* FRUITS CONSISTING OF CARPELS ONLY.

- of one carpel only
  - Legume.—*Ex.* Pea.
  - Follicle.—*Ex.* Larkspur.
  - Berry (simple).—*Ex.* Barberry.
  - Achænium.—*Ex.* Urtica.
  - Drupe.—*Ex.* Plum.
- of several or many carpels
  - distinct — any of the single ones occurring in one or more circles — cases:
    - many achænia on a hollow torus, having an urn-shaped synsepalous calyx, which finally becomes pulpy — *Ex.* Rosa.
    - many achænia on the surface of a fleshy torus — *Ex.* Strawberry.
    - many achænia, with or without an appendage derived from the styles, collected on a dry knobbed torus — *Ex.* Clematis, Potentilla
    - many small drupes united round a knobbed torus — *Ex.* Brambleberry.
    - a single circle of carpels adhering by their outer edge to the torus—the whole forming a fleshy fruit — The Pome.—*Ex.* Medlar, Apple.
    - pair of follicles — *Ex.* Asclepias.
    - numerous carpels crowded on an elongated receptacle — *Ex.* Magnolia.
    - numerous carpels separately half imbedded in a common fleshy receptacle — *Ex.* Nelumbium.
  - coherent
    - partially-forming a lobed fruit
      - epicarps generally separating at maturity: lobes of the fruit bursting asunder elastically — Regma.—*Ex.* Euphorbia, Dictamnus.
      - epicarps not separable: lobes dividing without elasticity — Dierisilis.—*Ex.* Tropæolum, Alisma.
      - two carpels each producing one seed from each side, forming four indehiscent nuts, like naked seeds: each lobe a — Nucumentum.—*Ex.* Borago, Lamium.
    - entirely or nearly so.†

† FRUITS of several or many coherent carpels entirely united, or nearly so.

- edges of the carpellary leaves only meeting, leaving the fruit one-celled, with parietal placentæ
  - fruit indehiscent: the carpels forming by their coherence a bag open at the apex — *Ex.* Reseda.
  - dehiscent
    - on the middle line of each carpel — *Ex.* Viola.
    - by pores under stigmatic rays — *Ex.* Papaver.
- edges of carpellary leaves meeting at the axis, being infolded and adherent, forming double partitions: placentæ axillary
  - adherence slight: dehiscence by separation of the carpels (Septicidal) — *Ex.* Colchicum.
  - dehiscence by circumscission — Pyxis.—*Ex.* Hyoscyamus.
  - dehiscence by the midribs of the carpellary leaves, *i.e.* vertically down the middle of each (Loculicidal) — *Ex.* Tulip.
  - dehiscence as in the last, but the valves formed by the united halves of two carpels breaking from the infolded portions which are united at the axis (Septifragal) — *Ex.* Morning Glory.
  - fruit indehiscent—pulpy—a berry — *Ex.* Solanum.
- edges of the carpellary leaves infolded to the axis, and again projecting into the cell, the placentæ forming a round or lengthened enlargement within each cell — *Ex.* Gaultheria.
- placentation *free central*, perhaps from the absorption of the parts of the carpellary leaves forming the partitions, or from the base only of each carpel producing placentæ
  - dehiscence by teeth at the apex — *Ex.* Cerastium, Primula.
  - by circumscission — Pyxis.—*Ex.* Anagallis.
- two, three, or more carpels only perfecting one seed — *Ex.* Chenopodium, Rumex.

☞ To face page 493.]

CLASSIFICATION OF FRUITS.

BY WILLIAM HINCKS, F.L.S., &c., PROFESSOR OF NATURAL HISTORY, UNIVERSITY COLLEGE, TORONTO.

FRUITS.

- multifloral or collective .... [The fruits of several or many flowers combined into a composite body.]
  - on the upper or inner surface of an expanded receptacle
    - which remains open .... *Ex*. Dorstenia.
    - which forms a nearly closed expansion lined with the numerous flowers, and finally becoming pulpy, as the contained fruits mature .... Syconus.—*Ex*. Fig.
  - formed from a spike or head of flowers; the separate fruits with their envelopes adhering together
    - each flower producing a separate pulpy fruit, without permanent envelopes. The whole united on a common axis .... Collective Berry.—*Ex*. Mulberry.
    - fruits from the separate flowers, with the exterior parts united into a composite fruit
      - seeds naked at the base of scales
        - scales pulpy .... Strobiloid Berry.—Ex. Juniper.
        - scales dry .... Strobilus.—*Ex*. Pinus.
      - seeds in carpels: exterior parts united with the carpels into a composite fruit
        - soft or pulpy .... Sorosis.—*Ex*. Bread-Fruit, Pine-Apple.
        - dry consisting of capsules or woody follicles, with their envelopes .... *Ex*. Banksia.
- unifloral (belonging to a single flower)
  - consisting of carpels with adherent exterior parts
    - calyx, as well as torus, adhering wholly or partially [fruit inferior; flowers *epigynose*]
      - woody pyxidium, with calyx adherent on the lower part, opening by a cover raised by the axis .... *Ex*. Lecythis.
      - capsule
        - dehiscent vertically, the entirely adherent calyx opening with the carpels .... *Ex*. Epilobium.
        - dehiscent near the apex of the carpels only, the adherent calyx forming a containing case .... *Ex*. Eucalyptus.
        - dehiscent by pores in each cell .... *Ex*. Campanula.
      - pulpy fruit of several coherent carpels, soft externally .... The Berry.—*Ex*. Fuchsia, Ribes.
      - pulpy fruit of several coherent carpels, with a coriaceous or woody external crust *Ex*. Pomegranate.
      - fleshy fruit of 3 carpels, with the external covering hardened .... Pepo.—*Ex*. Cucumber.
      - fruit of 2 dry single-seeded carpels, separating from below .... Cremocarp.—*Ex*. Parsley.
      - like the preceding, but not separating from below. Each portion a .... Coccus.—*Ex*. Galium.
      - single-seeded fruit, probably from 2 carpels, the limb of the adherent calyx often forming a frill or down .... Cypsela.—*Ex*. Dandelion.
    - torus only ....
      - partially adhering .... *Ex*. Tigridia.
      - totally adhering .... *Ex*. Nymphaea.
  - consisting of carpels only.*

SISTING OF CARPELS ONLY.

- of one carpel only ....
  - Legume.—*Ex*. Pea.
  - Follicle.—*Ex*. Larkspur.
  - Berry (simple).—*Ex*. Barberry.
  - Achænium.—*Ex*. Urtica.
  - Drupe.—*Ex*. Plum.
- distinct
  - any of the single ones occurring ...ses
    - many achænia on a hollow torus, having an urn-shaped synsepalous calyx, which finally becomes pulpy .... *Ex*. Rosa.
    - many achænia on the surface of a fleshy torus .... *Ex*. Strawberry.
    - many achænia, with or without an appendage derived from the styles, collected on a dry knobbed torus .... *Ex*. Clematis, Potentilla
    - many small drupes united round a knobbed torus .... *Ex*. Brambleberry

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AN ATTEMPT AT AN IMPROVED CLASSIFICATION OF FRUITS.

BY WILLIAM HINCKS, F.L.S., ETC.,
PROFESSOR OF NATURAL HISTORY, UNIVERSITY COLLEGE, TORONTO.

Read before the Canadian Institute, April 6th, 1861.

In the course of my botanical labours, both as a teacher and a student of scientific characters, I have strongly felt the importance of great accuracy in the definition of the different kinds of fruits,—in reference not to mere external marks, but to their real nature and structural constitution. My acquaintance with a very great number of botanical treatises, has not yet introduced me to any arrangement entirely satisfactory to my mind; I have, therefore, made an attempt to supply the deficiency, which I lay before the Institute as a slight contribution to practical science, which can be best appreciated by those most immediately engaged in this class of studies.

I premise that the gynœcium, the germ-producing part of the flower—like the andrœceum, the corolla, and the calyx—consists of one or more circles of similar organs, each of which is in its essential nature a leaf modified in its development, as is abundantly proved by analogical reasoning and by monstrosities. In the case of the gynœcium, each distinct organ is called a carpel (carpellum); its tip being the stigma; its elongated extremity, when present, the style; and the germs being produced in some definite relation to it, most usually along its border. Although the production of germs from the axis, as maintained by some high botanical authorities, is not antecedently very improbable, I cannot consider it as established by any good evidence, and it supposes so remarkable an anomaly in the mode of fertilization, as cannot be admitted without certain proof. Again, each carpel, according to the analogy of the leaf, has an upper and under surface, and a middle portion containing the vascular system. The under surface, which forms the external covering of the fruit, is called the epicarp; the vascular layer, the mesocarp; and the upper surface, which lines the interior of the carpel, the endocarp. The differences in the mode of development of these parts, explain the membranous, coriaceous, woody, fleshy, or pulpy character of fruits, or certain portions of them; and it thus appears why these differences are of minor importance, and may occur between fruits of the same essential structure.

The number of germs produced in a carpel depends partly on the productive tendency inherent in the species, arising from its elemental structure and vital energy; much, also, on the space afforded to it and the amount of nutriment it receives. It is common for a carpel to be single-seeded, and not uncommon for the seed so closely to fill the folded carpel that the whole passes for a naked seed. It may have two or several seeds; and in a few instances the germ-producing or placental portion of the edge of the carpel is extended and crowded with germs so as greatly to multiply the seeds. The coherence of carpels in a circle is very common, and may either be slight and partial, producing a lobed fruit, or more complete—either by the edges only of the carpels, causing a one-celled capsule with parietal placentæ, by their meeting on the axis so as to cause axillary placentæ, or by their turning inward from the axis, so that the placentæ project into the cells; and in these cases, if the substance be membranous, coriaceous, or woody, the opening may be by the separation of the carpels, by the splitting asunder of the midrib of the carpel, by separation of the external portion from the firmly united infolded parts, by the turning back of valves at the upper part, by circumscission, or by pores formed to allow of the escape of the seeds. If we add to these circumstances the various adherences of exterior parts, we have the means of explaining the nature of all known fruits. We endeavour to express the facts with as many distinct names for varieties of fruits as we have found adopted by good authorities, and can perceive to be useful, in the accompanying tabular view, which is by no means proposed as exhausting the varieties of fruits, but will at least sufficiently explain the principles upon which, I conceive, they ought to be studied.

ADDITIONAL NOTE ON THE OCCURRENCE OF FRESH WATER SHELLS IN THE UPPER DRIFT DEPOSITS OF WESTERN CANADA.

BY E. J. CHAPMAN,

PROFESSOR OF MINERALOGY AND GEOLOGY IN UNIVERSITY COLLEGE, TORONTO.

In a recent number of this Journal, I published a series of Notes on the general conditions of occurrence of the Drift deposits of Upper Canada, in which I strove to establish, more especially, the former extension and union of our great lake-waters. Amongst other facts tending to this view, I cited examples of the occurrence of fresh-water shells, identical with those of our existing lake-species, in some of the higher Drift-beds, as discovered respectively by Mr. Robert Bell of the Geological Survey of Canada, by Dr. Benjamin Workman, of Toronto, and by myself. I have now to add to the localities there cited, one of still higher interest in its bearings on this question, as it discloses, over a considerable area, an extraordinary abundance of fresh-water shells belonging to seven distinct genera. This locality was discovered and made known to me by one of my former students, Mr. A. E. Williamson, at present engaged on the Northern Railway of Canada. It lies around the Nottawasaga river, in the vicinity of the Angus Station of that railway. The shells, at least, are more abundant or best seen at this spot, but I have traced them over a distance of four miles south of Angus Station, and I have also found them to extend a mile or more in other directions. In all probability, however, they will be met with much beyond these limits, as my visit to the spot was a hurried one, and made during a day of extreme heat. They lie in fine sand, at various depths below the surface of the ground, varying, at the points examined, from about a foot to sixteen or eighteen feet, according to the surface inequalities of the district. Those at present collected comprise species of the following genera: *Unio*, *Cyclas*, *Amnicola*, *Valvata*, *Planorbis*, *Limnea*, and *Physa*. The sand in which they occur is in some places obliquely stratified, and is underlaid (apparently everywhere) by a deposit of fine sharp gravel, also in places obliquely laminated. The unios, though very fragile, are of large size and well preserved; and so abundant are they, that a cart-load might be collected from some cuttings in less than an hour.

The following species of these shells have been collected altogether: *Unio complanatus*, with apparently another species, not at present determinable; *Cyclas similis, C. dubia; Amnicola porata; Valvata tricarinata, V. piscinalis; Planorbis trivolvis, P. campanulatus, P. bicarinatus* (?); *Limnea palustris*; *Physa ancillaria.*

Around Angus Station there is a general depression of the country, but the Nottawasaga river at that spot is still about 30 feet above Georgian Bay, this latter lying at a distance of 22 or 23 miles to the north of it. The general level at which the shells occur at this locality may be taken at from 30 to 40 feet above Lake Huron, and at about 90 feet below the surface level of Lake Simcoe. The waters of this latter lake probably passed at one period from Kempenfeldt Bay into the Nottawasaga valley, and so escaped into Lake Huron by a more western channel than their present outlet at the Severn.

August 4th, 1861.

ON THE OCCURRENCE OF VANESSA CÆNIA IN CANADA WEST.

BY W. SAUNDERS, ESQ.

In May last, while on a visit to Port Stanley, I was much pleased to find in the possession of a collector there, Mr. William Edwards, two fine specimens of Vanessa Cænia which he had captured in the vicinity of the Port during the summer of 1858. No further captures of this beautiful insect were made until the present season, when, on the 30th of July, I received a note from my friend, stating that he had taken several specimens a day or two previous. On the 2nd of August I paid a visit to the spot where they occurred—which is on the railway track, about a mile from the Port. I had not been there long before one of these handsome creatures came floating past me on the wing. An exciting chase ensued. Although its flights were short, it was very difficult to approach, and always when alighting, turned to face its pursuer. After many cautious, though ineffectual attempts to take it by bringing the net suddenly down on it, it was finally made prisoner by a sudden sweep. In a short time another was seen which was taken in the same way; and in about an hour afterwards a third made its appearance, but although I did my best to capture this, I could not succeed in taking it.

They are confined, as far as I could learn, to a spot on the railway track about two or three hundred yards in length. It was there the two specimens were taken in 1858, and there they occurred again this season; nevertheless, we searched diligently for many hours in the vicinity, but failed to find one in any other place.

It is very probable that this species may occur in other localities throughout the Province, since T. Cottle, Esq., of Woodstock, is of opinion that he has seen it on the wing near his residence. It would be well for collectors to keep a sharp look out on all suspicious-looking Vanessæ, as the occurrence of this species (which is, I believe, not generally supposed to be found far north of Virginia) in different localities throughout the Upper Province would be an exceedingly interesting fact in the annals of Entomology.

For the benefit of those who may not have seen this insect or its photograph, I have added a short description of it, in order that it may be readily recognized.

General color of upper surface brown; anterior wings having a broad whitish band extending nearly from the costal to the inner margin, and enclosing near the anal angle a large black, eyelike spot, encircled by a yellowish brown iris. In some specimens, a second and very small spot is situated near the tip exterior to the band. Two smaller reddish bands bordered with black, and placed at equal distances from the body and the white band, cross the discoidal cell.

On each of the posterior wings are two conspicuous eye-spots, the under one much smaller than the upper, both encircled by a yellow iris bordered with black. Between these eye-spots and the hind margin is placed a band of red bordered externally by one or more dark marginal lines. The under surface of the wings is much paler then that of the upper, and although the markings are similar they are much less distinct.

The Caterpillar is stated by Boisduval to feed on the Linaria Canadensis. It is black and spinous, with two lateral white lines, the upper of which is marked with a row of reddish spots.*

London, C. W., August 13, 1861.

A POPULAR EXPOSITION OF THE MINERALS AND GEOLOGY OF CANADA.

(Continued from page 455.)

BY E. J. CHAPMAN,

PROFESSOR OF MINERALOGY AND GEOLOGY IN UNIVERSITY COLLEGE, TORONTO.

PART IV.

SOME REMARKS ON ORGANIC REMAINS, WITH SPECIAL REFERENCE TO CANADIAN FORMS.

Many stratified rocks, it has already been explained, contain the fossilized remains or impressions of vegetable and animal forms—vestiges of departed races of plants and animals which peopled the Earth and its waters during the epochs in which these rocks were under process of deposition. So numerous in some instances are the remains in question, that certain strata appear to be almost entirely made up of them, either in a perfect or in a fragmentary condition. The study of these fossils has a three-fold value: first, in enabling us to recognise one rock division from another, each division holding its own proper and separate forms; secondly, in elucidating obscure points in the structural and other relations of existing types; and thirdly, in shedding light upon many of the past conditions of the globe, both physical and organic. In illustration of the first of more practically useful character in connexion with these remains, it may be observed that in the great coal-bearing and all overlying

* Since writing the above, Vanessa Cœnia has been found in the townships of Ellis and Logan, about ten miles north of Stratford. From this it appears that its range is a more extensive one than I anticipated. The two places in which it has been found being some sixty miles or more apart, it is very probable that it will be met with in some spots intermediate. Since this Butterfly has undoubtedly been more prevalent than usual during the past season, it would be interesting to know to what extent it has prevailed in this section of country. I should be glad if collectors would communicate anything they know on the subject.—W. S.

strata, we do not meet with a single trace of the peculiar group of Crustaceans termed *Trilobites* (see figures and description in our next Number), although in earlier-formed or lower strata these forms occur generally, and often in great abundance. Hence, in a rock containing trilobites, no matter how similar such rock may be in aspect and mineral characters to coal-strata, we may be assured that it will be useless to bore or excavate for coal, at least with the expectation of finding great workable beds of that material, such as occur in the proper coal formation.

Some fossil remains, belonging to the most recent geological deposits, are identical with existing species; others are akin to these, without being actually identical with them; and others, again, are wholly without representatives in existing Nature. These various bodies comprise chiefly: the casts or impressions of sea-weeds, fern-fronds, and leaves of higher vegetable types, with occasional fruits and stems of trees; the remains of corals, star-fishes, and other radiated animals; the shells of mollusca; tests of crustaceans; and teeth, bones, and more or less complete skeletons of vertebrated animals. In some cases, these remains have evidently been entombed where the plants, corals, mollusks, &c., were actually living; whilst in others, they have been drifted to a greater or less distance with the sediments of which they now form part. The process of fossilization is a gradual replacement, atom by atom (as in the case of many mineral pseudomorphs), of the original organic substance of the body by mineral matter. The fossilizing agents comprise the general substance of the enclosing sediments, together with certain special substances, of which the more common include—silica, carbonate of lime, and carbonate of iron, the latter being frequently converted into peroxide of iron, and also into iron-pyrites. (See Vol. V., page 171.)

The causes which principally influence the preservation of organic bodies in the fossil slate, comprise:

1. The habitat of the plant or animal.
2. The conditions prevailing at the spot to which its remains may be brought, or at which it meets its death.
3. The inherent power of these remains to resist mechanical disintegration.
4. Their powers of resistance to chemical decomposition.
5. The nature of the rock-matters in which they may be enclosed; and the after conditions to which these matters may be subjected.

With regard to the first condition, it is abundantly evident that aquatic types are far more favourably circumstanced for preservation, than purely terrestrial forms; and littoral species, again, more so than pelagic tribes. But, allowing the body of the dead fish or floating cephalopod to be cast, uninjured, by winds and currents, on the shore, or the drowned mammal swept down to the river estuary, the co-operation of various conditions is required to ensure its preservation. Briefly—there may be no sediments under process of distribution at the spot; or the sediments may not be thrown down with sufficient rapidity to arrest decomposition; or the shore may be rocky and exposed, and mechanical destruction follow. Finally, if entombed forthwith, its calcareous parts may be dissolved out to constitute a cementing material for the surrounding mass; or subsequent metamorphic agencies may obliterate all traces of its form.

The more an organised substance approaches inorganic matter in its composition, the greater, of course, will be its capability of resisting the usual process of decay.

The following Table (drawn up chiefly from the researches of M. Hugard) shews, approximatively, the amount of inorganic matter in various animal bodies, and is thus of interest in a palæontological point of view:

Inorganic matter, 99 or more, per cent.:—Shells of Ostreæ and of some other acephalous mollusks.

Inorganic matter, 95 to 98 per cent.:—Most coral structures; shells of ordinary bivalves and gasteropods.

Inorganic matter, 90 to 95 per cent.:—Shells of ordinary cephalopods.

Inorganic matter, 60 to 70 per cent.:—Teeth of mammals, reptiles, and many fishes.

Inorganic matter, 50 to 66 per cent.:—Bones of mammals, birds, and reptiles; scales of fishes; shells of crustaceans.

Inorganic matter, 40 to 50 per cent.:—Elytra of certain insects (?).

Inorganic matter, under 5 or 6 per cent.:—Scales of reptiles; cartilage, hair, horns, and nails of mammals; feathers of birds, &c.

Fossilized Vegetable Remains:*—The fossil plants obtained from

* It will of course be understood that we are not attempting, here, an Essay on Palæontology. Our object is chiefly to convey to the uninitiated reader such an amount of information as will enable him to understand the terms of general employment in palæontological descriptions, and to obtain a proper conception of the natural relations and positions of our more common and characteristic fossil types. We have therefore sought to condense as much as possible, and to avoid all matters not immediately connected with the end in view.

the generality of Canadian rocks, are comparatively of little interest. Throughout the broad areas occupied by our Silurian strata, (as in other parts of the world,) only fucoids or seaweeds appear to occur. It is in the Devonian formations that land plants are first met with; but in Canada, with the exception of Gaspé in the extreme east of the Province, obscure traces of these forms have alone been discovered. In Western Canada, as in the case of the underlying Silurian strata, our lower Devonian beds have only yielded fucoidal types, and it is merely in the limited patches of the Chemung and Portage Group (see PART V.) that fragmentary remains and impressions of terrestrial forms occasionally occur. Long furrowed stems, several feet in length, and varying in diameter from an inch to three inches, occur in the dark bituminous shales of that formation, at Cape Ipperwash (Kettle Point,) on Lake Huron. These have been referred to *Calamites*, a genus of sub-aquatic or marsh plants of common occurrence in the coal strata, but their character is still obscure. The fossil plants of Gaspé are described in valuable papers by Dr. Dawson of Montreal, in the fifth and sixth volumes of the *Canadian Naturalist*. In fig. 64 we give a sketch of a common but still unnamed fucoid from the Trenton limestone of Belleville and other parts of Canada. Fig. 65 represents another supposed fucoid, the *Scolithus linearis* of Hall, from the Potsdam sandstone of the County of Leeds, C. W., and other districts (see PART V.) It forms, in general, cylindrical or flattened reed-like casts, varying in length from a few inches to a couple of feet, and traversing the strata across the direction of their bedding. The true nature of these casts, however, is still involved in doubt. By some palæontologists they are looked upon as resulting from holes or tubes made by sand-burrowing annelides. Finally, it may be observed that impressions of modern leaves (*Thuja, Populus, Acer, &c., &c.,*) are occasionally found in our drift clays and shell marl deposits (see PART V.)

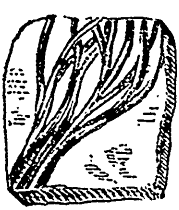

Fig. 64.

Fig. 65.

Fossilized Animal Remains:—Keeping always before us the fact that this Essay is addressed strictly to the general reader, it will be necessary, before adverting to the animal remains occurring in Canadian rocks, to pass briefly in review the classification-characters of the leading zoological groups as recognised in existing Nature. Animal organi-ms appear to be constructed after five principal types: the so-called Protozoic type, the Radiated type, the Molluscous type, the Articulated type, and Vertebrated type.

PROTOZOA stand upon the extreme and oscillating limit of the Vegetable and Animal worlds. They include a series of *Infusorial forms*, in great part of vegetable origin, *Sponges* and *Rhizopods*. RADIATED ANIMALS exhibit, at least in their typical forms, a radiated arrangement of their structural parts, as seen in the coral polyp, the sea-urchin, and the starfish. They are all aquatic, and chiefly marine. MOLLUSCOUS ANIMALS, as the name implies, are soft-bodied, and the greater part secrete an external calcareous shell, as in the oyster and the snail. In some few, however, the shell is internal, as in the cuttle-fish; and some again, as the common slug, are without a shell, or possess merely the rudiments of one. ARTICULATED ANIMALS comprise insects, crustaceans (as the lobster, crab, &c.,) and other forms with usually a distinctly jointed body, covered in many instances by a hard integument or even by a shell. Finally, VERTEBRATED ANIMALS possss an internal skeleton, of which the principal and most persistent part is the vertebral column. They include fishes, batrachians, (as newts and frogs,) reptiles, birds, and mammals.

Since the first creation of living things, representatives of each of these great types—that is to say, of the Radiated type, the Molluscous type, &c.,—probably peopled the earth in each and all of its varied periods of development; but hitherto, traces of vertebrated forms have escaped detection in the lowest fossiliferous rocks, fishes first appearing in Europe at the extreme top of the Upper Silurian deposits, and with us, in the Devonian strata.

Protozoa.—This sub-kingdom includes: INFUSORIA, SPONGES, and RHIZOPODS.

INFUSORIA.—These are microscopic organisms, for the greater part, if not wholly, of vegetable origin, although (as in the case of the well-recognized spores or earlier stages of development of many crypto-gams) possessing powers of locomotion. Recent Infusoria occur in all waters in which decomposed matters are present, and they are frequently found also in clear running streams. Some are entirely soft-bodied, but others are protected by a calcareous, siliceous, or ferruginous shell. The microscope has shewn that many bog-iron deposits, siliceous marls and tripolis are almost entirely made up of the remains of these creatures. Beds of tripoli occur at Laval and Lanoraie (Sir W. E. Logan) in the Lower Province, but their infusorial forms do not seem to have been specially examined.

SPONGES.—Modern sponges consist of a gelatinous mass, full of pores, and possessing in general the power of secreting a horny framework or kind of skeleton—the "sponge" of commerce. This horny framework is commonly strengthened by a number of sharp spines or spicula, crossing each other in various directions. The spicula are either siliceous or calcareous, according to the species. Fossil spicula often occur in flints and in infusorial deposits. Dr. Dawson has also detected them in the Drift deposits of Montreal, (see Part V.) The ancient sponges appear to have secreted a hard calcareous framework, and to have been more nearly related to corals. If we except the doubtful *Stromatopora* or *Stromatocerium*, (see under "corals," further on) our Canadian rocks do not appear to have yielded any determinate forms.

RHIZOPODS (or [illegible]ORAMINIFERA.)—The animals of this class are aquatic, and, with [illegible] exceptions, of extremely minute size. They swarm in many of [illegible] seas. Their soft gelatinous body is sometimes naked, or enclosed [illegible] a horny capsule; but more commonly it is protected by a calcareous and usually many-chambered shell, perforated for the passage of long and delicate filaments, whence the name of the class, from ρίζα, a root. The latter forms, or those possessing shells, are generally known as *Foraminifera*. The only representatives of these in Canadian Deposits occur in the Drift or Post-Pliocene accumulations of Montreal and its vicinity, where they were discovered by Professor Dawson. (See illustrations and descriptions in the Canadian Naturalist, vols. 2 and 4.) All have been recognised as identical with existing forms. Fig 66 is a greatly enlarged view of the most common species, *Polystomella umbilicatula*.

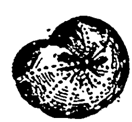

Fig. 66.

Radiated Animals.—The following Classes belong to this division: POLYPIFERA OR CORALS, ACALEPHA, and ECHINODERMATA.

CORALS.—The fossil forms of Canadian occurrence referred to this class may be conveniently arranged in two groups: *Graptolites* and *Corals proper*. The true position of the graptolites, however, is exceedingly uncertain; but the general opinion allots them a place near the Virgulariæ or sea-pens, belonging to the lower of the two great orders or divisions in which modern forms of this class are mostly arranged. It should be observed, nevertheless, that some naturalists divide the POLYPIFERA into three Orders—*Hydroida*, *Alcyonaria* and *Zoantharia* (or groups with other names synonymous with these)—and place the graptolites (with the modern *Sertularia*, &c.,) in the first order. Agassiz, again, removes this order to the class ACALEPHA.

Graptolites.—The common form of the graptolite-structure is that of a narrow band or "stipe," with a row of "teeth," *i.e.*, the mouths of cells, on one or on both sides. The teeth or serratures are pointed or even mucronate in some species, and obtuse in others. Sometimes in place of forming a narrow band, the cell-structure takes a leaf-like shape, and at other times it assumes a spiral or convolute form. Specimens have also been found, more especially in the Quebec group of rocks in the vicinity of Point Levi, in which several stipes cross each other or radiate from a common centre, around which there is a thin connecting membrane. Our ordinary examples, it is thus evident, are merely fragments of the true graptolite-structure; and as some of these occur in branching forms, of which the branches are only toothed on one side whilst the main stem is toothed on both margins, it is more than probable that the same species has been described in some instances under different names. *Being entirely confined to the Silurian strata,* the graptolites are especially interesting and valuable as geological test-forms. On this continent they are chiefly characteristic of the Lower Silurian division, (see PART V.) By some authors, the forms with serratures on each side of the stipe are described under the generic name of *Diplograpsus*; and those with serratures on one side only, under that of *Graptolithus*.

As examples of Canadian forms, we may cite at present *Graptolithus Logani*, Fig. 67. from the base of the Lower Silurian formation; *Graptolithus* (or *Diplograpsus*) *pristis*, Fig. 68, with acute or sub-mucronate serratures, from the Trenton limestone, Utica Slate, and Hudson River group of the same formation; *G.* (=*Diplograpsus*) *ramosus*, with obtuse or somewhat truncated serratures, Fig. 69, from the Utica Slate and Hudson River group (Lower Silurian); and *G. priodon*, (=*G. clintonensis*, Hall) Fig. 70, with reversed serratures, from the Clinton and Niagara group of the Upper Silurian series.

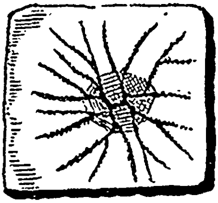

Fig. 67.

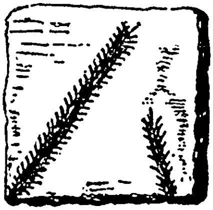

Fig. 68.

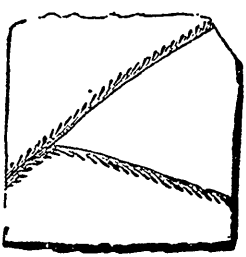

Fig. 69.

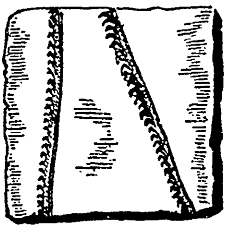

Fig. 70.

Corals proper :—The animal substance of corals consists of a soft gelatinous mass containing one or many digestive sacks or stomachs, each provided at the opening or upper part with a number of retractile tentacles. These sacks with their tentacles are technically known as "polyps." The gelatinous mass possesses likewise (in the majority of cases) the power of secreting amidst its tissues a calcareous or horny framework, the "coral" of popular language. As a general rule, this secreted solid portion consists of one or more cavities or cells, in and around which the organized fleshy sack or polyp is contained. This, however, is not always the case. Sometimes, as in the celebrated "Red Coral" of the Mediterranean, the polyp-cavity is fashioned in the midst of the gelatinous matter, without any corresponding cavities in the support. When cells occur in this support or "corallum," they exhibit either a round, oval, or polygonal opening; and, if more than one in number, they are either in juxtaposition, or connected by short transverse tubes, or by a mass of more or less porous tissue called "cœnenchyme." The cell is sometimes smooth within, but more commonly it is furnished with a number of radiating plates or lamellæ. These, in some forms, are but slightly developed, or occur only in a rudimentary condition; whilst in others they extend far into the cell, and even unite there in a central column. A central column or "axis" sometimes, however, exists by itself, and may have radiating lamellæ of its own projecting towards the circumference of the cell; but this latter modification is not observed in any of the Palæozoic types. Whether radiating lamellæ are present or not, the cell is very generally divided horizontally by a series of transverse plates or "diaphragms," either extending across the entire cell (Fig. 71, *a*, which shows three cells thus divided) or occupying the central

Fig. 71.

portion of this, whilst the sides are filled with small and more or less irregular plates, called "vesicular tissue," (Fig. 71, *b*) In the genus *Cystiphyllum*, again, the interior of the cell is entirely filled with these irregular vesicular plates (Fig. 71, *c*). Finally it may be mentioned that many corals possess an enveloping wall or sheath. This is termed an "epitheca."

The following are the more important or characteristic fossil species met with in Canadian rocks:

1. *Stromatocerium rugosum*, Fig. 72.—In this form, there are no apparent cells, but the corallum is made up of numerous concentric and wavy lamellæ. Lower Silurian: Trenton group*; more especially abundant at the lower part. This fossil is also known as *stromatopora rugosa*, and is sometimes classed as a sponge. A closely related species, *Stromatopora concentrica*, occurs in the Niagara group of the Upper Silurian series, and passes in some districts into the Devonian rocks.

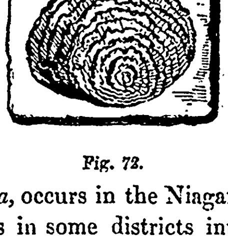

Fig. 72.

* The subordinate divisions of our Silurian and Devonian strata will be found described in full in Part V.

2. *Stenopora fibrosa* (= *Chætetes lycoperdon*) Fig. 73. This form is made up of long fibrous or acicular tubes, with numerous transverse diaphragms. These latter, however, to be properly seen, require the aid of a magnifying glass. The corallum is either globular, hemispherical, dendritic, or irregular. The dendritic forms often resemble sea-weeds, but, except in much weathered specimens, a magnifying glass will generally show their punctured surface (the openings of the cells), and their delicately fibrous structure. Very common throughout the Trenton Group, Utica Slate, and Hudson River Group of the Lower Silurian Series. Found also in the Upper Silurian rocks.

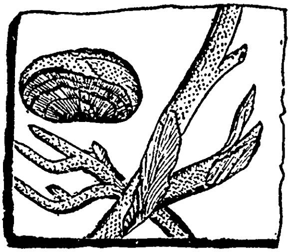

Fig. 73.

3. *Favosites Gothlandica* (= *F. Niagarensis*) Fig. 74.—The corallum in this species is properly hemispherical and sometimes of large size, but specimens are generally obtained in the form of irregular masses. These are made up of hexagonal or polygonal cell-tubes with numerous transverse diaphragms, and with pores in the cell walls. They are the "petrified honeycombs" of quarrymen, &c. Principally Upper Silurian; but found occasion- in the Lower Silurian and frequently in the Devonian Series.

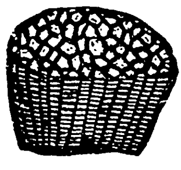

Fig 74.

4. *Michelinia convexa*, Fig. 75.—The corallum in this species consists of large but shallow polygonal cells, with convex and in part vesicular diaphragms, and pores in cell walls. Devonian strata, Canada West.

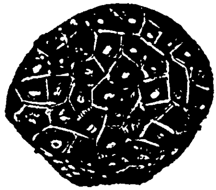

Fig. 75.

5. *Halysites catenulatus* (= *Catenipora escharoides*), fig. 76.—In this species, the well-known "chain coral," the oval cell-tubes are united in chain-like groups. There are numerous diaphragms, and some rudimentary radiating-lamellæ. Chiefly characteristic of the Clinton and Niagara group (Upper Silurian), but found also of late years in the Lower Silurian series.

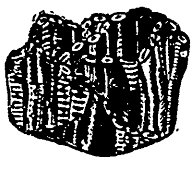

Fig. 76.

6. *Syringopora tubiporoides*, Fig. 77.—The corallum in this form consists of round, elongated, and somewhat flexuous tubes, connected by tranverse tubes of short length. Another species, *S. Hisingeri*, resembles this, but its tubes are of much smaller diameter. Both occur in the Devonian rocks of Western Canada.

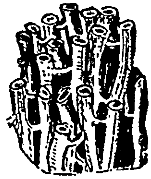
Fig. 77.

7. *Columnaria alveolata.* Fig. 78.—This species much resembles *Favosites Gothlandica*, the corallum being made up of hexagonal and polygonal cells in close juxtaposition, but the mouths of the cell-tubes are bordered by short radiating lamellæ. Numerous diaphragms are also present, but the cell-walls have no pores. Trenton group (Lower Silurian), and principally met with at the lower part of this group (= Black River limestone, see PART V.)

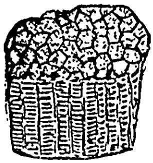
Fig. 78.

8. *Petraia cornicula* (= *Streptelasma* of Hall) Fig. 79. Corallum horn-shaped, simple, consisting of one large cell with well-developed radiating lamellæ, but without diaphragms. Trenton Group (Lower Silurian). A closely related species from the Niagara Group (Upper Silurian) has been named *P. calicula.* Another species, *P. profunda*, from the base of the Trenton Group, has a conical and nearly straight form. All of these vary in length from about half an inch to an inch and three-fourths.

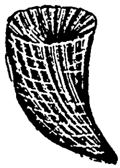
Fig. 79.

9. *Zaphrentis prolifica*, Fig. 80.—Corallum, horn-shaped, simple; with alternating large and small radiating lamellæ, and transverse diaphragms. A "septal fossette" or indentation passes down the interior of the cup on one side; and externally, the corallnm is enveloped in a thin epitheca. This is a comparatively large species, varying in length from about an inch and a half to over five inches; but a still larger species, *Z. gigantea*, is often found accompanying it. This latter form is two or three inches in diameter, and two feet

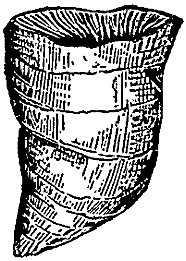
Fig. 80.

or more in length. Both occur in the Devonian series (Corniferous limestone (see PART V.) of Western Canada.

10. *Cystiphyllum Senecaense* (Billings) Fig. 81 (a fragment); Corallum horn-shaped, simple, slender, and usually curved. Interior filled with vesicular tissue. Radiating lamellæ quite rudimentary. Diameter three-fourths of an inch, to an inch and a half. Length, varying from three or four inches to two feet (Billings). Devonian rocks (corniferous limestone) of Canada West. Various other species of Cystiphyllum occur in these rocks. Amongst others, *C. aggregatum* (Billings), in groups of irregularly cylindrical tubes covered by a wrinkled epitheca.

Fig. 81.

These corals represent our most abundant and characteristic species, but numerous others occur in special localities. For information respecting many of these, the reader is referred to the Reports of Mr. Billings in the publications of the Canadian Geological Survey, and also to valuable memoirs by that palæontologist in the fourth and fifth volumes of the *Canadian Journal.* An extended analysis of these forms would not only exceed our proposed limits, but would be altogether out of place in an Essay like the present.

ACALEPHA.—Until lately, this class was held to include only a series of soft-bodied marine animals (*Medusæ,* &c.,) of which no fossil representatives have as yet been obtained. The recent researches of Professor Agassiz, however, render it very probable that the Graptolites and some of the lower forms usually classed amongst the corals may belong to this division.

ECHINODERMATA.—The echinoderms constitute a class of marine animals provided with an external test or shell, composed of many pieces, or with a tegumentary semi-calcareous skin. Some are free, and others, fixed animals. These latter are attached to the sea-bottom by a jointed calcareous stem; but in some instances the animal is only thus attached during a portion of its life, and becomes free in the adult condition. The class may be subdivided into the following Orders: 1, Crinoida; 2, Blastoida; 3, Cystidea; 4, Thyroida; 5, Asterida; 6, Ophiurida; 7, Euryalida; 8, Echinida; 9, Holothurida.

1. *Crinoida.*—In the majority of fossil crinoids or encrinites ("sea-lilies"), the general form consists of a body or digestive sack, covered by calcareous plates, and furnished at its upper part with a series of jointed arms or tentacles, and at its lower part with a jointed and perforated stem (composed of numerous round or pentagonal plates) by which it was attached to the sea-bottom: see fig. 82 This Order is of great palæontological interest. In the seas of the Palæozoic and Mesozoic periods, its representatives swarmed in vast numbers; whilst but few forms belonging to it have been obtained from Tertiary rocks (see the Table of Formations on page 453 above); and in existing seas the order is almost extinct, two or three species alone remaining to represent it. The best known of these is the *Pentacrinus caput-Medusæ* of the West Indian seas. A small species of *Comatula* exists also in the Irish Channel, and of late years has been carefully studied. This form is fixed by a stem in the early condition, and afterwards becomes free. The fixed stage was originally thought to be permanent, and the species was known as *Pentacrinus Europæus.* The genus *Marsupites,* of the Cretaceous rocks, was also a free form, during a portion, if not during the entire period, of its life.

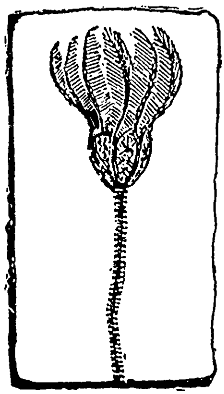

Fig. 82.

The cup-shaped body of the crinoid animal is technically termed the "calyx." It is enclosed by numerous polygonal plates, arranged, for each genus, in definite order. The plates in a row immediately above the stem are commonly known as "basals." These are usually three or five in number. The next series, absent, however, in many genera, are called sub-radials, and the next, supporting the base of the arms, are known as "radials." The radials always range in five vertical rows, each row being made up of one or several plates, between which occur other plates, termed inter-radials and anal plates. The upper part of the calyx is covered (in most genera) by numerous small and irregular plates, termed, collectively, the "vault." The vault-plates are sometimes prolonged into a so-called "trunk," the office of which is still undetermined. In some species the vault has two openings, in others only one.

Numerous stem-fragments of crinoids occur throughout our Silurian and Devonian rocks, but entire or even tolerably perfect forms are exceedingly rare. As the character of the stem differs frequently in the same species, and in different parts even of its own length, and is more or less alike again in different species, these fragments can only be described as "crinoid stems." Fig. 83 represents a piece of arenaceous shale, from below the Drift clay of Toronto, covered with portions of crinoid stems, some being seen in transverse sections, whilst others are shewn longitudinally. This shale belongs to the Hudson River Group of the Lower Silurian Series (see PART V.)

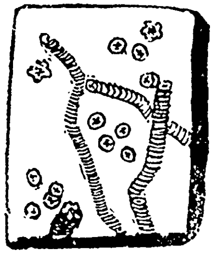

Fig. 83.

Owing to this fragmentary condition of our Canadian examples generally, and to the great rarity of perfect or determinable forms, it is unnecessary in an essay like the present (and would indeed be useless where we are obliged to restrict the number of our engravings) to attempt descriptions of genera and species. The crinoids of our Lower Silurian strata will be found described in great detail by Mr. Billings, in the fourth Decade of "Canadian Organic Remains."* Of the species met with in our other formations, no complete record has yet been published.

2. *Blastoida.*—The forms placed in this Order have been separated of late years from the Crinoids proper. They present an oval or globular body, (the calyx) composed of several series of plates, and having at the summit five "ambulacral areas" or rays, in the shape of a star, furrowed down the centre of each ray, and striated across. These are thought to have supported delicate tentacles, but no arms have been discovered. The body was fixed to the sea-bottom by a short, jointed stem. The order contains but few genera. The genus

* In further illustration of the inutility of entering into descriptions of these forms in the present place, it may be observed that, of several species described and figured by Mr. Billings, only single specimens are known. We have therefore thought it advisable to restrict, for the greater part, our limited number of engravings to representations of characteristic or commonly-occurring corals, brachiopods, lamellibranchiates, gasteropods, cephalopods, and trilobites.

Pentremites (fig. 84) is the principal. It is chiefly characteristic of the Devonian and Carboniferous formations. A closely related form—separated generically under the name of Blastoidocrinus*—has been described by Mr. Billings from the Chazy limestone of the Trenton Group, a member of the Lower Silurian series, (Canadian Organic Remains: Decade IV.)

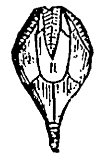

Fig. 84.

3. *Cystidea.*—The representatives of this Order are more or less closely allied to the crinoids. The cystideans possessed a globular or oval body attached to the sea-bottom by a short stem. The body was covered by polygonal plates, which in some genera were arranged in definite order, and in others, irregularly. Arms were either rudimentary or altogether wanting. The body openings were three in number, comprising (according to the more general view) an oral, anal, and ovarian aperture. The latter (or according to some palæontologists, the oral orifice) was surrounded by five or more triangular plates, forming a kind of pyramid. In addition to these openings, most genera exhibit a series of pores, either distributed irregularly over the body-plates or collected into lozenge-shaped areas termed "pectinated rhombs," see Fig. 85 (= *Glyptocystites Logani*, Billings).

Fig. 85.

The cystideans were limited entirely to the Silurian period. Not a trace of this Order is found in the rocks of any succeeding epoch. Various species, but mostly in a very fragmentary state, occur in our Canadian strata. These are illustrated and described by Mr. Billings in Decade III. of *Canadian Organic Remains.* The following is an analysis of the leading forms, extracted from a review, by the writer of this Essay, in the Fourth Volume of the *Canadian Journal* (*New S.e*

"With regard to the Lower Silurian species of Canadian cystideæ, Mr. Billings describes nineteen new forms, belonging to his genera, Pleurocystites, Glypto-

* *Pentremites* exhibits three series of plates (exclusive of the Ambulacroid series): Basals Radials, and Inter-radials, the latter resting upon the radials in alternate position. The radials are comparatively large, the inter-radials small, so that the ambulacroids extend nto the former. In *Blastoidocrinus* the reverse of this takes place. The inter-radials are large, and the mbulacroids do not extend below them.

cystites, Comarocystites, Amygdalocystites, Malocystites, Palæocystites, and Ateleocystites. The genus Pleurocystites is a very remarkable one. It is chiefly characterised by the dissimilar structure of the two sides of the body; a series of comparatively large plates covering the dorsal side, whilst the ventral side consists of an open space protected by an integument covered with numerous small plates. The genus, with us, appears to range from the Chazy to the Hudson River group; and geographically from Canada to Wales and Bohemia (Caradoc group and Barrande's *étage D.*) Six species are enumerated: *P. squamosus* (plates plane or slightly concave; pectinated rhombs, with obtuse angle above); *P. robustus?* (plates concave); *P. filitextus* (pectinated rhombs with acute angle above; plates on ventral side fewer and larger than in *P. squamosus*); *P. elegans; P. exornatus;* and *P. Anticostiensis* (plates probably smooth). *P. elegans* and *P. ornatus* may perhaps prove eventually to be mere varieties of *P. filitextus.* The genus Glyptocystites is characterised chiefly by its cylindrical body, enclosed in four series of plates (= 4 basal + 5 + 5 + 5) some with re-entering angles; and by the presence of *ten or more* pectinated rhombs, a strikingly peculiar character. It ranges from the Chazy to the Trenton group, and comprises the following species: *G. multiporus* (arms 4+ 1, extending down the sides of the body); *G. Logani* (plates with stellar ridges, arms not developed: Trenton): *G. gracilis; G. Forbesi* (plates large and strong, with numerous ridges and striæ: Chazy). Of the genus Comarocystites only one species, *C. punctatus*, has been recognised. It occurs in the Trenton group, and may be readily distinguished by its deeply-concave plates. The basal plates are three in number, succeeded by from eight to eleven irregular rows; the mouth is provided with a valvular apparatus, and there are *free arms.* The genus Amygdalocystites possesses the same plate-formula as Comarocystites, and the mouth is also furnished with a valvular apparatus; but, in addition to other distinguishing characters, the arms are recumbent, and composed of a double in place of a single series of joints. Three species are enumerated. One of these, however, may belong to a distinct genus, and the other two may perhaps be united. They comprise: *A. florealis, A. tenuistriatus* (?), and *A. radiatus.* In both Comarocystites and Amygdalocystites the plates are without pores, at least on the unworn external surface. The genus Malocystites has likewise an indefinite number of non-poriferous plates.* The arms are recumbent, and the mouth is nearly at the apex of the cup. Two species are described: *M. Murchisoni*, with eight long and winding arms, and *M. Barrandi*, with two short arms. In the genus named Palæocystites, the plates are numerous and also poriferous, or rather crypto-poriferous, as the pores do not extend directly to the outer surface, but communicate with the interior through the sutures, on the edges of which they open. Nothing is known respecting the arms, orifices, and stem. Three species are enumerated: *P. tenuiradiatus*,† *P. Dawsoni*, and *P. Chapmani*,

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* As subsequently shown, however, by Mr. Billings, the pores in Comarocystites appear to open out on the sides of the plates at the sutures, as in the genus Palæocystites. May not this be the case, also, with regard to Cryptocrinus (Von Buch), and the other so-called non-poriferous types?

† This is the *Actinocrinus tenuiradiatus* of Hall. The other species appertaining to the different genera enumerated in the text, belong entirely to Mr. Billings.

but their specific characters are necessarily somewhat obscure. Finally, in the genus Ateleocystites, a single species, *A. Huxleyi*, is mentioned. The calyx in this form appears to have, as in Pleurocystites, a dorsal side made up of comparatively few plates, with numerous small plates on the ventral side. In other respects, however, the genus is a very peculiar one, and perhaps referable to a distinct group."

4. *Thyroida.*—This Order is represented by a single genus, *Agelacrinites:* a peculiar type, connecting the cystideans with the star-fishes. It presents a somewhat flat, circular form with a five-rayed ambulacral star at the upper part, composed each of two series of interlocking plates, with the intermediate spaces covered by numerous scale-like imbricating plates, arranged more or less irregularly. The rays in some species are long and curved, and in others straight and short. Between two of these rays there is a circular opening, covered by five or ten triangular plates in the form of a "pyramid," as in the cystideans. The species range from the Lower Silurian to the Carboniferous formations. Figure 86 represents *Agelacrinites Billingsii* of the Trenton limestone (Lower Silurian). Other species from the same formation, *A. Dicksoni* and *A.* (*Edrioaster*) *Bigsbyi*, have long curved rays. (Decade III. "Canadian Organic Remains." See also for a more complete description of A. Billingsii, a paper by the writer in the *Canadian Journal*, Vol. V., p. 350, and in the *Annals of Natural History*, August, 1860.)

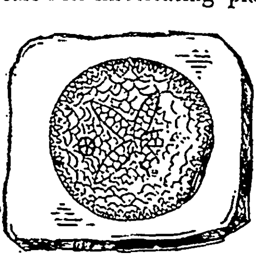

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Fig. 86.

5. *Asterida.*—This Order includes the greater number of the so-called star-fishes. The body is covered by a thick skin, strengthened by plates and tubercles of carbonate of lime. There is no stem, and the mouth is always on the underside of the body, in the centre of the arms or rays. These are five or more in number. The visceral cavity or stomach extends into them. Species occur in all formations from the Lower Silurian upwards, but the Order appears to be more numerous in existing seas than in the waters of any former epoch. In the Third Decade of Canadian Organic Remains, Mr. Billings describes several species from the Lower Silurian rocks. These are placed under the following genera, but specimens, it should be observed, are of rare occurrence, and the characters of those obtained are still more or less obscure.

Palasterina.—Five rays, with intermediate connecting area.
P. stellata, more or less regularly pentagonal.
P. rugosa, dorsal plates in part stelliform (ventral aspect unknown.)
Petraster.—Connecting area very slightly developed. Large marginal plates. *P. rigidus*, (characters imperfectly known.)
Stenaster.—No connecting area. Rays without spines or overlapping plates. *S. Salteri*, rays comparatively broad.
S. pulchellus, rays long and narrow.
Tæniaster.—No connecting area. Rays narrow, covered in part with spines, and with their outer, or adambulacral, plates partly overlapping. *T. spinosus; T. cylindricus.* (The latter of these is apparently the larger and more robust species of the two, but otherwise the characters are much alike).

In addition to these forms, small and more or less imperfect specimens of Asterida, probably referable to Hall's genus Palæaster, are occasionally obtained from the Niagara limestone of the Upper Silurian Series.

6. *Ophiurida*.—The star-fishes of this Order differ from the Asterida proper, in having their arms or rays quite distinct from the central visceral-cavity. With the exception of a doubtful fragment from the eastern Post-Tertiary deposits (see *Part V.*), no examples have as yet been noticed in Canadian rocks.

7. *Euryalida*.—In this Order, the arms and stomach are also distinct, but the body is only partially covered by calcareous plates. No fossil representatives.*

8. *Echinida*.—This is an important Order, but fossil representatives, are all but unknown below the Mesozoic rocks, and none (with the exception of a modern form in the Post-Tertiaries of Beauport, see Part V.) are of Canadian occurrence. The echinids, of which the modern "sea-egg" or "sea-urchin" may be taken as a type, have no arms. The body is hemispherical, oval, cordiform, &c., and covered by a calcareous test or shell, composed of polygonal plates joined at their edges. Some of these plates, in radiating areas termed "ambulacra," are perforated for the passage of retractile respiratory tubes. The test, moreover, is covered by moveable calcareous spines (which fall off after the death of the animal); and it has always two openings, one of which, the mouth, is invariably situated on the under side of the body. In existing seas these forms are exceedingly abundant, and they appear to have been equally numerous in the seas of the Cainozoic and Mesozoic ages (see Table of Formations, page 453, above).

* The *Protaster* of E. Forbes is now referred to the Ophiurida.

In the Palæozoic deposits, on the other hand, only three or four genera have been met with, and examples of these are rare. As already remarked, our Canadian rocks of this age have not yet offered any representatives of the Order.

9. *Holothurida.*—This Order comprises various more or less soft-bodied marine animals, of which the Holothuria or "sea-cucumber" may be taken as a type. Fossil representatives are of exceedingly doubtful occurrence. None belong to Canadian rocks.

This concludes our rapid sketch of the sub-kingdoms PROTOZOA and RADIATA. The MOLLUSCA and other types will come under review in our next Number.

OBSERVATIONS ON THE EXISTENCE OF VARIOUS MOLLUSKS AND ZOOPHYTES AT GREAT SEA DEPTHS.

BY M. MILNE EDWARDS.

(*Translated from the Comptes Rendus of July* 15, 1861.)

A more accurate knowledge of the depths assigned by Nature to the various species which inhabit the sea, has been rendered especially desirable by the bathymetrical researches of the late Edward Forbes and other observers, and also by the relations which appear to obtain between the existing and geological distribution of marine animals. I have therefore eagerly availed myself of all opportunities which seemed favorable for the prosecution of this class of observations.

M. Valenciennes has kindly presented me with several shells possessing much interest from the remarkable depths at which they were obtained. One of these is the *Voluta Junonia* (Sch.) found by Capt. B. Letourneur in the Gulf of Mexico at a depth of about 130 metres [=426½ feet]. Another belongs to *Lima excavata*, dredged by M. Hoeg at 487 metres [=1597·8 feet] off the coast of Greenland. This latter station much exceeds the lowest zone hitherto assigned to the habitations of marine mollusks, but other facts which I am about to describe, have proved the existence of these forms, and also of corals, at still greater depths.

The telegraphic communication between the island of Sardinia and the coast of Algeria having been interrupted, it became necessary to raise the cable, in order to examine the alterations to which this had been subjected. In carrying out this operation, the engineers made a careful study of the configuration of the sea-floor on which the cable rested, and determined with great accuracy, from point to point, the various depths at which it lay. In addition to this, and in order to obtain a further insight into all the circumstances which might have affected this sub-marine conductor, the foreign bodies found attached to it in different places were carefully preserved. Thanks to the kindness of M. Mangon (*Professeur à l'école des Ponts et Chaussées*), I have been enabled to examine several pieces of the cable; and I have thus had it in my power to ascertain some new facts with regard to the existence of certain animal species at depths in which it is usually considered impossible for animals to live.

A wide sub-marine valley, at a depth of between 2,000 and 3,000 metres [roughly, from 6,000 to 10,000 feet], extends from the island of Sardinia to the coast of Algiers. Between Bône and Cagliari the cable lay in this depression; and it had remained there about two years when the engineers commenced their operations upon it. In attempting to raise the cable, it broke, and a portion only was recovered. This was brought up from a depth of from 2,000 to 2,800 metres [=6561·8 to 9186·5 feet], and detached pieces were submitted to my examination. Amongst the foreign bodies which adhered to it, I found several corals and various mollusks, all living when first withdrawn from the water. One of the mollusks was a species of oyster, (*Ostrea cochlear*), a species which occurs abundantly in many parts of the Mediterranean, and which is known to be a deep sea form, as it is frequently found in the dredges of the coral fishermen, whose operations are generally carried on at a depth of 100 or 150 metres [=328 to 492 feet]. In the case observed, the animal was evidently attached to the cable when quite young, since its lower valve, measuring two and a half inches across, was completely moulded on the surface of the rope, and so curved as to embrace about half the circumference of this. To another part of the cable was also attached, though less firmly, a small species of Pecten, *P. opercularis* (var. *Audouini*), common enough in the Mediterranean. I obtained, likewise, another species of that genus, *P. Testæ*, an exceedingly rare form. Its valves are covered with fine and delicately reticulated striæ. M. Filippi alludes to the species as being only met with at great depths, that is to say, from 50 to 60 metres (164 to 197 feet). Associated with these three acephalous mollusks, were two gasteropods belonging to species of rare occurrence in localities usually explored by zoologists. One is the *Monodonta limbata;* the other, *Fusus lamellosus.* The shell of this latter, characterised by the fine striæ which traverse the whorls, was in a perfectly fresh condition, and contained, equally with the *monodonta,* the soft parts of the animal. These mollusks, it is therefore evident, were living at the spot from which they were obtained.

The corals living at these great depths offer still more interest. Those procured, number fourteen examples, belonging to three species of the Turbinolidæ. One does not appear to me to differ in any respect from the *Caryophyllia arcuata,* a very rare species, met with in the fossil state in the Upper Tertiary deposits of Castel Arquato, Piedmont, and which occurs likewise at Messina. Another species of the same genus, closely related to *C. clavus* but which is yet distinct, and so may be designated as *C. electrica,* seems to be much more abundant in the sub-marine valley in which the cable reposed, since I found ten individuals attached to the wire and bearing evident marks of having been developed upon this. I should add that this small species appears to be identical with a fossil coral of the Pliocene subdivision, discovered by M. Deshayes at Donera in Algeria. I am not able to refer to any established genus a third form of the Turbinolidæ, which was also attached to the same portion of the cable. This little coral, about one centimetre in length, does not exhibit the central axis of the *Caryophylliæ.* It seems to occupy an intermediate position between the genera *Ceratotrochus* and *Sphenotrochus.* I propose for it the name of *Thalassiotrochus telegraphicus,* to recall at one and the same time, its zoological affinities, its open-sea habitat, and the circumstances which led to its discovery. Finally, I should observe that to the same portion of the cable was attached a little branch of Bryozoons of the genns *Salicornaria* (*S. Farciminiodes*) ; and also several *Gorgonidæ,* and two species of *Serpulæ.* The calcareous tubes of the latter were of some size, and soldered to the wire along a considerable length. The serpulæ of the Mediterranean are too imperfectly known, however, to allow these annelids to be specifically determined, but I believe they may be referred to two distinct species.

We thus perceive that at the bottom of a part of the Mediterranean, with a sea-depth varying between 2,000 and 2,800 metres [=6561·8 to 9186·5 feet], a considerable number of animals, of completely sedentary habits, are actually living. Most of these, moreover, belong to species of reputed rarity; and some have hitherto escaped the observation of zoologists. It is likewise to be remarked that several of these forms do not appear to differ from certain fossil species, the remains of which are imbedded in the Upper Tertiary deposits that occur on opposite sides of the same basin. These results, it is thought, are not altogether devoid of interest, whether regarded geologically or in a zoological point of view; and they lead us to expect that a more complete exploration of the depths of the sea will bring to light the existence of other species supposed to be extinct because found hitherto only in the fossil state. Physiologists will perhaps, also, think the fact worth recording, that animals, as highly organised as gasteropodous mollusca, are able to live under a pressure of more than two hundred atmospheres, and at depths to which no notable quantity of light can possibly penetrate. E. J. C.

ON GREAT FLUCTUATIONS OF TEMPERATURE IN THE ARCTIC WINTER.

BY J. J. MURPHY, ESQ.

(*From the Proceedings of the Royal Society, June* 7, 1861.)

It might be expected that the climate of the Arctic Regions during winter, in the absence of the sun, must be almost a dead level of intense cold; but so far is this from being the case, that there is no other place and time where such great and rapid fluctuations of temperature have been observed.

This phenomenon is thus mentioned in the appendix to Wrangell's account of his expedition to the Siberian coasts of the Polar Sea:—

"Sometimes in the middle of winter a wind from the S.E. by E. causes the temperature to rise suddenly from $-24°$ to $+25°$, or even $+32°$; previously to this, the barometer sinks as much as four-tenths of an inch in the course of eight hours. The S.S.E. wind has no particular influence either on the barometer or thermometer."

In "The Search for Sir John Franklin," published in No. 1 of the *Cornhill Magazine*, occurs the following notice of the same phenomenon. The *Fox* was beset by vast fields of ice somewhere in Baffin's Bay :—

"December 28. During Divine Service yesterday the wind increased, and towards the afternoon we had a gale from the north-westward, attended with an unusual rise of temperature; to-day the gale continues, with a warm wind from the N.N.W.

"The Danish settlers at Upernavik, in North Greenland, are at times startled by a similar sudden rise of temperature. During the depth of winter, when all nature has long been frozen, and the sound of falling water has long been forgotten, rain will fall in torrents; and as rain in such a climate is attended with every discomfort, this is looked upon as a most unwelcome phenomenon. It is called the *warm south-east wind.* Now, if the Greenlanders at Upernavik are astonished at a warm south-east wind, how much rather must the seamen, frozen up in the pack, be astonished at a warm north-west wind! Various theories have been started to account for this phenomenon; but it appears most probable that a rotary gale passes over the place, and that the rise of temperature is due to the direction from which the whole mass of air may come, viz., from the southward, and not to the direction of the wind at the time."

The cause here assigned appears to me quite insufficient: the rise of the thermometer that we have to account for sometimes amounts to 70° or 80°, which is equal to the difference between very warm summer weather and very hard frost in our climate; and it is unexampled, and I think inconceivable, that any motion of a mass of air from warmer latitudes should produce so great an effect on the temperature; certainly the cyclones that come from the West Indian Seas and pass over our islands have no effect in the slightest degree approaching to it.

What I regard as the true cause of the phenomenon is suggested, though not distinctly pointed out, in Dr. Kane's Narrative, from which I will make a few extracts :—

"January 29. A dark water sky extended in a wedge from Littleton to a point north of the Cape. Everywhere else the firmament was obscured by mist. The height of the barometer continued as we left it at the brig, and our own sensations of warmth convinced us that we were about to have a snow-storm. * * * We were barely housed before the storm broke upon us. Here, completely excluded from the knowledge of things without, we passed many miserable hours. We could keep no note of time, and, except by the whirring of the drift against the roof of our kennel, had no information of the state of the weather. * * * We then turned in to sleep again, no longer heedful of the storm, for it had buried us deep in with the snow. But in the meantime, although the storm continued, the temperatures underwent an extraordinary change. I was awakened by the dropping of water from the roof above me; and upon turning back my sleeping bag, found it saturated by the melting of its previously condensed hoar-frost. My eider-down was like a wet swab. I afterwards found that the phenomenon of the warm south-east wind had come unexpectedly upon us. The thermometers at the brig indicated +26°, and, closer as we were to the water, the weather was probably above the freezing-point. When we left the brig—how long before it was we did not know—the temperature was − 44°. It had risen at least seventy degrees. * * * In the morning—that is to say, when the combined light of the noon-day dawn and the circumpolar moon permitted our escape—I found, by comparing the time as indicated by the Great Bear with the increased altitude of the moon, that we had been pent up for nearly two days."

It appears from these extracts, that although Dr. Kane did not see open water, he was made aware of its neighbourhood by the infallible sign of a "Water Sky." A rise of temperature to a few degrees above frost would be quite insufficient to produce open water by melting through the fields of ice in forty-eight hours; but, on the other hand, the breaking up of the fields of ice by a storm is an adequate cause for a great rise of temperature; for the water immediately below the ice is at the temperature of sea-water at its freezing-point, which is +28°; so that when a storm comes and breaks up the ice, the water comes into contact with air 70° or 80° colder, and warms the air.

There is no doubt of the power of a storm to break up the ice. Sir James Ross speaks of "the almost magical power of the sea in breaking up land-ice or extensive floes of from twenty to thirty feet thick, which have, in a few minutes after the swell reached them, been broken up into small fragments by the power of the waves." The theory that these sudden rises of temperature are caused by storms breaking up the ice and exposing the comparatively warm water below, also harmonizes with the fact that the warm winds, as mentioned by the officer of the *Fox*, in different parts of Baffin's Bay come from different points of the compass; while on the same coast they come from the same point. Thus Wrangell, as quoted above, mentions that in the part of the Siberian coast which he explored, a S.E. by E. wind sometimes raises the thermometer upwards of fifty degrees, while a S.S.E. wind has no effect on the temperature at all. This proves that the rise of temperature cannot be due to the transport of a mass of warm air; but it may be easily accounted for by supposing that the form of the coast enables the warmth-producing wind to act at a special advantage in breaking up or driving away the ice, and liberating the heat of the waters.

These extraordinary fluctuations of temperature appear to be common to the whole of the Arctic regions. Sir John Richardson, in his recent work on the Polar regions, states that "in Arctic America the phenomenon of warm winds (*teplot weter* of Wrangell) also occurs, and makes the month in which they happen, whether December, January, or February, warmer than the other two. The same warm wind was probably the cause of the rain which the Russian sailors observed in Spitzbergen in the month of January."

Rain implies a temperature several degrees above +28°, which is the temperature of the stratum of sea-water immediately below the ice. But we know that in the Polar regions the temperature of the sea increases in descending, until a stratum is reached of the invariable temperature of +39°; and we may suppose that in these storms the warmer water of the deeper strata is brought to the surface, and warms the air sufficiently to admit of rain. We know that powerful winds are able to produce temporary local currents, and it is easy to see that such a current when produced in a limited space free of ice, will give rise to this kind of *vertical circulation*, or interchange between strata of different depths.

Such storms as these must be eminently favourable to the production of rain; for the air that becomes warmed by contact with the comparatively warm water will, of course, take up watery vapour, and when it comes into contact with other masses of air that retain their usual intense cold, the vapour will be rapidly condensed; so that we cannot wonder at heavy rains being a general concomitant of these storms.

Wrangell, in the passages I have quoted, says the warm wind in

Siberia is preceded by a fall of the barometer. Dr. Kane, on the contrary, noticed a rise before the storm above described; it stood at "the extraordinary height of 30·85." I cannot suggest any explanation of these facts.

I believe I have now stated the true cause of what is certainly a very remarkable phenomenon—fluctuations of temperature of enormous magnitude, occurring in a very short time, and in the absence of the sun.

SCIENTIFIC AND LITERARY NOTES.

GEOLOGY AND MINERALOGY.

UNITY OF GEOLOGICAL PHENOMENA IN THE PLANETARY SYSTEM OF THE SUN. BY L. SÆMANN.

M. Louis Sæmann, of Paris, has sent us a somewhat remarkable memoir under the above title, (Sur l'unité des phénomènes géologiques du système planetaire du soleil), reprinted from a recent Bulletin of the Geological Society of France. In this communication, after bringing forward the generally received views in favour of the common origin of our sun and its planetary masses, and their analogous chemical composition under different states of condensation, the author discusses in detail the peculiar condition of the moon, as apparently hostile to his theory. The absence of water and of an enveloping atmosphere (properly so-called), are of course the points thus chiefly brought under consideration. M. Sæmann regards the moon as having passed through various phases, which the earth is also in its turn eventually destined to witness. The smaller mass of the satellite has led to a more rapid development of these phases, than in the case of the larger earth mass. Both air and water he conceives to have once existed in the moon, and to have been gradually absorbed by the rock-matters of which this is made up; and the air and water of the earth, it is argued, must in the course of time be equally absorbed. In support of this view, the author enters into various calculations, based chiefly on the experiments of M. Durocher (Bulletin de la Société Géologique, 2e sér., vol. x.) on the absorption of moisture by rocks generally, and he shews this to be much in excess of that which would arise from the complete absorption of the oceanic waters by the solid mass of the earth. Thus, he assumes the weight of the ocean to be one twenty-four thousandth part of the weight of the land; or, reducing all to one hundred parts, he makes the land equal to 99·9958, and the water to only 0·0042. On this assumption, if all the water were absorbed, the earth would be hydrated (so to say) to the extent of 0·000042, a mere nothing as compared with the absorptive powers of even the hardest rocks and minerals Certain feldspars, for example, became hydrated, in M. Durocher's experiments, to the extent of 0·0041, others to the extent of 0·0077, &c., and some even to that of 0·0260. In sandstones, limestones, and other ordinary rocks, the absorption is, of course, very much greater than this. The water absorbed would gradually produce, it is considered, definite hydrated compounds, and so remain fixed, more especially as the earth's internal heat became more and more diminished. With regard to the probable absorption of the atmosphere, M. Sæmann enters into computations of a similar character, basing his views, as far as possible, on the actual results of experimental inquiry, and bringing forward in this connexion many collateral questions of much geological interest. Our present limited space forbids, however, a more extended analysis of this important memoir.

ON THE SUPPOSED RELATIONS BETWEEN THE ROTATION OF THE EARTH AND THE GYRATORY MOVEMENTS WHICH TAKE PLACE IN LIQUID BODIES UNDER CERTAIN CONDITIONS.

In the *Comptes Rendus* (Tome xlix., p. 637), M. Perrot inserted a note, previously read before the *Académie des Sciences*, on the gyratory movements of water flowing through a circular aperture at the bottom of the enclosing vessel, in which he maintained that this movement (in the northern hemisphere) always took place from left to right, a peculiarity due to the diurnal movement of the earth. This view being opposed to the researches of M. Magnus, published at length in *Poggendorff's Annalen, Mai*, 1855, the subject has been reinvestigated by M. F. Laroque (*Annales de Chimie, etc., Mars*, 1861). The experiments of this latter observer appear to confirm fully the results of M. Magnus. According to M. Laroque, the rotatory motion arises from accidental causes, is irregular in its direction, and is thus in no way dependent on the rotation of the earth

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MINERALOGICAL NOTICES.

Quartz in Meteoric Iron:—G. ROSE (*Ber. d. Akad. d. Wissensch, zu Berlin*, 1861, *p.* 406), has announced the discovery of a minute but perfectly distinct crystal of quartz in the Meteoric iron of Xiquipilco in Mexico. This iron is nickeliferous, and is mixed with *Shreibersite* and with particles of a simple sulphide of iron. In the valley of Toluca, in which Xiquipilco lies, fragments of meteoric iron are scattered over a very considerable area. Eight specimens from this locality, belonging to the Royal Mineralogical Museum of Berlin, were examined in the hope of finding some additional crystals or grains of quartz but without success. Prof. Rose suggests, however, that particles of quartz may occur amongst the insoluble matters of other iron-meteorites.

Artificial Formation of Crystallized Specular Iron, Magnetic Iron Ore, Magno-ferrite, Periclase, Hausmannite, Cassitirite and Rutile:—These mineral species have been obtained by SAINT-CLAIRE DEVILLE in perfectly-formed crystals by the agency of hydrochloric acid gas. By passing a slow current of the gas over amorphous sesqui-oxide of iron in a heated porcelain tube, crystals of *specular iron ore* resembling in part those of Elba, and partly the flattened volcanic forms, were readily obtained. If the current be sufficiently slow, not a trace of a chloride is produced in this experiment, and the acid consequently is in no way decomposed. The crystals thus formed by M. Deville were capable of being measured. The intervention of aqueous vapour was found to be quite unnecessary, the gas acting perfectly in an absolutely dry condition. Protoxide of iron, as obtained by the process of Debray, yielded under this treatment a number of small octahedrons possessing the exact composition of *magnetic iron ore*. A mixture of sesqui-oxide of iron and calcined magnesia gave, in like manner, octahedrons with truncated edges, having the theoretical composition of pure *magno-ferrite*. Calcined magnesia alone, under a slow current of hydrochloric acid, yielded small octahedral crystals of *periclase*, without the slightest loss or change accruing to the acid itself. *Hausmannite* was also formed in dimetric octahedrons (of 104° to 105° over polar edges) from red oxide of manganese. *Cassiterite*, by the same process, in crystals of great beauty, from amorphous oxide of tin. The crystals were dimetric octahedrons, with their basal edges and angles replaced by the two square prisms, these shewing the proper interfacial inclinations of 135°. Finally, amorphous titanic acid furnished minute crystals of a blue colour and great brilliancy, belonging either to Rutile or Anatase, most probably to the former. Deville's experiments are given in detail in several numbers of the *Comptes Rendus* of June and July of the present year. They shed quite a new light on the formation of many crystallized substances in volcanic and other localities, and take rank amongst the most important contributions of the day to chemical geology.

Brucite:—The Brucite of Wood's Mine, Texas, has been described by Hermann, (*Jour. für Prakt. Chem.* lxxxii., p. 368), under the name of *Texalite* as a monoclinic modification of the hydrate of magnesia. This view, however, has been subsequently shewn to be erroneous by Professor George J. Brush of Yale College. Prof. Brush (*American Journal of Science and Arts, July*, 1861), proves clearly the identity of the so-called *Texalite* with *Brucite*, and shews that both are hexagonal.

Staurolite:—The composition of *Staurolite*, as determined more especially by the careful analyses of JACOBSON, is well known to vary greatly with regard to the respective amounts of silica and alumina. Rammelsberg has recently undertaken a further examination of this mineral (*Ber. d. Köngl. preuss. Akad. d. Wiss. zu Berlin, März*, 1861), but with the same general results, so far at least as respects its atomic constitution. Analyses of ten examples from various localities shew such different results—the silica varying, for example, from 28·86 to 51·32—that no one common formula can be adopted for all. But Rammelsberg shews, in addition to this, that the iron in the mineral is chiefly present in the state of *protoxide*, whilst all previous analyses had given it as sesqui-oxide. The writer of these notes, however, so long ago as 1848, in a short paper published in the *Chemical Gazette* of July 15 of that year, ("On the Composition of Acmite," &c., by E. J. Chapman), called attention to the fact that by the employment of a blowpipe-test previously announced by him for distinguishing the protoxide of iron from the peroxide of that metal in silicates and other compounds, he had "discovered the presence of FeO in translucent crystals of Staurolite, a mineral hitherto supposed to be a basic silicate of alumina in which a portion of the Al^2O^3 is replaced by Fe^2O^3." In Rammelsberg's analyses, as in those of Jacobson, the higher the amount of silica the lower that of the alumina, and the reverse. E. J. C.

NOTICES OF PUBLICATIONS RECEIVED.

Descriptions of New Palæozoic Fossils from Illinois and Iowa. By F. B. Meek and A. H. Worthen, Illinois State Geological Survey. In this communication, published in the Proceedings of the Academy of Natural Sciences of Philadelphia, June, 1861, the authors describe various new forms of crinoids and other types from the carboniferous rocks of Illinois and Iowa. Amongst the crinoids they establish a new genus *Bursacrinus*, intermediate apparently between *Ichthyocrinus* and *Cyathocrinus*, its generic formula being: Basals 5?; Sub-radials 5 (four hexagonal and one pentagonal); Radials 2 × 5; Anal 1; Inter-radials 0; Arms 10, bifurcating, but laterally connected. A sub-genus, under the name of *Trematodiscus*, is also proposed for the reception of certain forms of *Nautili* possessing a discoid shell with a wide, shallow, and usually perforated umbilicus. It will include a group of carboniferous species of European as well as of American occurrence.

In a recent notice, contained in the May number of the *Canadian Journal*, we fear we may unintentionally have done some injustice to the very able geologists engaged on the Illinois Survey. In acknowledging a publication forwarded by Prof. Hall, we stated that the descriptions of fossils which this comprised had been issued in order to claim priority for various new species that might probably appear under other names in the forthcoming Report of the Geology of Illinois, since the publication of the concluding portions of the Report on Iowa (under Prof. Hall's direction), had been suspended for a time. In making this remark, we did not for a moment intend to imply that Messrs. Meek and Worthen would intentionally re-describe any published form under another name; but simply that, where several observers were engaged on the same kind of work, coincidences of this sort were more or less unavoidable. We find that a large number of the fossils about to appear in the Illinois Report, were briefly described in the proceedings of the Philadelphia Academy in September and October, 1860; and we understand that every care has been taken, in drawing up this Report, to avoid the introduction of synonymes. The Report itself, with figures and extended descriptions, will be issued during the forthcoming year.

The Primordial Zone of Texas, with Descriptions of New Fossils. By B. F. Shumard. (From the American Journal of Science and Arts, September, 1861). The occurrence of Lower Silurian strata in Texas (subsequently referred by Barrande to the Primordial Zone) was announced by Ferdinand Rœmer in 1852. Prof. Shumard, in 1859, shewed their occurrence over a much more extended area than had been recognized by Rœmer, and placed them in parallelism with the Potsdam Sandstone and Calciferous Sand Group of Iowa, Wisconsin, and Minnesota. In his present notice, the same author enters into a more detailed analysis of their mineral and other characters, and describes several new Trilobites from the lower or Potsdam Sandstone division.

Contributions to Palæontology. By James Hall. (Fourteenth Annual Report of the Regents of the State Cabinet, Albany; Appendix C, and Continuation, July, August, and September, 1861). Professor Hall, in these issues, continues his descriptions of various new fossils, comprising numerous brachiopods, cephalopods, trilobites, &c., chiefly from the Hudson River Group of Ohio and Tennessee, and from the Devonian Strata of New York. Our restricted space, at present, forbids an analysis of these forms; but we may observe that in the first part of Appendix C, published in July, a description is given of a new *Euomphalus*, named *E. Conradi* by the author. This species appears to be identical with the *Euomphalus de Cewi* of Billings, described and figured in the July number of this Journal. Should this apparent identity prove true, we think that Mr. Billings may fairly claim the species, since that number of the Journal was published on the 9th of July, and copies of Mr. Billings' paper were previously transmitted to him. Even if the dates prove coincident, the description of the species in the Journal must be looked upon as the more complete and satisfactory of the two, as it is illustrated by figures. The Devonian trilobites described in this Appendix by Prof. Hall, belong to the following genera: Calymene, (1 species), Dalmania, (14 species), Phacops, (3 species), Proetus, (15 species), Lichas, (2 species), Acidaspis, (fragmentary examples), and Beyrichia, (1 species).

The Gold of Nova Scotia. By A. C. Marsh, A. B. (From the Am. Journ. of Science and Arts, Nov. 1861.) This is an interesting account of the newly-discovered gold districts of Tangier and Lunenburg. The gold lies chiefly in quartz veins traversing disturbed strata of clay-slate. It is accompanied by mispickel and iron pyrites, the latter, according to Mr. Marsh, being more or less auriferous.* The author also observed three crystallized specimens of gold from the Tangier locality, two of which were octahedrons, and the other a rhombic dodecahedron, with bevelled edges. An analysis of the Tangier gold (sp. gr. 18·95) gave Mr. Marsh: gold 98·18; silver 7·76; copper 0·5; iron, a trace. A sample from Lunenburg (sp. gr. 18·37) consisted of: gold 92·04; silver 7·76; copper 0·11; with also a trace of iron. These gold-containing metamorphic rocks of Nova Scotia are referred by Professor Dawson, (Acadian Geology: Supplement) to the base of the Lower Silurian series. The gold appears to extend over a wide area, since indications of it are said to have been found in the sands of Sable Island, at a distance of one hundred miles or more from the main land.

The Canadian Naturalist and Geologist: (Vol. VI. No. 5.) Oct. 1861. This Number of the Naturalist is an exceedingly interesting one. In addition to sundry miscellaneous notices, it contains original papers by G. Barnston, E. Billings, H. G. Venner, Dr. Dawson, T. Sterry Hunt, and D. W. Beadle. The geological contributions comprise an article on the occurrence of Graptolites in

* This we have verified in specimens obtained from Tangier, and kindly presented to us by Mr. Hawkins, P.L.S., of Toronto.—E. J. C.

the base of the Lower Silurian series by Mr. Billings, and an analysis by Prof. Sterry Hunt of Barrande's recent Review of the Primordial Zone of North America. Dr. Dawson contributes some Additional Notes on Aboriginal Antiquities found at Montreal.

On the Dimorphism of Arsenic, Antimony, and Zinc. By Josiah P. Cooke, Jr. (From the Amer. Journ. March, 1861.) Both Arsenic and Antimony as occurring in nature, and a . ɹmonly obtained in the reguline state, are well known to crystallize in rhombohedral or hemi-hexagonal forms. Zinc, as artificially produced, has been generally referred to the Hexagonal, or to the Trimetric system. The experiments of Professor Cooke as detailed in this memoir, seem to prove conclusively, however, that these metals may be also made to assume a monometric crystallization. Arsenic and Antimony were crystallized by sublimation in a current of hydrogen gas. They gave minute octahedrons, combined at times, in the case of the antimony crystals, with the faces of the cube, and in one instance, with those of the rhombic dodecahedron. These modifications do away with all suspicion that the minute crystals may have consisted of rhombohedrons with truncated polar angles. The crystals were moreover carefully examined in order to prove that they did not consist of partially-reduced arsenious acid on the one hand, and of oxide of antimony on the other. The oxidation of the metals would scarcely have taken place however, as these experiments were conducted. Zinc in combination with variable amounts of copper has been shewn by Storer to crystallize in regular octahedrons, and Professor Cooke describes some octahedral crystals of zinc and arsenic, in which the latter metal was in too small a proportion to form a definite chemical compound. The heteromorphous character of these metals appears therefore to be fairly established. E. J. C.

MISCELLANEOUS.

ON CLEANING AND PREPARING DIATOMS, ETC., OBTAINED FROM SOUNDINGS.

BY J. B DANCER.

The first operation generally required is to separate the soundings from the tallow or fatty matter which has been employed to bring them up from the bottom. I may here mention that Lieutenant Stellwagen, an American officer, has invented a sounding-lead which does not require grease. It has a trap at the bottom for collecting the soundings. I am sure our section will join with me in the wish that the soundings which our worthy Secretary hopes to receive from various parts of the world may be collected with an apparatus of this kind. The grease involves a considerable amount of trouble, and some loss. The mass of soundings and grease is to be placed in a basin or an evaporating-dish, and boiling water poured on it; the melted fat rises to the surface, and when cold can be easily skimmed off. This operation may be repeated until the sediment appears free from grease; to insure this, draw the water carefully from the sediment, and pour liquor ammonia on it; I prefer it to potass or soda; this will combine with the grease, if any remain, and form a soapy solution. This may now be treated with hot water for the final washing. This sediment must be allowed to settle quietly for an hour or two each time before the water is carefully decanted or drawn off with a syphon; otherwise the minute forms of Diatomaceæ will be lost, and the operator greatly disappointed in the result of his labour. Having now cleared the soundings from all extraneous matter, the next operation is to ascertain, by the microscope, the nature of the objects thus obtained. Take up with a glass tube some of the sediments, draw the contents of the tube along a slip of glass, and examine it with a low power. If Foraminiferæ or large Diatomaceæ are present, they may be removed by means of a split hair or a bristle from a shaving-brush, gummed or fixed in a cleft in a split of wood, and then placed on a clean slip of glass for further examination. If you have a considerable quantity of mud or sand under the operation, with an abundance of Foraminiferæ, as is frequently the case, they can be separated by first drying the soundings, and scattering them on the surface of water in a basin; the heavy particles of sand will sink, but the light Foraminiferæ will float for a time, and can be easily collected. Another mode is to stir up the sediment, and then pour off the lighter articles into test-tubes or wine glasses. In this manner, by having a number of glasses, you can separate the varieties according to their specific gravities. If the Diatomaceæ obtained are recent and abundant, they should be separated from the calcareous portions of the soundings, and boiled in hydrochloric acid; and if not sufficiently cleaned, they may be boiled in nitric acid. The contents of the diatoms can be removed by burning them. Place them between two thin pieces of talc, and submit them to the flame of a spirit-lamp. Some use thin glass to support them when cleaning a quantity. I have burnt them in a small platinum crucible with success. It is advisable to mount specimens dry, and also in balsam, for careful microscopic examination. Those mounted dry show the markings most distinctly. There is one difficulty which the slide-mounter meets with on his first essay, and which I will briefly allude to, viz., retaining the object in its proper place on the slide whilst the thin glass is being pressed down on the balsam. Some operators place the thin glass on the objects, and allow the balsam to flow gradully between the glasses by capillary attraction. Professor Williamson employs a little gum in the water which contains the Diatomaceæ; this fixes them when dry, and the balsam does not remove them. Some objects, such as Foraminiferæ, require a long soaking in spirits of turpentine to displace the air from the chambers. By using an air-pump this process is much facilitated. A solution of balsam in chloroform will doubtless be an improvement in mounting this class of objects. It is needless to take up the time of the section by entering minutely into the details of mounting all the various objects which may be met with in specimens of soundings. Those interested may consult Quekett, Carpenter, and Hogg's works on the microscope; and Smith on Diatomaceæ. I must now apologise for taking up so much time on a subject which many present may be conversant with.

P.S.—Since the above was written, several engravings, with descriptions have appeared in the 'Mechanics' Magazine,' December 28, 1860, of the deep-sea-sounding apparatus invented and used on board *The Bull Dog* during the sounding expedition in the North Atlantic Ocean, under the command of Sir F. L. M Clintock, with one of these machines. Twenty-four ounces of ooze was brought up from a depth of 1,913 fathoms.—*Journal of the Microscopical Society.*

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST—AUGUST 1861.

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

Day.	Barom. at temp. of 32°. 6 A.M.	2 P.M.	10 P.M.	MEAN.	Temp. of the Air. 6 A.M	2 P.M	10 P.M	ME'N	Excess of mean above Average	Tens. of Vapour. 6 A.M	2 P.M	10 P.M.	M'N	Humidity of Air. 6 A.M	2 P.M.	10 P.M.	M'N	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Resultant Direction.	Velocity of Wind. 6 A.M	2 P.M	10 P.M	Result.	ME'N	Rain in Inches	Snow in Inches.
1	29.553	29.501	29.535	29.5523	68.4°	78.2°	66.3°	71.63°	+ 4.67°	.604	.686	.620	.641	.87	.71	.95	.83	N b E	S S E	Calm.	S 55 E°	7.5	5.5	0.0	1.41	2.23	...	...
2	.533	.456	.438	.4735	65.2	78.2	71.0	72.05	+ 5.20	.510	.718	.700	.649	.82	.74	.92	.82	Calm.	S E b E	N E b N	N 72 E	0.0	7.5	1.2	1.70	4.37	...	...
3	.553	.617	.621	.6030	72.0	78.9	70.2	74.20	+ 7.35	.672	.646	.651	650	.86	.65	.88	.78	N	S S E	N E b E	N 84 E	11.4	7.5	3.2	3.92	6.07	...	...
4	.546	.407	—	—	69.2	82.5	—	—	—	.607	.793	—	—	.86	.71	—	—	N E b E	S b W	W	S 37 W	4.2	6.2	7.5	3.58	5.80	0.005	...
5	.464	.436	.504	.4840	71.7	80.3	67.7	73.17	+ 6.37	.630	.755	.502	.646	.81	.73	.75	.78	N W b N	S b E	W	N 84 W	1.5	4.6	2.8	0.87	3.26	...	...
6	.535	.535	.609	.5620	63.0	74.2	66.6	68.92	+ 2.15	.450	.628	.545	.560	.78	.75	.83	.78	Calm.	S E	Calm.	S 80 E	0.0	5.0	0.0	1.25	1.84	0.013	...
7	.613	.625	.632	.6232	63.0	64.1	61.9	62.65	— 4.03	.487	.565	.503	.516	.85	.94	.90	.90	E N E	E N E	N E	N 56 E	3.6	7.3	4.0	4.78	4.95	0.465	...
8	.621	.627	.595	.6117	61.9	68.4	64.8	65.18	— 1.48	.428	.481	.489	.476	.77	.69	.80	.77	N E	E b N	N E b N	N 74 E	4.0	8.2	1.0	4.28	4.47	0.115	...
9	.522	.503	.450	.4885	65.5	68.1	63.4	66.57	+ 0.02	586	.594	.548	.580	.93	.87	.93	.89	E b N	E N E	W b N	N 68 E	7.0	4.0	2.5	1.91	3.29	0.015	...
10	.431	.383	.471	.4343	60.9	77.8	66.6	69.15	+ 2.63	.414	.670	.441	.525	.78	.71	.67	.72	Calm.	S S W	N b W	N 29 W	0.0	12.0	4.0	2.84	6.87	...	...
11	.601	.602	—	—	57.2	67.0	—	--	—	.337	.375	—	—	.71	.55	—	—	N b E	S S E	N N E	N 88 E	1.0	3.5	1.0	1.59	2.58	...	...
12	.582	.592	.588	.5900	60.5	58.0	55.8	57.92	— 8.43	.360	.416	.422	.398	.69	.86	.95	.84	N E	N E	N E b N	N 43 E	2.0	9.6	14.0	9.92	10.01	0.760	...
13	.589	.673	.770	.6892	56.5	68.1	58.3	60.77	— 5.47	.378	.524	.367	.425	.83	.77	.75	.80	N E b N	E	Calm.	N 54 E	12.0	4.6	0.0	4.05	5.09	...	...
14	.840	.857	.858	.8543	55.4	63.4	54.0	59.40	— 6.83	.316	.428	.335	.366	.72	.61	.80	.72	N b W	S S W	Calm.	S 7 W	1.2	2.8	0.0	0.91	1.39	...	...
15	.897	.875	.790	.8415	48.2	71.0	58.7	61.35	— 4.80	.287	.484	.373	.391	.85	.64	.75	.72	Calm.	S	Calm.	S 25 E	0.0	3.0	0.0	0.68	1.02	...	...
16	.760	.707	.713	.7272	53.8	72.0	62.7	64.70	— 1.50	.400	.486	.426	.450	.90	.62	.75	.74	Calm.	S E b S	S W b S	S 6 E	0.0	8.2	1.0	2.93	3.21	..	...
17	.713	.693	.747	.7213	58.3	73.8	65.2	66.18	+ 0.22	.412	.633	.445	.507	.85	.77	.71	.78	Calm.	S E b S	N b W	S 85 W	0.0	2.5	0.5	0.36	1.88	Inp.	...
18	.803	.778	—	—	54.4	75.3	—	—	—	.330	.662	—	—	.78	.76	—	—	N W	S	N	S 80 W	2.2	7.6	1.0	0.12	2.58	Inp.	...
19	.793	.784	.794	.7905	53.8	68.1	61.9	64.13	— 1.63	.428	.511	.477	.469	.83	.75	.86	.78	N N E	E	Calm.	N 78 E	1.5	5.5	0.0	2.17	2.60	...	...
20	.853	.862	.841	.8545	60.9	68.8	61.2	64.23	— 1.3.	.426	.410	.446	.424	.80	.58	.83	.71	N E b E	E	Calm	S 89 E	2.0	8.6	0.0	3.19	3.24	...	...
21	.766	.618	.511	.6202	61.6	78.2	70.6	70.48	+ 5.05	.481	.717	.653	.621	.87	.74	.88	. 3	Calm.	S b W	S W b S	S 49 W	0.0	13.5	5.0	3.86	7.08	0.575	...
22	.458	.546	.664	.5710	61.6	68.4	56.2	61.70	— 3.65	.507	.575	.328	.451	.92	.83	.72	.81	N W	N W	N W	[illegible]	[illegible]	[illegible]	[illegible]	9.73	9.92	...	...
23	.750	.718	.753	.7407	52.6	73.8	59.8	63.15	— 1.98	.342	.382	.302	.371	.86	.46	.76	.66	N W	W N W	W N W	N 75 W	[illegible]	[illegible]	[illegible]	4.45	5.21	...	...
24	.779	.774	.803	.7882	52.6	73.8	65.5	63.18	+ 0.23	.353	.517	.493	.455	.89	.62	.78	.74	Calm.	S b W	N	S 41 W	0.0	6.6	3.6	0.88	1.85	...	...
25	.835	.790	—	—	56.9	73.1	—	—	—	.396	.527	—	--	.85	.64	—	—	Calm.	S E	E b S	S 50 E	0.0	3.0	1.0	1.10	1.60	0.115	...
26	.733	.685	.673	.6937	64.5	74.6	65.2	67.92	+ 3.38	.507	.579	.550	.560	.83	.67	.88	.82	E b S	SW b W	Calm.	S 21 W	0.8	2.0	0.0	1.82	1.98	0.605	...
27	.659	.621	.639	.6312	65.2	74.6	63.4	68.03	+ 3.72	.563	.607	.521	.557	.90	.71	.89	.81	S S W	S S W	W b S	S 29 W	8.5	12.5	5.8	6.32	7.00	0.085	...
28	.662	.620	.631	.6312	60.1	69.9	64.1	66.07	+ 1.93	.476	.670	.499	.545	.92	.92	.83	.85	Calm.	S b E	N W b N	S 23 W	0.0	4.4	0.5	1.87	2.33	0.165	...
29	.623	.585	.617	.6087	62.3	71.0	57.6	63.27	— 0.55	.471	.528	.410	.473	.84	.69	.86	.81	Calm	S b W	Calm.	N 75 W	0.0	0.5	0.0	1.20	2.38	0.035	...
30	.636	.619	.701	.6592	54.4	69.3	56.2	60.45	— 3.17	362	.372	.275	.354	.86	.50	.60	.67	W N W	N W b W	N W	N 49 W	7.6	13.3	9.5	10.71	10.92	...	...
31	.755	.784	.779	.7840	51.1	66.6	57.2	59.40	— 3.92	.289	.313	.324	.315	.76	.48	.69	.63	N N W	S S W	N N E	N 31 W	1.5	6.0	2.0	1.85	3.54	...	...
M	29.6348	29.6141	29.6366	29.6330	60.48	71.75	62.67	65.48	— 0.28	.450	.552	.472	.495	.84	.70	.81	.78	....	....	....	....	3.10	6.73	2.64	......	4.21	2.953	...

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR AUGUST, 1861.

Highest Barometer........................ 29.902 at 8 a. m. on 15th } Monthly range =
Lowest Barometer ... . 29.332 at 4 p. m. on 10th } 0.520 inches.

Self-registering Thermom.
- Maximum Temperature .... 85°2 on p.m. of 4th } Monthly range=
- Minimum Temperature .... 47°0 on a.m. of 15th } 38°2
- Mean maximum Temperature .... 74°30 } Mean daily range=
- Mean minimum Temperature .... 58°15 } 16°16
- Greatest daily range .... 25°0 from a. m. to p. m. of 15th.
- Least daily range................. 4°6 from a. m. to p. m. of 7th.

Warmest day......... 3rd... Mean temperature......... 74.20 } Difference = 16°28.
Coldest day .... 12th... Mean temperature......... 57°92 }
Maximum Radiation. { Solar................................ 101°8 on p. m. of 2nd } Monthly range =
{ Terrestrial .... 39°0 on a. m. of 15th } 62°8
Aurora observed on 4 nights, viz.: 1st, 2nd, 14th and 22nd.
Possible to see Aurora on 17 nights; impossible on 14 nights.
Raining on 15 days,—depth 2.953 inches; duration of fall 43.3 hours.
Mean of cloudiness = 0.54. Above average .09.
Most cloudy hour observed, 4 p. m., mean = 0.64; least cloudy hour observed do. midnight; mean, = 0.42.

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

North.	South.	East.	West.
1240.81	903.18	983.30	938.11

Resultant direction N. 8° E.; Resultant velocity 0.46 miles per hour.
Mean velocity............................ 4.21 miles per hour.
Maximum velocity .... 21.7 miles, from 10 to 11 a. m. on 30th.
Most windy day ....30th......... Mean velocity, 10.92 miles per hour. } Difference=
Least windy day.........15th......... Mean velocity 1.02 ditto. } 9.90 miles.
Most windy hour......1 to 2 p.m. ....Mean velocity 6.92 ditto. } Difference=
Least windy hour......2 to 3 a.m. ....Mean velocity 2.32 ditto. } 4.60 miles.

1st. Dense Fog 8 to 11 p.m. Sheet Lightning in N.W. at midnight.
2nd. Sheet Lightning round horizon from 6 p.m. to midnight.
3rd. Shooting Stars numerous at night.
4th. Thunderstorm. Lightning and Rain from 9 p.m.
5th Dense Fog 6 to 7 p.m. Sheet Lightning at midnight.
9th. Shooting Stars numerous at night. Dense Fog from 10.30 p.m.
20th. Well defined Solar Halo at 2 p.m.
21st. Perfect Solar Halo at 7.30 a.m. Thunderstorm, Lightning and heavy Rain, 9 p.m. to 1 a.m. of 22nd.
23rd. Lunar Corona from 10 p.m. to midnight.
25th. Very perfect Solar Halo during the forenoon.
26th. Sheet Lightning in N.W. at 10 p.m.
27th. Thunderstorm, Lightning and Rain, from 8.30 to 11.50 p. m.
28th Sheet Lightning in W. and S.W., from 7 p.m.
29th. Thunderstorm from 3.35 to 4 p.m. Rainbow at 4.10 p.m.

Heavy Dew recorded on 14 mornings during the month.
The Resultant Direction and Velocity of the Wind for the month of August, from 1848 to 1861 inclusive, were respectively N. 58 W. and 0.85 miles.

COMPARATIVE TABLE FOR AUGUST.

YEAR.	Temperature.					Rain.		Snow.		Wind.		
	M'n.	Diff. from Aver.	Max. ob'd.	Min. ob'd.	Range.	No. of days.	Inch's.	No. of days.	Inch's.	Resultant Direction.	Resultant V'y	Mean Force or Velocity.
	°	°	°	°	°							
1840	64.7	−1.3	80.1	47.4	32.7	12	2.903	...	...	...	...	....
1841	64.4	−1.6	83.5	46.7	36.8	9	6.170	...	...	...	...	0.19 lbs.
1842	65.7	−0.3	80.7	45.3	35.	6	2.500	...	...	...	...	0.30
1843	66.4	+0.4	85.5	44.4	41.1	4	4.850	...	...	...	...	0.12
1844	64.3	−1.7	82.5	44.3	38.2	17	Imp.	...	...	...	...	0.16
1845	67.9	+1.9	82.5	44.4	38.1	9	1.725	...	...	...	...	0.19
1846	68.4	+2.4	86.3	50.4	35.9	9	1.770	...	...	...	...	0.17
1847	65.1	−0.9	83.1	44.9	38.2	10	2.140	...	...	...	...	0.19
1848	69.2	+3.2	87.5	49.3	38.2	8	0.855	...	...	S 21° E	0.98	4.55mls.
1849	66.3	+0.3	79.5	51.4	28.1	10	4.970	...	...	N 71° W	0.60	3.76
1850	66.8	+0.8	84.2	43.0	41.2	13	4.355	...	...	N 15° E	0.35	4.46
1851	63.6	−2.4	79.8	43.6	36.2	10	1.369	...	...	N 63° W	0.40	4.63
1852	65.9	−0.1	81.2	46.7	34.5	9	2.695	...	...	N 70° W	0.56	3.30
1853	68.6	+2.6	91.6	47.6	44.0	11	2.575	...	...	S 36° E	0.30	4.26
1854	68.0	+2.0	98.1	47.0	51.1	5	0.455	...	...	N 64° W	1.76	4.60
1855	64.1	−1.9	82.1	44.9	37.2	7	1.455	...	...	N 63° W	1.04	6.97
1856	63.6	−2.4	81.3	44.0	37.3	12	1.680	...	...	N 60° W	2.88	7.03
1857	65.3	−0.7	85.3	50.1	35.2	13	5.265	...	...	N 77° W	1.51	6.36
1858	67.6	+1.6	83.4	45.4	38.0	11	3.890	...	...	N 69° W	1.57	6.50
1859	66.6	+0.6	81.4	46.2	35.2	11	3.990	...	...	N 36° W	1.62	5.96
1860	64.5	−1.5	81.8	47.1	34.7	14	3.405	...	...	N 70° W	1.83	5.80
1861	65.5	−0.5	82.5	48.2	34.3	15	2.953	...	...	N 8° E	0.46	4.21
M	66.02	...	83.81	46.47	37.35	10.2	2.951	...	...	....	...	5.17 Ml.
Diff. from av'r	− 0.54	...	− 1.31	+ 1.73	− 3.05	+ 4.8	+ 0.002	...	...	....	...	− 0.96

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—SEPTEMBER, 1861.

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

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Average	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Result't. Direction.	Velocity of Wind.					Rain in inches.	Snow in inches.
	6 A.M.	2 P.M.	10 P.M.	Mean.	6 A.M.	2 P.M.	10 P.M.	ME'N		6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.		6 A.M.	2 P.M.	10 P.M.	Result.	ME'N		
					°	°	°	°	°												°							
1	29.846	29.781	—	—	54.0	67.0	—	—	—	.335	.409	—	—	.80	.61	—	—	N N E	E b S	E b N	S 88 E	4.0	8.3	3.0	4.45	4.70	Inp.	...
2	.635	.582	.492	.5660	62.3	76.0	69.2	69.83	+ 7.10	.484	.665	.593	.588	.86	.74	.83	.81	Calm.	S b E	S W b S	S 41 W	0.0	6.2	13.0	6.98	8.3	0.002	...
3	.559	.545	.702	.6110	62.7	78.2	61.2	66.77	+ 4.33	.492	.624	.317	.472	.86	.61	.58	.70	W S W	S W b S	N W	N 64 W	1.0	8.0	15.6	8.08	10.21	0.070	...
4	.797	.827	.799	.8040	53.3	64.5	55.8	58.55	— 3.58	.344	.354	.355	.346	.84	.58	.80	.71	N N W	N W b W	N	N 30 W	5.4	7.2	5.0	4.21	4.47	...	...
5	.714	.608	.481	.5885	50.4	67.7	63.4	61.28	— 0.55	.330	.399	.483	.415	.90	.58	.82	.77	Calm.	S E	S S W	S 18 E	0.0	6.2	4.6	2.76	3.02	..	...
6	.355	.344	.524	.4182	59.4	73.8	57.3	63.87	+ 2.43	.446	.463	.346	.410	.88	.55	.73	.69	Calm.	W b S	N W b N	N 87 W	0.0	14.2	3.3	6.56	7.20	...	...
7	.682	.763	.886	.7878	50.8	60.9	54.0	55.47	— 5.68	.307	.355	.313	.327	.85	.67	.75	.75	N	N N W	Calm.	N 20 W	1.0	5.3	0.0	2.30	2.88	Inp.	...
8	.943	.932	—	—	47.2	61.6	—	—	—	.249	.333	—	—	.76	.61	—	—	N b E	S E b S	Calm.	S 66 E	2.6	7.2	0.0	2.01	2.58	Inp.	...
9	.962	.959	.935	.9483	54.9	61.6	54.7	57.63	— 2.72	.367	.428	.325	.366	.85	.78	.76	.77	Calm.	Calm.	Calm.	N 17 E	0.0	0.0	0.0	0.90	1.38	Inp.	...
10	.935	.833	.642	.7825	53.6	63.4	61.2	59.58	— 0.47	.340	.431	.474	.417	.82	.73	.87	.81	N	E b N	E b S	N 80 E	1.0	2.0	4.4	3.98	4.17	0.345	...
11	.370	.383	.472	.4075	62.7	61.9	59.4	61.17	+ 1.52	.543	.503	.446	.491	.95	.90	.88	.90	E b N	N	N N W	N 9 W	9.2	0.8	7.5	2.47	3.55	0.030	...
12	.509	.544	.602	.5602	58.0	68.4	54.4	60.73	+ 1.50	.423	.319	.361	.382	.88	.50	.86	.74	N W b W	W N W	Calm.	N 66 W	5.8	12.2	0.0	2.93	3.12	...	...
13	.678	.658	.713	.6833	51.8	72.2	63.7	63.33	+ 4.48	.332	.497	.465	.444	.86	.62	.78	.75	Calm.	S b W	Calm.	S 18 W	0.0	7.6	0.0	2.74	2.77	...	...
14	.676	.574	.575	.6083	61.9	65.9	66.3	65.07	+ 6.73	.489	.581	.603	.561	.88	.91	.93	.90	S b E	S E b S	W S W	S 41 W	0.6	2.8	4.0	1.23	2.05	0.115	...
15	.657	.673	—	—	59.8	74.2	—	—	—	.452	.540	—	—	.88	.63	—	—	Calm.	S b W	N N W	N 27 W	0.0	0.3	0.5	2.55	2.92	...	...
16	.843	.769	.669	.7470	50.0	60.9	55.5	56.33	— 1.18	.304	.321	.347	.332	.84	.59	.79	.73	N N E	E S E	Calm.	N 78 E	2.8	6.6	0.0	1.87	2.39	...	...
17	.569	.549	.592	.5713	54.7	62.3	50.8	55.93	— 1.07	.325	.325	.335	.328	.76	.57	.90	.74	N E	E N E	N W b N	N 15 E	1.0	5.4	1.4	3.49	4.29	Inp.	...
18	.599	.571	.534	.5665	51.1	67.4	58.3	60.43	+ 3.82	.352	.442	.412	.421	.94	.65	.85	.81	N	S	S W	S 19 W	7.4	6.8	3.0	4.19	5.85	...	...
19	.501	.412	.538	.4862	56.5	72.0	68.8	66.93	+10.82	.413	.627	.263	.459	.91	.80	.37	.69	S W b W	S W b S	N W b N	S 62 W	3.8	8.8	9.8	4.20	7.23	Inp.	...
20	.554	.522	.354	.4665	58.3	60.1	56.2	57.73	+ 2.13	.390	.448	.417	.421	.80	.86	.93	.88	N	E b N	N E b E	N 44 E	5.0	8.8	8.5	7.32	8.29	0.895	...
21	.392	.527	.634	.5287	51.5	53.3	51.1	52.03	— 3.08	.357	.291	.330	327	.94	.71	.88	.84	N	N N E	N W b N	N 4 W	6.2	12.0	3.8	8.20	8.44	0.043	...
22	.624	.516	—	—	39.2	59.8	—	—	—	.223	.381	—	—	.94	.74	—	—	N N W	S b W	S W b S	S 57 W	4.0	9.5	7.0	4.89	6.74	...	...
23	.495	.523	.648	.5675	50.4	65.5	50.8	56.03	+ 1.82	.330	.480	.283	.361	.90	.76	.76	.79	W N W	W	Calm.	N 67 W	5.8	10.3	0.0	8.01	8.24	...	...
24	.736	.734	.700	.7252	45.5	63.4	52.6	55.00	+ 1.25	.262	.363	.332	.324	.86	.62	.84	.76	N W	S	S S W	S 1 W	2.4	3.5	0.7	1.25	1.94	...	...
25	.685	.604	.533	.6032	48.6	68.4	62.3	61.15	+ 7.92	.322	.448	.484	.433	.94	.65	.86	.81	Calm.	S S E	E	S 25 E	0.0	5.0	1.0	1.99	2.17	...	...
26	.412	.327	.377	.3783	61.6	69.9	55.8	62.72	+ 9.98	.493	.556	.377	.473	.90	.76	.85	.82	S b E	S W b S	Calm.	S 36 W	3.5	14.0	0.0	3.88	5.13	0.175	...
27	.362	.259	.097	.2307	55.5	53.3	49.0	52.53	+ 0.32	.369	.377	.307	.348	.84	.92	.88	.88	Calm.	N	N W b W	N 44 W	0.0	5.0	13.0	5.07	7.06	1.855	...
28	.252	.432	.706	.4880	47.2	52.9	41.7	47.58	— 4.25	.287	.274	.228	.263	.89	.69	.86	.80	W S W	W	W b N	S 85 W	3.0	18.5	0.6	7.48	7.75	0.020	...
29	.888	.951	—	—	37.1	52.9	—	—	—	.182	.274	—	—	.83	.69	—	—	Calm.	S S W	Calm.	S 82 W	0.0	5.0	0.0	2.76	3.29	0.057	...
30	30.089	30.076	30.087	30.0847	46.8	54.0	46.4	48.95	— 1.87	.293	.292	.278	.281	.91	.69	.88	.81	Calm.	S S E	N b E	N 46 E	0.0	3.0	3.0	1.18	2.03	...	...
M	29.6176	29.5972	29.6113	29.6084	54.38	64.72	56.80	59.07	+ 1.58	.376	.436	.379	.400	.87	.70	.81	.79	....	....	....	....	2.52	7.02	3.76	......	4.81	3.607	......

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR SEPTEMBER, 1861.

Highest Barometer . . . . 30.104 at 8 a. m. on 30th. } Monthly range=
Lowest Barometer . . . . 29.076 at 8 p. m. on 27th. } 1.028 inches.

Self-registering Ther.
- Maximum temperature . . . . 78°8 on p.m. of 3rd } Monthly range=
- Minimum temperature . . . . 37°1 on a.m. of 29th } 41°7
- Mean maximum temperature . . 66°38 } Mean daily range=14°58
- Mean minimum temperature . . 51°80 }
- Greatest daily range . . . . . . 24°0 from a. m. to p. m. on 13th.
- Least daily range . . . . 4.6 from a. m. to p. m. on 21st.

Warmest day . . 2nd ... Mean Temperature . . . =69°83 } Difference=22°25.
Coldest day . . . 28th ... Mean Temperature . . . =47°58 }

Maximum Radiation { Solar . . . . 96°4 on p. m of 3rd } Monthly range=
{ Terrestrial . . . . 29°5 on a. m. of 29th } 66°9.

Aurora observed on 4 nights, viz.: on 2nd, 4th, 5th, and 15th. Possible to see Aurora on 16 nights; impossible on 14 nights.
Snowing on — day: depth, — inches; duration of fall, — hours.
Raining on 17 days; depth, 3.607 inches; duration of fall, 60.1 hours.
Mean of cloudiness=0.60; above the average 0.11 Most cloudy hour observed 2 p.m.; mean =0.72; least cloudy hour observed, midnight; mean=0.50.

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

North.	South.	East.	West.
1265.27	937.58	590.28	1537.60

Resultant direction, N 71° W; Resultant Velocity, 1.39 miles per hour.
Mean velocity 4.81 miles per hour.
Maximum velocity 19.8 miles, from 3 to 4 p.m. on the 28th.
Most windy day 3rd—Mean velocity 10.21 miles per hour. } Difference 8.83 miles.
Least windy day 9th—Mean velocity 1.38 miles per hour. }
Most windy hour, noon to 1 p. m.—Mean velocity, 7.65 miles per hour. } Difference
Least windy hour, 5 to 6 p. m. —Mean velocity, 2.42 miles per hour. } 5.23 miles.

2nd. Slight thunderstorm, 4 to 5 p.m., and sheet lightning at midnight.—13th. Lunar halo, 8 to 10 p.m.—15th. Zodiacal light very bright from 7 p.m.—16th. Solar halo at 6.15 a.m.—19th. Solar halo at 7.30 a.m.—20th. Thunderstorm at 6.20 to 8 a.m., and sheet lightning at 7 p.m. to midnight.—22nd. Hoar frost at 5.50 a.m. (First of the season.)—24th. Lunar corona at midnight.—28th. Imperfect rainbow at 4 p.m.—29th. Thin ice on shallow vessels. (First of the season.)

Heavy dew recorded on 10 mornings during the month.

The Resultant Direction and Velocity of the Wind for the month of September, from 1848 to 1861 inclusive, were respectively N. 62° W., and 1.13 miles.

From an inspection of the Comparative Table, it will be seen that the Month of September, 1861, was comparatively warm, dry, calm, and cloudy.

COMPARATIVE TABLE FOR SEPTEMBER.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Difference from Average.	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant. Direction.	Resultant. Velocity.	Mean Velocity
1840	54.0	— 3.9	70.2	29.4	40.8	4	1.380	...	...	...	...	...
1841	61.3	+ 3.4	79.9	37.5	42.4	9	3.340	...	...	...	...	0.26lbs
1842	55.7	— 2.2	83.5	28.3	55.2	12	6 160	...	...	...	...	0.45 "
1843	59.1	+ 1.2	87.8	33.1	54.7	10	9.760	...	...	...	...	0.57 "
1844	58.6	+ 0.7	81.5	29.6	51.9	4	Imp	...	...	...	...	0.26 "
1845	56.0	— 1.9	78.8	35.3	43.5	16	6.245	...	...	...	...	0.34 "
1846	63.6	+ 5.7	84.0	39.0	45.0	11	4.595	...	...	...	...	0.33 "
1847	55.6	— 2.3	74.8	38.1	36.7	15	6.665	...	...	...	...	0.33 "
1848	54.2	— 3.7	80.9	29.5	51.4	11	3.115	...	...	N 71 W	2.38	5.81ms.
1849	58.2	+ 0.3	80.6	33.5	47.1	9	1.480	...	...	N 75 W	0.69	4.23 "
1850	56.5	— 1.4	76.0	31.7	44.3	11	1.735	...	...	S 65 W	1.02	4.78 "
1851	60.0	+ 2.1	86.3	33.4	52.9	9	2.665	...	...	N 14 E	1.03	5.45 "
1852	57.5	— 0.4	81.8	36.1	45.7	10	3.630	...	...	N 77 W	0.53	4.60 "
1853	58.8	+ 0 9	85.4	36.1	49.3	12	5.140	...	...	N	1 06	4.33 "
1854	61 0	+ 3.1	93.1	36.3	56.8	14	5.375	...	...	N 22 W	1.33	4.04 "
1855	59.5	+ 1.6	81.7	36.1	45.6	12	5.585	...	...	N 20 E	1.29	7.61 "
1856	57.1	— 0.8	77 3	37.4	39.9	13	4.105	...	...	S 79 W	1.98	6.53 "
1857	58.6	+ 0.7	81.4	34.1	47.3	11	2.640	...	...	N 68 W	1.61	5.55 "
1858	59.1	+ 1.2	80.1	36.8	43.3	8	0.735	...	...	S 74 W	1.53	5.69 "
1859	55.2	— 2.7	73 8	35.7	38.1	15	3.525	...	...	N 44 W	1.60	6.36 "
1860	55.3	— 2.6	74.2	28.7	45.5	14	1.959	...	...	N 71 W	2.63	5.79 "
1861	59.1	+ 1.2	78.2	37.1	41.1	17	3.607	...	...	N 71 W	1.39	4.81 "
Mean	57.91	...	80.51	34.22	46.30	11.2	3.973	...	...	...	...	5 40
Diff. from Av'ge.	+1.16	...	—2.31	— 2.88	—5.20	+ 5.8	—.366	...	...	...	...	—0.59

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—AUGUST, 1861.

(NINE MILES WEST OF MONTREAL.)

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

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

Day.	Barom. corrected and reduced to 32°			Temp. of the Air.—F.			Tension of Vapour.			Humidity of Air.			Direction of Wind.			Horizontal Movement in Miles in 24 hours.	Mean of Ozone.	Rain in inches	Snow in inches.	Weather, &c. A Cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.		t'nths			6 A.M.	2 P.M.	10 P.M.
1	29.788	29.729	29.720	67.4	89.6	70.1	.584	.855	.586	.87	.62	.80	E S E	E S E	E S E	5.60	2.0	...	...	C. C. Str. 4.	Clear.	Clear. Ft.A.B.
2	723	619	543	70.0	84.7	72.2	621	870	706	85	73	90	S E	S b E	N W	31.40	1.5	Inap.	...	Fog.	C. C. Str. 10.	Cirr. Str. 10.
3	709	753	837	71.4	85.1	68.3	592	570	509	83	47	75	W	W	W S W	87.00	1.5	...	...	Clear.	Clear.	Clear.
4	786	608	514	65.2	85.7	73.5	516	768	712	84	63	83	S E b E	S S E	S S W	58.10	2.0	Inap.	...	Do.	C C. Str. 8.	Cu. Str. 4. Th.
5	545	614	651	68.1	84.1	64.6	483	789	528	72	68	86	W N W	W	W	175.00	2.0	0.310	...	Cu. St. 10.	Clear.	C. C. Str. 8.
6	710	705	837	60.5	68.3	57.7	419	349	378	80	51	81	W	W N W	N b W	119.80	1.6	...	...	Clear.	Str. 4.	Cu. Str. 4.
7	854	819	890	59.7	78.5	64.6	345	619	497	68	64	83	S	S W b S	S	56.40	1.5	...	...	Do.	Clear.	Str. 4.
8	869	799	826	61.6	76.6	61.1	383	497	419	71	59	80	E b N	N N E	S S E	60.80	1.0	...	...	Do.	Do.	Clear. Au. Bo.
9	784	701	741	60 1	83.0	61.4	396	558	415	76	50	77	E b N	S b E	S b E	11.00	1.0	...	...	Do.	Cirr. 2.	C. C. Str. 4.
10	488	420	548	68.5	83.6	61.0	577	711	360	85	62	68	W S W	S W	S E b E	160.40	1.5	0.290	...	C. C. Str. 4.	Cu Str. 6.	Cl'r. Dist. th.
11	698	809	816	52.1	78.2	58.5	334	704	387	86	73	79	W S W	S	W N W	48.70	1.5	...	...	Clear.	Clear.	Clear. Au. Bo.
12	897	823	850	53.2	73.4	59.4	305	476	380	79	59	76	N E b N	S S E	N N E	78.10	1.5	...	...	Cu. Str. 4.	C. C. Str. 8.	Cu. Str. 9.
13	891	913	939	54.6	71.0	50.4	301	316	323	71	42	65	N N E	N E b E	N E b E	229.30	2.0	...	...	Do. 6.	Cu. Str. 4.	Do. 4. In.ft.H.
14	990	999	30.060	53.5	71.1	51.0	295	386	252	73	53	68	N E b E	S S W	S S W	224.40	2.0	...	...	Do. 10.	Do.	Clear. Au. Bo.
15	30.091	30.089	026	49.7	80.2	62.4	315	452	420	89	44	77	S S W	S S W	S S W	50.30	1.5	...	...	Cl'r. H'y dew.	Do.	Do.
16	29.905	29.941	29.973	58.0	84.3	66.6	400	558	496	84	50	77	S	S S W	S S W	45.60	1.5	...	...	Clear.	Clear.	Cu. Str. 10.
17	896	846	30.004	64.2	78.8	66.0	409	514	509	70	54	81	S W	W S W	S W	90.60	1.5	Inap.	...	Cu. Str. 4.	C. C. Str. 8.	Do. 10.
18	894	999	29 951	64.1	79.6	65.0	373	465	513	62	47	86	N	W	W N W	57.50	1.5	...	...	Cirr. 4.	Cu. Str. 4.	Do. 10.
19	30.017	999	30.036	58.1	83.1	60.2	288	637	426	61	56	62	N E b E	N E b E	E b S	61.10	1.0	...	...	Clear.	Clear.	Cu. Str. 4.
20	082	30.190	151	50.0	76.6	56.6	318	376	363	74	42	81	N N E	E S E	E b N	155 50	1.0	...	...	Do.	Cirr. 4.	Clear.
21	070	015	29.897	56.0	69.3	65.1	363	564	816	81	79	84	E b N	S E	S E	34.70	3.0	Inap.	...	C. C. Str. 10.	Cu. Str. 4.	Cu. Str. 10.
22	29.612	29.612	615	61.6	69.1	51.9	493	584	410	91	79	84	S W b S	S S W	W	123.90	3.0	0.680	...	Rain.	Do. 10.	Clear.
23	853	817	918	53.5	73.6	63.7	348	476	453	86	59	80	W S W	S W	W S W	176.61	2.0	...	...	Clear.	Do. 4.	Do. [thun.
24	903	916	30.004	64.1	76.2	63.0	446	652	510	77	73	88	S S W	S S W	W	81.75	2.5	0.370	...	Do.	Clear.	Cu. Str. 6. dis.
25	925	982	011	62.0	78.6	63.1	493	626	422	91	65	75	W	S S W	S W b W	21.20	1.5	...	...	Do.	Cu. St. 6.	C. C. Str. 8.
26	30.006	30.035	29.951	65.8	83.5	63.7	576	657	471	92	56	81	S	S S E	S b E	20.20	2.0	0.300	...	C. C. Str. 4.	Do. 8.	Clear.
27	29.934	29.840	866	65.0	76.1	65.3	556	652	549	91	73	89	S b W	S S E	S b W	76.00	2.0	Inap.	...	Cu. Str. 10.	C. C. Str. 4.	C. C. Str. 4.
28	858	818	821	62.4	81.2	68.0	466	585	619	85	56	92	S W	S S W	S	64.10	1.5	...	...	Do. 10.	Cu. Str. 4.	Cu. Str. 8.
29	865	720	851	63.6	78.6	57.5	543	619	343	94	64	72	S	W	S b W	88.80	1.0	Inap.	...	Rain.	Cirr. 4.	Clear.
30	793	709	89[illegible]	57.7	77.1	59.1	407	436	387	87	49	79	S S W	S S W	W	62.40	1.5	Inap.	...	Clear.	Cu. Str. 8.	Cu. Str. 10.
31	850	996	992	49.0	68.4	53.2	303	411	328	89	60	83	W	W S W	W S W	198.40	1.5	...	...	Do.	Clear.	Clear.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—SEPTEMBER, 1861.

(NINE MILES WEST OF MONTREAL.)

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

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

Day.	Barom. corrected and reduced to 32°			Temp. of the Air.—F.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Horizontal Movement in Miles in 24 hours.	Mean of Ozone. (tenths)	Rain in Inches.	Snow in Inches.	WEATHER, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.					6 A.M.	2 P.M.	10 P.M.
1	30.030	30.017	30.039	49.3	72.2	56.6	297	.365	.368	.85	.47	.81	W S W	W S W	W S W	32.10	2.0	...	...	Clear.	Clear.	Clear. Au. Bo.
2	29.959	29.914	29.851	52.2	68.9	61.0	.376	.502	.475	.87	.72	.85	E b E	S S W	E b N	44.90	2.5	0.386	...	Cu. Str. 8.	Cu. Str. 4.	Cu. Str. 10.
3	637	720	889	71.0	81.4	63.0	.651	.585	.453	.88	.56	.80	W S W	S S W	S S W	232.10	2.5	...	...	Do. 4.	Do. 4.	Clear. d.t.9.30
4	882	931	30.021	59.0	65.0	53.7	.358	.307	.315	.73	.51	.77	W	W	W S W	230.60	1.5	...	...	Clear.	Do. 4.	Do. ft. Au. Bor.
5	992	980	29.844	48.6	69.6	55.7	.278	.367	.370	.81	.52	.84	S	S b E	S S E	20.00	2.0	...	...	Do. Frost.	C. C. Str. 4.	Cu. Str. 2.
6	699	477	552	56.1	74.6	60.1	.398	.568	.462	.90	.67	.91	S S E	E S E	E S E	173.76	2.0	0.306	...	Cu. Str. 8.	Cu. Str. 2.	Clear.
7	850	897	902	56.0	72.4	52.0	.370	.550	.285	.84	.69	.76	S S W	S S W	S S W	214.40	1.5	...	...	Do. 4.	Clear.	Do. [Au. Bor.
8	30.090	30.110	30.170	46.5	61.0	50.1	.280	.352	.290	.88	.70	.82	W S W	S W	S W	38.10	1.5	...	...	Clear.	Cu. Str. 4.	Cu. Str. 2. Ft.
9	129	175	150	48.2	68.6	53.0	.285	.349	.303	.85	.51	.77	S	E S E	S E	9.40	1.5	...	...	C. C. Str. 10.	Do. 8.	Clear.
10	198	114	017	51.0	67.7	58.0	.348	.386	.368	.93	.57	.81	E S E	E S E	E	9.80	2.0	...	...	Do. 8.	Clear.	Do.
11	29.833	29.700	29.662	53.3	57.1	54.1	.321	.378	399	.80	.81	.93	N E b N	S S E	N	79.80	2.5	0.156	...	Cu. Str. 10.	Rain.	Cu. Str. 4.
12	624	666	736	52.5	68.4	56.1	.361	.509	.391	.93	.75	.87	S S W	S S W	S S W	132.30	2.0	...	...	Do. 10.	Cu. Str. 4.	Clear.
13	802	804	914	56.1	75.6	63.0	.427	.584	422	.97	.66	.76	S b E	S	S S E	118.70	2.5	...	...	Fog.	Clear.	Do.
14	912	830	805	60.1	75.2	64.2	.432	.745	.563	.85	.86	.94	S E b E	S E	S E	47.60	2.5	0.066	...	C. C. Str. 4.	Cu. Str. 10.	Rain.
15	700	862	967	68.2	73.6	54.2	.584	.476	.341	.87	.59	.83	S W	W b S	N W	238.10	2.5	...	...	Cirr. 2.	Do. 4.	Clear. Au. Bo.
16	972	30.052	934	41.0	69.6	51.0	.235	.329	.302	.91	.46	.82	S W b W	S S E	S E b E	43.50	1.0	...	...	Clear. Frost.	Clear.	Cu. Str. 10.
17	770	29.799	817	47.5	68.0	52.0	.291	.516	.289	.89	.77	.76	E S E	S S E	S E b E	0.70	1.5	...	...	C. C. Str. 8.	Do.	Clear.
18	799	823	871	48.2	79.6	65.1	.269	.606	.523	.88	.60	.86	N E	S E b E	S E	17.02	1.5	...	...	Cu. Str. 4.	Cu. Str. 10.	Do.
19	714	704	683	61.0	78.4	72.0	.449	.626	.60	.85	.65	.78	S E b E	S S E	E S E	205.10	1.5	...	...	Cirr. Str. 4.	Clear.	Do.
20	842	848	837	57.6	61.7	52.9	.229	.263	.328	.91	.48	.83	W S W	S b E	N E b E	42.90	3.0	...	...	C. C. Str. 4.	Cu Str. 10.	Rain.
21	680	660	756	47.0	48.0	45.0	.291	.310	.282	.89	.92	.96	N E b E	N E b E	N E b E	518.30	4.0	2.646	...	Rain.	Do. 4.	Do.
22	763	757	770	46.2	51.0	48.8	.256	.302	.305	.92	.82	.89	N b W	S E b E	S S W	184.10	3.0	...	...	Cu. Str. 10.	Do. 10.	C. C. Str. 8.
23	610	630	707	47.0	69.5	54.0	.309	.464	.369	.96	.79	[illegible]	S S E	W b S	S S W	44.40	2.5	0.090	...	Rain.	Clear.	Cu. Str. 10.
24	860	904	991	50.0	69.7	51.3	.290	.592	.321	.82	.83	.86	S W	S W	S W b S	109.50	1.5	...	...	Clear.	Do.	Clear. Au. Bo.
25	924	993	845	48.0	64.1	55.0	.310	.314	370	.92	.53	.87	S S E	S b W	E S E	38.91	1.5	...	...	Fog.	Cirr. 4.	Do.
26	770	750	656	50.1	79.1	65.0	.309	.619	.583	.85	.64	.94	S S E	S S E	S S E	91.80	2.0	...	...	C. C. Str. 8.	Cu, Str. 4.	Cu. Str. 1.
27	590	515	303	58.5	58.7	57.6	.476	.423	.459	.97	.88	.97	S S E	S S E	E	205.70	3.5	1.066	...	Rain.	Rain.	Rain.
28	276	540	643	54.3	55.6	51.0	.390	.259	.328	.92	.68	.89	S W b S	W S W	W S W	178.20	3 0	0.100	...	Cu. Str. 10.	Cu. Str. 4.	C. C. Str. 4.
29	999	30.050	30.196	41.1	50.1	38.6	.212	.309	.201	.82	.85	.86	W b S	W b S	S W	157.40	1.5	In'p.	...	Do. 8.	Clear.	Clear.
30	30.270	235	293	40.2	59.0	40.0	.232	.416	.216	.95	.85	.91	S S E	S b E	S b E	8.02	2.0	...	...	Do. 10.	Cu. Str. 4.	Do.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR AUGUST, 1861.

Barometer	Highest, the 20th day	30.190
	Lowest, the 10th day	29.420
	Monthly Mean	29.853
	Monthly Range	0.770
Thermometer	Highest, the 1st day	90°.0
	Lowest, the 20th day	46°.2
	Monthly Mean	66°.84
	Monthly Range	43°.8
Greatest intensity of the Sun's Rays		108°.4
Lowest Point of Terrestrial Radiation		41°.7
Amount of evaporation		3.02
Mean of Humidity		.736

Rain fell on 12 days, amounting to 1.950 inches; it was raining 12 hours and 41 minutes, and was accompanied by thunder on 5 days.

Most prevalent wind, the S. S. W.

Least prevalent wind, the N.

Most windy day, the 14th; mean miles per hour, 9.35.

Least windy day, the 9th; mean miles per hour, 0.42.

Aurora Borealis visible on 4 nights.

Solar Haloes visible on 3 days.

The Electrical state of the Atmosphere has indicated rather high intensity.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR SEPTEMBER, 1861.

Barometer	Highest, the 30th day	30.299
	Lowest, the 28th day	29 276
	Monthly Mean	29.849
	Monthly Range	1.023
Thermometer	Highest, the 18th day	79°6
	Lowest, the 25th day	35°0
	Monthly Mean	58°06
	Monthly Range	44°6
Greatest intensity of the Sun's rays		97°8
Lowest point of Terrestrial Radiation		32°0
Mean of Humidity		.804
Amount of Evaporation		1.83

Rain fell on 9 days, amounting to 4.816 inches; it was raining 66 hours and 50 minutes, and thunder was heard on 1 day.

Most prevalent wind, S. S. E.

Least prevalent wind, E.

Most windy day, the 21st day; mean miles per hour, 21.60.

Least windy day, the 17th day; mean miles per hour 0.02.

Aurora Borealis visible on 5 nights. On 2 nights the Magnetic disturbance was considerable during its apparition.

The Electrical state of the Atmosphere has indicated feeble intensity.

First Frost occurred on the 5th day.

Solar Haloes seen on 2 days.

ERRATA.

Page 87, line 5 from bottom, *for* teamway, *read* tramway.

" 188, line 5 from top, *for* resembling, *read* resembles.

" 191, line 14, *for* F R.S, *read* F.G.S.

" 229, line 4 from bottom, *before* exhumed human relics, *insert* the.

" 301, line 5 from bottom, *for* Professor of Mineralogy, *read* Professor of Metallurgy.

" 487, line 26, *for* arranged, *read* surveyed.

" 500, line 3 from bottom, *for* of, *read* or.

" 516, line 10, *erase the word* ambulacral.

INDEX.

SCIENTIFIC AND LITERARY NOTES:

MINERALOGY AND GEOLOGY.

POSTSCRIPT.—Since our remarks on fossil sponges, in the "Minerals and Geology of Canada," page 505, were printed off, we have received a publication of the Geological Survey, containing descriptions of various new species of Lower Silurian Fossils, by E. Billings, F.G.S. In this publication, Mr. Billings describes, under the generic name of *Eospongia*, two sponges recently brought by Mr. Richardson from the Chazy Limestone of the Mingan Islands, together with a third species (*Astylospongia parvula*) from the Trenton Limestone of Ottawa City. These, however, as compared with the generality of Silurian fossils, may be looked upon as quite of exceptional occurrence. Nevertheless, to prevent misconception, the reader is requested to alter the words "determinate forms," page 505, line 16, into "characteristic forms."—E. J. C.

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