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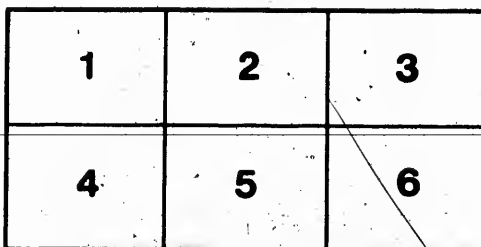
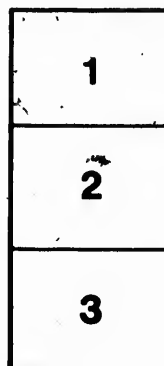
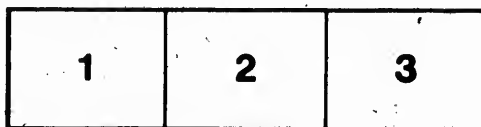
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GEOLOGICAL SURVEY OF CANADA.

SIR W. E. LOGAN, F.R.S., DIRECTOR.

Nov. 1861.

I. On some new or little-known species of Lower Silurian Fossils from the Potsdam Group (Primordial Zone). By E. BILLINGS, F.G.S.

The fossiliferous rocks on the north shore of the Straits of Belle Isle, from which a portion of the species hereinafter described were procured, consist of the following in descending order:—

1. LIMESTONES.—Reddish and greenish coloured limestone, varying in some places to grey, with some red and green shale. The fossils are *Palaophycus incipiens*, *Archocyathus Atlanticus*, *A. Minganensis*, *Obolus Labradoricus*, *Obolus chromatica*, *O. ? cingulata*, *Paradoxides Vermontensis*, *P. Thompsoni*, *Conoccephalites miser*, *Bathyurus parvulus*, *B. senaria*, *Merella rugosa*, *S. pulchella*, and *S. obtusa*. There are besides these two species of *Obolus* and one of *Orthisina*, and numerous fragments of trilobites, apparently of several undescribed forms. The thickness of these limestones is 141 feet.

2. SANDSTONES.—Grey, red and reddish grey sandstones, the lower beds holding pebbles of white quartz from the size of a pea to one or two pounds in weight. The only fossil observed is *Scolithus linearis*. Thickness 231 feet.

These rocks rest upon the Laurentian, and their fossils show them to be of the age of the Potsdam group. They were examined by Mr. J. Richardson during the past summer.

Another exposure of rocks of the same age occurs about three miles east of Phillipsburgh in the County of Missisquoi, and extends south into the State of Vermont, where it is largely developed and constitutes the Red Sandrock of the geologists of that State. During several visits made to this exposure last summer, I could find no fossils on the Canadian side of the boundary-line, but several important localities occur in the immediate neighbourhood in Vermont. At one of these, $1\frac{1}{2}$ miles east of Swanton, a number of species have been found by the Rev. J. B. Perry and Dr. G. M. Hall of that town. These gentlemen are engaged in making a careful geological examination of the rocks and fossils of their

a neighbourhood, and have requested me to describe the new species collected by them. At this locality *Palaeophycus incipiens*, *Obolella cingulata*, *Paradoxides Vermontana* and *P. Thompsoni* occur in the black slates conformably interstratified with the sandstones and magnesian limestones which constitute the principal mass of the formation. It will be observed that several other species are also found here, but the prevailing forms are the four above mentioned, and, as they are most abundant in the limestones of the Straits of Belle Isle, there can be little doubt that the two deposits, although 860 miles distant from each other, are of the same age. The occurrence of *Scolithus linearis* and the general aspect of the fossils, also show that these rocks must be very nearly, if not exactly, in the same geological horizon with the Upper Primal Sandstones and Slates of Pennsylvania.

Only one out of all the species collected in the above-mentioned localities is known to range upwards. This is *Archeocyathus Mingonensis*, which however has not been found above the lower half of the Calciferous formation.

PLANTÆ.

SCOLITHUS LINEARIS. (Hall.)

Scolithus linearis.—(Hall.) Pal. N. Y. Vol. I, Pl. I. Figs. 1, a, b, c.

This species occurs at Anse au Loup in the sandstone, but I have not detected it in the limestone of that locality. The form differs from the one which is so common in the Potsdam sandstone of Canada in being larger and straighter. It is perfectly identical with that of the Upper Primal Sandstone of Pennsylvania, and also with that of the Potsdam Sandstone of Tennessee. (Formation III of Prof. Safford.)

PALÆOPHYCUS INCIPIENS. (N. sp.)

Description.—This species consists of elongated straight or slightly curved stems from half an inch to three-fourths of an inch in width. The transverse section is irregularly oval, with two acute edges, but it is probable that this flattened form is due to compression. Although numerous specimens lying in the rock were examined, no indication of branching was observed. The specimens are usually from four to six inches in length, but some are more than one foot. They occur abundantly on the surface of certain strata, and the specimens from Anse au Loup are perfectly identical with those which abound in the slates near Swanton in Vermont, holding *Conocephalites*, *Paradoxides Thompsoni*, *P. Vermontana*, &c.

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Locality and Formation.—Anse au Loup, on the north shore of the Straits of Belle Isle, in sandstone of the Potsdam group. Also 14 miles east of Swanton, in the State of Vermont, in rocks of the same age.

Collectors.—J. Richardson, Rev. J. B. Perry, and Dr. G. M. Hall.

PALÆOPHYCES CONGREGATUS. (N. sp.)

Description.—Stems cylindrical, from one to four lines in diameter, often crowded together in such abundance as to completely cover the surface of the rock. They lie across each other in every direction, and appear to be so interlaced that where very thick the same stem can seldom be traced for more than one inch in length. They are either straight or crooked, and sometimes present sudden slight enlargements of the diameter, giving them a somewhat nodulose aspect.

Locality and Formation.—One mile south of the boundary line, on the road leading from Moor's Corners in St. Armand to Saxe's Mills in Highgate, Vermont. In the thin beds of the Potsdam group. Red Sandrock formation of Vermont.

Collector.—E. Billings.

AMORPHOZOA OR ZOOPHYTA.

In the limestone at Anse au Loup there are numerous fossils which from their radiated structure have the aspect of true corals, and yet in polished sections seem to possess the poriferous organization of sponges. I shall therefore leave it an open question as to which of the two divisions they should be referred. There appear to be two closely-allied genera, but for the present I shall place all the species in one.

Genus *ARCHEOCYATHUS.* (N. gen.)

Generic characters.—Turbinate simple or aggregate; cup deep. The internal structure so far as it can be made out, consists of an inner wall constituting the inner surface of the cup, and an external wall or epitheca enveloping the whole. Between the two walls there are numerous radiating septa, the interseptal spaces being filled with poriferous or cellular tissue. It is highly probable that the inner wall is permeated by pores communicating with the interseptal tissue.

In *A. Atlanticus* the radiated structure is not so well defined as it is in the others, but still it can be observed in the polished sections. In *A. Minganensis* the septa are well developed, and give to the fossil the aspect of a *Petraia* or *Zophrentis*. It may be that these two species should be placed in different genera, but as there are numerous fragments of what appear to be intermediate forms, it would seem to be the better course to group them together in the first instance.

4
ARCHEOCYATHUS ATLANTICUS. (N. sp.)

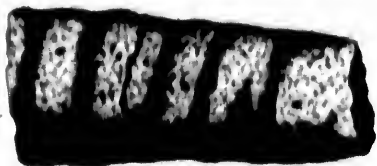


Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.

Fig. 1.—A fragment of this species. Fig. 2.—Transverse polished section of the same specimen. Fig. 3.—Longitudinal section of the same. Fig. 4.—The weathered extremity of a specimen with more numerous and regular septa, probably of a distinct species.

Description.—The only specimen of this species in the collection is a fragment four inches and a-half in length, fourteen lines in diameter at the larger and nine lines at the smaller extremity. Where the diameter is eleven lines the cavity of the cup is four and a-half lines across, and the space between the walls three lines. Of the radiating poriferous septa there are about sixty; they are so irregular that it is only in certain places in finely polished sections that the radiated structure can be detected. On one side where the specimen is weathered the structure presents the appearance of a rather compact cellular tissue. The form appears to be elongate conical, gradually tapering, the surface marked by wide shallow encircling oblique annulations, from three to six lines distant from each other. The outer wall does not seem to be poriferous, but this appearance may be due to the crystalline condition of the rock into which it is converted.

Locality and formation.—Anse au Loup on the north shore of the Straits of Belle Isle, in limestone of the Potadam group.

Collector.—J. Richardson.

ARCHIOCYATHUS MINGANENSIS.—(Billings.)

Petraea Minganensis.—(Billings.) Canadian Naturalist and Geologist. Vol. 4.
p. 340. 1859.

Description.—Elongate, turbinate, rapidly expanding from the base for one or two inches, then becoming cylindrical. The form is that of a large *Cyathophyllum* or *Zuparentis*. The cup extends in depth nearly to the base. The radiating septa are thin and closely crowded together, there being eight or ten in the width of three lines. The surface is annulated by strong rough ridges from one-fourth to half an inch apart, each ridge most abrupt on the upper side, and having an elevation of two or three lines above the bottom of the intervening furrows. The inner wall is exceedingly thin, apparently less than half a line. The base is curved for about two inches.

Specimens of the base attain a diameter of two inches in a length of three inches, but there is one fragment of the cylindrical part which must have belonged to an individual four inches in diameter. The large individuals appear to have attained a length of two feet or thereabouts.

This species was first described by me from casts of the interior of the cup, and placed provisionally in the genus *Petraea*. I think all the specimens collected at Anse au Loup and in the Calciferous Sandrock at the Mingan Islands, belong to the same species.

Locality and Formation.—Anse au Loup, on the north shore of the Straits of Belle Isle; in limestone of the Potsdam group. Also at Romain's Island, and on the north side of Harbour Island, in the lower half of the Calciferous formation.

Collector.—J. Richardson.

BRACHIOPODA.

OBOLUS LABRADORICUS (N. sp.)



Fig. 5.

Fig. 5. Dorsal valve of *O. Labradoricus*.

Description.—Dorsal valve sub-circular, the hinge-line straight and equal to about three-fourths the width of the shell; rather strongly and uniformly convex, most prominent at one-fourth the length from the beak,

the latter small, neatly pointed, scarcely distinct from the cardinal edge. Surface with fine concentric striae, which converge slightly on approaching the cardinal edge 15 to 20 in one line, and also with a few coarser concentric undulations of growth, the whole crossed by minute radiating striae just visible to the naked eye. The shell is black and friable like that of a *Lingula*. Length, $5\frac{1}{2}$ lines; width, about 6 lines.

Ventral valve unknown.

Locality and Formation.—Anse au Loup, on the north shore of the Straits of Belle Isle. Limestone of the Potsdam group.

Collector.—J. Richardson.

Genus OBOLELLA. (N. gen.)

Generic characters.—Shell ovate circular or sub-quadrate, convex or plano-convex. Ventral valve with a false area which is sometimes minute and usually grooved for the passage of the peduncle. Dorsal valve either with or without an area. Muscular impressions in the ventral valve four; one pair in front of the beak near the middle or in the upper half of the shell, and the others situated one on each side near the cardinal edge. Shell calcareous. Surface concentrically striated, sometimes with thin extended lamellose ridges.

In general form these shells somewhat resemble *Obolus*, but the arrangement of the muscular impressions is different. In *Obolus* the two central scars have their smaller extremities directed downwards, and converging towards each other; but in this genus the arrangement is exactly the reverse.

The three species in which I have seen the muscular impressions are the following:—

1.—*O. chromatica*,—hereinafter described. In this species the central muscular impressions are divergent below.

2.—A species which occurs in the well-known deposit of limestone near Troy in the State of New York. This is probably *Avicula ? desquamata*. (Hall) (Pal. N. Y. Vol. I. P. 292, Plate 80, fig. 3.) In two specimens of this species which I have before me the scars are in the upper part of the valve and diverge below. The small scar on each side close to the margin is visible.

3.—A small species from the Potsdam sandstone of the St. Croix River in the Western States, where it occurs associated with the Primordial trilobites described by the late eminent geologist Dale Owen. In this the central scars are close together one on each side of the median line and parallel.

The genus appears to be closely allied to *Obolus*, but sufficiently different, on account of the disposition of the muscular impressions, to be classified as a distinct species.

The four species known to me occur in the Primordial Zone and do not range into the second Fauna.

OBOLELLA CHROMATICA. (N. sp.)



Fig. 6.

Fig. 6. *Obolella chromatica*.—a. Ventral valve; b. dorsal; d. interior of one of the valves, supposed to be the ventral, showing the muscular impressions; c. outline restored from detached valves.

Description.—Broad oval, the rostral extremity obtusely pointed, front broadly rounded, greatest width a little below the middle; both valves rather strongly and uniformly convex, most tumid at about one third the length from the beak. Ventral valve more acute above than the dorsal, beak depressed below the greatest elevation of the shell, slightly elevated above the margin, with a small area beneath it which is inclined backward at an angle which varies from 45° to 60° . Dorsal valve with an obtusely rounded umbo, the beak scarcely distinct from the cardinal edge and not elevated above the margin. Surface with fine concentric striae or small minutely rugose ridges of growth of variable size, from 4 to 8 in one line, often smooth from exfoliation, or wearing. Colour of the shell in the reddish limestone a honey yellow, in grey limestone greyish; when exposed, to the weather becomes white and minutely fibrous.

Length and breadth about three lines.

In some specimens the ventral valve is depressed convex, the beak being on a level with the greatest elevation of the shell. The shell is thick and strong, and when well preserved breaks with a granular fracture. When weathered, a tendency to fibrous exfoliation is manifested.

This species is closely allied to the form that is found so abundantly in the Troy limestone, but the muscular impressions in that one are rather closer together and nearer the beak. (At least they are so in the specimens in my possession.)

Many of the specimens are a little more obtuse in the upper half than those figured. The individuals are exceedingly numerous and differ little in size.

Locality and Formation.—Anse au Loup, on the north shore of the Straits of Belle Isle. In limestone of the Potsdam group.

Collector.—J. Richardson.

OBOLELLA CINQUILATA. (N. sp.)



Fig. 7.



Fig. 8.



Fig. 9.

Fig. 7.—Ventral valve of *O. cinquilata*. Fig. 8.—Cast of interior of ventral valve.
Fig. 9.—Dorsal valve.

Description.—Hinge-line straight, a little less than the greatest width of the shell; sides straight or slightly convex for about one half the length; anterior angles obtusely rounded; front margin either uniformly convex or with a small portion in the middle somewhat straight. Greatest width a little in front of the middle. Ventral valve strongly and uniformly convex, most tumid about the middle; beak depressed below the greatest convexity of the shell; cardinal edges straight or gently concave, diverging from the beak at an obtuse angle. Area unknown. Dorsal valve somewhat flat, most elevated at the beak, in front of which, along the middle of the shell, there is a wide shallow concavity extending to the front margin; on each side of the beak, descending with a somewhat flat slope to the cardinal angles; area unknown, apparently half the height of the ventral area and nearly at right angles to the plane of the margin. Beak erect, obtusely pointed, forming the most elevated part of the shell. Surface with strong concentric sub-lamellose ridges which do not converge to the beak but terminate on the cardinal edges, their course conforming to the margin of the shell. Four or five ridges in the width of one line.

Length of largest dorsal valve seen $6\frac{1}{2}$ lines, greatest width 8 lines. Length of largest ventral valve in a straight line from beak to front 7 lines, width 10 lines. The proportional length and width appear to vary. The apical angle of the ventral valve also varies, being in some specimens much more pointed at the beak than in the one above figured. Specimens of all sizes occur from 3 lines in width upwards.*

* Since the above was written, I have examined many casts of the interior of this species, and am inclined to the opinion that it is generically distinct from *Obolella chromatica*. From the very considerable elevation of the beak the dorsal valve must have an area and probably a foramen. In one specimen there are two large oval impressions faintly impressed, but still distinctly visible. There is no trace of the lateral scars; and the form, notwithstanding the characters of the surface, conveys the idea of an *Orthisina*. Should, upon further examination, my suspicions turn out to be well founded, I shall call the genus *KORUSINA*, after the celebrated European naturalist, *KORUS*.

Locality and Formation.—Anse au Loup, on the north shore of the Straits of Belle Isle. In limestone of the Potsdam group.

Also abundantly in the condition of casts $1\frac{1}{2}$ miles east of Swanton in Vermont.

Collectors.—J. Richardson, Dr. G. M. Hall, Rev. J. B. Perry.

ORTHISINA FESTINATA. (N. sp.)



Fig. 10. Fig. 11. Fig. 12. Fig. 13.

Fig. 10.—Side view of *O. festinata*. Fig. 11.—Ventral valve. Fig. 12.—Area of ventral valve. Fig. 13.—*Camerella antiquata*.

Description.—Subquadrate or semioval, hinge-line equal to the greatest width of the shell. Ventral valve sub-pyramidal, beak elevated, surface with a straight or slightly convex slope in all directions to the margin, area triangular, a little inclined backwards, foramen about as wide as high, closed by a convex deltidium which is perforated at the beak. Dorsal valve nearly flat. Surface with angular bifurcating ribs, five or six in the width of two lines at the margin, crossed by fine concentric striae, of which there are from seven to ten in one line.

Width on hinge-line from 10 to 15 lines; length about a third less than the width. Height of beak of central valve from two to three lines.

Both valves show longitudinal undulations radiating from the beak to the margin.

This species closely resembles some of the ordinary forms of the genus, but differs internally from any known to me in the Second Fauna in the absence of the dental plates, no traces of which can be perceived in the casts.

Locality and Formation.— $1\frac{1}{2}$ miles east of Swanton in Vermont. Potsdam group.

Collectors.—Dr. G. M. Hall and Rev. J. B. Perry.

CAMERELLA ANTIQUATA. (N. sp.)

Fig. 13.

Description.—Ovate or subcircular beaks, obtusely pointed (as seen in the east), both valves moderately or rather strongly convex. Surface width from 8 to 10 small rounded ribs which do not reach quite to the beaks.

Some of the specimens are proportionally more elongated than others. The front margin appears to be always broadly rounded, and the greatest width at about one-fourth the length from the front margin.

Length from 4 to 6 lines; width either equal to or a little less than the length.

This species resembles *C. varians* of the Chazy, but is more numerous and ribbed.

Locality and Formation.— $1\frac{1}{2}$ miles east of Swanton, Vermont, in the Potsdam group.

Collectors.—Rev. J. B. Perry, Dr. G. M. Hall.

OTHER SPECIES OF BRACHIOPODA.

In addition to the above there are in the sandstone of Vermont, 1 mile south of the Province line, two other species, one of which appears to be an *Orthisina*, about the same size and shape as *O. festinata*, but more finely ribbed, and an *Orthis*, somewhat like *O. perversa* of the Chazy.

At Anse au Loup there are also two species of *Orthis*, and apparently one *Orthisina*, all different from the Vermont species.

CRUSTACEA.

PARADOXIDES THOMPSONI. (Hall, sp.)*

- OLENUS THOMPSONI, (Hall) 12th Reg. Rep. N. Y., p. 59. 1859.
 BARRANDIA THOMPSONI, (Hall) 13th Reg. Rep. N. Y., p. 116. 1861.
 PARADOXIDES THOMPSONI, (Emmons) Mem. of Geol. p. 280. 1860.
 PARADOXIDES THOMPSONI, (Barrande) Bul. Geo. Soc. France. 2d series. Vol. 18, p. 278. 1861.

A well preserved head of this species was collected in the limestone at Anse au Loup.

* In a Postscript to the 14th Regents' Reports, dated October, 1861, which I have seen in the form of a single loose sheet, Professor Hall proposes to change the generic name of these species to *Olenellus*. If the genus should turn out to be distinct from *Paradoxides*, I shall be most happy to adopt the name.

PARADOXIDES VERMONTANA. (Hall, sp.)

(The synonymy of this species is the same as *P. Thompsoni*.)

Several very good specimens of the glabella and head were collected in the limestone of L'Anse au Loup. It seems to be more abundant there than *P. Thompsoni*.

CONOCEPHALITES MISER.

Fig. 14.

Description.—Glabella elongate, conical, very convex, most elevated at about the mid-length, slightly narrowed at the neck segment, widest in the middle, narrowly rounded in front, well defined all round by the dorsal furrows. Neck segment strongly convex and bearing a short broad-based spine directed upwards and backwards. Neck-furrow extending all across; the posterior glabellar furrow well defined across, forming an obtuse angle backward in the median line; median glabellar furrow also running across, but not so strongly defined as the posterior; anterior furrows extending one-third across.

Length of glabella, 2 lines; width in the middle, about half the length.

There is no described species to which this one bears any close relation on account of the peculiar character of the posterior and median furrows running quite across the glabella.

Locality and Formation.—Anse au Loup, on the north shore of the Straits of Belle Isle, in limestone of the Potsdam group.

Collector.—J. Richardson.

CONOCEPHALITES ADAMSI. (N. sp.)



Fig. 14.



Fig. 15.



Fig. 16.



Fig. 17.



Fig. 18.

Fig. 14. *Conocephalites miser*. Fig. 15. *C. Adamsi*. Fig. 16. *C. Teucer*. Fig. 17. *C. Vulcanus*. Fig. 18. *C. arenosus*.

CONOCEPHALUS.—ADAMS. *Silliman's Am. Jour. of Science*, 2nd series. Vol. 5, p. 109. May, 1848.*

CONOCEPHALITES.—BILLINGS. *In same Journal*, 2nd series. Vol. 32, p. 232, Sept. 1861. Also in *Can. Nat. and Geol.*, Vol. 6, p. 324, Aug. 1861.

* ON THE TACONIC ROCKS; by Prof. O. B. ADAMS.—The following is the notice taken of this species by Prof. Adams in the paper cited, while speaking of the Potsdam Sand-

Description.—Head broad semicircular, moderately convex; glabella oblong-conical, nearly two-thirds the whole length of the head, the front obtusely rounded or somewhat straight, the anterior angles narrowly rounded, the sides nearly straight from the anterior angle to the neck furrow, just in advance of which is the widest part. The neck furrow well defined all across; the glabellar furrows indistinct; the dorsal furrow is well defined all round the glabella. The cheeks are moderately tumid: a line drawn across the glabella about the mid-length would pass through the eyes. The distance of the eye from the dorsal furrow is equal to the greatest width of the glabella; the eye appears to be very small. The margin in front of the glabella is equal in width to about one-third the whole length of the head; it is bordered by an obtuse narrow elevated

stone in Vermont:—"From position therefore, it is inferred that the Red Sandrock is more recent than any of the Champlain division. Its fossils afford less demonstrative evidence. With the exception of *Plectoides* they are rare, having been found only at Highgate, where fragments of the shields of trilobites, having some resemblance to *Conococephalus*, occur very abundantly, and *Atrypa hemispherica* very rarely. These fossils, especially the latter, if correctly identified, indicate the period of the Medina sandstone and Clinton group, regarding these two rocks as belonging to one period."

At the date of the publication of Prof. Adam's paper, the geological position of *Conococephalus* was not generally understood, as Barrande's "*Notice préliminaire*," in which the character of the Primordial Zone were first clearly pointed out, had then been only lately published (in 1846). In July last I was shown this trilobite by Messrs. Hall and Parry of Swanton, and directed the attention of Prof. B. Silliman to it. I was not then aware of the existence of Prof. Adam's paper, but saw it soon after, and published it in full in the *Canadian Naturalist* of August. While preparing these sheets for the press I received (Nov. 16th) the November No. of Silliman's Journal, in which there is the following surprising piece of information:—

"Letter from C. Hitchcock, Esq., on the first observation on the fossils of the red sandstone formation of Vermont.—Eda. Silliman's Journal:—As a notice of the *Conococephalus* from the red sandrock series in Highgate, Vt., has appeared in your Journal (Second Series, Vol. XXXII. p. 232) it is but just to the dead to state who were the original discoverers of this trilobite. By referring to the Third Annual Rept. Geol. Vt. 1847, pages 14 and 31, it will appear that Prof. Z. Thompson conducted Prof. C. B. Adams to Highgate, where both gentlemen procured a large number of these trilobites. They were sent to Prof. J. Hall in 1847 for determination; who gave them the name of *Conococephalus*, the same to which Mr. Billings now refers them. At that time the precise position of the *Conococephalus* was not known. Nor was Prof. Hall able to give more definite information respecting them in 1858 when I showed him the specimens again.

"These trilobites are noticed on pages 339 and 340 of our Third Report, which will be shortly ready for distribution.

"Amherst, Mass, Oct. 23d, 1861."

The astonishing part of the above communication is, that for the last 14 years there has been an abundance of palaeontological evidence to establish the age of the Red Sandrock of Vermont, and yet the great problem has remained unsolved until 1861. The Geological position of *Conococephalus* was known long previous to 1858.

rim, just within which is a groove, which is more deeply impressed on each side than directly in front of the glabella, there being at this place a gently convex elevation resembling that which occurs in Barrand's species, *C. Sulzeri* and *C. coronatus*. The ocular ridge is well defined where the surface is preserved, but is rarely visible in the sandstone casts. Most of the specimens are distinctly carinate along the median line of the glabella.

It is possible that there may be a median tubercle on the neck segment, but none of our specimens have this part sufficiently well preserved to show it.

The following are the dimensions of a specimen of the average size:—Length of head 5 lines; length of glabella $3\frac{1}{2}$ lines; greatest width of glabella 2 lines; width of glabella at front $1\frac{1}{2}$ lines; distance of eye from side of glabella 2 lines.

Dedicated to Prof. C. B. ADAMS, late State Geologist of Vermont.

Locality and formation.—Highgate, Vermont, in the Potsdam group, about a mile east of the Highgate Springs.

Collectors.—Rev. J. B. Perry, Dr. G. M. Hall, and E. Billings.

CONOCEPHALITES VULCANUS. (N. sp.)

Fig. 17.

Description.—Head broad, moderately convex; glabella obtusely conical, with the neck segment triangular and extended backwards in the middle; neck furrow not extending across, being interrupted by a strong carina which runs along the median line; dorsal furrow all round, but not sharply defined. Front margin about one-third the length of whole head, with a projecting rim, and a transverse groove situated two-thirds the distance from the front of glabella. Checks moderately convex; ocular ridge well defined, a line drawn across the head a little in advance of the mid-length of the glabella, would pass through the eyes; the latter distant from the glabella at least half the whole length of the head. No indications of glabellar furrows visible.

Length of head, $4\frac{1}{2}$ lines; of glabella, including the backward projecting angle of the neck segment, 3 lines; width of glabella just in advance of neck furrow, $2\frac{1}{2}$ lines; distance of eye from glabella, $2\frac{1}{2}$ lines.

This species differs from *C. Adamsi*, in the character of the neck furrows, and in the greater proportional width of the glabella.

It was found along with *C. Adamsi* in the same beds.

CONOCEPHALITES TRUCRA. (N. sp.)?

Fig. 10.

Compare *C. Billingsi*.—(Shumard.) *Silliman's Am. Jour of Science*. 2d Series. Vol. 32. p. 220. Sept. 1861.

Description.—Head semi-oval, glabella conical, convex, well defined all round by the dorsal furrows, about two-thirds the whole length of the head, widest just in advance of the neck furrow, sides gently convex, front neatly rounded, neck furrow well defined all across; posterior furrows commencing at about one-half the length of the glabella, and running inwards and backwards nearly to the neck furrow and one-third across; median furrows curved backwards, and extending one-fourth across; anterior furrows short; ocular ridges well defined; front margin one-third the whole length of head, with a well defined groove running across, in front of which there is an elevated marginal rim, which rises with a flat slope upwards and forwards; the groove across the margin is situated at about one-fourth the distance from the front of the glabella to the elevated edge of the rostrum; the cheeks are moderately tumid; the neck segment is well developed, with a small median tubercle scarcely the fourth of a line in height, and in some specimens seem to be absent altogether.

Thorax of 13 or 14 segments; axis strongly defined, cylindrical; side lobes about one-third wider than the axis.

The pygidium is very small, being scarcely one-sixth the length of the thorax. The only specimen in which it has been observed attached to the thorax is not sufficiently well preserved to enable me to describe it in detail.

The following are the measurements of two of the specimens:—Length of head $4\frac{1}{2}$ lines; length of glabella 3 lines, width, just in advance of neck furrow, $2\frac{1}{2}$ lines, and at one-third the length from front margin 2 lines.

In $\frac{1}{2}$ specimen consisting of the thorax and pygidium the whole length is six lines, of which the pygidium occupies apparently a little less than one line. Width at first segment $5\frac{1}{2}$ lines; width of axis at same place $1\frac{1}{2}$ lines; width at anterior margin of pygidium about 3 lines.

The position of the eye is not shewn in any specimen that I have seen, but from the width of the portions of the fixed cheeks which remain, it must be distant from the dorsal furrows nearly the width of the glabella.

This species appears to be closely allied to the one above cited from Shumard's paper, so far as the characters of the glabella are concerned. As however the proportions are a little different, I shall dispose of it as above until I can have an opportunity of submitting a specimen to Dr. Shumard.

Locality and formation.— $1\frac{1}{2}$ miles east of Swanton in Vermont, in the slates of the Potsdam group.

Collectors.—Mr. J. B. Perry, Dr. G. M. Hall, Sir W. E. Logan.

CONOCEPHALITES ARENOSUS. (N. sp.)

Fig. 18.

Description.—Glabella conical about three fourths the length of the head, convex, well defined by the dorsal furrows all round, neck furrow all across, posterior glabella furrows represented by obscure indentations which appear to be directed obliquely backwards from near the mid-length to near the neck furrow; there appear to be no median and anterior furrows. Front margin with an elevated rostrum and a transverse groove, the latter passing at about one third from the front of the glabella. Ocular ridge well defined.

Length of head $3\frac{1}{2}$ lines; of glabella $2\frac{1}{2}$ lines; width of glabella at base $1\frac{1}{2}$ lines; at one third the length from front $1\frac{1}{2}$ lines.

Another head is $4\frac{1}{2}$ lines in length.

The characters of the impressions taken to be the posterior glabella furrows are not well ascertained.

Locality and Formation.—In thin bedded, flaggy sandstone by the side of the road leading from Moore's Corners in St. Armand to Saxe's Mills in Highgate, Vermont, about one mile south of the Province line. Potsdam group.

Collector.—E. Billings.

BATHYURUS SENECTUS. (N. sp.)



Fig. 19.



Fig. 20.



Fig. 21.

Fig. 19. Head of *B. senectus*. Fig. 20. Supposed pygidium of the same. Fig. 21. *B. parvulus*.

Description.—Glabella sub-cylindrical, clavate, strongly convex, one fourth wider at the front margin than at the neck segment, sides nearly straight, front obtusely rounded and presenting a strong convex elevation, neck furrow extending all across, three pairs of glabella furrows represented by small but distinct and obtuse indentations in the sides. Fixed cheeks rather strongly convex. Eyes of moderate size, semicircular; a line drawn across the head at about one third the length of the glabella from behind would pass through them, and they are distant from the side of the glabella about the width of the neck segment. The front of the neck is surrounded by a narrow border which appears to be flat; there appears to be some evidence of a spine on the neck segment.

The pygidium found in the same fragment of stone with one of the specimens of the glabella of this species is in all general characters that of a *Bathyurus*. It is semicircular, convex, axis cylindrical, strongly convex, terminating behind with an abruptly rounded descent, six annulations, the first three or four most strongly defined. The lateral lobes have four segments each, separated by strong rounded furrows; there is a narrow entire margin all round with a distinct groove inside, which appears however to be interrupted at the end of the axis.

The dimensions of the most perfect specimens are as follows:—

Glabella,—length $3\frac{1}{2}$ lines; width at neck segment $1\frac{1}{2}$ lines, at the front 2 lines; distance of the eye from the side of the glabella $1\frac{1}{2}$ lines. The eye appears to be about $\frac{1}{2}$ of a line in length.

Pygidium,—length 3 lines; width at anterior margin $5\frac{1}{2}$ lines; width of axis 1 line.

Locality and Formation.—Anse au Loup, on the north shore of the Straits of Belle Isle. Limestone of the Potsdam group.

Collector.—J. Richardson.

BATHYURUS PARVULUS. (N. sp.)

Fig. 31.

Description.—Glabella cylindrical strongly convex, much elevated above the fixed cheeks, uniformly arched from the front margin for half the length backwards, very slightly narrower at neck segment than at front margin, sides straight, nearly parallel, and distinctly defined by the dorsal furrows. Neck furrow extending all across, posterior glabellar furrows indicated by a barely perceptible indentation on each side, no anterior furrows. Front of head surrounded by a narrow flat margin. Eyes distant from the sides of the glabella about the width of the neck segment.

On a side view the head has a convexity equal to about one quarter of a sphere. Length of head $2\frac{1}{2}$ lines; width of glabella $1\frac{1}{2}$ lines; width of the flat border surrounding the front of the head about $\frac{1}{2}$ of a line.

A line drawn across the head at about one third of the length from the posterior margin of the glabella would pass through the centres of the eyes. The eyes appear to be about $\frac{1}{2}$ of a line in length.

This species differs from *B. senectus* in the almost total absence of glabellar furrows; and in the nearly equal width of the glabella throughout its whole length.

Locality and Formation.—Anse au Loup, on the north shore of the Straits of Belle Isle. In limestone of the Potsdam group.

Collector.—J. Richardson.

Genus *BALTERELLA*. (N. gen.)

Generic characters.—Small slender elongate conical tubes, consisting of several hollow cones placed one within another, the last one forming the chamber of habitation of the animal. The cross section of these tubes is circular or subtriangular, and they are either straight or gently curved; the surface is concentrically or longitudinally striated.

I think these fossils, although no doubt allied to *Serpulites*, sufficiently different therefrom to constitute a distinct genus. Their structure is so compact that they are seldom found compressed, while all species of *Serpulites* are almost invariably in that condition, shewing that they consist in general of something more like a membranous sack than a hard shelled tube.

This genus is dedicated to J. W. *BALTER*, Esq., Palaeontologist of the Geological Survey of Great Britain.

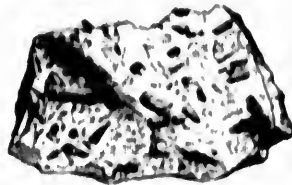
BALTERELLA RUGOSA. (N. sp.)

Fig. 22.

Fig. 22. A piece of Limestone with *B. rugosa*.

Description.—This little species is straight, conical, tapering uniformly to an acute point. Length from two to four lines, the greater number of the specimens being under three lines; diameter at larger extremity one line in a specimen four lines in length; the smaller ones are often a little more obtuse. Aperture circular, equal to about three-fourths the whole diameter. It is not certain that in any of the specimens observed the surface is preserved; they all appear to be divested of the outer covering, and exhibit four to six imbricating sharp annulations in the length of one line, the edges towards the larger end. These are doubtless the exposed edges of the several sheaths of which the tube is composed. They are usually straight but some are slightly curved.

This species must be closely allied to *Serpulites Macullochi* (Salter), but upon an average they are smaller than those figured by Salter in the Jour. Geol. Soc. Vol. 15, Pl. 13, fig. 31.

Locality and formation.—Anse au Loup on the north shore of the Straits of Belle Isle, in limestone of the Potadam group.

Collector.—J. Richardson.

SALTARELLA PULCHRELLA. (N. sp.)

Description.—Elongate conical gently curved, six to eight lines in length and from one line to one and a half in width at the aperture. Surface ornamented with small encircling striae just visible to the naked eye.

This species is larger than *S. rugosa*, always a little curved, not so abundant, and when weathered does not present the sharp imbricating angulations of that species.

Locality and Formation.—Same as *S. rugosa*, but apparently not in the same bed, as the two species are not found together in the same fragments of rock.

SALTARELLA OBTUSA. ?(N. sp.)

Description.—Six to eight lines in length; diameter at aperture about three lines. The transverse section is always sub-triangular, and in some of the specimens one side appears to be flat like a *Theca*, and I would refer it to that genus only that the tube is composed of successive layers. None of the specimens are perfect, but the form is sufficiently different from that of the other two to indicate a distinct species.

Locality and Formation.—Same as the preceding, but not associated with *S. rugosa*, although it occurs in the same fragments of rock with *S. pulchella*.

2.—On some new species of Fossils from the Calciferous, Chazy, Black Trenton formations.

ASTYLOSPONGIA. (N. gen.)

ASTYLOSPONGIA (pars).—(Roemer). *Die Silurische Fauna des Westlichen Tennessee*, p. 7, 1860.

Generic characters.—Sub-globular, pyriform or sub-hemispherical sponges, not free, with an internal arrangement of pores (sometimes reticulated), radiating irregularly from the central axis; cup of variable depth.

Dr. Ferdinand Roemer in his beautiful work on the Silurian Fauna of Western Tennessee, has described three genera of Silurian sponges, *Astyspongia*, *Palaomanon*, and *Astrasporgia*. The first of these he says consists of free sponges, hence the generic name. We have several species in the Lower Silurian rocks of Canada, which were evidently

attached and not free. Most of the specimens have a well developed pedicel. Some of the others which exhibit no pedicel evidently attached themselves while young to some cylindrical body and grow around it. We have several with the stalk of a crinoid passing quite through either in the centre or a little on one side. Others are perforated through the centre as if they had grown around some upright slender body, which has disappeared during the natural process of fossilization. Those with the stalks of crinoids passing through them could not have been *free*, and the others with the central perforation appear to be of the same species. The structure and general form does not differ from those which exhibit perfect evidence of a pedicel. I propose therefore to separate the species here mentioned from *Astylopongia*, and arrange them under the name of *Rospongia*.

I shall place a new species from the Trenton limestone, corresponding in form to Roemer's *A. incise-labata*, in *Astylopongia*.

ROSPONGIA ROEMERI. (N. sp.)

Description.—Elongate pyriform or club-shaped; the internal structure in polished sections shows numerous circular tubes, those in the central part of the mass the largest.

The best preserved specimen that I have observed is 5½ inches in length and three inches in diameter at two inches from the top. The larger extremity is rounded, with a small depression one inch wide and half an inch in depth in the centre. It tapers gradually from 3 inches to a diameter of 1½ inches at the small end where it is broken off. The pores as shown in a polished transverse section, are from ¼ a line to 2 lines in diameter.

Dedicated to Dr. FERDINAND ROEMER.

Locality and formation.—Mingan Islands, Chazy limestone.

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

ROSPONGIA VAREANS. (N. sp.)

Description.—This species is depressed turbinate, expanding from the obtusely pointed pedicel to a width of from two to three inches, at a height of from one to two and a-half inches. The upper margin is obtusely rounded. The width of the cup is about one-third of the whole diameter, and about a-half or three-fourths of an inch deep, rounded at the bottom, and with a thick rounded margin. The greatest width of the species is in general near the top, but in those which have grown around the stalk of a crinoid there is a depression below as well as above, so that it is often difficult to say which is the cup or which the base. The transverse polished

section shows numerous radiating tortuous channels, often branching from $\frac{1}{2}$ to 1 line in diameter, and usually distant once or twice their width. The vertical section shows other channels ascending and sloping outwards. The weathered surfaces are irregularly striated with obscure rounded often interrupted radiating ridges of from $\frac{1}{2}$ to 1 line wide.

Some of the specimens are nearly flat, but in general they are obscurely turbinate or very depressed pyriform.

Locality and formation.—Mingan Islands, Chazy limestone.

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

ASTYLOSPIGIA PARVULA. (N. sp.)

Description.—Small, sub-globular, the sides grooved by from five to seven deep furrows, which divide it into as many lobes. The furrows are about half the width of the lobes. There is no trace of either a cup or a pedicle at either extremity. The individuals are from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch in diameter.

This species is of the same form as Roemer's *A. inciso-lobata*, with the exception of the absence of the central depression or cup. It is also less than half the diameter of that species.

Locality and Formation.—City of Ottawa. Trenton limestone.

Collector.—E. Billings.

LINGULA PERRYI. (N. sp.)

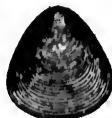


Fig. 23.

Fig. 23.—*Lingula Perryi*. Dorsal valve.

Description.—Dorsal valve triangularly oval, the front margin gently convex or nearly straight, the anterior angles broadly rounded, the apex obtusely pointed; the sides from the apex for one half the length, or a little more, gently convex or somewhat straight and diverging at an angle of about 60°. The beak is rounded, prominent and situated about $\frac{1}{2}$ of a line from the margin of the apex. The most convex part of the shell is at about one fifth the length from the beak; from this point the surface descends with a uniform gentle and very slightly convex slope in all directions to front margin and anterior angles and half of the sides; in the pos-

terior or upper half with an abrupt slope, becoming concave on each side of the beak. Surface ornamented with fine lamellose ridges distant from each other two or three in one line.

Length of specimen 9 lines; greatest width, at one fourth the length from front margin, about 8 lines.

The shell appears to be smooth between the lamellose concentric striae, but in more perfect specimens finer striae may exist. The striae become more crowded in the upper part, where they curve round to the beak.

This beautiful *Lingula* has somewhat the appearance of *Lingula Belli* of the Chazy Limestone. That species however usually exhibits three flat slopes, one to the anterior margin and one to each side.

Dedicated to the discoverer, Rev. J. B. Perry, of Swanton, Vermont.

Locality and Formation.—Limestone at Highgate Springs, Vermont, apparently of the age of the Black River.

LITUITES FARNSWORTHI. (N. sp.)

Fig. 24.

Description.—Tube very slender, forming about three complete whorls; section circular or very nearly so; siphuncle small close to the shell in the median line on the outer or ventral side; septa gently arched and numerous; chamber of habitation deep.

In the best-preserved specimens the first two whorls are in contact and make a coil one inch across. The whorls then commence to separate, and become more and more distant until at the completion of the third the distance is from $1\frac{1}{2}$ to $2\frac{1}{2}$ inches. Where the whole spire is $4\frac{1}{2}$ inches across, the diameter of the aperture is one inch; at $8\frac{1}{2}$ inches it is 9 lines. There are usually from 8 to 12 septa in half an inch, but the distance is variable in the same specimen. In the one figured there are 5 or 6 in half an inch in the latter part of the second and commencement of the third whorl, but farther on towards the outer chamber there are 12 or 15 in the same distance. The siphuncle is about $\frac{1}{4}$ of a line in diameter and about the same distance from the shell. The chamber of habitation appears to be three or four inches deep. No part of the free portion is straight, the curve continuing although becoming gradually less quite to the aperture. Surface of shell unknown.

This species differs from all known American species in being more slender, and in having more numerous septa.

Dedicated to the discoverer, Dr. F. P. Farnsworth, M.D., Phillipsburgh, Canada East.

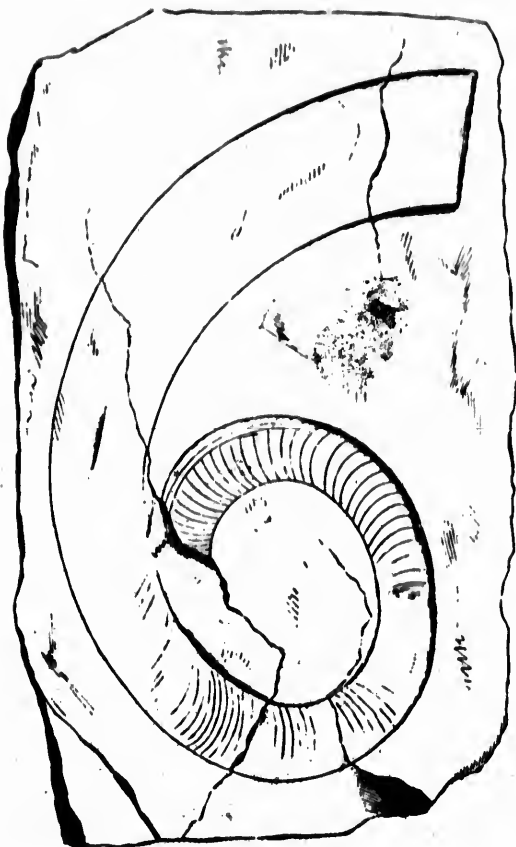


Fig. 24.

Fig. 24.—*Lituites Farnsworthi*. Since the above was engraved, better specimens have been received. The figure does not show the many close septa near the outer chamber, which can be made out, although indistinctly, in the specimen.

Locality and Formation.—Phillipsburgh in the County of Missisquoi, Canada East. In the upper part of the Calciferous sandrock.

Collectors.—Dr. F. P. Farnsworth, E. Billings.

23

LITOTYLLUS IMPERATOR. (N. sp.)

Description.—Very large, the coiled portion alone being $10\frac{1}{2}$ inches across. The first two whorls are $2\frac{1}{2}$ inches and the first three $4\frac{1}{2}$ inches across. The first three are coiled in contact; after which the whorls begin to separate and at the completion of the fourth are distant about $\frac{1}{2}$ of an inch. The last whorl is then produced nearly in a straight line for about 2 inches, after which (in the only specimen collected) it is not preserved. The dorso-ventral diameter of the tube where broken off is almost $4\frac{1}{2}$ inches. The distances of the septa vary greatly. In the commencement of the third whorl there are three in one inch, but they gradually become more distant until at the end of this whorl there are only two in one inch. The distance then diminishes, and at the middle of the fourth whorl there are four in one inch. (These measurements relate to the outer side.) Beyond this they are not seen, but the siphuncle is preserved to the end of the fourth whorl and shows the traces of nine septa in the last inch. The siphuncle is exposed in the specimen in two places, both in the fourth whorl. In the first quarter of the length of this whorl it is concealed. In the second quarter it is laid bare for a length $5\frac{1}{2}$ inches. It is here 4 lines in diameter, and its position is as nearly as can be, central. In the last quarter of the whorl there is another exposure of about 4 inches; its diameter being five lines, and its position, where last seen, $2\frac{1}{2}$ inches from the ventral or outer margin, and $1\frac{1}{2}$ inches from the dorsal or inner margin. The position therefore of the siphuncle in this species varies in different parts of the same individual. This agrees with Barrande's observations on *Orthoceras mundum*, in which the siphuncle passes from one side to the other in such a manner that 10 or 12 specimens might be made out of different fragments of the same individual specimen, provided the position of the siphon were alone to be taken into account and the pieces described by different observers without a knowledge of their connection.*

The only specimen collected is firmly imbedded in the limestone matrix, and is worn away so as to exhibit a complete section along the plane of the coil, showing all the whorls and the siphuncle as above mentioned. The character of the surface cannot thus be observed. But judging from the appearance of the shell as seen in the section the last whorl is crossed by wide shallow undulations, but no traces of these can be seen on the inner whorls, where the shell is also visible.

Locality and Formation.—Phillipsburgh, in the County of Missisquoi, Canada East. In the upper part of the Calciferous Sandrock.

Collector.—Dr. F. P. Farnsworth.

* BARRANDE. In *Brown's Neues Jahrbuch*, 1859, p. 608.

AMPYX HALLI. (N. sp.)

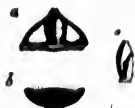


Fig. 25.

Fig. 25.—*Ampyx Halli*. a, head; b, pygidium; c, side view.

Description.—Head somewhat triangular or semioval. Glabella elongate oval terminating in front with an acute elevated rostrum, the length of which is not known, and truncated behind by the neck furrow, narrowly convex and rather sharply carinated along the median line. Glabellar furrows represented by two obscure indentations on each side, the posterior at a little less than one line from the neck segment and the anterior about two lines; the latter are deep pits situated in the dorsal furrow or just in the angle formed by the junction of the base of the glabella with the fixed cheeks. The neck segment is a flat plate inclining upwards and backwards at an angle of about 45° . The neck furrow is well defined all across the whole width of the head, being least distinct in passing over the posterior part of the glabella.

Pygidium semioval with a flat border all round abruptly bent down at nearly a right angle. Axis conical, moderately convex, extending the whole length and causing a slight projection in the posterior margin. Side lobes nearly flat, with five or six flat ribs each with a fine pleural groove extending the whole length. On the axis there appear to be ten or twelve closely crowded annulations occupying five sixths the length, the apex being apparently smooth. On approaching the margin the side ribs seem to curve a little forwards. Length of head, excluding the rostrum, $8\frac{1}{2}$ lines, measured along base of glabella. Width of glabella at neck segment $1\frac{1}{2}$ lines, and just in front of the anterior pits 2 lines; elevation at neck segment less than one line, and at front of head, so far as seen, about 2 lines. These measurements refer to the largest head seen.

No perfect head has been collected, and I cannot therefore give the length of the rostrum or moveable cheeks.

Dedicated to Dr. G. M. Hall of Swanton, Vermont.

Locality and Formation.—St. Dominique, in the County of Yamaska, Canada East, and at Highgate Springs in Vermont. In the Chazy Limestone.

Collectors.—J. Richardson and Dr. G. M. Hall.

