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Naturalist & Geologist,

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NATURAL HISTORY SOCIETY

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THE

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This Magazine will appear bi-monthly, and be conducted by the following Committee, appointed by the Natural History Society of Montreal:—

☞ Article XXX., in our last number, copied from the Journal of the Canadian Institute, we find was first published in the Report of the Smithsonian Institution at Washington, and the wood engravings we used were drawn and engraved at the expense of that Institution. We make this correction with pleasure.—Eds.

☞ The second plate illustrating Article XV. accompanies this number.—Eds.

☞ All business communications to be addressed, *prepaid*, to the Publishers. Articles and communications for the Journal may be addressed to the Editors, care of the Publishers.

☞ Authors of original articles can have 12 copies of them by giving timely notice; it is too late when the forms are broke up.

☞ The Editors have to apologise for the tardy appearance of this number, arising from circumstances over which they had no control.

☞ The next number of this Journal will be published on the 15th of February, 1859.

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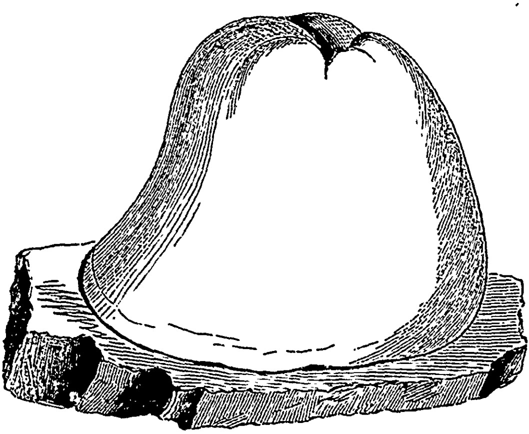


Fig. 1.—*Actinia Dianthus.* Contracted.

ARTICLE XXXII.—*On Sea Anemones and Hydroid Polyps from the Gulf of St. Lawrence.* Read before the Natural History Society of Montreal.

The creatures to which this notice relates are of great interest, whether we regard their singular and beautiful plant-like forms, their zoological relations, or the curious questions that concern their growth and reproduction. They are favourite subjects of study with all sea side collectors, and they have engaged and are engaging the most minute attention of some of the ablest naturalists. I do not propose in the present paper to add anything to their general natural history, but merely to record the occurrence on the coast of British America of some species found by myself in Gaspé, or collected at Metis and Murray Bay by Miss Carey of Perth, who has placed a number of interesting specimens in my hands for determination.

I.—*Sea Anemones collected in Gaspé.*

The Actiniæ, or Sea Anemones, belong to a large and important group of radiated animals, including the coral building polyps of the intertropical seas, and constituting the class *Anthozoa* of Owen's system, and the *Polypi* of that of Agassiz. The Actiniæ are the largest and most interesting representatives of this group in these latitudes. They derive their common name from their flower-like aspect, though they are truly animals, and are both complex in structure and voracious in their habits. When expanded they present a circular fleshy disc having the mouth in the centre, and at or near the circumference a fringe of tentacles

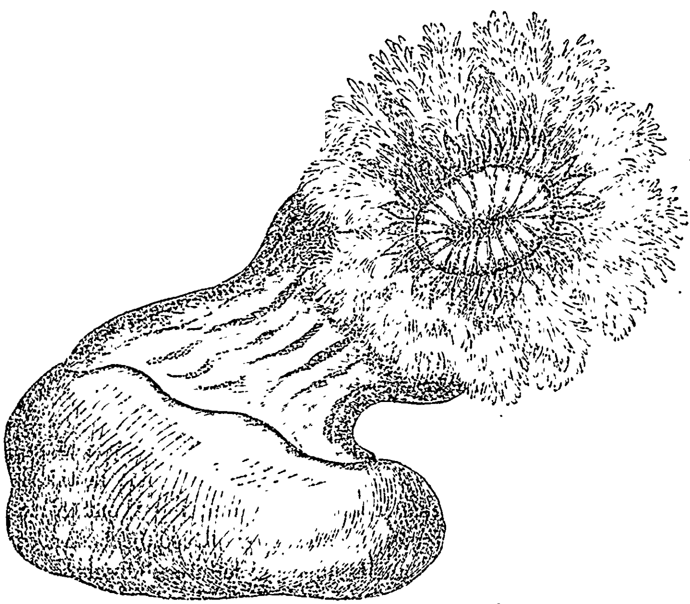


Fig. 2.—*Actinia Dianthus.* Expanded.

serving as organs of touch and prehension, and which can be extended or retracted at pleasure. The whole of the upper surface is tinted with gay or softly blended colours, often of great beauty. Internally the mouth leads into a sac-like stomach, surrounded by a space divided by a series of radiating membranous lamellae, between which are the organs of respiration and reproduction. Without the whole is a thick muscular skin.

Fixed by their flat bases to rocks or stones, the Actiniæ extend their tentacles and seize and devour any small animals that come within their reach. When at rest or when alarmed, the animal withdraws all its oral and tentacular apparatus, and the body shrinks into a cylindrical, spheroidal, or conical mass.

(1.)—*Actinia Dianthus.*

Near the mouth of Gaspé Basin is a patch of gravelly bottom at a depth of from eight to ten fathoms, which abounds in sea anemones, and especially in the fine species represented in Figs. 1 and 2, and which appears identical with the *A. dianthus* of the British coast. It falls within the characters of the published descriptions of that species, and cannot properly be separated from it, though it presents some points of difference. As compared with the British figures and descriptions, my Gaspé specimens show somewhat longer oral bands, with wedge shaped secondary bands between their extremities; the inner tentacles are more crowded toward the margin, and the range of colouring is different. These characters may however be within the limits of variation of the species.*

In the spot above referred to, not only were the Actiniæ abundant, but the stones to which they were attached could be taken up with the dredge; so that in a few hours dredging, about thirty perfect specimens were obtained, and being placed in basins of salt water, could be drawn and studied at leisure. Observed in this way, they presented a great variety of colouring, form, and attitude. I have selected the drawings copied in Figs. 1 and 2, from several others, as exhibiting the ordinary attitude of repose, and that of watching for prey, with the body extended to its full length. Both figures represent individuals of small size—the larger specimens being four inches in diameter when expanded. In their habits they corresponded with the accounts of the species given by Johnston and Landsborough, and like the British speci-

* Johnston, British Zoophytes. P. 232.

mens they adhered very firmly to the stones, and could scarcely be detached without injury to the base. When disturbed, they ejected water forcibly from the pores of the skin, along with their long white filaments, probably organs of defence, and possessing an urticating or benumbing property.

The range of colouring was very great, and was quite independent of the age or size of the specimens; but when several specimens were attached to the same stone, they were usually of the same colour. The prevailing tint externally was umber brown of various shades, but some specimens were fawn coloured, and this passed in others into a very pale flesh colour; some were beautifully striped with brown on a fawn or flesh coloured ground. In every case the colours of the disc and tentacles corresponded in intensity with those of the outer coat. The following descriptions show this relation in the more conspicuous colour varieties.

(*a*) Body externally very pale flesh colour, sometimes nearly white; oral bands pale flesh colour; outer tentacles rich flesh colour. The inner tentacles in this and the other varieties were paler than the outer. The specimen represented in Fig. 1 was of this variety.

(*b*) Body flesh colour or fawn, striped with brown; oral disc flesh colour; outer tentacles rich dark flesh colour. The specimen represented in Fig. 2 was of this colour.

(*c*) Body reddish brown; oral bands reddish orange; outer tentacles deep purple.

(*d*) Body umber brown, lighter when expanded; oral bands fawn or dull orange; outer tentacles purplish slate colour. Some of the largest specimens were of this colour, and presented a lurid or dingy aspect, very strongly contrasting with their delicately complexioned neighbours.

I have not met with any notice of the occurrence of A. dianthus in America, except in Stimpson's Marine Invertebrata of Grand Manan, where it is stated that a specimen supposed to belong to this species was taken, but lost before it could be examined. As already stated, I believe the specimens above described to be referrible to this species, but should they prove on comparison to be distinct and previously undiscovered, I shall claim for them the name of A. Canadensis.

(2.)—*Actinia* ———— ? N. S.

With the specimens just described were found a few individuals of a very distinct species, not unlike *A. Mesembryanthemum*, or *A. Marginata*, but quite distinct. The largest specimens obtained were an inch in diameter. Specimens of this size have about 150 tentacles, conical, transversely striated, and uniform in size, placed at the margin of the disc in about three rows. The disc rises when expanded considerably above the plane of the tentacles. The body below the tentacles is short, and expands toward the base. When contracted the form is blunt conical, with a smooth outer skin, apparently destitute of tubercles and pores.

Fig. 3.

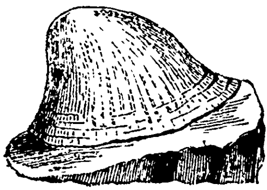


Fig. 4.

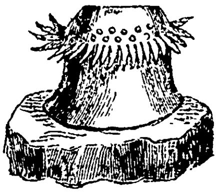
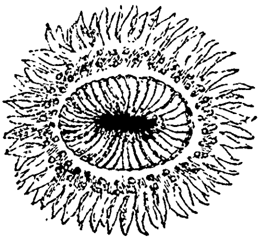


Fig. 5.



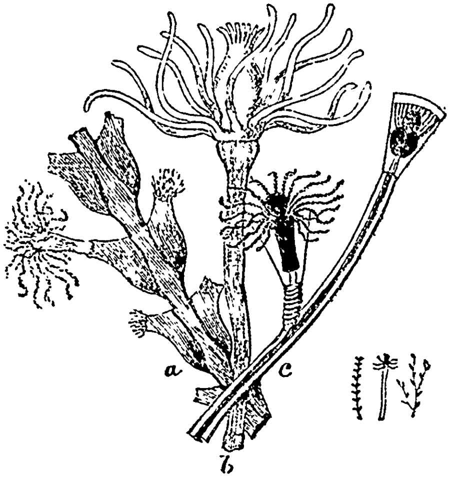
The colour, when contracted, is a fine reddish salmon, arranged in vertical stripes on a light ground. When expanded the lip and oral bands are reddish; the tentacles are salmon colour, deeper toward the tips. The disc between the tentacles and the oral bands is dull purple, with two rows of pure white spots This beautiful species is comparatively locomotive and active; and when placed in a basin, removed from its stone, and crept around in search of a more convenient situation.

I think it very probable that Stimpson's *A. Carneola* is the young of this species; but my specimens do not include any so small as that which he figures, and the colour and tentacles differ. If distinct from *A. Carneola* it is probably new. Its description is as follows:—

Body short, cylindrical, smooth; colour red, arranged in stripes; tentacles triserial, short, conical, striated, reddish; disk prominent, dull purple with two rows of white spots. Oral bands numerous, flesh colour.

Should it prove new, the specific name *Nitida* would well express the sleek neat appearance for which it is remarkable.

Fig. 6.



Group of Hydrozoa from the Gulf of St. Lawrence.

(*a*) Sertularia pumila.
(*b*) Tubularia — ——.
(*c*) Laomedea dichotoma.

II.—*Hydroid Polyps collected at Gaspé, Metis, etc.*

The hydroid polyps are of much simpler structure than the Actiniæ, each animal being little more than a gelatinous sac, furnished with a circle or circles of tentacula. They constitute the class Hydrozoa of Owen; and by Agassiz and some other naturalists are placed with the Acalephae, an arrangement which expresses their close relationship to the Medusae or Jelly fishes. The marine hydrozoa, though individually of simple structure, have a remarkable tendency to multiply by a process of gemmation or budding, the result of which is the formation of complex groups of little horny cells, each having its animal occupant, and the whole when dried resembling a small sea weed. In some of the tribes, by a different kind of budding from that which merely increases the polypary, locomotive individuals are produced, which detaching themselves from the parent, swim away in a form as different from that of the sessile polyp as the butterfly from the caterpillar. Others are not known to have this double kind of existence, but produce ova or little locomotive ovoid bodies which lay the foundation of new groups.

To a visitor to the sea side, provided with a microscope, these creatures form a very agreeable study. When taken up alive and placed in a vessel of sea water, the extension and retraction of their beautiful transparent bodies and crowns of tentacles looking like beads strung on a spider's thread, present a spectacle strikingly illustrative of the amount of life that exists hidden under plant forms in the sea. When a mere boy, I have spent many holiday afternoons in searching for these creatures that I might enjoy this curious spectacle, and I still treasure many rough sketches of their forms and structures made to perpetuate the wonders which they disclosed under the microscope. I am sorry that in the present notes I can refer not to the living animals but only to dried specimens.

Family *Tubulariadæ.*

1. *Eudendrium ramosum.*—The genus Eudendrium has tubular branches, at the ends of which are pretty reddish polyps, not retractile, and with one or two rows of tentacles. In Miss Carey's collection is a specimen not distinguishable from the species above named, which is a common British form. I have not met with it elsewhere.

2. *Tubularia indivisa.*—In the genus Tubularia the cells are simple horny tubes, with beautiful flesh-colored polyps, not retractile, and with two rows of tentacles. The *T. indivisa* occurs of large size at Sable Island, from which I have a specimen collected by Mr. Willis, of Halifax. It was attached to a sponge. Stimpson notes it as occurring at Grand Manan.

3. *Tubularia larynx.*—This pretty little species I found alive in great numbers at Gaspé, and covered with its little bead-like reproductive buds. The body is flask-like, of a red color, and covered with short tentacles At the base of the body is a second series of larger and lighter colored tentacles, and immediately above these the little gems are attached like flower-buds fastened by their smaller ends to the body.

4. *Tubularia* ———.—Another small species, about the size of *T. larynx*, but with a simple and very flexible tube, occurs in

the Gulf of St. Lawrence. I have not seen it for many years, and a drawing which I have preserved, does not correspond exactly with any described species known to me, but it closely resembles *T. Dumortierii* of Van Beneden. (See Fig. 6.)

The species both of Eudendrium and Tubularia, give birth in summer to beautiful medusiform individuals, or free polyparies, that swim on the surface of the water like little translucent balls or cups of jelly, and in turn give birth to the germs of fixed generations like their parents.

Family *Campanulariadæ.*

1. *Laomedea (Companularia) dichotoma*—The genera Campanularia and Laomedea, which perhaps should not be separated, have slender ringed branches supporting conical or bell-shaped cells, in which are beautiful tassel-like polyps. This species occurs in Miss Carey's collection from Metis, and I have also specimens from Nova Scotia, one of which is represented in the living state in Fig. 6.

2. *L. gelatinosa.*—In Miss Carey's collection from Metis. It is noted by Stimpson as found at Grand Manan.

3. *L. geniculata*, or a similar species is very common on seaweeds in the Gulf of St. Lawrence.

These creatures also produce medusiform progeny in immense abundance in the summer months, and it is partially through these means that they appear in countless multitudes on the leaves of marine plants, the bottoms of boats, and similar situations, in which they are developed as if by magic.

Family *Sertulariadæ.*

1. *Sertularia argentea.*—The genus Sertularia includes species that have two rows of cells placed like teeth or triangular projections on the opposite sides of the stalk. The polypary is horny, usually brownish and plant-like in appearance. S. argentea, known to British collectors as the "Squirrel's-tail coralline," is one of the most beautiful species, and was found in Gaspé Bay attached to shells of Pecten Magellanicus, and itself loaded with quantities of smaller Zoophytes, which somewhat mar its beauty though they add to its interest. This species is common to both sides of the Atlantic. Stimpson found it at Grand Manan.

2. *S. pumila.*—"Sea-oak coralline" is a small species which

clings to submerged wood and sea-weeds. I have seen in Nova Scotia sunken logs completely covered with a brown fleece of this creature, and specimens from Metis occur in Miss Carey's collection. It is said like many others of these little animals. to be very phosphorescent when agitated in the dark, and its polyps are exceedingly limpid and delicate when extended from the cells. In Fig. 6 is represented a portion of a stem with one of the polyps extended.

3. *S. latiuscula.*—This is a species discovered by Stimpson at Grand Manan, in the Bay of Fundy. A fine specimen from Metis in Miss Carey's collection corresponds so closely with Stimpson's description, that I cannot doubt it is the same species.

4. *Sertularia* ———.—In Miss Carey's collection from Murray Bay, is a small Sertularia, having the general aspect and mode of growth of S. pumila, but its color is gray or pearly, and its form is more delicate, the stem being very slender, so that the pairs of cells appear like a string of broad arrow heads. They are exactly opposite, the upper part projecting at right angles from the stem, the opening small and the lower part rapidly contracting. I have not seen the animals or ovicapsules. This species is possibly the same with that described by Desor in Proc. Bos. Socy. Nat. His., Vol. 4, as *S. plumea.*

5. *Plumularia falcata.*—In the genus Plumularia the cells are placed only on one side of the branchlets, which often have a fine feathered arrangement. A number of specimens in my own and Miss Carey's collections from Sable Island, the coast of Nova Scotia and Metis, all appear referrible to the species above named, which would thus appear to be very abundant and widely diffused on our coasts. It is also mentioned by Stimpson as occurring at Grand Manan.

In the collection of Miss Carey above referred to, there are several species of Bryozoa, which I hope to notice in a future paper, in connection with species which I have recently found fossil in the tertiary clays and gravels, or living in the Gulf of St. Lawrence.

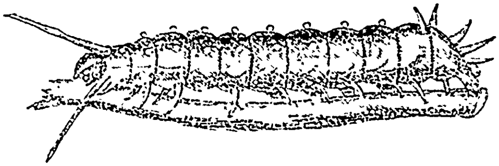
J. W. D.

ARTICLE XXXIII.—*Description of a Canadian Butterfly, and some remarks on the Genus Papilio.*

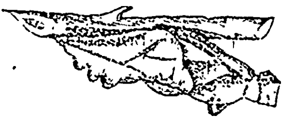
In the August number of this magazine, appeared a letter from Charles J. Bethune, Esq., of Cobourg, C.W., communicating the interesting fact of the occurrence of *Papilio Philenor* in great numbers at West Flamboro' and Toronto, between the 7th and 18th of last June. We subjoin a description of this insect, which is the fourth species of the Genus *Papilio* now known to inhabit Canada; and as seven occur in Ohio, there appears no reason why some additional species should not turn up in the more southern portions of the Upper Province. We therefore give synoptical tables of all the North American species described in Boisduval and Leconte, and which we hope will enable any collector to name his specimens, either of the Larvæ or Perfect Insects, at a glance.

GENUS PAPILIO.

Species 4—P. Philenor, Linn.



a



b

a The Larva. *b The Pupa.*

Papilio Philenor, Linnæus, Mantissa, p. 535, 1771.
" " Fabricius, Systema Entomologiæ, p. 445, No. 12, 1775, &c.
" " Herbst, Pap., tab. XIX, *f.* 2-3, 1785—1806.
" " Smith and Abbott, the Nat. Hist. Lepid. Ins. of Georg., Vol. 1, p. 5, tab. III, 1798.
" " Godart, Encyclop. Method, Ins., tab. IX, part 1, p 40, No. 47, 1819—1821.
" " Say, American Entomology, Vol. 1, tab. 1, 1824.
" " Boisduval et Leconte, Ico., &c., des Lepid., &c. de l'Amer. Sept., t. 1, p. 29, pl. XI, 1833.
" Astinous, Drury, Ins. I, tab. II, f. 1—4, 1775.
" " Cramer, Pap. XVIII, p. 26, pl. CCVIII, fig. a. b., 1770—1791.

Wings slightly denticulated, edged with cream color in the crenæ or notches.

On the upper side: the anterior pair are black, marked by a row of white spots (obsolete, or nearly so, in many specimens) parallel to the hind margin; the posterior pair are also black, glazed over with greenish or bluish, shining scales, except at the base, and have a row of six whitish lunules near the hind margin. Tails short and narrow, greenish, bordered with white at their base.

On the under side: the anterior wings are somewhat duller than on the upper, and are ornamented with a marginal row of four or five distinct yellowish spots. The posterior wings are washed with very brilliant greenish blue, except at the base, which is black and marked with a yellow spot; they are also distinguished by a marginal row of seven lunules of a lively yellow, surrounded by black, and all but the last bordered with white on their external margin; these lunules correspond with the white ones of the upper surface. Inside this marginal row of lunules, are generally four white dots.

The body is blackish tinged with green, with a lateral line of yellow dots. The Antennæ are black. There is but little difference between the two sexes.

The Larva is brown, with two lateral series of small reddish tubercles. It is provided with two long spines on the first segment, and on the sides near the feet, it has nine of moderate length, and others, also of moderate length, are placed upon the three last segments. It lives on the Virginian Snakeroot (*Aristolochia Serpentaria*).

The Butterfly appears in Spring or the beginning of Summer, and, according to Boisduval, is common in all North America wherever the Snakeroot flourishes. In a paper "on the Diurnal Lepidoptera of Northern and Midland Ohio," read before the Cleveland Academy of Natural Sciences, January 17th. 1854, and to which we have frequently had occasion to refer, Prof. J. P. Kirtland observes, that this species "was among the most rare of our butterflies until I introduced into my garden a few plants of the *Aristolochia Sipho* and *pubescens*. Since then they have multiplied in immense numbers."

Aristolochia Sipho (Pipe Vine, or "Dutchman's Pipe") grows most luxuriently in some of the gardens in the neighborhood of Montreal, climbing over verandahs, &c., the leaves frequently measuring 12 × 13 inches, and we are not without hopes that this beautiful butterfly may therefore eventually extend its range even into Lower Canada. Prof. Emmons describes it in his Insects of New York, but says nothing whatever regarding its natural history. It is not included in Dr. Harris's Catalogue of the Insects of Massachusetts. The figures of this Insect given by Cramer and Say, are very erroneously coloured, that in Boisduval is better, still it gives but a poor idea of the beautiful metallic lustre on the hind wings.

ON THE NORTH AMERICAN SPECIES OF THE GENUS PAPILIO.

The following pages embody such information as I have been able to collect with regard to the species of Papilio inhabiting North America. At the present day, all the old works on American Entomology have become so scarce and valuable, that it is rare to meet with a copy of any of them in this country, excepting the few, too often imperfect, contained in some of our public libraries, as will be presently shown. At the same time, unfortunately for the Canadian Entomologist, there is no modern work at all calculated to fill their place, and it is much to be regretted that there is no one capable of doing for Canadian Insects what Dr. Gray, in his admirable "Manual of the Botany of the Northern United States," has done for our Plants.

TABLE SHOWING THE RANGE AND FOOD-PLANTS OF THE NORTH AMERICAN SPECIES.

SPECIES.	HABITAT.	FOOD-PLANTS OF LARVA
P. Ajax, Smith & Abbott,............	Georgia, Virginia, Ohio (Kirtland),...	Plants of the order ANONACEÆ.
P. Marcellus, Cramer,......	" " " (Kirt.) Europe?	
P. Sinon, Fabr.,...	South America, Cuba, Jamaica, Florida.	?
P. Asterias, Fabr	West Indies, Virginia, Georgia, New York, Massachusetts, Ohio, &c. Upper and Lower Canada, Newfoundland (Gosse),..............................	Plants of the order UMBELLIFERÆ.
P. Calchas, Fabr (Palamedes, Cramer,).......	Georgia, Virginia, and many of the Northern States,............................	Plants of the genus LAURUS.
P. Troilus, Linn,	Jamaica, Georgia, Virginia, Mass. Ohio, Canada West,.........................	
P. Turnus, Linn, (Alcidamas, Cramer,).......	Virginia, Georgia, Carolina, Mass., N. York, Maine, Ohio, all Canada, Newfoundland (Gosse),.........................	Plants of the genus PRUNUS. *Liriodendron tulipifera* (Kirtland). *Ptelea trifoliata* (Abbot). *Tilia Americana*, Willow, Poplar, Brown Ash (Gosse), Alder &. Elm.
P. Glaucus, Linn.,	Georgia and Virginia,......................	*Styrax Americana*, (Boisduval).
P. Thoas, Linn, (Cresphontes, Cramer,).......	South America. W. Indies, Florida, Georgia, Ohio (Kirtland),.................	Plants of the genera CITRUS & XANTHOXYLUM (Kirtland).
P. Villiersii, Godart	Cuba, Florida,..................................	?
P. Polydamas, Linn,..................	Brazil and Guiana, Cuba, Florida,....	Plants of the genus ARISTOLOCHIA.
P. Philenor, Linn., (Astinous, Cramer)	Most of the Northern States, Ohio, Canada West,................................	

SYNOPSIS OF THE SPECIES.

A. *Scarlet* spots on the *Posterior* wings.

a. Scarlet spots both on the *upper* and *under side*. Also a scarlet *stripe* on the under side.

P. AJAX,........Black, banded with yellowish white; hind wings, upper side, with two blue lunules, and *two scarlet* and *one blue* spots at the anal angle.

P. MARCELLUS,..Black, banded with yellowish white; hindwings, upper side, with two blue lunules and *one blood-red* spot at the anal angle.

P. SINON,.......Black, banded with *greenish white;* hindwings, upper side, *without* any blue lunules and with a large, bilobed, oblique, red spot at the anal angle.

b. Scarlet spots on the *under side only*, *no* scarlet stripe.

* Posterior wings *with tails*.

P. VILLIERSII,...Greenish black, bronzed and shining; all the wings on the upper side with a marginal row of bluish lunules, those on the hind wings very large.

* Posterior wings *without tails*.

P. POLYDAMAS,..Greenish black, bronzed; all the wings on the upper side with a band of deep yellow near the middle.

B. *No* scarlet spots on the wings.

a. General color of the wings, *black*.

* Posterior wings the *same color* as the upper.

+ An *ocellus* at the anal angle.

P. ASTERIAS,....On the upper side, a band of yellow spots through the middle of each wing; posterior wings with a row of blue, and a marginal one of yellow lunules; ocellus fulvous, with a black pupil.

++ A *lunule* at the anal angle.

P. TROILUS,.....The marginal row of lunules on the upper side of the posterior wings *greenish-grey*, an orange spot at the apex of the wing, anal lunule *half orange, half greenish-grey*.

P. CALCHAS,....Marginal lunules of the upper side of the posterior wings *yellow*, lunule *blue*, *no other blue* spots on the upper side of the wings.

P. GLAUCUS,....Marginal lunules of the upper side of the wings *yellow*, *bordered with fulvous*, the apical and anal lunules *fulvous*, these wings also *powdered* with *blue*.

** Posterior wings *washed with metallic green*.

P. PHILENOR, ...On the upper side all the wings with a marginal row of *white lunules*.

*** *Under side* of the Posterior wings principally *yellow*.

P. THOAS, ...On the upper side a band of large yellow spots through each wing; at the anal angle of the posterior wings is a fulvous lunule, surmounted by some blue dots.

b. General color of the wings *yellow*.

P. TURNUS,.....Upper side banded with black; a row of blue lunules on the posterior wings, and fulvous lunule at the anal angle.

SYNOPSIS OF THE LARVÆ.

A. Without Spines.

a. Cylindrical (nearly the same size throughout).

* Marked with transverse bands.

P. ASTERIAS,....Larva apple-green; each segment with a transverse black band, interrupted with orange spots. It very much resembles that of the European *P. Machaon.*

** Colours distributed in blotches.

P. THOAS,......Larva brown, marked with three large patches of white.

*** Marked with ocellated spots.

P. POLYDAMAS,..Larva brown, streaked with red; upon each segment 4 yellowish ocellated spots, having the anterior part red. *Tentacles brown.*

P. VILLIERSII,...Larva———?

b. 3rd and 4th Segments much thicker than the rest.

* 3rd or 4th Segment with transverse bands of various colors.

P. AJAX,.......Larva apple-green; at the juncture of the 3rd and 4th segment, a tri-color band, pale blue, dark blue and yellow.

P. MARCELLUS,..Larva whitish with transverse yellow bands and violet lines. On the 3rd segment two bands, white and black.

P. SINON,.......Larva———?

** 3rd Segment with ocellated spots.

† Under side of the body of a different color from the upper.

P. CALCHAS,....Larva apple-green on the back and sides, with the under side and legs *red*, the two colors separated by a marginal yellow line. Head reddish-yellow with a black colar. Iris of the ocellus flesh color, pupil blue. Upon the 4th segment a flesh-colored spot.

P. TROILUS,.....Larva green above, flesh color underneath; a yellow line separating the two colors. Head *flesh color*, with a black colar. Iris of the ocellus flesh color, pupil blue. Upon the 4th segment *two* flesh-colored spots.

†† Color uniform or nearly so.

P. GLAUCUS,....Larva apple-green. Head brown with a yellow colar; ocellus with yellow iris and a *single* blue pupil. Between the 5th and 6th segments a double transverse band, yellow and black.

P. TURNUS, ...Larva apple-green. Head flesh-color with a yellow colar. Ocellus with yellow iris and a *double* blue pupil. Between the *4th and 5th* segments a double tranverse band, yellow and black.

B. Spinose.

P. PHILENOR,....Larva brown with two lateral series of small reddish tubercles and spines.

On examining the above analytical tables, and comparing them with that showing the food-plants of the Larvæ, it will be seen that this extensive genus is naturally divided into various groups, characterized not only by peculiarities in the colors of the wings and structure of the Larvæ, but also by their geographical distribution and pabulum.

The Larvæ of the group represented by *P. Asterias*, feed exclusively on plants of the order *Umbelliferæ* (such as Parsley, Poison Hemlock, Carrot, &c.,). The species occur in Europe, Asia, Africa and America. This may be regarded as the typical group.

P. Thoas is the largest North American species. It represents a rather large and very natural group, almost peculiar to South America. The species all feed on plants of the genus *citrus* (such as Orange, Lemon, &c.,). This species was formerly considered as belonging exclusively to the Southern States, but according to Prof. Kirtland it occurs in Ohio, feeding there, however, on *Xanthoxylum* (Hercules Club and Prickly Ash).

P. Polydamas forms with some South American species a small but very natural group; they feed on plants of the genus *Aristolochia* (Pipe Vines). This is the only North American species without tails to the posterior wings, and the tentacular organ on the head of the of the Larva is brown, whilst in the other species it is yellow or orange.

P. Ajax, *Marcellus* and *Sinon*, bear a great resemblance to each other in the perfect state, though not in the Larva. They feed in America on plants of the order *Anonaceæ* or Custard Apples (such as *Acimina triloba*, North American Papaw, &c.,). This group is represented in Europe by *P. podalirius*.

P. Calchas and *Troilus* have very similar larvæ. They feed on plants of the genus *Laurus* (such as the Spice-bush, Sassafras, &c.,). *P. Calchas* is not unlikely to occur in Canada West.

P. Glaucus and *Turnus* are closely allied both in the Imago and Larva, the ground color of the wings of the first, however, is black, whilst that of the latter is yellow. The larva of *glaucus* feeds on *Styrax Americana* (Storax, a Southern plant), whilst that of *turnus* lives on a great variety of shrubs and trees, such as Ash, Elm, Plum, Tulip-tree, Basswood, &c.; while young it is bluish-grey at each extremity and white in the middle (Gosse), and just before changing to the pupa it becomes purplish-brown.

P. Philenor is the only N. American species with a spiny Larva. It feeds exclusively on plants of the genus *Aristolochia* (Virginian Snakeroot, Pipe-Vine, &c.,).

LIST OF WORKS TO BE CONSULTED BY STUDENTS OF CANADIAN DIURNAL LEPIDOPTERA.

Abbott & Smith. Natural History of the rarer Lepidopterous Insects of Georgia, including their systematic character, metamorphoses, and the plants on which they feed. 2 vols. folio. Colored plates. London, 1779. Text in French and English. Very scarce; advertised price in New York, $55.00.

This work contains figures and descriptions of many Canadian Butterflies and Moths. There is a copy in the Library of the Provincial Parliament, Toronto.

Agassiz, Louis. Lake Superior, its Physical Character, Vegetation and Animals, &c. 1 vol., 8 vo. Boston, 1850. Libraries of P. Parliament and Geological Survey.

There is a figure and description of *Pontia oleracea*, and of several other Canadian Lepidoptera, by Dr. Harris, in this work.

Boisduval & Leconte. Histoire générale et Iconographie des Lepidoptéres et des chenilles de l'Amerique Septentrionale. 2 vols. Text and plates (colored). Paris, 1833. French.

This work is very scarce, but, through the kindness of E. Billings Esq., I have had access to a copy in his possession. It contains beautifully colored figures of nearly all the known Canadian species of Butterflies, besides many not included in our fauna; the letter-press is unfortunately incomplete. A newer edition in 1 vol. (1843), also very scarce, is advertised in New York at $25.00.

Cramer, Pierre. de nitlandsche Kapellen, ou Papillons Exotiques des trois parties du monde, L'Aise, L'Afrique, et L'Amerique. 5 vols., 4 to. Colored plates. Amsterdam, 1775—1791. Text in Dutch and French.

There is an incomplete copy of this fine and rare work in the Library of the Montreal Natural History Society. It has figures of nearly all the North American Papilios, and a great number of the Diurnal and Nocturnal Lepidoptera found in Canada. The descriptions are, however, very meagre and incomplete.

Duncan's British Butterflies (Vol. XXIX, Naturalist's Library). 1 vol., 8 vo. Colored plates. Edinburgh, 1836. Price in London, 4s. 6d. Libraries of P. Parliament and Montreal N. H. Society.

This may be consulted for such British Species as occur in this country. It is a very complete little work, though somewhat out of date.

Duncan's Foreign Butterflies (Vol. XXXI, Naturalist's Library). 1 vol., 8vo. Colored Plates. Edinburgh, 1837. Price in London, 4s. 6d. Libraries of P. Parliament and M. Nat. Hist. Society.

In this there are descriptions and figures of a few American species.

Ernst & Engramelle, Papillons d'Europe. 8 vols., 4to. Colored plates. Paris, 1770—1793. Libraries of the P. Parliament and Montreal Nat. Hist. Society.

This fine work may be consulted with advantage for such European species as occur in Canada.

Emmons, E. Insects of the State of New York (Vol. V of the Agriculture of New York). 4 to. Colored plates. Albany, 1854. Advertised price, $7.50 Libraries of P. Parliament and McGill College.

This work is so inaccurate and the figures so badly executed, that it is of little value to an Entomologist. It, however, contains figures and descriptions of some Canadian Butterflies, &c., and may assist a beginner in naming his specimens.

Fabricius, J. C. Systema Entomologiæ, &c. 3 vols. Flensburgi et Lipsiæ, 1775. Text in Latin.

This old work contains correct though short descriptions of a great number of Canadian Insects of all orders. It may be occasionally picked up cheap at second-hand bookstalls, but is a rare work. Mr. Billings possesses a copy.

Godart (Article Papillon). Encyclopedie Methodique. 8 vols., 4 to. Paris 1789—1825. Lib. Provincial Parliament.

Contains numerous Canadian Butterflies, &c.

Gosse, P. H. The Canadian Naturalist. 1 vol., 8 vo. 44 engravings. London, 1840. Price, $3.60. Lib. P. Parliament, McGill College, &c.

Mr. Gosse notices 26 species of Canadian Butterflies, and figures 5 of them. It is a most useful book to a Canadian Entomologist, furnishing him with accurate information regarding the habits, food-plants, seasons, &c., of many species in all orders.

Humphreys & Westwood. British Butterflies and their transformations. 1 vol., 4 to. Colored plates. London, 1841. Advertised price in New York, $15.00. Lib. Geological Survey.

Figures of the Larva, Pupa, Imago, and food-plants of all the British and of a few American species. The Text contains much valuable information regarding the Families, Genera and Species.

Kirby, Rev. W. Fauna Boreali Americana, vol. 4. The Insects; with colored figures. 4 to. Norwich, 1837. Lib. P. Parliament and McGill's College.

Some Canadian Butterflies and other Lepidoptera are described and figured in this work, which is now, unfortunately, rather scarce.

Linnæus, Systema Naturæ. Ed. 13. 3 vols., 8 vo. Vindobonæ, 1775. Lib. Mont. Nat. Hist. Soc.

In this there are short descriptions in Latin of all the Lepidopterous Insects known at the time of publication. It is of but little use at the present day, except as a reference in cases of doubt as to the priority of a name.

Say, Thomas. American Entomology; or Descriptions of the Insects of North America, illustrated by colored figures from original drawings, executed from nature. 3 vols., 8 vo. Philadelphia, 1824—28. Very scarce. Advertised price in New York. $30.00. Libraries of McGill's College and Lit. and Hist. Soc. of Quebec.

Contains figures and descriptions of a few Canadian Butterflies, &c.

Stainton, H. T. A manual of British Butterflies and Moths. Vol. 1 (comprising the Butterflies and Stout-bodied Moths), 12 mo. London, 1857. Price in London, 4s 6d. Vol. 2nd is in course of publication in monthly parts, price 3d. each. Can be obtained of B. Dawson, Bookseller, Gt. St. James St. Montreal.

This will be found a most valuable work to the Canadian student, and its extremely low price puts it within the reach of every one. It is illustrated with excellent wood-cuts of nearly every genus of British Lepidoptera, and enables a collector in this country to determine the genera of a large portion of our Lepidopterous Insects. It is much to be wished that there existed a similar work on Canadian species.

Turton's Translation of Gmelin's Edition of the Systema Naturæ of Linnæus (Insects, vols. 3 and 4). 7 vols., 8 vo. Lib. Mont. Nat. Hist. Society.

Short descriptions of the Lepidoptera of the world, known at the time of publication, with their Habitats, &c.

Westwood, J. O. Introduction to the Modern Classification of Insects. 2 vols., 8 vo., with 133 illustrations on wood. Price in London, 18s. Lib. of P. Parliament, Toronto.

A most useful work, now, I believe, nearly out of print. It is the best work of its kind ever published, and almost indispensable to any one wishing to investigate the Classification of insects in general. It contains figures of the Larvæ and Pupæ of every family of Butterflies.

The valuable works of Dr. Thaddeus Harris, Insects of Massachusetts injurious to vegetation, 1841, Treatise on the Insects of New England. 8vo. Cambridge, 1842, &c., are very scarce, and I have not as yet been fortunate enough to meet with them.

The prices of some of the above works have been derived from the Catalogue of Standard and Recent Books on Natural History of H. Bailliere, 290 Broadway, N. York.

For numerous modern works on the Lepidoptera of the world, and of which I know of no copies to be found in Canada, I must refer the reader to Stainton's Entomologist's Annuals for 1855—56—57—58 (price of each in London, 2s. 6d.), which contain a variety of useful information concerning the study of Entomology.

WILLIAM STEWART M. D'URBAN.

MONTREAL, November 22nd, 1858.

ARTICLE XXXIV.—*New Genera and Species of Fossils from the Silurian and Devonian formations of Canada.* By E. BILLINGS, F. G. S. &c.

(By the kind permission of Sir W. E. LOGAN, the following article has been extracted from the Report of the Geological Survey of Canada for 1857.)

Genus FISTULIPORA (McCoy).

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

Generic Characters.—" Corallum incrusting, or forming large masses, composed of long, simple, cylindrical, thick-walled tubes the mouths of which open as simple, equal, circular smooth-edged cells on the surface, and have numerous transverse diaphragms at variable distances; intervals between the tubes occupied by a cellular network of small vesicular plates, or capillary tubules traversed by diaphragms."

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

1. Fistulipora Canadensis (Billings).

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

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

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

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

Collector.—A. Murray.

Genus Columnaria (Goldfuss).

Generic characters.—Composed of large masses of elongated sub-parallel corallites, which when separate are round, but when in contact polygonal. Radiating septa either rudimentary, or well developed, sometimes reaching the centre. Transverse diaphragms numerous, usually complete, and either horizontal, oblique or flexuous.

Columnaria Goldfussi (Billings).

Description.—This species is found in large amorphous or subglobose masses composed of long straight or flexuous polygonal corallites with an average diameter of about half a line; transverse diaphragms from four to six in a line; radiating septa rudimentary, but distinctly striating the interior walls.

Formation and Locality.—Hudson River group? Snake Island and Traverse point, Lake St John.

Collector.—J. Richardson.

Columnaria Blainvilli (Billings).

Description.—Forming large sub-globose pyriform or hemispheric masses of polygonal corallites one line and a-half in diameter; about eighteen radiating septa which reach the centre; transverse diaphragms three or four to one line.

The radiating septa in fractured specimens where the interiors of the tubes are well exposed, striate the surface exactly as in *Columnaria alveolata*, from which species and from *Favistella stellata*, Hall, it only differs by its smaller size.

Formation and Locality.—Hudson River Group. Snake Island, Lake St. John.

Collector.—J. Richardson.

Columnaria rigida (Billings).

Description.—Forming large masses of polygonal corallites usually three lines in diameter, but with numerous smaller ones, and occasionally others of a larger size; radiating septa, about twenty, not reaching the centre; transverse diaphragms from two to four in one line.

This species also resembles *C. alveolata*, but differs in the greater development of the radiating septa which extend about half-way to the centre. The tubes are also about the same size as those of *Favistella stellata*, Hall, which differs in the septa not only reaching the centre, but also in their often being so strongly developed there, as to produce by their junction the appearance of a pseudo-columella.

Formation and Locality.—Hudson River group? Lake St. John.

Collector.—J. Richardson.

Columnaria erratica (Billings).

Description.—Forming large masses of corallites either in contact or separate. The separate cells are round, those in contact more or less polygonal, the radiating septa rudimentary, forming about four sulci in the breadth of one line upon the interior; diameter of corallites from two to five lines, in general about three and a-half lines. The transverse diaphragms are not visible in the specimens examined. The walls of the separate corallites are thick and concentrically wrinkled.

One specimen with corallites two lines in diameter appears to be a variety of this species.

Formation and Locality.—Trenton. Blue Point, Lake St John.

Collector.—J. Richardson.

Genus PALÆOPHYLLUM (Billings).

Generic characters.—Corallum fasciculate or aggregate; corallites surrounded by a thick wall; radiating septa extending the whole length; transverse diaphragms either none or rudimentary; increase by lateral budding.

This genus only differs from *Petraia* or *Streptelasma* by forming long fasciculate or aggregate masses instead of being simple.

PALÆOPHYLLUM RUGOSUM (Billings).

Description.—Corallum in large aggregations of scarcely separate corallites, which where they open out upon the surface of the rock are from one to six lines in diameter, the average adult size being about four lines. Radiating septa reaching the centre; about twenty-two septa in a corallite four lines in diameter, with an equal number in a rudimentary state between.

The great disparity in the size of the tubes in the same mass is owing to the mode of increase and gradual growth of the young corallites. These, of all sizes from one line in diameter and upwards, are uniformly intermingled with the adult individuals.

Formation and Locality.—Trenton. Lake St. John, Little Discharge.

Collector.—J. Richardson.

PETRAIA RUSTICA (Billings).

Description.—Straight or slightly curved, covered with a strong epitheca, which is more or less annulated with broad shallow undulations; radiating septa about one hundred or usually a little more; much confused in the centre, where they form a vesicular mass; every alternate septum much smaller than the others, only half the whole number reaching the centre. Length from two inches and a half to three inches and a half. Diameter of cup one inch to one inch and a half; depth of cup half an inch or somewhat more.

This species appears to be the same as that described by Edwards and Haime under the name of *Streptelasma corniculum.* The true *S. corniculum* of Mr. Hall is a very different species, being always shorter and much curved.

Formation and Locality.—Hudson River group. Snake Island, Lake St. John.

Collector.—J. Richardson.

Genus SYRINGOPORA (Goldfuss.)

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

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

SYRINGOPORA DALMANII (Billings).

Description.—Forming large masses; corallites long sub-parallel, slightly radiating, occasionally a little flexuous, annulated one line or rather more in diameter, distant usually half a line, occasionally in contact or where flexures occur, more than one line apart; connecting processes very short, about two lines distant.

Formation and Locality.—Upper Silurian, Head of Lake Temiscaming.

Collector.—Sir W. E. Logan.

SYRINGOPORA COMPACTA (Billings).

Description.—Forming large hemispherical masses of straight parallel or slightly diverging corallites, which are so closely agregated as to compose a nearly solid mass; about six corallites in two lines.

This species differs from all others of this genus hitherto described in the closeness of the corallites. These are so small, straight and closely united that large masses broken in the longitudinal direction of the tubes have the aspect of some species of *Monticulipora.*

Formation and Locality.—Upper Silurian. L'Anse a la Vieille, Gaspé.

Collector.—Sir W. E. Logan.

SYRINGOPORA VERTICILATA, (Goldfuss.)

(Goldfuss, *Petr. Germ.*, vol. i. p. 76, note 25, 26.)

Description.—Forming large masses, corallites nearly straight, about two lines in diameter, and from two to three lines distant; connecting tubes three or four lines distant, verticilating, or three or four radiating from the main tube at the same level in different directions, like the spokes of a wheel.

Formation and Locality.—Upper Silurian. Head of Lake Temiscaming. Goldfuss' specimens were from Lake Huron.

Collector.—Sir W. E. Logan.

SYRINGOPORA RETEFORMIS (Billings).

Description.—Forming large masses; corallites much geniculated, frequently anastomosing or connecting by stout processes; diameter of corallites about two-thirds of a line, distant from each other from half-a-line to a line and a-half; distance of connecting processes one line to three lines, usually about two lines.

Formation and Locality.—Upper Silurian. Isthmus Bay; Lake Huron.

Collector.—A. Murray.

SYRINGOPORA DEBILIS (Billings).

Description.—Corallites a little more than half a line in diameter, distant one or two diameters; connecting processes slender, distant one or two lines.

Formation and Locality.—Upper Silurian. L'Anse à la Vieille.

Collector.—Sir W. E. Logan.

SYRINGOPORA TUBIPOROIDES, (Yandell and Shumard.)

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

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

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

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

Collectors.—A. Murray, E. Billings.

Syringopora nobilis (Billings).

Description.—Corallites three lines in diameter, distant two to four lines. The connecting processes in this species have not been observed, but the size of the corallites is quite sufficient to separate it from any known species.

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

Collector.—A. Murray.

Syringopora elegans (Billings).

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

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

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

Collector.—A. Murray.

SYRINGOPORA HISINGERI (Billings).

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

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

Collectors.—A. Murray and E. Billings.

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

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

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

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

Genus MICHELINIA (De Koninck).

Generic characters.—" Corallum compound, forming rounded, or conoidal masses of inseparably united, thick-walled, polygonal tubes of large size, marked internally with numerous vertical, lamellar striæ, and communicating pores; base of cells filled up by very irregular, numerous, highly inclined vesicular plates, not forming distinct horizontal diaphragms; external or basal epitheca of the general mass, strong, concentrically wrinkled, and sometimes spinose."—*McCoy, British Palæozoic Fossiles, page* 80.

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

Michelinia convexa (D'Orbigny).

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

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

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

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

Michelinia intermittens (Billings).

Description.—Corallum forming large hemispherical masses; calyces nearly equal in diameter, with periodical constrictions

* See Polypiers Fossiles des Terrains Palæozoiques, page 251.

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

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

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

MICHELINIA FAVOSOIDEA (Billings).

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

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

Collector.—E. Billings.

GENUS ZAPHRENTIS (Rafinesque).

Generic Characters.—Corallum simple, elongated, free and turbinated, surrounded by a complete epitheca; cup more or less deep; no columella?; a single fossette well developed and occupying the place of one of the radiating septa; these are in general well developed, denticulated upon their margins, and extend upon the surface of the transverse diaphragms to the central of the visceral chambers.

Edwards and Haime in the *Polypiers Fossiles*, page 326, have in substance given the above definition of this genus. In some of the species there is a rudimentary columella, and sometimes even in the same species the radiating septa may or may not reach the centre in different individuals.

ZAPHRENTIS PROLIFICA (Billings).

Description.—Corallum simple, turbinate, curved, with a few broad shallow encircling folds. Septal fossette of a pyriform shape, gradually enlarging from the margin towards, but not quite reaching the centre, variable in its position in relation to the curvature of the fossil. Radiating septa in the adult specimens between sixty and seventy-five of the larger size, alternating with a like number of smaller ones, the former in some of the individuals extending to the centre on the bottom of the cup, where they are spirally twisted or irregularly contorted, in other specimens not reaching the centre, which is then occupied by a smooth space or often with a columella elongated in a direction from the septal fossette towards the opposite side. The septa are also sharp-edged for about half the distarce from the bottom of the cup to the margin, then become gradually less projecting until at the edge of the cup they are reduced to mere flat rounded ridges. Length from four to five inches or a little more. Width of cup from two inches to two inches and a-half. Depth of cup about one inch.

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

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

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

2nd. With a columella slightly developed.

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

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

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

6th. Septa covering the columella.

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

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

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

This species somewhat resembles Z. *cornicula* (Lesueur), but differs in the edges of the septa, which are not dentated as in that species.

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

ZAPHRENTIS SPATIOSA (Billings).

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

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

Formation and Locality.—Devonian; Onondaga and Corniferous limestones, Rama's Farm, near Port Colborne Canada West.

Genus CYSTIPHYLLUM (Lonsdale.)

Generic Characters.—Corallum simple, turbinate, entirely filled with vesicular celluliferous structure; radiating septa rudimentary or obsolete.

CYSTIPHYLLUN SULCATUM)Billings.)

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

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

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

Collector—E. Billings.

Genus CYRTODONTA (Billings).

Generic Characters.—Equivalve, inequilateral; umbones near the anterior end; general form obliquely tumid, transversely subrhomboidal or ovate, posterior extremity larger than the anterior and usually broadly rounded; two muscular impressions, of which the posterior is superficial and the anterior sometimes deeply excavated; three oblique often more or less curved, anterior teeth, situated either beneath or a little in front of the umbones; two or three remote posterior lateral teeth parallel with the hinge line; pallial line simple; ligament external; some of the species have a narrow area between or behind the beaks.

CYRTODONTA RUGOSA (Billings).

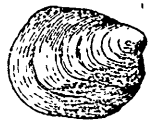


Fig. 1.

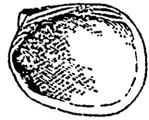


Fig. 2.

Figure 1. Exterior of right valve.
" 2. Interior of same specimen.

Description.—Small, sub-rhomboidal or sub-quadrate, the dorsal and ventral margins being somewhat parallel, and the anterior and posterior extremities obtusely rounded, the latter broader than the former; obliquely tumid from the beaks to the posterior ventral angle; the beaks rather small and incurved; a broad, shallow, scarcely perceptible depression extending from the ventral margin obliquely forward and upward towards the umbones; surface concentrically striated, and also marked with several more or less prominent sub-imbricating concentric ridges of growth; hinge line nearly straight, a little curved; interior shewing in the right valve three anterior teeth, the central one of which is the largest; two posterior lateral teeth, In the left valve there appear to be four anterior teeth; but as the specimens are somewhat imperfect, this may not be the correct number. Width nine lines; length from the centre of the hinge line to the centre of the ventral margin, seven lines; depth of a single valve, three lines.

None of the specimens that I have seen are larger than the one, represented in figures 1 and 2.

Locality and Formation.—Fourth Chute of the Bonne chère Pauquette's Rapids, and La Petite Chaudière Rapids near the city of Ottawa north side, associated with numerous fossils of the Trenton and Black River formations.

Collectors—Sir W. E. Logan, J. Richardson, E Billings.

CYRTODONTA HURONENSIS (Billings).

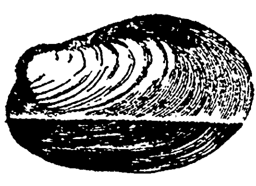


Fig. 3.

Fig. 4.

Figure 3. View of left valve from Lake Huron.
" 4. Interior of another specimen, same locality.

Description.—Transversely oval; anterior and posterior extremities rounded; ventral margin moderately convex, dorsal margin a little more convex than the ventral; umbones rather small, incurved; greatest tumidity extending from the umbones obliquely towards the posterior ventral angle; surface concentrically marked with fine striæ and ridges of growth. Width one inch five lines; length at the centre, one inch.

Locality and Formation.—The specimens are from an island in the group lying off Point Palladeau, Lake Huron, where they were found associated with Chazy, Black River and Trenton fossils; also at Point Claire, Island of Montreal.

Collector—A. Murray.

CYRTODONTA SUBCARINATA (Billings)

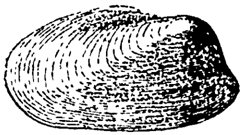


Fig. 5.

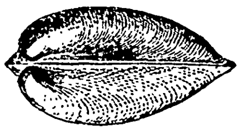


Fig. 6.

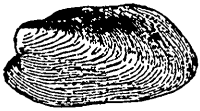


Fig. 7.

Figure 5. A specimen from Point Claire.
" 6. Dorsal view of same specimen.
" 7. A cast from lot 26, con. 5, Osnabruck.

Description.—Transversely sub-oval; ventral margin scarcely convex, straight or slightly sinuated for a small space of the centre; dorsal margin elevated in the centre and sloping with a slight curve towards the posterior end, which is narrowly rounded, or truncate in the casts of the interior; umbones moderately small, incurved, and somewhat carinate for a greater or less distance; surface marked with obscure concentric ridges of growth. The interior has not been seen. Width one inch three lines; length nine lines.

This species may perhaps be considered a variety of the last; but the proportions are somewhat different, and it is always characterised by the strong, rounded carina, which extends from the umbones to the posterior ventral angle.

Locality and Formation.—Occurs at Pointe Claire and in numerous localities in the valley of the Ottawa in the top of the Chazy, throughout the Birdseye and Black River limestones, and in the base of the Trenton.

Collectors—Sir W. E. Logan, A. Murray, J. Richardson, E. Billings.

CYRTODONTA CANADENSIS (Billings).

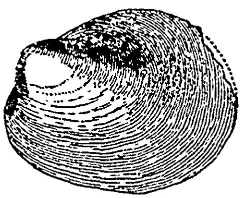


Fig. 8.

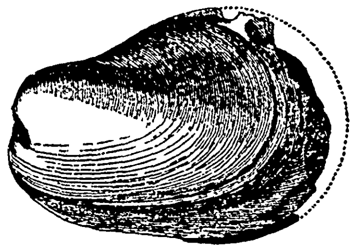


Fig. 9.

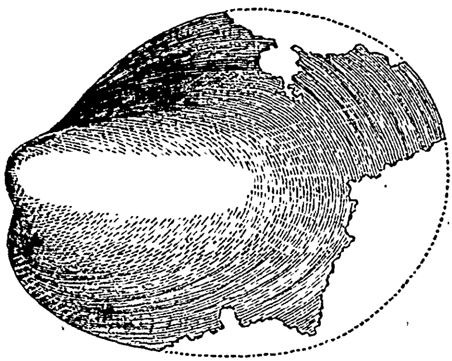


Fig 10.

Figure 8. A small specimen from the north side of St. Joseph's Island, Lake Huron.
" 9. An elongated variety from the lower beds opposite the foot of timber-slide, 4th Chute of the Bonne chère.
Fig. 10. A large specimen from Pauquette's Rapids.

Description.—Transversely broad-oval; anterior, posterior, and ventral margins, and also the posterior half of the dorsal margin regularly rounded; a portion of the ventral margin about the centre of the width is sometimes nearly straight; dorsal margin elevated, somewhat compressed; diagonally and rounded ventricose from the umbones towards the posterior ventral angle; beaks short, obtusely rounded, incurved; surface nearly smooth or obscurely marked with concentric ridges; a few strong imbricating lamellæ of growth near the margin of some specimens. Width from fifteen lines to two inches and one-fourth; length from eleven lines to twenty-one lines.

Some of the specimens are a little more transverse than others; but there are intermediate forms connecting the specimen, represented by Figure 9, with Figures 8 and 10.

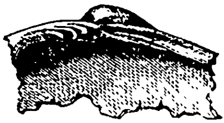


Fig. 11.

Fig. 11. A fragment, shewing the anterior teeth.

The anterior teeth are short, the central one being the longest and the most curved; the posterior teeth of the specimen represented by Fig. 10 are two in number, elongated and prominent.

Locality and Formation.—Island of St Joseph's Lake Huron; La Petite Chaudière Rapids near the City of Ottawa; Fourth Chute of the Bonne-chère and Pauquette's Rapids; associated with fossils of the Trenton and Black River formations.

Collectors—Sir W. E. Logan, J. Richardson, A. Murray, E. Billings.

CYRTODONTA SPINIFERA (Billings).

Fig. 12.

Description.—Small, sub-circular; greatest length and breadth about equal; moderately convex; hinge line much elevated; umbones small, incurved; dorsal margin nearly straight from the umbones about half way to the posterior extremity of the hinge line; anterior, ventral, posterior and posterior half of dorsal margins broadly and regularly rounded; surface smooth, with a few short stout spines.

The specimen figured shews the anterior teeth: they are three in number, and do not differ from those of *C. rugosa*, Length eight lines; breadth the same.

Locality and formation.—Pauquettes Rapids, and Fourth Chute of Bonne-chère, associated with fossils of the Trenton and Black River Formations.

Collectors—Sir W. E. Logan, J. Richardson, E Billings,

CYRTODONTA OBTUSA (Hall sp.)

(*Ambonychia obtusa*, Hall, Palæontology of New York. Vol. 1, p. 167. Plate 36; Figures 8*a*, 8*b*.)

Fig. 13.

Fig. 14.

Figure 13. Left valve from Pauquette's Rapids.
" 14. Interior of same shewing the teeth.

Description.—The following is Professor Hall's description: "Obliquely ovate, short, gibbous; umbones short, obtuse, scarcely incurved or bending forwards; shell somewhat compressed towards the lower margin, convex on the centre and becoming inflated above; anterior side obtuse, rounded, scarcely extending beyond the umbones; posterior side compressed, scarcely alated; cardinal line straight, margin of shell curving from its posterior extremity; surface?"

"The specimens seen are casts, where the markings of the shell are not preserved. This species is distinguished from the others by its short, ovate form, as well as the shorter, very obtuse and gibbous umbones. It departs somewhat from the typical forms of the genus (*Ambonychia*); but it has nevertheless the essential features, and cannot be referred to any other genus." (Pal. N. Y., vol. 1, page 167.)

Locality and Formation.—City of Ottawa, Belleville, and at Trenton on the bay of Quinte, in the Trenton limestone; at the Fourth Chute of the Bonne-chère, and also at Pauquette's Rapids very perfect specimens are common, associated with fossils of the Trenton and Black River formations.

Collectors.—Sir W. E. Logan, J. Richardson, and E. Billings.

Cyrtodonta sub-truncata (Hall sp.)

Edmondia sub-truncata, Hall, Palæontology of New York, Vol. i., page 156, Plate 35, Figure 3 c, (not Fig. 9, Plate 34.)

This species is common in the Trenton and Black River limestones of Canada at all the localities above mentioned. The silicified specimens shew the internal characters of Cyrtodonta very clearly

Cyrtodonta sub-angulata (Hall sp.)

Edmondia sub-angulata, Hall, Palæontology of New York, Vol. i., page 156, Plate 35, Figures 2 a, b.

A specimen of this species from Pauquette's Rapids exhibits in the right valve two posterior lateral teeth and an area between the beaks. That portion of the hinge line occupied by the anterior hinge teeth is destroyed, so that their character cannot be observed. There is an ante ior muscular impression as in the other species.

It occurs at Panquette's Rapids and at La Petite Chaudière.

Cyrtodonta cordiformis (Billings).

Description.—Sub-rhomboidal; cordiform; extremely ventricose; umbones strongly incurved; obtusely carinate on their upper side; the carination extending backwards and diagonally downwards, becoming more rounded and nearly obsolete before reaching the posterior ventral angle; the hinge-line is straight, short, and about at right angles to the direction of the carina; from the extremity of the hinge-line the posterior side slopes abruptly, but with a moderate curve, to the posterior ventral angle; ventral margin a little convex, and about as long as the posterior side; anterior margin half the length of the ventral, not much curved; anterior muscular scar oval and distinctly marked; surface concentrically striated. Length of largest specimen examined from the beaks to the posterior ventral angle, thirteen lines: length of hinge-line, seven lines; length of posterior and ventral sides, about ten lines each. The diagonal carina is not straight, but has a strong upward curve.

Locality and Formation.—East point of St. Joseph's Island, Lake Huron; Trenton limestone.

Collector.—A. Murray.

CYRTODONTA SIGMOIDEA (Billings).

Description.—Sub-rhomboidal, ventricose, a strong obtusely angular carina extending from the closely appressed beaks with a sigmoid curve to the posterior ventral margin; anterior end rounded, projecting a little in front of the beaks; ventral margin longer than the dorsal and moderately convex; posterior extremity obliquely truncate. Width one inch and a half; length from the umbones to the ventral margin thirteen lines.

Locality and Formation.—Hudson River group; Anticosti.

Collector.—J. Richardson.

Sub-genus VANUXEMIA (Billings).

Generic characters.—Ovate; beaks terminal or sub-terminal; posterior extremity rounded; anterior more or less acuminated; two muscular impressions; anterior teeth variable in number, sometimes curved and striated; posterior lateral teeth from two to four.

VANUXEMIA INCONSTANS (Billings)

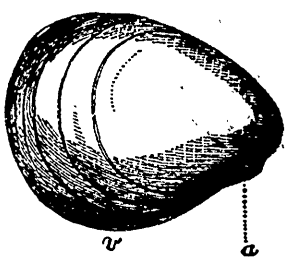


Fig. 15.

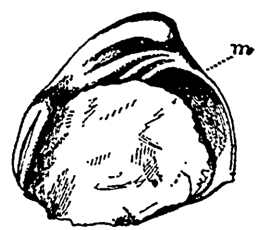


Fig. 16.

Figure 15. Right valve; *v*, ventral margin; *a*, the small anterior ear.
" 16. A fragment shewing the teeth obscurely; *m*, the muscular impression.

Description.—Ovate; moderately convex; beaks terminal gradually expanding from the beaks to the posterior extremity, which is broadly rounded; dorsal margin slightly and uniformly convex from the beaks to the posterior angle; anterior extremity represented by a very small projection beneath the beaks; ventral side regularly rounded, except a short pace near the beaks, which is sometimes concave and partly occupied by the small projection of the anterior extremity. Three strong curving anterior teeth; two posterior lateral teeth; shell very thick towards the anterior end; a small area between the beaks; the anterior muscular impression is apparently excavated in the edge of the very thick shell. Surface with a few more or less strongly marked concentric furrows of growth. The beaks are short, rounded, and closely incurved.

The proportional length and breadth varies. The specimens are usually an inch and a half in length from the beaks to the posterior extremity, the greatest width from the dorsal to the ventral side being an inch and three or four lines. There is a small variety, scarcely an inch in length, and more obtuse at the anterior end, than the specimen figured; it is also more ventricose.

Locality and Formation.—Fourth Chute of the Bonne-chère, La Petite Chaudière Rapids near the city of Ottawa, and numerous localities in the valley of the Ottawa, associated with fossils of the Black River and Trenton formations.

Collectors.—Sir W. E. Logan, E. Billings, J. Richardson.

VANUXEMIA BAYFIELDII (Billings).

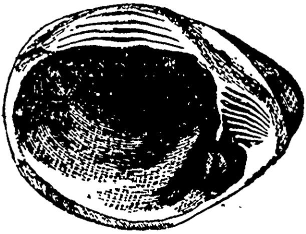


Fig. 17.

Figure 17. Interior of the left valve of *V. Bayfieldii.*

Description.—Very ventricose; ovate; the anterior extremity, including the beaks, narrowly rounded; the posterior end broadly rounded; shell very thick; seven anterior teeth; four posterior teeth; anterior muscular impression large, deep, and excavated in the very much thickened edge of the shell; posterior muscular impression sub-circular, superficial and situated just beneath the posterior extremity of the hinge line.

The specimen is deeply imbedded in a coral (*Monticulipora petropolitana*), and only exhibits the edges and inside of the shell. From the great thickness of the shell, casts of the interior must bear very little resemblance to a perfect specimen. The form is very like that of *Vanuxemia inconstans*, but the characters of the interior leave no doubt as to its distinctness.

Locality and Formation.—Bayfield Sound, Lake Huron a single loose specimen; Lower Silurian; appears to be of the Hudson River Group.

Collector.—A. Murray.

Genus MATHERIA (Billings).

Generic Characters.— Transverse; equivalve; inequilateral; beaks near the anterior end; dorsal and ventral margins subparallel; two small obtuse cardinal teeth in the left valve, and one in the right; no lateral teeth; two muscular impressions; ligament external.

This genus is dedicated to Mather, one of the Geologists of the New York Survey.

MATHERIA TENER.

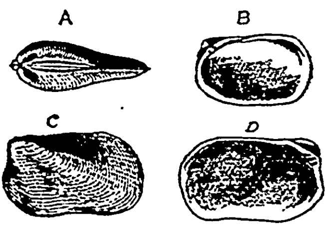


Fig. 18.

Figure 18. A, dorsal view of *Matheria tener*; B, interior of right valve; C, exterior of left valve; D, interior of left valve.

Description.—Small, oblong, depressed; dorsal and ventral margins nearly straight and parallel; upper half of posterior extremity obliquely truncate; lower half rounded; anterior extremity sub-truncate from the beaks nearly to the anterior ventral angle, which is rounded, and projects slightly beyond the umbones. From the beaks to the anterior ventral angle extends a prominent obtusely angular carina; surface marked with fine concentric striæ. Width eight lines; length four lines.

Locality and Formation.—Blue Point, Lake St. Johns; Trenton limestone.

Collectors—J. Richardson, R. Bell.

Genus OBOLUS (Eichwald).

OBOLUS CANADENSIS (Billings).

Fig. 19.

Fig. 20.

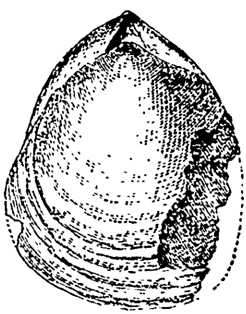


Fig. 21.

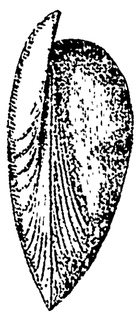


Fig. 22.

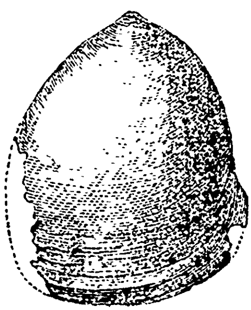


Fig. 23.

Figure 19. Dorsal valve.
20. Interior of dorsal valve.
21. Dorsal view of an elongated specimen which has both valves in place but a little distorted.
22. Side view of the same specimen.
23. Ventral view.

Description.—The form of this magnificent species is somewhat variable, the width being often greater than the length, and sometimes less. Usually, it is transversely broad oval; the apex of the dorsal valve obtusely angular, and that of the ventral rather acute. The dorsal valve is moderately and pretty uniformly convex; the ventral valve depressed-convex. The beak of the ventral valve projects about two lines above that of the dorsal valve, and exhibits a wide, scarcely concave area, with a triangular excavation representing the obsolete foramen; the surface is smooth, or with a few concentric imbricating furrows of growth. In the inside of the dorsal valve there are near, but above the centre, two pyriform muscular impressions, with their pointed extremities close together and directed downwards, while in the upward direction they diverge outwards; they are separated by an obscure rounded ridge, and surrounded on the lower side by an elevated angular border, which forms a projecting point just below their lower extremities. Beneath and close to the hinge there is a narrow and deep flexuous furrow. The muscular impression at the cardinal angles figured by Davidson in *O. Apollinis* (Eichwald), *O. transversa* (Salter), and *O. Davidsoni* (Salter), are very indistinct in this species; the area of the ventral valve does not appear to be striated. The interior of the ventral valve is not clearly shewn in any of our specimens. Width usually about two inches, but some of the fragments undoubtedly belonged to individuals which were three inches wide. The length from the beaks to the base, is either equal to or a little greater or less than the width, the dimentions being variable.

Locality and Formation.—Occurs abundantly at the Fourth Chute of the Bonne-chère, Pauquette's Rapids, and in the Townships of Stafford and Westmeath, County of Renfrew, associated with fossils of the Trenton and Black River limestones.

Collectors.—Sir W. E. Logan, J. Richardson, and E. Billings.

Genus EICHWALDIA (Billings.)

Generic Characters.—Large valve perforated on the umbo for the passage of the peduncle; the place of the foramen beneath the beak occupied by an imperforate concave plate; the interior divided by an obscure medio-longitudinal ridge; interior of smaller valves divided throughout from the back to the front by a very prominent medio-longitudinal ridge; no hinge, teeth, sockets, or other articulating apparatus in either valve.

After a great deal of examination and comparison I have not been able to refer the species for which the above generic name is proposed to any of the described genera. Although several silicified specimens exhibiting the interior have been obtained, they do not show any muscular impressions. The perforation on the back of the beak was at first supposed to be a fracture, but we have now specimens which exhibit its characters so complete, ly that I do not think it possible there can be any mistake. The internal structure of the larger valve somewhat resembles that of *Pentamerus* or *Camarophoria*, the concave plate beneath the beak appearing to be the homologue of the floor of the triangular chamber found in these genera. I cannot make out however, that it is in any way connected with the medio-longitudinal ridge as is the case in both *Pentamerus* and *Camarophoria*. In removing the limestone from silicified specimens the delicate processes in the interior of species of brachiopoda are very often destroyed, and it is possible that the connection in question may exist in perfect specimens, but not appear after treatment with acids. It is therefore uncertain whether or not it is attached to the plate beneath the beak. If it should be hereafter ascertained that it is so connected, the foramen on the umbo would still be sufficient to show that this is a new genus, to the establishment of which the characters of the smaller valve and the absence of any articulating and apophysary apparatus would be additional characters. As other specimens can be procured and as the internal characters cannot be well shewn by wood-engraving, I shall for the present give figures of the exterior only.

EICHWALDIA SUBTRIGONALIS (Billings.)

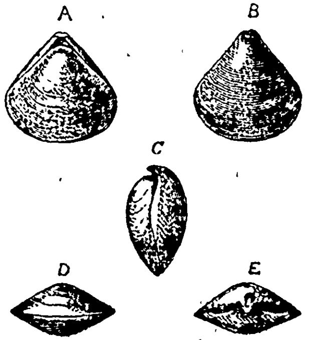


Fig. 24.

Figure 24. A, dorsal view; B, ventral; C, side; D, front; E, apex, shewing the foramen.

Description.—Sub-triangular; both valves moderately convex and smooth, apical angle about ninety degrees or a little less; sides from the beak to about one half the length straight, then rounded; front more or less broadly rounded; beak of larger valve extended, incurved at the point and with a moderately large concave area beneath; beak of smaller valve strongly incurved apparently entering the visceral cavity beneath the area of the larger valve; length and width about equal.

Locality and Formation.—Fourth Chute of the Bonne-chère and Pauquette's Rapids, associated with numerous fossils of the Black River and Trenton Formations.

Collectors—Sir W. E. Logan, J. Richardson, E. Billings.

ARTICLE XXXV.—*Some Observations on Donati's Comet of* 1858. By Charles Smallwood, M.D., LL.D., Professor of Meteorology in the University of McGill College, Montreal. (Presented to the Natural History Society.)

The measured limits that were set to the orbit of our earth by the Creator's fiat, and which tend to develop with remarkable regularity the budding flowers of spring, to ripen the golden fruits of autumn, and bring the returning seasons of "summer and winter," are instances of those permanent and perpetual laws which mark the wisdom, the power, and the beneficence of the Almighty Architect. To contemplate the starry host night after night, seems to have been the primitive and favourite occupation of the Chaldean shepherds while in the pursuit of their pastoral duties; and to admire and to study its grandeur is still the sublime occupation of many, who, when the dim veil of night invites the busy thoughtless world to slumber and spreads darkness over the resorts of pleasure, delight to search in the all but fathomless depths of space for some bright speck or point of light, removed from the observer to such a distance that the human mind cannot embrace even the thought of its immensity, and whose light has taken even thousands of years to reach us. This distant spot of light is to us fixed in its position ever since the human eye aided by the telescope has gazed upon it, and the micrometer has marked its position with the greatest accuracy. Hundreds too of those minute and distant objects have been yearly "catalogued." The earth has undergone its changes, but the glorious canopy of the heavens has thus remained unchanged.

Another class of heavenly bodies move—revolve in orbits like that of our earth—round the common centre of our system, the sun. The limits and courses of these wandering bodies, the night-watchings of the astronomer have pencilled and measured as with a span; he has also weighed them as in a balance. A very few years ago the number of these bodies—the planets—did not exceed *five*, but recently the catalogue has increased to *sixty-one*; and but a few years have passed away since Leverrier, as with a colossal stride, placed one foot as it were on the centre of the sun and the other on the surface of the remotest star of our system, and pointed out the spot where a new planet—Neptune—was to be found: such has been the modern progress of science.

At certain periods of the world's history another class of erratic bodies, called comets, have appeared in the celestial vault, whose perihelion passage was in comparatively close proximity to the orbit of our earth, while its aphelion circuit far exceeded the immense distance of those remote stars already mentioned. Bodies of this nature in all ages of the world have attracted the attention of astronomers, and filled the wondering inhabitants with awe and amazement, appearing for a few nights, and even at noon-day, with excessive splendour, and then *apparently* vanishing into the depths of space for ever. The written history of the appearance of comets has always been associated with some disaster, hence the popular fear at their appearance. (I need only call to recollection the panic which spread over the United States and the Continent of Europe last year.)

The description of the appearances of these bodies has often been distorted by the fears of the historian and the excited imagination of the ignorant. So far back as 596 years before Christ, the mother of the Chinese Emperor Yu, considered the comet of that year as auspicious for the future Empire and the yet unborn Emperor; but modern astronomy has robbed these bodies of their terrors, and they are now considered as forming a part of our solar system, and appearing at certain intervals of time. To trace the orbits of these bodies and predict their return involve calculations of no small labour. Their light density subjects them during their circuit to perturbations from all other bodies which can act upon them, and so deflects or retards their course: hence the difficulty in predicting their return. But here again science has once more triumphed, and a Halley, a Biela, and an Encke have traced their orbits, measured their distances, predicted their returns with the greatest accuracy, and even calculated their elements.

In July, 1264, a comet, whose tail was 100 degrees in length and of great brightness, made its appearance in the constellation *Cancer*, passing through *Auriga* and *Taurus*; its orbit was below the plane of the Ecliptic, and its aphelion extended twice the distance of Neptune. It disappeared on the night of the 2nd of October, the night that Pope Urban IV. died.

Hevelius, Fabricius, Lalande, Pingré, and others have collected numerous records of a remarkable comet which appeared in March 1566, which is described as blazing with uncommon splendour like a globe of flame about half the size of the moon, and displaying a vast train of light. It first was seen near *Spica Virginis*, and soon advanced with great rapidity and with a retrogade motion (a movement contrary to the motion of the planets), towards the north, as far as *Ursa Major*. It then advanced towards the south, when it was gradually lost to view. It was seen for nearly two months. Its position seems to have been marked with such accuracy as the instruments used in those days permitted, and it is said to have moved so rapidly as to have passed over 75 degrees from east to west, and 30 degrees from south to north, in four days. It is considered to have been one of the greatest comets ever seen.

A body of such a nature and with such appearances, was, as a matter of course, associated with some great disaster; and history has associated it with the death of two great German princes, diseases in cattle, famine, pestilence, and war. The emperor Charles V. taking fright, abdicated his throne, imagined that its appearance predicted his death, and actually made preparations for his final departure from this world; but Kepler says he survived some years after. Its distance from the sun, at its aphelion, was 8,500,000,000 miles, while its perihelion passage was within the orbit of Venus. This famous comet has received the name of Charles V.'s. comet, from the fact of his abdication at its advent.

Our object, in referring to the history and appearance of only two of these bodies, among some hundreds that have been recorded, is for the purpose of directing attention to their probable reappearance, and to contrast their movements with those of Donati's comet of 1858, as the impression has extended that Donati's comet was in reality the *expected* comet of 1566. As far back as 1751, Mr. Dunthorpe of Cambridge, England, in comparing the elements of the comets of 1264 and 1556, found them so similar, that the two were considered by him as identical, and that it was a comet whose period was about 292 years, making its re-appearance in 1848.

Mr. Barber of Etwell, in following up these calculations, found that Dunthorpe had not taken into account the perturbations occasioned by Jupiter and Saturn, and he found that between the years 1556 and 1592 their united attraction would diminish the period of its appearance 263 days, but that between 1592 and 1806 it would be increased, by the action of Jupiter *alone*, no less than 751 days, or more than two years.

Babinet of Paris has also published his results, and found that the orbits of the comets of the years 304, 685, 975, 1264 and 1556, have some appearances in common, and have always been marked with an extraordinary display.

Bomme of Middleburg has re-calculated their orbits, and says that the re-appearance of the last may be expected in August 1858, with an uncertainty of two years.

Hind of Bishop's Observatory, Regent's Park, has paid especial attention to the orbits of the comets of 1264 and 1556, and, after many intricate and careful calculations, taking into account the perturbations caused by Jupiter, Saturn, and Neptune, has also come to the conclusion that the comet of 1856 would probably appear in August 1858, with an error of two years.

The opinion of this eminent practical astronomer has often been the subject of severe criticisms, owing to the misrepresentation of what has been called his "predictions," which have in reality been nothing more than opinions, and probabilities reduced from deductions and calculations worked out by himself, upon the orbits of these comets, which are bodies of a very uncertain nature.

Hock of Leyden has recently raised some objection to the views of Hind on the identity of the comets of 1264 and of 1556; but Hind, in a letter written to me under the date of the 12th May, 1857, says: "*I still maintain the opinion that I have so long held respecting the identity of the comets of* 1264 *and* 1556."

The re-appearance of this remarkable comet will throw much light upon the perturbatory influences of those heavenly bodies, which may be in proximity to its orbit, and it can now be scarcely doubted that Donati's comet of 1858 was *not* the expected comet of 1556.

The comet which has so recently visited us, and which has now passed from view, was discovered by Donati at Florence, on the 2nd of June 1858, in Right Ascension 9h. 25m. 12s., North Polar distance 67° 13′. Its appearance was a round, bright, nebulous patch of light, with a condensed centre, and without any tail. It was seen at Berlin, by Bruhns, on the 7th of August; and on the 23rd of the same month it was visible at Cambridge, England. It was seen in Canada as early as the 6th or 7th of September. On the 12th at 8 p. m., M. T., its appearance was bright and nebulous, the tail was slightly curved upwards, and it was near the star *Xi* of the constellation *Ursa Major*, being nearly in a line with the pointers *Merak* and *Dubhe*. Its position (nearly*) was Right Ascension 11h. 20m., and North Polar distance 54° 23′. It was seen after sunset and before sunrise (which led to the supposition of two distinct visible comets). Its appearance gradually increased both in brightness and magnitude, until the 10th of October. On the 28th of September, at 8 p. m., its place was R. A. 12h. 32m., N. P. D. 57° 10′. Its tail extended over nearly thirteen degrees, and was calculated to be about eighteen millions of miles in length. It was then in the constellation *Canes Venatici*. On the 2d of October its R. A. was 13h. 30m., N. P. D. 66°. Its tail was nearly twenty-seven degrees in length, curved and reaching to *Eta Ursa Major* (Benetnach). It passed over a cluster of small stars in *Coma Berenices*, which were visible through it. Its calculated distance from us was 50,000,000 of miles, and its motion was at the rate of 20,000 miles per minute. On the 4th of October it was near the bright star *Arcturus*, and nearly rivaled it in brightness. On the 10th–11th of October it passed from North to South Declination. On the 10th, at 6:30 M. T., its R. A. was 15h. 56m., and N. P. D. nearly 90°. It was now at its maximum of brightness, and was a most brilliant and magnificent spectacle. Its tail was nearly 50° in length, curved like a Turkish sabre, and passing upwards through the constellation *Ophiuchus*, the star *Phi* of that constellation apparently bounding its concave edge. Its convex border was much brighter and better defined than its concave; it extended upwards nearly as far as *Zeta Herculis*. It crossed the Earth's path on the 18th, and was nearest the planet *Venus* on the morning of the 18th.

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* The measurements are taken only approximately from stars in its neighborhood.

On the evening of the 18th it was dim and near the horizon, and required the aid of powerful telescopes to distinguish it, although it was seen as late as the 22nd in some of the United States Observatories south of us. On the 21st its N. P. D. was 118° 15′, having passed over upwards of 100° in its path. At each observation a dark shade of light could be seen passing from the body of the central nebulous mass, triangular in shape, as though the body of the comet projected a shadow on the surrounding coma. The direction of this shadow was upwards.

From some recent calculations of Bruhns of Berlin, he is of opinion that the period of its revolution round the sun exceeds 2,000 years. Loewy has fixed its period of revolution at 2,494 years.

The Chinese records make mention of a comet which appeared 331 years before the Christian era, associated, as customary, with the popular belief of wars and disasters, and corresponding in date with the battle of Arbela. These records also make mention of the appearance of remarkable comets both at an earlier and a later date.

Donati's comet seems to have surpassed the comet of 1811 both in size and brightness; the extreme length of its tail, according to Sir Wm. Herschell, was only 25 degrees, while that of Donati's on the 10th of October was nearly 50 degrees in length. The night of the 10th was peculiarly fitted for observation, and nothing could have exceeded the magnificent blaze of light that proceeded from both the nucleus and tail.

Its appearance, course, motion, and disappearance would tend to the opinion that it is a distinct body from the comets of 1264 and 1556; so that the appearance of the body that excited so much wonder at those periods of time, and which has occupied the attention of mathematicians and astronomers up to the present date, may yet be looked for.

The superior advantages of observation that we now possess have not been lost upon Donati's comet, and its place has been so accurately laid down, that its reappearance cannot be mistaken; and the calculation of its orbit may in a measure tend to throw some light on the perturbations that may influence all such-like bodies.

Several other comets were also visible during the year, but excited little attention owing to their small size.

St. Martin, Isle Jesus, 1st Dec., 1858.

ARTICLE XXXVI.—*The Fresh Water Algæ of Canada.* A Paper presented to the Natural History Society of Montreal, by the Rev. A. F. Kemp.

(Second Part.)

In our previous paper it was said that "we have not yet found a single example of the verticellate genus *Batrachospermum.* In vain we have searched for it in places where it might naturally be expected, yet not a frond have we seen. It may still be found; but, so far, the researches of two years in the Canadas have been in vain." So far as the Eastern Province is concerned, this statement is still true: no specimen has rewarded our search up to this time. But we are happy to say that a correspondent and diligent collector in Paris, Canada West, has been more fortunate. A most beautiful example of this genus has been sent us, both in the moist and dry state. We have examined it with the utmost care, and, after the most careful comparison with the figures and descriptions of Hassall, our impression was that it did not bear any distinct resemblance to any of the species described or figured in that work. On referring, however, to Vaucher's "Histoire des Conferves," we find his species *B. moniliforme* described in such terms as to lead us to think that our plant is identical with it. The characters which he notes as belonging to it are: "Filaments *ramose, moniliform*; articulations, *globose, gelatinous.*" Our specimen possesses all these characters, but also has another and a peculiar one, which this description does not embrace, namely, that of having branched moniliform fibrillæ on the internodes of the main stem between the whorled articulations. While this feature is not noticed by Vaucher in his specific characters of the plant, he yet in his appended notes says, that "this plant does not always present the same appearance: sometimes the ramifications are so very numerous, that the conferva resembles only an irregular filament; sometimes, on the contrary, they are so very rare, that the verticelli become quite distinct: but the shades which separate the two extremes are so very numerous, that they may be regarded as varieties of the same species."

A correspondent in Boston, U. S., having compared our plant with those in the collection of the late Mr. Bailey, says that it appears to be identical with some of his specimens marked *B. moniliforme*, some of which, he remarks, differ considerably from one another.

A further comparison with specimens from the collection of the late Dr. Landsborough convinces us that this Batrachosperm is none other than *B. moniliforme.* The species is very rare in Scotland, and was found by Dr. Landsborough only in one or two localities favorable for the warmth of their temperature,—in one instance in a stream in which the water from a condensing steam-engine flowed. As compared with ours, Dr. L.'s plants have a very poor and sickly appearance, and the figure given by Vaucher (natural size) is quite diminutive. It would thus appear that although we have not obtained a new species, we have yet to say that our plant is greatly more prolific and more distinct in its characters than any of the described European species. We deem it of sufficient importance and beauty to present to our botanical readers three illustrated figures of its principal parts, together with a full description of its characteristic features.

BATRACHOSPERMUM MONILIFORME. *Vauch.* Figs. 1–3.

Char.—Frond *dark green, very mucous, large.* Main branches *dichotomous;* secondary branches *irregular, partially secund, divaricate, beset with short ramuli, irregularly pinnate, occasionally compound.* Whorls of the stems *spherical, distinct, distant, large, those of the branches sub-distant, and those of the ramuli approximate.* The internodes *of the main stems and the base of the larger branches beset with short, minute, branched, articulate fibrillæ.*

Hab.—On stones, in a clear, rapid stream. Paris, Canada West.

This is really a most beautiful plant. A frond now before us covers, in its dried state, a space of six inches by five, and is very prolifically branched. Fig. 1 (p. 452) is a representation of one of the main stems. The extremities of the branches are rather more delicate than in the original, but otherwise it is an accurate likeness of the object. The whorls are as distinctly marked in the original as they are in this figure.

The *second* illustration (p. 453) represents the appearance of the whorls with the fibrillæ between the articulations, and a branchlet, as seen under a half-inch object glass. In the original the whorls are rather more distinct, and their filaments more crowded than they appear here to be represented; but, upon the whole, the wood-cut comes very near the appearance of the object itself.

The *third* figure (p. 454) represents a branched filament of the whorls, and is one of the most characteristic specimens selected from several equally proliferous and similarly branched. The di-

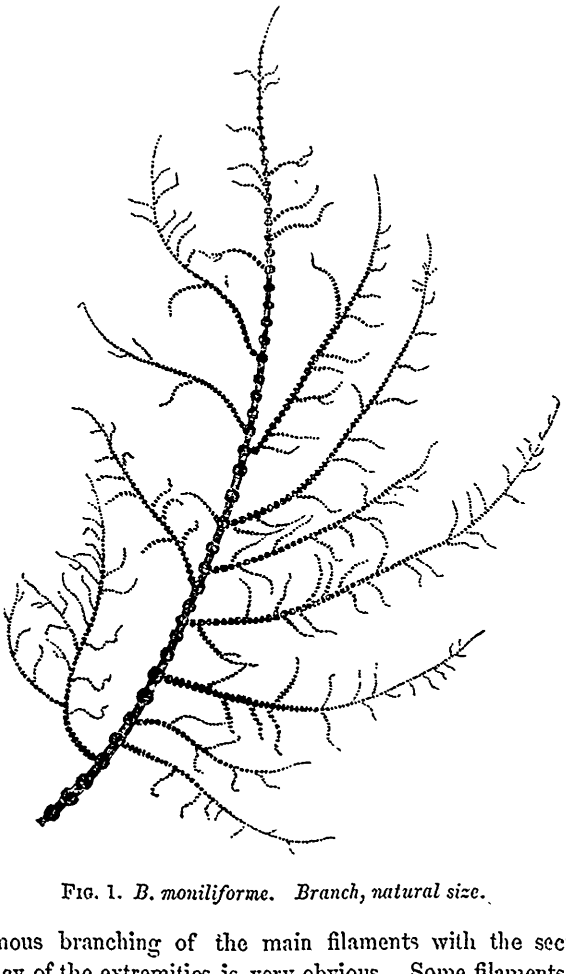

FIG. 1. *B. moniliforme. Branch, natural size.*

chotomous branching of the main filaments with the secund tendency of the extremities is very obvious. Some filaments are even more secund and more proliferous towards the extremities than this one; no two are indeed alike. They present to the eye under an object-glass of 400 diameters, objects of great variety of form and exceeding beauty. In some cases the cells are much more swollen, and have more of the club shape than those of the figure (3); others again are less moniliform. The mucous character of this plant seems to arise, not from the extended ciliæ at the extremities of the filaments, as we find to be the case in *B. bombusinum* and others, but from the clear, and apparently lubricous

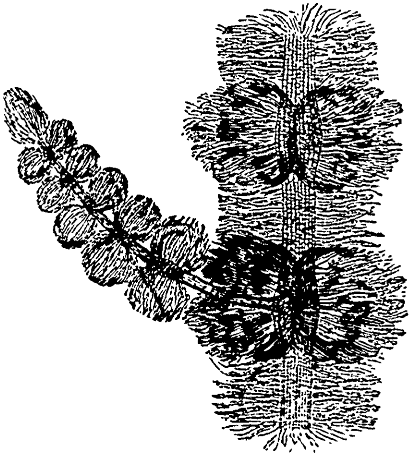

FIG. 2. *B. moniliforme. Whorls and fibrillæ, magnified.*

sheath, in which the filaments are enclosed. This sheath we have not represented in the figure (3): its appearance is so clear and delicate that we despaired of expressing it in a wood-cut. Under the microscope it has the appearance of a line of light surrounding and uniting the cells, so that they do not come into contact with one another, as they appear in the figure, but are separated by this mucous integument. These cells contain a light-green endochrome, in which there are distinct and dark colored granules. The probability is that these granules are zoospores, which, on the maturity of the plant, break through the cells, and, becoming fixed, germinate like the mother plant. The proper fructification is however by glomerules, which grow in the whorls, and seemingly spring like buds from the articulations. They are in this specimen composed of three or four cells, much enlarged and swollen at the extremities, and very club-shaped. The two upper articulations emit numerous articulate branches, which radiate in all directions, and vary in length. This is a most distinct and curious object. It is surrounded with a very thin coat of mucous, and contains bright green granules. We are unable to say how it germinates. Whether it is a bud or a conceptable for seed, we cannot discover; but the latter is probably the case.

The fibrillæ of the internodes are branched in the same manner as the filaments of the whorls, only the cells are less moniliform and

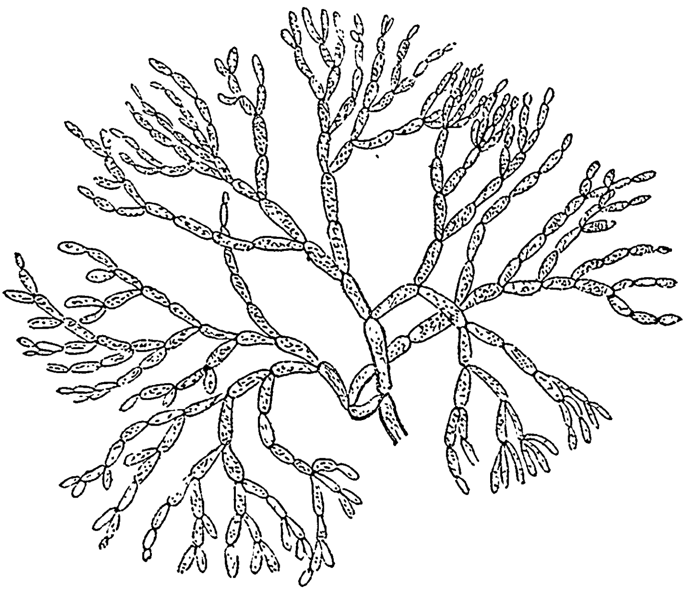

FIG. 3. *B. moniliforme. Filament of a Whorl, highly magnified.*

more delicate. The branches are besides not quite so proliferous as in the other, and they spring from the cells which form the outer membrane of the stem (fig. 2). The stem is thickly beset with them, and has much the appearance of a *Thorea*. This is the characteristic feature of this plant. It is evidently, too, much more proliferous in the filaments of its whorls (fig. 3) than any we have yet seen. This, however, may be only an effect of climate or situation, and need not be considered as a distinct or specific character. The stems of this plant are cylinders, the walls of which are composed of many small, articulated, tubular filaments, united together by a mucous integument. They swell out slightly at the articulations of the stem, from which the whorls spring, as may be seen in Fig. 2, and have much the appearance of a bamboo.

Some species of this genus are regarded as the most hardy of the

Algæ. They are frequently found in cold springs. And Bory mentions that he had carried, many times, individuals of the species *B. confusum* from one locality to another, and that they continued to prosper in spite of the change of habitation. He also steeped many of them in lukewarm water, afterwards in boiling, and no part of the *batrachosperm* appeared under the microscope to have undergone the slightest disorganisation; and certain sprigs replaced in their native place continued to vegetate after these experiments. "I do not think," says he, "that there exist other vegetables which boiling water does not immediately disorganise: there are not others that can resist temperatures so opposite." We have made a like experiment with our plant, and find that boiling water does not affect it in the least; probably some part of its mucous may be abstracted, but it remains in all its parts the same as before. It would appear, however, that the species *B. moniliforme* flourishes best, if not exclusively in warm temperatures, or in places where the winter is comparatively open and mild.

We have gone back in the order of arrangement to introduce this plant. It should have come in immediately before the *Chaetophoreæ*. According to the classification of Hassall, it is the only genus of the family *Batrachospermeæ*, We regret that we are not permitted the pleasure of mentioning the name of the collector. We, however, anticipate that much will yet be done by this diligent and painstaking correspondent to illustrate the Marine and Fresh-Water Algæ of Canada.

Fam. VIII.—CONJUGATEÆ.

" *Char.*—Filaments *simple, equal, often conjugating.* Endochrome *mostly figured.* Sporangia *formed generally by the union of the contents of two cells, either in different or in the same filaments.*" Hass.

"This is perhaps the most curious of all the tribe of *Confervæ*. When viewed together they form an exceedingly natural group but one which is defined rather by the enumeration of a number of characters than by one in particular."

When examined by a microscope they are seen to be unbranched, and of uniform diameter. For the most part they are unattached, their natural home being quiet, deep, and clear pools. In the young state they are frequently rooted to stones. Those also that are found in streams are fixed to stones or wood. In their young condition they are smooth and unctuous to the touch, and of a deep green color. "They are composed of an assemblage of elongated cells placed end to end, and all of them enclosed and

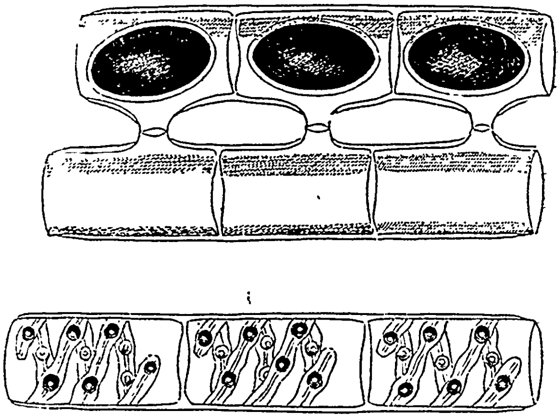

Fig. 4. *Zygnema varians, showing the spiral thread, the conjugation, and the sporangia.* Hass. Brit. F. W. Alg., pl. 29.

held in union by an investing membrane. The interior of these cells are chiefly filled with endochrome, which is variously disposed, sometimes in the form of spiral threads and stars, at others completely filling their cavities." Mixed up with the endochrome there are observed numerous vesicles, which are presumed to be unfertilized zoospores. Sometimes adjacent cells conjugate, (fig. 6. *a.*) and their contents coalesce; and sometimes the conjugation takes place with a cell of a contiguous filament, (figs. 4 and 6, *b*, p. 459) a passage of communication having been formed by the protrusion of little tubular processes from each cell. This phenomenon of conjugation is one of the chief characteristics of this large family of plants, and it is certainly a very curious process. The idea of most botanists is that it is necessary in order to the fecundity of the plant—that fertilization does not take place—sporangia are not formed—until this process has been completed. There is however no regularity in the passing of the contents of the cells of one filament into that of the other, neither is there anything analogous to the pistils and stamens of flowering plants; nor does it appear that the one plant is male and the other female, or that there is any difference in the physical character of the granules contained in either cell. The larger cell invariably attracts the contents of the smaller: sometimes this will happen in the one and sometimes in the other filament (fig. 6, b.). The same thing is observable in the conjugation of adjacent cells in the same filament; the cell wall of one is everted into the other and a channel of communication is thus formed, through which the smaller mass of endochrome passes into the larger. The united contents of two cells form a large circular or oval cist, (fig. 6, a.) most frequently of a deep green color, but occasionally becoming reddish brown. The endochrome soon becomes a mass of granules; and by and by the cist, or sporangium as it is called, breaks away from the filament and floats free in the water. The granules (zoospores) finally burst the cells walls, and, after moving about freely in the water, germinate into filaments.

A curious organ has been observed in this family of plants by Hassall, J. Agardh, J. S. Bowerbank, Kutzing and others, which they call a cytoblast. "It is solitary, and usually occupies a central situation in each cell of the genus Zygnema. It consists generally of two membranes, but sometimes there are three; the innermost of these being either circular or elliptical, and presenting a nucleated appearance, (as may be seen in Fig. 5, p. 458) The surface of the enclosed membrane is smooth, while that of the external is rendered irregular by the giving off of numerous tubular prolongations or radii which terminate in the spiral threads formed by mucous, and containing endochrome and large bright granules, which I regard as unfertilized spores."

"The structure of this curious organ explains with apparent satisfaction one of the offices which it is destined to discharge, viz., that of a laboratory or *stomach*, in which the materials necessary for the growth and vitality of the cell and its contents are received and digested, and from which they are conveyed by means of the tubular radii to those organs by which the materials are to be assimilated."

"The cytoblast, therefore, is at first fixed in the centre of the cell by the prolongations which proceed from it (see Fig. 5); but it happens that at a certain epoch these radii disappear, and then the cytoblast floats freely within the cavity of the cell; the disappearance of the rays, the cessation of the growth of the cells, and the assumption of the characters of reproduction, being almost contemporaneous, the two latter being readily accounted for by the disappearance of the radii."

"In addition to the organs above described two others have been noticed by Mr. Bowerbank in a species of *Zygnema*, which I transmitted to him, and subsequently by myself in a variety of other species. The one is cruciform, and adherent to the inner wall of the cell, (see Fig. 5). It, Mr. Bowerbank remarks, is the vegetable structure which secretes the raphides. They are probably not definite organs, but crystals. The other body is small, elongated, somewhat curved, and attached to or lying upon the plant, (see Fig. 5). This, Mr. B. observes, is certainly a string of minute cytoblasts."—*Hass.*

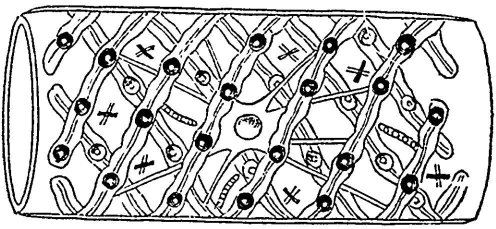

Fig. 5. *Cell of Z. nitidum, showing the spiral threads containing spores the cytoblast, and the cruciform raphides.* Hass. *F. W. Algæ, plate* 17.

We have collected and examined with great care multitudes of these plants—they are to be found in great abundance in almost every stagnant pool—and only in one instance (*Z. curvatum*) have we, during a period of two years, observed conjugation in the L. Canadian specimens. We eagerly looked for it last spring, the time of the year, at which, according to Hassall, it is most usually found in England, and have, up to the beginning of winter, almost every week examined specimens from various localities, and in all conditions of growth, but in no instance have we found conjugation, with the exception noted. We have also failed to discover in any case the cytoblastic organ.

A specimen has however been sent us of *Z. catenæforme* from Paris, C. W., about 360 miles S. West from Montreal, which curiously presents the three forms in which conjugation is sometimes found. In the following figure (6) it will be seen that at (*a*) the contiguous cells are in conjugation, while at (*b*) it is the contiguous filaments, and that the contents of the opposite cells pass alterately into each other.

From these considerations one would be led to infer that these characters are either very evanescent in their nature and rapid in their functions, or that they are mere accidental conditions of the plant and not necessary to its fecundation. In a few instances we have seen the sporangia very distinct, but only in a few. For the most part the spores, or zoospores, contained

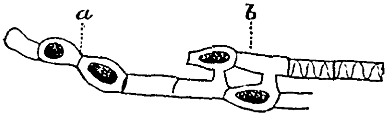

Fig. 6. Z. catenæforme, in conjugation.

in the spiral threads, becoming diffused through the cells break the walls and escape into the water. This simple process seems to be the one most commonly followed. If fertilization only takes place through the agency of sporangia and by the zoospores which it contains, or only by the action of the cytoblast, the plant, according to our observation for now two years, would soon altogether disappear. Apparently, however, without the conjugation of adjacent cells, or of cells of adjacent filaments, and without the cytoblastic organ, spores or zoospores are formed, and, escaping from the cells, immediately become fertile. From the facts which have come under our observation we are tempted to think that the union of cells is purely accidental, and results from the process of endosmosis, or by simple attraction. We are the rather confirmed in this conjecture by the fact that conjugation takes place chiefly in spring when life is most active and the membranes of the cells most delicate. The intrusion of the new matter into a cell may also under such conditions result in the formation of new cell membranes; and the occasional reddish color of the sporangia may be merely the effect of age. Not having seen the cytoblastic organ we can form no conjecture as to its function, bnt the fact that it is of so rare occurrence naturally leads to the inference that it is an accidental excess of mucous in the cell and by no means necessary for the fertilization of the spores. Hassall himself admits "that this combination (conjugation) is not an essential to the perpetuation of the species"; but he does this on the ground that the cytoblastic organ is that which fertilizes the zoospores, and thinks that by this means the permanence of species is explained where cells have broken up "before the union of endochrome, or the formation of spores, has taken place." But, allowing this to be the case, how again shall we account for the permanence, or the reproductive germs, of those species in which there are neither cytoblastic organs, nor conjugation of cells? That such species are permanent, and germinate from spores or zoospores produced in the cells, we entertain no doubt, or at all events, from the evidence before us, we regard it as highly probable. It is possible that future and more careful research may yield a different result. In the meantime, and with all humility, we propound these views. They are contrary, we know, to the inductions of naturalists of the highest distinction and most accurate observation; but we submit them to our botanical friends in the hope that they may lead to enquiry and the elucidation of the truth. Our intelligent correspondent in Paris informs us that the research of the past year has failed to discover any but one single instance of conjugation (fig. 6). There must therefore, we think, be either a specific difference between our plants and the European, or the characters referred to must not be essential to the reproduction of the species. In the absence of conjugation we have found a difficulty in fixing upon characters that may be regarded as *specific*, The length of the cells and the number of spiral threads frequently vary in the same filaments. Still it does appear that there is a normal size of the cells, and a normal number of spiral threads and coils in the several species, which may, after a little experience, be readily distinguished; other forms are obviously exceptional. The cells grow by sub-division, previous to which they are somewhat elongated, and afterwards considerably shortened, until they attain maturity. The normal length will consequently be that which lies between the two extremes. The same process of growth will naturally somewhat affect the spiral threads also, and produce anomalies in their form during their state of transition. So far, therefore, we know of no characters by which to determine our Canadian species except the size of the cells, the number of their spiral threads, and other normal arrangements of the endochrome.

Genus ZYGNEMA. Ag.

" *Char.*—Endochrome *arranged in spiral order within each cell. Sporangia generally oval, and never lodged in the transverse tubes of communication.*" Hass.

Derivation.—*zugos*, a yoke; *nema*, a thread.

Hassall, Brit. F. W. Alg.; Vauch. Conf. d'Eau douce; Bory in Dict. Class.

This genus is placed first in order in the family as being the most remarkable in its appearance and complicated in its structure.

The endochrome is arranged in the form of spiral threads, as may be seen in Figs. 4 and 5; the number of spires varying from one to eight, and the number of threads from one to six. These spiral cords are tubular, and contain at intervals, united together by a delicate cord, brilliant granules, which Müller, in his surprise on first discovering a species of the genus, likened to precious stones European naturalists have divided them into two sub-genera, in one of which the filaments unite, as in Fig. 4, and in the other no such conjugation takes place.

The structure of the joints of some species of the *Zygnema* has been a subject of special observation by European naturalists. Mohl, quoted by Hassall, says that "In *Z. elongatum* (Ag.) the dissepiments have a very peculiar structure which I have found in no other species. The terminal surface of each cell is not *even*, but elongated into a blunt conical process. This process can only be observed in its true state when two joints are separated one from the other; when on the contrary the threads are unbroken, the process is generally introverted, like the finger of a glove. This is the common condition, and in most threads no joint is found otherwise constructed." It is not quite accurate to say that the eversion is only truly observed when two joints are separated. Hassall remarks that it has nothing whatever to do with the separation of the cells, but depends upon the unequal internal pressure of the granular contents which occurs chiefly at the period of reproduction.

Z. CURVATUM. Hass.

" *Char.*—Filaments *nearly equal in diameter to those of Z. neglectum.* Conjugation *angular.* Cells *three or four times as long as broad, coalescing without the intervention of transverse tubes.* Spires *about four in number, faintly indicated.* Sporangia *oval.*" Hass.

Habit.—In pools at Moffatt's Island, St. Lambert, Montreal.

This species is remarkable for the direct conjugation of the cells without the intervention of tubes, and is the only species of the genus that does so. By this junction the filaments become geniculate, or bent at angles more or less obtuse, a very good idea of which may be obtained by bending the middle joint of a finger on each hand and bringing the knuckles together.

Z. PELLUCIDUM. Hass.

" *Char.*—Filaments *of rather less diameter than those of Z. curvatum; mucous almost transparent.* Conjugation *parallel.* Cells *six or seven times as long as broad.* Spires *indistinct (in our specimen very clearly developed) usually four in number.* Sporangia *circular, lodged in cells which are considerably enlarged for their accommodation.*" Hass.

Hass., Brit. F. W. Alg., p. 143, pl. 25, figs. 1 and 2.

Hab.—In pools at the Old Race Course, Mile End.

This is a very curious and beautiful species, and one by no means common either in Europe or Canada. The spires are very distinct, and cross one another at acute angles. We have not seen this plant in conjugation or sporangia, but we have no doubt as to its other characters, and these are sufficiently striking to render it easy of identification.

Z. DECIMIUM. Ag.

" *Char.*—Filaments *rather fine.* Cells *twice or thrice as long as broad.* Spires *two, crossing each other.* Granules *large.* Sporangia *oval, obtuse, not producing inflation of the cells in which they are lodged.*" Hass.

Hass., Brit. F. W. Alg., p. 144, pl. 23, figs. 3 and 4. Harv. Manual, p. 143.

Hab.—Frequent in stagnant pools throughout Canada.

We can only determine our specimens by the length of the cells, and the number and character of the spires. Concerning the Sporangia we can say nothing from our own knowledge, but we have no doubt whatever as to the identification of the species It is a very beautiful plant under the microscope, and very distinct in its characters.

Z. ÆSTIVUM. Hass.?

" *Char.*—Filaments *very delicate.* Spire *single.* Cells *usually about four times as long as broad, but sometimes much longer and occasionally shorter.* Sporangia *oval, not producing any inflation of the cells in which they are found.*" Hass.

Hass., Brit. F. W. Alg., p. 146, pl. 28, figs. 3 and 4.

Hab.—Common in pools.

We have marked this species doubtful, because two of the characters are that the cells containing the sporangia are not inflated, and the sporangia are oval; neither of which appearances have we been able to observe or verify.

Z. CATENÆFORME. Hass.

"*Char.*—Filaments *a little finer than those of Z. malformatum Cells usually rather more than twice as long as broad. Sporangia largely inflating the cells in which they are contained, acutely oval.*" Hass.

Hass. Hist. F. W. Alg., p. 147, pl. 30, figs. 3 and 4.

Hab.—Paris, C. W., in pools.

This is the second species which has been found conjugated in Canada to our knowledge. It was collected during the last autumn, and had the appearance of age. We have represented it in fig. 6 (p. 459) as it appeared in conjugation under an object glass of 100 diameters. This species, Hassall informs us, cannot be distinguished from "*Z. commune* before conjugation. After this has occurred, the difference in the length of the cells, and the form of these is so obvious, as not to leave any doubt of its being distinct from that species." In *Z. commune* the sporangia do not, it would appear, occasion any inflation of the cells in which they are formed, whereas in this species the cells are considerably inflated, as may seem in the figure 6. It appears to us that this is a very doubtful difference. It is very questionable whether such a difference will uniformly characterise all the individuals of either species. We suspect that there is no real difference between the two, and that they are in fact one and the same plant. Berkeley remarks that "Characters like those in Hassall's F. W. Algæ, dependent simply on comparative size, are altogether inadmissible." Until, therefore, we can obtain some more thorough discrimination of the species belonging to this family; we must be satisfied with such as we have.

Besides these species named we have collected probably *Z. rivulare*, *Z. commune*, and *Z. gracile.* We have frequently observed several other—as we think—distinct species; but, in the absence of conjugation and sporangia, we have not been able to identify them with any of those described by Hassall. We hope in a future paper to enter more at large into the discrimination of the species to be found in the waters of Canada.

The species of this family are, with scarcely an exception, inhabitants of fresh water, and are probably distributed very widely over every region of the world. They have been found by Drs. Hooker and Thompson on the Southern Himalayas, and in the lower parts of India. The genus *Zygnema* ascends as high as 15,000 feet on the Himalayas. Species identical with the European are found in almost every part of the United States and Canada. South America is said to yield scarcely a trace of them, but this may be accounted for from the fact that few botanical explorers of these regions have thought the lowly Algæ worth observing. We doubt not that a diligent Algologist would reap a rich harvest of curious species in the everglades of that region, and in the waters and tributaries of its mighty rivers.

Passing over the other genera of the family CONJUGATEÆ, and also the family CYSTOSPERMEÆ, of which we have found no specimens as yet in Canada, we come to—

FAM. X.—MONOCYSTEÆ.

This family consists of three genera of fresh-water Algæ, viz., *Cladophora*, *Coleochæte*, and *Lyngbya*. In the species there is no union of the cells or intermingling of their contents; each cell contains all that is requisite for its reproduction in the way of fertilizing vesicles and zoospores. When the zoospores have been fertilized the cells swell up, until, by the increase of the size of the zoospores, the cell walls are ruptured, and the zoospores escape through the aperture thus produced. The plants of this family are for the most part attached to submerged stones or wood, and grow by the lateral and longitudinal development of their cells, and the production of new branches at the articulations.

SUB-FAM. I.—CLODOPHOREÆ.

Genus 1.—CLADOPHORA. Kütz.

" *Char.*—Filaments *attached, much branched, not setigerous, and not invested with secondary cells.*" Hass.

Derivation.—From *klados* a branch, and *phoreo* to bear.

This genus is very marked, and easily distinguished; for the most part its species are prolifically branched, and very simple in the structure of their cells.

CLADOPHORA GLOMERATA. Dillw.

" *Char.*—Filaments *tufted, bushy; somewhat bright green, shining.* Branches *crowded, irregular, erect; the ultimate ramuli secund, sub-fasiculate.* Articulations *four and eight times longer than broad.*" Hass.

Hass., Brit. F. W. Alg., p. 213, pls. 56 and 57, figs. 1 and 2; Harv. in Manual, p. 134.

Hab.—Common over the whole length of the fresh-water portion of the St. Lawrence, the Ottawa, and their tributaries.

The characters by which to distinguish the species of this articulate genus of Algæ are very slight, and require great caution in the observer so as not to multiply species without cause. A great difference in the diameter of threads belonging to the same frond will constantly be found, and the proportions of length and breadth in the articulations are quite variable. Berkeley says, in his "Introduction to Cryptogamic Botany," p. 166, that "species, evidently of the most close affinity, cannot be separated from mere consideration of relative proportion without any other characters. Even the branching of the threads is not sufficient, or the mode of branching. *Cladophora glomerata* assumes a multitude of forms which it would be rash in the extreme to separate; and it may safely be affirmed that of published species of *Cladophora* and *Conferva*, at least one-half will ultimately be reduced." There is a normal character in the forms of the cells and in the style of branching which the practised eye soon detects. But, so variable are the appearances of Cladophora, and so modified are its characters by habitat, that it is hard to divide them into species at all. Hassall, not over scrupulous as to the multiplication of species, himself admits only two into his distribution of the genus. Under *C. glomerata* he includes *C. ægagropila* (Linn.) and *C. Brownii* (Harv.), and accounts for the appearance of the former by the force of the mountain streams rolling detached portions of *C. glomerata* into compact balls; and of the latter by the submmersed habitat in which it grows. It is also with doubt that he admits his second species, *L. crispata*, to a distinct place. The three British species, *C. nigricans*, *C. fracta*, and *C. flavescens*, he refers to this one; all being, as he thinks, different states of the same plant. He concludes by saying that "The suspicion also may, I think, be entertained that *C. crispata* itself is but a condition of *C. glomerata*, changed by the difference in its place of growth—it growing for the most part in still water, in deep ponds, and lakes. I have often seen specimens which it would be impossible to refer with certainty to either species."

The fructification of this plant is very simple. Every cell seems to contain fertile zoospores. At maturity they either burst through the cell walls, or a natural apperture is formed for their escape on one side of the distal extremity of the cells. We doubt, however, whether this last apparent aperture is destined for this purpose. It is only observable in those cells from the extremities of which the second ramuli have not been developed; and the slight lateral protrusion which they exhibit is rather, we think, to be regarded as the incipient state of future branchlets than channels for the passage of zoospores. That the zoospores escape by bursting the walls of the cells is doubtless the normal form of this stage of the reproductive process. No plants are more proliferous than these. Young branches continue to spring from old stems for years, so that in running water they sometimes stretch out to several feet in length. Very fine dark green fronds, of from 6 to 12 inches long, may be obtained in autumn from the rapid currents at the railway bridge St. Lambert, Montreal. Long and beautifully green fronds clothe the edges of the rock over which the Niagara rolls. It infests the bottom of ships and boats, and assumes there a delicate and pretty appearance. It grows readily in the aquarium, and is both a beautiful specimen and a valuable aerating plant.

REVIEWS.

Canadian Ginseng: Memoire presentó à S. A. R. le Duc d'Orléans, Regent de France, concérnant la precieuse plant du Gin-sing de Tartarie; par le Père JOSEPH-FRANCOIS LAFITAU, S. J.

The name of *Ginseng*, or *Jinchen*, is given by the Chinese to the *Aralia quinquefolia* (*Panax quinquefolium*, *Linn.*), to which they ascribe marvellous tonic and restorative powers, commemorated in its name of *panax*, and also in the Chinese appellation which is said to signify "dose for immortality"; although the experience of Europeans has not justified this high reputation. It has been used for ages by the Chinese, among whom it was often sold for thrice its weight in silver. Their supply of this root was obtained exclusively from Tartary; but the père Jartoux, a Jesuit Missionary, having described and figured the plant, the père Lafitau, at that time missionary at Sault St. Louis (Caughnawaga) in 1716, discovered the Ginseng on the banks of the St. Lawrence. This discovery led to an important commerce, and the Ginseng of Canada was exported in large quantities to China; in 1752 its price at Quebec was twenty-five francs the pound, and there was shipped of it to the value of 500,000 francs.

This new source of profit excited among the colonists so much cupidity, that in their haste, they gathered the roots at wrong seasons of the year, and drying them without care, the value of the product deteriorated, and it lost favour in the Chinese market, so that in 1854 the exportation fell to 33,000 francs; and the fallen credit of the Ginseng gave rise to a proverb still known among our peasants, "*Ça tombera comme le ginseng.*" Large quantities of Ginseng are however still exported from the United States, which in 1852 furnished 158,455 pounds, valued at 102,-703 dollars; and, as the plant is still common in the Province, there is no reason why it might not again become a source of profit.

The pamphlet before us was addressed by Lafitau to the Duke of Orleans, then Regent of France, about the year 1718. It contains a curious history of the Ginseng among the Chinese, as gathered from the researches of père Jartoux and others; an account of its discovery in Canada, and a minutely detailed description of the plant, with figures. To this succeeds a learned disquisition upon the virtues of the plant, and an attempt to identify it with the *mandragora* of Theophrastus. This pamphlet had become very rare; and Mr. Hospice Verreau, Principal of the Jacques-Cartier Normal School, has had the good idea to reprint the memoir, which he has enriched with interesting notes, to which we are indebted for the above facts, prefacing it with a biographical sketch of the père Lafitau, one of those learned and zealous apostles whose labours form a noble chapter in the early history of Canada. After several years spent in this country, he returned to France about 1718, and in 1724 published a learned work, in two large volumes, with 41 plates, on the "Manners and Customs of the North American Indians," in which he endeavoured, by erudite and ingenious arguments, to prove their Pelasgic origin. He also published in 1733 a History of the Portuguese Conquests in America, in 4 vols. The Père Lafitau died about 1740. An engraving, copied from a portrait of him preserved at Sault St. Louis, forms the frontispiece to this curious and interesting pamphlet. T. S. H.

A General View of the Animal Kingdom. By Mrs. A. M. Redfield. New York: Kellog. Agent in Montreal: Mr. Telfer.

Many attempts have been made to represent the arrangement and forms of the Animal Kingdom on diagrams and charts for

Educational purposes, and all are more or less imperfect, partly because the classification in many departments is in an unsettled state, and partly because the true arrangement of the animal kingdom is probably not capable of accurate representation on a plane surface. For these reasons in the more modern zoological representations, as for instance in the admirable series of figures by Patterson, issued by the Department of Science and Art in England, the attempt to represent the classification to the eye has been abandoned; and instead, we have merely each group illustrated by an appropriate example. Mrs. Redfield, undeterred by past failures, has attempted to combine the form of the diagram with a sufficient amount of pictorial example, and has attained a very creditable measure of success. Her classification is in sufficient accordance with the views of the best naturalists for all practical purposes of instruction, and the illustrative objects are well selected and represented. The method of arrangement, likewise, has a certain degree of pictorial grace and beauty which commends it to the eye. It will be found very serviceable either for school or family instruction, more especially in giving a general view of the extent and variety of the animal kingdom.

The text-book intended to accompany the chart, is a thick volume of 700 pages, with a great number of additional illustrations, and a large amount of explanations of the classification and technical terms, and fact and anecdote. It would be easy, as in the case of all similar works, to refer to little inaccuracies; but, on the whole, we think the work an excellent one of its class, and cordially recommend it. One merit of considerable importance is, that where practicable, American examples are given, so that the teacher may often be able to refer to creatures known to the pupils.

SCIENTIFIC GLEANINGS.

TWENTY-EIGHTH MEETING OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

In our last number we reprinted the greater part of the truly excellent address of Prof. Owen as President of the Association. Our space will not admit of our giving a detailed account of the proceedings of this Congress of Science. For those who are interested in the progress of scientific enquiry in its various departments, abstracts of the papers and observations which were the subjects of discussion will be found, more or less full, in the pages of the Athenæum, or in the annual volume of the Society's Proceedings. It may, however, be interesting to general readers to have an opportunity of perusing the addresses of the Chairmen of the various sections. These are of a highly interesting and instructive kind. In a few words they indicate the progress of the past year, and the chief points to which enquiry should be directed for the future. The gentlemen selected to fill the honorable position of Chairmen of sections are all celebrated in their special departments; words from their lips may, therefore, be regarded as the last oracles from the priests of nature. Having surveyed the field from its highest elevations they speak with authority as to its character and prospects.

MATHEMATICAL AND PHYSICAL SECTION.

President—Rev. Dr. Whewell.

The President, on taking the chair, addressed the Section:—The managers of the Association have assigned a small room to this Section. I hope that no one is at present inconvenienced by this. I shall be glad if it should be found that in this respect the managers have been mistaken. But the fact is, that we are very much in the habit in this Section of treating our subjects in so sublime a manner that we thin the room very decidedly. This is true, but this is no fault of ours. We seek the laws of Nature, and Nature presents to us her laws in a form which is to many persons repulsive,—namely, a *mathematical* form. It has been truly said, both by sacred and profane writers, that all things are made by number, weight, and measure. Now things which happen by number, weight, and measure, happen according to mathematical laws, according to the relations of number and space. According to such relations the laws of various of the appearances which Nature presents to us were studied at the earliest periods of the intellectual progress of man; and if the laws detected by man on such subjects are in some respects perplexing to many from their mathematical form and complexity, and are thus repulsive, they are at least attractive in another point of view,—for the extent and brilliancy of the success which has been obtained in these fields of speculation are such as could not have been in any degree anticipated at an early period. And the truths obtained in this way at an early period of man's intellectual progress are even still of great value and interest, and are essential parts of the body of scientific truth at the present time. The astronomy of the ancient Greeks, expressed in the mathematical forms which they devised, has been an important element in the formation of that astronomy of modern times of which I have several of the eminent masters near me. And this connected progress of knowledge from ancient to modern times has been exemplified in various portions of science, and still goes on appearing in new examples. You recollect, perhaps, that a Roman philosopher, Seneca, made a remark which, though conjectural, is striking. In speaking of comets, he said, these objects now appear to follow no law, as the planets do. They appear unforeseen and unexpected, filling us with perplexity and alarm. Yet these bodies, too, he said, shall disclose their laws to astronomers in future years. Their returns will be predicted, their laws known, and our posterity will wonder that we did not discern what is so plain. And this prophecy has been fulfilled. Comets have had their returns predicted, and have fulfilled their predictions. And though this is not always the case, for comets still shine forth unpredicted and unforeseen, yet still, even in such cases, we are not quite destitute of knowledge of their law and progress; for when an unexpected stranger of this class blazes forth in our sky, as soon as he has shown himself for a few days, we can mark the path which he will follow, the rate at which he will travel, and in a great degree the appearances which he will assume. And even objects which as yet are still more lawless and perplexing to our science than comets are, still not altogether extraneous to the domain of our knowledge. There is a class of such objects which has been especially attended to by the British Association. This is the subject of the first of the communications which are to be laid before this Section to-day. I speak of Prof. Powell's "Report on Luminous Meteors." These objects, falling stars, shooting stars, fiery globes, or whatever they may be commonly called, have attracted the attention of this Association for many years; and the Report which we are to have laid before us to-day is the continuation of several Reports of the same kind prepared by the same gentleman in preceding years. These bodies, as I have said, are in a great degree irreducible to laws and extraneous to our science; yet not wholly so. We have speculations of ancient times by some of our most eminent philosophers, in which these bodies play an important part. Prof. W. Thompson has been led, by his mathematical speculations on Heat, to the conclusion, that the heat of the sun is maintained by the perpetual falling in upon his surface of the abnormal bodies moving in the solar system, which appear to us as luminous meteors and shooting stars. And he conceives that he has shown that there is in those bodies an aboundable supply to keep up the heat of the sun; and that, by the effects of them, the sun may have gone on radiating heat for thousands and thousands of years without the smallest diminution. And this, again, is the result of profound and complex mathematical calculations,—so wide is the domain of mathematical reasoning, and so necessary is it in any line of speculation in which we are to convert our ignorance into knowledge. I may mention, as a public example of this, a case which is far removed from the vastness of astronomical phenomena,—a case of the manipulation of mathematical law upon a scale of the smallest dimensions, and in the work of a humble insect. I speak of the form of the cells of bees: a mathematical problem which already attracted the attention of the ancient Greeks, and which has been the subject of mathematical investigation by several of the most eminent mathematicians of modern times,—the most eminent, for being a problem involving the properties of space of these dimensions, it requires admirable powers of mathematical conception Upon this subject two communications are promised to the present Meeting, to be laid either before this Section or the Section of Natural History. And in order further to exemplify the advantages derived from the action of the British Association, I may mention another report upon a very different subject, Mr. Cayley's "Report on the Progress of Theoretical Dynamics." The generality, multiplicity, and complexity of the recent labours of analysts in this department of mathematics have been so great that ordinary mathematicians cannot hope to follow them by reading the original memoirs; and I am greatly obliged, as one of them, to Mr. Cayley for enabling us compendiously and easily to understand what has been done and how it has been done. Perhaps, after all, his report is not so very unlike that of Prof. Powell "On Luminous Meteors,—for the original researches of the great analysts who have treated this subject, though bright and objects of wonder, are so far above our head and so difficult to understand, that they are not unlike the things tabulated in the other report. And now, having explained that we must often be necessarily difficult to follow in this Section, I must ask the ladies and gentlemen here present, as the *Spectator* has his readers, to believe that, if at any time we are very dull, we have a design in it.

(*To be continued.*)

BREEDING SKYLARKS.

(*To the Editors of the Canadian Naturalist.*)

SIR,—A correspondent in your October number remarks that: "It would tend much to increase the practical value of your "Journal, if your subscribers were from time to time to communi-"cate facts relating to any department of the Natural History "of the Province." Adopting this suggestion, I beg to note a singular incident which has occurred in Quebec, in respect to the breeding of skylarks An amateur noted for possessing the best singing larks in the city, has succeeded in rearing in captivity six or seven healthy broods of these birds. The plan he adopted is as follows: in pairing season, the birds are removed from the cages to a quiet room, the floor of which is covered with green sod; a wire blind allows free access to the air; no one except the owner is allowed access during the period of incubation. The birds although wild when in cages, become so tame in the room that the owner has in some instances even removed them with his hand from the nest without their manifesting any alarm. Their nest was so artfully concealed in the thick grass that it was impossible to notice it, unless the old bird was seen coming from it. The young birds were wholly fed on grass-hoppers, until they were a week old. Should rainy weather set in and grass-hoppers become scarce, the young brood would wither and die. Many thriving birds were lost in this manner. Some of the larks thus bred were remarkable for the sweetness of their song. This is the only instance I know of, in which skylarks have been bred in captivity in Canada. Another instance of captive European birds breeding in Canada, occurred some years ago. A pair of English blackbirds, the property of the late Wm. Patton, Esq., *Seigneur* of Montmagny, being allowed the free range of a small room, built their nest in an old boot. The young were thriving and gave much promise, when one night old and young fell victims to the voracity of a cat. Should you reserve me a small corner in your Magazine, I may send you a short notice of our Wood Thrush (Tundus Melodus), and Veery, the Tundus Wilsonii, as observed in the pine Groves of Spencer Wood. Truly may it be said that the Canadian Fauna and its agree-able songsters are comparatively unknown. Although the birds of Canada cannot compare for sweetness of song with European warblers, still many of them are highly worthy of note. Who, ever, for example, can listen unmoved to the rollicking, jingling and merry song of the Boblink, when from the bough of some magestic elm, he pours forth his morning hymn?

J. M. L.

Spencer Grange, near Quebec.
October, 1858.

INDEX.

MONTHLY METEOROLOGICAL REGISTER, SAINT MARTIN'S, ISLE JESUS, CANADA EAST, (NINE MILES WEST OF MONTREAL,) FOR THE MONTH OF AUGUST, 1858.

Latitude, 45 degrees 32 minutes North. Longitude, 73 degrees 36 minutes West. Height above the level of the Sea, 118 feet.

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

Day of Month.	Barometer corrected and reduced to 32° F. (English inches.)			Temperature of the Air. F.			Tension of Aqueous Vapour.			Humidity of the Atmosphere.		
	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	29·864	29·740	29·840	65·0	80·3	62·1	·460	·677	·498	·85	·66	·91
2	817	996	941	56·7	74·0	62·4	·420	·469	·517	·90	·57	·91
3	922	818	892	55·2	69·1	89·6	390	529	461	90	75	91
4	647	668	654	60·4	67·0	64·3	487	550	536	94	84	92
5	626	629	685	61·0	77·0	69·0	480	646	671	91	71	95
6	671	693	672	65·4	74·7	64·7	570	614	550	89	68	92
7	806	842	963	60·2	78·1	65·6	480	550	576	88	58	92
8	977	960	925	57·0	87·8	72·3	438	902	745	94	74	92
9	896	795	814	67·1	88·3	74·9	563	915	751	87	69	88
10	871	812	762	69·0	93·0	74·2	628	942	751	88	61	88
11	711	713	750	66·9	69·0	68·1	570	665	655	89	92	97
12	867	840	30·098	67·2	85·0	62·8	522	558	429	79	80	77
13	30·138	30·119	113	60·7	85·5	63·0	426	897	549	82	33	97
14	070	29·875	29·832	56·8	95·6	70·4	413	992	628	90	64	85
15	29·848	842	853	67·0	87·7	68·2	619	785	577	92	69	85
16	881	861	949	60·0	79·0	59·8	374	574	469	75	58	94
17	914	788	725	56·8	88·3	68·9	391	778	600	87	59	88
18	621	559	494	62·0	87·6	60·1	491	741	473	88	57	88
19	577	672	700	45·0	57·6	50·9	251	332	309	84	69	85
20	680	600	892	50·7	70·5	57·0	328	551	443	89	75	97
21	696	687	646	50·7	71·0	62·4	384	537	523	96	71	94
22	707	485	880	86·9	66·1	55·0	443	470	295	97	73	68
23	851	830	885	49·4	68·0	19·9	240	411	272	68	60	78
24	907	882	887	49·0	60·4	56·1	278	480	443	71	91	97
25	30·061	30·029	30·117	80·0	76·6	55·3	303	640	348	89	71	86
26	078	29·998	29·933	45·0	81·0	64·1	258	644	803	88	64	86
27	29·852	783	804	60·3	71·6	63·5	420	503	569	82	66	97
28	704	614	535	64·6	80·1	69·0	590	677	642	97	66	92
29	471	424	581	59·5	75·0	63·0	469	673	577	94	79	90
30	439	545	654	60·4	75·2	61·0	511	618	511	97	79	97
31	787	719	754	55·9	79·4	63·6	420	651	549	94	60	96

Day of Month.	Direction of Wind.			Mean Velocity in Miles per hour.			Amo'nt of Rain in inches.	Amo'nt of Snow in inches.	Weather, Clouds, Remarks, &c., &c. [A cloudy sky is represented by 10, a cloudless one 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.
1	N. N. E.	E. by N.	N. E.	2·36	1·60	0·85	....	....	Clear.	C. Str. 6.	Clear.
2	N. E. by E.	N. E. by E.	N. E. by E.	3·77	12·16	4·56	Inapp.	....	C. Str. 9.	Cirr. 4.	Clear. Aurora Borealis.
3	N. E. by E.	S. E. by E.	S. E.	1·80	1·18	0·71	0·070	....	" 6.	C. Str. 10.	Rain.
4	W. N. W.	S. by E.	S. by W.	7·17	16·76	12·23	0·860	....	Rain.	" 8. Distant Thunder.	C. Str. 6.
5	W. by S.	W.	W. S. W.	6·80	3·67	0·55	....	....	C. C. Str. 8.	Cirr. 4.	C. Str. 4.
6	N. W.	N. N. W.	S. S. W.	2·77	9·62	0·87	0·200	....	Str. 9.	C. Str. 9.	Clear.
7	S. E. by E.	W. by S.	S. E. by S.	5·45	1·08	0·95	....	....	Clear.	Clear.	Clear.
8	S. E. by E.	S. by E.	S. S. E.	0·00	1·53	0·11	....	....	C. Str. 2.	Clear.	C. Str. 8.
9	S. E. by S.	S. by E.	S. S. E.	0·00	0·08	0·10	....	....	" 8.	C. C. Str. 6.	" 10.
10	S. E.	S. E. by S.	S. E.	0·20	0·06	0·01	....	....	Str. 10.	Clear.	" 4.
11	S. E.	E. by S.	S. by E.	0·17	2·10	0·95	0·490	....	C. C. Str. 4.	Rain.	Ni. 10. Distant Thunder.
12	N. by E.	N. by E.	N. N. E.	1·65	12·20	0·70	....	....	Clear.	Clear.	Clear. Aurora Borealis.
13	N. E.	E. N. E.	E. N. E.	0·11	1·33	0·00	....	....	"	Clear.	"
14	N. E. by E.	S. E. by S.	S. E.	0·00	0·02	0·00	....	....	"	Clear.	Clear.
15	S. E.	S. S. W.	W. N. W.	0·00	0·00	0·00	Inapp.	....	C. C. Str. 9.	Cirr. 4.	C. Str. 10.
16	W.	W. S. W.	S. S. W.	1·01	0·01	0·73	....	....	Clear.	Clear.	Clear. Aurora Borealis.
17	S. S. W.	S. W.	S. S. W.	0·00	0·46	0·83	....	....	"	Clear.	Clear.
18	S. W.	S. W. by S.	W. S. W.	0·11	6·23	8·45	....	....	"	C. C. Str. 6.	C. Str. 10.
19	N. N. W.	W. by S.	W. S. W.	0·70	0·12	0·02	0·160	....	Str. 4.	" 10.	" 8.
20	S. W.	S. by E.	S. E. by E.	0·00	0·00	0·00	0·650	....	C. Str. 9.	" 6.	Ni. 10. Rain.
21	W. S. W.	W. S. W.	S. by W.	0·00	0·00	5·12	0·100	....	Rain.	" 6.	Ni. 10. Rain.
22	W.	W.	W. N. W.	0·53	7·23	7·00	0·410	....	C. Str. 10.	C. Str. 10.	C. C. Str. 9.
23	W. N. W.	W. N. W.	S. W. by W.	9·07	11·81	3·40	....	....	" 4.	" 3.	Clear.
24	W. S. W.	W. by S.	S. W. by W.	0·62	14·00	1·40	Inapp.	....	Clear.	" 4.	Str. 2.
25	N. N. E.	S. S. W.	S. by W.	0·00	0·08	0·02	....	....	Clear.	Clear.	Clear.
26	N. E. by E.	N. E. by E.	S.	0·20	1·17	1·27	....	....	Clear.	Clear.	Clear. Aurora Borealis.
27	S. E. by S.	S. E. by S.	S. E. by S.	0·78	6·21	1.30	0·076	....	C. Str. 10.	C. Str. 10.	C. Str. 10.
28	S. E. by S.	S. E. by S.	E. S. E.	0·00	0·00	0·00	....	....	" 10.	C. C. Str. 6.	Ni. 10. Rain.
29	S. W. by W.	W. S. W.	W. S. W.	0·42	4·02	3·03	1·100	....	" 10.	" 4.	C. Str. 9.
30	S. W.	S. by W.	S. E. by S.	0·00	0·00	0·00	0·101	....	Rain.	Cirr. Cum. 4.	C. Str. 9.
31	E.	E.	S. by W.	6·03	0·05	0·18	....	....	C. Str. 10.	C. Str. 6.	C. Str. 6. Aur. Bor.

REPORT FOR THE MONTH OF SEPTEMBER, 1858.

Day of Month.	Barometer			Temperature of the Air			Tension of Aqueous Vapour			Humidity of the Atmosphere		
	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	29·757	29·797	29·827	64·0	71·0	60·6	·525	·572	·511	·86	·76	·97
2	872	863	600	60·0	84·4	65·7	·450	·623	·549	·88	·55	·89
3	554	523	892	63·5	69·3	61·8	543	671	557	97	95	97
4	606	552	898	89·0	79·5	65·0	446	651	503	91	66	86
5	585	578	694	55·9	66·1	58·1	420	536	452	94	84	94
6	740	815	956	56·1	73·7	58·6	413	476	452	90	59	94
7	947	849	883	52·0	85·0	68·2	334	643	577	86	58	85
8	839	815	852	64·0	86·1	74·2	529	721	614	89	55	68
9	813	823	814	70·7	67·6	60·1	621	584	511	85	87	96
10	734	614	529	65·0	89·0	76·2	549	721	731	97	53	81
11	749	638	679	61·1	69·1	60·4	480	457	420	91	63	82
12	787	674	519	50·0	70·2	52·1	341	516	321	96	70	86
13	860	885	30·092	40·7	66·4	50·0	219	316	302	87	49	82
14	30·075	30·047	017	40·1	76·4	56·6	221	614	413	91	68	89
15	29·934	29·815	29·782	54·0	72·6	62·7	369	483	399	89	61	72
16	557	129	033	52·6	58·4	55·7	384	476	427	90	97	97
17	433	562	783	54·2	58·1	49·7	362	309	290	87	64	82
18	30·024	30·097	30·118	40·0	59·7	49·6	219	588	272	87	73	78
19	206	161	153	49·0	67·0	52·0	265	522	334	75	79	86
20	29·918	29·750	29·720	48·3	83·5	71·0	285	630	644	85	54	86
21	731	707	652	60·1	68·1	48·0	426	658	316	82	90	95
22	864	924	997	42·2	44·6	40·0	308	166	182	79	56	73
23	976	910	871	31·0	70·1	50·0	161	586	265	95	80	75
24	698	30·054	30·001	47·4	60·3	43·2	292	285	209	92	54	75
25	30·132	29·885	163	32·4	57·8	45·2	168	236	269	89	50	88
26	187	30·214	246	37·7	68·1	50·1	193	411	335	86	60	93
27	254	194	189	40·7	69·7	48·7	219	423	303	87	59	89
28	126	015	29·964	41·8	69·9	54·3	235	391	362	91	54	87
29	29·785	29·610	505	47·1	69·8	58·0	256	456	416	81	63	85
30	594	579	624	54·6	63·0	52·9	390	392	321	93	69	86

Day of Month.	Direction of Wind			Mean Velocity			Rain	Snow	Weather		
	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	S. W.	S. W.	S. W.	0·02	1·67	0·31	0·220	....	C. Str. 3.	C. Cir. 6.	C. Str. 2. Aur. Borealis.
2	S. W. by S.	S. by W.	S. by W.	0·03	0·51	0·67	....	....	Clear.	Clear.	Clear.
3	S. by W.	S. W.	S. S. W.	2·73	0·27	1·43	0·300	....	C. Str. 10.	C. Str. 10.	"
4	S. W.	S. W. by S.	S. by W.	0·22	0·86	0·90	....	....	Clear.	" 4.	C. Str. 6.
5	S. S. W.	N. W. by W.	W. by S.	0·09	6·73	3·01	0·310	....	"	" 4.	Clear. Thunder.
6	W. S. W.	N. N. W.	W. S. W.	1·73	0·20	1·86	1·201	....	"	" 6.	Clear.
7	S. W.	W. S. W.	S. W.	0·00	1·51	3·77	....	....	"	Light Cirri.	Clear. Aurora Borealis.
8	S. W.	S. W.	S. W.	7·50	0·52	6·08	....	....	"	C. Str. 4.	C. Str. 4.
9	W. S. W.	N. E. by E.	N. E. by E.	0·70	2·98	4·75	Inapp.	....	C. Str. 10.	" 8.	" 8.
10	E. S. E.	E. S. E.	S. S. E.	0·00	0·00	0·00	0·017	....	" 10.	" 4.	Clear. Lightning.
11	W. S. W.	W. S. W.	W. S. W.	0·01	2·74	1·92	0·066	....	" 3.	" 6.	C. Str. 2. Aur. Borealis.
12	W.	W.	W.	0·08	1·23	19·01	0·200	....	Rain.	C. C. Str. 4.	Str. 3. " "
13	W. by S.	W. S. W.	S. W.	0·26	0·77	0·81	....	....	Clear.	" 3.	Clear.
14	E. S. E.	S. E.	S.	0·00	0·10	0·62	....	....	"	Clear.	C. Str. 6.
15	S.	S.	S.	0·00	6·43	6·51	....	....	C. C. Str. 6.	C. Str. 4.	" 9.
16	N. E.	N. E. by E.	W. by N.	3·60	11·77	1·05	2·790	....	Ni. 10.	" 6.	" 6.
17	W. by N.	W. by N.	S. W. by W.	5·40	6·75	3·61	0·636	....	Rain.	C. C. Str. 6.	" 10.
18	W.	W.	W.	0·00	4·00	0·00	....	....	Clear.	Clear.	Clear. Aurora Borealis.
19	N. E. by N.	S. by W.	S. by W.	0·00	0·04	0·08	....	....	"	Cir. Cum. 3.	C. Str. 10.
20	S. W. by S.	W. S. W.	S. W.	3·67	2·60	1·26	....	....	"	C. C. Str. 4.	" 10. Aur. Borealis.
21	N. E. by E.	N. E. by N.	W.	8·50	4·76	5·31	0·680	....	C. Str. 10.	Rain.	Rain.
22	N. W.	N. W.	W. N. W.	1·06	0·12	0·03	Inapp.	....	Clear.	C. C. Str. 10.	Clear. Aurora Borealis.
23	W.	W. S. W.	W. S. W.	2·96	2·16	0·87	....	....	"	C. Str. 6.	C. Str. 6.
24	S. W. by W.	S. W. by W.	N. W.	2·11	1·62	0·00	Inapp.	....	C. Str. 10.	Clear.	Clear.
25	W. by S.	N. N. W.	S. S. W.	2·22	0·00	0·26	....	....	Clear.	Cirr. 3.	"
26	W. S. W.	S. S. E.	S. S. E.	0·00	0·01	0·00	....	....	C. Str. 4.	" 4.	C. Str. 2.
27	W. by S.	S. E.	S. E.	0·00	0·05	0·00	....	....	" 8.	C. Str. 2.	Clear.
28	E. by N.	S. E.	S. E. by E.	0·01	0·25	0·61	....	....	C. C. Str. 8.	" 4.	C. Str. 10.
29	S. by E.	S. S. E.	S. E. by E.	0·42	2·22	1·22	0·410	....	C. Str. 6.	" 8.	" 10. Thunder.
30	W. by S	W. by N.	N. E. by E.	0·61	2·35	0·00	....	....	" 4.	" 2.	C. Str. 10.

REMARKS FOR AUGUST, 1858.

Barometer....
- Highest, the 13th day, 30·138 inches.
- Lowest, " 29th " 29·424 "
- Monthly Mean, 29·789 inches.
- Monthly Range, 0·714 "

Thermometer...
- Highest, the 14th day, 93°7.
- Lowest, the 19th day, 38°8.
- Monthly Mean, 66°12.
- Monthly Range, 54°9.

Greatest intensity of the Sun's rays, 117°0.
Lowest point of terrestrial radiation, 37°9.
Mean of humidity, ·818.

Amount of Evaporation in inches, 2·68.
Rain fell on 14 days, amounting to 4·023 inches; it was raining 34 hours 59 minutes, and was accompanied by thunder on 5 days.
Most prevalent wind, S. E. by E. Least prevalent wind, S.
Most windy day, the 4th day; mean miles per hour, 12·05.
Least windy day, the 20th day; mean miles per hour, 0·00.
Aurora Borealis visible on 6 nights.
The Electrical state of the atmosphere has indicated moderate intensity.
Ozone was present in moderate quantity.

REMARKS FOR SEPTEMBER, 1858.

Barometer......
- Highest, the 27th day, 30·254 inches.
- Lowest, " 16th " 29·033 "
- Monthly Mean, 29·830 inches.
- Monthly Range, 1·221 "

Thermometer.
- Highest, the 10th day, 90°2.
- Lowest, " 23rd " 30°5.
- Monthly Mean, 59°13.
- Monthly Range, 59°7.

Greatest intensity of the Sun's rays, 104°1.
Lowest point of terrestrial radiation, 30°1.
Mean of humidity, ·804.
Amount of Evaporation in inches, 2·34.

Rain fell on 14 days, amounting to 5·839 inches; it was raining 43 hours 25 minutes, and was accompanied by thunder on 3 days.
Most prevalent wind, S. W. Least prevalent wind, S. E.
Most windy day, the 21st day; mean miles per hour, 6·19.
Least windy day, the 10th day; mean miles per hour, 0·00.
Aurora Borealis visible on 7 nights.
The Electrical state of the atmosphere has indicated feeble intensity.
Ozone was present in moderate quantity.
First Frost on the 14th day.
Comet first seen on the 5th September.

MONTHLY METEOROLOGICAL REGISTER, AT MONTREAL, (LATITUDE 45° 30′ N., LONGITUDE 73° 36′ W.) FOR THE MONTH OF AUGUST, 1858.

HEIGHT ABOVE THE LEVEL OF THE SEA, 57·07 FEET.

BY A. HALL, M. D.

Day of Month.	Barometer, Corrected and reduced to Fah., 32°.			Temperature of the Air.			Tension of Aqueous Vapour.			Humidity of the Atmosphere.			Direction and Velocity of Wind at hour of observation.			Mean velocity of the wind in miles per hour.	Amo'nt of Rain in Inches.	Clouds and their Proportion, in Numbers, from 0, Cloudless, to 10, perfectly Overcast.			OBSERVATIONS.
	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.		10 a. m.	7 a. m.	2 p. m.	9 p. m.	
1	29·952	29·926	29·974	60·6	71·9	64·3	·442	·455	·433	·83	·58	·73	N E 2.	E N E 1.	N E 1.	1·00	....	Cir. St. 5	Cu. 3	0 0	Meteor at 2·23 A. M., from constellation "Aquila."
2	30·053	30·051	30·063	56·0	69·2	62·9	·420	·496	·478	·94	·70	·83	Calm.	Calm.	Calm.	2·37	....	Cu. St. 10	Strat. 4	0 0	
3	069	034	29·999	66·0	78·0	60·0	·470	·310	·456	·73	·32	·88	E S E 2.	E S E 6.	Calm.	2·75	....	Cu. St. 6	Cu. St. 10	Nim. 10	Rain.
4	29·898	29·809	761	61·0	66·1	61·4	442	536	536	83	84	92	S 2.	S 1.	Calm.	2·08	0·56	Nim. 10	Nim. 10	Nim. 10	Rain. Distant lightning at night.
5	760	742	715	63·5	75·2	68·0	536	628	577	92	73	85	S W 1.	Calm.	Calm.	0·62	0·58	Cu. St. 6	Cu. 5	Cu. St. 7	
6	808	830	900	68·5	75·0	66·5	349	591	425	51	68	64	Calm.	Calm.	Calm.	0·04	....	Cu. St. 8	Cu. St. 5	Strat. 3	Rain.
7	30·030	30·038	30·097	62 7	73·8	67·4	478	363	450	83	43	67	Calm.	Calm.	Calm.	0·04	Inap.	0 0	0 0	0 0	
8	174	078	059	75·0	78·0	70·0	554	478	449	64	50	61	Calm.	Calm.	Calm.	0·00	....	0 0	0 0	Strat. 1	
9	056	29·979	000	69 0	75·0	73·0	599	666	581	85	77	72	Calm.	Calm.	Calm.	0·00	....	Cir. St. 7	0 0	Cu. St. 8	
10	29·918	884	29·871	75·0	83·0	75·0	591	520	519	68	46	60	Calm.	Ca'm.	Calm.	0·04	....	Cir. St. 8	Cir. 1	Strat. 1	
11	882	886	888	68·8	75 0	70 0	367	785	658	52	90	90	Calm.	Calm.	Calm.	0·45	....	Strat. 2	Nim. 10	Nim. 10	Rain. Distant Thunder.
12	30·041	30·100	30·187	69·0	77·2	68·2	529	422	380	75	46	56	N E 3.	N E 1.	Calm.	1·25	0·19	0 0	0 0	0 0	Auroral Light.
13	304	260	260	63·0	79·0	70·0	446	574	449	77	58	61	N E 1.	N E 1.	N E 1.	0·12	....	0 0	0 0	0 0	
14	238	150	29·984	67·0	79·8	72·6	489	677	524	75	66	66	Calm.	Calm.	Calm.	0·08	....	Cir. 2	0 0	0 0	Auroral Light.
15	29·899	29·78[illegible]	910	65 0	80·0	69·0	516	523	529	84	51	75	Calm.	W S W 1.	W S W 1.	0·75	....	Cir. Cu. 6	Cir. Cu. 8	0 0	
16	30·183	30·068	30·092	60·0	70 2	61·0	456	385	442	88	53	83	Calm.	Calm.	Calm.	0·00	....	0 0	0 0	0 0	Faint Auroral Bank.
17	104	29·992	29·884	58 8	78·9	70·0	416	501	621	85	51	85	Calm.	Calm.	Calm.	0 08	....	0 0	Cu. 3	0 0	
18	29·745	547	555	69·0	83·8	80·0	635	623	977	90	53	96	Calm.	S 2.	W S W 2.	0·95	....	0 0	Cu. 5	Nim. 10	Rain, with thunder.
19	803	851	863	55·0	59·4	55·0	362	323	321	87	65	74	N W 1.	N N W 1.	N [illegible] W 1.	0·29	0·12	Cu. 10	Cu. St. 10	Cu. St. 9	
20	853	791	777	52·8	65·4	58·5	295	359	483	73	58	100	W N W 0·5.	W S W 0·5.	W 1.	0·03	....	Cu. St. 10	Cu. St. 7	Nim. 10	Rain.
21	860	859	904	55 7	68·0	63·5	420	476	483	94	69	78	N W 0·5.	N W 0·5.	W 0·5.	0 01	0·79	Cu. St. 9	Cu. St. 10	Cu. St. 16	Rain.
22	812	758	897	55 0	64·0	55·0	295	464	321	68	77	74	W 1.	W 6.	W N W 3.	0·95	0·37	Cu. St. 10	Cu. St. 10	Cu. St. 10	Rain.
23	30·017	982	30·019	54·0	58·0	52·0	282	255	257	67	53	56	N W 1.	W N W 1.	W N W 7.	2·29	0·08	Cu. 7	Cu. 5	Cu. 3	
24	29·920	917	012	61·0	61·0	58·0	442	396	337	83	76	70	W S W 1.	W S W 1.	N W 1.	2·00	....	Cu. 5	Nim. 10	0 0	Rain. Lunar Corôna.
25	30·210	30·244	257	52·4	63·8	56 6	276	257	302	70	43	66	Calm.	Calm.	Calm.	0·00	0·05	0 0	0 0	0 0	
26	057	118	051	53·5	75·0	64 6	315	419	464	77	52	77	N W 3.	Calm.	Calm.	0·95	....	0 0	Cir. Cu. 6	0 0	
27	29·984	29·929	29·921	54·0	70·0	64·0	335	482	529	80	66	89	S 1.	S 10.	S S E 2.	3·91	....	Cu. St. 10	Cu. St. 10	Nim. 10	Rain at night.
28	829	735	647	69·0	72·0	68 3	529	631	648	75	81	95	Calm.	Calm.	Calm.	0·16	0·30	Nim. 10	Cu. St. 10	Nim. 10	Rain.
29	588	592	621	68·0	71 0	64·3	577	508	433	85	66	73	W S W 1.	W S W 1.	Calm.	0·45	0·33	Cu. St. 9	Cu. St. 9	Cu. St. 10	
30	678	713	758	60 5	67·0	63·0	480	457	478	91	69	83	Calm.	S W 1.	Calm.	0 75	0·05	Nim. 10	Cu. St. 5	Strat. 2	Rain early A.M.
31	861	858	885	55 8	67 0	63·0	363	489	510	81	75	88	Calm.	Calm.	Calm.	0·00	....	Cu. St. 10	Cir. St. 10	Cu. St. 10	

REPORT FOR THE MONTH OF SEPTEMBER, 1858.

	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.	7 a. m.	2 p. m.	9 p. m.			7 a. m.	2 p. m.	9 p. m.	
1	29·944	29·926	29·951	62 0	70·0	63 6	·533	·516	·433	·94	·70	·73	W 1.	W 1.	W 0·5.	0·29	....	Cu St. 10	Cu. St. 8	Strat. 1	Aurora, with streamers.
2	964	838	795	58·8	74 0	67·5	·439	·429	·556	·88	·51	·84	Calm.	S 0·8.	Calm.	0·08	....	Cir. 2	Cir. 2	0 0	
3	718	678	705	66·0	67·0	63·0	·570	·662	·543	·89	·100	·94	S 0·7.	S W 0·5.	S W 0·5.	0·37	....	Cu. St. 10	Nim. 10	Cu. St. 3	Rain.
4	762	718	692	69·0	71·0	65 2	497	608	48[illegible]	70	80	78	W S W 0·5.	W S W 0·5.	S W 0·5.	0 12	0·78	Nim. 10	Cir. Str. 5	Cu. St. 9	
5	659	864	804	60 2	73·8	59 5	456	641	463	88	77	79	Calm.	W S W 3.	Calm.	0·87	....	Strat. 1	Cu. 9	Strat. 2	Distant lightning in the evening.
6	954	30·016	30·148	63 0	70·0	60 3	478	516	426	83	70	82	N W 1.	W N W 1.	Calm.	0·79	0·45	Cir. St. 9	Cu. St. 8	Cu. St. 5	
7	30·189	031	29·988	57·2	75·0	69·0	407	484	496	87	56	70	S W 1.	S W 9.	Calm.	2·75	....	Cu. St. 7	Cu. St. 2	0 0	Auroral Light.
8	005	29·919	885	62 6	82 0	73·6	416	730	561	72	67	65	Calm.	W 8.	W 1.	4·25	....	Strat. 3	Strat. 1	0 0	Faint Auroral Light.
9	29·982	30·001	988	72 3	66 0	62·0	601	502	491	78	78	88	W 2.	N N W 4.	Calm.	5·79	....	Cu. St. 10	Cu. St. 10	Cu. St. 7	Rain.
10	901	29·740	612	61 0	76 0	72 5	511	722	745	97	86	95	Calm.	S E 5.	S E 4.	3·29	0·08	Nim. 10	Cir. St. 6	Strat. 1	Rain.
11	775	750	655	61 7	67 8	60 0	429	380	396	77	56	76	W 6.	W S W 1.	Calm.	2 29	0·20	Cu. St. 10	Cu. St. 9	0 0	Rain.
12	765	828	968	54·0	63·0	55·0	362	327	295	87	57	68	W 1.	Calm.	Calm.	1·79	....	Cu. St. 10	Cu. St. 8	Cu. 7	Rain. Aurora, with streamers.
13	30·222	30·192	30·257	55 0	62 0	53·0	295	256	321	68	46	80	Calm.	W N W 1.	Calm.	0 29	0·18	Cu. St. 5	Cu. St. 5	0 0	Auroral Light.
14	297	212	196	60 0	66 0	64·0	367	316	314	71	49	53	Calm.	W S W 1.	W S W 1.	1·25	....	Cu. St. 7	Strat. 1	0 0	
15	142	29 994	29·906	56 2	67 0	61·6	363	393	530	81	59	97	S 2.	Calm.	S 6.	6·95	....	Cu. St. 8	Cir. St. 6	Cu. St. 10	
16	29·526	264	232	53 0	57·8	56 0	403	474	420	100	100	94	N E 5.	N E 11.	W 2.	6 00	0·39	Nim. 10	Nim. 10	Nim. 10	Rain.
17	523	766	871	53 8	60 0	50 0	369	310	335	90	60	93	W N W 5.	W S W 15.	W N W 1.	1·87	1·00	Nim. 10	Cu. St. 8	Nim. 7	Rain in showers.
18	30·224	30 220	30·270	46·6	58·9	52 0	256	242	232	81	48	60	W S W 1.	W S W 5.	W S W 1.	1·79	0·29	Cu. St. 10	Cu. St. 8	0 0	
19	423	317	301	49 0	59 0	53 9	272	323	335	78	65	80	Calm.	E N E 3.	Calm.	0·25	....	Cir. Cu. 7	Cir. 9	Cir. Cu. 8	Solar Halo.
20	120	29·954	29 882	54 0	76 0	70 2	362	577	586	87	64	80	S W 1.	S W 7.	S W 5.	5·50	....	Cir. Strat. 1	Cir. 5	Strat. 1	
21	29·848	821	952	66 0	52·0	49 0	604	388	322	94	100	92	N E 4.	N N E 12.	N N E 1.	5·66	Inap.	Cu. St. 10	Nim. 10	Cir. St. 10	Rain, thunder, and lightning.
22	30·044	30·038	30 095	45·0	46 8	43 0	182	156	186	61	48	67	N N W 5.	N N W 3.	W 1.	1·54	0 64	Cu. 5	Cu. St. 10	0 0	
23	143	123	29 981	40 4	52·7	49 0	154	201	247	61	51	71	Calm.	W 5.	Calm.	2 45	....	0 0	Cu. 6	0 0	
24	29·844	29 928	30·152	49 0	55 0	46·0	322	218	238	92	50	77	W 1.	W 3.	N 3.	2·16	0·06	Nim. 10	Cu. St. 6	0 0	Rain.
25	30·281	30 251	261	41 3	55 0	45 0	147	295	228	57	68	76	N 2.	Calm.	W 1.	1·12	....	Strat. 1	Strat. 2	0 0	
26	331	319	355	44 7	55 9	49 0	258	263	272	88	39	78	Calm.	Calm.	Calm.	00·0	....	Cu. St. 10	Cu. 2	Cu. 4	Faint Auroral Light.
27	365	278	327	46·0	58·0	49 0	262	255	272	84	53	78	W S W 1.	Calm.	Calm.	0·04	....	Cu. 9	Cu. St. 7	0 0	
28	321	147	187	47 8	60 0	56 0	273	255	309	85	49	64	S W 1.	Calm.	Calm.	1 75	....	Cu. St. 8	Cu. St. 4	Cu. St. 10	
29	29·983	29 717	29 787	51 5	63·0	58 6	341	386	446	89	67	91	Calm.	S 3.	S 1.	1·41	....	Cir. Cu. 5	Nim. 10	Nim. 10	Rain.
30	682	755	730	57·4	63 3	53·0	429	386	219	91	67	44	W 1.	W N W 4.	W N W 12.	5·87	0 13	Strat. 1	Cu. 3	Nim. 10	Rain.

REMARKS FOR AUGUST, 1858.

Barometer ......
- Highest on the 13th day: 30·304 inches.
- Lowest " 18th " 29·517 "
- Monthly mean, 29·0564 inches.
- Monthly range, 0·757 "

Thermometer..
- Highest on the 10th day, 85°2.
- Lowest " 24th " 49°0.
- Monthly mean, 66°37.
- Monthly range, 36°2.

Warmest day was the 10th, its mean temperature being 77°66.
Coldest " " 23rd, " " " 54°66.
Greatest intensity of the sun's rays, 137°5, on the 13th day.
Mean of humidity for the month, ·7'2.
Rain fell on 13 days during 51 hours 20 minutes, amounting to 3·42 inches.

The most prevalent wind was the W. S. W.
The least prevalent wind was the E. N. E. and S. S. E.
The mean Monthly Dew Point, 56°55.
The most windy day was the 27th day, the mean velocity 3·91 miles per hour.
The most windy hour between 12 and 1 p. m. of the 27th day; the mean velocity, 14 miles per hour.
There occurred calm days on the 8th, 9th, 16th, 25th and 31st.
No record of wind from the N., N.N.E., E., S.E., or S.S W.
Cloudless days occurred on the 7th, 12th, 13th, 16th, and 25th.
The Aurora was seen on 3 nights. It was not visible on 14 nights.
C[illegible]ns in moderate proportion.

N. B. The rain and snow guages are noted each morning at 10 a. m.

REMARKS FOR SEPTEMBER, 1858.

Barometer ......
- Highest on the 19th day: 30·423 inches.
- Lowest " 16th " 29·232 "
- Monthly mean, 1·191 inches.
- Monthly range, 29·969 "

Thermometer..
- Highest on the 3rd day: 59°0.
- Lowest " 26th " 40°0.
- Monthly mean, 59°08.
- Monthly range, 49°0.

Warmest day was the 8th, its mean temp. having been 77°66.
Coldest day was the 21th, " " " 43°33.
Greatest intensity of the sun's rays, 129° on the 2d & 10th days.
Mean of humidity for the month, ·747.
Rain fell on 13 days during 60 hours 45 minutes, amounting to 4·30 inches.

The most prevalent wind was the W.
The least " " were the N.W. and E.N.E.
No record of wind from the E., E.S.E., S.S.E., or S.S.W.
No cloudless day occurred.
A calm day occurred on the 26th.
The most windy day was the 15th, the mean velocity having been 6·95 miles per hour.
The most windy hour between noon and 1 p. m. of 16th day, the actual velocity having been 18 miles per hour.
The Aurora was seen on 5 nights. It was not visible on 13 nights when it could have been seen, if existing; the remaining nights were clouded.
Ozone was in moderate ratio.

N. B. The rain and snow guages are noted each morning at 10 a. m.