E. De Cew, and E. Billings.

Athyris (?) rostrata.—(Hall.)

Atrypa rostrata.—Hall. *Geology of the Fourth District of New York*, page 202, fig. 2.

Fig. 43. Fig. 44.

Figs. 43, 44. *Athyris rostrata.*—Dorsal and side views.

Description.—Elongate oval, both valves evenly convex and smooth. Ventral valve the larger, most ventricose in the upper half; beak proportionally large, sub-cylindrical, incurved, not in contact with the umbo of dorsal valve, apparently perforated by a large foramen. Dorsal valve smaller than the ventral, but proportionally as strongly convex, umbo rather broadly rounded, beak incurved and deeply buried beneath that of the ventral valve.

Length about six lines; greatest width a little in front of the middle of the ventral valve, five lines; depth of both valves a little above the middle, three lines and a half.

The surface at first sight appears to be quite smooth, but upon a closer examination it will be found to exhibit some fine obscure concentric rings of growth.

This neat little fossil is smaller and proportionally broader, and more ventricose than *A. scitula.*

Locality and formation.—Lot 26, con. 3, Bosanquet. Hamilton Shales.

Collectors.—A. Murray and J. Richardson.

Athyris (?) Chlöe.—*N. Sp.*

Fig. 45. Fig. 46. Fig. 47.

Fig. 45. *Athyris Chloe.*—Ventral valve. Fig. 46.—Side view.
Fig. 47.—Dorsal view.

Description.—Transversely sub-oval; greatest width usually about the middle, sometimes a little above or below; front margin often with a rounded projecting lobe in the middle; both valves convex. Ventral valve with a concave mesial sinus which occasions a linguiform projection in the middle of the front margin, and becomes obsolete at about half the length of the shell; umbo well defined; beak closely incurved down to the umbo of the dorsal valve, usually, if not always, perforated at the tip by a small circular aperture. Dorsal valve with a rounded mesial fold which elevates the middle of the front margin and becomes obsolete at about half the length.

Surface with somewhat obscure rounded but apparently much depressed, simple or undivided radiating ribs, of which there are on an average in the specimens examined, three in the width of one line. There are also, especially towards the front margin, a few squamose rings of growth. There appear to be some fine concentric striæ, but the surface in the specimens is not quite perfect.

Width, from five to nine lines; length, a little variable, according to the greater or less developement of the mesial fold.

In one specimen with the fold large, the length is seven lines to a width of nine lines.

In this species I have detected no appearance of an area, but in perfect specimens the hinge-line is extended to three-fourths the width of the shell, and in such cases the cardinal angles, although rounded, are elevated and much compressed.

Locality and formation.—Lot No. 26, con. 3, Bosanquet. Hamilton Shales.

Collectors.—A. Murray, J. Richardson.

(To be continued.)

NOTES ON LATIN INSCRIPTIONS FOUND IN BRITAIN.

PART V.*

BY THE REV JOHN M^C^CAUL, LL.D.,
PRESIDENT OF UNIVERSITY COLLEGE, TORONTO.

16. In Horsley's *Britannia Romana, Northumberland,* xcvi., we have the following inscription:

SILVANO
PANTHEO
PRO · SAL
RVFIN · TRIB · ET
LVCILLAE · EIVS
EVTYCHVS
LIB · COS
V · S · L · M ·

* Since Part IV. was published, I have had access to the *Archæologia Æliana,* and have read the paper by Mr. Hodgson, to which reference is made in my note in page 355. In that paper, after a critical examination in detail of each phrase or passage of the inscription, Mr. H. proposes the following reading of it:—

"*IMPP. CAESS.*
L. SEP. SEVERO PIO PERT. P. M.
ARAB. PARTH. ADIABENICO MAXI.
COS. III. ET M. AVREL. ANTONINO PIO
COS. II. AVG. *ET P. SEPT. GETAE. NOB. CAES. COS*
PORTAM CVM MVRIS VETVSTATE DI-
LAPSIS JVSSV ALFEN. SENECINIS VO
COS. CVRANTE COL. ANITI. ADVENTO PRO
AVG. NN. COH. I. VANGION. ———
CVM AEMI. SALVIAN. TRIB.
SVO A SOLO RESTI.

Which may thus be explained at length:—

Imperatoribus Cæsaribus
Lucio Septimio Severo Pio Pertinaci, Pontifici Maximo,
Arabico, Parthico, *Adiabenico Maximo,*
Consuli tertium, et Marco Aurelio Antonino Pio,
Consuli secundo, Augustis, et Publio Septimio Getæ, nobilissimo Cæsari, consuli
Portam cum Muris Vetustate di-
lapsis, Jussu Alfeni Senecinis (Senecionis?) Viri
Consularis, curante Antistio (or Anitistio) Advento, pro
Augustis nostris, Cohors prima Vangionum ———
Cum Æmilio Salviano, Tribuno
Suo, a Solo restituit."

On comparison with the reading which I proposed in No. XXIII. of this Journal, p. 359, it will be observed that there are several points of difference; but on re-consideration of the

Horsley expands it thus: "Silvano Pantheo pro salute Rufini tribuni et Lucillæ ejus Eutychus libertus consulis votum solvit libens merito," and supplies *uxori* after *ejus*, in the fifth line. The only doubt which I have as to the accuracy of this expansion, relates to LIB · COS. If Eutychus had been a freedman of the Consul, as Horsley believed, the order, according to usage, would have been COS · LIB; and instead of the office, *consul*, the name of the individual would have been given, for consuls, as such, had no *liberti*. I regard LIB · as standing for *Librarius*, and COS · for *consulis*. The *librarius* was a book-keeper, who had charge of the accounts, and is mentioned in many inscriptions, in connexion with the officer or body in whose service he was, e. gr. LIB · PRAEF · *Librarius Præfecti*, LIB · CH ·, *Librarius cohortis*.

17. Amongst the *Marmora Oxoniensia* is an altar, found at Chester, bearing an inscription of the date A.D. 154, which has been frequently copied and explained.*

There can be but little doubt that the true reading of the inscription is as follows:

---

subject, I see no reason for changing the opinions which I have expressed in the article and embodied in the restoration. The only question, about which some doubt is suggested, relates to the date. The notice in the inscription of Caracalla as Cos. II. of course fixes the date within the cancelli—205, the year of his second consulship, and 208, the year of his third consulship. Mr. Hodgson argues for 207, assuming that the emperors were at the time in Britain, and adopting Horsley's opinion that "Severus came into the island in the year 207 at latest." He finds confirmation of his assumption as to the presence of the emperors, in the title of Senecio being in this inscription *vir consularis*, instead of *legatus eorum pr. pr.*, as it appears on a stone found at Greta Bridge.

Although the conjecture, that the change of title indicates "the exercise in person [by the emperors] of both the military and civil powers of the government, rendering the office of legate no longer necessary," seems plausible, yet there can, I think, be no doubt that both Mr. Horsley and Mr. Hodgson are in error in fixing 207 as the year of the arrival of the emperors in Britain. The statement of Xiphiline, that Severus died in the island "three years after he undertook the British expedition," suggests 208 as the date of his arrival, for he died in 211 (on February the 4th; not the 12th, as given by Mr. Hodgson in a note); and this date (208) is confirmed by reference to coins e. gr., one of Caracalla's bearing the legend:

PROF.AVGG.PONTIF.TR.P.XI COS.III.

from which it appears that the *profectio Augustorum* took place in the eleventh TRIB. POT. and third COS. of Caracalla, *i.e.* 208. I am still of opinion, for the reason stated in the note, p. 359, that 205 is the most probable date of the inscription, although it is possible that the intention of those who set up the stone may have been to indicate that the work was commenced, carried on, and completed during the time in which Severus was COS.III., Caracalla COS.II., and Geta COS.

* It is especially interesting on account of the epithet *Tanarus*, which is given to Jupiter; and the supposition is not improbable, that *Tanarus*, *Taras*, and *Taranuncus* denote the same deity, the *Thor* of the northern nations.

I·O·M·TANARO
T·ELVPIVS·GALER
PRAESENS·GVNTIA
PRI·LEG·XX·V·V
COMMODO ET
LATERANO COS
V·S·L·M

Of the interpretations which have been proposed, the most extraordinary is that given by De Wal, in his *Mythologiæ Septentrionalis Monumenta*. He expands it thus:

"Jovi Optimo Maximo Tanaro,
Titus Elupius, Galeria *tribu*,
et Præsens, Guntia *tribu*,
Primipilares legionis xx Valeriæ Victricis,
Commodo et
Laterano consulibus,
Votum solvunt lubenter merito."

The obvious objections to this rendering are, that there is no ground for supposing that the altar was erected by two persons, and that there is no authority for a tribe called *Guntia*. I can see no reason for rejecting the opinion adopted by Horsley (*Britannia Romana*, p. 315), and Orelli (n. 2054), that GVNTIA is the name of the birth-place of Titus Elupius Præsens, scil. *Guntia*, a town in Vindelicia. The *legitimus ordo nominum*, from the *prænomen* to the *patria*, is thus preserved, with the exception, indeed, of the *nomen patris*, but that is omitted in the inscription. Gough's objection (*Camden's Britannia*, vol. iv. p. 89) to the position of the tribe (*Galeria*) between the names (*Elupius* and *Præsens*), with his consequent preference of *Galerius*, is not worth considering; for it is plain that he was not aware that, in the normal arrangement of Latin names, the *nomen patris* and *tribus* come between the *nomen gentilicium* and the *cognomen*. And yet Mr. Wright (*Celt, Roman, and Saxon*, p. 260), influenced perhaps by the objection, gives *Galerius*.

Horsley suggests a doubt whether we should read PRI for *primipilus*, or PRE for *præfectus*; but there seems no ground for questioning the received reading. With Henzen, however, I think it uncertain whether we should regard it as standing for *primipilus* or

princeps. Of the two I prefer the latter, as we find PRI · PRI. for *princeps prior*, or *primus*, in Orelli, n. 3451.

18. In the *Celt, Roman, and Saxon*, there is an instructive chapter on "The different races in Roman Britain," in which Mr. Wright has collected the scattered notices which bear on the Ethnology of the period. As might be expected in a task of considerable labour, and involving many minute details, some errors have crept in, which require notice, lest they should mislead others. One of these (page 253) is, that "Caius Antiochus Lysimachus, commemorated in a Greek inscription found in Scotland, was no doubt a Greek."

Mr. Wright has been led into error by a mistake in Professor Thomson's edition of *Stuart's Caledonia Romana*. In No. 1 of Plate VI. of that work,* a stone, preserved in the Museum of the Society of Antiquaries of Scotland, is figured, in which the name Lysimachus occurs; but the stone was found, not in Scotland, but in Africa, and Prof. Thomson acknowledges the mistake in his preface.

19. Mr. Wright also remarks, in the same chapter:

"Uriconium (*Wroxeter*) appears to have been occupied by Thracians: Cirencester by Thracians and Indians."

There is no doubt that an inscription has been found at each of those places, which furnishes evidence that a horseman of a Thracian cohort was buried in each, but there is no ground for the assertion that there were "Indians" at Cirencester. An inscription, indeed, was found there, commemorating *Dannicius*, a horseman *alæ Indianæ*; but this body did not derive its name from the nationality of the men composing it. It was probably called after *Julius Indus*, mentioned in *Tacit. Ann.*, iii. 42; and there is reason to believe that the men serving in it were, for the most part, *Treviri*. The *alæ* seem to have received such designations† as *Indiana, Frontoniana, Sebosiana*, from the names of the officers who first raised or organized them, and in this respect resembled the military bodies in our own service in the East Indies, known by such names as "Jacob's," or "Hodson's Horse."

* The stone is a sepulchral memorial of Antiochis, the daughter of Lysimachus. It is not easy to tell, from the faint copy which I have before me, what the letters are which Mr. Wright read "Caius;" but they unquestionably do not stand for that name. The first letter seems to be L, from which I infer that they most probably are *sigla* for the year of the Emperor, as is common in the Greek inscriptions of Egypt and Cyrene.

† *Vide* Henzen, nn. 5442 and 6722; also Roulez, *Mem. de l'Acad. Royale de Belgique* vol. xxvii. p. 12.

20. In 1830, an ancient grave-stone was found in excavating the foundations of Mr. J. S. Padley's house, in Lincoln. It is figured in the *Gentleman's Magazine* for 1842, p. ii. p. 351; and the inscription is given in the *Monumenta Historica Britannica*, p. cxii. n. 53*a*; and by Henzen, n. 6676, as follows:

L·SEMPRONI·FLA
VINI·MILTIS·LEGVIIII
Q(?) ALAVDI SEVERI
AER VIIANOR XXX
ISPANICA LERIA
CIVI MA

It is plain that the first two lines are to be read:

L[ucii] Semproni[i] Fla-
vini mil[i]tis leg[ionis] nonæ

but there is considerable doubt as to the word or words preceding SEVERI, in the third line. Mr. Padley remarks, that if the first letter in the line be Q, it may stand for *quadratæ*, i.e. *legionis nonæ quadratæ;* and reads the following word as "Alaudæ (a lark), a name given to legions, the soldiers of which wore tufted helmets, supposed to resemble the crest of the lark." The Editor of the Magazine suggests that the letter is G (not Q), "and is certainly some epithet of the legio Alauda. Perhaps galeatæ alaudâ, crested by the lark; or galeritæ alaudâ." The rest of the line, I SEVERI, is read by Mr. Padley as *Julii Severi*, and the reading is illustrated by the observation that "Julius Severus was a governor of Britain under Hadrian." The Editor of the *Monumenta Historica Britannica* adopts *Alaudæ*, but doubts whether I should be read as *Julius* or *Junius*, as there were two proprætors of Britain named *Severus;* the one, *Julius*, under Hadrian, the other, *Junius*, under Commodus. Henzen is of opinion that the latent reading of the line is "*Sub curA* (or something similar) cLAVDI SEVERI." I have but little doubt that Henzen's emendation CLAVDI is correct; and I regard the first A in ALAVD as a mistake for C. One of the *cognomina* of the 5th legion was *Alaudæ;* whilst those of the 9th were *Hispanica* and *Macedonica*. The first letter of the line, which is stated to resemble "the letter *q* inverted," and "the Etruscan G, the Roman G reversed," appears to me to be merely an inverted C, standing, as it often does, for *centuria*, and denoting

that Lucius Sempronius Flavinus was a soldier in that century of the 9th legion, which was under the command of Claudius Severus. Such a notice of the *century*, with the name of the centurion, is frequently found in the sepulchral inscriptions of soldiers. To Mr. Padley's reading of the next line, "aerum vii; annorum xxx," there can be no objection, as *aerum* is sometimes used for *stipendiorum*. *Vide* Orelli, nn. 3551, 3552; and Henzen, nn. 5202, 6841. The fifth line is read by Mr. Padley as "Ispanica Leria;" and the sixth as "Civitas Materna." Henzen adopts this reading of the fifth line, remarking that Leria was a city of Hispania Tarraconensis; but suggests, for the sixth, instead of "Civitas Materna," "Civi Ma[ximi exempli.]" There are, I think, but few scholars who would regard either of these interpretations of the last line as satisfactory; and on reference to the copy of the inscription in the Magazine, I find that there is no authority on the stone for the second I in CIVI, and that MA is most probably an erroneous reading of NIA. It appears to me, then, that we may read the last line thus: C·IVNIA, *curante Junia*, denoting the person who had caused the memorial of Flavinus to be executed. For the reasons which I have stated, I would read the whole inscription *in extenso* thus:

L·SEMPRONI·FLA	L[ucii] Semproni[i] Fla-
VINI·MILTIS·LEG VIIII	vini, mil[i]tis leg[ionis] viiii,
O CLAVDI·SEVERI	c[enturia] Claudi[i] Severi,
AER·VII ANOR·XXX	aer[um] vii, an[n] or[um] xxx,
ISPANICA LERIA	[H]ispanica Leria,
C·IVNIA	c[urante] Junia.

21. At the Mount, near York, there has been recently discovered "a slab, upwards of six feet long, with four incised figures in the upper part, and below them an inscription of six lines, of which nearly the whole is legible." "The inscription, as far as it can be deciphered, reads as follows:

D · M · FLAVIAE · AVGVSTINAE
VIXIT · AN · XXXVIIII · M · VII · D · XI · FILIVS
NVS · AVGVSTINVS · VXT · AN · I · D · III
AN · I · M · VIIII · D · V · CAERESIVS
I · LEG · VI · VIC · CONIVGI · CARI
ET · SIBI · F · C."

[*i.e.*: *D*[*iis*] *M*[*anibus*] *Flaviæ Augustinæ*;
Vixit an[nis] xxxviiii, m[ensibus] vii, d[iebus xi.] Filius
nus Augustinus V[i] x[i]t an[no] i, d[iebus] iii,
an[no] i, m[ensibus] viiii, d[iebus] v, Cæresius
i . leg[ionis] vi vic[tricis] conjugi cari-
et sibi f[aciendum] c[uravit.]

The Rev. J. Kenrick lately read a paper on the subject before the Yorkshire Philosophical Society, from the report of which, in the *Gentleman's Magazine* for January, 1860, I have taken the foregoing particulars. On the interpretation of the inscription, Mr. Kenrick offered the following remarks:

"The monument appears to have been raised by Cæresius, a soldier of the sixth conquering legion, to the Manes of his wife, Flavia Augustina, and two children, who died in their infancy, and prospectively for himself. Only the termination, NVS, of the son's name remains; there is room on the stone for the letters necessary to form FLAVIANVS, which is not unlikely to have been the name. But the space before the term of life, in the fourth line, is so small, that there is only room for a single name, and we must suppose an ellipsis of VIXIT to be supplied from the preceding clause. CAERESIVS is a name, which, in the forms CAERETIVS and CAERECIVS, occurs in Gruter. The beginning of the fifth line may have contained the second name of Cæresius, which one might have expected to be followed by some designation of his military character or office, as CENT·MIL. or TRIB·MIL. It is difficult to find any word ending in I, which could grammatically have stood in this position. The number of the cohort is often prefixed to the names of auxiliaries, prætorians, &c., but not of legionaries; and though the number of *stipendia* and years of service is often noted in inscriptions to deceased soldiers, it could hardly be looked for on a monument which a soldier had prepared for himself. It is natural to conjecture that the I is a remnant of an L, in which case MIL may have preceded the title of the legion, but the appearance of the stone does not favour the conjecture. The space at the beginning of the sixth line is, no doubt, to be filled up with the remaining letters of CARISSIMAE."

The only difficulty in the inscription is, as Mr. Kenrick points out, in the I before LEG. He justly rejects the suppositions that the number either of the cohort or of the *stipendia* is denoted by I as a numeral. The natural conjecture is certainly that it should be read L, as the last letter of MIL; but that is not favoured by the appearance of the stone. Under the circumstances, I am inclined to propose PRI, as in article 17 of this paper, for PRI[NCEPS]. There is little use in speculating on the second name of *Cærecius;* but there seems to be sufficient space before PRI for some such as FVSCVS,

the cognomen of the *Cærecius* mentioned in p. cccIxxix, n. 6, of Gruter.

22.* At Corbridge (the ancient *Cortospitum*), two altars were found bearing Greek inscriptions. One of them is figured in Dr. Bruce's *Roman Wall*, p. 313, and the inscription is thus translated:

"ΑΣΤΑΡΤΗΣ	Of Astarte,
ΒΩΜΟΝ Μ'	The altar
ΕΣΟΡΑΣ	You see,
ΠΟΥΛΧΕΡ Μ'	Pulcher
ΑΝΕΘΗΚΕΝ	replaced."

This translation omits that pleasing characteristic, which is often found in Greek inscriptions, whereby the object is regarded as addressing the reader; and not only is ME overlooked in the second and in the fourth line, but the sense of ANEΘHKEN is not correctly expressed. It does not mean "replaced," but "set up," "erected," "dedicated." Mr. Wright, p 269, correctly renders it:

"Of Astarte
the altar me
you see,
Pulcher me
dedicated."

i.e. You see me the altar of Astarte; Pulcher dedicated me. He also notices the circumstance, that the inscription "forms a line in Greek hexameter verse." It is strange, that, being aware of this, he did not observe that a slight emendation will give the same structure in the inscription on the other altar. Following Horsley, he reads:

"ΗΡΑΚΛΕΙ	To Hercules
ΤΙΡΡΙΩ	the Tyrian
ΔΙΟΔΩΡΑ	Diodora
ΑΡΧΙΕΡΕΙΑ	the high-priestess."

It is plain that TIPPIΩ destroys the metre, and that the verse should stand thus:

ΗΡΑΚΛΕΙ ΤΥΡΙΩ ΔΙΟΔΩΡΑ ΑΡΧΙΕΡΕΙΑ.

i.e. Ἡρακλεῖ Τυρίῳ Διοδώρα ἀρχιέρεια.

In another Greek inscription, found at Chester, in, I believe, 1856, we have also an Hexameter, which has escaped the notice of Dr.

* As the number of Greek inscriptions found in Britain is very small, I have thought it better to incorporate any remarks, which I have to offer on them, with my Notes on Latin Inscriptions.

J. Y. Simpson, in his paper on the subject in the *Proceedings of the Soc. of Antiq. of Scotland*, vol. ii. p. i. p. 80. He reads the words, which form the verse,* thus :

ΕΡΜΟΓΕΝΗΣ
ΙΑΤΡΟΣ ΒΩΜΟΝ
ΤΟΝΑΑΝΕΘΗΚΑ.

i.e. ΕΡΜΟΓΕΝΗΣ ΙΑΤΡΟΣ ΒΩΜΟΝ ΤΟΝΑ ΑΝΕΘΗΚΑ.

It is evident that the fourth letter in the third line is not A but Δ, and that the E, which follows it in ΤΟΝΔΕ, is here elided. Accordingly the verse should be :

ΕΡΜΟΓΕΝΗΣ ΙΑΤΡΟΣ ΒΩΜΟΝ ΤΟΝΔ' ΑΝΕΘΗΚΑ.

i.e. I, Hermogenes, a physician, dedicated this altar.

23. In Mr. C. Roach Smith's *Collectanea Antiqua*, vol. i. p. 135, a grave-stone, which was found some sixty years ago in Whitechapel, London, is figured ; and the following explanation is given of the inscription which is on it :

"D.M.
IVL.VALIVS
MIL.LEG.XXVV
AN.XL.H.S.E
C.A.FLAVIO
ATTIO.HER

Dïs Mânibus. Julius Valius miles legionis vicesimæ valentis victricis, anno quadragesimo, hic sepultus est. Caio Aurelio herede."

There is no difference between this expansion and that proposed in the *Gentleman's Magazine*, vol. liv. p. 672, excepting the emendation of the number of the legion, which Mr. Smith correctly gives as xx, instead of xxx, and the accidental omission of *Flavio Attio* between *Aurelio* and *herede*.

As there are obvious objections to this rendering, I would read the inscription thus :

D·M·	D[iis] M[anibus] ;
IVL·VALIVS	Jul[ius] Valius,
MIL·LEG·XX·V·V	Mil[es] leg[ionis] xx V[aleriæ] V[ictricis],
AN·XL·H·S·E	An[norum] xl, h[ic] s[itus] e[st],
C·A·FLAVIO	c[uram] a[gente] Flavio
ATTIO·HER·	Attio her[ede].

* The preceding words [ΣΩΤ] ΗΡΣΙΝ [ΤΙΙ] ΕΡΜΕΝΕΣΙΝ *seem to be a portion of an* irregular pentameter.

24. In the same work of Mr. Smith's, vol. iii. p. 201, we find the following notice of "an imperfect inscription found at Caernarvon (Segontium), which was contributed to the 'Archælogia Cambrensis,' by Mr. James Foster."

"It is on two pieces of stone, which, on comparison, appeared to have belonged to one and the same slab;

· · · EPT . SEVERVS . PIUS . PER · ·
· · · VREL . ANTONINV · · · · · ·
· AQVAEDVCTIVM VETVS · · · · ·
· · · BS . COH . I . SVNC . RESIT · · ·
· · · VIPF · · ·
· · · IVL · · ·

"The first two lines mention Severus and Caracalla; the second and third [third and fourth] refer to an aqueduct or aqueducts, which, having become decayed through age, had been restored by the first cohort of the Tungri; that is to say, presuming the SVNC of the engraving in the "Archæologia Cambrensis" for April, 1853, should be TVNG. The remaining lines probably gave the name of the commander of the cohort, and that of the superintendent of the work of restitution."

It is plain, that Mr. Smith correctly explains

[S]EPT[IMIVS] SEVERVS · PIVS · PER[TINAX]
[A]VREL[IVS] ANTONINV[S]

as standing for the Emperors Severus and Caracalla; and

AQVAEDVCTIVM VETVS[TATE]
[COLLA]BS[VM] COH[ORS] I SVNC RESTIT[VIT]

as referring to* an aqueduct, which, having become decayed through age, had been restored. Nor is his opinion as to the contents of the fifth and sixth lines improbable; but I have no doubt that the cohort named in the fourth line is not *cohors prima Tungrorum*, but *cohors prima Sunuc*[*orum*], the N and V being ligulate. This cohort is mentioned in the *tabula honestæ missionis* found at Stannington, in Yorkshire (*Gough's Camden*, iii. p. 263, *Monum. Hist. Brit.* n. 9), from which it appears that at the time (A.D. 124) it was serv-

* I regard *aquæductium* as used for *aquæductum*.

ing in Britain under the command of *Auluntus Claudianus*. This Caernarvon stone is valuable, as it and the *tabula* are the only extant memorials of the cohort. The *Sunuci*, or *Sunici*, were a Belgic people. They are mentioned by Tacitus and Pliny, but their position has not been exactly defined. It is probable, however, that they lived between Cologne and the Meuse, about the eastern part of the modern Belgic province of *Limbourg*.

25. In the *Archæologia Æliana*, vol. iv., a broken slab, which was found in Birdoswald *(Amblogana)* during the excavations which were made under the direction of Mr. Potter in 1852, is figured; and that gentleman gives the following expansion of the inscription, which it bore:

"SVB MODIO IV	Sub[limo] Dio Ju-
LIO LEG AVG PR	-lio leg[ato] Aug[ustali] Pro-
PR COH I AEL DC	Prætori Coh[ors] i Æl[ia] D[a]c[orum]
CVI PRAEEST M	cui præest M[arcus]
CL MENANDER	Cl[audius] Menander
TRIB	Trib[unus]."

Mr. Potter is of opinion, that "if this reading be correct, there is reason to suppose that the Julius here mentioned was Julius Severus, who, in the time of Hadrian, was proprætor of Great Britain;" and after examination, rejects a different reading which had been suggested, viz. *Sub Modio Julio*.

I am unable to comprehend the grounds on which Mr. Potter adopted *Sublimo Dio*, a reading which is unprecedented and scarcely intelligible. I concur with Mr. Smith (*Collectanea Antiqua*, iii. p. 201), in preferring *Sub Modio Julio*, which (as Mr. Potter remarks) gives "the name of a proprætor of Britain not hitherto known." I am not satisfied, however, as to the correctness of *Julio*. The fracture of the slab seems to have so materially injured the letters, in the second line, given as LI, that it may reasonably be doubted whether that be the right reading. I am inclined to venture on the conjectures, that the injured letters are ST, and that the *Modius Justus* named here is the same, who, at a different time, was LEG·AVG·PR·PR of Numidia. He is mentioned in the following inscription given by Renier (*Inscriptions de l'Algérie*, n. 44):

STAT · AGRIP	Stat[iæ] Agrip-
PINAE CON	pinæ, con-
IVGIS MO	jugis Mo-
DI IVSTI LEG	di[i] Justi, leg[ati]
AVG · PR · PR	Aug[usti], Pr[o] Pr[ætore],
CONSVLIS ·	Consulis,
SPEGVLATO	Speculato-
RES ET	res et
BENEFICIARI	Beneficiari[i].

In Mommsen's *Inscript. Neapolit.* n. 5274, we also find the names *Modius Justus*.

REMARKS ON THE LAW OF STORMS, AS SET FORTH IN A TRACT PUPLISHED BY RICHARD BUDGEN, IN THE YEAR 1739.

BY THE REV. C. DADE, M.A.

Read before the Canadian Institute, March 26th, 1849.

Among the "Curiosities of Literature" may justly be reckoned the numerous family of Tracts, especially those of a bygone age. These "Sibylline leaves," as they may be called, take a wide range, for there is scarcely a branch of human learning which they leave untouched. The theologian, the physician, the lawyer, the historian, may find in them much valuable metal amidst a heap of dross and refuse. The philosopher may detect the rude germ and faint lineaments of many a theory confirmed and illustrated by the labours of a succeeding generation, and the practical operator may discover projects and inventions appropriated perhaps, without scruples, by those who have reaped where they never sowed. They rescue from oblivion remarkable persons and events, throw light upon the manners and customs of our forefathers, relieve the generalization of history by presenting life-like pictures of a bygone age; and we have seen of what signal service they have been made to render in the hands of a consummate master, by elucidating many a dark passage of the annals of our country. The collection, therefore, and preservation of these "*dis-*

jecta membra" is far from being an unprofitable service. From their very nature they were fleeting and evanescent, and often doomed to an ephemeral existence, wanting those attributes of bulk and density to which many a huge folio and quarto owes its preservation.

The tract under consideration is worthy of notice on more than one account. It gives a minute and apparently trustworthy record of an extraordinary natural phenomenon. It exhibits the rude and imperfect outline of that which the youngest in the family of Sciences is rapidly ripening into just form and proportions. It points out to the meteorologist of the present day, richly furnished with all the means and appliances which the genius of the philosopher, aided by the skill of the mechanic, can supply, the way in which these phenomena were dealt with by those who were utterly without such helps. And in the particular case under consideration it will lead to the enquiry whether it has not anticipated a theory capable of great results and expansion, which has been claimed as the offspring of the present generation.

The title of this tract is as follows: "The Passage of the Hurricane from the seaside at Bexhill, in Sussex, to Newingden Level, the twentieth day of May, 1729, between nine and ten in the evening, containing:—

(1) An account of the Weather and bearing of the Winds that preceded the Hurricane, with the celerity of its circular and progressive motion.

(2) A particular account of the Damage and Devastation of the Buildings, Timber, &c., that stood in the way of its course.

(3) Some observations on the way and manner of its course.

(4) By way of enquiry, some account attempted of the causes of Tempests, Whirlwinds, and Hurricanes. By Richard Budgen.

The tract is dedicated to "Sir Hans Sloane, Bart., the President, and to the Council and Fellows of the Royal Society," and is accompanied by an "Exact Plan" describing the passage of the Tornado or Hurricane, which is represented by a spiral line, shewing its breadth, and likewise that the gyration was from E. to W. The divisions of the several Estates passed over by the Hurricane are carefully delineated, the whole being a well executed diagram.

Who or what the said R. B. was, we have no means of knowing. He was a dilligent observer of the weather in his way, and he alludes to his own and his friends' journals. He seems to have been a man

of an inquisitive and philosophical turn of mind, and a projector withal, for we have another production of his in which he describes a notable invention of his own, viz.: "An Engine to work by the Wind, that with a long time, and a close and intent application of thoughts, and a large expence in making and altering of models, I have now brought to answer the ends proposed." These ends were nowise trifling, and had they answered the anticipations of the worthy projector would doubtless, instead of having been consigned to the limbo of forgetfulness, have earned for him the expected immortality. However, as an observer of nature, he seems to have been most indefatigable. In his description of the hurricane and its effects, he does not omit the smallest particular from the "uprooting of over a thousand and five oaks on the demesne of Sir Thomas Webster, Bart.," to the damaging of a stack of chimneys, or the unroofing of a pig-stye. He opens his narrative by saying, "We had the surprising horror of seeing (at about twenty miles distance), such unintermitting coruscations, together with such dreadful darting and breaking forth of liquid fire at every flash of lightning in the way of the hurricane, as perhaps has not been seen in this climate for many ages. He proceeds to give "a careful collation of the weather for the nine days preceding the hurricane," as follows:

"May 11.—Storm of hail in the evening, wind W. b. N., the wind for a long time before having been northerly.

12.—White frost, warm and fair with moderate breeze S. b. W.

13.—Clear, light breeze from the S.

14.—Cloudy, light breeze from W.

15.—Very clear, warm breeze from S. E.

16.—Very serene air, with a sensible increase of heat; wind S. E.

17.—Very clear with a soft W. wind.

18.—Very serene, and began to be exceeding hot and sultry. Wind S.

19.—A somewhat thick air in the morning, but very clear and exceeding hot in the afternoon. Wind S. W. b. S.

20.—A slight flying tempest in the morning with a little scattering rain. The rest of the day very clear and extreme hot and sultry. Wind S. till about 5 P.M., when there began to appear a haziness in the S., which by degrees, with a vanishing edge, arrived at our zenith about 7 P.M., when there began to appear plain symptoms of a tempest. We distinctly heard the thunder at 8 P.M., and had a prospect

of two different tempests. It appeared like a prodigious smoke rolling from a limekiln. It landed about 9 P.M., its course being nearly from S. b. W. to N. b. L. Length of its track twelve miles, which it passed over in twenty minutes; and seventy rods may be taken for the mean diameter of its vertiginous motion."

"The duration of the offensive wind could not exceed twenty seconds. The direct velocity of the storm is forty-two feet in a second, to which adding forty-three feet, for the increase by the vertiginous or spiral motion, makes eighty-five feet, which is the space run through in every second of time near the outward verge of the gyration, and the velocity by which all obstacles received the impulse of the wind."

Budgen alludes to the "storm's eye"—the *El ojo* of the Spanish mariners—often noticed since.* "At Ewhurst a brightness was observed in the clouds approaching about the breadth that afterwards appeared to have been taken in by the hurricane, and such a strong light during the time of the greatest violence of the storm, as far exceeded any of the preceding flashes of lightning."

Again, he observes:—"By passing thro' and between buildings, touching both sides, and by the circular lanes in some places, in woodlands that were full of timber, and by some particular buildings rent in divers parts by impulses of several directions, undeniably proves that the swift vertiginous motion of hurricanes is not owing to any force equally impressed upon the fluid in motion, according to, and as they are commonly compared to, liquid whirlpools, &c., but rather that the offensive part of the fluid, which moves with such violence as scarcely to be resisted, appears to have taken in not more than $\frac{1}{20}$th or $\frac{1}{25}$th of the diameter of the whirlwind or fluid in a vertiginous motion, for where it raged with the greatest violence in the thickets of timber some trees had not the least appearance of a storm, yet all the trees about them were torn up by the roots and shattered into splinters."

Again:—"That its motion was contra-solem, or from the right hand to the left, was plain from all bodies being drove down near the eastern verge towards the north, and near the western towards the south. By increasing in breadth as it ascended to the tops of the

* "A very remarkable fact is that while all around the horizon was a thick dark bank of clouds, the sky above was so perfectly clear that the stars were seen."—*Reid on the Law of Storms*, p. 393, &c.

hills, gives reason to believe the body of the hurricane was like a truncated cone inverted, which, perhaps, when this knowledge is raised to a higher pitch, and these appearances better understood, may be found a necessary form not only for hurricanes, but all kinds of spouts and whirlwinds."

It is not necessary to follow the author in his minute details of the devastation caused by this hurricane. Suffice it to say that it levelled buildings, tore up by the roots, splintered, or destroyed a vast number of oak trees, to the number of 1,300 or 1,400 on one estate alone. The description is valuable for it proved from ocular demonstration the theory of the rotary and progressive motion of storms, as set forth by the author. We need not dwell upon the latter portion of his essay, in which he endeavours to account for the origin of these awful phenomena. Budgen admits the necessity of more extended observation in after times as a fit employment for some "philosophical genius." His words are, (page 11),—"Neither does it appear to me that any just conclusion from reasoning can be produced without being furnished not only with a long series of observations, but a good collection of such kind of experiments as have not yet been tried, or at least never published;" and the object of his tract was to "collect such certain facts as had the appearance of being most useful, and assisting to lead a philosophical enquirer towards the causes." We see then, in the pamphlet before us, the law of storms clearly enunciated. The hurricane, from actual observation, is found to have a progressive motion nearly in a straight line, and, at the same time, a circular motion contra-solem, and we see that this doctrine was established by R. Budgen one hundred and twenty-nine years ago. Now, in the Foreign *Quarterly Review*, we read the following statement: "Col. Reid lays no claim to originality in this discovery (*i.e.*, the Law of Storms) which belongs essentially to Mr. Redfield, of New York, who was *the first person* (Col. Reid says) that gave any just notion of the nature of hurricanes. It is due to Mr. Redfield to mention that until Col. Reid informed him of Col. Coppers having previously suggested the rotary theory of storms, he was quite ignorant of the fact. The doctrine held by Mr. Redfield, and we think substantiated by the facts brought together by him and Col. Reid, is that a hurricane or great gale is simply a whirlwind revolving in a direction contrary to the hands of a watch, or from right to left, supposing yourself in its centre, and that at the same time the centre of

the vortex is advancing in a line nearly straight, at a rate of progression which is very slow compared with the velocity of rotation."

Thus it appears that this theory, set forth as original in 1835, was explicitly enunciated in 1730 by Richard Budgen; and we might almost say demonstrated by an appeal to facts. We are not now talking of its developement in later years, or of that vast accumulation of details due to the industry and research of later observers. We may further remark, that in this sketch no mention is made of any kind of philosophical instruments. It would have signally added to the interest and value of the observations, had there been careful records of the thermometer and barometer; but these instruments, though long before invented, were little known and used by any but the learned, and were rude in their construction and equipments. It is only in the present age that the skill of the artist has been enlisted in the service of the philosopher, and theory and practice made to go hand in hand. Nevertheless, as was observed in the outset, these rude and imperfect attempts are not unworthy of notice. No modern philosopher will be inclined to say "*Pereant isti qui ante nos nostra dixerunt,*" but will rather award a just meed of praise to those obscure seekers after knowledge, who, with means and appliances so scanty, were yet enabled to accomplish so much.

REVIEWS AND NOTICES OF BOOKS.

Course of Practical Chemistry, as adopted at University College, Toronto. By Henry Croft, F.C.S., Professor of Chemistry, University College. Toronto: Maclear & Co., 1860.

Perhaps in no one department of science, is so much active interest displayed at present, as in that of Chemistry. This is due, without doubt, to the important bearings of Chemical Science on many of the leading questions of the day. In Agriculture, in Technology—throughout the wide field which that department properly embraces—in Medicine, Pharmacy, and Medical Jurisprudence, its practical applications are prominent and manifold; whilst, to its more indirect influence and reactions, many of its sister sciences owe, in great part, the rapidity of their modern progress. The great advance made in these latter times by Chemistry itself, has been essentially brought

about by the perfection of one of its branches—that which relates to the analysis of mineral and organic bodies, and which, in conventional language, is often called *Practical Chemistry*. This forms, as it were, the basis or groundwork on which the whole structure of Modern Chemistry has been reared. Without a knowledge of the accurate composition of bodies—a knowledge won only by the gradual perfection of chemical analysis—the law of Definite Proportions or Combining Weights, with its natural sequence the Atomic Theory, the great facts of Isomorphism, the Theory of Compound-Radicals, and other leading views of the modern science, would have been still unrecognised. The Chemical-Reagent and the Balance, it should also be remarked, first truly deprived the designing hosts of the *Subtles* and *Faces* of their knavish office, in dispelling the alchemistic dreams in which this science originated, and which so long controlled its progress.

Chemistry is often taught, or attempted to be taught, in schools and elsewhere—but how? In many instances, simply by word of mouth, by recitations from some elementary text-book, in which merely the broad facts of the science are set forth and commented upon in popular language, whilst neither teacher nor pupil possesses the slightest practical knowledge of the various bodies whose properties are brought under discussion. We once heard a school-teacher of this kind, discourse very flowingly on some chemical topics, but who, on being subsequently applied to by one of his scholars for information as to whether a certain substance, a sample of which he brought him, contained copper, was utterly unable to reply, or even to suggest the proper means by which the question might be solved. This is certainly not a desirable method of either teaching or learning chemistry; and he who would obtain a correct knowledge, elementary or otherwise, of this subject, is strongly urged, after mastering its general principles, to resort to his reagents, his blowpipe, and his test-tubes; and to familiarise himself with at least the common properties and reactions of the ordinary metals and non-metallic elements, and their compounds. No special laboratory is required for this purpose, nor is any expensive apparatus necessary. One of our best chemists, the celebrated Dr. Wollaston, kept all his working instruments on a tea-tray. A trustworthy handbook will be wanted, and the student cannot certainly find a more suitable one for his purpose, than that of which the title is placed at the head of this notice. The

name of its author is a sufficient guarantee that the work has been well performed. Although various treatises on Chemical Analysis exist, many of these are too extensive for general use, and others are not readily procurable in this country; and thus, Professor Croft's very excellent manual will supply the Canadian student with a long-felt want. The work is divided into four sections. The first treats of apparatus and reagents; the second gives the reactions of the more common bases and acids, with tables for the detection of these bodies; the third comprises the detection of poisons, both mineral and vegetable; and the fourth includes special directions on alkalimetry and acidimetry, the analysis of soils and mineral waters, the examination of bile and urinary calculi, and other matters. The work is thus not only adapted to the requirements of our University and other general students; but, to the medical student, also, it will prove equally acceptable. E. J. C.

Examples of the Application of Trigonometry to Crystallographic Calculations, drawn up for the use of Students in the University of Toronto. By E. J. Chapman, Professor in University College; late Professor in University College, London. Toronto: Printed by Lovell & Gibson, Yonge Street, 1860.

The University of Toronto having adopted the "Application of Trigonometry to Crystallographic Computations" as one of the honor subjects for students of the fourth year, the graduated series of examples, given with some introductory matter in the present pamphlet, has been drawn up to convey a general idea of the principles involved in this application.

The examples are illustrated by five lithographed plates, containing various original diagrams, designed expressly for this memoir. Amongst others, two new projections are given, shewing, at a glance, the relative positions of the forms of the Trimetric System of Crystallization—to which group, as that best adapted to exhibit the nature of crystallographic calculations in general, the examples are chiefly confined. This method of projection may be applied equally to all the other systems; and its employment by the student will be found, it is thought, of much advantage, in fixing in the memory the form-relations of the different crystal groups. The Notation employed

is also new; and in some additional remarks, a quick and simple method of computing the axial ratios of Rhombohedrons, with four diagram illustrations, is laid before the reader.

SCIENTIFIC AND LITERARY NOTES.

FRANKLIN INSTITUTE: PHILADELPHIA.

We have much pleasure in calling attention to the following notice, recently forwarded to us by the Franklin Institute of Philadelphia. The munificent offer of Mr. Boyden is open, it will be seen, to all residents of North America and the West India Islands:

BOYDEN PREMIUM.

Uriah A. Boyden, Esq., of Boston, Mass., has deposited with the Franklin Institute the sum of one thousand dollars, to be awarded as a Premium to "any resident of North America, who shall determine by experiment whether all rays of light, and other physical rays, are, or are not transmitted with the same velocity."

The following conditions have been established for the award of this Premium:

1. Any resident of North America, or of the West India Islands, may be a competitor for the Premium. The Southern boundary of Mexico being considered as the Southern limit of North America.

2. Each competitor must transmit to "Wm. Hamilton, Actuary of the Franklin Institute, Philadelphia, a memoir describing in detail the apparatus, the mode of experimenting, and the results; and all memoirs received by him before the first day of January, one thousand eight hundred and sixty two, (1862,) will, as soon as possible after that date, be transmitted to the Committee of Judges.

3. The Board of Managers of the Franklin Institute, shall, before the first day of January, one thousand eight hundred and sixty-two, select three citizens of the United States, of competent scientific ability, to whom the memoirs shall be referred; and the said Judges shall examine the memoirs, and report to the Franklin Institute whether in their opinion, any, and if so which of the memoirs is worthy of the Premium. And, on their report, the Franklin Institute shall decide whether the Premium shall be awarded as recommended by the Judges.

4. Every memoir shall be anonymous, but shall contain some motto or sign by which it can be recognised and designated, and shall be accompanied by a sealed envelope, endorsed on the outside with the same motto or sign, and containing the name and address of the author of the memoir. It shall be the duty of the Actuary of the Franklin Institute, to keep these envelopes securely, and unopened until the Judges shall have finished their examinations; when, should the Judges be of opinion that any one of the memoirs is worthy of the premium, the corres-

ponding envelope shall be opened, and the name of the author communicated to the Institute. The other envelopes shall be destroyed without being opened.

5. Should the Judges think proper, they may requre the experiments described in any of the memoirs to be repeated in their presence.

6. The memoir which may obtain the Premium, shall become the property of the Franklin Institute and shall be published as it may direct. Any unsuccessful memoir will be returned to the author at his request.

GEOLOGY AND MINERALOGY.

ANALYSIS OF CANADIAN WOLFRAM.—BY T. STERRY HUNT, F.R.S.

In volume 1, page 308, (New Series), of the *Canadian Journal*, will be found a crystallographic and mineralogical description, by Professor Chapman, of a specimen of Wolfram, discovered in a boulder of gneiss on the shore of "Chief's Island," Lake Couchiching, Canada West. A chemical examination of a portion of this specimen has yielded the following results:—

The specific gravity of the mineral was found to be 6·938. Two grammes of it were finely levigated, and decomposed by prolonged digestion with *aqua regia*; after which, the solution was evaporated to dryness, and the residue being heated with water and hydrochloric acid, the insoluble yellow portion was separated, washed with spirit of wine, and finally digested with ammonia. The ammoniacal solution left by evaporation and ignition, 1·469 grm. of tungstic acid. The residue, insoluble in ammonia, weighed ·048 grm. It was heated in a platinum crucible with fluorid of potassium, and an excess of sulphuric acid to drive off any silica which might be present, and then fused with the resulting bisulphate of potash. The fused mass was transparent, but on adding water white flakes separated, =·039 grm., and the solution contained ·005 of oxide of iron and manganese. The loss, equal to ·004 grm., was supposed to be silica, and the white matter, which was grey after ignition, and insoluble in a solution of potash, was regarded as niobic acid.

The iron was separated as peroxyd from the hydrochloric solution by carbonate of baryta, and equalled ·181 of protoxyd. The manganese, being lost by an accident, was calculated from the difference. We have thus, for 100 parts of this specimen of Wolfram, the following composition:—

Tungstic acid	73·45
Niobic acid (?)	1·95
Protoxyd of iron	9·05
Protoxyd of manganese	15·35
Silica	·20
	100·00

[These results lead to the general formula 2 (FeO, WO^3) + 3 (MnO, WO^3): the specimen belonging to the *mangano-wolframit* of Breithaupt, as stated in the mineralogical description referred to above.]

NOTES ON THE GEOLOGY OF THE BLUE MOUNTAIN ESCARPMENT, IN COLLINGWOOD TOWNSHIP, CANADA WEST.—BY E. J. CHAPMAN.

1. The elevated tract of land, known popularly as the "Blue Mountains," in the Township of Collingwood, C.W., and which forms a somewhat striking feature in the scenery of that district, constitutes a spur (or more properly, perhaps, the north-eastern point), of the line of escarpment which runs from the western extremity of Lake Ontario to the western shores of Georgian Bay: its face being opposed, generally, to the east or north-east. The range of this escarpment north of Dundas was briefly pointed out by Mr. Murray, of the Geological Survey, in his Report for 1850-1. It has also been laid down by Mr. Sandford Fleming in a small railway-map published in 1857. The Report accompanying Mr. Fleming's map contains, in addition, a slight but substantially correct sketch of the general geological features of the surrounding district. In Mr. Murray's Report, the formations west of the escarpment (commencing with the Upper Silurians) are alone considered.

2. Near the base of the "Blue Mountains," on the shore of Nottawasaga Bay, the Trenton Limestone constitutes the lowest visible formation. This, which at the spot in question scarcely appears above the ordinary level of the lake, is succeeded by interstratified beds of bituminous limestone and bituminous shale, belonging to the base of the Utica Slate series. This peculiar interstratification of shale and limestone is alluded to by Mr. Murray in his Report (for 1848-9) on the shores of Georgian Bay and the west coast of Lake Huron. Three fossils are especially abundant in these beds, viz.:—*Triarthrus Beckii*, *Asaphus Canadensis*, and a *Lingula* allied to *L. obtusa*, if not identical with that species. Another lingula, *L. quadrata*, is also not uncommon. The trilobites are usually in a fragmentary condition: the glabella, &c., of *T. Beckii*, and the pygidium of *A. Canadensis*, being the parts commonly met with. The linguleæ, on the contrary, are beautifully preserved; and their dark, lustrous shells stand out in strong relief on the light gray weathered surface of the rock. *Orthis testudinaria* is also of not uncommon occurrence; and, in some beds, ill-preserved graptolite fragments, belonging apparently to *G. pristis*, are occasionally met with. A small species of *Leperditia* is likewise present in great numbers. It is identical with that first discovered in the Utica Slate of Western Canada by Mr. J. F. Smith, and which is still, we believe, without a specific name.

3. The Utica Slate deposit, comprising altogether a thickness of about seventy or eighty feet, passes under the Mountain, and is succeeded by greenish and other colored arenaceous shales or thin-bedded sandstones belonging to the Hudson River group. This latter formation appears (at this locality) to constitute the chief mass of the mountain. Its thickness cannot be far short of 650 feet. On the northern face of the escarpment it is exposed in several gullies, but it yields scarcely a trace of fossils: an indistinct *ambonychia radiata* and some faint graptolite markings were alone obtained. Farther west, as where the formation comes out on Georgian Bay, and at Owen Sound, fossils occur in it, however, in some abundance.

4. On the top of the mountain, some exposures of siliceous limestone occur. These beds belong undoubtedly to the Clinton sub-formation; so that, between

their outcrop and the upper termination of the Hudson River Group, the Medina Sandstone should be found. It is, nevertheless, impossible to determine this in a satisfactory manner, and consequently to ascertain the exact thickness of the Hudson River Group, as the intermediate space is so greatly obscured by drift and vegetation.

5. The beds of siliceous limestone on the top of the Mountain are polished and striated by glacial action. The polished surface of the stone exhibits two sets of striæ or furrows, crossing at a slight angle, but having a general N.N.W. and S.S.E. direction. Here and there, the lines of furrow pass across projecting hard points, under the south side, or lea, of which, a slight interruption in the furrow takes place. This shows the abrading agency to have moved from the north, southwards.

6. On passing over the summit of the mountain, towards the south-west and west, limestone strata, containing Niagara fossils, crop out; but, as these extend beyond the limits of the Blue Mountain district, they were not specially examined.

7. The slopes of the Mountain and the surrounding country are more or less thickly covered by drift-clay and boulders. At the foot of the Mountain, on the south-east side, a high ridge of drift extends for some miles in a direction roughly parallel to the escarpment. This ridge has at first sight a certain resemblance to the terminal moraine of an ancient glacier; but it is evidently nothing more than a sub-aqueous formation or fringing bank, accumulated during the drift period, when the summit of the mountain formed a broad shoal, or low island, in the glacial sea. The formation of the escarpment itself is due to the denuding forces of a still earlier time; and the enormous amount of sedimentary matter carried off during its denudation, may to some extent be realized, when we consider its height above the general level of the country, and its extension to the south of Lake Ontario.

PROFESSOR DAWSON, LL.D., ETC., ON VEGETABLE STRUCTURES IN COAL.

The February number of the Journal of the Geological Society contains, amongst other valuable papers, a communication of no ordinary interest, by Dr. Dawson of McGill College, Montreal, on the characters of the different vegetable structures preserved in coal. The paper is illustrated by a great number of lithographed figures, without the aid of which, it would be useless to attempt anything like a special analysis of its contents. The structures preserved in the soft fibrous layers called "mineral charcoal," are first investigated; and afterwards, those preserved in the compact or lustrous portion of ordinary coal. Many new and exceedingly interesting details are brought out by these investigations, rendering Dr. Dawson's paper one of the most valuable contributions to our knowledge of the Carboniferous flora, that has appeared for some time. The paper concludes with a few general deductions, as given in the following extract:—

1. With respect to the plants which have contributed the vegetable matter of the coal, these are principally the *Sigillariæ* and *Calamiteæ*, but especially the former. With these, however, are intermixed remains of most of the other plants of the period, contributing, though in an inferior degree, to the accumulation of

the mass. This conclusion is confirmed by facts derived from the associated beds, —as, for instance, the prevalence of *Stigmaria* in the underclays, and of *Sigillariæ* and *Calamites* in the roof-shales and erect forests.

2. The woody matter of the axes of *Sigillariæ* and *Calamiteæ* and of Coniferous trunks, as well as the scalariform tissues of the axes of the *Lepidodendreæ* and *Ulodendreæ*, and the woody and vascular bundles of Ferns, appear principally in the state of mineral charcoal. The outer cortical envelope of these plants, together with such portions of their wood and of herbaceous plants and foliage as were submerged without subaërial decay, occur as compact coal of various degrees of purity; the cortical matter, owing to its greater resistance to aqueous infiltration, affording the purest coal. The relative amounts of all these substances found in the states of mineral charcoal and compact coal depend principally upon the greater or less prevalence of subaërial decay, occasioned by greater or less dryness of the swampy flats on which the coal accumulated.

3. The structure of the coal accords with the view that its materials were accumulated by growth, without any driftage of materials. The *Sigillariæ* and *Calamiteæ*, tall and branchless, and clothed only with rigid linear leaves, formed dense groves and jungles, in which the stumps and fallen trunks of dead trees became resolved by decay into shells of bark and loose fragments of rotten wood, which currents would necessarilly have swept away, but which the most gentle inundations or even heavy rains could scatter in layers over the surface, where they gradually became imbedded in a mass of roots, fallen leaves, and herbaceous plants.

4. The rate of accumulation of coal was very slow. The climate of the period in the northern temperate zone, was of such a character that the true Conifers show rings of growth not larger nor much less distinct than many of their modern congeners.* The *Sigillariæ* and *Calamites* were not, as often supposed, composed wholly, or even principally, of lax and soft tissues, or necessarily short-lived. The former had, it is true, a very thick cellular inner bark; but their dense woody axes, their thick and nearly imperishable outer bark, and their scanty and rigid foliage would indicate no very rapid growth or decay. In the case of *Sigillariæ*, the variations in the leaf-scars in different parts of the trunk, the intercalation of new ridges at the surface representing that of new woody wedges in the axis, the transverse marks left by the successive stages of upward growth—all indicate that at least several years must have been required for the growth of stems of moderate size. The enormous roots of these trees, and the conditions of the coal-swamps, must have exempted them from the danger of being overthrown by violence. They probably fell, in successive generations, from natural decay; and, making every allowance for other materials, we may safely assert that every foot of thickness of pure bituminous coal implies the quiet growth and fall of at least fifty generations of *Sigillariæ*, and therefore an undisturbed condition of forest-growth enduring through many centuries. Further, there is evidence that an immense amount of loose parenchymatous tissue, and even of wood, perished by decay; and we do not know to what extent even the most durable tissues may have disappeared in

* Paper on Fosils from Nova Scotia. Quart. Journ. Geol. Soc. 1847.

this way; so that in many coal-seams we may have only a very small part of the vegetable matter produced.

5. Lastly, the results stated in this paper refer to coal-beds of the middle coal-measures. A few facts which I have observed lead me to believe that, in the thin seams of the lower coal-measures, remains of *Nœggerathia* and *Lepidodendron* are more abundant than in those of the middle coal-measures.* In the upper coal-measures similar modifications may be expected. These differences have been to a certain extent ascertained by Goeppert for some of the coal-beds of Silesia, and by Lesquereux for those of Ohio;† but the subject is deserving of further investigation, more especially by the means proposed in this paper, and which I hope, should time and opportunity permit, to apply to the seventy-six successive coal-beds of the South Joggins.

HIPPURITE LIMESTONE IN JAMAICA.

Mr. Lucas Barrett, Director of the Geological Survey of Jamaica, has discovered examples of *Hippurites* and *Ventriculites* in limestones of Cretaceous age in Jamaica. The Hippurite limestone occurs on the Plantain Garden River, and also on the central mountains at an elevation of 2,500 feet above the sea. These remarkable forms of the higher Cretaceous series, so abundant in Southern Europe, were met with some years ago, it may be remarked, by Ferdinand Rœmer, in Texas.‡

CALCEOLA IN THE UPPER SILURIAN ROCKS OF TENNESSEE.

Until quite recently, but one undoubted species of the genus Calceola (viz., *C. sandalina*) was recognised by palæontologists. This species was thought also to be exclusively confined to Devonian rocks. Professor Stafford, in a paper published in a late number of *Silliman's Journal*, now maintains, and apparently on good data, that the supposed *C. sandalina*, of Tennessee, is a distinct species; and that the deposits in which it occurs, belong really to the Niagara period. He proposes for the new species, the name of *Calceola Americana*. It is associated in Tennessee with *Orthis elegantula, Platyostoma Niagarensis, Caryocrinus ornatus*, &c. It differs from *C. Sandalina*, in not exhibiting any groove or furrow on the central process of the larger valve; in the absence of the internal rows of punctures as occurring in the European species; and by other well-marked characters. Good examples of *C. sandalina* (shewing the interior of the valves), may be seen in the collection of the University of Toronto.

FOSSIL FOOT-TRACKS OF THE CONNECTICUT VALLEY.

Mr Roswell Field, of Greenfield, Massachusetts, who has devoted his leisure time for many years to the study of the supposed *ornithichnites* of the Connecticut sandstone, and whose collections of these remarkable tracks are perhaps un-

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* I may refer to my late paper on Devonian Plants from Canada for an example of a still older coal made up principally of remains of Lycopodiaceous plants of the genus *Psilophyton*. (Quart. Journ. Geol. Soc. No. 60, p. 477.)

† Report of Survey of Ohio, 1858.

‡ Persons interested in Palæontology, will find examples of *Hippurites*, and other so-called *Rudistes*, in the Geological Museum of the University of Toronto.

rivalled, has published some interesting remarks on the subject, in the last number of *Silliman's Journal*. In these remarks, Mr. Field expresses his conviction that the foot-tracks in question are of reptilian origin. Many of the supposed biped tracks are now shewn to have been made by quadrupeds; and in some instances, in which the animals appear to have sunk deeply in the yielding sediments, the impression caused by the tail is plainly visible in the form of a central groove.

EIGHTH SUPPLEMENT TO DANA'S MINERALOGY.

In the absence of Professor Dana, who is now in Italy, the usual semi-annual Report on the progress of Mineralogy has been well and carefully drawn up by Professor G. J. Brush. No very remarkable works have appeared since the date of the last Supplement, nor have any very important researches been published. Some of the more interesting, comprise: Rammelsberg's discovery of Magnesia in the Vesuvian Iron Ores, and the foundation of his new species, the Magnoferrite; the recognition of Tin Ore (Cassiterite) in specimens from *Los Angelos*, California, by Dr. C. T. Jackson; and the suggested Trimetric or Monoclinic crystallization of Tourmaline, by Jenzsch and Breithaupt. In connection with the subject of Mineralogy, we may mention with regret the recent death of the veteran professor, J. F. L. Hausmann, of Göttingen. Professor Hausmann died on the 26th of last December, at the advanced age of seventy-seven. E. J. C.

CONTRIBUTIONS TO METEOROLOGY,

Reduced from observations taken at St. Martin, Isle Jesus, C. E.

BY CHARLES SMALLWOOD, M. D., LL.D.,
Professor of Meteorology in the University of McGill College, Montreal.

These observations extend over the year 1859. The geographical co-ordinates are Latitude 45° 32′ North, Longitude 73° 36′ West, from Greenwich. The cisterns of the Barometers are 118 feet above the mean sea level. The results obtained are reduced from tri-daily observations taken at 6 A. M., 2 P. M., and 10 P. M. These periods divide the day into three equal parts of eight hours each. The self-registering principle is applied to many of the instruments, and the usual corrections are also applied for temperature and any peculiarity in their construction. The readings are frequently verified, so as far as possible to insure accuracy.

Atmospheric pressure.—The highest reading of the Barometer during the year, occurred at 4 P. M., on the 3rd of December, and indicated 30.726 inches, which is the highest reading on record here *except one*, which took place on the 8th of January, 1855, when the Mercurial column stood at 30.876 inches. The extreme height of December last, did not seem to extend very far East or West. The highest reading at Toronto, kindly furnished me by Professor Kingston, was 30.392 inches, and at Quebec 30.563 inches. At Temple Grove, on the eastern slope of the Mountain, the residence of the Hon. Mr. Justice McCord, it attained a *maximum* of 30.865 inches, and these observations may be fully relied upon,

coming from Mr. McCord, the "Pioneer of Canadian Meteorology." This reading is the highest recorded by him. At Montreal, Dr. Hall gives the *daily mean* of the reading as 30.744 inches. At Point St. Charles, the highest reading was 30.771 inches. At Portland, Maine, Mr. Henry Willis gives the *maximum* reading of the day at 30.70 inches. The lowest reading was at 6 A. M., on the 19th of March, and indicated 28.620 inches. The readings at Portland on that day, are recorded as being also the *minimum* reading of the year. This circumstance of low reading has given the greatest monthly range of the year to March. August gives the lowest range of the year viz., 0.530 inches. The mean Barometer pressure for the year was 29.821 inches, which exceeds by 0.098 of an inch only, the mean of last year. The mean height of the Barometer for the months were as follows:

January..	30.021 inches.	May	29.834 inches.	September	29.771 inches.
February.	29.837 "	June.....	29.784 "	October ..	29.779 "
March. ..	29.686 "	July	29.818 "	November	29.940 "
April....	29.638 "	August ..	29.760 "	December	29.971 "

The monthly range for the year was as follows:

January...	1.487 inches.	May	0.696 inches.	September.	1.063 inches.
February..	1.588 "	June.....	0.671 "	October ...	0.909 "
March	1.872 "	July	0.564 "	November .	1.259 "
April	1.232 "	August ...	0.530 "	December .	1.316 "

The greatest range within twenty-four hours, with a rising column, occurred on the 2nd and 3rd of December, and rose from 30.062 to 30.661 inches, equal to a rise of 0.599 of an inch, and the greatest range with a falling column, was on the 18th and 19th March, and which fell from 29.650 inches to 28.620 inches, equal to 1.030 inches of variation; a sudden rise also occurred on the 14th September from 8 A. M. till 1 P. M., and indicated 0.251 of an inch of rise in three hours.

Temperature of the Atmosphere.—The mean temperature of the year was 40°73 F., which is 0°69 of a degree higher than the mean of last year (1858,) and indicates 0°83 of a degree lower than the mean of a series of years. This is owing to the low temperature of January and of December. The mean temperature of the months is as follows:

January	10°90	May.....	59°42	September	54°31
February	15°62	June	62°00	October	42°42
March	30°93	July	67°58	November.....	29°38
April.....	38°63	August.....	68°72	December	8°93

December is the coldest December on record here by 4°83 degrees, compared with a series of years. February of last year (1858) was the coldest February on record here, the mean temperature being 7°56. July, which for a series of years has indicated the highest mean temperature, was 1.14 degrees lower than the month of August. This was owing to the heavy rain storms of July. June of 1858 was the warmest month of that year—the highest reading of the Thermometer for this year was on the 17th of May, and indicated 99.2 degrees, which is the highest reading of the Thermometer for the month of May on record. The highest

reading for a series of years has been in July; and February, for a corresponding number of years, has indicated the lowest reading, but December of this year (1859) shows a *minimum* of 4.38 degrees compared with a series of years, and January 2.36 degrees below the average or mean of a like series of years. The lowest reading of the year was on the 10th of January, and at 6 A. M. indicated —43°6 (below zero,) a degree of cold almost unprecedented in the annals of Canadian Meteorology, the cold term showed .124 hours 30 minutes, during which the Thermometer was below zero. Mercury froze in open vessels—the *mean* temperature of the 9th day was —27°8, of the 10th —29°0, and of the 12th —28°2. This cold term was felt generally throughout Canada and the Eastern States, and travelled from the west, eastward. At Rochester, which is 4° 15' West of this Observatory, and 398 feet higher above sea level, the extreme cold was felt some hours earlier than at this place. At New York the temperature was —9°0; at Boston, —14°8; at Toronto, —26°5; at Quebec, —40°8; at Huntingdon, —44°0, and Mercury was said to have become quite hard in fifteen minutes, when exposed in a saucer. The great absolute range or climatic difference for the year, was 142.8 degrees, and the monthly range of temperature (or climatic difference) was as follows:

January	88°0	May	69°0	September	49°2
February	66°7	June	59°9	October	63°7
March	59°0	July	61°6	November	48°0
April	60°2	August	54°7	December	74°7

The mean temperature of the Winter Quarter was 12°96, of the Spring Quarter 42°66, of the Summer Quarter 66°10, and of the Autumn Quarter 42°03.

Frost occurred in every month of the year. The Thermometer, sunk eighteen inches in the ground. indicated in May a temperature of 58°, in June 66°10, in July 76°2, and in August 73°0.

Humidity of the Atmosphere.—The mean relative amount of Humidity for the year (saturation being 1.000), was .768, which was .010 less than the mean of last year. The mean Humidity for the months was as follows:

January	.792	May	.708	September	.797
February	.776	June	.706	October	.754
March	.823	July	.705	November	.819
April	.792	August	.742	December	.808

July was the driest month, and this is borne out by the observations of a series of years; complete saturation was not observed during the year.

Rain fell on 98 days, amounting to 49.741 inches; it was raining 527 hours 20 minutes, and was accompanied by thunder on 20 days. The amount of rain which fell indicated 0.294 of an inch less than the amount of last year, but exceeded by 6.736 inches the mean amount of a series of years, and the number of days upon which rain fell exceeded by twenty-five the average amount of a like number of years. The greatest amount fell in September, on the 11th day, from 3 h. 40 min. P. M., to 4 h. 24 min. P. M., making one hour and forty-four minutes of time, there fell 1.670 inches of rain; and on the 4th of August, in two hours of time, there fell 2.000 inches of rain.

Snow fell on 58 days, amounting to 94.68 inches; it was snowing 440 hours, 40 minutes. This shows an increase of 35·69 inches over the amount which fell last year, but the amount is nearly equal to the average of a series of years. February and December, are the months which give the greatest amount of snow. The first snow of the winter of 1858–9, fell on the 4th of November—the last snow of spring fell on the 23rd of April.

Evaporation.—The amount of evaporation from the surface of water, during the six months for which observations are recorded (owing to frost,) was 15.29 inches. This is considerably below the average or mean of a series of years. The evaporation from the surface of ice exceeded the usual amount.

Wind.—The most prevalent wind was the N. E. by E., and the least prevalent the South. The aggregate horizontal movement in miles for the year, was 59224.60 miles, which exceeds by 17886.00 miles the amount of last year. The mean annual velocity was 6.19 miles per hour, which is 1.58 miles per hour more than the mean velocity of last year. The following is the monthly horizontal movement in miles:

January..	4889.90 miles.	May	4415.70 miles.	September	3941.10 miles.
February .	3656.80 "	June	3463.10 "	October ..	5579.01 "
March....	6861.29 "	July	2744.00 "	November.	4701.50 "
April	5847.90 "	August ..	2780.00 "	December.	5679.20 "

March was the most windy month, and July the calmest. The greatest velocity observed was 37.20 miles per hour.

The greatest Intensity of the Sun's Rays was in August, and indicated 110.8 degrees. The lowest point of Terrestrial Radiation was in January, and was —43°6 (below zero.)

Clouds.—There were 56 days cloudless, and 129 nights suitable for Astronomical purposes.

Dew.—The yearly amount of Dew was below the usual mean or average.

The Aurora Borealis was visible at observation house on 36 nights. A very brilliant display occurred on the 28th of August, observed in Canada, the West Indies, and Europe.

The Zodiacal Light was bright and well defined.

Lunar Haloes visible on seven nights.

Parhelias were visible on five days.

The winter of 1859–60 fairly set in on the 22nd of November.

Ozone.—The mean annual of Ozone has shewn about the usual average quantity.

Atmospheric Electricity.—The tri-daily observations are still continued in this important branch of science, but are far too extended for a short notice.

The Eclipse of the Sun was visible on the 19th of July.

Crows (*Corvus corone*) first seen 8th of March. The Song Sparrow (*Fringilla melodia,*) first heard 14th of March; Wild Ducks (*Anser Canadensis,*) first seen flying south, 18th March; Swallows (*Hirudo rufa*) first seen 19th April; Frogs (*Rana fontinalis*) first heard 16th of April; Shad (*Alosa prostabilis*) first caught 23rd May; Fire Flies (*Lampyris corusca*) first seen 24th May; Snow

Birds (*Plectrophanes nivalis*) first seen 10th of November—Crows did not winter here.

Plum tree in flower 11th of May; Lilac in full leaf 14th of May; Dandelion in flower 12th May; Wild Strawberry in flower 25th May, matured 24th June; Gooseberry in leaf 8th May; Currant in leaf 18th May.

The potato rot, which was but partial this year, commenced on the 8th of August.

St. Martin's, Isle Jesus, 1st Feb., 1860.

CANADIAN INSTITUTE.

Session 1859—60.

EIGHTH ORDINARY MEETING—*11th February*, 1860.

Prof. Wilson, LL.D., President, in the Chair.

I. *The following Gentlemen were elected Members:*

Charles M. Fuller, Esq., Lithographer, Toronto.
S. H. Strong, Esq., Barrister, Toronto.
William Canniff, M.D., M.R.C.S., Toronto.
Thomas Griffith, Junr., Toronto (*Junior Member.*)

II. *The following Papers were read:*

1. By the Rev. Prof. W. Hincks, F.L.S.:
"On some Questions in relation to the theory of the structure of Plants of the Orders Brassicaceæ and Primulaceæ."
2. By Prof. Kingston, M.A.:
"On the Meteorological Phenomena of 1859."

NINTH ORDINARY MEETING—*18th February*, 1860.

Prof. Wilson, LL.D., President, in the Chair.

I. *The following Gentleman was elected a Member:*

Caleb E. English, M.A., Barrister, Toronto.

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

Books marked with an asterisk (*) are in parts or unbound.

From the Geographical and Statistical Society, New York:

		Vols.
Bulletin of the Society.	Vol. I. 3 Nos.	1*
do.	Vol. II.	1*
Journal of the Society.	Vol I. 10 Nos.	1*
Johnson's Railroad to the Pacific		1*
Criminal Statistics of New York.	1854	1*
Hewitt on Iron		1*
Life and Travels of Professor Keilhau		1*

	VOLS.
Report of the Council of the American Geographical and Statistical Society, for 1857	1*
First Annual Report of the Cooper Union, for the Advancement of Science and Art	2*

From the CHICAGO HISTORICAL SOCIETY.

Fourth Annual Report of the Chicago Reformatory School. 1859	1*

From the AUTHOR.

Croft's Practical Chemistry	1

III. *The following Papers were read:*

1. By Sandford Fleming, Esq., C.E.:
"On some improved varieties of Rail-joints."
2. By Prof. Hind, M.A.:
"On the Manufacture of Shale Oil from the Utica Slate of Collingwood."
3. By C. Fuller, Esq.:
"On the Processes and Results of Chromo-Lithography, illustrated by Drawings and Specimens of the process in all its stages."

TENTH ORDINARY MEETING—*25th February*, 1860.

Prof. WILSON, LL.D., President, in the Chair.

I. *The following Papers were read:*

1. By the Rev. W. S. Darling:
"Remarks on the Manuscripts of the Middle Ages."
2. By the Rev. Prof. G. P. Young, M.A.:
"On the relation which can be proved to subsist between the area of a plane triangle and the sum of the angles, on the hypothesis that Euclid's eleventh axiom in any case fails."
3. By the Hon. G. W. Allan, M.L.C.:
"Notes on some of the different Races composing the population of the Nile Valley. Illustrated by coloured drawings procured by the Author when in Egypt."

ELEVENTH ORDINARY MEETING—*3rd March*, 1860.

Prof. WILSON, LL.D., President, in the Chair.

I. *The following Papers were read:*

1. By T. C. Wallbridge, Esq.:
"On some ancient Mounds on the shores of the Bay of Quinté."
2. By W. Graeme Tomkins, Esq., C.E.:
"On the thickness of the Earth's crust."
3. By P. Freeland, Esq.:
"Notes on some specimens of Diatomaceæ, collected on the St. Lawrence." Illustrated by Microscopical specimens.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—FEBRUARY, 1860.

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.			Result. 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	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	30.038	30.042	30.030	30.0422	—8.4	8.6	5.0	1.70	—22.18	.027	.041	.041	.037	.88	.64	.79	.76	N b E	W S W	W N W	N 71 W	7.0	7.5	3.0	3.23	3.72	...	...
2	30.012	30.051	30.129	30.0728	5.3	14.7	11.5	10.98	—12.87	.046	.060	.066	.058	.82	.71	.92	.81	Calm.	W N W	W b N	N 75 W	0.0	1.6	1.0	2.40	2.47	...	inap.
3	30.112	29.937	29.862	29.9603	7.5	18.3	19.1	14.35	— 9.42	.049	.068	.090	.067	.78	.68	.87	.78	W b N	S E	Calm.	S 25 E	1.6	7.3	0.0	3.06	3.90	...	0.1
4	29.920	.993	30.015	.9788	14.0	23.4	19.1	19.42	— 4.27	.074	.063	.096	.083	.91	.54	.94	.80	N W b W	Calm.	Calm.	N 34 W	8.2	0.0	0.0	0.34	0.85	...	...
5	.869	.666	—	—	25.2	33.2	—	—	—	.122	.151	—	—	.90	.80	—	—	Calm.	S E b E	S	S 13 E	0.0	9.0	6.0	4.20	6.45	0.135	0.2
6	.268	.342	29.337	.3105	37.5	37.5	33.2	35.52	+12.00	.213	.143	.166	.172	.94	.63	.87	.83	S W	W b S	Calm.	S 79 W	10.0	13.0	0.0	5.79	5.96	...	...
7	.407	.033	.728	.6033	32.1	30.3	25.6	28.28	+ 4.85	.157	.103	.089	.112	.86	.61	.63	.71	S W b W	W b N	S W b W	N 81 W	7.3	20.0	8.0	10.10	10.43	...	inap.
8	.657	.572	.532	.6792	25.6	35.0	31.0	29.97	+ 6.60	.120	.158	.140	.139	.87	.77	.80	.83	S W b W	S W b S	S S W	S 38 W	6.2	8.3	5.0	6.80	6.92	...	...
9	.336	.034	.390	.2565	31.0	41.5	13.3	27.87	+ 4.60	.155	.153	.046	.121	.89	.57	.60	.70	S W b S	W S W	N W b W	N 79 W	6.5	17.5	38.5	18.15	22.98	inap.	...
10	.788	.937	.901	.9118	5.0	10.6	5.7	7.07	—16.20	.044	.041	.047	.045	.79	.57	.78	.74	N W b N	N W b N	N b W	N 29 W	16.0	8.6	4.5	7.66	8.44	...	0.2
11	.725	.417	.469	.5382	8.2	19.8	12.0	13.97	— 9.30	.057	.095	.067	.076	.91	.90	.90	.91	N N E	S S E	N	N 1 E	5.5	2.0	5.5	2.67	7.10	...	2.0
12	.788	.791	—	—	2.4	21.6	—	—	—	.047	.101	—	—	.96	.87	—	—	N W b N	S W b W	W S W	S 74 W	3.2	11.0	0.5	4.18	5.17	...	...
13	.571	.440	.571	.5323	21.6	30.3	29.5	27.33	+ 4.08	.109	.148	.144	.136	.94	.88	.87	.90	Calm.	W b S	N	N 10 W	0.0	2.0	7.0	3.59	4.08	...	4.0
14	.737	.827	.853	.8122	22.0	18.9	4.6	14.50	— 8.77	.104	.071	.048	.071	.87	.68	.90	.81	N	N N W	N b E	N 4 E	10.5	10.5	12.2	8.56	11.29	...	...
15	.671	.411	.239	.4223	16.9	24.8	27.0	23.87	+ 0.62	.084	.112	.136	.115	.90	.84	.93	.89	E	E b S	W S W	S 70 E	16.0	14.5	9.6	5.56	13.59	...	3.0
16	.336	.490	.632	.5117	18.3	11.5	3.9	9.57	—13.80	.088	.061	.045	.059	.87	.82	.86	.85	N W	W b N	N N W	N 62 W	27.0	22.0	6.0	12.19	13.18	...	...
17	.747	.683	.511	.6318	—4.4	9.0	8.2	4.88	—18.47	.032	.042	.052	.043	.90	.64	.82	.78	N N W	N N W	N E b N	N 66 E	5.0	1.2	9.5	5.45	7.51	...	...
18	.131	28.929	.107	.0503	19.4	12.2	9.7	13.40	—10.03	.080	.071	.057	.071	.76	.94	.85	.88	E	N E b N	N N W	N 13 E	23.0	20.6	15.0	16.25	20.73	...	9.0
19	.347	29.617	—	—	7.5	15.8	—	—	—	.043	.054	—	—	.69	.59	—	—	N N W	W N W	W	N 73 W	26.4	4.4	4.0	9.06	11.79	...	...
20	.569	.471	.578	.5382	22.7	34.2	27.4	28.28	+ 4.67	.110	.149	.117	.129	.90	.75	.77	.82	S W b S	S W	W S W	S 55 W	17.5	10.4	5.0	7.08	7.17	...	0.3
21	.669	.720	.647	.6748	19.8	39.1	38.9	33.72	+ 9.98	.089	.148	.194	.154	.83	.61	.81	.78	W S W	S S W	N E b E	N 80 E	3.2	4.5	10.5	4.96	7.00	0.305	...
22	.329	.120	.075	.1577	38.9	46.9	45.4	43.83	+20.02	.228	.272	.292	.259	.96	.84	.96	.90	N b E	S E	W S W	S 2 W	11.3	2.8	8.0	3.88	8.15	0.275	...
23	.054	.247	.581	.3137	38.2	32.8	22.7	30.88	+ 6.95	.203	.137	.087	.137	.87	.74	.71	.76	S W b S	W	W N W	N 78 W	8.0	28.5	19.6	15.88	17.43	inap.	inap.
24	.609	.560	.634	.5977	22.0	23.9	15.8	20.48	— 3.65	.101	.096	.072	.086	.86	.74	.80	.77	N W	N W	N W b N	N 59 W	8.0	16.0	8.0	9.32	10.15	...	inap.
25	.681	.719	.867	.7677	14.4	22.3	18.0	18.42	— 5.92	.064	.066	.071	.067	.76	.56	.73	.68	W b N	W b N	N W	N 68 W	7.2	18.0	1.5	10.04	10.57	...	inap.
26	.972	.900	—	—	13.6	31.3	—	—	—	.067	.129	—	—	.83	.73	—	—	N W	S S W	S W b W	S 31 W	1.6	13.5	13.0	8.01	8.75	...	...
27	.735	.767	.906	.8142	35.3	45.4	41.3	40.22	+15.50	.164	.206	.172	.181	.80	.67	.65	.72	S W	S W	N b W	N 81 W	5.7	2.8	11.0	2.32	4.86	...	...
28	30.013	.994	.955	.9837	36.0	33.5	33.2	34.27	+ 9.37	.180	.165	.166	.169	.85	.86	.87	.85	N N E	E b N	E	N 75 E	4.8	10.2	9.5	8.28	8.53	0.230	...
29	29.840	.755	.659	.7382	33.2	39.7	40.4	37.90	+12.88	.173	.226	.250	.222	.91	.93	.99	.93	E	Calm.	N E b N	N 52 E	4.3	0.0	6.3	3.70	3.99	0.385	...
M	29.6382	29.6040	29.6507	29.6324	20.48	26.57	21.66	22.83	— 0.84	.110	.116	.110	.112	.87	.72	.82	.81	.....	.....	.....	.....	8.66	9.92	7.85	.....	8.73	1.330	18.8

Highest Barometer . . . . . 30.136 at midnight on 2nd, } Monthly range=
Lowest Barometer . . . . . 28.920 at 2.30 p. m. on 18th, } 1.216 inches.

Self-registering Ther.
- Maximum temperature . . . . 50°2 on p.m. of 22nd } Monthly range=
- Minimum temperature . . . . —8°5 on a.m. of 1st } 58°7
- Mean maximum temperature . . 29°43 } Mean daily range = 14°11.
- Mean minimum temperature . . 15°32 }
- Greatest daily range . . . . . 26°5 from p. m. of 4th to a.m. of 5th.
- Least daily range . . . . . 2.4 from a.m. to 2 p.m. of 7th.

Warmest day . . 22nd ... Mean Temperature . . . 43°83 } Difference=42°13.
Coldest day . . . 1st ... Mean Temperature . . . 1°70 }

Maximum { Solar . . . . . 65°5 on p. m. of 22nd } Monthly range=
Radiation { Terrestrial . . . . . —19.5 on a. m. of 17th } 85°0.

Aurora observed on 2 nights, viz.: on 16th and 21st,; possible to see Aurora on 11 nights; impossible on 18 nights.
Snowing on 13 days; depth 18.8 inches: duration of fall 69.8 hours.
Raining on 7 days; depth, 1·330 inches; duration of fall, 45.5 hours.
Mean of cloudiness=0.67; most cloudy hour observed, 6 a. m., mean=0.74: least cloudy hour observed, 10 p. m.; mean=0.60.

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

North.	South.	East.	West.
2201.86	1109.92	1223.78	3232.44

Resultant direction, N 61° W; Resultant Velocity, 3.28 miles per hour.
Mean velocity of the wind 8.73 miles per hour.
Maximum velocity . . . 40.6 miles per hour, from 8 to 9 p.m. on the 9th.
Most windy day . . 9th—Mean velocity, 22.08 miles per hour.
Least windy day . . 4th—Mean velocity, 0.85 do
Most windy hour, noon to 1 p. m.—Mean velocity, 11.08 miles per hour. } Difference
Least windy hour, 11 p. m. to midnight.—Mean velocity, 6.84 do. } 4.24 miles.

1st. Lunar Halo and Corona from 7.30 to midnight (very perfect.)—3rd. Lunar Halo during the evening.—6th. Eclipse of the Moon partially visible from 7 to 9 p. m. —8th. Lunar Corona from 9 to 11 p. m.—9th. Hail shower at noon. Rapid descent of temperature from 2 p.m. to midnight—range in 10 hours =32°2.—13th. Solar Halo during forenoon (well defined.)—14th. Solar Halo at 2 p.m. (imperfect.)—21st. Ground fog 7 a. m. Mild day.—22nd. Thunderstorm 6 to 8 p. m. (first of the season.)—27th. Solar Halo 2 p.m.; Lunar Halo 10 p. m.—29th. Dense fog all day; sheet lightning in S. W. at 10 p. m.

The Resultant Direction and Velocity of the Wind for the month of February, from 1848 to 1860 inclusive, were respectively N. 69° W., and 2.96 miles.

Great change of temperature from 2 p. m. of 9th to 8 a. m. of 10th. Range in 18 hours = 37°6.

The mean Temperature for the month of February, 1860, was exactly the average of the last 21 years. The depth of Rain and Snow recorded were both in excess of the average, the former by 0.273; the latter by 1.42 inches. The mean velocity of the Wind, was also greater than the average of 13 years, by 0.85 miles per hour.

COMPARATIVE TABLE FOR FEBRUARY.

YEAR.	TEMPERATURE. Mean.	Difference from Average.	Maximum observed.	Minimum observed.	Range.	RAIN. No. of days.	Inches.	SNOW. No. of days.	Inches.	WIND. Resultant Direction.	Resultant Velocity.	Mean Velocity
	°	°	°	°	°					°		
1840	28.0	+ 5.2	49.1	— 8.3	57.4	8	1.475	6	...	...	...	...
1841	22.4	— 0.4	43.4	— 0.3	43.7	1	inapp	9	...	...	...	0.61 lbs
1842	26.9	+ 4.1	48.7	+ 2.5	46.2	8	3.625	9	...	...	...	1.03 "
1843	14.5	— 8.3	37.5	—10.2	47.7	1	0.475	21	14.4	...	...	1.05 "
1844	26.0	+ 3.2	47.1	— 0.4	47.5	4	0.430	7	10.0	...	...	0.43 "
1845	26.0	+ 3.2	46.6	— 3.9	50.5	5	Imp.	9	10.0	...	...	0.99 "
1846	20.4	— 2.4	41.4	—16.2	57.6	0	0.000	13	46.1	...	...	0.65 "
1847	21.5	— 1.3	42.2	— 1.0	43.2	2	0.550	13	27.3	...	...	0.69 "
1848	26.6	+ 3.8	46.9	— 0.6	47.5	4	0.775	8	10.8	N 65 W	2.53	5.69ms.
1849	19.5	— 3.3	41.1	— 9.2	50.3	2	0.240	13	19.2	N 41 W	1.48	6.58 "
1850	26.0	+ 3.2	49.2	+ 1.3	47.9	7	1.235	9	23.1	N 80 W	3.43	7.61 "
1851	27.6	+ 4.8	50.2	+ 1.3	48.9	7	2.600	4	2.4	N 64 W	1.99	6.94 "
1852	23.4	+ 0.6	41.2	— 3.2	44.4	3	0.650	11	13.0	S 75 W	3.34	6.42 "
1853	24.1	+ 1.3	43.4	— 0.6	44.0	4	1.030	15	12.6	N 49 W	2.51	7.30 "
1854	21.1	— 1.7	42.7	— 5.7	48.4	5	1.460	15	18.0	N 7 E	1.73	6.91 "
1855	15.4	— 7.4	37.3	—25.0	62.3	2	1.770	14	21.8	N 40 W	4.34	8.17 "
1856	15.7	— 7.1	35.3	—18.7	54.0	0	0.000	8	9.7	N 81 W	7.70	10.71 "
1857	28.5	+ 5.7	51.2	— 5.9	57.1	11	3.050	11	11.7	S 78 W	3.68	9.82 "
1858	17.0	— 5.8	40.9	— 6.6	47.5	1	inapp.	16	26.7	N 72 W	3.22	9.12 "
1859	26.0	+ 3.2	43.3	+ 3.9	39.4	6	0.455	14	8.3	N 54 W	2.72	8.50 "
1860	22.8	0.0	48.1	— 8.4	56.5	7	1.330	13	18.8	N 61 W	3.28	8.73 "
Mean	22.83	...	44.13	—5.49	49.62	4.2	1.057	11.3	17.38	...	...	7.88

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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	Resul't.	ME'N		
					°	°	°	°	°																			
1	29.459	29.439	29.582	29.4993	41.5	45.3	41.5	42.85	+17.63	.257	.284	.250	.262	.98	.94	.96	.95	N E b E	N b E	W S W	S 83 W.	8.6	4.8	11.3	3.12	6.93	0.017	...
2	.580	.817	.918	.7852	36.1	48.3	35.0	40.15	+14.73	.195	.225	.142	.184	.92	.66	.70	.74	S W b S	W N W	N b E	N 69 W	17.5	22.2	2.3	3.90	12.76	...	...
3	.616	.220	.236	.3443	36.4	43.3	44.7	41.07	+15.35	.200	.212	.116	.173	.93	.75	.37	.68	E b N	S S W	W S W	S 69 W	15.5	12.0	21.5	13.76	20.35	0.015	...
4	.414	.611	—	—	36.8	33.5	—	—	—	.110	.088	—	—	.50	.46	—	—	W	W	N W b W	N 83 W	27.5	32.0	3.5	14.52	16.57	...	0.2
5	.500	.270	.324	.3507	27.7	35.5	31.6	31.63	+ 5.43	.106	.155	.148	.137	.69	.76	.83	.76	S E b E	E b S	N b W	N 63 E	11.0	9.8	8.3	4.60	7.41	...	...
6	.582	.645	.465	.5428	29.9	35.3	33.5	33.08	+ 6.58	.139	.153	.156	.153	.83	.74	.81	.81	N W b N	E	E b N	N 78 E	2.5	11.2	16.0	12.35	12.96	0.265	0.1
7	.159	.094	.301	.1930	36.8	52.5	41.8	45.42	+18.60	.203	.202	.148	.232	.93	.74	.55	.73	N E b E	Calm.	W	W	8.5	0.0	3.2	7.94	9.68	...	...
8	.396	.471	.484	.4588	40.0	47.1	36.1	40.35	+18.12	.138	.158	.145	.130	.54	.48	.68	.52	W b N	W b N	N W b N	N 63 W	18.5	18.0	8.6	13.07	14.07	...	...
9	.421	.367	.439	.4110	27.0	31.7	23.4	26.57	— 0.95	.093	.096	.108	.094	.63	.53	.86	.67	N N W	W	N W b W	N 49 W	13.2	21.2	21.0	19.28	20.01	...	0.2
10	.514	.506	.579	.5413	15.4	27.0	27.7	23.77	— 4.05	.064	.086	.092	.085	.72	.58	.60	.65	N W b N	N W	W N W	N 52 W	19.2	24.5	20.0	18.02	18.36	...	inap.
11	.603	.461	—	—	25.0	38.9	—	—	—	.110	.125	—	—	.80	.52	—	—	W b N	~ W	N b W	N 75 W	6.6	15.4	1.0	6.61	8.64	...	0.5
12	.334	.579	.767	.5825	22.0	21.2	14.2	18.28	—10.27	.096	.082	.054	.075	.81	.72	.65	.74	N	N W b N	N W	N 31 W	22.8	27.6	18.8	19.81	20.46	...	1.0
13	.326	.808	.764	.7997	16.9	28.5	20.4	25.65	— 3.32	.078	.118	.130	.109	.83	.75	.79	.78	Calm.	S S W	W N W	S 55 W	0.0	10.8	4.2	4.06	5.22	...	inap.
14	.734	.712	.792	.7525	24.1	37.9	37.8	34.00	+ 4.68	.107	.137	.190	.145	.82	.60	.84	.72	W N W	S S W	N W	S 82 W	2.8	5.8	5.8	2.70	3.91	...	...
15	.862	.896	.903	.8853	28.8	44.0	33.5	36.17	+ 6.45	.120	.153	.140	.149	.81	.53	.73	.70	N W	W	S S E	S 25 W	6.0	5.8	3.8	1.92	3.82	...	...
16	.916	.863	.808	.8637	28.8	45.4	35.7	36.83	+ 6.80	.120	.215	.148	.162	.81	.70	.71	.73	S S E	S E	Calm.	S 74 E	4.8	5.8	0.0	3.07	3.50	...	...
17	.838	.841	.808	.8535	32.8	46.7	41.5	40.18	+ 9.73	.134	.199	.211	.179	.72	.62	.80	.71	E b N	E b S	N E	N 75 E	3.6	6.0	6.0	3.86	4.32	...	...
18	.903	.834	—	—	34.2	50.9	—	—	—	.168	.220	—	—	.85	.58	—	—	N E	E b S	E b S	N 73 E	1.4	9.2	3.5	5.80	6.40	...	...
19	.646	.508	.466	.5310	39.7	42.5	38.6	40.78	+ 9.52	.217	.263	.207	.229	.89	.97	.88	.89	N E b E	E b S	W b N	S 62 E	5.0	6.5	11.5	0.89	4.83	.585	...
20	.334	.340	.512	.4002	35.3	40.7	25.9	34.60	+ 2.93	.189	.180	.093	.148	.92	.70	.66	.71	W S W	W b N	N W	N 58 W	7.0	19.5	32.0	20.38	22.77	Inap.	0.2
21	.642	.685	.739	.6910	18.7	28.1	27.0	24.78	— 7.30	.051	.108	.093	.082	.49	.70	.63	.60	N W	N W	N W	N 44 W	26.2	30.6	22.8	28.77	28.83	...	...
22	.622	.398	.449	.4828	22.7	37.1	32.1	31.07	— 1.42	.045	.084	.165	.099	.37	.87	.90	.55	N W	N W	W b N	N 51 W	32.6	32.6	12.0	20.00	21.48	...	...
23	.444	.288	.262	.3240	26.7	35.0	29.5	30.33	— 2.45	.140	.142	.121	.134	.96	.70	.74	.80	N E b E	S E	W N W	N 82 W	2.3	7.2	8.0	5.46	10.08	...	0.1
24	.193	.242	.347	.2678	25.9	28.1	24.1	25.68	— 7.48	.125	.116	.085	.107	.88	.75	.65	.76	W b N	N W b W	W b N	N 64 W	18.8	17.2	14.5	17.14	17.50	...	0.1
25	.365	.429	—	—	22.3	29.7	—	—	—	.085	.104	—	—	.71	.63	—	—	N W b W	N W b N	N W b W	N 53 W	16.8	17.8	11.0	16.16	16.44	...	inap.
26	.608	.654	.715	.6803	20.7	31.3	23.4	25.35	— 8.63	.071	.079	.094	.078	.64	.45	.73	.59	N W	W N W	N W b N	N 39 W	17.0	14.0	4.0	10.10	10.66	...	...
27	.630	.612	.404	.5112	22.3	41.5	35.1	33.78	— 0.63	.100	.134	.165	.131	.83	.50	.81	.68	W S W	S S W	S W b W	S 47 W	5.6	21.5	9.0	12.28	13.63	...	...
28	.405	.436	.400	.3978	29.5	32.1	30.6	31.30	— 3.42	.136	.150	.093	.131	.83	.81	.54	.74	W N W	W N W	S W b W	N 82 W	22.0	22.2	9.2	12.81	14.71	...	...
29	.234	.295	.393	.3090	30.3	48.0	33.5	30.07	+ 3.97	.112	.146	.140	.135	.66	.44	.73	.58	S W b W	S S W	Calm.	N 86 W	6.4	8.0	0.0	4.45	6.13	...	...
30	.330	.214	.167	.2325	30.6	57.4	45.4	45.03	+ 9.53	.144	.151	.272	.189	.85	.30	.90	.67	N W	S S W	S W	S 45 W	3.0	22.5	10.0	10.82	11.52	...	...
31	.044	.078	.174	.1077	40.9	66.4	46.2	53.20	+17.28	.272	.431	.178	.270	.84	.65	.56	.64	W S W	W S W	N b W	N 84 W	15.2	19.4	4.0	7.96	10.66	...	...
M	29.5159	29.4881	29.5281	29.5111	29.39	39.92	33.29	34.48	+ 4.10	.136	.168	.144	.148	.78	.65	.73	.71	.....	.....	.....	.....	11.87	15.52	9.90	.....	12.41	0.882	2.4

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR MARCH.

Highest Barometer ..... 29.934 at 8 a. m., on 6th } Monthly range=
Lowest Barometer ..... 29.044 at 6 a. m. on 31st } 0.890 inches

Self-registering Thermom.

Maximum Temperature ..... 67°0 on p. m. of 31st } Monthly range=
Minimum Temperature ..... 12°8 on a. m. of 13th } 54°2

Mean maximum Temperature ..... 41°89 } Mean daily range=
Mean minimum Temperature ..... 27°35 } 14°54

Greatest daily range ..... 30°1 from a. m. of 7th.
Least daily range ..... 2°8 from a. m. to p. m. of 12th.

Warmest day..... 31st ... Mean temperature..... 53.20 } Difference = 34°92.
Coldest day..... 12th ... Mean temperature..... 18°28 }

Maximum } Solar..... 79°, on p. m. of 31st } Monthly range=
Radiation. } Terrestrial..... —2°6 on a. m. of 13th } 81°6.

Aurora observed on 12 nights, viz., on 12th, 13th, 14th, 15th, 16th, 17th, 19th, 21st, 23rd, 26th and 27th.

Possible to see Aurora on 19 nights; impossible on 12 nights.

Snowing on 11 days,—depth 2.4 inches; duration of fall 22.4 hours.

Raining on 5 days,—depth 0.882 inches; duration of fall 22.0 hours.

Mean of cloudiness = 0.49.

Most cloudy hour observed, 6 a. m., mean = 0.56; least cloudy hour observed, 10 p. m., mean, = 0.41.

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

North.	South.	East.	West.
3679.66	1155.32	1051.26	6116.93

Resultant direction N. 64° W.; Resultant Velocity 7.61 miles per hour.

Mean velocity..... 12.41 miles per hour.

Maximum velocity ..... 39.5 miles, from 11 a. m. to noon on the 22nd.

Most windy day ..... 21st .....Mean velocity 23.83 miles per hour. } Difference=
Least windy day ..... 16th.....Mean velocity 3.50 ditto. } 25.33 miles.

Most windy hour... 2 to 3 p. m..... Mean velocity 16.33 ditto. } Difference
Least windy hour... 11 p. m. to midnight.....Mean velocity 9.73 ditto. } 6.60 miles.

1st. Dense Fog from 6 to 10.30 a. m.—2nd. Lunar Halo 10 p. m. and midnight.—5th. Indistinct Solar Halo 11 a. m.—8th. Wild pigeons very numerous. Lunar Halo from 11 30 p. m.—13th. Imperfect Solar Halo at 3 p. m.—14th. Zodiacal light very bright 7 to 8 p. m.—19th. Dense Fog 7 to 9 p. m., emitting a very offensive odour. 20th, 21st and 22nd. Cold stormy days.—28th. Imperfect Lunar Halo 8 to 9 p. m.—29th. Very perfect Lunar Halo from 8 p. m.—30th. Imperfect Lunar Halo at 8.30 p. m.—31st. Indistinct Lunar Halo at 10 p. m.

Almost continued displays of Auroral Light from 12th to 27th of this month; some of them very brilliant.

The Resultant Direction and Velocity of the Wind for the month of March, from 1848 to 1860 inclusive, were respectively N 61° W, and 3.58 miles.

The month of March, 1860, was warm, dry, and very windy.

The Mean Temperature was 4°19 above the average of the last 21 years.

The depth of rain was 0.637 inches, and the depth of snow 6.47 inches less than their respective averages.

The Mean Velocity of the Wind for the month, was not only the greatest for any March on our record, but it was absolutely the most windy month of the whole series, giving an excess above the average of the last 13 years of 3.37 miles per hour.

COMPARATIVE TABLE FOR MARCH.

Year.	Temperature.					Rain.		Snow.		Wind.		
	M'n.	Diff. from Aver	Max ob'd.	Min. ob'd.	Range.	No. of days.	Inch's.	No. of days.	Inch's.	Resultant Direction.	Resultant V'y.	Mean Force or Velocity.
	°	°	°	°	°							
1840	33.3	+3.0	56.9	8.7	48.2	8	1.640	8	...	...	...	.....
1841	27.7	—2.6	53 5	—6.9	60.4	5	1.170	7	...	...	...	0.51 lbs.
1842	35.8	+5.5	65.7	14.9	53.8	4	3.150	8	...	...	...	0.70
1843	21.3	—9.0	38.6	—2.8	41.4	2	0.625	18	25.7	...	...	1.18
1844	31.3	+1.0	50.3	9.6	40.7	8	2.470	8	14.0	...	...	0.57
1845	35.4	+5.1	61.7	9.9	51 8	5	Imp.	8	2.8	...	...	0.66
1846	33.1	+2.8	49.3	7.6	41.7	9	1 965	5	2.3	...	...	0.30
1847	26.2	—4.1	44.3	4.8	39.5	5	0.850	6	4.2	...	...	0.71
1848	28.6	—1.7	58.9	0.9	58.0	5	1.220	6	9.7	N 66° W	2.03	5.80 mls.
1849	33.5	+3.2	53.4	15.4	38.0	7	1.525	2	2.3	N 3° W	1.48	5.37
1850	29.8	—0.5	46.0	6.0	40.0	2	0.745	7	11.2	N 52° W	2.62	7.62
1851	32.4	+2.1	58.7	13.1	45.6	3	0.770	9	8.8	N 21° W	1.93	7.65
1852	27.7	—2.6	44.8	—3.2	48.0	8	3.080	12	19.5	N 8° W	0.71	5.81
1853	30.6	+0.3	56.3	—0.1	56.4	6	1.080	8	7.1	N 58° W	2.60	5.96
1854	30.7	+0.4	52.8	10.4	42.4	9	2.425	3	2.8	N 53° W	3.39	8.03
1855	28.5	—1 8	48 6	—2.9	51.5	5	1.485	11	18.1	N 88° W	4.76	9.95
1856	23.1	—7.2	39.3	—13.6	52.9	0	0.000	12	16.2	N 71° W	7.68	11.39
1857	27 8	—2.5	56.5	—3.9	60.4	4	0.335	15	11.3	N 63° W	6.63	10.84
1858	28.4	—1.9	54.1	—5.5	59.6	10	0.917	6	0.2	N 58° W	5.45	8.56
1859	33.3	+6.0	53.7	10.4	43.3	15	4.054	8	1.0	N 64° W	1.96	10.39
1860	34.5	+4.2	66.4	14.2	52.2	5	0.882	11	2.4	N 64° W	7.61	12.41
M	30.29	...	52.99	4.14	48.85	5.9	1.519	8.5	8.87	.....	...	8.44 Ml.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—FEBRUARY, 1860.

(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.			Horizontal Movement in Miles in 24 hours.	Mean of Ozone.	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.	6 A.M.	2 P.M.	10 P.M.					6 A.M.	2 P.M.	10 P.M.
1	30.143	30.205	30 173	—25.0	— 5.2	—11.1	.010	.026	015	.64	.70	55	N E b E	s s w	s	7.23	0.5	...	...	Clear.	Clear.	Clear.
2	190	280	260	—11.6	12.1	2.1	116	039	038	56	57	73	N E b E	s E b E	N E b E	0.52	0.5	...	...	Hazy.	Cirri 4.	Cu. Str. 10.
3	470	300	201	1.0	16.8	3.2	032	053	042	70	58	86	N E b E	N E b E	N E b E	4.90	1.5	...	Inp.	Cu. Str. 10	Cu. Str. 4.	C. C. 4. Lu. H.
4	141	107	053	1.0	17.9	10.9	041	068	057	85	67	79	N E b E	N E b E	s E b E	42.60	2.5	...	...	Do. 10.	Clear.	Clear.
5	014	002	29.840	— 5.6	28.7	30.8	028	129	161	81	80	90	s E b E	E b s	E b s	100.10	2.6	...	...	Hoar frost.	Cu. Str. 10.	Cu. Str. 10.
6	29.380	29.320	375	33.0	40.9	37.0	168	212	199	88	83	90	s b E	s b E	s w	136.20	5.3	Inp.	Inp.	Cu. Str. 10.	Do. 10.	Do. 10.
7	500	529	860	30.1	33.2	23.4	148	176	100	88	87	80	w	w b s	s w	264.00	4.0	...	...	Do. 10.	Do. 10.-	Clear.
8	869	874	899	20.5	26.8	18.6	091	105	093	84	75	90	s w	W s W	W s W	67.70	3.0	...	...	Do. 2.	Clear.	Do.
9	567	109	068	18.2	38.9	37.7	088	195	209	90	80	90	s w	s w b s	s w	47.90	2.0	Inp.	...	Clear.	Cu. Str. 10.	Slight rain.
10	504	807	30.131	4.6	1.0	— 5.0	038	034	022	73	71	63	w b N	W N W	N N W	655.10	2.0	...	0.50	Snow.	Clear.	Clear.
11	30.102	914	29.862	—13.3	— 4.1	— 1.0	012	025	036	49	66	84	w s w	W s W	N E b E	117.70	2.0	...	...	Clear.	Do.	Snow.
12	005	729	974	— 1.1	18.0	11.6	028	082	051	68	83	70	N E b E	S W	s w	146.90	2.3	Inp.	Inp.	Cu. Str. 10.	Cu. Str. 4.	Cu. St. 10.
13	29.842	580	701	15.1	31.9	23.1	070	148	106	81	80	85	s s E	s b w	W N W	6.90	4.0	...	Inp.	Do. 10.	Slight snow.	Do. 10.
14	30.047	864	142	— 1.1	10.9	1.0	028	065	032	66	62	70	W S W	W S W	w	106.70	3.3	...	...	Clear.	Clear.	Clear. Zod. Lt.
15	252	941	846	— 8.1	7.0	6.5	018	036	037	58	56	63	N N E	N E b E	N N E	151.40	2.3	...	...	Do.	C. C. Str. 4.	Cl. Im. Lu. Ha.
16	29.424	422	689	20.0	25.8	10.3	091	123	054	84	88	77	E b s	s b E	W	223.00	5.0	...	7.90	Snow.	Snow.	Clear.
17	894	799	876	—13.0	12.6	— 7.2	019	039	019	74	51	60	w	w	w	67.00	0.5	...	...	Clear.	Clear.	Clear. Au. Bor.
18	803	614	374	—19.2	4.0	3.1	008	038	036	40	72	78	s w	N E b E	N E b E	115.60	3.0	...	1.00	Do.	Cu. Str. 10.	Snow.
19	256	340	774	8.9	12.9	6.4	051	054	037	78	71	69	N E b E	w	w b N	530.60	3.3	...	5.10	Snow.	Do. 10.	Clear. Au. Br.
20	894	650	664	1.0	25.3	28.3	030	111	135	69	81	88	s b E	s b E	S W b s	123.20	1.6	...	1.10	Cu. Str. 2.	Do. 10.	Cu. Str. 10.
21	801	754	950	26.0	49.5	31.0	111	272	142	81	78	84	W b s	s b w	s s w	103.10	1.3	...	...	Cir. Cum. 4.	Clear.	Cl. splen. A.B.
22	874	462	207	17.2	42.4	39.9	076	261	234	80	96	93	N E b E	s b E	s E	59.80	7.6	0.295	...	Cu. Str. 10.	Rain.	C. Str. 2. Au. B.
23	075	028	320	35.4	38.4	34.2	183	223	194	91	95	97	s s W	c s w	W S W	111.60	6.6	0.147	...	Clear.	Do.	Cu. Str. 10.
24	676	682	779	16.0	21.1	15.1	059	064	061	65	56	73	W S W	W S W	W S W	397.40	4.0	...	...	Cu. Str. 10.	Cirri. 2.	Clear.
25	961	827	071	10.4	25.0	13.2	052	094	059	71	68	74	S W b s	s w	w	91.80	3.3	...	...	Do. 10.	Clear.	Do.
26	30.244	30.164	30.090	3.7	22.7	19.0	030	079	087	59	65	84	w b N	s w	s s E	87.00	4.6	...	...	Clear.	Cu. Cu. 4.	Cu. Str. 10.
27	29.979	29.960	29.901	15.0	46.1	30.0	072	262	201	82	84	86	N E b E	s E	s b w	26.10	8.0	Inp.	...	Cu. Str. 10.	Cu. Str. 10.	Do. 4.
28	30.321	30.300	30.260	20.1	28.4	24.1	091	129	111	85	82	85	N E	N N E	N E b E	204.00	6.0	...	...	Do. 4.	Do. 4.	Do. 10.
29	157	030	29.954	21.7	32.0	34.6	106	168	180	86	88	89	N E b E	N E b E	N E b E	127.30	10.0	0.174	...	Do. 10.	Rain.	Do. 10.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—MARCH, 1860.

(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 Vapour.			Humidity of Air.			Direction of Wind.			Horizontal Movement in Miles in 24 hours.	Mean of Ozone.	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.
1	29.745	29.583	29.533	32.1	35.0	34.8	.168	.204	.196	.89	1.00	.97	N E b E	N E b E	S E b E	64.00	10.0	0.361	...	Cu. Str. 10.	Slight rain.	Rain.
2	425	516	30.043	32.3	41.3	32.2	175	228	155	95	87	89	W S W	W b S	W N W	254.30	7.0	...	...	Do. 10.	Cu. Str. 6.	Clear.
3	30.102	431	29.987	21.3	32.4	39.2	090	156	201	80	82	84	N E b E	S E b E	S E	148.80	1.3	...	...	Clear.	Do. 9.	Cu. Str. 10.
4	29.300	434	759	31.0	34.0	21.1	155	170	080	89	80	71	S b W	S b W	W N W	147 50	1.3	...	Inap.	Do.	Snow.	Clear.
5	768	500	612	14.1	26.8	10.9	067	123	048	81	87	69	S W b S	W b S	N E b E	165.00	3.0	...	0.14	Cu. Str. 10.	Do.	Cu. Str. 10.
6	856	722	904	8.3	27.0	20.9	057	099	085	80	69	78	S E	S E b E	N E	121.70	3.0	...	Inap.	Clear.	Clear.	Clear.
7	824	600	420	19.1	38.2	34.4	077	201	190	76	86	95	N N E	N E b E	E S E	157.70	3.0	Inap.	1.00	C. Str. 10.	Snow.	Rain.
8	353	256	520	20.4	42.8	36.7	136	230	184	83	85	85	S E b E	S b W	W S W	146.60	4.0	...	...	Clear.	Cu. Str. 9.	Cu. Str. 4.
9	452	462	479	28.0	32.1	21.6	123	143	090	82	79	78	N W	N W	N W	137.10	1.0	...	...	Do.	Do. 10.	Cu. Str. 10.
10	348	301	454	16.0	28.4	21.1	070	129	080	80	82	71	E	W	W	654.40	1.0	...	Inap.	Snow.	Do. 10.	Do. 10.
11	547	440	601	20.0	32.0	28.2	090	143	128	78	79	83	W	W	W	451.80	1.0	...	...	Clear.	Clear.	Clear.
12	669	625	670	18.9	26.9	27.0	087	112	129	85	76	88	N E b E	N E b E	N E b E	211.80	0.5	...	Inap.	Cu. Str. 10.	Cu. Str. 10.	Cl. Ft. Au. Br.
13	976	850	914	11.4	35.9	22.7	056	170	079	72	80	65	S W b S	S W b S	S W b W	172.20	0.5	...	...	Clear.	Clear.	Clear. Au. Br.
14	971	797	790	13.4	41.0	31.0	052	190	142	72	74	84	S W b W	S W	S W b S	9.70	1.0	...	...	Do.	Do.	Do. do.
15	30.017	962	944	24.4	39.6	36.1	105	290	177	80	82	85	S W b S	S W b S	S b E	2.20	1.5	...	...	Do.	Do.	Clear.
16	130	747	942	29.0	57.9	46.0	129	343	241	82	72	84	S b W	S b W	S	0.80	1.5	...	...	Do.	Do.	Clear. Au. Br.
17	050	994	949	31.1	54.1	39.4	155	362	190	80	87	80	S b E	S b E	S E	1.00	1.3	...	...	Do.	Do.	Cl. A. B. So. H.
18	159	939	932	30.1	52.0	37.6	148	334	178	89	86	83	E	E b N	E b S	0.00	3.3	...	...	Do.	Do.	Clear. Au. Br.
19	29.920	492	479	30.0	60.0	49.0	148	317	223	89	62	64	E b N	S E b E	S S E	0.00	3.6	...	...	Do.	Do.	Do. do.
20	354	042	369	39.0	39.0	37.0	201	223	199	86	95	90	S S E	W S W	S S W	1.00	4.3	0.017	...	Cu. Str. 10.	Rain.	Cu. Str. 9.
21	479	527	624	20 0	24.0	17.0	106	094	068	86	73	75	W b S	W	W b N	133.90	2.0	...	0.51	Do. 10.	Snow.	Do. 10.
22	327	318	560	10.1	20.9	17.2	048	096	078	78	85	83	W b N	W	S S W	306.30	2.3	...	1.38	Snow.	Cu. Str. 10.	Clear.
23	541	324	329	6.4	34.0	23.6	049	144	100	89	75	79	S W	S W	S S W	65.90	1.0	...	...	Clear.	Clear.	Do. Au. Br.
24	125	080	210	21.1	52.9	26.1	080	131	117	71	70	76	S S W	W b S	W S W	220.80	2.3	...	Inap.	Cu. Str. 4.	C. C. Str. 8.	Cu. Str. 10.
25	214	234	500	19.6	34.0	31.6	081	155	149	77	79	84	W S W	S W b S	W b N	164.90	3.3	...	1.10	Snow.	Do. 10.	Do. 10.
26	679	532	829	23.6	36.2	26.3	100	149	117	79	71	81	W	W S W	W S W	176.10	3.3	...	...	Cu. Str. 10.	Cu. Str. 4.	Do. 10.
27	797	547	610	12.1	40.0	33.0	060	182	156	80	73	85	S W b S	S W b S	S W b S	90.80	1.0	...	...	Clear.	Clear.	Clear.
28	361	350	471	34.6	36.1	26.9	149	170	115	74	80	83	S	W	S W	194.00	1.0	...	...	Do.	C. Str. 4.	C. C. Str. 9.
29	501	400	514	17.0	33.7	27.6	078	162	123	85	84	82	S S W	S W	S	21.60	1.3	...	...	Cu. Str. 10.	Do. 10.	Clear.
30	574	183	164	24.2	52.6	40.0	100	282	221	79	73	90	S b W	S S E	S S W	2.10	4.0	...	...	Clear.	Clear.	Do.
31	162	28.714	008	33.6	61.1	45.0	182	383	251	91	71	84	S E	S W	W S W	162.00	2.0	...	...	C. C. St. 4.	Do.	Do.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR FEBRUARY, 1860.

Barometer	Highest, the 3rd day	30.470
	Lowest, the 23rd day	29.028
	Monthly Mean	29.813
	Monthly Range	1.442
Thermometer ...	Highest, the 21st day	49°5
	Lowest, the 1st day	—25°0
	Monthly Mean	15°70
	Monthly Range	74°5
Greatest Intensity of the Sun's Rays		68°1
Lowest point of Terrestrial Radiation		—27°4
Mean of Humidity		.751

Rain fell on 7 days, amounting to 0.616 inches; it was raining 29 hours and 55 minutes.
Snow fell on 8 days, amounting to 15.60 inches; it was snowing 48 hours and 25 minutes.
Most prevalent wind, the N. E. by E.
Least prevalent wind, the S.
Most windy day, the 10th day; mean miles per hour, 28.30.
Least windy day, the 2nd day; mean miles per hour, 0.18.
Aurora Borealis visible on 4 nights.
Lunar Haloes visible on 2 nights.
The electrical state of the atmosphere has indicated moderate intensity.
Zodiacal Light visible. Venus prevents an early or well defined view.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR MARCH, 1860.

Barometer	Highest, the 18th day	30.159
	Lowest, the 31st day	28.714
	Monthly Mean	29.562
	Monthly Range	1.445
Thermometer ...	Highest, the 31st day	61°1
	Lowest, the 6th day	8°3
	Monthly Mean	30°52
	Monthly Range	52°8
Greatest intensity of the Sun's rays		83°0
Lowest point of terrestrial radiation		8°0
Mean of Humidity		.813

Rain fell on 3 days, amounting to 0.378 inches; it was raining 23 hours 10 minutes.
Snow fell on 10 days, amounting to 4.10 inches; it was snowing 43 hours 1 minute.
Most prevalent wind, the W.
Least prevalent wind, the E.
Most windy day, the 10th day; mean miles per hour, 27.26.
Least windy day, the 19th day; calm.
Crows first seen on the 1st day.
Song Sparrow (*Fringilla melodia*) first heard on the 10th day.
Distant Lightning on the 5th day.
Wild Geese (*Anser Canadensis*) first seen on the 27th day.
Aurora Borealis visible on 8 nights.
Solar Halo visible on 1 day.
The Electrical state of the atmosphere has indicated rather feeble intensity.

ADDITIONAL NOTE.

CALCEOLA IN THE UPPER SILURIAN ROCKS OF TENNESSEE.

Since writing the note under the above title (page 307), it has occurred to us that an Upper Silurian species of *Calceola*, from Tennessee, was described by F. Roemer, some years ago, under the name of *C. Tennesseensis*. Professor Stafford's species is perhaps identified with this.—E. J. C.