GEOLOGICAL AND NATURAL HISTORY SURVEY OF CANADA.

ALFRED R. C. SELWYN, LL.D., F.R.S., DIRECTOR.

PALÆOZOIC FOSSILS.

VOL. III., PART I.

BY

J. F. WHITEAVES, F.G.S., F.R.S.C., ETC.

PALÆONTOLOGIST AND ZOOLOGIST, G. & N. H. S. C.

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T

ALCYONARIA.

Heliolites interstinctus, Linn.

Hespeler, T. C. Weston, 1867: a single specimen, identified by E. Billings.

ZOANTHARIA TABULATA.

Halysites compactus, Rominger.

Galt, Rev. Andrew Bell, 1846-50: Elora, R. Bell, 1861, and Mr. David Boyle, 1880: Hespeler, T. C. Weston, 1867.

Two average Canadian specimens of this species have been forwarded to Dr. Rominger, who has kindly examined them and confirms the correctness of their identification.

ZOANTHARIA RUGOSA.

Cystostylus infundibulus, Whitfield.

Syringopora infundibula, Whitfield. Ann. Rep. Geol. Surv. Wiscons. 1877, p. 79.
Cystostylus infundibulus, Whitfield, Geol. of Wiscons. 1882, Vol. iv, p. 274, pl. 14, fig. 7.

New Hope, E. Billings, 1857: Elora, Mr. David Boyle: Durham, Mr. Joseph Townsend, 1883.

Pycnostylus. (Gen. Nov.)

Internal structure very similar to that of *Amplexus*, the radiating septa being rudimentary and extending but a short distance from the inner surface of the outer wall, but the tabulæ, though well developed and complete, are entirely horizontal and neither bend upwards at the periphery nor "embrace each other with their reflexed margins."*

Corallum compound, consisting apparently of an aggregation of numerous, slender, cylindrical or subcylindrical polyp stems, which divide by calicular gemmation at distant intervals into sets of three, four or more, ascending, sub-parallel, contiguous, flexuous branches. Structure of the calices previous to gemmation, and characters of the basal portion of the corallum unknown.

The above named genus is constituted for the reception of two spe-

* Min. Conch., vol. 1, p. 165.

cies of coral, one of which has already been partially described by Dr. H. A. Nicholson, on pages 66 and 67 of his report on the Palæontology of Ontario for 1875, as follows:

"The Guelph Limestones contain in abundance a species of coral, which I am unable to refer with certainty to its proper genus. Some specimens have the form of detached cylindrical tubes, irregular in their thickness, but varying in diameter from a line and a half to three lines. These tubes are flexuous, and furnished both with very well developed tabulæ, and with marginal septa in the form of strong longitudinal ridges. Examples of this kind present precisely the characters of the genus *Amplexus*, and I have been under the impression that they were referable to *Amplexus laxatus*, of Billings, a form which is quoted in the "Geology of Canada," as occuring in the Guelph Limestones, but the description of which I have been unable to consult."

"Other specimens, equally or more abundant, consist of numerous closely approximated tubes, similar in their structure to the above, and apparently forming part of a composite mass. This would lead one to separate these specimens from *Amplexus*, which contains only simple forms; but one would still be left uncertain where to place them. The genus to which such specimens are referable by their general form and mode of growth is *Diphyphyllum*; but they differ from this genus and agree with *Amplexus*, in the presence of complete tabulæ, (not a mere central tabulate area), and in the rudimentary condition of the septa. The same form occurs in the Corniferous Limestone, but I must at present leave its position unsettled."

Pycnostylus Guelphensis. (N. Sp.)

Plate 1, figs. 1, 1*a* & 1*b*.

? Amplexus laxatus, Billings. 1863. "Geology of Canada," pages 340 & 342, but with no description nor figures.
Amplexus (?) sp. Nicholson. 1875. Palæontology of Ontario, p. 66.

Corallites long and slender, averaging from three to seven millimetres in diameter, and dividing uniformly at the same point into either three or four branches. Epitheca marked by transverse constrictions and re-elevations at irregular distances, but not longitudinally ribbed. Primary septa alternating with smaller secondary ones.

New Hope, E. Billings, 1857: Guelph, R. Bell, 1861: Hespeler, T. C. Weston, 1867: Elora, Mr. D. Boyle, 1880: Durham, Mr. J. Townsend.

A common and characteristic fossil of the Guelph Formation, to

which two manuscript names, unaccompanied by any description or figure, have been applied at different times by Mr. E. Billings. In the Museum of the Survey the species is labelled *Amplexus congregatus*, Billings, by that naturalist himself, the label being not written but printed. The same coral is called *Amplexus laxatus* in the latter part of the twelfth chapter of the "Geology of Canada." As both of these specific names would be singularly inappropriate for this coral as now understood, it is not thought desirable to perpetuate either.

Natural transverse sections of this species, (as in the original of fig. 1*b*, on plate 1) shew a quadripartite, and more rarely a tripartite division of the corallites. This appearance might be supposed to be the result of fission, rather than of calicular gemmation, but is really due to the coalescence of the inner walls of the corallites immediately after budding,—as in the case of the genus *Diphyphyllum*.

Pycnostylus elegans. (N. Sp.)

Plate 1, figs. 2 & 2*a*.

Corallites attaining to a diameter of from thirteen to seventen millimetres: increasing by calicular gemmation in such a manner as to divide into six or seven branches on the same plane: external surface regularly and longitudinally ribbed, the ribs alternating with the septa within: all the septa of uniform height and size.

Hespeler, T. C. Weston, 1867: Durham, Mr. J. Townsend.

The only specimen of this coral in which calicular gemmation is plainly visible is presented by figure 2 on plate 1. Part of this specimen is covered with rock, but on the exposed surface five buds are visible, one of which is an inch and a quarter long, while the other four are broken off at their bases. Judging by the diameter of the buds in proportion to that of the calyx from which they spring, it is probable that the entire cycle would consist of either seven or eight.

It is possible that the specimens for which the above name is provisionally suggested may prove to be portions of the basal extremity of *P. Guelphensis* denuded of their epitheca, but at present no intermediate examples between the two forms have been collected.

BRACHIOPODA.

Spirifera plicatella, Sowerby.

Durham, Mr. J. Townsend: three single valves.

ATRYPA RETICULARIS, Linn.

Hespeler, T. C. Weston, 1871: two specimens of the ordinary form and one small valve with few and distant nodulous ribs, resembling the variety figured by Davidson in the "Silurian Brachiopoda" (Pl. xiv., fig. 22,) as "approaching in character *A. aspera*."

MONOMERELLA OVATA. (N. Sp.)

Plate 2, fig. 1, & plate 8, figs. 1, 1*a*, 1*b*, & 1*c*.

Shell inequivalve, the ventral valve being much larger than the dorsal: outline ovate as viewed laterally, the greatest breadth being a little in advance of the middle: valves regularly convex or with a faint mesial impression on each: maximum thickness through the closed valves in some specimens equal to, and in others slightly exceeding their greatest breadth. Umbo of the ventral valve tumid, gibbous and prominently arched, its beak being curved strongly and abruptly inwards and down to the centre of the posterior margin of the hinge plate: umbo of the dorsal valve smaller than that of the ventral and not nearly so prominent nor so much curved. Surface marked by rather coarse, irregular and concentric lines of growth. Test very thick posteriorly, but gradually becoming much thinner towards the anterior margin.

Characters of the interior of the dorsal valve unknown. So far as they can be ascertained at present, the markings on the interior of the ventral valve are as follows: The outline of the hinge plate or cardinal area is crescentic or semi-circular, its posterior margin being broadly and convexly rounded and its anterior border correspondingly concave. The hinge itself is very broad, flat, and closely as well as concentrically striated. In some specimens, the breadth of the hinge area in the centre, and as measured from back to front, exceeds half an inch. The deltidium and deltidial slopes are obscurely indicated by a faint depression in the centre of the cardinal area, and by equally faint divaricating, impressed lines.

The cardinal facet is narrower than the hinge plate: the outer margin of the cardinal facet is concavely and rather deeply emarginated on both sides of the cardinal buttress: the exposed portion of the cardinal buttress extends from the centre of the front margin of the cardinal facet nearly as far as the inner margin of the anterior boundary of the platform, as a narrow and acutely pointed septum, whose altitude as well as breadth diminishes rapidly towards the front: the platform, which is not vaulted, is feebly developed, obscurely defined and scarcely

raised above the lowest level of the valve posteriorly, and is bounded anteriorly by a moderately prominent, transverse, rounded ridge, which is curved shallowly towards the front margin, in the middle, or bent towards the front at a very obtuse and rounded angle. The muscular impressions are not distinguishable.

Length of the most perfect specimen along the median line, fifty-eight millimetres: maximum breadth, forty-three mm.: greatest thickness through the closed valves, forty-five mm.

Durham, Mr. J. Townsend: one perfect specimen, with the valves slightly displaced, and four detached ventral valves. Two of these separated valves have the interior completely filled with the matrix, and the others are so much worn or eroded inside that some of the characters of the interior of the ventral valve cannot be satisfactorily ascertained.

In all the previously described species of *Monomerella* the ventral valve is more or less flattened, its umbo and beak are erect, and its hinge area is distinctly triangular. The ventral valve of the present species, on the contrary, is remarkably tumid and inflated, its umbo is prominently arched, its beak incurved, and its cardinal area crescentic in outline. When its valves are closed *M. ovata* looks not at all unlike a *Pentamerus* of the type of *P. oblongus* or a large *Meristella* but the internal character of its ventral or pedicle valve seem to show that it is a true *Monomerella.*

Monomerella ovata, var. lata.

Plate 2, figs. 2 & 2*a*, & plate 8, figs. 2 & 2*a*.

Ventral valve (the only one known at present) moderately convex, with or without a mesial depression: outline sub-circular: length and breadth about equal: umbo somewhat prominent, beak slightly incurved: surface concentrically striated: test thick.

Hinge area concavely arched in front, obscurely sub-angular in the centre behind: umbo double chambered: umbonal cavities wide and deep: lateral muscular scars of the platform rather large, rhombic ovate, longitudinally striated, and converging anteriorly but without meeting. Other characters as in the type of the species.

Durham, Mr. J. Townsend: two ventral valves with the test preserved, and a well preserved natural cast of the same valve.

The best specimens of all the species of Trimerellidæ which are described in the present paper have been sent for examination to Thomas Davidson, Esq., F.R.S., to whom the writer is indebted for valuable

suggestions in regard to their generic and specific affinities. From their nearly circular form and from other peculiarities, the writer had supposed that the three valves just described might possibly belong to a large form of *Monomerella orbicularis*, Billings, but Mr. Davidson is inclined to think that they should be regarded rather as a variety of *M. ovata*, a conclusion which has therefore been adopted here. Mr. Davidson is also of opinion that the internal markings of the present shell are more like those of *M. prisca*, Billings, than they are like those of *M. orbicularis*.

Rhynobolus galtensis. (Billings, Sp.)

Plate 2, fig. 1a, and plate 8, figs. 3 & 3a.

Obolus Galtensis, Billings.....1862, Pal. Foss., Vol I., p. 168, fig. 151.
Trimerella minor, Dall.....1871, Am. Jour. Conch., Vol. VII., p. 83.
Rhynobolus galtensis, Hall, ...March, 1871, (Teste Davidson). "Rep. on the State Cab. of Nat. Hist. preparations of Pal. New York."
Obolellina Galtensis, Billings.....Dec. 1871, (Teste Davidson). Can. Nat., Vol. VI., N. S., p. 222. Also April, 1872.
Dinobolus galtensis, Davidson & King.....1872, Rep. Meeting Brit. Ass.
Trimerella [*?*] *galtensis*, Davidson & King..1874, Q J. G. S., Vol. XXX., p. 151, Plate 18, fig. 13 & plate 19, figs. 4 and 4a.

This species, which as the above synonymy shews, has been placed in five different genera, has previously been described almost exclusively from casts of the interior of the shell.

Three ventral valves with the whole of the test preserved, and one dorsal valve of a *Rhynobolus* which is probably referable to *R. Galtensis* have recently been collected at Hespeler and Durham. Two of these ventral valves have their interiors completely filled with rock and the third has only the hinge area exposed, on the inner side; but the inside of the dorsal valve is fortunately empty.

The characters exhibited by these four specimens may be thus expressed: The shell is compressed convex and nearly lenticular in transverse section when the valves are closed: its outline as viewed laterally is ovate, the length is always greater than the breadth, and the maximum breadth is usually (but not invariably) a little in advance of the mid-length. The outer surface of both valves is marked by concentric and somewhat imbricating striæ of growth and the test is not very thick.

The ventral or pedicle valve has an almost erect but somewhat

obtusely pointed umbo, whose lateral margins are obliquely convex: its beak is small and very slightly incurved, and its hinge area is broad, as measured from its anterior to its posterior margin, and shallowly crescentic.

The dorsal or brachial valve is about as convex as the ventral, but its cardinal area is comparatively narrow from back to front: the crown of the crescent is regularly arched and parallel with the front margin of the cardinal area, and on each side the crescent terminates in a small subpyriform scar. The platform is scarcely raised above the lowest level of the valve posteriorly, and is bounded at the sides and in front by a V-shaped raised ridge, whose pointed base is directed forwards. The middle muscular scars of the platform are broadly rounded on their inner margins, which latter nearly touch each other in the centre. On their outer margins the middle scars are bounded by the posterior half of the V-shaped ridge which has already been described as forming the lateral and anterior boundary of the platform itself. The anterior muscular scars occupy or are placed upon a small subrhomboidal or somewhat lozenge-shaped area on the platform in front of the middle.

As compared with Messrs. Davidson's & King's figure of the pedicle valve of the "*Trimerella* (*?*) *Galtensis*" of their paper,* the umbones and beaks of the ventral valves described above are not so much pointed nor so flatly conical in their lateral outline, and their cardinal areas are crescentic rather than triangular.

The markings on the interior of the dorsal valve from Durham described above are essentially the same as those on the mould of the brachial valve of the *Trimerella Galtensis* of Messrs. Davidson's & King's paper, though in the Durham specimen the crown of the crescent seems to be regularly rounded in the middle and not pointed.

The generic name *Rhynobolus* (Hall, 1871,) as applied to the present species, is adopted here in accordance with a suggestion to that effect recently made to the writer by Mr. Davidson. In a letter received in November, 1883, Mr. Davidson says:—"Although with much uncertainty this shell was placed by Prof. King and myself in the genus *Trimerella*, it is not a true *Trimerella* and should be removed from that genus. It is more closely allied to *Monomerella*, and perhaps it would be better to retain Prof. Hall's generic name of *Rhynobolus* for its reception."

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* On the Trimerellidæ. Quart. Journ. Geol. Soc. Lond. Vol. XXX, pl. 18, fig. 13.

LAMELLIBRANCHIATA.

Goniophora crassa. (N. Sp.)

Plate 2, figs. 3, 3*a*, 3*b*, & 3*c*.

Shell mytiloid or nearly semi-ovate in lateral outline, transversely elongated, length about twice the maximum height, narrow in front and widening behind, highest a little behind the middle. Valves obliquely sub-carinated or strongly angulated along their centre, the angulation extending in a curved line from the beaks to the posterior end of the base,—very convex and obliquely compressed both above and below the median angle, so that the outline of a transverse section through both when closed would be distinctly rhomboidal. Thickness through the valves, as measured on the median angle, somewhat exceeding their maximum height. Dorsal margin ascending gradually in nearly a straight line from the anterior terminal beaks to the upper portion of the commencement of the posterior end: posterior margin broadly and obliquely rounded or obliquely subtruncated, descending rather abruptly and forming a somewhat angular junction with the basal line below, but rounding evenly to the dorsal margin above. Ventral (or basal) margin nearly straight or slightly concave from the posterior end to a little in advance of the middle, then narrowing rather gradually upwards towards the beaks: umbones narrow, curved, carinated, overhanging the anterior end and extending downwards to the basal margin: beaks hooked, curved inwards and downwards, and margined beneath by a distinct groove.

Surface marked with numerous, closely disposed, fine raised striæ of growth, also by a few distant and much coarser concentric sulcations. Test very thick, especially in the umbonal region.

Anterior muscular impression subcircular and deeply excavated: posterior muscular impression more elongated, not excavated, obscurely defined, except above, where it is margined by a narrow and slightly raised ridge. Hinge of the left valve apparently furnished with a longitudinally elongated, raised tooth-like process, which runs nearly parallel to the upper margin of the anterior adductor impression, (which it partly bounds above), and nearly parallel also to the upper and outer edge of the hinge line, from which latter it is separated by a deep groove, which widens gradually behind.

Umbonal cavity (in one specimen at least) strongly concamerated, its cavity being divided off into a number of (at least eight or nine) exceedingly narrow chambers, by thin, successive and concentric laminæ of shell.

Length of the largest specimen known, sixty millimetres; maximum height of the same, thirty mm.

Durham, J. Townsend: five fine specimens with the test preserved. Two casts of a shell which probably belong to this species were collected at Hespeler by T. C. Weston in 1867.

Megalomus compressus. (Nicholson & Hinde.)

Megalomus compressus, Nicholson & Hinde. Report on the Palæontology of Ontario, 1875; pp. 68, 69.

The above species or varietal form was described and figured from mere casts, but Mr. J. Townsend has recently collected fine specimens of it at Durham, with most and in some cases the whole of the shell beautifully preserved. The test of *M. compressus* is rather thick (about five millimetres in thickness on the umbones) especially in the umbonal region, and its outer surface is concentrically striated.

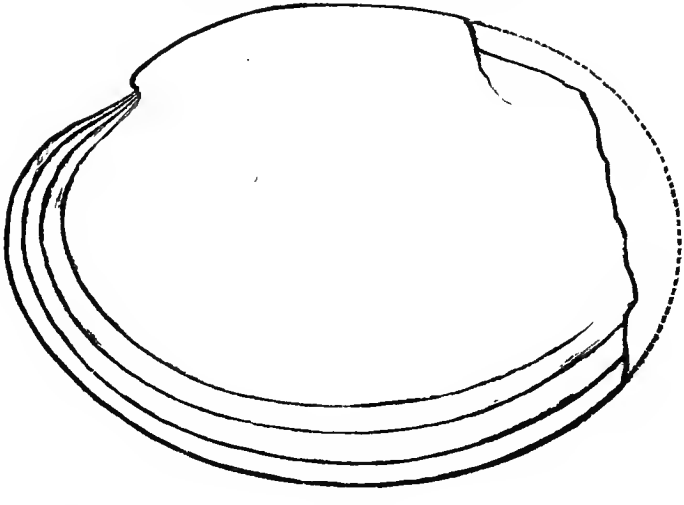

Fig. 1. *Megalomus compressus*, Nicholson & Hinde. Outline of left valve of a typical but possibly extreme variety, with most of the test preserved.

The character most relied upon as a means of distinguishing *M. compressus* from *M. Canadensis* is the lateral compression of the valves of the former. In *M. compressus* the thickness through the closed valves is stated to be "more than one third of their maximum height," whereas in *M. Canadensis* the convexity of the shell is about equal to its great-

est height. Moreover, in what appears to be a typical, though possibly an extreme form of *M. compressus*, with the test preserved, (an outline of which is represented in wood-cut, fig. 1) the umbo is compressed and comparatively narrow, the beak is curved very slightly downwards, there is no lunule, and the anterior end projects beyond the beaks as a broadly rounded lobe. Fig. 1*e*, on Plate lxii of the second volume of the Palæontology of New York, which is described by Prof. Hall as "a cast of a specimen" of *M. Canadensis* "somewhat distorted by pressure which has projected the lower anterior end somewhat beyond the beaks above," represents perfectly a normal and undistorted cast of this form of *M. compressus*.

In the most typical form of the true *M. Canadensis*, when the shell is preserved, the exceedingly broad and tumid umbones are anterior, terminal, and overhang the abrupt downward and backward slope of the lower part of the anterior end. The beaks, too, which in consequence of the enormous breadth of the umbones, are placed two-thirds of the way from the dorsal margin to the base, are recurved and strongly hooked, and under them there is a rather deeply excavated heart-shaped lunule whose width is greater than its height.

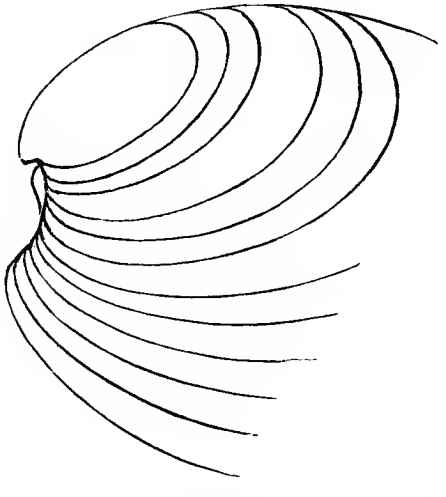

Fig. 2. Anterior end of left valve of a specimen of a *Megalomus* which is intermediate in character between *M. compressus* and *M. Canadensis*.

But between these two extremes there occur almost every intermediate gradation, both in the amount of convexity as compared with the height and in the outline of the shell, especially at the anterior end.

Thus, in some much compressed specimens which on that account would be referred to *M. compressus*, the umbones are terminal and overhang the anterior end, and there is a somewhat deeply excavated lunule, as in the typical *M. Canadensis*. The anterior half of a left valve of a *Megalomus* from Durham represented in the wood-cut, fig. 2, on the preceding page, belongs to a specimen which is almost exactly intermediate in its characters between *M. compressus* and *M. Canadensis*.

Connecting links between the two forms are so frequently found as to suggest the conclusion that *M. compressus* is only a variety of *M. Canadensis*, a view which is identical with that expressed in 1852 by Prof. Hall, who after examining a large number of examples of *Megalomus*, states that he is "unable to find any characters indicating more than a single species."

According to Dr. R. Bell, the first discoverer of this curious genus was his father, the Rev. Andrew Bell, then of Dundas, who sent specimens of the typical species to Prof. Hall in 1847 or 1848.

Anodontopsis concinna. (N. Sp.)

Plate 2, fig. 4, and plate 7, figs. 4 & 4a.

Small compressed—convex, about one-third longer than high, very inequilateral, outline subtrapezoidal: anterior end short, rounded and rather narrow, posterior end larger and wider, its upper and lower margins being nearly parallel, and its extremity somewhat obliquely truncated: dorsal margin straight and almost parallel behind, sloping rapidly and obliquely downwards in front: ventral margin nearly straight but slightly convex in the middle, rounding upwards very abruptly at the anterior end, and ascending to a much less height and in a very gentle curve to its subangular junction with the basal margin of the posterior extremity. Umbones broad and angulated behind, beaks small, not prominent, directed forwards and situated about half way between the centre of the shell and the outer boundary of the anterior end. Posterior area not distinctly defined, consisting of a very oblique, concave inflection of the valves bounded by a faint angulation which extends from the beaks towards the posterior end of the base, but which becomes nearly obsolete in the lower half of the shell.

Surface markings and hinge dentition unknown.

Length of the largest specimen collected, twenty-five millimetres: maximum height of the same, seventeen mm.

Galt, T. C. Weston, 1867: a cast of a right valve. Durham, Mr. J. Townsend: a perfect cast of both valves, which, however, are both

open and slightly displaced in the specimen, so that it is impossible to measure the exact convexity through the closed valves.

This specimen is very similar in shape to the *Anodontopsis angustifrons* of McCoy,* from the Upper Ludlow rocks of Westmoreland, but its anterior margin is not so narrowly rounded and its dorsal margin is not arched posteriorly.

Genus Ilionia, Billings.† 1875.

Canadian Naturalist, 2nd Series, Vol. viii., p. 301.

"The above generic name is proposed for such forms as *Tellina prisca* (Hisinger), *Anatina sinuata* (Hall), and the species herein described. All the specimens I have seen are internal casts, and the characters of the hinge line, therefore, cannot be given. The form is irregularly ovate, compressed or sub-lenticular; one extremity larger than the other; beaks turned towards the larger end, which is, therefore, supposed to be anterior. In all the species a concave depression commences on the umbones and extends downwards to the posterior ventral margin. A large sub-ovate muscular impression in the upper half of the posterior extremity." Billings.

Ilionia Canadensis, Billings.

Ilionia Canadensis, Billings. 1875. Can. Nat., N. Ser., Vol. viii. p. 301.

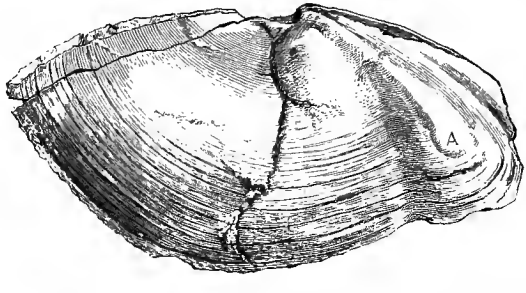

Fig. 3. "Left side of a cast of the interior of *I. Canadensis*."

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* British Palæozoic Fossils in the Cambridge Museum. 1855. P. 271, pl. 1*k*, 14 and 15.

† As the original definition of this genus and of the typical species may not be readily accessible to the reader, they are reprinted here, with the figures which accompanied them.

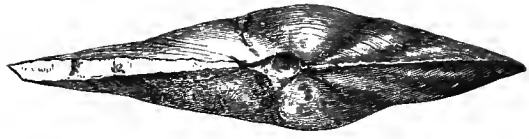

Fig. 4. "Dorsal view of the same."

Shell "transversely irregularly ovate; compressed, sub-lenticular; length about twice the greatest height; umbones situated a little behind the mid-length; ventral margin with a concave notch at about the posterior fourth of the whole length. In front of this notch the margin is uniformly convex, gradually sloping upwards nearly (if not quite) to the hinge line. The dorsal margin is not perfect in the specimen figured, but judging from the direction of the striæ on the surface of the cast, it is nearly straight, or at the most only slightly convex in front of the beaks, and nearly parallel with the length of the shell, sloping slightly downwards. Behind the beaks it is gently convex, nearly straight, and slopes downwards to the narrowly rounded angle, the latter situated at about one-third the height of the shell. The margin of the beaks is compressed. Close under the beaks, in front, there appears to have been a short escutcheon.* "From the umbones backwards for about six lines, a linear groove runs along close to the dorsal edge on each side. This may be related to the ligament.

The most projecting point of the anterior extremity appears to be situated considerably above the mid-height of the shell, near the hinge line. The posterior angle is below the mid-height.

Surface concentrically striated.

Length, three inches; greatest height a little in front of the mid-length, eighteen lines; greatest depth of both valves, just below the umbones, eight lines.

The specimen was collected by Sir W. E. Logan in the Upper Silurian rocks at Port Daniel on the Bay of Chaleurs." E. Billings.

Five badly preserved casts collected by Mr. T. C. Weston in 1867 from the Guelph limestones at Hespeler, have been identified with this species by Mr. E. Billings. A single specimen from Elora which is also referable to *I. Canadensis*, has been forwarded to the writer by Mr. David Boyle.

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* The word "escutcheon" appears to be here used inadvertently instead of lunule. J. F. W.

Ilionia galtensis. (N. Sp.)

Plate 3, figs. 1. 1*a* & 1*b*.

Shell compressed, sinuated, most convex in the direction of a line which might be drawn from the beaks to the centre of the ventral margin, behind which faint prominence there is a broad, shallow depression, bounded posteriorly by an oblique and somewhat curved keel or narrow ridge, which extends from the beaks to the posterior end of the ventral margin, and marks out a laterally compressed posterior area. Length about one third (or less than one third) greater than the height; anterior end broader than the posterior, rounded and somewhat expanded at its upper and lower margins: posterior end narrowing above and below, and truncated almost vertically but somewhat concavely at its extremity. Dorsal margin nearly straight or slightly convex, and sloping very gently downwards behind the beaks, concave and somewhat ascending in front of them: ventral margin convex anteriorly, narrowing rather rapidly and concavely upwards posteriorly.

Umbones rather broad, subcentral and carinated behind: beaks small, appressed, not very prominent. Surface concentrically striated.

Length of a specimen from Galt, thirty-one millimetres: height of same, twenty-one mm.: thickness, eight mm. In another example, from Durham, the proportions are not quite the same, the length being twenty-eight mm., the height twenty-one mm. and the thickness eight.

Galt, Dr. R. Bell, 1861: Durham, Mr. Joseph Townsend. A single, nearly perfect but not very well preserved cast, with the mould in the rock from which it was taken,—from each of these localities.

The *Anatina sinuata* of Hall, which Mr. E. Billings regarded as the American type of his genus *Ilionia*, was described from two imperfect specimens in very poor condition. Judging by the figure of the best of these, the broad, non-sinuated and presumably anterior end of *I. sinuata* is much longer than the abruptly contracted and narrow posterior end, and the beaks, which Prof. Hall says are "vertical or not perceptibly inclined to either side of the shell," are consequently placed at some distance behind the middle. In *I. Galtensis*, however, the anterior and posterior ends are about equal in length, and the beaks are subcentral and curve forwards.

Ilionia (?) costulata. (N. Sp.)

Plate 2, fig. 5.

Shell compressed, very gently convex, nearly equilateral, transversely

subelliptical, twice as long as high: anterior end regularly but narrowly rounded, posterior end narrowing equally and rather abruptly at its extremity both above and below and subangular or somewhat pointed in the middle: superior border slightly convex in front, and descending with an extremely gradual curve behind: basal margin broadly rounded: beaks small, not very prominent, curved forwards and placed a little in advance of the mid-length. Surface marked with about twenty or twenty-one regularly disposed, equidistant, concentric ribs. Hinge dentition and muscular impressions unknown.

Length, twenty millimetres: height ten mm.

Elora, T. C. Weston, 1867: two moulds of the outer surface of the shell. Durham, Mr. J. Townsend: one mould. The description and figure are taken from a gutta percha cast of the mould collected by Mr. J. Townsend.

As the internal characters of this little shell are unknown, its generic position is quite uncertain. It is only provisionally placed in Billings' genus *Ilionia.*

GASTEROPODA.

Subulites compactus. (N. Sp.)

Plate 3, fig. 2, and plate 7, fig. 6.

Shell slender, subcylindrical or narrowly subfusiform, the length being approximately rather more than three times greater than the breadth: last whorl of the spire broader and more convex than any of the others: suture lightly impressed: body-whorl narrower than the preceding volution, at least in its dorsal aspect, cylindrical and somewhat constricted at and above the middle, decreasing unequally and rather rapidly in breadth below: base apparently truncated, with a moderately deep siphonal notch, which is bounded posteriorly by an oblique and not very prominently rounded keel, with a shallow depression behind it. Surface apparently smooth.

Approximate length from twenty to twenty-two millimetres: maximum breadth six mm. Durham, Mr. J. Townsend. A single cast, with the apex of the spire and a portion of the base broken off.

This is a much smaller species than the *Subulites ventricosus* of Hall, which is common in the Guelph Formation at Galt, Hespeler, Elora and Durham, or than the *S. terebræformis* of Hall and Whitfield, from rocks of the same age in Ohio. From the former it differs also in its much more slender contour, and from the latter in its shorter and more closely coiled spire.

Loxonema magnum, Whitfield.

Loxonema magna, Whitfield. 1878. Ann. Rep. Geol. Surv. Wisc., 1877, p. 83.
" " " 1882. Geol. Wisc., Vol. 4, p. 317, pl. 24, fig. 1.

Galt: E. Billings, 1857: one imperfect specimen, consisting of two entire volutions, with the whole of the test preserved. Elora, T. C. Weston, 1867: a very perfect cast. Hespeler, T. C, Weston, 1867: one large but imperfect cast.

Codonocheilus.* (Gen. Nov.)

Shell turreted, subfusiform or pupoid: volutions of the spire rather numerous, (about eight or nine in the typical species) compressed laterally and closely enrolled: outer half of the body-whorl produced obliquely outwards and downwards: lip thin and broadly expanded: aperture apparently nearly circular: umbilicus small or entirely closed: test thin.

The above genus is constituted primarily for the reception of a little shell which is abundant in the Guelph Limestones at some localities. Casts of it are of frequent occurrence at Durham, but not more than about a dozen specimens with the test preserved have been seen by the writer, and only one of these is full grown. In this specimen, which must be regarded as the type of the genus, the exact shape of the aperture cannot be ascertained, as the ventral surface of the shell is partly buried in the matrix. Although associated with purely marine organisms and therefore probably itself marine, the dorsal aspect of an adult example of *Codonocheilus*, with its subfusiform or pupoid spire, its obliquely spreading body-whorl and its expanded lip, is exceedingly similar in a general way to that of several genera of recent operculated land shells, such as *Megalomastoma*, *Cataulus*, and *Tomocyclus*. It is probable that the *Cerithium Helmerseni* of DeVerneuil, † from the Upper Silurian rocks, of Russia will prove to belong to this genus, but the body-whorl of that species is not preserved in the specimen figured.

Codoncheilus striatum. (N. Sp.)

Plate 3, fig. 3.

Shell small, about twice as long as broad, subfusiform or somewhat pupoid, spire acutely conical or acuminate at the apex, and ven-

* From κωδων, a trumpet, and χειλος a lip.

† "Geologie de la Russie d'Europe et des Montagnes de l'Oural," Vol. 2, p. 342, pl. 22, fig. 4.

tricose below: sutures narrow, linear and impressed: body-whorl, including the basal portion of the expanded outer lip, about one half the entire length: surface marked with minute striæ of growth which become rather strongly marked just behind the outer lip.

Dimensions of the most perfect specimen,—length, eleven millimetres; breadth, four and a half mm.; length of body-whorl, including the basal or anterior end of the outer lip, six m.m.

Hespeler, T. C. Weston, 1867. Two immature specimens with the test preserved, one of unusually large size. Edge Mills, Durham, abundant: Mr. J. Townsend.

Holopea Gracia. Billings.

Plate 3, fig. 4.

Holopea Gracia Billings. Palæozoic Fossils, Vol. 1, p. 159.

Not Holopea Gracia, Nicholson. (As of Billings). Rep. on the Pal. of the Prov. of Ontario, 1875, p. 72, pl. 3, fig 17.

The type of this species, which is a mere cast of the interior, and which from not having been figured appears to have been misunderstood, is represented on Plate 3. Two large specimens of a *Holopea* with the test preserved, which are almost certainly referable to *H. Gracia*, have recently been collected at Durham by Mr. J. Townsend. These, if correctly identified, shew, (1) that the species attained much larger dimensions than the type now figured; (2) that when the shell is preserved the umbilicus is completely closed; (3) that the surface markings consist of crowded and oblique raised striæ, which curve somewhat convexly backwards above the middle of the body-whorl, and concavely as well as more abruptly backwards at the base. In one of the Durham specimens, too, the apex of the spire is remarkably obtuse.

Cyclonema sulcatum, Hall.

Plate 3, fig. 5.

Cyclomena sulcata, Hall. Pal. N. York, Vol. 2, p. 347, pl. 84, figs. 1, 1*a–d*.

This species was originally characterized by Prof. Hall from exfoliated casts, but the fine specimen collected by Mr. Townsend at Durham, and represented on Plate 3, has most of the test preserved on the last volution. The lower half of the body-whorl is marked by nine revolving raised ridges which are rather narrower than the spaces between them. These ridges are most prominent around the narrow

but deep umbilical depression, and become gradually more faintly marked until the two upper ones are nearly obsolete. Above, and next to the suture, there is a faint revolving and rather wide groove, which is succeeded by a broad smooth band. The whole surface of the body-whorl is also crossed by numerous oblique striæ of growth.

Although the words "umbilicus none" occur in the original definition of the genus *Cyclonema*,* yet as the *C. sulcata* is distinctly described by Prof. Hall as having a small umbilicus, it is clear that this generic character will have to be modified so as to include species with a small umbilical perforation which does not expose any part of the inner whorls,—or else that the present species should be removed to some other genus, for which procedure there does not seem to be any sufficiently adequate reason. In the writer's judgment also, the *Trochonema pauper* of Hall and the *Cyclonema sulcata* of the same author ought not to be placed in different genera.

TROCHONEMA INORNATUM. (N. Sp.)

Plate 3, fig. 7.

Shell angularly turbinated, depressed, much broader than high; whorls from three to four, increasing very rapidly in size; spire step-shaped, moderately elevated, occupying rather less than one-half the entire height, its volutions flattened above and obliquely compressed at the sides; body-whorl flattened both above and below nearly at a right angle to the axis of the shell, and compressed laterally and somewhat concavely in the middle,—biangulated, its upper portion being distinctly shouldered, and its basal margin rather less distinctly so; umbilicus very small, or perhaps entirely closed when the whole of the test is preserved; aperture evenly rounded on the inner or columellar side and rather obscurely biangular externally. Test moderately thick; surface nearly smooth but marked by fine transverse lines of growth, which are distinctly insinuated on the superior angle of the body-whorl.

Breadth of the most perfect example collected, twenty-four millimetres; entire height of the same, twenty mm.; height of the spire only, nine mm.

Elora: R. Bell, 1861: one specimen, with most of the test preserved. Durham, Mr. J. Townsend: a single cast.

The best specimen has most of the shell broken away in the umbilical region, so that it is uncertain whether the base was imperforate or

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*On page 89 of the second volume of the Palæontology of the State of New York.

narrowly umbilicated. It seems most probable that the latter was the case, but that the umbilical pit or cavity was too narrow to expose any portion of the inner whorls.

Euomphalus macrolineatus, Whitfield.

Plate 3, fig. 6.

Euomphalus macrolineatus, Whitfield. Ann. Rep. Geol. Surv. Wisc. for 1877, p. 82.
" " " Geol. Wisc., vol. 4, p. 294, pl. 18, figs. 5 and 6.

Elora, T. C. Weston, 1867. Durham, Mr. J. Townsend. Two specimens, which appear to belong to the same species, were collected by Mr. R. Bell in the Upper Silurian Rocks of the Baie des Chaleurs, in 1862, one at L'Anse à la Barbe, and the other at L'Anse à la Vieille.

The types of *Euomphalus macrolineatus* from Wisconsin are described as being "subdiscoidal, with a depressed convex spire," and the under side of its shell is said to be unknown. Not being able to decide positively, from description and figures alone, whether the Canadian specimens were specifically identical with that species or not, the nearly perfect example figured on plate 3 was sent to Prof. Whitfield for examination, who kindly reports on it as follows: "I can see no real difference between this and *E. macrolineatus*. The ribs are a little more distant, but not enough to be specific. My specimens were both impressions of the exterior, and much flattened, so that I considered it a *Euomphalus*. Your specimens differ from true *Cyclonema* in the aperture and umbilicus." To the writer, these latter appear to be exactly congeneric with the *Cyclonema sulcatum* of Hall, which, however, may not be a true *Cyclonema*.

The characters of well-preserved and undistorted Canadian specimens which are here identified with *E. macrolineatus* on Prof. Whitfield's authority, may be thus defined. Shell turbinate, a little broader than high, composed of about three volutions, which increase very rapidly in size: last whorl but one somewhat depressed above and laterally depressed below the broadly rounded shoulder, in such a manner as to give the shell a rather step-shaped outline: body-whorl occupying two thirds or more than one half the total height,—depressed above, inflated and ventricose below: umbilicus deep but narrow, its width being less than one fourth of the diameter of the base: aperture nearly circular, lip thin and simple. Surface marked by numerous, narrow, elevated revolving ridges, which are crossed by crowded and oblique striæ of growth. On the upper and outer part of the body-whorl, the three revolving ridges nearest to the suture are comparatively wide apart, and are separated by shallowly concave grooves about four times as

wide as the ridges themselves : below this the revolving ridges are much more numerous and closely disposed, their breadth in the lower half of the body-whorl being fully equal to the width of the grooves between them.

Approximate height of the most perfect specimen, thirty-seven millimetres : maximum breadth of the same, forty-four mm. : height of the body-whorl of do., twenty-four mm.

The amount of elevation of the spire of Canadian examples of this species, as compared with the maximum breadth, varies considerably in different individuals.

Euomphalus galtensis.

Plate 3, figs. 9 and 9*a*.

Shell depressed and nearly discoidal, spire sunk slightly below the highest level of the body-whorl, breadth rather more than twice the height : volutions three, increasing very gradually in size, those of the spire shouldered and nearly rectangular : body-whorl biangulated, but with the basal angle somewhat rounded off,—depressed above, especially near the suture, compressed convex below and flattened laterally in the middle : umbilicus about one-third the diameter of the base, deep, step-sided and exposing part of the inner volutions : outer lip more or less acutely insinuated or notched on the superior angle, above and below which its margin is convexly curved, the insinuation being caused by the junction or partial intersection of these two convex curves. Surface markings unknown, with the exception of a few distant lines of growth on the body-whorl, which run parallel with the outer lip.

Dimensions of the specimen figured :—breadth, thirty-eight millimetres ; height, seventeen mm. ; width of umbilicus, about twelve mm.

Galt, E. Billings, 1857. Hespeler, T. C. Weston, 1867. Durham, Mr. J. Townsend. All the specimens obtained so far are either mere casts or else they have the test so much exfoliated that the finer surface markings are quite obliterated.

Straparollus crenulatus. (N. Sp.)

Plate 3, fig. 8, 8*a* and 8*b*.

Shell turbinate, compressed vertically, height one third less than the maximum breadth, whorls three to four : spire short, about one-third the entire height, somewhat conical, its volutions being obliquely rounded : suture excavated : body-whorl compressed vertically both

above and below, ventricose and inflated in the middle; umbilicus about one third the diameter of the base, very deep and exposing all the inner whorls up to the apex; mouth nearly circular but narrower above and very slightly emarginated or indented by the penultimate whorl: outer lip apparently thin and simple, convex above and obliquely convex below. Surface marked by a few narrow and not very prominent spiral ridges, which are crossed obliquely by numerous flexuous crenulated raised ridges or lamellæ. On the outer half of the body-whorl there are about seven or eight of these spiral ridges, four above, and either three or four below the middle. The upper ones, one of which is placed very close to the periphery, are distant and rather clearly defined, but the lower ones are close together and extremely indistinct. These latter, too, are exclusively confined to the outer portion of the base, and disappear altogether before reaching the umbilical margin.* The crenulated raised lines, however, which cross the whorls obliquely, are as strongly marked in and around the umbilicus as they are on the central and upper portions of the body-whorl, and they are much more numerous as well as more closely disposed than the spiral ridges.

Maximum breadth of the largest specimen collected, forty-five millimetres: height of the same, about thirty mm.

Durham, Mr. J. Townsend: two specimens.

This shell would probably not be regarded as a true *Straparollus* by those who follow the nomenclature adopted by D'Orbigny, McCoy, DeKoninck and Stoliczka, but it accords fairly well with the characters of that genus as re-defined by Professors H. A. Nicholson † and James Hall. ‡ It seems to be closely allied to and is probably congeneric with the so-called *Euomphalus funatus* and *E. rugosus* of Sowerby, from the Wenlock limestone.

Pleurotomaria perlata, Hall.

Pleurotomaria perlata, Hall. 1852. Pal. N. Y., Vol. II., p. 349, pl. 84, figs. 5*a*, *b*, *c*.

By some inadvertence this species is figured on page 341 of the "Geology of Canada" for 1863, as *Pleurotomaria solarioides*, Hall, which latter shell Prof. Whitfield believes to be a *Straparollus*.

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* In figures 8*a* and 8*b* of Plate 3, the spiral ridges on the lower half of the body-whorl are rather incorrectly represented. They should be less distinct, closer together, and confined to the outer portion of the base.

† Manual of Palæontology, London. 1879. Vol. II., p. 24.

‡ Palæontology of the State of New York. 1879. Vol. V., part 2, p. 54.

Pleurotomaria occidens, Hall.

Pleurotomaria occidens, Hall. Twentieth Reg. Rep., p. 364, pl. 15. figs. 11 and 12.

Elora, T. C. Weston, 1857: one specimen, identified with the above species by E. Billings.

Pleurotomaria Valeria, Billings.

Plate 4, figs. 1 and 1*a*.

Pleurotomaria Valeria, Billings. 1865. Pal. Foss., Vol. I., p. 169.

The type of this species, which is only a cast and which was not figured, has the whole of the spire buried in the matrix so that the basal surface and part of the body-whorl only are exposed. Two or three fine specimens with the test preserved have recently been collected at Durham by Mr. J. Townsend, the best of which is represented on plate 4, fig. 1*a*. These give a good idea of the characters and surface markings of the upper portion of the shell. On the spire the test appears to be nearly or quite smooth, but on the upper half of the last volution the sculpture consists of crowded and rather flexuous transverse striations. The species may be readily known by its depressed-turbinate form, its sub-angular whorls, its prominently and distinctly keeled periphery and its wide open umbilicus.

Pleurotomaria cyclostoma. (N. Sp.)

Plate 3, figs. 12 and 12*a*.

Shell conical, a little broader than high: whorls about five: spire moderately elevated, occupying about one half the entire height, its whorls flattened obliquely: last whorl but one bearing in its centre a narrow spiral band which is bordered on both sides by a thread-like and minute raised ridge: band quite obsolete in the first and second volutions, and nearly so in the third: suture indistinct. Body-whorl with the periphery angulated and carinated, the keel being narrow, acute, simple and prominent: band placed half way between the keel and the suture: base nearly flat, imperforate: aperture circular.

Body-whorl (and perhaps the lower portion of the spire) marked by crowded transverse striæ or lines of growth: on the upper part of the body-whorl these striæ appear to be insinuated convexly backwards towards and to the band, while on the lower face of the same whorl they radiate concavely backwards: the outer margin of the basal portion of the body-whorl also is marked by two or three faint spiral

grooves, one of which forms the anterior boundary of the keel which encircles the periphery.

Maximum height of the most perfect specimen collected, twenty-one millimetres: breadth of the same, twenty-five mm.

Durham, Mr. J. Townsend: two specimens, both with the test preserved.

One of the most curious features of this species is the extreme thickening of the shell on the periphery of the last volution, from which it results that although the outer lip is sharply carinated exteriorly, yet the mouth or aperture is almost exactly circular in outline. This peculiar character is seen also in the *Pterocheilos primus* of Moore, from the English Lias, but in that genus the columella is much produced anteriorly, which is by no means the case with the present species.

P. cyclostoma appears to differ from *P. bispiralis* of Hall, from the Guelph formation, principally in its more obliquely flattened and less ventricose spire, its indistinct suture and its much narrower spiral band.

Pleurotomaria Durhamensis. (N. Sp.)

Plate 4, fig. 2.

Shell turbinate-conical, a little higher than broad; spire moderately elevated, about equal to the body-whorl in height, its upper portion distinctly acuminated; whorls eight or nine, the first five or six increasing very slowly in size and obliquely compressed but not angulated, the next two, which immediately precede the body-whorl, increasing much more rapidly both in height and breadth and rather strongly angulated below the middle: body-whorl angulated a little above the middle and obliquely flattened above the angle; base convex and evenly rounded; umbilicus about one third the diameter of the base and apparently deep. Surface markings unknown.

Height, twenty-six millimetres: breadth, twenty mm.

Durham, Mr. J. Townsend: a single but very perfect cast.

The general outline of this shell is not at all unlike that of the *Straparollina pelagica* of Billings, from the Quebec Group of Newfoundland, but in the latter species the whorls are said to be only five or six in number and the lower ones are not distinctly angulated.

Murchisonia Hespelerensis. (N. Sp.)

Plate 4, fig. 3.

Shell angularly turbinated, not much elongated, the length being about one third greater than the breadth: spire about equal to the

body-whorl in length: volutions six, the first, second and third ventricose and obliquely rounded, the fourth and fifth angulated in the middle: body-whorl rather obtusely angulated above the middle, rounded and ventricose below: umbilicus very small in the cast and probably closed altogether when the test is preserved: surface markings unknown.

Entire height of the specimen figured, twenty-eight millimetres: height of the spire only, fifteen mm.: maximum breadth, nineteen mm.

Hespeler, T. C. Weston, 1867: township of Glenelg, J. Townsend, 1883.

A longer and narrower shell than the preceding species, with fewer and more centrally angulated whorls and a narrower umbilicus. It appears to be more nearly allied to the *M. Mylitta* of Billings, from the same formation, of which it may prove to be an extreme variety. The differences between the two are as follows:—In *M. Mylitta* the whorls are four or five, the last whorl, which is the only one that is angulated, is two thirds of the entire length: in *M. Hespelerensis* there are six whorls (or between five and six) the fourth, fifth and six of which are distinctly angulated, and the body-whorl is about one half of the entire length.

Murchisonia constricta. (N. Sp.)

Plate 4, fig. 4.

Shell turreted, spire long and slender, whorls numerous, probably about twelve, increasing slowly in size, the earlier ones flattened or faintly concave, the later ones bearing an obtuse spiral band or faint angulation at a distance of three-fourths their height from the suture above, and concavely constricted above the angulation: suture linear, moderately impressed: last volution short, less than one third the entire length, obtusely angulated a little above the middle, rather strongly concave above the angulation, rounded and ventricose below: base imperforate, but with a distinct groove on the inner and lower side of the thickened basal portion of the columella: aperture subovate, higher than wide and somewhat angular exteriorly: outer lip thin and simple: test rather thin: surface markings unknown.

Durham, Mr. J. Townsend. A single specimen, with eight whorls and most of the test preserved, but with its outer surface too much worn to show any of the sculpture.

This species appears to be most readily distinguishable from *M. Boylei*, Nicholson,* which it closely resembles in form, by the different posi-

* Report upon the Palæontology of the Province of Ontario. 1875. Page 71, pl. 3, fig. 1.

tion of its spiral band or angulation on the lower whorls of the spire, and by the much more strongly marked constriction of the same whorls above the angulation. In *M. Boylei* the spiral band is described as being situated a "little above the suture, causing the lower part of each whorl to project over the upper portion of the whorl next below,"* while in *M. constricta* the spiral band, although situated below the middle, in the later whorls of the spire, is removed from the suture below by a distance equal to at least one-fourth the entire height of the whorl.

MURCHISONIA TURRITIFORMIS, Hall.

Plate 4, fig. 5.

Murchisonia turritiformis, Hall. Palæont. N.Y., Vol. II., p. 347, pl. 61, figs. 6*a* & 6*b*

The original description of this species is as follows: "Spire elongated, turritiform, composed of numerous flattened volutions: surface unknown; columella small. This species is readily distinguished by its flattened volutions, which, in the cast, present the marks of a carina near or a little below the centre. One specimen preserves five volutions, being imperfect at both extremities: the shell originally had probably not less than fifteen volutions." "Position and locality. In the limestone at Galt, Canada West."

The two imperfect casts upon which this species was based were obviously insufficient to enable its characters to be accurately defined. Much more perfect specimens of a *Murchisonia*, which certainly correspond better to the description and figures of *M. turritiformis* than to those of any other species of the same genus from the Guelph Formation, have since been collected at Galt, Elora, Hespeler and Durham, by Messrs. A. Murray, R. Bell, T. C. Weston, D. Boyle, and J. Townsend. One of these specimens, in the Museum of the Survey, is labelled *M. turritiformis* in the handwriting of Mr. E. Billings, while another and more perfect one is represented by figure 5 of plate 4. In all of these shells the whorls of the spire are encircled near but a little below their middle by a narrow and not very prominent, spiral band or obtuse angulation, which is scarcely strongly marked enough to leave its impress upon the cast. Above the band the whorls are slightly concave, and beneath it as slightly convex. On the outer half of the body-whorl the band is placed a little above the middle, and the base is rather strongly convex. The test seems to have been thin, and near the mouth its surface markings consist of fine and rather crowded

* Report upon the Palæontology of the Province of Ontario, 1875, p. 71.

striations, which are insinuated convexly backwards both above and below towards and to the band. The shell increases very slowly in breadth; thus, in a specimen three inches and a quarter in length, which has between seven and eight of the whorls preserved, the greatest diameter at the smaller end is eleven millimetres, while that of the larger end, close to the aperture, is only twenty-five.

Prof. Whitfield, who has examined the specimens from which figure 5 on plate 4 was drawn, and compared it with Prof. Hall's types, thus expresses his opinion on the former. "This shell is intermediate between *M. turritiformis and M. longispira*, Hall. The apical angle is more acute than that of *M. turritiformis*, while the angle of the volution is here central and on that one is at the base of the volution. Compared with *M. longispira* the rate of increase in the diameter is about the same, also the angle on the whorl, but the length of the volutions in your shell is a little greater than in that species. One or two other specimens would probably unite Hall's two species as one."

Murchisonia conradi, Hall.

Plate 4, fig. 6.

Murchisonia Conradi, Hall. 18th Regents' Report, p. 344, pl. 15 (6.) fig. 19.

Three nearly perfect and well preserved specimens of a *Murchisonia* which should probably be regarded as a mere local variety of the above named species, have been collected at Elora by T. C. Weston and D. Boyle, one of which is represented on plate 4. They differ chiefly from the Wisconsin type of *M. Conradi*, as figured by Prof. Hall, in not being nearly as slender in their proportions, and in the blunter and less prominent carination of their whorls.

Murchisonia macrospira, Hall.

Plate 4, figs. 7 and 7*a*.

Murchisonia macrospira, Hall. Palæont. N. Y., Vol. II., p. 346, pl. 83, fig. 5.

This species was described from a mould of the interior of the shell obtained at Galt, Ont., a gutta-percha cast of which has been forwarded to the writer by Prof. Whitfield. As stated by Prof. Hall, the type specimen shews "the impression of four and a part of the fifth volution." A similar but in some respects more perfect mould from the same locality, which shews the impress of eight volutions, was collected by Mr. A. Murray in 1857, a gutta-percha cast of which is represented by figure 7 of plate 4. The original of figure 7a on the same plate is a

small specimen of *M. macrospira* collected by Mr. D. Boyle at Elora in 1880, and presented by him to the Museum of the Survey. It consists of three or three and a half whorls and has most of the test beautifully preserved. When perfect the type of the species figured by Prof. Hall must have had one volution more than the larger of the two specimens represented on plate 4.

From the two additional specimens figured, taken in connection with the type, it would appear that the shell must have consisted of about nine ventricose whorls, which increase rather rapidly in breadth in proportion to the total length, which latter may be roughly estimated at rather more than twice the greatest breadth of the body-whorl. The band or spiral carina, though distinct and well marked, is broad, rounded and not very prominent. On the earlier whorls of large individuals the band is obsolete: on the lower whorls of the spire it is subcentral, while on the outer half of the body whorl it is placed above the middle. The later whorls of the spire are more swollen and inflated below the band than they are above it. The surface markings consist of fine transverse striations, which are insinuated convexly backwards towards and to the band.

Murchisonia soluta. (N. Sp.)

Plate 4, figs. 8 and 8a.

Shell elongated, slender, consisting of a spirally twisted calcareous tube which is nearly circular in transverse section, and which increases very slowly in diameter; whorls moderately numerous, free, disconnected and widely separated from the commencement, but very closely and compactly coiled laterally; last volution and last but one bearing a rounded and rather broad but not very prominent band or keel a little above the middle; aperture expanded on the columellar side; surface markings unknown.

Galt, Rev. Andrew Bell, 1846-50. Hespeler, T. C. Weston, 1867: one fragment. Elora, D. Boyle, 1880, and J. Townsend, three specimens. Durham, J. Townsend: four specimens.

All the specimens of this peculiar shell that have come under the writer's notice are casts which are imperfect either at one extremity or at the other. In the largest and finest example in the Survey collection, which is figured on plate 4 (figure 8), and which has the body whorl and the two preceding volutions preserved, the diameter of the cast of the shelly tube immediately behind the expansion of the aperture is seventeen millimetres, and that of its broken termination above, between

five and six. The last two whorls of this specimen are separated by a space equal to more than double the diameter of the thickest unexpanded part of the cast of the tube of which the body-whorl is composed. In another specimen, the original of figure 8a. on plate 4, in which four of the earliest whorls are preserved, the diameter of the cast is five millimetres at the largest and a little more than one millimetre at the smallest end, and the volutions are separated by spaces somewhat wider than the maximum diameter of the cast of the tube. It would appear, therefore, that the entire number of volutions is about seven or eight, and that the later whorls are rather more widely separated proportionately than the earlier ones.

Although it has been thought best to give a provisional name to the specimens above described, as a matter of convenience, it is not at all unlikely that they may prove to be monstrosities or abnormally developed individuals of some regularly formed species of *Murchisonia*, to which they may bear the same morphological relationship as the well-known but exceedingly rare scalariform varieties of the living *Helix aspersa* of Muller, figured by Moquin Tandon and Chenu, do to the ordinary form of that species. Of all the species of *Murchisonia* from the Guelph formation known to the writer, these singularly constructed shells seem to come nearest to *M. macrospira*, partly in the number and contour of their volutions, but more especially in the breadth and slight elevation of their rounded spiral band or carina. The fragment represented by figure 9 on plate 4 is a portion of a cast of a shell from Durham, which appears to be intermediate in its characters between *M. soluta* and some normally developed species of *Murchisonia*, perhaps *M. macrospira*. The whorls of this fragment, although free and disconnected, are still somewhat approximated, and its spiral keel is precisely like that of *M. soluta*.

The *Enomphalus circinalis* of Goldfuss is a good example of an almost completely uncoiled species of that genus, but its apical whorl is represented as being regularly spiral.

Murchisonia tropidophora. (N. Sp.)

Plate 7, figs. 5 and 5a.

The above name is proposed for a remarkable shell, of which only one imperfect specimen is known to the writer, and for which a new genus may have to be constituted. This specimen has about one-third of the apical or posterior end broken off, and the remaining portion consists of a shelly tube which increases rapidly in diameter, especially near and at the aperture, and which is obliquely, spirally and tightly

twisted on itself rather than regularly coiled. The upper half of the volution bears two prominent, acute and distant, spiral keels, which are separated from each other by a broad concave groove. Above the upper keel, which forms a distinct shoulder to the volution, the surface is obliquely flattened or slightly concave, and below the second keel the surface is somewhat convex. At the base of the earlier half of the last volution there is a third keel, but on the later half of the same volution this basal keel is continued as the outer margin or boundary of the mouth on the columellar side, and ultimately becomes confluent with the basal portion of the outer lip. The aperture appears to have been nearly circular, and it is certainly broadly and effusely expanded at its base. In addition to the keels the exterior of the test, which seems to have been rather thick, is marked by very faint, fine and flexuous, transverse striæ of growth.

Durham, Mr. J. Townsend, 1883: a single specimen, with most of the test preserved but with the apical portion and part of the outer lip broken off,

It is at present doubtful whether this shell is a *Murchisonia*, allied to but perfectly distinct from the *M. helicteres* of Salter,—a second species of *Codonocheilus*, or, as already suggested, a new generic type. From *M. helicteres* it differs not only in the number and arrangement of its spiral keels, but also in the fact that although much drawn out in the direction of its length, the spiral tube of which it is composed is so tightly twisted on itself that its volutions are in contact throughout on their inner faces and not entirely free and disconnected.

The aperture of *M. tropidophora*, so far as known, seems very similar to that of *Codonocheilus*, but in the only species of that genus yet described all the volutions but the last are regularly spiral.

The circumstance that the basal keel at the commencement of the body-whorl in this species is continuous with the raised margin of the mouth on the columellar side and that it finally becomes confluent with the outer lip at the base of the shell, seems to the writer to be a unique feature among gasteropoda and one which strongly favours the idea that the present species may prove to be the type of a new genus.

Genus Tryblidium, Lindström. 1880.

Fragmenta Silurica (Stockholm), page 15.

"Testa e stratis fibrilloso-prismaticis, osculis minutissimis perforatis contexta, modice elevata, apice prope marginem anteriorem posito et plerumque detrito, ita ut strata testæ interna deteguntur. Impressiones musculares numerosæ, per sex paria in orbiculo elongate ordinatæ,

quorum anteriora maxima sunt et inter se continuatione augusta juncta. Species hujus generis nonnullis speciebus generis Metoptomæ secundum descriptiones et figuras a Billings in libro 'Canadian Organic Remains'" (sic) vol. 1, page 87 cet., datas affines sunt. Generi Nacellæ Schum. e tribu Patellidarum quoad formam valde congruens, hocce genus siluricum impressiones musculorum ad instar Olanæ (Patellæ) cochlearis L. dispositas habet." Lindström.

As already partially suggested by Mr. Dall,* it seems clear that of the nineteen species provisionally referred by E. Billings to Phillips' genus *Metoptoma*, in the first volume of the "Palæozic Fossils" of Canada, not one of them really belong to that genus as now understood. As the name implies, in *Metoptoma* proper the widest end of the basal margin, which was supposed by Prof. Phillips to be the anterior end, is distinctly concave or notched, a character which is not possessed by any of the so-called species of *Metoptoma* from the Cambro-Silurian or Silurian rocks. In the writer's judgment *Metoptoma Quebecensis*, Billings, belongs to the genus *Palæacmæa* of Hall and Whitfield: *M. Niobe*, *M. Nycteis*, *M. Eubule*, *M. Erato*, and *M. Hyrie*, Billings, are typical species of *Tryblidium*, Lindström: *M. Trentonensis*, *M. Estella*, *M. instabilis* and *M. simplex*, Billings, appear to differ only from the generic characters of *Tryblidium* in that the outline of their basal margins is sub-circular rather than ovate: while the rest of the species described by Billings in the volume cited are probably types of two or three new and at present uncharacterized genera.

The Guelph Formation has yielded a single specimen of an interesting new species of *Tryblidium*, which may be thus described.

Tryblidium Canadense. (N. Sp.)

Plate 5, figs. 1 and 1a.

Shell patelliform, conical, much depressed: highest a little behind the middle (as viewed laterally), sloping rather abruptly downwards behind the most prominent point, and more gradually towards and down to the apex in front: sides obliquely convex: apex placed very near to the anterior end, but not quite terminal, pointed, incurved, but scarcely hooked, and depressed below the greatest elevation to a distance of rather more than one-half the entire height: base broadly ovate, narrowest under and in front of the apex: length greater than the breadth: maximum height less than half the breadth: muscular impressions not satisfactorily shown: surface marking unknown.

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* In the American Journal of Conchology, vol. 6, p. 281. 1881.

Length, forty-five millimetres: breadth, thirty-eight mm.: maximum height, seventeen mm.: height of lower surface of apex from the base, seven mm.

Hespeler: T. C. Weston, 1867: a single but perfect cast of the interior of the shell.

Scenella conica. (N. Sp.)

Plate 5, figs. 2 and 2a.

Shell small, conical, moderately elevated, the height being equal to one-half the length of the aperture or base: sides slightly compressed: apex pointed, erect and almost central, but placed a little nearest to the narrowest end: base or aperture ovate or subovate in outline, about one-fifth longer than broad: surface markings and muscular impressions unknown.

Length of an average specimen, ten millimetres: breadth of the same, eight mm.: height, five mm.

Durham: J. Townsend: eight tolerably perfect but not very well preserved casts of the interior of the shell.

The genus *Scenella* of Billings has never been properly defined, and consequently ought either to be re-constituted or abandoned. The "obscure carina extending from the apex down one side to the margin," given as part of the diagnosis of *S. reticulata*, is not even a constant specific character, for there is no such keel on an exceptionally large specimen of that species from the typical locality in the Museum of the Survey. The surface ornamentation, too, upon which the genus was mainly based, is clearly of not more than specific importance.

The specimens from Durham described above are here placed provisionally in the genus *Scenella* on account of their very close resemblance in external form to *S. reticulata*, but the muscular impressions, which would probably afford the surest indications of the true affinities of both, are entirely unknown. They may, however, be referable to Whitfield's genus *Lepetopsis*.

In the second volume of the "Palæozoic Fossils" of Canada, on page 77, *Stenotheca pauper* and *Scenella reticulata* are described under the head of *Huronian* fossils, whereas both of these species are from the Menevian limestones of Conception Bay, Newfoundland, which directly overlie the black shales or slates of the "Acadian" Group or Lower Cambrian of that Island.

Opercula of Gasteropoda.

Plate 3, figs. 10, 10a, 10b, and 11, and pl. 7, fig. 7.

Several specimens of the operculum or opercula of one or more species of holostomatous gasteropoda have been collected at Hespeler by Mr. T. C. Weston and at Durham by Mr. J. Townsend, the largest of which measures fully three quarters of an inch in its greatest diameter. These opercula are all calcareous, thick, circular in outline and multispiral. Though often perfect and well preserved, the sculpture of their outer surface is usually obscured and nearly covered by small portions of the tenacious matrix. So far they have never been found in place, so that it is quite uncertain to which species they belong or to how many.

In certain specimens (such as the one represented by figures 10, 10a and 10b of plate 3, which for convenience may be called No. 1) the outer side is conical and moderately elevated,—the height of the cone being usually rather less than one-half the diameter of its base,—the apex is subcentral, the whorls are sinistral and bounded externally with a thin, laminar, raised ridge, the spaces between the coils of which are obliquely striated across. On their inner sides (which, however, are possibly imperfect) they are gently concave, the central portion paucispiral and the outer obscurely annular.

In other individuals (such as the original of figure 11 on plate 3, which may be distinguished temporarily as operculum No. 2,) the outer side is much more compressed than that of No. 1, and might better be described as depressed convex rather than conical. The inner surface of No. 2 is nearly flat and marked with concentric annular striations, but there is a small pit in the centre, and a rather narrow, elevated and annular rim around its outer margin.

It is most probable that these opercula belong to shells of the genus *Euomphalus* or *Straparollus*, in the sense at least in which these words are used in this article, perhaps to *E. Galtensis* or *S. crenulatus*. Stoliczka says* that the opercula of *Euomphalus* (which he regards as a synonym of *Straparollus*) "very much resemble those of *Torinia*, being thick and composed of numerous lamellar volutions," a description which would apply perfectly to those from Durham. On the other hand, the opercula of *Euomphalus funatus*, as figured by Bailey† are also very like the Durham specimens, and this similarity would rather favour the view that the latter may be the opercula of *Straparollus crenulatus*.

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* Paleontologia Indica. Cretaceous Fauna of Southern India, page 254.

† Figures of Characteristic British Fossils. vol. 1, plate 21, fig. 9.

HETEROPODA.

Bucania stigmosa (?) Hall.

Plate 5, figs. 3 and 3a, and pl. 8, fig. 4.

Bucania stigmosa, Hall. 1852. Palæont. N. York, vol. 2, p. 92, pl. 28, figs. 8, 8 a to e.

Galt: A. Murray and E. Billings, 1857: two casts of the interior of the shell. These agree perfectly with similar but better preserved casts from the Niagara Formation at Grimsby, Ont., in the Museum of the Survey, which have been identified with *B. stigmosa* by E. Billings, but in the absence of any knowledge of the shell of the Galt specimens their determination must be regarded as doubtful.

Tremanotus Alpheus, Hall.

Bellerophon angustata, Billings, as of Hall.....1863. Geol. Can., p. 344, fig. 352.

Bucania Chicagoensis, McChesney.....1860, New. Pal. Foss. Expl. of pl. 8, fig. 4.

Tremanotus Alpheus, Hall.....1864, Eighteenth Reg. Rep., p. 347, pl. 15, figs. 23 and 24.

Bellerophon (*Bucania*) *perforatus*, Winchell & Marcy. 1865 (?) Mem. Bost. Nat. Hist. Soc., vol. 1, p. 100, pl. 3, fig. 7.

Tremanotus Alpheus, Hall and Whitfield.....1875, Pal. Ohio, vol. 2, pt. 2, p. 145, pl. 8, fig. 1.

Guelph: Hespeler, T. C. Weston, 1867 and 1871: Elora; Mr. D. Boyle, 1880: Durham; Mr. J. Townsend. Not uncommon.

As Professor Hall has pointed out,* the specimen figured in the "Geology of Canada" as *Bellerophon angustatus* is no doubt referable to *T. Alpheus*, as are also a dozen other good specimens in the Survey Museum. But in justice to the memory of Mr. E. Billings, who was officially responsible for the palæontological part of the volume cited, it should not be forgotten that the "Geology of Canada" was published a year before the first description of *T. Alpheus* appeared in print. Moreover, it is by no means clear that *T. Alpheus* is sufficiently distinct from *Bucania angustata*. On the contrary it is highly probable that these two names have been given to the same species in different states of preservation. Prof. Hall states that *T. Alpheus* "bears some resemblance to *Bucania angustata*," * * "but differs in the more rotund volutions, and in the interrupted oblong nodes representing the perforations on the periphery, while that species is free from nodes or

* Eighteenth Reg. Rep., p. 347.

carina."* The brief and rather vague description of *Bucania angustata*, by the same author, is as follows: "Volutions narrow, rounded on their sides, expanding near the aperture. The specimen figured is a rough cast in limestone, preserving no remains of surface markings. The volutions are less extended laterally than any other species of equal size known in our strata."†

Most of the specimens of *T. Alpheus* in the Museum of the Survey are, however, very strongly compressed at the periphery, and these agree perfectly in shape with Hall's figures and description of *Bucania angustata*. The "interrupted oblong nodes" on the periphery, which seem to be always present in casts of the adult shell of *T. Alpheus*, are said to be absent in *B. angustata*; but this statement may very well have been due to the accidental circumstance that the type and only specimen known of the latter species happens to be too imperfectly preserved to show them.

On page 304 of the second edition of the "American Palæozoic Fossils," Mr. S. A. Miller says that *T. Alpheus* is a synonym for *Bucania Chicagoensis*.

Ecculiomphalus circinatus. (N. Sp.)

Plate 5, figs. 4, 4a, 4b, and 4c, and pl. 8, fig. 5.

Shell sinistral, composed of about one and a half free and disconnected spiral volutions, which are coiled nearly on the same plane and which increase rather rapidly in their dorso-ventral but more slowly in their lateral diameter; upper side somewhat flattened vertically or gently convex; periphery subangulated or narrowly rounded; under side rather strongly convex, subcarinated or more or less faintly subangulated in the middle, especially near the mouth; aperture ovately-triangular, inequilateral, unsymmetrical and higher than wide. Surface of the test densely striated across; upper side of the outer half of the last volution of the cast marked by two distant and nearly parallel spiral grooves, one of which is placed near the inner edge and the other about the middle. Posterior extremity, in one specimen at least, distinctly septate or chambered, the septa being simple, concave, and placed at distances of from one to two millimetres apart.

Galt, Rev. Andrew Bell, 1846-50: Galt and Hespeler, T. C. Weston, 1867: Elora, D. Boyle: Durham, Mr. J. Townsend.

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* Eighteenth Reg. Rep., p. 347.

† Idem.

The condition in which this species is most frequently found is in that of not very well preserved casts of the interior of the shell. In such specimens the slight angulation of the periphery and of the centre of the lower side is often nearly or quite obsolete, and the outline of the aperture is subovate, the upper side being less convex than the lower. In two unusually well-preserved fragments of this species from Durham, however, which have most of the test preserved, the aperture is clearly subtriangular or ovately triangular in contour.

Prof. McCoy states* that there are "no chambers" in shells of the genus *Ecculiomphalus*, but the present species is occasionally septate. Stoliczka places *Ecculiomphalus* in the Solaridæ, but its affinities appear to have been very near to *Maclurea*.

CEPHALOPODA.

Trochoceras desplainense, McChesney.

Plate 5, fig. 5.

Trochoceras Desplainensis, McChesney. 1859, New Palæozoic Fosssils, p. 68, pl. 8, fig. 1.
Trochoceras Desplainense, Hall.....Twentieth Reg. Rep., p. 359, pl. 16, figs. 8, 9 and 10.

Hespeler, T. C. Weston, 1867: two specimens, one a mould of the exterior of the outer whorl in a compact dolomite, and the other a cast of the interior of part of the body whorl.

Trocholites multicostatus.

Piate 6, figs. 1 and 1a.

Lituites multicostatus, Whitfield. Geol. of Wisc., vol 4. 1882, p. 303, pl. 20, fig. 7.

Elora, R. Bell, 1861: Hespeler, T. C. Weston, 1867 and 1871: Durham, Mr. J. Townsend: six specimens in all. Three imperfect examples of a shell which is probably referable to this species were collected by T. C. Weston in 1867, from the Niagara formation at Grimsby, Ont.

The *L. multicostatus* of Whitfield, from the Niagara formation of Waukesha, Wisconsin, appears to have been described from distorted or abnormally compressed individuals, which did not show the position

* British Palæozoic Fossils. Page 301.

of the siphuncle. The volutions of the shell in that species are said to be " very gradually increasing in size throughout and probably circular in a transverse section when not compressed, but in the specimen used and figured are of very much greater diameter in a dorso-ventral direction than laterally, giving a rather acute dorsal keel; most likely due to compression, the specimen being imbedded in the rock parallel to the stratification."

The outline of a natural transverse section of a specimen from Hespeler, which in other respects agrees well with the description of *L. multicostatus*, is transversely sub-elliptical or subreniform, its dorso-ventral diameter is much less that its breadth laterally, its periphery is broadly rounded and somewhat flattened, and there is not the slightest indication of a keel. The siphuncle is small and situated in the centre of the inner margin of the whorls, and the species appears to be a true *Trocholites*, very closely allied to the *T. ammonius* of Conrad.

Orthoceras crebescens, Hall.

Orthoceras crebescens, Hall.....20th Reg. Rep. St. of N. Y., p. 354, pl. 19, figs. 1, 2, and 3.
Orthoceras crebescens, Hall and Whitfield. Pal. Ohio. Vol. 2, p. 148, pl. 9, fig. 2.

Hespeler, T. C. Weston, 1871: Elora, Mr. James Gladstone, 1876, and since presented by the Trustees of the Elora Public School Museum per Mr. David Boyle: Durham, Mr. J. Townsend.

The Hespeler specimen is a coarse cast of the greater part of the body chamber, measuring eight inches and a half in length by four and a quarter in breadth at the larger and three and a half at the smaller end. The fine example from Elora is entirely septate and is divided into fifteen chambers; it measures rather more than eight inches and a half in length by three and a quarter in breadth at the larger and two and a third at the smaller end.

Orthoceras medullare, Hall.

Orthoceras medullare, Hall. Rep. Progr. Geol. Surv. of Wisconsin, 1859.
" " " Twentieth Reg. Rep., p. 353, pl. 20.

Elora, collected by Mr. David Boyle in 1876, and since presented by the Trustees of the School Museum.

A large cast of the septate end of the shell, measuring about seven and a half inches in length, with a portion of the test preserved. The septa are distant about one-third the lateral diameter, and the siphuncle is partly exposed on one side of the small end.

Orthoceras cadmus, Billings.

Orthoceras cancellatum, Hall ..... (*not* Eichwald.) 1852. Palæont. of the State of N. Y., Vol. II., p. 292, pl. 63, figs. 1 and 4*a*, *b*; and pl. 65, figs. 4*a* *b*.
Orthoceras Cadmus, Billings..... 1866. Cat. Sil. Foss. of Anticosti, p. 83.
Orthoceras subcancellatum, Hall.... 1877. Cat. of Am. Pal. Fossils, by S. A. Miller, p. 245.

Elora, T. C. Weston, 1867: a single fragment identified with the above-named species by E. Billings. The types of *O. Cadmus* are not from Anticosti, but from the Niagara formation at Grimsby, Ont.

Orthoceras annulatum, Sowerby.

Orthoceras annulatum, Sowerby.... 1818. Min. Conch. Tab. 133.
Orthoceralites undulatus, Hisinger.. Anteckn. V., Tab. 4, fig. 6, Vet. Akad. Handlingar, Tab. 7, fig. 8.
Orthoceralites undulatus, Hisinger.. Lethea Suecica, 1827, p. 28, Tab. 10, fig. 2.
Orthoceras annulatum, Sowerby.... Murchison's Silurian System and Siluria.
" " " .... Hall, Pal. N.Y., Vol. II., p. 293, pls. 64 and 65.
" " " .... " Twentieth Reg. Rep., p. 351, pl. 20, figs, 4 and 5.
" " " .... Hall and Whitf. Pal. Ohio, Vol. II., p. 147. pl. 9, fig. 1.
Orthoceras nodocostum, McChesney. 1861. New Pal. Foss., p. 94.
" " " Trans. Chic. Ac. Nat. Sc., p. 53, pl. 9, fig. 5.
Orthoceras Laphami, " 1861. New Pal. Foss., p. 91.

Hespeler, T. C. Weston, 1867: Elora, one specimen, presented by the Trustees of the School Museum through Mr. David Boyle.

This species is not uncommon in the Niagara formation at Grimsby and St. Catherines, Ont., and one example of it has been found in the "Chaleur Group" of L'Anse au Gascon in the Baie des Chaleurs.

Orthoceras Darwini, Billings.

Plate 6, figs. 2 and 2a.

Orthoceras Darwini, Billings. 1862. Pal. Foss. Canada, Vol, I., p. 161.

The type of this species, which has not previously been figured, is a very imperfect and badly preserved cast of the interior of part of the septate end of the shell. The siphuncle is visible only on the terminal septum of the smaller end, whose supposed ventral surface is partly removed by weathering, so that some allowance should probably be made for Mr. Billings' qualified statement that the centre of its siph-

uncle "appears to be"....."6 lines from the dorsal and 3 lines from the ventral margin." At any rate, in the writer's judgment, the eccentricity of the siphuncle in this species, the only character by which it can be distinguished from the *Cyrtoceras Myrice* of Hall and Whitfield, is more apparent than real and is probably due to distortion or to the accidental and unequal erosion of the posterior end of the specimen. The shell of *O. Darwini* is gently curved as is that of *C. Myrice*, and the exterior of both is longitudinally grooved or fluted, the breadth of the grooves or furrows in each case being about one line.

Cyrtoceras Myrice, Hall and Whitfield.

Plate 6, figs. 3 and 3a.

Cyrtoceras Myrice. Hall and Whitf. 1875. Pal. Ohio, Vol. II., p. 149, pl. 8, fig. 9.

Two specimens of this species, in excellent condition, have been collected at Durham by Mr. Joseph Townsend, both of which are now in the Survey Museum. One is a cast oi the interior of nearly the whole of the septate portion of the shell, while the other, the one figured on plate 6, shews the central and apparently moniliform siphuncle and concave constriction of the body-chamber. The position of the siph-part of the uncle was unknown in the typical Ohio examples of *C. Myrice*, which, as stated in the remarks on the previous species, is doubtfully distinct from *Orthoceras Darwini.*

Cyrtoceras septoris, Hall.

Gomphoceras septoris, Hall.....1864, Eighteenth Reg. Rep., p. 350, figs. 9 and 10.
Cyrtoceras septoris, Hall and Whitfield. 1875, Pal. Ohio, vol. 2, p. 151.

Elora, R. Bell, 1861: A cast of the body chamber only, shewing the very peculiar aperture characteristic of this species.

Phragmoceras Nestor, Hall, var Canadense.

Plate 7, figs. 1, 1a, and 1b.

Phragmoceras Nestor, Hall.....1867, Twentieth Reg. Rep. State of New York, p. 347, figs. 7 and 8.
Phragmoceras Nestor, Whitfield. Geology of Wisconsin, vol. 4, p. 301, pl. 19, fig. 3.

Shell somewhat compressed, apparently very little curved: septate end expanding rapidly in the dorso-ventral diameter, septa numerous, the four or five next to the body chamber averaging about five

millimetres in their distance apart, and as close together on the ventral or siphonal side as they are on the dorsal or anti-siphonal: siphuncle marginal or nearly so, moniliform and about eight millimetres broad in its greatest diameter on the septum next to the body-chamber. Chamber of habitation ovate in outline in transverse section, narrowest on the siphonal side, expanding very slowly in its dorso-lateral diameter and broadest in that direction at or a little below the mouth: maximum height of the same chamber in some specimens about equal to, and in others much less han, its greatest dorso-ventral diameter, its ventral side being always shorter than the dorsal. Aperture linear and narrowly contracted in the middle for a distance of a little more than an inch, expanded and nearly circular at both ends, the anti-siphonal expansion being much larger than the siphonal. Surface of the septate portion and of the posterior halt of the chamber of habitation marked by very faint, longitudinal, rounded ribs.

Hespeler, T. C. Weston, 1867 · Elora, loaned by the Trustees of the School Museum per Mr. David Boyle: Durham, Mr. J. Townsend, 1883. A single cast from each of these localities, one of which is that of the body chamber only, showing the shape and position of the siphuncle, while the others are casts of the same chamber with from six to nine septate chambers attached. As the posterior end of each happens to be imperfect, it is difficult to estimate the exact amouut of their curvature.

These specimens resemble the *P. Nestor* of Hall, from the Niagara Group of Wisconsin, much more closely than they do the *P. Hector* of Billings, from the Guelph Formation, especially in the shape of the aperture and in the contour of the chamber of habitation. They appear to indicate a mere local and stratigraphical variety of *P. Nestor*, which can most readily be discriminated from the type of that species by its much straighter form,—in consequence of which the edges of the septa are nearly equidistant all round,—and by its faintly ribbed outer surface. This latter character, however, does not seem to be constant, for the ribbing is only to be seen in places on two of the Canadian specimens, and not at all on a third. The cast from Elora, which on the whole should probably be regarded as belonging to this variety of *P. Nestor*, is not only perfectly smooth but its dorsal aperture is produced into a short tube.

A specimen in the Museum of the Survey which was collected by Dr. R. Bell in 1862 at L'Anse à la Barbe in the Baie des Chaleurs from rocks of nearly if not quite the same geological horizon as the Guelph Formation, can scarcely be distinguished from the typical form of *P. Nestor*.

Phragmoceras parvum, Hall and Whitfield.

Plate 7, fig. 2.

Phragmoceras parvum, Hall and Whitfield. 1875, Pal. Ohio, vol. 2, p. 151, pl. 8 fig. 10.

Two imperfect casts of the chamber of habitation of a *Phragmoceras* have been collected at Hespeler, which resemble *P. parvum* in their small size and in the tubular prolongation of the ventral end of the aperture. These specimens appear to differ from the type of that species only in not being quite so much curved.

Ascoceras Townsendi. (N. Sp.)

Plate 6, figs. 4 and 4a.

Shell small, slightly compressed at the sides, regularly oval in transverse section, its septate portion conical and widening gradually as well as somewhat convexly upwards from an obtusely pointed base: chamber of habitation unknown, with the exception of a small portion of its decurrent extremity: test and surface markings of the test also unknown. Septa apparently three in number. The first or posterior septum crosses the dorsum at a distance of about one millimetre from the posterior end, then curves concavely upwards on each side and finally passes over the ventral edge at a distance of eleven millimetres from the posterior end. The second septum crosses the dorsum close to the first and runs closely parallel with it on each side in its upward and concave curve, after which it bends first convexly towards the dorsum, and then suddenly backwards towards the ventral edge, which it ultimately passes over at a distance of four and a half millimetres above the septum. On the immediate centre of the dorsum the third septum is about one millimetre distant from the second: then for some distance on each side, as far as the upward concave curve extends, the sutures of the third and second septum are confluent, after which the third septum also bends convexly towards the dorsum, and then rather abruptly backwards towards and to the ventral edge, which it finally crosses at a distance of four millimetres above the second septum. The siphuncle is visible only at the pointed or posterior end: it is very small, and at this point is situated close to the centre of the dorsal margin of the first air chamber. The ventral half of the first air chamber is marked by a transverse groove or constriction.

Durham, Mr. J. Townsend, 1883: a well preserved cast of the septate portion of the shell, with a small portion of the decurrent posterior

extremity of the body-chamber. Although the type specimen is not perfect, this curious and interesting little shell appears to be easily distinguishable from all other species of the genus by its compressed conical form, and by the peculiar arrangement of the septa. The writer desires to couple with it the name of its discoverer, Mr. Joseph Townsend, of Durham, a zealous collector of the fossils of that locality, to whom the Museum of the Survey is indebted for many choice specimens, some of which are described and figured in the present paper.

TRILOBITA.

Ceraurus Niagarensis, Hall.

Ceraurus Niagarensis, Hall. 1867. Twentieth Regents' Rep.. p. 376, pl. 21, fig. 10.

Hespeler, T. C. Weston, 1867: two specimens of the glabella.

EURYPTERIDA.

Eurypterus Boylei. (N. Sp.)

Plate 7, Fig. 3.

Carapace moderately convex, broader than long, greatest breadth a little above the middle; semiovate, broadly rounded in front and squarely truncated behind; sides somewhat convex at their margin above, but straighter below; front and sides bordered by an elevated, narrow ridge, which is highest and most strongly marked on the posterior half of the sides. Eyes reniform, prominent, about four millimetres in the greatest diameter; nine mm. apart (as measured from the centre of their inner margins) and placed at a distance of six mm. from the anterior, and of seven mm. from the lateral margin. Ocelli not clearly indicated, but probably placed on or near a small rounded prominence or elevation, which is situated exactly in the middle of the space between the two eyes. Surface of the carapace apparently finely granulose, and ornamented with minute rounded tubercles, some of which are isolated and others confluent in sets of two or three.

Thoracic and caudal portions together consisting of twelve segments, exclusive of the telson or caudal spine; the first, second, third and

fourth thoracic segment each bearing on the median line a single, large and prominent, transversely elongated tubercle, which is arcuate or reniform at its base and somewhat bilobate at its summit. The lateral diameter of each of these tubercles greatly exceeds the longitudinal, and measuring at their base, the proportions of each tubercle may be thus approximately estimated; that on the first thoracic segment, lat. diam. four mm., long. diam. not quite one mm.; that on the third, lat. diam. nearly five mm., long. diam. rather more than one mm.; that on the third, lat. diam. five mm., long. diam., two mm.; and that on the fourth, lat. diam. five and a half mm., long. diam., three mm.

Telson produced into a gradually narrowing, slightly curved, and rather obtusely pointed linear spine, which seems to be triangular in transverse section.

Antennæ, endognaths and ectognaths unknown, as is also the nature of the surface markings of the test of the thoracic and caudal segments.

Entire length, including the telson, about seventy-five mm. (or three inches); length of carapace, twenty mm., greatest breadth of the same, twenty-seven mm.; length of telson, fifteen mm.

Elora, collected in 1881, by Mr. David Boyle, an intelligent and successful collector of the fossils of the Guelph formation for many years, to whom the writer begs to dedicate the species. The specimen figured, which has been kindly presented to the Museum of the Survey by the Trustees of the Elora School Museum, is an impression in a rather coarse-grained dolomite of the exterior of the upper surface of the carapace, with the whole of the thoracic and caudal segments in situ. Although the type and only specimen known is too imperfectly preserved to admit of as accurate a description as could be wished, the species, nevertheless seems to be sufficiently well characterized by the single large and peculiarly shaped tubercle placed on the median line of the upper surface of each of its four anterior thoracic segments.

PLATE I.

Unless otherwise stated, all the figures are of natural size.

PYCNOSTYLUS GUELPHENSIS (page 3).

Figure 1. Portion of a hand specimen, shewing a natural longitudinal section of some of the corallites.

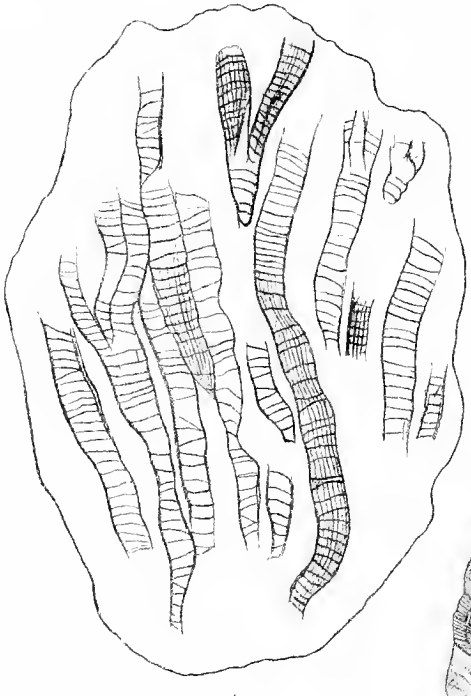
" 1*a*. An isolated corallite of this species, which has divided above into four branches, two of which (c c) are broken off at their bases.

" 1*b*. Piece of a natural transverse section of the corallites, shewing their quadripartite and more rarely tripartite division subsequent to gemmation.

PYCNOSTYLUS ELEGANS (page 4).

Figure 2. Anterior end of a corallite of this species, showing its calycinal gemmation and ribbed outer surface.

" 2*a*. Natural longitudinal section of a portion of a corallite, exhibiting the complete tabulæ and marginal septa.



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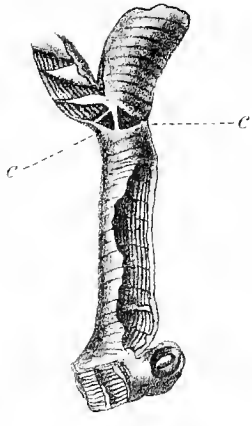

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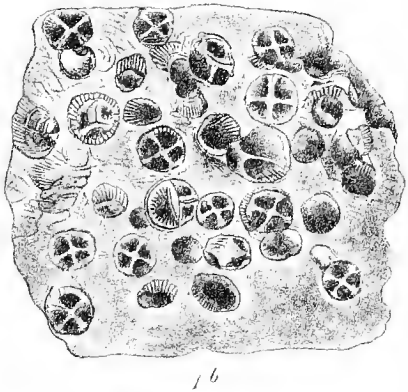

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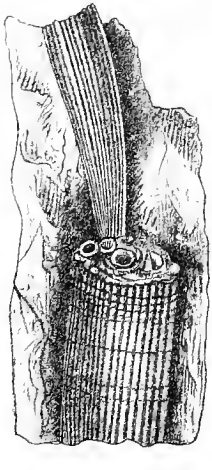

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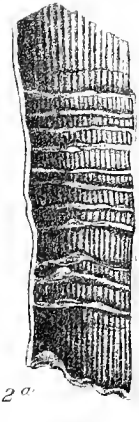


2a

PLATE II.

MONOMERELLA OVATA (page 5).

Figure 1. Interior of a ventral or pedicle valve, partly restored. The proportions of this restoration are not quite correct, the cardinal facet being too broad and the platform too large as well as placed too far forwards. Additional figures of better specimens of this species and its variety are given on Plate 8.

MONOMERELLA OVATA, VAR. LATA (page 6).

Figure 2. Interior of the ventral or pedicle valve.

" 2*a*. Exterior of the same specimen.

RHYNOBOLUS GALTENSIS (page 7).

Figure 1*a*. Exterior of the ventral or pedicle valve. This species also is further illustrated on Plate 8.

GONIOPHORA CRASSA (page 8).

Figure 3. Exterior of a left valve.

" 3*a*. Exterior of a right valve.

" 3*b*. Interior of a left valve.

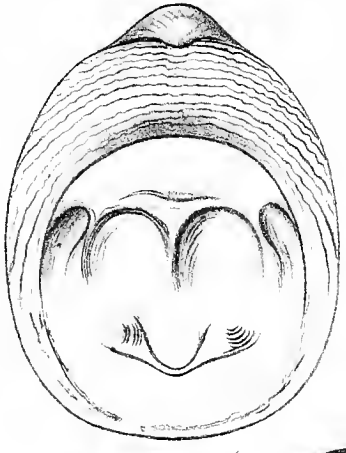
" 3*c*. Dorsal view of the closed valves, to show the concamerated structure of the inside of the anterior end.

ANODONTOPSIS CONCINNA (page 12).

Figure 4. Exterior of a cast of a right valve. As this figure is not very satisfactory, two additional illustrations are given on Plate 7.

ILIONIA (?) COSTULATA (page 15).

Figure 5. Side view of a right valve, taken from a gutta-percha impression of a mould of the exterior of the shell.



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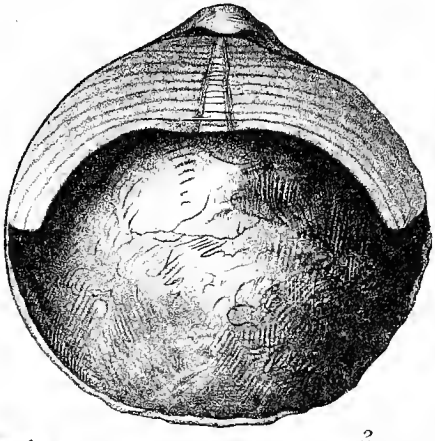

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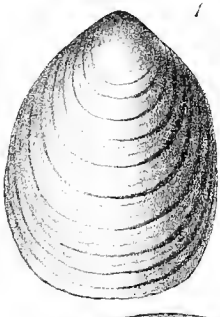

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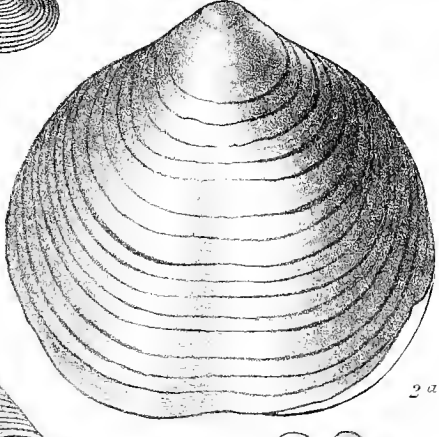

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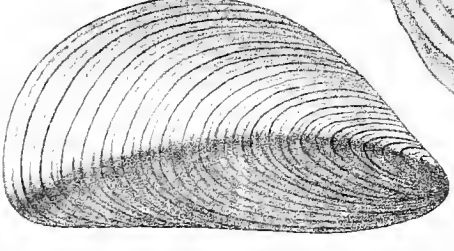

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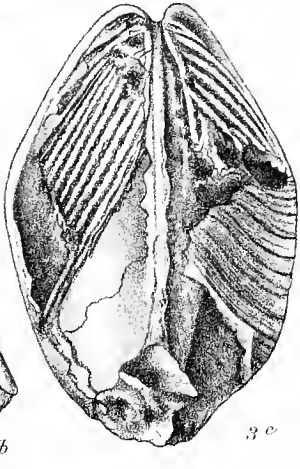


3 c

3 a

4

3 b

PLATE III.

Ilionia Galtensis (page 14).

Figure 1. Left valve of a specimen from Durham.
" 1*a*. Right " " " " " "
" 1*b*. Side view of a right valve, from Galt.

Subulites compactus (page 15).

Figure 2. Side view, somewhat enlarged. This figure is not quite accurate, and another has accordingly been given on Plate 7.

Codonocheilus striatum (page 17).

Figure 3. Side view of the most perfect specimen known, about twice the natural size.

Holopea Gracia, Billings (page 18).

Figure 4. Side view of the type of the species.

Cyclonema sulcatum, Hall (page 18).

Figure 5. Specimen with most of the test preserved.

Euomphalus macrolineatus, Whitfield (page 20).

Figure 6. Side view of a specimen from Durham.

Trochonema inornatum (page 19).

Figure 7. The most perfect specimen known to the writer.

Straparollus crenulatus (page 21).

Figure 8. Large specimen from Durham, as seen from above.
" 8*a*. Side view of a smaller individual from Durham.
" 8*b*. Basal aspect of the same.

Euomphalus Galtensis (page 21).

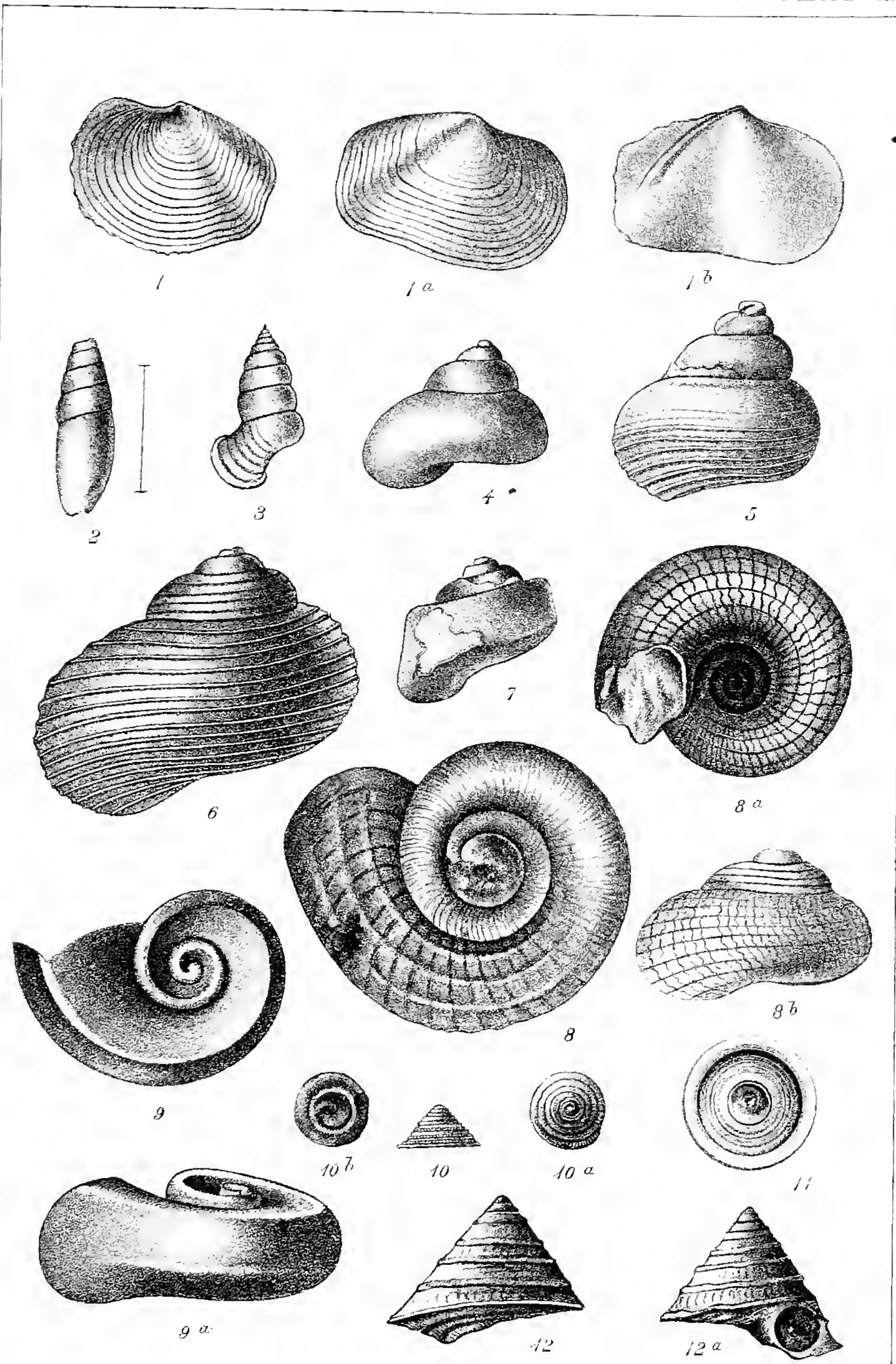
Figure 9. A nearly perfect cast, as seen from above.
" 9*a*. Lateral aspect of the same specimen.

Opercula of Gasteropoda (page 33).

Figure 10. View of operculum No. 1., as seen from above.
" 10*a*. Side view of the same specimen.
" 10*b*. Basal aspect of do.
" 11. Base of operculum No. 2. A side view of this specimen is given on plate 7.

Pleurotomaria cyclostoma (page 23).

Figure 12. Side view of a specimen from Durham.
" 12*a*. Another view of the same specimen, to show the circular aperture.



A H Foord & J W H Watts R C A. Del[t] A. Mortimer Lith

PLATE IV.

PLEUROTOMARIA VALERIA, Billings (page 23).

Figure 1. Basal view of the type of the species.

" 1*a*. Specimen from Durham, showing spire and test, which the type does not.

PLEUROTOMARIA DURHAMENSIS (page 24).

Figure 2. An unusually perfect cast of the interior of the shell.

MURCHISONIA HESPELERENSIS (page 24).

Figure 2. Lateral view of a cast.

MURCHISONIA CONSTRICTA (page 25).

Figure 4. Specimen with the test preserved.

MURCHISONIA TURRITIFORMIS, Hall. Var. (page 26).

Figure 5. The most perfect specimen in the Survey collection.

MURCHISONIA CONRADI, Hall (page 27).

Figure 6. A stout form of this species, from Elora.

MURCHISONIA MACROSPIRA, Hall (page 27).

Figure 7. Drawing of gutta-percha impression from a mould of the interior collected at Galt.

" 7*a*. Small specimen from Elora, with the whole of the test preserved.

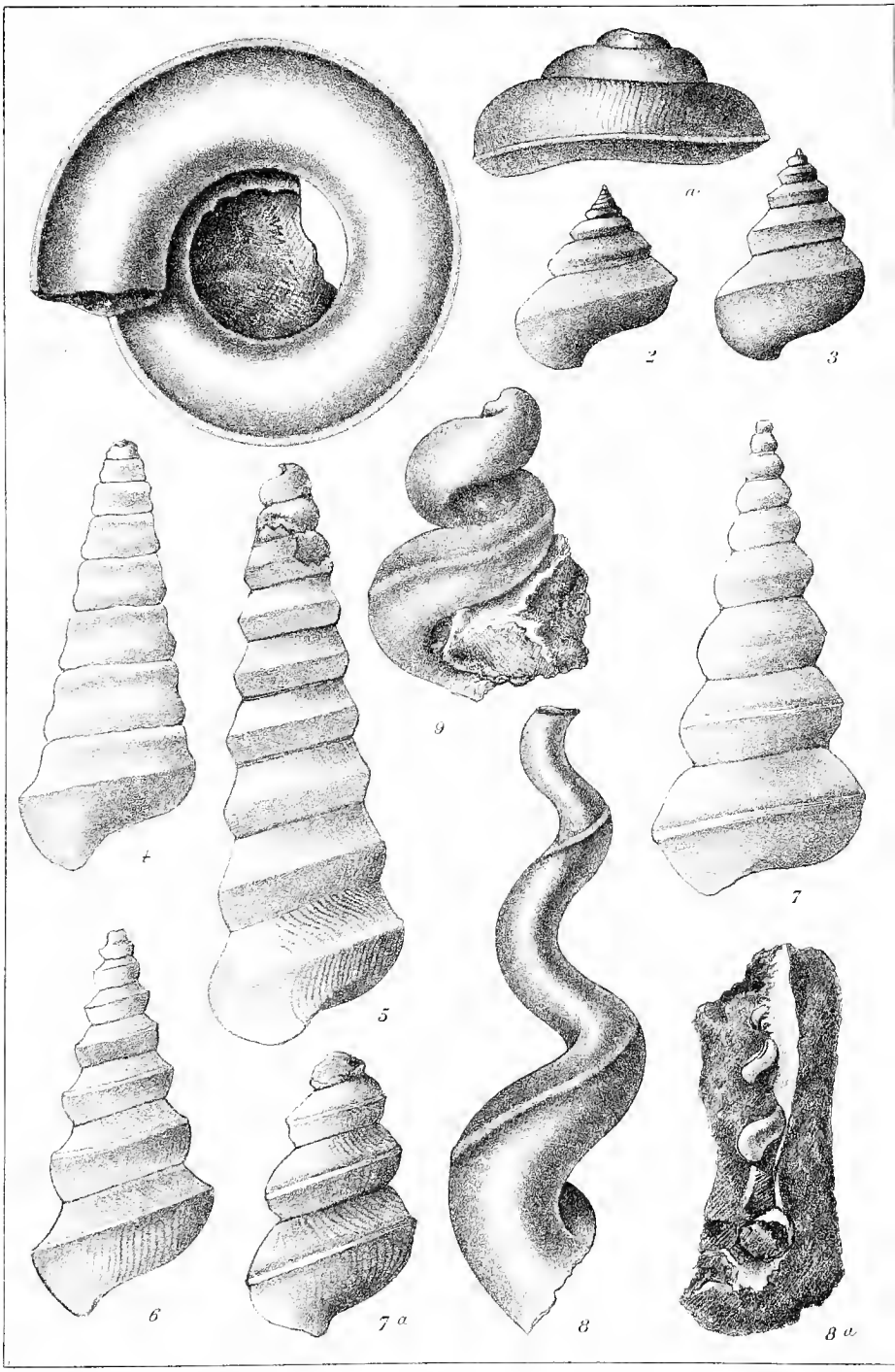
MURCHISONIA SOLUTA (page 28).

Figure 8. Cast of the interior of the shell of this species, with the apical portion broken off.

" 8*a*. Cast of the earlier whorls of the shell.

MURCHISONIA. Sp. Undt. (page 29).

Figure 9. Fragment of cast of a shell with characters intermediate between *M. macrospira* and *M. soluta*.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8a
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PLATE V.

Tryblidium Canadense (page 31).

Figure 1. Cast of the interior, as seen from above.

" 1*a*. Lateral view of the same specimen.

Scenella conica (page 32).

Figure 2. Summit view of a cast.

" 2*a*. Side view of the same.

Bucania stigmosa, (?) Hall, (page 34).

Figure 3. Side view of a cast.

" 3*a*. Another view of the same, to show the shape of the aperture and periphery. The periphery, however, is usually subcarinated, and the aperture more expanded, as shown on plate 8, fig. 4.

Ecculiomphalus circinatus (page 35).

Figure 4. Upper side of a cast of the interior, from Durham. The two grooves represented in this figure are too strongly defined, and they are entirely obsolete on the anterior half of the specimen.

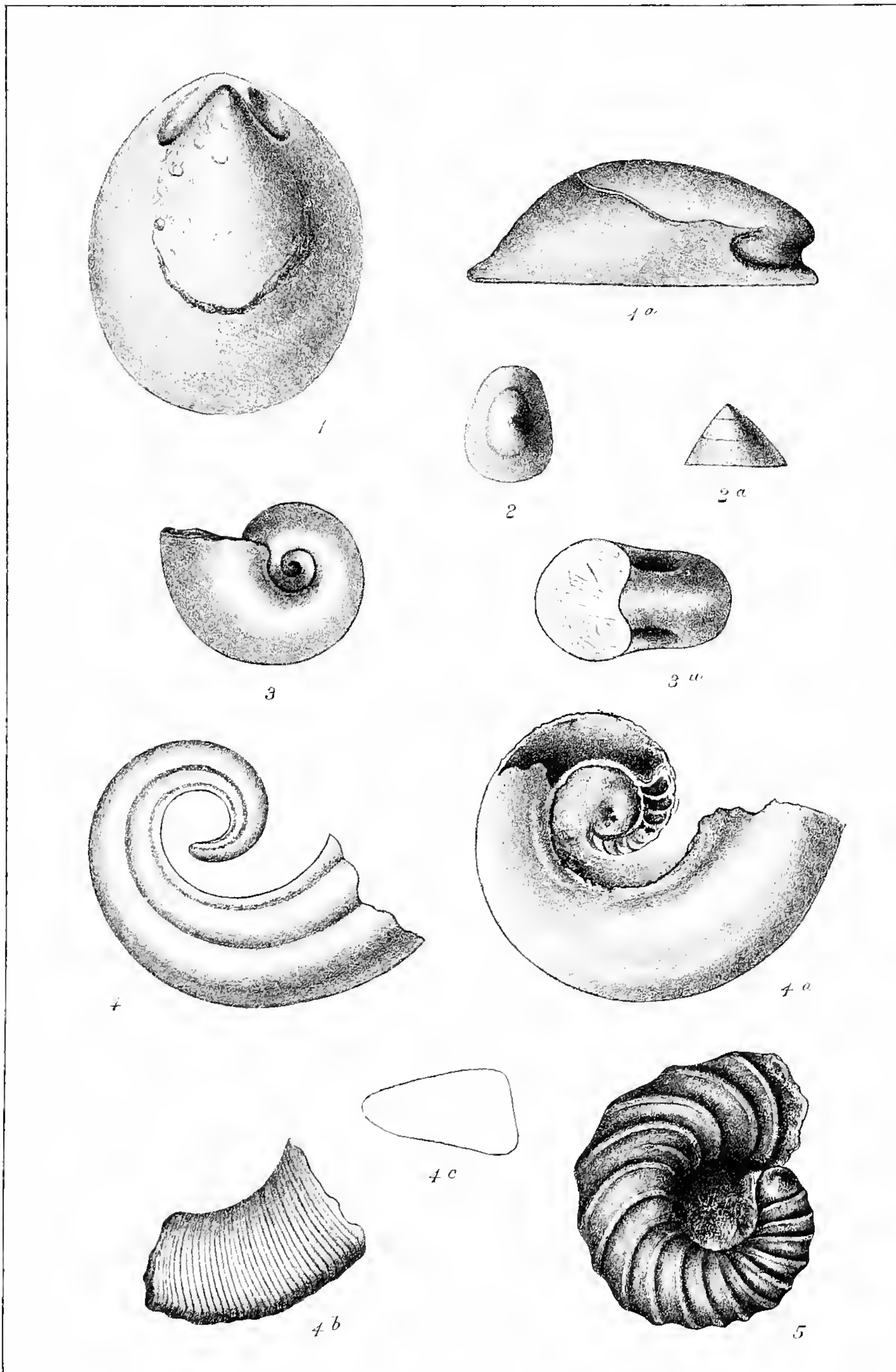
" 4*a*. Upper side of another cast, to show the septate character of the commencement of the volution.

" 4*b*. Fragment with the test preserved, to show the surface ornamentation.

" 4*c*. This was intended for an outline of a transverse section of the shell, near the mouth, but it is entirely incorrect. The true shape of a transverse section of the anterior end of the volution is given on plate 8, fig. 5.

Trochoceras Desplainense, McChesney, (page 36).

Figure 5. Drawing from gutta-percha impression of a natural mould collected at Hespeler.



A H Foord Del^t

PLATE VI.

TROCHOLITES MULTICOSTATUS, Whitfield, Sp. (page 36).

Figure 1. Side view, taken from a gutta-percha impression of a natural mould of the exterior collected at Durham.

" 1*a*. Septum of the same species, showing the position of the siphuncle.

ORTHOCERAS DARWINI, Billings (page 38).

Figure 2. The type of the species, from New Hope, which is laterally and abnormally compressed.

" 2*a*. Smaller end of the same specimen, to show the outline of a transverse section at that point.

CYRTOCERAS MYRICE, Hall & Whitfield (page 39).

Figure 3. Specimen from Durham, for comparison with the preceding species.

" 3*a*. View of a septum from the middle of the same specimen, which shows the size, shape and position of the siphuncle.

ASCOCERAS TOWNSENDI (page 41).

Figure 4. Side view of a cast of this species, from Durham.

" 4*a*. View of smaller end of the same, to show the position of the siphuncle.

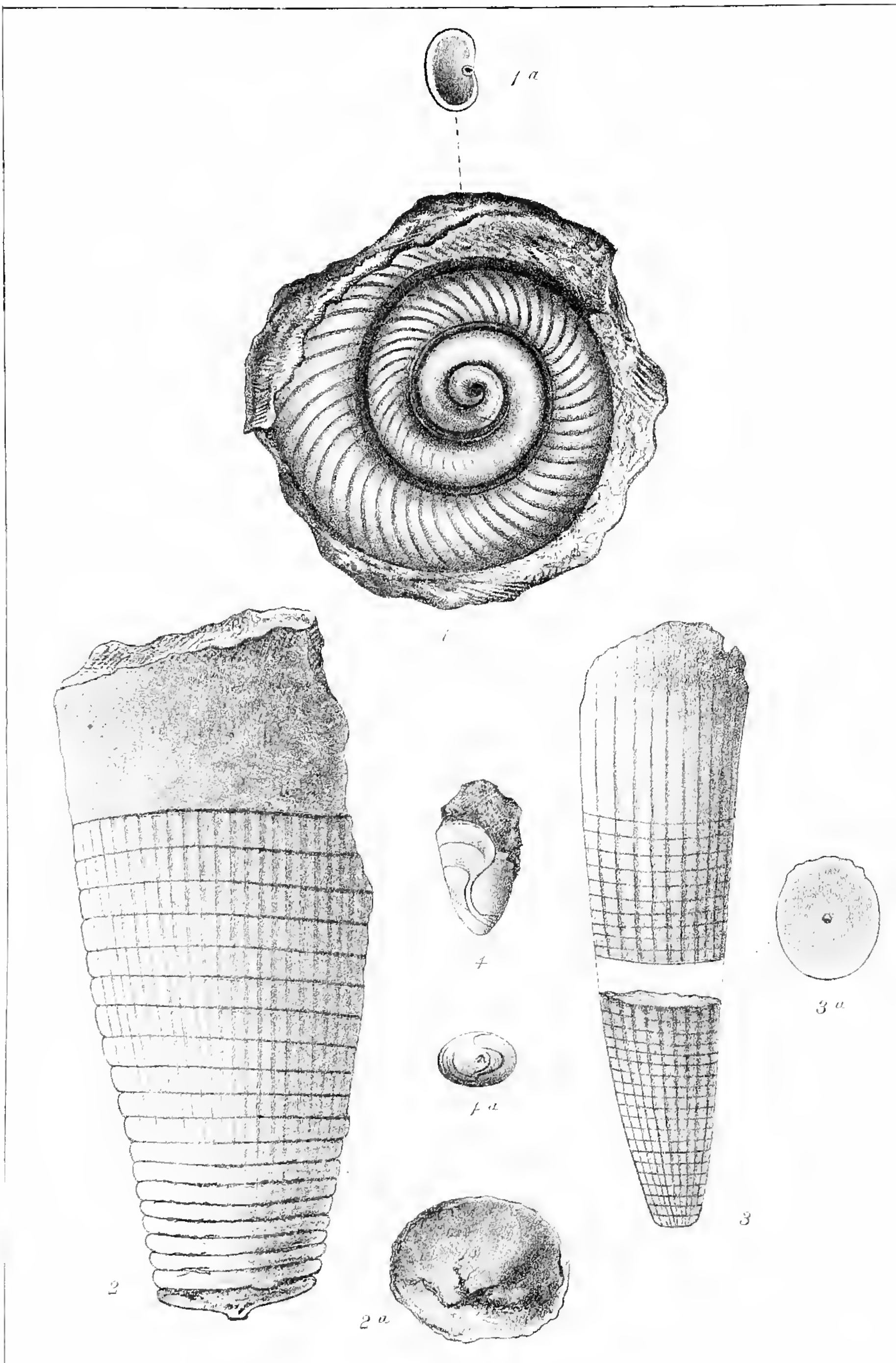

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PLATE VII.

PHRAGMOCERAS NESTOR, Hall. VAR CANADENSE, (page 39).

Figure 1. Specimen from Durham, with part of the septate end preserved.
" 1*a*. Cast of the chamber of habitation, from Hespeler.
" 1*b*. Aperture of the last specimen, as seen from above.

PHRAGMOCERAS PARVUM, Hall & Whitfield, (page 41).

Figure 2. Cast of the chamber of habitation, from Hespeler.

EURYPTERUS BOYLEI (page 42).

Figure 3. Natural mould of the exterior of the species, from Elora.

ANODONTOPSIS CONCINNA (page 12).

Figure 4. Right valve of the ordinary form of the species.
" 4*a*. Right valve of an unusually short and broad variety, from Galt.

MURCHISONIA TROPIDOPHORA (page 29).

Figure 5. Side view of the only specimen known to the writer.
" 5*a*. Another view of the same, to show the aperture.

SUBULITES COMPACTUS (page 15).

Figure 6. Side view of a specimen from Durham, about twice the natural size.

OPERCULUM OF GASTEROPOD (page 33).

Figure 7. Side view of operculum No. 2.

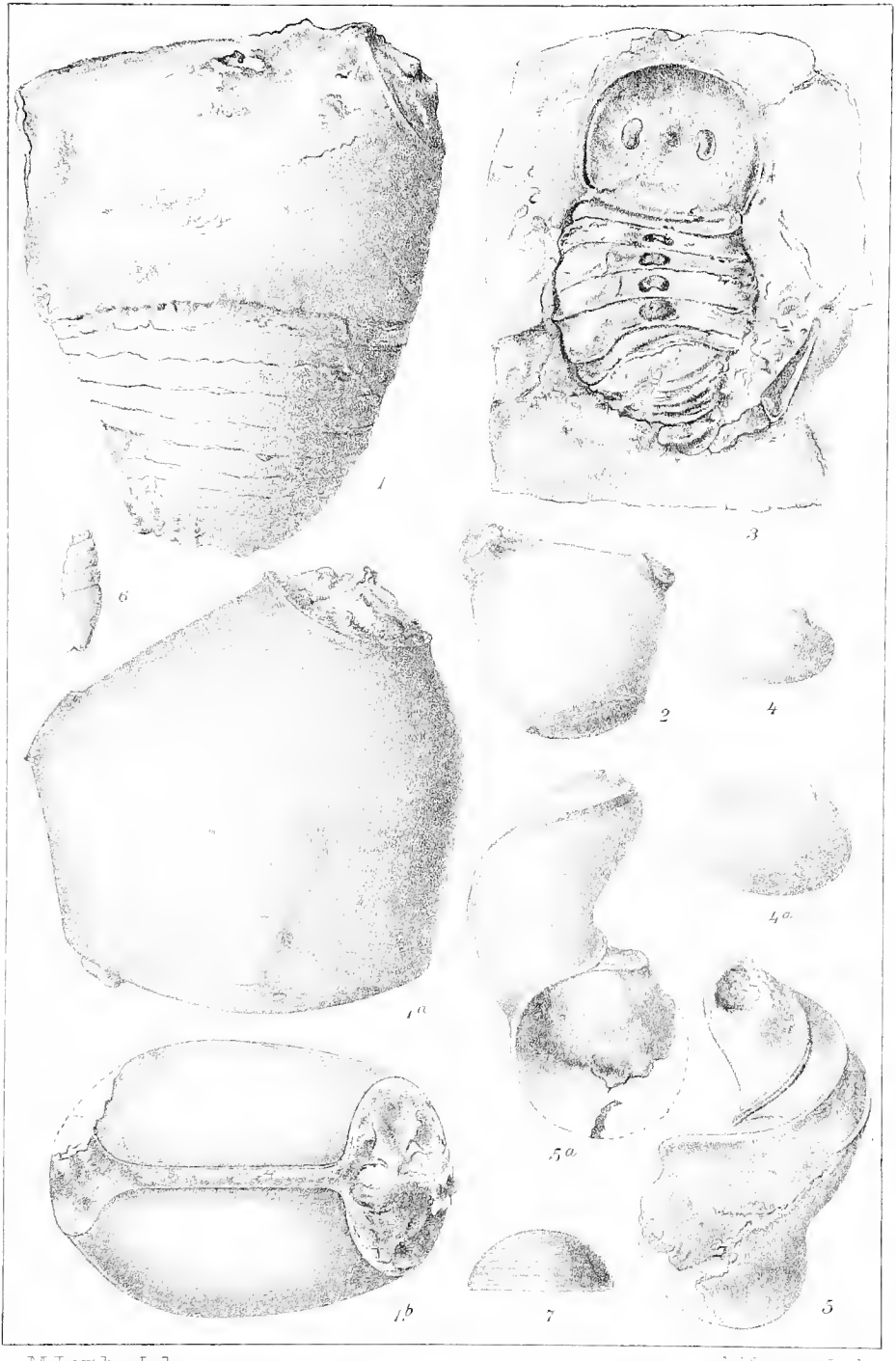
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PLATE VIII.

MONOMERELLA OVATA (page 5).

Figure 1. Specimen with both valves.
" 1*a*. Another view of the same.
" 1*b*. Interior of a ventral or pedicle valve.
" 1*c*. Portion of another ventral valve to show the deltidium and deltidial slopes.

MONOMERELLA OVATA, VAR. LATA., (page 6).

Figure 2. Interior of a ventral valve.
" 2*a*. Natural cast of the interior of a ventral valve.

RHYNOBOLUS GALTENSIS, Billings, Sp. (page 7).

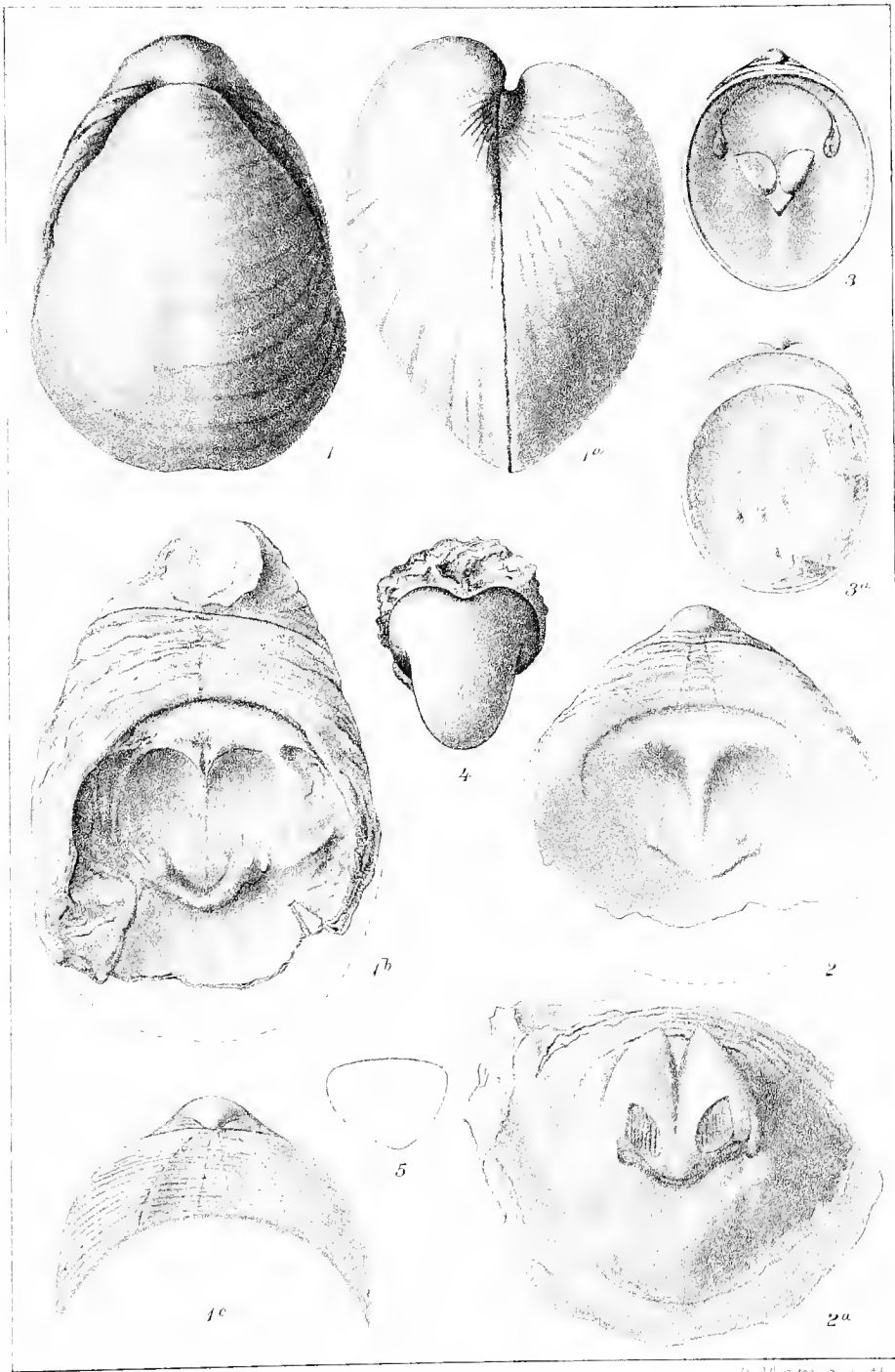
Figure 3. Interior of a dorsal or brachial valve.
" 3*a*. A ventral or pedicle valve, to show the hinge area.

BUCANIA STIGMOSA (?) Hall, (page 34).

Figure 4. View of another specimen, to show the somewhat expanded aperture and sinus on the outer lip.

ECCULIOMPHALUS CIRCINATUS (page 35).

Figure 5. Outline of a transverse section of the shell near the aperture.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GEOLOGICAL SURVEY OF CANADA

GEORGE M. DAWSON, C.M.G., LL.D., F.R.S., DEPUTY HEAD AND DIRECTOR

PALÆOZOIC FOSSILS

VOL. III., PART II.

2. Revision of the fauna of the Guelph formation of Ontario, with descriptions of a few new species

3. Systematic list, with references, of the fossils of the Hudson River or Cincinnati formation at Stony Mountain, Manitoba

BY

J. F. WHITEAVES, F.G.S., F.R.S.C., ETC.

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The present Report, which forms the second part of the third volume of "Palæozoic Fossils" now in course of publication by this Survey, consists of two papers, viz.: (2) a revision of the fauna of the Guelph formation of Ontario, with descriptions of a few species, and (3) a systematic list, with references, of the fossils of the Hudson River or Cincinnati formation at Stony Mountain, Manitoba.

The drawings for the seven plates illustrative of the first of these papers, were made from nature by Mr. L. M. Lambe, F.G.S., the artist to the Survey, and reproduced on stone by Mr. O. E. Prud'homme.

GEORGE M. DAWSON.

GEOLOGICAL SURVEY DEPARTMENT,
OTTAWA, July 8th, 1895.

PALÆOZOIC FOSSILS.

VOL. III.

2. *Revision of the fauna of the Guelph formation of Ontario, with descriptions of a few new species.*

By J. F. Whiteaves.

Since the first part of this volume was written, quite a number of fossils from this formation have been acquired by the Survey, most of which were collected by Mr. Joseph Townsend, of Toronto. Some of these fossils are much better specimens than had hitherto been obtained, of species that were already insufficiently characterized, others are new to this formation in Ontario, and a few appear to have been previously undescribed. Of late years particular attention has been given to the collecting of natural moulds of the exterior of shells of gasteropoda, etc., from this formation, as it has been found that gutta percha impressions of such moulds often give much more information about the exact shape and surface markings of the shell than can be derived from mere casts of the interior. Quite a number of these natural moulds have recently been obtained from a small exposure on the south bank of the Grand River at Belwood, formerly called Douglas or Garafraxa, in the township of West Garafraxa, seven miles north-east of Fergus. Several of the figures on the plates which accompany this paper are drawn from impressions of such moulds. These impressions were skilfully and most successfully made by Mr. L. M. Lambe, to whom the writer is indebted for valuable assistance in ascertaining the characters of some of the more critical species which are neither enumerated or described in this Report.

The publication of many special monographs and papers, and notably that of Lindström's beautifully illustrated memoir "on the Silurian gastropoda and pteropoda of Gotland,"* has thrown so much new light upon the fossils of the Silurian (Upper Silurian) rocks, that it is now thought practicable to attempt a revision of the entire fauna of the Guelph formation as developed in Ontario, based not merely upon the new material collected, but upon all the specimens in the Museum of the Survey.

*Kongl. Svenska vetenskaps-academiens Handlingar, Bandet 10, No. 6. Stockholm, 1884

In the earlier days of the Survey's operations, the fossils of this formation were collected—at Galt by A. Murray in 1847, by Professor James Hall in 1848, by E. Billings, assisted by John (not James) Richardson, in 1857, by Dr. R. Bell in 1861, and by T. C. Weston in 1867; at Guelph by E. Billings in 1857; at New Hope (now called Hespeler*) by E. Billings in 1857, by T. C. Weston in 1867 and 1871; at Elora by Dr. R. Bell in 1861, and by T. C. Weston in 1867. Some of the fossils of the Guelph formation in the Museum of the Survey were collected by Mr. David Boyle at Elora between the years 1876 and 1881, and a large number of unusually fine specimens, upon which both this and the preceding part of the present volume are largely based, were collected by Mr. Townsend in the vicinity of Durham in 1878-75, and since then at Elora, Belwood, etc.

For the information of those who may not be familiar with the literature of the subject, it may be well to state that the earliest descriptions of the fossils of this formation in Canada are contained in the second volume of the Palæontology of the State of New York, published in 1852 and in pages 154-169 of the first volume of "Palæozoic Fossils" published by the Survey in 1862 and 1865. In the former, fifteen species were described and figured by Professor James Hall, and, in the latter, twenty-one additional species were described by E. Billings, sixteen of which are figured. Between 1865 and the date of publication of the first part of this volume (1884), descriptions of a few more fossils from the Guelph formation of Ontario have appeared in various publications, but it will not be necessary to refer to these descriptions or publications any further here, as the name of each species in the following systematic list will be accompanied with full references to the memoirs or papers in which it has been described or quoted. The classification followed in this list is for the most part that adopted by Zittel in his Handbuch der Palæontologie, but the gasteropoda are arranged in accordance with the order followed in Lindström's monograph of the Silurian gastropoda, etc., of Gotland.

In 1888 rocks containing numerous specimens of a coral apparently identical with *Pycnostylus Guelphensis*, and of a Stromatoporoid apparently referable to *Clathrodictyon ostiolatum*, and therefore probably of the age of the Guelph formation, were discovered by Mr. J. B. Tyrrell at Davis Point, on the eastern shore of Lake Manitoba. At the meeting of the American Association for the Advancement of Science at Rochester, N. Y., in 1892, Professor Albert L. Arey exhibited quite a large series of fossils characteristic of the Guelph formation, which were collected in the immediate vicinity of that city.

*The name New Hope was formally and officially changed to Hespeler in July, 1858.

ALCYONARIA.

Heliolites interstinctus, L.

Madrepora interstincta, Linnæus .....1767. Syst. Nat., ed. 12, p. 1276.
Heliolites interstincta, Edwards & Haime.1855. Brit. Foss. Corals, p. 249 (which see for a list of synonyms of European specimens), pl. 57, figs. 9, 9, *a-d*.
" " Billings.....1863. Geol. Canada, p. 305, fig. 301.
Heliolites interstinctus, Rominger.....1876. Geol. Surv. Mich., Foss. Corals, p. 11, pl. 1, fig. 1.
" " S. A. Miller.....1889. N. Am. Geol. & Palæont., p. 192, fig. 181.

Hespeler, T. C. Weston, 1867 : two imperfect and badly preserved specimens, which were identified with this species by E. Billings. In the "Geology of Canada" (1863) *H. interstinctus* had previously been recorded as occurring in the Niagara limestone at Thorold and Owen Sound, Ontario, and in rocks of about the same geological horizon at Port Daniel, in the Baie des Chaleurs.

Halysites catenularia, L.

Tubipora catenularia, Linnæus.....1767. Syst. Nat., ed. 12, p. 1270.
Catenipora labyrinthica, Goldfuss.....1826. Petref. German., vol. I., p. 75, pl. 25, fig. 5.
Halysites catenularia, Edwards & Haime..1855. Brit. Foss. Corals, p. 270 (which see for a full list of synonyms of European specimens, up to that date), pl. 64, figs. 1, 1, *a-c*.
Catenipora escharoides, Hall.....1852. Pal. N. York, vol. II., p. 127, pl. 35, figs. 1, 1, *a-i*.
Halysites catenulatus, Billings.....1863. Geol. Canada, p. 305, fig. 303.
Halysites catenularia, Nicholson.....1875. Rep. Pal. Prov. Ont., p. 51, figs. 24, *a-b*.
Halysites catenulata, Rominger.....1876. Geol. Surv. Mich., Foss. Corals, p. 77, pl. 29, figs. 1, 2 and 4.
Halysites catenulatus, var. *labyrinthicus*, Whitfield. Geol. Wiscons., vol. IV., 1882, pp. 271-72, pl. 13, fig. 7.
" " S. A. Miller.....1889. N. Am. Geol. & Palæont., p. 191, fig. 180.

Guelph, E. Billings, 1857 ; Elora, Dr. R. Bell, 1861 ; Hespeler, T. C. Weston, 1867 ; and Durham, J. Townsend, 1878-1882. In the Geology of Canada, *H. catenulatus* is said to have been found in the Black River limestone of the Ouatchouan River, Lake St. John, P.Q. ; in the Hudson River formation at the west end of the island of Anticosti ; in all the divisions of the "Anticosti Group" of that island ; and, in the Niagara

limestone, near Thorold, Owen Sound, the Manitoulin Islands, Rockwood and Isthmus Bay (Lake Huron); at Lake Temiscamang, Dudswell and Port Daniel. The specimens in the Museum of the Survey from most of these localities belong to the large tubed or typical form of the species which Prof. Whitfield suggests (op. cit.) should be called *H. catenulatus* var. *labyrinthicus*, but some of those collected at Lake St. John by Mr. James Richardson in 1857 or by Mr. Walter McOuat in 1871, and at Port Daniel by Sir W. Logan in 1843, represent the small tubed form or dimorphic variety which Edwards and Haime described and figured as the *Halysites escharoides* of Lamarck.

Since 1863, characteristic examples of the typical form of *H. catenularia* have been collected by Dr. R. Bell (in 1879) at the second and third limestone rapids of the Nelson River, Keewatin, and it has been found to be abundant in the Trenton limestone of the Red River valley, in Manitoba (at East Selkirk and Lower Fort Garry), of the western shore of Lake Winnipeg and of many of the islands in that lake. Specimens of the typical form of the "chain coral" and of the variety with extremely small corallites (*H. catenulatus* var. *microporus*, Whitfield) were collected by Prof. A. P. Coleman in 1864, in the Silurian (Upper Silurian) rocks of the north-east shore of the Columbia River, near Donald. Mr. McConnell obtained the typical form in 1886 at several localities "along the central and more elevated parts of the Beaverfoot Range of the Rocky Mountains and its continuations," in rocks which are well exposed between Palliser and Golden, on the line of the Canadian Pacific Railway. Mr. Tyrrell collected it in 1889 in rocks apparently of the age of the Niagara limestone, on the Saskatchewan River at and below Cedar Lake. It has been found near the Neigette River, six or seven miles east of Rimouski village, in the province of Quebec, by Mr. Weston in 1880, and at Lake Metapedia by Prof. L. W. Bailey in 1888.

Halysites agglomeratus, Hall.

Catenipora agglomerata, Hall.....1843. Geol. Rep. 4th Distr. N. York: tables of fossils, No. 22, fig. 2.
" " Hall.....1852. Pal. N. York, vol. II., p. 129. pl. 35, figs. 2, *a-g*.
Halysites agglomerata, Nicholson...1875. Rep. Pal. Prov. Ont., p. 51, figs. 24, *c-d*, and p. 66.

Guelph, Prof. H. A. Nicholson (op. cit., p. 66).

Halysites agglomeratus, var. compactus.

Halysites compactus, Rominger....1876. Geol. Surv. Mich., Foss. Corals, p. 78 pl. 29, fig. 3.
" " Whiteaves...1884. This volume, pt. 1, p. 2.

Galt, Rev. A. Bell, 1846-50; Elora, Dr. R. Bell, 1861; and Hespeler, T. C. Weston, 1867. In the specimens from these localities the corallites are circular in outline and closely approximated, but they are irregularly disposed and do not form continuous lines or loops. The distances between adjacent corallites are usually not much greater than their own diameter, which averages about two millimetres.

ZOANTHARIA.

TETRACORALLA.

PYCNOSTYLUS GUELPHENSIS, Whiteaves.

Pycnostylus Guelphensis, Whiteaves. 1884. This volume, p. 3, pl. 1, figs. 1, 1*a* and 1*b*.

Abundant at Guelph, Hespeler, Elora and Durham; the names of the collectors of the specimens and the dates at which the specimens were collected having been already given on the third page of the first part of this volume. The genus *Pycnostylus*, of which *Orthopœdium*, Schluter, 1889, is probably a synonym, differs from *Amplexus* only in the circumstance that it grows in colonies of compound and apparently fasciculated corallites.

PYCNOSTYLUS ELEGANS, Whiteaves.

Pycnostylus elegans, Whiteaves..1884. This volume, pt. 1, p. 4, pl. 1, figs. 2 and 2*a*.

Hespeler, T. C. Weston, 1867; Durham, J. Townsend, 1878-85; apparently much rarer than the preceding species.

ZAPHRENTIS. Species undeterminable.

Specimens of a species of *Zaphrentis*, which are too imperfect to be satisfactorily identified, but which are apparently allied to and possibly identical with the *Z. Racinensis* of Whitfield,* from the Niagara limestone of Wisconsin, were collected at Guelph by Dr. R. Bell in 1861, at Hespeler by Mr. T. C. Weston in 1871, at Elora by Mr. David Boyle in 1880, and at Durham by Mr. Joseph Townsend between the years 1879 and 1882. Most of these specimens from Ontario are mere casts of the interior of the calyx of the coral, in a bad state of preservation.

CYSTOSTYLUS INFUNDIBULUS, Whitfield.

Syringopora infundibula, Whitfield...1877. Ann. Rep. Geol. Surv. Wiscons., p. 79.

Cystostylus infundibulus, Whitfield ...1882. Geol. Wiscons., vol. IV., p. 274, pl. 14, fig. 7.

" " Whiteaves...1874. This volume, pt. 1, p. 2.

*Geology of Wisconsin, vol. IV. (1882), p. 277, pl. 14, figs. 1 and 2.

As already stated, on the second page of the first part of this volume, this species has been collected in the Guelph formation at New Hope (= Hespeler), Elora and Durham.

HEXACORALLA.

Favosites Gothlandica, Lamarck.

Favosites Gothlandica, Lamarck.....1816. Hist. des An. sans Vert., vol. II., p. 206.
Calamopora Gothlandica, Goldfuss.....1829. Petr. Germ., pl. 26, figs. 3*a*, 3*b*, 3*c*, 3*e* (cæt. exclusis).
Calamopora favosa, Goldfuss .....1829. Ibid., pl. 26, figs. 2*a*, 2*c*.
Favosites Gothlandica, Edw. & Haime 1851. Polyp. Foss. Terr. Palæoz., p. 232, and (1854) Brit. Foss. Cor., p. 256, pl. 60, figs. 1 and 1*a*.
Favosites Goldfussi, Edw. & Haime.....1851. Polyp. Foss. Terr. Palæoz., p. 235, pl. 20, fig. 3, and (1853) Brit. Foss. Cor., p. 214, pl. 47, figs. 3, 3*c*.
Favosites Niagarensis, Hall.....1851. Pal. N. York, vol. II., p. 125, pl. 34*A*, bis., fig. 4.
Favosites favosa, (?) Hall.....1851. Ibid., p. 126, pl. 34*A* bis., fig. 5.
Favosites Gothlandica, Billings.....1859. Canad. Journ., n.s., vol. IV., p. 99.
" " " .....1863. Geol. Canada, p. 305, fig. 302.
" " Nicholson.....1874. Rep. Pal. Prov. Ont., p. 45.
Favosites favosa, Nicholson.....1875. " " " " 51.
" " " .....1875. Palæont. Ohio, vol. II., p. 229.
Favosites favosus, Rominger.....1876. Geol. Surv. Mich., Foss. Cor., p. 20, pl. 4, figs. 1-4 and pl. 5, fig. 2.
Favosites Gothlandica, Nicholson.....1879. Tab. Cor. Palæoz. Per., p. 46, pl. 1, figs. 1, 3 and 5.

In the "Geology of Canada" this species is stated to occur in the Guelph formation at Galt, Hespeler, Elora and Fergus, and Prof. H. A. Nicholson cites it as from Hespeler, in his second Report on the Palæontology of the Province of Ontario. There are, however, no examples of the typical form of *F. Gothlandica*, with large corallites, from the Guelph formation, in the Museum of the Survey, and the only specimen that the present writer has seen from that formation in Ontario which can be at all satisfactorily identified with *F. Gothlandica*, is a small colony collected at Galt by Dr. R. Bell in 1861, in which the largest corallites do not exceed two millimetres in their maximum diameter.

Favosites Forbesii, Edwards & Haime.

Favosites Forbesii, Edw. & Haime..1851. Polyp. Foss. Terr. Pal., p. 238.
" " " " ..1855. Brit. Foss. Cor., p. 258, pl. 60, figs. 2, 2, *a-g*.
" " Nicholson .....1879. Tab. Cor. Palæoz. Per., p. 56, pl. 1, fig. 7, and pl. 2, figs. 1, 1*a* and 1*b*.

This species is mentioned by Professor H. Alleyne Nicholson, in his second Report on the Palæontology of Ontario, as having been found at Hespeler, but it is not included in any of the lists of fossils from the Guelph formation in the "Geology of Canada," and the writer has failed to recognize it in any of the later collections received by the Survey.

Favosites Hisingeri, Edwards & Haime.

Favosites Hisingeri, Edw. & Haime..1851. Polyp. Foss. Terr. Pal., p. 240, pl. 17, figs. 2, 2, *a-b*.
Astrocerium venustum, Hall .....1852. Pal. N. York, vol. II., p. 120, pl. 34, figs. 1, *a-j*.
Favosites Hisingeri, Edw. & Haime..1855. Brit. Foss. Cor., p. 259, pl. 61, figs. 1, 1*a* and 1*b*.
Favosites venusta, Nicholson..... 1875. Rep. Pal. Prov. Ontario, p. 65.
Favosites venustus, Rominger.....1876. Geol. Surv. Mich., Foss. Cor., p. 22, pl. 5, fig. 3.

Galt, Dr. R. Bell, 1861 ; Hespeler, T. C. Weston, 1867 ; Elora, Dr. R. Bell, 1861, T. C. Weston, 1867, and D. Boyle, 1880 ; Durham, J. Townsend, 1878-82. Most of the specimens from these localities are so highly dolomitized that the more minute internal structures of the corallites are obliterated, but the spiniform septa are well preserved in a specimen from Lot 16, Concession 1 of Bentick, and the mural pores in specimens from Durham.

In the Geology of Canada (1863) *F. Hisingeri* is recorded as occurring in the Niagara limestone at Thorold and Drummond Island, also in rocks of about the same age at Port Daniel, in the Baie des Chaleurs. It has recently been recognized by Mr. L. M. Lambe in collections made by Mr. James Richardson, in 1856, at the Jumpers and Cormorant Point, Anticosti, and by Mr. T. C. Weston, in 1865, at Wall's Cove, Anticosti.

Favosites polymorpha (Goldfuss) Billings.

Favosites polymorpha (Goldfuss) Billings...1863. Geol. Canada, pp. 340 and 342.
" " Nicholson.1875. Rep. Pal. Prov. Ont., p. 65.

Hespeler, Elora and Fergus, E. Billings ; Hespeler and Elora, Professor H. A. Nicholson.

The corallites of the few specimens of a Favosite with a branching corallum that the writer has seen from the Guelph formation at these and other localities in Ontario, are polygonal, unequal in size and thin walled. These specimens clearly do not belong to the genus *Pachypora* and their specific relations are obscure. They are here provisionally referred to *F. polymorpha* in accordance with the identifications of Billings and Nicholson.

HYDROMEDUSÆ.

HYDROIDA.

CLATHRODICTYON OSTIOLATUM, Nicholson.

Stromatopora ostiolata, Nicholson..... .....1873. Ann. Nat. Hist., ser. 4, vol. XII., p. 90, pl. 5., figs. 1 and 1*a*.

" " " .....1874. Rep. Pal. Prov. Ont., pl. 1, figs. 1 and 1*a*.

" " " .....1875. Rep. Pal. Prov. Ont., p. 63.

" " " .....1878. Journ. Linn. Soc., vol. XIV., pl. 2, figs. 1 and 2.

Clathrodictyon (*Stromatopora*) *ostiolatum*, Nicholsón..1886. Mon. Brit. Stromatop., pt. 1, p. 14.

Clathrodictyon ostiolatum, Nicholson.....1887. Ann. Nat. Hist., ser. 5., vol. XIX., p. 11, pl. 3, figs. 1-3.

The specimen upon which this species was based was collected by Mr. John Wilkie at Guelph, not later than the year 1873, but a few specimens which have been identified with *C. ostiolatum* by Professor Nicholson and which are now in the Museum of the Survey, were collected by Mr. David Boyle at Elora in 1880, and by Mr. Joseph Townsend at Durham in 1884.

CLATHRODICTYON FASTIGIATUM, Nicholson.

Clathrodictyon fastigiatum, Nicholson..1886. Mon. Brit. Stromatop., pt. 11, p. 43, fig. 3.

" " " ..1887. Ann. Nat. Hist., ser. 5, vol. XIX., p. 8, pl. 2, figs. 3 and 4.

" " " ..1888. Mon. Brit. Stromatop., pt. 2, p. 152, pl. 19, figs. 1-5.

Glenelg Township, six miles from Durham, J. Townsend, 1884: five specimens, which have been examined and named by Professor Nicholson.

LABECHIA. Species undeterminable.

Durham, J. Townsend, 1884: a few specimens of the cænosteum of an apparently undescribed species of this genus, which are too imperfect and too badly preserved to admit of a sufficiently accurate description of their distinctive characters.

STROMATOPORA GALTENSIS, Dawson. (Sp.)

Cœnostroma Galtense, Dawson.....1875. Life's Dawn on the Earth, p. 160.

" " " .....1879. Quart. Journ. Geol. Soc., Lond., vol. XXXV., p. 52.

Stromatopora Galtensis, Nicholson..1891. Mon. Brit. Stromatop., p. 173.

Hespeler, T. C. Weston, 1867: one specimen. Prof. Nicholson, who has examined a portion of this specimen, says (op. cit.) that its minute structure "is practically destroyed by dolomitization, but all its general characters would lead to the belief that it is very closely related to *Stromatopora typica*, Rosen, and is probably identical with it." He further states that *Cœnostroma constellatum* of Spencer,* from the Niagara limestone near Hamilton, does not appear to be any way distinguishable as regards its general characters from *C. Galtense*, Dawson," and that he is "strongly disposed to think that it is really identical with *S. typica*, Rosen. If the above view should prove to be correct, then *Cœnostroma Galtense*, Dawson, and *C. constellatum*, Spencer, must be considered as synonyms of *S. typica*, Rosen."

STROMATOPORA ANTIQUA, Nicholson and Murie.

Pachystroma antiqua, Nicholson & Murie..1878. Journ. Linn. Soc., vol. XIV., p. 224, pl. 4, figs. 2-5.
Stromatopora antiqua, Nicholson.....1886. Mon. Brit. Stromatop, pt. 1, p. 17, pl. 5, figs. 8-11.

Durham, J. Townsend, 1884: one specimen, which is now in the Museum of the Survey.

STROMATOPORELLA. Species undeterminable.

Durham, J. Townsend, 1884: two specimens, which are too imperfect to admit of their specific relations being satisfactorily ascertained.

BRACHIOPODA.

TRIMERELLA GRANDIS, Billings.

Trimerella grandis, Billings.....1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 166, figs. 151, *a-b*.
" " Dall.....1870. Am. Journ. Conch., vol. II., pt. 2, p. 160 and (1871) vol. VII., p. 82.
" " Davidson & King.1874. Quart. Journ. Geol. Soc. Lond., vol. XXX., p. 144, pl. 13, figs. 2 and 3.
" " Nicholson.....1875. Rep. Pal. Prov. Ont., p. 67, and p. 68, fig. 37.
" " Hall .....1892. Pal. N. York, vol. VIII., pt. 1, pls. 4*A*, figs. 1 and 2, and 4*B*, figs. 2, 3, 4 and 5.

Casts of the interior of shells of this species are abundant at Galt, Guelph, Elora, Hespeler and Durham, but the writer has seen only one specimen in which any portion of the test is preserved. This is an imperfect pedicle valve collected at Durham by Mr. J. Townsend in 1883, which shows part of the exterior of the test and most of the characters

*Bulletin No. 1 of the University of the State of Missouri, p. 48, pl. 6., fig. 11.

of the interior of that valve. It is much flattened exteriorly, and its surface is nearly smooth, possibly as a result of weathering prior to fossilization. Its beak is erect, and its "cardinal area" and "deltidium" are not flattened obliquely backward and receding, as those of the *T. Lindstræmi* from Gotland are. Its interior does not present any additional characters to those of Davidson and King's restoration of the pedicle valve of *T. grandis* on Plate 13, fig. 2c, of their paper on the Trimerellidæ (op. cit.), but the platform vaults are apparently a little longer in proportion to the entire length of the valve.

Trimerella acuminata, Billings.

Trimerella acuminata, Billings.....1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 167 and p. 168, fig. 151.
" " Davidson & King..1874. Quart. Journ. Geol. Soc. Lond., vol. XXX., p. 146, pl. 15, figs. 4-7, and pl. 16, figs. 1 and 2.
" " Nicholson.....1875. Rep. Pal. Prov. Ont., p. 68, fig. 36.
" " Hall.....1892. Pal. N. York, vol. VIII., pt. 1, pl. 4 B, fig. 6.

This species has been collected at the same localities as *Trimerella grandis*, and almost invariably in the same condition, viz., as casts of the interior of the shell. A large but very imperfect pedicle valve of a specimen of *T. acuminata*, with part of the test remaining, though in a very bad state of preservation, was, however, collected at Hespeler in 1867 by Mr. T. C. Weston. It has most of the beak broken off, as well as a large portion of one side of the valve, and shows little more than that the surface of the test is marked by concentric lines of growth, at irregular intervals.

Trimerella Ohioensis, Meek.

Plate 10, figs. 1 and 1a.

Trimerella Ohioensis, Meek.....1871. Am. Journ. Sc. & Arts, Ser. 3, vol. I., p. 315.
" " Dall.....1871. Am. Journ. Conch., vol. VII., pt. 2, p. 83.
" " Meek.....1873. Rep. Geol. Surv. Ohio, vol. I., pt. 2, p. 183, fig. *a*, and pl. 16, figs. 1, *a-c*.
" " Davidson & King..1874. Quart. Journ. Geol. Soc. Lond., vol. XXX., p. 153, pls. 16, figs. 3-7, and 19, figs. 1 and 2.
" " Hall.....1892. Pal. N. York, vol. VIII., pt. 1, p. 35, pl. 4A, figs. 3-9.

"Guelph limestone, Canada? one valve, E. Billings." Dall. The writer has either not seen or has failed to recognize the specimen referred

to by Dr. Dall, but the unusually perfect specimen represented on Plate 10, which was collected at Durham by Mr. J. Townsend in 1884, is probably the pedicle valve of a variety of *T. Ohioensis*. The interior of this valve, however, is so completely filled with the matrix that its identity with that species is not quite certain. The exterior of the valve is compressed convex, its marginal outline broadly subovate, broader than long and broadest in advance of the midlength. The beak is slender, elongate and acuminate, its apex being acutely pointed and slightly incurved. The maximum length of the valve is a little more than three inches, and its greatest breadth not quite two inches and a half. Its outer service is marked with concentric striæ of growth. Its "deltidium" is much higher or longer than broad, but the surface markings of the whole of its cardinal area are obscured by the tough and tenacious matrix.

A cast of the interior of both valves of a specimen from Elora, kindly lent to the writer, for examination, by Mr. B. E. Walker, of Toronto, appears to be referable to this species.

In the second part of the first volume of the "Report of the Geological Survey of Ohio," pages 184 and 185, Mr. Meek concludes that *T. Ohioensis* is more nearly related to *T. acuminata* than to *T. grandis*, and states that he "should not be surprised if further comparisons should prove the *T. Ohioensis* to be only a more robust, broader variety of *T. acuminata*."

Trimerella Billingsii, Dall.

Trimerella Billingsi, Dall.....	1871.	Am. Journ. Conch., vol. VIII., pt. 2, p. 82, pl. 11, figs. 1 and 2, but, acc. to Dav. & King, not fig. 3.
" " Davidson & King..	1874.	Quart. Journ. Geol. Soc. Lond., vol. XXX., p. 150, pl. 16. figs. 8 and 9.

"One cast of a neural valve showing the characters of the area, posterior margin, &c., distinctly, was kindly lent for examination and description by Mr. Billings. I have also seen two other specimens from the same locality." Dall.

"All we have seen of this species is the internal cast, measuring two inches three lines in length by one inch five lines in width, of a single pedicle-valve, found by Mr. Billings in the Guelph limestone at New Hope, West Canada." Davidson and King.

The cast of the interior of the pedicle valve referred to in the foregoing quotations, which was collected by Mr. Billings at Hespeler in 1857, and which is still in the Museum of the Survey, is the only specimen of *T. Billingsii* that the present writer has seen.

Trimerella Dalli, Davidson and King.

Trimerella Dalli, Davidson & King..1874. Quart. Journ. Geol. Soc. Lond., vol. XXX., p. 154, pl. 15, figs. 1-3.
" " Nicholson.....1875. Rep. Pal. Prov. Ont., p. 68.

Hespeler, T. C. Weston, 1867: several casts of the interior of the shell. Elora and Hespeler, Professor H. A. Nicholson.

Monomerella prisca, Billings.

Monomerella prisca, Billings.....1871. Can. Nat., vol. VI., ser. 2, p. 221.
" " Davidson & King..1874. Quart. Journ. Geol. Soc. Lond., vol. XXX., p. 156, pl. 17, figs. 5-8.
" " Nicholson.....1875. Rep. Pal. Prov. Ont., p. 68, fig. 38.
" " Hall.....1892. Pal. N. York, vol. VIII., pt. 1, p. 41, pl. 4C, figs. 6-13.

The types of this species and all the specimens of it referred to by Messrs. Davidson and King in their paper on the Trimerellidæ were collected at Hespeler by Mr. Weston in the spring of 1871. Professor Nicholson (op. cit.) records it as occurring also at Elora. All the specimens of *M. prisca* and *M. orbicularis* that have yet been obtained are mere casts, in dolomite, of the interior of the shell.

Monomerella orbicularis, Billings.

Monomerella orbicularis, Billings.....1871. Can. Nat., vol. VI., ser. 2, p. 221.
" " Davidson & King..1874. Quart. Journ. Geol. Soc. Lond., vol. XXX., p. 158, pl. 17, fig. 10.

Elora, T. C. Weston, 1867; five casts of the interior of the shell: Durham, J. Townsend; a similar specimen.

Monomerella ovata, Whiteaves.

Monomerella ovata, Whiteaves.1884. This vol. pt. 1, p. 5, pls. 2, figs. 1, and 8, figs. 1, 1, *a-c*.
" " Hall.....1892. Pal. N. York, vol. VIII., pt. 1, pl. 4D, figs. 13-15.

Durham, J. Townsend, 1875-82: one perfect specimen, with the valves slightly displaced, and four separate pedicle valves.

Monomerella ovata, var. lata.

Monomerella ovata, var. *lata*, Whiteaves.1884. This vol., pt. 1, p. 6, pls. 2, figs. 2 and 2*a*, and 8, figs. 2 and 2*a*.
" " " " Hall.....1892. Pal. N. York, vol. VIII., pt. 1, pls. 4C, figs. 17-18, and 4D, figs. 11 and 12.

Durham, J. Townsend, 1874-82: two pedicle valves with the test preserved, and a well preserved cast of the interior of the same valve. Specimens which Professors Hall and Clarke believe to belong to this variety have since been found in the Niagara limestone at Hawthorne, Illinois.

Monomerella Durhamensis. (N. Sp.)

Plate 9, fig. 1, and pl. 15, fig. 1.

Shell strongly convex, especially in the umbonal region, elongate subovate in marginal outline, much longer than broad, broadest in advance of the midlength, and narrow and pointed posteriorly: beaks of both valves extremely large and elevated, apparently equal or nearly equal in size, each with a correspondingly high cardinal area or pedicle surface.

Pedicle valve. Cardinal area obliquely flattened, slightly divergent from that of the brachial-valve, subdivided longitudinally into a central and four lateral portions, corresponding to the "deltidium," "deltidial ridges," and "areal borders," of authors, by four slightly divergent linear grooves. "Deltidium" fully twice as high as broad, flat, its surface marked by crowded and nearly transverse raised lines, which curve slightly forward and are crossed and made somewhat tuberculate by a few small and feebly developed longitudinal ridges. "Deltidial ridges" rather broad, nearly half as broad as the deltidium, slightly convex and transversely striated. "Areal borders" narrow. Characters of the interior of this valve unknown.

Brachial valve. Umbonal region enormously thickened, the test of the beak being almost solid, though composed of numerous thin laminæ. Cardinal area flat, not subdivided longitudinally by four grooves, as that of the pedicle valve is, but striated across, and bounded externally on each side by a low narrow ridge with rounded summit, like the "areal border" of a *Trimerella*. "Cardinal facet" apparently rather narrow, though its limits posteriorly are not clearly defined, curved a little forward in the centre and slightly backward on each side. Immediately in front of the cardinal facet, and on each side of its forward curve, there is a shallowly subcrescentic excavation or depression of the hinge plate. Crown of the crescent apparently narrow, its sides and ends not clearly defined. Interior of the valve deeply concave posteriorly, simple and devoid of umbonal chambers. Platform sharply V-shaped; platform vaults apparently shallow; anterior septum short, extending from the apex of the platform to a short distance from the front margin of the valve.

Surface of the exterior of both valves apparently smooth.

The only specimen known to the writer is not sufficiently perfect to admit of exact measurements, but, when unbroken, it was probably about three inches and a half in length, and an inch less in its greatest breadth.

Edge Mills, near Durham, J. Townsend, 1884 : a single specimen with a considerable portion of the test preserved, though the apices of the beaks of both of the valves are broken off. The specimen consists of two pieces, which fit together exactly. One of these pieces, the original of figure 1 on Plate 9, shows the test, though badly exfoliated, of the pedicle valve, the well preserved hinge area of that valve, and an imperfect cast of the interior of the brachial valve. The other piece shows both sides of the test of the umbonal region and part of the beak of the brachial valve, the other portion of that valve, as represented by figure 1 on Plate 15, being drawn from a gutta percha impression of the corresponding cast of the interior of the shell. The test in the umbonal region of the brachial valve is fully half an inch in thickness.

This remarkable shell is referred to the genus *Monomerella*, mainly on the authority of Professor J. M. Clarke, who has carefully examined the specimen described. The species differs from the typical forms of the genus, in the enormous development of the beak and pedicle surface of the brachial valve, and in the apparent presence of shallow platform vaults in that valve, but it could very well be congeneric with such shells as *M. Egani* and *M. Kingii*.

MONOMERELLA. Species uncertain.

Rhynobolus Galtensis, Whiteaves. (Pars.)..1884. This volume, pt. 1, pl. 8, fig. 3*a*, but not fig. 3.

Monomerella, Sp. ? Hall & Clark.....1892. Pal. N. York, vol. VIII., p. 45, pl. 40, figs. 3 and 4.

The specimen from Hespeler represented on Plate 7, figure 3a, of the first part of this volume, as the pedicle valve of *Rhynobolus Galtensis*, was thus identified to a certain extent on the authority of the late Dr. Thomas Davidson, by whom it had been examined and studied. Except in the much greater proportionate breadth of the hinge plate, it is remarkably similar, in shape, size and surface markings, to the brachial valve of that species, but its interior is completely filled with the matrix. More recently, however, Professors Hall and Clark have expressed the opinion that this specimen is probably the brachial valve of a species of Monomerella, and in this opinion the writer is inclined to concur. They state, with much apparent justice, that this specimen does not agree with the pedicle valve of the shell now known as *Rhinobolus Galtensis*, as figured by Davidson and King, but that "it is, on the contrary, of about the same outline as the brachial valve" of that species, with a low incurved umbo and a very broad margin of contact, much like that seen in the species *Monomerella ovata* and *M. Greenii*." The brachial valve of *M. ovata*, however, is much larger, more strongly convex, and its beak much more incurved than

that of the species now under consideration : while the hinge plate of the corresponding valve of *M. Greenii* is much narrower in proportion to its size.

Rhinobolus Galtensis, Billings. (Sp.)

Plate 15, fig. 2.

Obolus Galtensis, Billings.....1862. Geol. Surv. Canada, Pal. Foss., vol. I, p. 168, fig. 152.

Trimerella minor, Dall.....1871. Am. Journ. Conch., vol. VII., p. 83.

Rhynobolus——? (Compare *Obolus Galtensis*, Billings) Hall.....1871. Twenty third Rep. Reg. N.Y. St. Cab. Nat. Hist., p. 247, pl. 13, fig. 10, and expl. of that plate.

Obolellina Galtensis, Billings.....1871. Can. Nat. and Geol., vol. VI., N. S., p. 222.

" " .....1872. Ib., pp. 327-329.

Trimerella ? Galtensis, Davidson & King..1874. Quart. Journ. Geol. Soc. Lond., vol. XXX., p. 151, pls. 18, fig. 13, and 19, figs. 4 and 4 *a*.

Rhynobolus Galtensis, Whiteaves.....1884. This vol., pt. 1, p. 7, pl. 8, fig. 3, and perhaps pl. 2, fig. 1 *a*, but not pl. 8, fig. 3 *a*.

Rhinobolus Galtensis, Hall & Clarke.....1892. Pal. N. York, Vol. VIII., pl. 4B, and explanation of that plate.

The original description of *Obolus Galtensis*, Billings, is as follows : "Ovate, both valves moderately convex ; sides gently, and front margin broadly rounded ; apical extremity of ventral valve 70° ; greatest width a little below the middle. The area of the ventral valve is flat, with a concave groove along the middle ; and while in one specimen it lies nearly in the plane of the margin, in another it slopes a little outwards. The largest specimen seen is 25 lines in length and 18 in width. *Locality and Formation.*—Galt. In the Guelph formation ; Middle Silurian. *Collectors :* E. Billings, R. Bell." In a paper "On the Genus Obolellina," published in the Canadian Naturalist and Geologist for April, 1872, Mr. Billings adds the following particulars : "The beak of the ventral valve is very large, its length being one-half that of the body of the shell. It is slightly incurved. The area has three furrows, the peduncular and the two lateral grooves. The muscular impressions are rhomboidal rather than ovate, and confined to the central portion of the shell. There are no cavities under the area."

While writing the paper last mentioned Mr. Billings states that "fifteen casts of the interior of *O. Galtensis*" were lying before him, but the specimens in the Museum of the Survey upon which the foregoing descriptions of that species would seem to have been most largely based,

are five in number. Two of these are natural casts of the interior of the brachial valve, both from New Hope, now called Hespeler: the one evidently that referred to as the "largest specimen seen," and the other, (a gutta-percha impression of which is represented on Plate 15,) the original of figure 152, printed inadvertently upside down, on page 168 of the first volume of the "Palæozoic Fossils." One is a cast of the interior of both valves of a small specimen from Galt. This is the original of figures 4 and 4*a* of Plate XIX. of Davidson & King's paper on the Trimerellidæ, in the thirtieth volume of the Quarterly Journal of the Geological Society of London. The remaining two are casts of the interior of the pedicle valve, with the inner surface of the beak and area also fairly well preserved, both from Galt. The smaller of these two is the type of *Trimerella minor*, Dall, and both are almost certainly the specimens upon which Billings, Davidson and King based their descriptions of the beak and area of the ventral or pedicle valve of the species now under consideration.

The genus *Rhinobolus* was based upon a gutta-percha impression of a natural cast of the interior of a ventral or pedicle valve collected by Hall at Galt in 1848. Billings, Davidson and King seem to have been fully satisfied that the type of *Rhinobolus* is a ventral or pedicle valve of *O. Galtensis*, Billings, although Hall and Clarke appear to have entertained some doubts on this point, possibly because they had not seen any authentic examples of the pedicle valve of that species, which was not figured by Billings. However that may be, it seems to the writer that the characters of the two pedicle valves from Galt, upon which Billings evidently based his description of that valve of *O. Galtensis*, are essentially similar to those of the type of *Rhinobolus* as described and figured by Hall.

R. Galtensis was collected at Galt by A. Murray in 1847; at Galt, Guelph and New Hope (now Hespeler) by E. Billings in 1857; at Galt and Guelph by Dr. R. Bell in 1861; at Hespeler by T. C. Weston in 1867 and 1871; and at Durham by J. Townsend in 1880-83. Most of the specimens collected are natural casts of one or both valves, but a few (six) brachial valves with the test preserved were obtained at Durham by Mr. Townsend. On Plate IV. B (fig. 8) of the eighth volume of the Palæontology of the State of New York, Hall figures "the interior of a small brachial valve" of *R. Galtensis*, from Elora. The specimen from Durham, figured on Plate 2, fig. 1*a*, of the first part of this volume, as the pedicle valve of *R. Galtensis*, has the cardinal area completely covered with the matrix and the interior filled with dolomite, so that its identification with that species is by no means certain.

Rhinobolus.

(Species uncertain, but perhaps a var. of *R. Galtensis.*)

Plate 9, figs. 2 and 2 a.

Pedicle valve. Exterior compressed convex, subovate in marginal outline, about one-third longer than broad, broadest a little in advance of the midlength and rather abruptly pointed behind, its surface marked with concentric lines of growth at irregular but somewhat distant intervals. Interior shallowly concave, the concave portion a little longer than broad. Beak elevated, solid, erect: cardinal area or pedicle surface a little broader than high, occupying about one-fourth of the length of the valve, its interior margin convex and slightly produced in the centre and concave on each side. "Deltidium" gently convex, moderately prominent, much higher than broad and striated across: "deltidial ridges" broad, not so much raised as the "deltidium" and almost flat: "areal borders" consisting of a pair of widely divergent narrow and acute angular ridges, which are separated from each of the deltidial ridges by a linear groove. "Umbo-lateral scars" represented by a pair of distant, small and indistinctly defined shallow pits. Crescent much like that of *Trimerella*, but with its sides more nearly marginal. Platform apparently essentially similar to that of *R. Galtensis*, but placed a little farther forward.

Brachial valve. Unknown.

Length, forty-eight millimetres; greatest breadth, thirty-two mm.; maximum thickness of test, eight mm.

Irvine Rocks, Elora, at the "cave" near Modeland's foundry, J. Townsend, 1885: a nearly perfect and well preserved specimen of the pedicle valve, with the test preserved and showing the whole of the characters of both the inside and outside of that valve, though the front margin of the platform is slightly broken.

This shell has a much shorter cardinal area or pedicle surface than that of the pedicle valve of *R. Galtensis*, but it may possibly represent only an extreme variety of that species.

Orthis.

A few casts of the interior of single valves of apparently two species of *Orthis* have been collected at Durham, but they are all much too imperfect and too badly preserved for identification or description.

Strophomena.

Elora, T. C. Weston, 1867: a coarse cast of the interior of the convex valve of a species of this genus, which is also much too imperfect to be identified.

Spirifera plicatella, L.

Anomia plicatella, Linnæus....1767. Systema Naturæ, 12th ed., p. 1154.
plicatella, Davidson..1866. Brit. Silur. Brach., p. 84 (which see for a complete list of synonyms of British and European specimens up to that date) pl. 9, figs. 9-12.

Durham, J. Townsend, 1874-82: one small specimen with both valves preserved, two separate dorsal and two separate ventral valves. Elora, J. Townsend, 1892: one small specimen with both valves preserved. All the specimens that the writer has seen, so far, are either casts of the interior of the shell or else have the outer layer of the test exfoliated and hence do not show the fine radiating raised lines characteristic of the species. The two dorsal valves from Durham have the mesial fold partly divided by a faint longitudinal grove, and there are three low, rounded plications on each side of the fold. The characters of the two ventral valves from Durham are so similar to those of the *Spirifer bicostatus*, the *Orthis bicostatus* of Vanuxem, as described and figured by Professor Hall, that it is just possible that these two valves should be referred to that species rather than to *S. plicatella*. *S. plicatella* and its var. *radiata* had previously been recorded (in the Geolcgy of Canada, 1863) as occurring in the Clinton formation at Flamborough West, near Dundas; in the Niagara limestone at Thorold, Flamborough West and Grimsby; in rocks of about the same age at Port Daniel, in the Baie des Chaleurs; and in division 4 of the Anticosti group at South-west Point and the Jumpers.

Spirifera crispa, Hisinger.

Terebratula crispa, Hisinger (not of Linnæus)..1826. Vet. Akad. Handlingar, pl. 7, fig. 4.
Spirifer crispus, Hall.....1852. Pal. N. York, vol. II., p. 262, pl. 54, figs. 3, *a-k*.
Spirifera crispa, Davidson.....1866. Brit. Silur. Brach., p. 97 (which see for a full list of synonyms, with references, of British and European specimens) 3, *a-k*. pl. 10, figs. 13-15.

Durham, J. Townsend, 1882: a single ventral valve.

According to Professor Hall (op. cit., p. 263), *S. crispa* occurs in the Niagara shales at Lockport, Lewiston and other localities in the state of New York, but Dr. Davidson says that he does "not feel certain" . ....." whether the American fossil really belongs to Hisinger's species." In the "Geology of Canada" (1863) *S. crispa* is recorded as having been found in the Niagara limestone at Thorold, Ontario, and (under the name "*S. crispata*," an obvious inadvertence or typographical error) in rocks of the same age, at Port Daniel.

Whitfieldella Hyale, Billings. (Sp.)

Charionella (?) Hyale, Billings..1866. Geol. Surv. Can., Pal. Foss., vol. I., p. 166, figs. 150, *a* and *b*.
Charionella Hyale, Nicholson....1875. Rep. Palæont. Prov. Ont., p. 67.
Whitfieldella Hyale, Hall.....1893. Pal. N. York, vol. VIII., pt. 2, pp. 60 and 79.

Galt, John (not James) Richardson, 1857, and R. Bell, 1861 ; Hespeler and Elora, T. C. Weston, 1867 ; Elora, Nicholson and Hall. Apparently abundant at each of these localities.

Atrypa reticularis, L.

Anomia reticularis, Linnæus.....1767. Syst. Nat., ed. xii., p. 1152.
Atrypa reticularis (L.) Hall.....1852. Pal. N. York, vol. II., p. 72 (which see for a list of synonyms, with references, of this ubiquitous species) pl. 23, figs. 8, *a-e*.
" " " Davidson. ..1866. Brit. Silur. Foss., pp. 129-30 (which see for a still fuller list of synonyms of British and European specimens of this shell) pl. 14, figs. 1 to 22.

Hespeler, T. C. Weston, 1867 : two specimens. This species is apparently rare in the Guelph formation.

Atrypa reticularis, var. aspera.

Terebratulites asper, Schlotheim.....1813. Leonard's Taschenbuch, p. 74, pl. 1, fig. 7.
Atrypa aspera, Dalman.....1827. Vet. Akad. Handl., pl. 4, fig. 3.
Atrypa reticularis, var. *aspera*, Davidson..1864. Brit. Dev. Brach., p. 57 (which see for a list of synonyms of this shell), pl. 10, figs. 5-8.

Hespeler, T. C. Weston, 1867 · one small but very characteristic ventral valve, which is marked by eight nodulose radiating ribs or plications.

Rhynchonella pisa, Hall & Whitfield.

Rhynchonella pisa, Hall & Whitfield..1875. Rep. Geol. Surv. Ohio, vol. II., pt. 2, p. 135, pl. 7, figs. 18-22.

Hespeler and Elora, T. C. Weston, 1867 : a single cast of the interior of the shell from each of these localities. These specimens agree very well with the description and figures of *R. pisa*, but they are too imperfect to be identified with much certainty.

Pentamerus oblongus, J. de C. Sowerby.

Pentamerus lævis, James Sowerby.....1813. Min. Con., vol. I., p. 76, pl. 28.
Pentamerus oblongus, J. de C. Sowerby....1839. Silur. Syst., pl. 19, fig. 10.
Pentamerus lævis, Sowerby.....1839. Ib., pl. 19, fig. 9.

Pentamerus oblongus, Hall.....1843. Geol. Rep. 4th Distr., N. York, p. 7, figs. 1-5.
" " " .....1852. Pal. N. Y., vol. II., p. 79, pl. 25, figs. 1, *a-m*, and pl. 26, figs. 1, *a-d*.
" " Billings.....1863. Geol. Canada, p. 316, fig. 326.
" " Davidson.....1867. Brit. Silur. Brach., p. 151 (which see for a list of synonyms of British and European specimens of this species) pl. 18, figs. 1-12 and pl. 19, figs. 1 and 2.
" " Nicholson.....1875. Rep. Pal. Prov. Ont., p. 61, figs. 31, *a-b*.
" " Hall & Whitfield....1875. Rep. Geol. Surv. Ohio, vol. II., pt. 2, p. 137, pl. 7, fig. 9.
" " Whitfield .....1882. In Geol. Wiscons., vol. IV., p. 288, pl. 17, figs. 4-9.

Durham, J. Townsend, 1878-82: four casts of the interior of the shell.

This well-known species, which is stated by Hall to be abundant in the Clinton group of the state of New York, appears to be comparatively rare in the Clinton and Guelph formations in Canada, but to be one of the commonest fossils of the Niagara formation throughout Ontario, and of the two upper divisions of the Anticosti group of the island of that name. It has long been known to be abundant in the outlier of Niagara limestone at Lake Temiscaming, and, more recently, it has been recorded by Dr. H. M. Ami,* as occurring at the Forks of the Scaumenac River, in the province of Quebec, where it was collected by Dr. R. W. Ells in 1883.

PENTAMERUS OBLONGUS, var. BISINUATUS.

Pentamerus bisinuatus, McChesney.....1861. New Pal. Foss., Extr. No. 2, p. 85.
" " " .....1865. Illustr. N. Sp. Foss., pl. 9, figs. 1, *a-b*.
" " Whitfield .....1882. Geol. Wiscons., vol. IV., p. 290, pl. 17, fig. 3.
Pentamerus oblongus, var. *bisinuatus*, Hall..1893. Pal. N.Y., vol. VIII., pt. 2, fasc. 2, pp. 238 and 239.

Durham, J. Townsend, 1882: a cast of the interior of the dorsal or brachial valve, showing the single septum said to be characteristic of that valve of *P. bisinuatus*. But, according to Hall (op. cit.), the septa of the brachial valve of *P. oblongus* "are usually very short and rest upon the inner surface of the shell. It sometimes happens that these septa unite before reaching the inner surface, and the spondylium thus formed is supported by a very low axial septum. This is the case in the original specimen of *P. bisinuatus*, McChesney, and in the Wisconsin shell referred to that variety by Whitfield."

*In Geological Survey of Canada, Report of Progress for 1882-83-84, p. 26 E.

Pentamerus occidentalis, Hall.

Plate 9, figs. 3 and 3 a.

Pentamerus occidentalis, Hall.....1852. Pal. N. York, vol. II., p. 341, pl. 79, figs. 1, *a-s*, and 2.
" " Billings...1863. Geol. Canada, p. 337, figs. 341, *a*, *b* and *c*.
" " Nicholson.1875. Rep. Pal. Prov. Ont., p. 67, fig. 35.

Galt, A. Murray, 1847, E. Billings, 1857, and T. C. Weston, 1867; Hespeler, T. C. Weston, 1867; Elora, Dr. R. Bell, 1861, and T. C. Weston, 1867; Durham, J. Townsend, 1878-82. Guelph, Professor H. A. Nicholson; who very justly states that it is "one of the most characteristic brachiopods of the Guelph formation." The unusually perfect specimen represented on Plate 9, was collected at Durham by Mr. Townsend. A specimen from Galt, kindly forwarded to the writer by Mr. B. E. Walker, of Toronto, shows that the surface of this species, when well preserved, is marked by low, rounded longitudinal ribs, which are very unequal in breadth, and crossed by numerous, close-set, minute lines of growth, and by rather distant faint transverse constrictions, indicative of periodic arrests of growth.

Pentamerus (Barrandella) ventricosus, Hall.

Pentamerus ventricosus, Hall.....1860. Geo. Surv. Wiscons., Rep. Progr., p. 2, and (1862) Geol. Rep. Wiscons. vol. I., p. 436.
" "
Pentamerus (Pentamerella) ventricosus, Hall.....1868. Twentieth Rep Reg. N.Y. St. Cab. Nat. Hist., p. 374, pl. 13, figs. 18-21.
Pentamerus ventricosus, Nicholson.....1875. Rep. Pal. Prov. Ont., p. 67.
Pentamerus (Pentamerella) ventricosus, Hall & Whitfield...1875. Rep. Geol. Surv. Ohio, vol. II., pt. 2, p. 138, pl. 7, figs. 7 and 8.
Pentamerus ventricosus, Whitfield.....1882. Geol. Wiscons., vol. IV., p. 291, pl. 17, figs. 11-13.
Pentamerus (Barrandella) ventricosus, Hall.....1893. Pal. N. York, vol. VIII., pt. 2, fasc. 2, pp. 242 and 243.

Hespeler and Elora, Professor H. A. Nicholson. The writer has never seen a specimen of this species from the Guelph formation of Ontario, nor indeed from rocks of any age in Canada.

PELECYPODA.

Pterinea.

Two casts of the interior of single valves of a species of *Pterinea* were collected at Elora by Mr. Townsend in 1882 and 1892. One of these is the cast of a small right valve, not quite seven millimetres in length and with the posterior wing broken off, the other a nearly perfect cast of a left valve. It is scarcely practicable to identify such specimens specifically, but in many respects they agree fairly well with Hall's description and figures of *P. brisa*, which is regarded as a synonym of *P. striæcosta*, McChesney.

Amphicælia neglecta, McChesney. (Sp.)

Ambonychia neglecta, McChesney.....1861. Descr. New. Pal. Foss., Extr. No. 2, p. 88.
Pterinea (Amb.) neglecta, McChesney....1865. Expl. of pl. 9, fig. 2, Illust. New. Pal. Foss.
Amphicælia neglecta, McChesney.....1868. Trans. Ac. Sc. Chicago, vol. I., p. 41, pl. 9, fig. 2.
" " Meek & Worthen....1868. Geol. Ill., vol. III., p. 358, pl. 5, fig. 9.
Leptodomus neglectus, Whitfield.....1882. Geol. Wiscons., vol. IV., p. 292, pl. 18, figs. 3 and 4.

Elora, J. Townsend, 1892 : an imperfect cast of the interior of the right valve of a shell which is probably referable to this species.

Megalomus Canadensis, Hall.

Megalomus Canadensis, Hall .....1852. Pal. N. York, vol. I., p. 343, pls. 80, figs. 1, *a-c* ; 81, figs. 1, *a-f* ; and 82, figs. 1, *a-i*.
" " Billings...1863. Geol. Canada, p. 338, fig. 342.
" " Nicholson.1874. Rep. Pal. Prov. Ont., p. 68, figs. 39, *a-c*.

Galt, A. Murray, 1847, E. Billings, 1857, and T. C. Weston, 1867 ; Guelph, E. Billings, 1857, Dr. R. Bell, 1861, and T. C. Weston, 1867 ; Hespeler, T. C. Weston, 1867 ; Elora, Dr. R. Bell, 1861, T. C. Weston, 1867, and D. Boyle, 1873 ; Durham, J. Townsend, 1878-82 ; and Belwood, J. Townsend, 1889.

Casts of the interior of this remarkable shell are abundant in almost every exposure of the Guelph formation in the province, but specimens with the test preserved are rare. The species occasionally attains to a comparatively gigantic size. Thus, a cast of the interior of the closed valves found by Mr. Townsend at the junction of the Big and Rocky Saugeen rivers, in the township of Bentinck, is seven inches and two-tenths in length, six inches and three-tenths in height and four inches and nine-

tenths in breadth or thickness. A large left valve, from Durham, with the test preserved, is seven inches and seven-tenths in length and its maximum height is four inches and eight-tenths.

Megalomus compressus, Nicholson and Hinde.

Megalomus compressus, Nicholson and Hinde. 1875. Rep. Pal. Prov. Ont., pp. 68 and 69, figs. 40, *a-b*.
" " Whiteaves.....1884. This volume, pt. 1. pp. 10-12, figs. 1 and 2.

This shell is found, but much less frequently, at the same localities as the preceding species, of which it may be only a variety.

Goniophora crassa, Whiteaves.

Goniophora crassa, Whiteaves. 1884. This volume, pt. 1, p. 9, pl. 9, figs. 3, 3, *a-c*.

Hespeler, T. C. Weston, 1867 · an imperfect cast of the interior of both valves and a similar but nearly perfect cast of a right valve. Durham, J. Townsend, 1874-82 : several specimens, most of which are single valves, with the test preserved.

Conocardium.

Numerous specimens of a small and probably undescribed species of this genus were collected at Durham by Mr. Townsend in 1874-82, but none of them are sufficiently perfect or well preserved to be described with any reasonable degree of accuracy. They are either mere casts of the interior of the closed valves, or fragments of moulds of the exterior of the shell.

Anodontopsis concinna, Whiteaves.

Anodontopsis concinna, Whiteaves. 1884. This volume, pt. 1, p. 12, pl. 2, fig. 4, and pl. 7, figs. 4 and 4 *a*.

Galt, T. C. Weston, 1867 : a cast of the interior of a right valve : Durham, J. Townsend ; a similar cast of both valves.

Ilionia Canadensis, Billings.

Ilionia Canadensis, Billings.....1875. Can. Nat. and Geol., N. Ser., vol. VIII., p. 301.
" " Whiteaves..1884. This volume, pt. 1, p. 13, fig. 3.

Hespeler, T. C. Weston, 1867 ; five badly preserved casts of the interior of as many closed valves : Elora, D. Boyle ; a similar specimen.

Ilionia Galtensis, Whiteaves.

Plate 15, fig. 3.

Ilionia Galtensis, Whiteaves....1884. This volume, pt. 1, p. 15, pl. 3, figs. 1, 1, *a-b*.
" " S. A. Miller...1889. N. Am. Geol. and Palæont., p. 483, fig. 833.

This species was based upon two very imperfect specimens, the one collected at Galt by Dr. R. Bell, in 1861, and the other at Durham by Mr. Townsend between the years 1878 and 1882. Neither of these specimens gives a correct idea of the marginal outline of the valves or of the nature of the surface ornamentation. Since the first part of this volume was written, Mr. Townsend has obtained five additional and more perfect examples of *I. Galtensis* at Durham, and, quite recently (in 1894), the unusually perfect and well preserved left valve from Elora figured on Plate 15. This specimen, which is drawn from a gutta-percha impression of a natural mould of the exterior of that valve, shows that, when perfect, the valves are nearly as high as long and that the ventral margin is narrowly rounded and somewhat produced at or a little in advance of the mid-length. The beaks are small and subcentral, and the surface markings are seen to consist of very numerous and closely disposed fine concentric striæ, with a few coarser ones at irregular but more distant intervals.

The systematic position of *Ilionia* is quite problematical, as the muscular impressions are not at all well preserved in any of the specimens collected, and its hinge dentition is still unknown. Zittel, in the first part of the second volume of his Handbuch der Palæontologie, published in 1881, places it between the Pholadomyidæ and the Anatinidæ, in a group characterized as "palæozoic genera with a simple pallial line, and of doubtful systematic position." Tryon, in the third volume of his "Structural and Systematic Conchology," published in 1884, places it in the Anatinidæ, and Fischer, in the last "fascicule" of his Manuel de Conchyliologie, published in 1887, includes it in the Lyonsiidæ. On the other hand, the external form of the Elora specimen of *I. Galtensis* figured on Plate 15, is so similar to that of some of the lower Palæozoic species of *Lucina* (inclusive of *Paracyclas*) that it is difficult to see how *Ilionia* is to be distinguished from *Lucina*, and in this connection it is to be observed that the *Tellina prisca* of Hisinger, which E. Billings states is a typical *Ilionia*, is regarded by Bronn and Ferdinand Rœmer* as a *Lucina*.

Ilionia (?) costulata, Whiteaves.

Ilionia (?) costulata, Whiteaves. 1884. This volume, pt. 1, p. 15, pl. 2, fig. 5.

Elora, T. C. Weston, 1867; two specimens: and Durham, J. Townsend, 1879-1883; one specimen. No additional examples of this species have been obtained, since it was first described in 1884.

*In the explanation of Plate 14, figs. 2, *a-b*, of the first vol. of the Lethæa Geognostica.

GASTEROPODA.

SCENELLA CONICA, Whiteaves.

Scenella conica, Whiteaves. 1884. This volume, pt. 1, p. 32, pl. 5, figs. 2 & 2*a*.
" " S. A. Miller. 1889. N. Am. Geol. and Palæont, p. 392, fig. 648.

Of this species there are about a dozen specimens in the Museum of the Survey, which were collected at Durham by Mr. Townsend between the years 1879 and 1884. Each of these is a nearly perfect cast of the interior of the shell, upon which not a vestige of the muscular impressions can be detected.

The genus *Scenella*, which was constituted by E. Billings in 1872, is not mentioned in Dr. Paul Fischer's manual of recent and fossil shells, by Zittel in his Handbuch der Palæontologie, nor by Nicholson in the latest or any other edition of his Manual of Palæontology. Tryon, in his "Structural and Systematic Conchology," and S. A. Miller (op. cit.) place it in the class Pteropoda, but its conical, limpet-like shell suggests that it may rather be referable to the Patellidæ or Capulidæ. It seems to the writer that *Scenella*, *Palæacmea* (Hall, 1873), and *Hercynella* (Kayser, 1878) are very closely related, if not actually synonymous.

CAPULUS CANADENSIS, Whiteaves.

Plate 11, fig. 1.

Tryblidium Canadense, Whiteaves. 1884. This volume, pt. 1, p. 31, pl. 5, figs. 1 & 1 *a*.

The only known specimen of this species is a cast of the interior of the shell, from Hespeler, which does not show the muscular impressions at all clearly. Still, upon this cast there is an obscure, narrowly elliptical depression on each side of, and at a short distance below, the nearly terminal apex. These depressions seem to be united into one continuous subhemispherical scar, under and immediately behind the presumably posterior apex. This supposed muscular scar is not quite correctly represented in the two figures of *Tryblidium Canadense* on Plate 5, of the first part of this volume, and a new figure of the type specimen is given on Plate 11. If the appearances just described are correctly interpreted, they would seem to indicate that the fossil now under consideration is referable to the Capulidæ of Cuvier rather than to the Patellidæ, though one would expect to find the muscular impressions upon the cast represented by slight elevations rather than depressions. Until more perfect specimens are obtained, therefore, it is thought desirable to refer the present species to *Capulus*, in the sense in which De Koninck uses that generic name, rather than to *Tryblidium*.

BELLEROPHON. Species undeterminable.

Bucania stigmosa (?) Whiteaves..1884. This volume, pt. 1, p. 34, pls. 5, figs. 3 and 3*a*, and 8, fig. 4; but perhaps not *B. stigmosa*, Hall (1852).

The two specimens from Galt that are doubtfully referred to *Bucania stigmosa* on page 34, and figured on Plates 5 and 8 of the first part of this volume are mere casts of the interior of the shell, that are too imperfect to be identified specifically.

TREMATONOTUS ANGUSTATUS, Hall. (Sp.)

Bucania angustata, Hall.....1852. Pal. N. York, Vol. II., p. 349, pl. 84, figs. 7, *a-d*.
Bucania Chicagoensis, McChesney.1860. Decr. N. Sp. Foss. Pal. Rocks W. S., p. 49.
Bellerophon angustata, Billings....1863. Geol. Canada, p. 344, figs. 352, *a-b*.
Tremanotus Alpheus, Hall.....1865. (Jan.) Extr. in adv. of Twentieth Rep. Reg. N. Y. St. Cab. Nat. Hist., p. 347. (teste Hall & Whitfield.)
Bucania Chicagoensis, McChesney 1865. (April.) Plates illustr. N. Sp. Foss. Pal. Rocks W. S., pl. 8, figs. 4, *a-b*.
Tremanotus Alpheus, Hall.....1867. Twentieth Rep. Reg. N. Y. St. Cab. Nat. Hist., pl. 15, figs. 23 and 24.
" " Meek.....1875. Rep. Geol. Surv. Ohio, Vol. II., pt. 2, p. 145, pl. 8, fig. 1.
" " Whiteaves...1884. This volume, pt. 1, p. 34.

Galt, A. Murray, 1847, and E. Billings, 1857; Guelph, E. Billings, 1857; Hespeler, T. C. Weston, 1867 and 1871; Elora, D. Boyle, 1880; and Durham, J. Townsend, 1878-82.

All the specimens from these localities, in the Museum of the Survey, are casts of the interior of the shell. Those of adult shells almost invariably show traces of the "interrupted oblong nodes" on the centre of the periphery, that are said to be characteristic of *T. Alpheus*, and most of them are marked with spiral grooves on the outer volution. These "oblong nodes" on the periphery are said to be absent in *B. angustata*, but the type of that species is stated to be a "rough cast in limestone," which is doubtless too imperfectly preserved to show them. In the writer's judgment, *B. angustata* and *T. Alpheus* are names expressive merely of different states of preservation of the same species.

It is not improbable that *T. angustatus* itself may prove to be identical with the *Bellerophon dilatatus* of Sowerby, which is now known to belong to the genus *Trematonotus*. However this may be, in the Museum of the Survey there is a fine specimen of *T. dilatatus*, identified as such by the late Mr. E. Billings, and showing the widely expanded outer lip of

the adult shell, collected by Dr. R. Bell in 1862 from rocks of about the age of the Niagara limestone, at L'Anse à la Vieille in the Baie des Chaleurs ; and another but less perfect specimen, also identified, though with some doubt, by Mr. Billings as this species, collected by the late Mr. James Richardson in 1856 from "Division 2" of the Anticosti Group, at Cape Sand Bay, Anticosti.

Pleurotomaria.

The Pleurotomariæ that have so far been collected from the dolomites of the Guelph formation in Ontario are so imperfectly preserved that it is not yet practicable to group them according to their natural relations Many of the species are still known only from casts of the interior of the shell, and even in those rare specimens which are partly or wholly testiferous, the minute structures of the slit band are not preserved. Under these circumstances the only course that seems to be feasible is first to group together those species that are now known to have an alate or spinose periphery, and afterwards to consider those apparently devoid of either, in accordance with the dates at which they were described, commencing at the earliest.

A. Periphery alate.

Pleurotomaria Valeria, Billings.

Plate 4, figs. 1 and 1a, and pl. 11, figs. 2 and 3.

Pleurotomaria Valeria, Billings...1865. Geol. Surv. Canada, Pal. Foss., Vol. I., p. 169.

" " Whiteaves.1884. This volume, pt. 1, p. 23, pl. 4, figs. 1, and 1 *a*.

Probably = *Pleurotomaria alata*, Wahlenberg.

Cfr. *Pleurotomaria alata* (Wahl.) as figured by Lindström in 1884 on pl. 10, figs. 18-32 of his Silurian Gasteropoda and Pteropoda of Gotland.

The type of *P. Valeria*, which was figured for the first time in the present volume, is an imperfect cast of the interior of the shell, collected by Mr. E. Billings at Galt in 1857. Between the years 1879 and 1882 a few specimens of this species, with the test partially and imperfectly preserved, were obtained at Durham by Mr. Townsend, and one of these is figured on Plate 4, fig 1 *a*. Two specimens from this locality are natural moulds of the exterior of the apical side of the shell, and gutta-percha impressions of these moulds, such as that represented on Piate 11, fig. 2, show that the comparatively slender tubular portion of the outer volution is encircled externally by a thin and slightly curved alate expansion, that is broader than the tube itself, and shallowly concave. The corresponding alation of the later volutions of the spire is not even indicated in either

of these casts, so that they do not give a very good idea of the original contour of the spire, and the only surface markings that they show, are numerous flexuous growth lines upon the outer volution.

The umbilical side of a shell of this species is well seen in the gutta-percha impression of a natural mould of the exterior of a specimen collected by Mr. Townsend and the writer at Belwood in 1893, and represented by fig. 3 on Plate 11. In this specimen the peripheral alation of the outer volution is remarkably perfect, the outer lip is clearly defined and the incremental striæ are beautifully preserved. These latter are curved concavely backward on the tubular part of the outer volution, and obliquely as well as convexly outward and forward on the peripheral alation.

From the additional information afforded by these specimens it would seem that *P. Valeria* is most probably synonymous with *P. alata*. Still, as the few specimens of *P. Valeria* that have been collected so far, are neither sufficiently perfect nor well preserved to admit of a satisfactory comparison with the published descriptions and figures of *P. alata*, it is thought better to provisionally retain the name already given to the former.

Pleurotomaria velaris. (N. Sp.)

Plate 11, figs. 4 and 4 a.

Shell conical, more than twice as broad as high: its base widely and deeply umbilicated. Volutions perhaps as many as six or seven when perfect, though only the last four are preserved in the single specimen collected, those of the spire obliquely compressed, the alation of each of its three later volutions partially overlapping and appressed to the volution that immediately succeeds it. Outer volution expanded laterally and rather strongly convex next to the alate periphery above: the alation broad and curving concavely outward and downward, as viewed from the apical side: base of the tubular portion gently convex around the umbilicus: aperture transversely subelliptical, a little broader than high.

Surface of the apical side marked by low, rounded, flexuous, transverse plications and striæ of growth, also by numerous small revolving raised lines or minute spiral ridges, that are more distinct upon the peripheral alation of the last volution than upon its tubular portion. Crescents of the slit band unknown. Base marked only by flexuous incremental striæ, that curve concavely and obliquely forward upon the tubular portion of the outer volution, and convexly outward and forward on its alate expansion.

The specimen described is not sufficiently perfect to admit of an accurate statement of its proportionate dimensions, but both the figures are of the natural size.

Irvine rocks, Elora, J. Townsend, 1885 : one specimen with the test preserved. The apex is imperfect, but the three latest volutions of the spire, and most or the outer volution, with the characteristic alation of each, are well preserved.

The shell for which the foregoing name is suggested, may prove to be a variety of *P. Valeria* or of *P. alata*, but the surface markings of its apical side seem to be very different to the corresponding markings of either of those species.

Pleurotomaria Halei, Hall. Var.

Plate 10, figs. 2 and 2 a.

Pleurotomaria Halei, Hall...1861. Rep. Sup. Geol. Surv. Wiscons., p. 34.
" " ...1865. Extr. in adv. of Eighteenth Rep. on the N. Y. St. Cab. Nat. Hist., p. 344.
" " ...1867. Twentieth Rep. Reg. N. Y. St. Cab. Nat. Hist., pl. 15, figs. 13 & 14.
Cfr. *Pleurotomaria limata*, Lindström. 1884. Silur. Gastr. and Pterop. Gotland, p. 114, pl. 10, figs. 2-17.

Shell conical or turbinate conical, much broader than high, and deeply though not very widely umbilicated. Volutions probably four or five when perfect, though only the three later ones are preserved in the specimens collected, those of the spire ventricose or expanded, the penultimate volution distinctly angulated anteriorly, in some specimens, such as the one figured, a little below the middle, and in others at or near the base and next to the suture below. Outer volution widely expanded, a little higher than the spire, obliquely convex near the suture and faintly concave next to the alate periphery above ; encircled about the midheight with a prominent, but apparently non-spinose, alate keel four millimetres and a half in altitude, which incloses the slit band ; rather strongly convex beneath, but depressed and deeply umbilicated in the centre, the umbilicus occupying about one-third of the diameter of the base, though its margin is rounded and indefinite.

The surface markings of the umbilical side are well preserved in most of the specimens collected, and consist of crowded, flexuous, striæ of growth, which curve obliquely and concavely backward from the peripheral alation to the umbilicus, and are crossed by spiral incised lines. The crescents of the slit band are crowded, but they are not sufficiently well preserved to show the details of the irstructure. The surface ornamentation of the apical side is not nearly so well exhibited, but it appears to consist of numerous and closely disposed lines of growth, which are crossed by one or more spiral ridges.

Durham, J. Townsend, 1882-89 : nine specimens. As seen from above, these specimens bear a certain general resemblance to *P. Elora*, Billings,

but in the former the alation of the outer volution is central and apparently non-spinose, and the base rather strongly convex exteriorly. In *P. Elora* the alation of the outer volution is basal and distinctly spinose, and the base flattened around the umbilicus.

B. Periphery of the outer volution distinctly spinose.

PLEUROTOMARIA ELORA, Billings.

Plate 11, figs. 5 and 6.

Pleurotomaria Elora, Billings. 1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 154, fig. 135.
" " " 1863. Geol. Canada, p. 343, fig. 348.

This species was described from a very imperfect cast of the interior of the shell collected by Dr. R. Bell at Elora in 1861. A few additional and much more perfect specimens, some of which have most of the test preserved, have recently been obtained by Mr. Townsend at Durham, Elora and at Aboyne, one mile east of Elora. The testiferous specimens, two of which are figured, show that the angulated periphery of the outer volution, when perfect, is armed with a single row of long and slightly curved, slender and hollow spines, not unlike externally to those of *Guildfordia* or some recent species of *Astralium*. In two remarkable specimens collected by Mr. Townsend at Aboyne in 1892, and presented by him to the Museum of the Survey, these spines, as shown by figure 6 on Plate 11, are more than three-quarters of an inch in length. In another specimen, the original of fig. 5 on the same plate, the spines appear to commence on the outer half of the last volution of the spire, where they form a spiral row of small tubercles immediately above that part of the suture which separates the spire from the outer volution, near the aperture, in consequence of their being almost completely overlapped by the upper portion of the outer volution. The surface of the apical side of the shell is marked by the usual flexuous striæ of growth and that of the spire by a few spiral raised lines, but the markings of the umbilical side are still unknown.

C. Periphery (as far as known) neither alate nor spinose.

PLEUROTOMARIA BISPIRALIS, Hall.

Pleurotomaria bispiralis, Hall. 1852. Pal. N. York. vol. I., p. 349, pl. 84, figs. 2, *a-b*.

Galt, Professor James Hall, 1848 : a single mould of the exterior of the shell. An imperfect and very badly preserved cast of the interior of a shell collected at Hespeler by Mr. Weston in 1867 has since been identified with this species by E. Billings. *P. bispiralis* appears to be very rare, as these two specimens are, so far as the writer is aware, the only ones known. It is recognizable by its narrow turbinate-conical form, by its imperforate or nearly imperforate base and by its elevated spire, encircled with two spiral ridges.

Pleurotomaria perlata, Hall.

Pleurotomaria perlata, Hall. 1852. Pal. N. York, vol. I, p. 349, pl. 34, figs. 5, *a*, *b*, *c*.
Pleurotomaria solaroides, Billings (probably by inadvertence). 1863. Geol. Canada, p. 341, fig. 347.

Galt, A. Murray, 1847, and Professor James Hall, 1848; Galt and Hespeler, E. Billings, 1857; Elora, T. C. Weston, 1867; Belwood, J. Townsend and J. F. Whiteaves, 1893. A fine large species of which only casts of the interior of the shell have yet been found. It is, however, distinguishable at a glance from all the other Pleurotomariæ of the Guelph formation, by its compressed lenticular form, acutely angulated periphery and deep but rather narrow umbilicus.

Pleurotomaria Galtensis, Billings.

Plate 11, fig. 7.

Pleurotomaria Galtensis, Billings. 1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 154, fig. 136.
" " " 1863. Geol. Canada, p. 334, fig. 349.

The types of this species are two imperfect casts of the interior of the shell, collected at Galt by Dr. R. Bell in 1861. The apices of both of these specimens are broken off, and only the three outer volutions are preserved in the more perfect of the two. In September, 1893, Mr. Townsend and the writer obtained at Belwood two casts of the interior of a shell which is evidently referable to *P. Galtensis*, with corresponding moulds of the exterior of each, from which the intermediate test has long ago disappeared. The figure on Plate 11 is a representation of a gutta-percha impression of one of these natural moulds. It shows that the volutions of the spire are angulated and subcarinate at or near their base, that the outer portion of the last volution is angulated a little above the mid-height and encircled by a spiral ridge which is concave on the apical side and convex on the umbilical, also that the very convex umbilical side is imperforate when the test is preserved. On each side of the spiral angulation the whole surface of the shell appears to have been smooth.

Pleurotomaria Deiopeia, Billings.

Plate 12, fig. 1.

Pleurotomaria Deiopeia, Billings. 1862. Geol. Surv. Canada, Pal. Foss., vol. I, p. 155.

This insufficiently defined species, which is now figured for the first time, was based upon a very imperfect cast of the interior of the shell,

with a small piece of the test preserved, collected by Dr. R. Bell at Elora in 1861. No other specimen of it has been seen by the writer. In addition to the original description it may be added that the umbilicus of the type of *P. Deiopeia* is so narrow that it is most probable that the base of the shell is imperforate when the test is preserved.

Pleurotomaria Hercyna, Billings. (Sp.)

Murchisonia Hercyna, Billings. 1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 158, fig. 141.

Galt, E. Billings, 1857 : two casts of the interior of the shell, one of which has a portion of the test preserved. Elora, T. C. Weston, 1867 : two similarly preserved specimens. According to Professor Lindstr m,* the *Murchisonia Hercyna* of Billings comes near to *Pleurotomaria elliptica*, Hisinger, and may possibly be only a variety of that species, though the Canadian shell is more elongated, and its apical angle is more acute. The characters of *M. Hercyna*, on the whole, seem certainly to accord better with those of *Pleurotomaria* than with those of *Murchisonia*.

"Pleurotomaria? Viola," Billings.

Plate 12, fig. 2.

Pleurotomaria? Viola, Billings. 1865. Geol. Surv. Canada, Pal. Foss., vol. I, p. 169.

Galt, E. Billings, 1857 : a badly preserved cast of the interior of the shell, with nearly the whole of the spire buried in a compact crystalline dolomite, and showing little more than the general shape of the broadly and very deeply umbilicated base. This specimen, which is the type of the species, and which has not been figured before, is the original of the drawing reproduced on Plate 12. Elora, D. Boyle, 1880 : a cast of the interior, with the basal portion only exposed. Belwood, J. Townsend, 1886 : two similar specimens.

This species is so imperfectly characterized that it is very doubtful if it can be retained. No specimen has yet been collected in which even a very small piece of the test is preserved, or any considerable portion of the spire is visible, and the outer volution of the type, as described by Billings, shows only "some appearance of an angulation." It is by no means certain, even, that the species should not be referred to *Strapparollus* rather than to *Pleurotomaria*.

*On the Silurian Gastropoda and Pteropoda of Gotland. Kongl. Svenska Vetenskaps-Akad. Handl., vol. XIX., No. 6, Stockholm, 1884, p. 106.

Pleurotomaria occidens, Hall.

Pleurotomaria occidens, Hall. 1867. Twentieth Rep. Reg. St. N. York, p. 364, pl. 15, figs. 11 and 12.
" " Hall and Whitfield. 1875. Rep. Geol. Surv. Ohio, vol. II., pt. 2, p. 142, pl. 8, fig. 3.

Elora, T. C. Weston, 1867 (one specimen), and J. Townsend, 1892 (one specimen); both with a considerable portion of the test preserved. In his memoir on the Silurian Gastropoda and Pteropoda of Gotland (page 113), Professor Lindström includes *P. occidens* among the synonyms of *P. labrosa*, Hall. This latter species was collected by Sir W. E. Logan, in 1843, from limestones of about the age of the Niagara limestone at Port Daniel, P.Q., and from the supposed Lower Helderberg limestone between Cape Gaspé and Cape Rosier.

Pleurotomaria cyclostoma, Whiteaves.

Pleurotomaria cyclostoma, Whiteaves. 1884. This volume, pt. 1, p. 23, pl. 3, figs. 12 and 12 *a*.

Durham, J. Townsend, 1874-82: two specimens.

Pleurotomaria Durhamensis, Whiteaves.

Pleurotomaria Durhamensis, Whiteaves. 1884. This volume, pt. 1, p. 24, pl. 4, fig. 2.

No other specimen of this species has been obtained, to the writer's knowledge, than the one which was described and figured in the first part of this volume. A salient feature in this specimen is the slender acuminate apex, which is composed of no less than four minute but distinct volutions. It may prove to be only a variety of *P. Galtensis*.

Pleurotomaria Townsendii. (N. Sp.)

Plate 15, fig. 9.

Shell small, turbinate, naticoid, a little higher than broad, spire elevated, but, in its dorsal aspect, distinctly shorter than the last volution: base imperforate. Volutions five in number, increasing rather rapidly in size, those of the spire convex and rounded, the outer one moderately inflated and a little broader than high.

The surface markings are indicated only in the concave mould of the exterior (or convex surface of the test) of the last volution and part of the last but one, of the specimen figured. To the naked eye the surface of

the outer volution appears to be nearly smooth and marked only with a narrow and apparently flat spiral band a little above or on the apical side of the mid-height. Under a lens it seems to be marked with numerous and extremely minute transverse lines of growth, which are crossed by equally minute spiral raised lines, but the specimen is not sufficiently well preserved to show the minute details of the sculpture at all satisfactorily.

Dimensions of the most perfect specimen, the original of fig. 9 : entire height, as measured in the median line of the dorsal surface, fourteen mm. ; greatest breadth, eleven mm. and a half ; height of spire, five mm. and a half.

Durham, J. Towsend, 1878-82 : one natural mould of the exterior of the shell (with part of the test of the spire preserved, though its outer surface is buried in the matrix) and four small casts of the interior of the shell.

This little shell appears to belong to that section of the genus *Pleurotomaria* which Lindström, in the memoir previously referred to, designates as the *Naticoideæ*. According to Lindström, only one species of that section was previously known, viz., the *P. exquisita* of that author himself, from the Silurian rocks of Gotland. The minute surface markings of *P. Townsendii*, so far as they can be ascertained at present, seem to resemble those of *P. exquisita*, but in that species the slit band is placed below or on the umbilical side of the mid-height, the spire is shorter and much more obtuse and the base distinctly umbilicated.

Murchisonia.

It will be convenient to group the species of this genus that are known to occur in the Guelph formation of Ontario, as far as practicable in their natural order, commencing with the short-spired Pleurotomaria-like forms, and ending with the slender species with very numerous volutions. *M. Hercyna*, Billings, is now regarded as a *Pleurotomaria ; M. Boydii*, Hall, appears to the writer to be a *Loxonema ;* and Fisher's genus *Loxoplocus* will be retained for *M. soluta* (Whiteaves) of which *M. tropidophora* (Whiteaves) is now known to be a synonym. Specimens of *M. bivittata* collected at Belwood by Mr. Townsend in 1892, which happen to be broken in such a way as to afford good longitudinal and transverse sections of the empty shell, show that the earlier volutions of the spire are divided into chambers by numerous transverse partitions, also that the columella, which has long been known to be encircled with two spiral folds, is tubular and hollow throughout.

A. Short spired species, approaching to *Pleurotomaria.* Volutions four to seven.

Murchisonia Hespelerensis, Whiteaves.

Murchisonia Hespelerensis, Whiteaves. 1884. This volume, pt. 1, p. 24, pl. 41, fig. 3.

Hespeler, T. C. Weston, 1867, one perfect cast of the interior of the shell; Township of Glenelg, J. Townsend, 1883, a similar specimen. This species should, perhaps, be referred to *Pleurotomaria* rather than to *Murchisonia*.

Murchisonia Mylitta, Billings.

Murchisonia Mylitta, Billings. 1862. Geol. Surv. Canada, Pal. Foss., vol. I, p. 157, fig. 140.

Elora, R. Bell, 1861: a single cast of the interior of the shell with a small portion of the test preserved. The specimen is represented as measuring twenty-four millimetres, or a little less than an inch in height, but the figure of it is slightly restored, the spire of the original being rather badly preserved and its apex broken off. According to Mr. Billings, the shell of this species is short and consists of "four or five ventricose whorls, with a narrow spiral band a little above the middle on the last," and, it may be added, on the last only.

Murchisonia. (Species uncertain.)

Plate 12, fig. 3.

Between the years 1878 and 1882 Mr. Townsend collected, at Durham, five specimens of a rather large short-spired *Murchisonia* which may represent the adult condition of *M. Mylitta*, but which in some respects seems to be intermediate in its characters between that species and *M. Xanthippe*, Billings. The largest of these specimens, which is imperfect at the apical end, is fifty-four millimetres or upwards of two inches in height or length, and three of the smaller ones have most of the test preserved. In these latter the slit band, which is enclosed in a prominent but narrow spiral ridge or keel, encircles the outer volution above the mid-height, especially near the aperture, as represented by the figure on Plate 12, and the volutions of the spire are angulated a little below the mid-height. The whole five give one the impression of a shell like the *Murchisonia bicincta* of Hall, with only one spiral keel developed, and closely resembling that form of *M. bicincta* from Ardre figured by Lindström under the name *Pleurotomaria bicincta* on Plate 8, figure 20, of the "Silurian Gastropoda and Pteropoda of Gotland." In that monograph the "*Trochonema (Eunema) fatua* of Hall, from the Niagara limestone of Wisconsin, is regarded as a synonym of *Pleurotomaria bicincta*.

Murchisonia Xanthippe, Billings.

Murchisonia Xanthippe, Billings. 1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 155, fig. 137.

Galt, E. Billings, 1857: a single and apparently slightly distorted natural mould of the exterior of the shell.

Murchisonia Vitellia, Billings.

Murchisonia Vitellia, Billings. 1862. Geol. Surv. Canada, Pal. Foss, vol. I., p. 156, fig. 138.
" " Nicholson. 1875. Rep. Pal. Prov., Ont., p. 3, fig. 6.

Galt, E. Billings, 1857: a natural mould of the exterior of the shell. The woodcut of the type of this species is taken from a gutta-percha impression of this mould. Elora, Professor H. A. Nicholson. Durham, J. Townsend, 1883: one fine large specimen with the test preserved. The volutions in *M. Vitellia* are described by Mr. Billings as six in number, "strongly ventricose, obtusely angular, and with a flat spiral band along the middle."

B. Spire elongated, shell slender: *Murchisonia* proper.

BB. Volutions not more than twelve.

Murchisonia Conradi, Hall.

Murchisonia Conradi, Hall. 1867. Twentieth Rep. Reg. N. Y. St. Cab. Nat. Hist., p. 344, pl. 15 (6), fig. 19.
" " Whiteaves. 1884. This volume, p. 27, pl. 4, fig. 6.

The three specimens collected at Elora by Messrs. Weston and Boyle, and referred to on page 27 of this volume as a local variety of *M. Conradi*, are the only ones from the Guelph formation of Ontario that the writer has seen. Professor Hall states that the shell of the typical form of this species consists "of about seven volutions."

Murchisonia Logani, Hall.

Murchisonia Logani, Hall. 1852. Pal. N. York, vol. II., p. 346, pl. 83, figs. 4, *a-b*.

Galt, A. Murray, 1847, and E. Billings, 1857; Elora, R. Bell, 1861, and T. C. Weston, 1867; Hespeler, T. C. Weston, 1867; and Fergus, teste E. Billings, in the "Geology of Canada."

The surface markings of this species are still unknown. all the specimens that have been collected so far being either coarse and imperfect natural moulds of the exterior of the shell, upon which no remains of the

slit band or lines of growth are preserved, with the corresponding cast of the interior in place, or separate casts. All that appears to be known of the shell is, that it is elongate, turreted and composed of about eleven rounded ventricose volutions, that are much broader than high.

Murchisonia macrospira, Hall

Murchisonia macrospira, Hall		1852.	Pal. New York, Vol. II., p. 346, pl. 83, fig. 5.
"	"	Billings	1863. Geol. Canada, p. 339, fig. 334.
"	"	Nicholson	1875. Rep. Pal. Prov. Ont., p. 70, pl. 3, fig. 9.
"	"	Whiteaves	1884. This volume, p. 27, pl. 4, fig. 7 and 7*a*.

Galt, A. Murray, 1845, and E. Billings, 1857 ; Elora, D. Boyle, 1880. The species has also been collected at Durham by Mr. Townsend, and at Belwood (in 1893) by Mr. Townsend and the writer. With the exception of the one from Elora represented on Plate 4, fig. 7*a*, of the present volume, all the specimens of this species that the writer has seen are natural moulds of the exterior of the shell. The type of *M. macrospira*, as figured by Professor Hall, is a mould of the exterior of five of the later volutions. A gutta-percha impression of this mould has recently been presented to the Museum of the Survey by Professor R. P. Whitfield. It shows that the volutions are rounded, ventricose and encircled at their mid-height by a low, rounded, spiral ridge which represents the slit band. Other specimens shew that the number of volutions is at least nine.

It is very doubtful whether the distinction between this species and *M. Logani* can be be sustained. The original figures of both give the impression that the volutions of *M. Logani* are a little broader in proportion to their height and perhaps slightly more numerous than those of *M. macrospira*, but these apparent differences do not seem to hold good when a series of specimens is compared. In the diagrammatic figure of *M. macrospira* on page 339 of the "Geology of Canada," the volutions are more like those of *M. Logani* than those of *M. macrospira*. Again, the writer can see no difference, except in size, between the specimen which Professor Nicholson figures on Plate 3, fig. 4, of his second "Report upon the Palæontology of the Province of Ontario" as *M. Logani*, and that which he figures on the same Plate, figure 9, as *M. macrospira*.

Murchisonia Boylei, Nicholson.

Murchisonia Boylei, Nicholson. 1875. Rep. Pal. Prov. Ont., p. 71, pl. 3, fig 1.

Elora, D. Boyle : a natural mould of the exterior of the shell, which is stated by Professor Nicholson to have been presented to the Museum of

Toronto University. The shell, as represented by a gutta-percha impression of this mould, is described as "turreted, with a long conical spire, the apical angle of which is about 18°". Its volutions are said to be "ten or eleven in number, increasing regularly from the apex to the mouth, flat, with a well marked spiral band or angulation situated just above the suture," which causes "the lower part of each whorl to project over the upper portion of the whorl next below." The suture is represented as "canaliculated," the body whorl as little larger than the preceding one, and not ventricose, and the base as "somewhat produced below, apparently with a small umbilicus.

The writer has never seen a specimen of *M. Boylei*, but it appears to be a well characterized and distinct species.

Murchisonia constricta, Whiteaves.

Murchisonia constricta, Whiteaves..1884. This volume, p. 25, pl. 4, fig. 4.

Durham, J. Townsend: a single specimen. Perhaps a variety of the preceding species.

Murchisonia bivittata, Hall.

Plate 12, figs. 5 and 6.

Murchisonia bivittata, Hall.....1852. Pal. N. York, vol. II., p. 345, pl. 83, figs. 1, *a-b*.
" " Nicholson..1875. Rep. Pal. Prov. Ont., p. 70, pl. 3, fig. 7, but not fig. 8.

Galt, A. Murray, 1847, and E. Billings, 1857; Hespeler, T. C. Weston, 1867 and 1871; Elora and Hespeler, Professor H. A. Nicholson; Belwood, J. Townsend, 1892, and J. Townsend and J. F. Whiteaves, 1893.

This is one of the commonest fossils of the Guelph formation at these localities, and one that, as has been pointed out by Professors Hall and Nicholson, is most readily recognized by the "double spiral fold or carina" upon its columella. The condition in which *M. bivittata* is usually obtained, is either that of natural longitudinal sections of the hollow shell, with the columella preserved throughout and the broken edges of the test exposed; or casts of the interior, or specimens with the outer layer of the test exfoliated. When perfect the shell was evidently composed of two layers of about equal thickness, but no considerable portion of the outer surface of the test is preserved in any specimen that the writer has seen.

Specimens of this species recently collected at Belwood by Mr. Townsend and the writer, give the following additional information about the

external shape of its shell and its internal peculiarities. Figure 5 on Plate 12, which represents a gutta-percha impression of a natural mould of the exterior of the shell from Belwood, shows that it is rather slender and composed of about twelve volutions. Those of the spire are compressed convex above and distinctly angulated below the mid-height; the suture is deeply impressed; the outer volution is angulated, apparently with a spiral band, about the mid-height, and rounded and apparently narrowly umbilicated below. Figure 6, on the same plate, represents a longitudinal section of the upper portion of the shell, also from Belwood. It shows that the transverse shelly partitions of the earlier volutions of the spire are concave, numerous, and placed at intervals of from one to two millimetres apart. Other specimens from the same localities show that the columella is hollow throughout, as previously stated on page 78.

M. bivittata seems to be most nearly related to *M. Estella*, Billings, but in the latter species the shell is still more slender and composed of more than fifteen volutions. The diagrammatic representations of *M. bivittata* on page 339 of the "Geology of Canada" is very unsatisfactory and does not give a correct idea of its characters.

BBB. Volutions more than twelve.

MURCHISONIA ESTELLA, Billings.

Murchisonia Estella, Billings..1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 157, fig. 139.

Galt, E. Billings, 1857, an imperfect mould of the outside of the shell, consisting of fifteen volutions, and Dr. R. Bell, 1861, a similar specimen. According to Mr. Billings "this species is allied to *M. longispira*, Hall," ..... "but is more acutely angular in the whorls."

MURCHISONIA LONGISPIRA, Hall.

Murchisonia longispira, Hall.....1852. Pal. N. York, vol. II., p. 345, pl. 83, figs. 2, *a-b*.
" " Nicholson...1875. Rep. Pal. Prov. Ont., p. 70, pl. 3, figs. 11 and 12.

Galt, A. Murray, 1847, E. Billings, 1857, and Dr. R. Bell, 1861; Elora, T. C. Weston, 1861, and D. Boyle, 1880; Hespeler, T. C. Weston, 1871; Guelph, Professor H. A. Nicholson; Durham, J. Townsend, 1878-82. *M. longispira* is remarkable for its extremely elongated and very slender spire, also for its numerous volutions, which are stated to be "rounded on the surface, and carinated below the centre." Professor Hall says that he has counted twenty-five volutions in a mould of this species

from Galt, that is imperfect at the base. Not more than twenty-one volutions can be counted in the most perfect specimen (from Elora) in the Survey collection, but this specimen is imperfect at both ends.

Murchisonia turritiformis, Hall.

Plate 12, fig. 4.

Murchisonia turritiformis, Hall.....1852. Pal. N. York, vol. II., p. 347, pl. 83, figs. 6, *a-b*.
" " Nicholson....1875. Rep. Pal. Prov. Ont., p. 70, pl. 3, fig. 10.
" " Whiteaves...1884. This volume, pt. 1, p. 26, pl. 4, fig. 5.

Galt, A. Murray, 1847, and E. Billings, 1857 ; Elora, Dr. R. Bell, 1861 and D. Boyle, 1880 ; Hespeler, T. C. Weston, 1867 and 1871 ; Durham, J. Townsend, 1874-82.

The specimen represented on Plate 12, the test of which is beautifully preserved on the seven later volutions, though the earlier ones are broken off, was obtained by Mr. Townsend, in 1885, at the "cave," Irvine rocks, Elora, and presented by him to the Museum of the Survey. In this specimen the volutions of the spire are laterally compressed, but most prominent and obtusely sub-angular a little below the mid-height, where they are encircled by a rather narrow and not much elevated spiral band, which is flattened at the summit and bounded above by a spiral impressed line. The outer volution, which is not much larger than the one which precedes it, and rounded below, is encircled by the spiral slit band a little above the mid-height. On each of the volutions the numerous and close-set striæ of growth curve obliquely backward to the slit band above and forward to the suture, on those of the spire, or to the base of the outer volution, below.

Loxoplocus solutus, Whiteaves.

Plate 12, figs. 7 and 8.

Murchisonia soluta, Whiteaves.....1884. This volume, pt. 1, p. 28, pl. 4, figs. 8 and 8 *a*.
Murchisonia tropidophora, Whiteaves..1884. Ibid, p. 29, pl. 7, figs. 5 and 5 *a*.
Loxoplocus tropidophorus, Fischer.....1885. Man. de Conchyl., etc., p. 847.

The original description of *M. soluta* was based upon a number of casts of the interior of shells collected at Hespeler, Elora and Durham by Messrs. Weston, Boyle and Townsend, which show only one spiral keel on each volution. *M. tropidophora*, on the other hand, was described from an imperfect specimen with nearly the whole of the test preserved, and

shewing the characters of the entire outer volution, which is encircled by three spiral keels. The aperture is circular and the outer lip slightly expanded.

In 1892, however, Mr. Townsend obtained natural moulds of the exterior of two shells (one at Elora and the other at Belwood), which have convinced the writer that the specimens upon which *M. soluta* and *M. tropidophora* were based, are merely different states of preservation of the same species. Fig. 7, on Plate 12, represents a wax impression of the mould from Elora, and fig. 8, on the same plate, a similar impression of the mould from Belwood. These show that, when the test is preserved, the spire is encircled by three spiral keels, two of which are placed comparatively close together, at the upper part of each volution, and the third at the base. On the outer volution of the type of *M. tropidophora* the basal carina ultimately becomes confluent with the upper or posterior margin of the lip, on the columellar side.

Euomphalus inornatus, Whiteaves.

Plate 13, fig. 1.

Trochonema inornatum, Whiteaves. 1884. This volume, pt. I, p. 19, pl. 3, fig. 7.

The specimen from Elora represented on Plate 3 of the first part of the present volume is the only one that the writer has seen, upon which any portion of the test is preserved. The figure of this specimen, however, is not at all satisfactory, and the additional and much more correct illustration upon Plate 13 of the present part of this volume, is drawn from a cast of the interior of the shell, from Durham. In spite of its comparatively elevated spire, and narrow or perhaps closed umbilicus, the general shape and the insinuation of the growth lines on the shoulder of the outer volution, would seem to indicate that this shell is referable to *Euomphalus* rather than to *Trochonema*. It may prove to be merely an abnormal form of the species next to be considered.

Euomphalus Galtensis, Whiteaves.

Euomphalus Galtensis, Whiteaves .....1884. This volume, pt. 1, p. 21, pl. 3, figs. 9 and 9 *a*.

Cfr. *Euomphalus Gotlandicus*, Lindström....1884. Sil. Gastr. and Pter. Gotland, p. 139, pl. 13, figs. 19-31.

Galt, E. Billings, 1857; Hespeler, T. C. Weston, 1867; and Durham, J. Townsend, 1878-82.

This species is very closely related to, if not identical with, the *E. Gotlandicus* of Lindström. Still, if the two should prove to be identical, *E.*

Galtensis is a little the older name, as may be seen from the fact that the first part of this volume is quoted from, more than once, in Professor Lindström's monograph.

Euomphalus circinatus, Whiteaves.

Ecculiomphalus circinatus, Whiteaves. This volume, pt. 1, p. 35, pls. 5, figs. 4, 4, *a-c*, and 8, fig. 5.

Galt and Hespeler, T. C. Weston, 1867; Elora, D. Boyle, 1878; Durham, J. Townsend, 1878-84.

Professor Lindström says *that the genus *Ecculiomphalus* was originally based by Portlock upon two shells which are expressly stated to bear "great resemblance to an unrolled *Euomphalus*." Since then *Ecculiomphalus* has been made to include "species of evolute *Euomphali* and likewise evolute *Pleurotomariæ*. It must, consequently, Professor Lindström thinks, "be broken up and its species distributed in these genera." In view of these remarks, *Ecculiomphalus circinatus* appears to the writer to be a sinistrally coiled evolute *Euomphalus*. Further, Professor Lindström has shown† that in *Euomphalus Gotlandicus* the shell may be either involute with the whorls everywhere in contact, or evolute and loosely coiled, also that its volutions are coiled indifferently to the right or to the left. Hence it is not at all improbable that *E. circinatus* may prove to be merely an evolute sinistral variety of *E. Galtensis*, though at present no specimens with characters intermediate between these two forms have been seen by the writer.

Professor James Hall has applied the name *Phanerotinus*, Sowerby, to the uncoiled species of *Euomphalus*, but the type of the genus *Phanerotinus*, the *Euomphalus cristatus* of Phillips, is stated by that palæontologist to be provided with a "large double dentated keel, continued to the inner whorls."

Loxonema Boydii, Hall.

Loxonema Boydii, Hall.....1843. Rep. Fourth Geol. Distr. N. Y., p. 138, fig. 3 (?).
Murchisonia Boydii, Hall.....1852. Pal. N. York, vol. II., p. 346, pl. 83, fig. 3.
" " Billings....1863. Geol. Canada, p. 399, fig. 345.

Galt, A. Murray, 1847, and E. Billings, 1857; Hespeler, T. C. Weston, 1867; and Durham, J. Townsend, 1878-82.

After the brief description of *Murchisonia Boydii* in the second volume of the Palæontology of the State of New York, Professor Hall says: "the

*Silurian Gastropoda and Pteropoda of Gotland, p. 138.
†Ibid., on pl. xiii, figs. 19-31.

few impressions of striæ remaining upon the cast are not sufficient to decide whether the fossil be a *Loxonema* or *Murchisonia;* and since all the Galt specimens, which are of the same age, appear to belong to *Murchisonia,* I have concluded to refer this one to the same genus." All the specimens from Ontario that the writer has seen are mere casts of the shell, upon which no vestiges of the surface markings are preserved. Still in these the general shape of the shell, with its compressed convex but evenly rounded volutions, devoid of the slightest indication of a slit band, appears to the writer to be much more like that of a *Loxonema* than that of a *Murchisonia.* Moreover another species of *Loxonema* is now known to occur in the Guelph formation of the province. The largest specimen of *L. Boydii* known to the writer, when perfect, would probably have been about an inch and three-quarters in height or length. The apical angle of specimens from Ontario is 24°.

The genus *Loxonema* is included by Lindström in the family of Euomphalidæ of De Koninck on account of its insinuated growth lines like those of *Euomphalus,* its solid axis and earliest "whorls filled with an organic deposit of homogeneous calcite," as in that genus. On the other hand, the late Dr. Paul Fischer* regarded these points of resemblance as of little importance, and placed *Loxonema* in the Pyramidellidæ and *Euomphalus* in the Solariidæ.

Loxonema magnum, Whitfield. Var.

Plate 13, fig. 2.

Loxonema magnum, Whiteaves. 1884. This volume, pt. 1, p. 17.

Shell rather large, elongated, turreted, slender: apical angle about 16° Volutions not less than eight and probably as many as ten when perfect, the later ones moderately convex and not much broader than high, the last not much larger than the one which immediately precedes it: suture deeply impressed in the cast. Surface markings unknown.

Galt, Hespeler and Elora: the specimens referred to on page 17 of the first part of this volume as *Loxomena magnum,* Whitfield. They seem, however, never to have attained to so large a size as *L. magnum,* and their volutions are apparently much more convex proportionately than those of that species. The rate of increase of the volutions of the typical *L. magnum* is said to indicate a "length of fully eight inches for the entire shell," but judging by the proportions of specimens from different localities in Ontario, their entire length could scarcely have been much more than five inches. Still, these supposed differences may be more apparent than real, and the writer is by no means convinced that the Ontario specimens are specifically distinct from *L. magnum.*

*Manuel de Conchyliologie, &c., p. 715.

Pycnomphalus solarioides, Hall. (Sp.)

Plate 13, figs. 3, 3 a, 4-8.

Pleurotomaria solarioides, Hall.....1852. Pal. N. Y., vol. II., p. 348, pl. 84, fig. 4 *b*, but not 4 *a*.
" " Nicholson..1875. Rep. Pal. Prov. Ont., p. 72, pl. 3, fig. 15 (?).
Straparollus solarioides, Whitfield....1882. Geol. Wiscons., vol. IV., p. 358.

Galt, A. Murray, 1847, and E. Billings, 1857 ; Hespeler, T. C. Weston, 1867 ; Durham, J. Townsend, 1878-82 ; Elora and Belwood, J. Townsend, 1892. Nicholson (op. cit.) says that *P. solarioides* is "not uncommon in the Guelph formation of Hespeler, Guelph and Elora."

In the writer's judgment, figure 4*a* on plate 84 of the second volume of the Palæontology of New York, which is stated to represent the base of a specimen of *Pleurotomaria solarioides*, represents rather the under side of an imperfect specimen of *P. perlata*. A number of specimens collected by Mr. Townsend at Durham, Elora and Belwood, which correspond perfectly with the other figure (fig. 4*b*) of *P. solarioides* on plate 84 of the volume referred to, have convinced the writer that this species is referable to Lindström's genus *Pycnomphalus*.

Some of these specimens are mere casts of the interior of the shell. In these the volutions are depressed somewhat obliquely above and regularly rounded beneath. The base appears to be widely and deeply umbilicated, and the inner volutions exposed up to the apex, as represented by fig. 5. Other specimens are casts of the interior, with the test preserved in the umbilical cavity and between the volutions. A section through the centre of one of these, transverse to the volutions, as shown in fig. 6, shows that the inner surface of the latter is encircled by a narrow and slightly recurved prominent spiral ridge, which projects to the centre, leaving open only a narrow spiral umbilical perforation. This spiral ridge was first observed by Mr. Lambe in a natural section of a specimen from Belwood. Besides these a few natural moulds of the exterior of the base of the shell, in a dolomitic limestone, have been collected. A gutta-percha impression of one of these moulds from Belwood (fig. 4) shows the characters of the lower half of the aperture, the heavy thickening of the inner or columellar lip, the contour of the exterior of the base, with its narrow umbilical perforation, and some indications of the growth lines around the umbilicus. The largest specimen of this species that the writer has seen (the original of fig. 4, on plate 13,) is fifty-one millimetres, or a little more than two inches in its maximum diameter.

Polytropis, DeKoninck.

In a paper on the development of the gastropoda from the Cambrian to the Trias,* Professor E. Koken remarks that, in his view, the genus *Oriostoma* of Munier Chalmas includes very different things. The typical species of *Oriostoma* (or *Horiostoma*, as the word is amended by Fischer) he thinks belong to the Capulidæ, while the forms from the Upper Silurian described by Lindström (excluding *O. helicinum*, *O. dispar* and *O. nitidissimum*) group themselves around the *Euomphalus rugosus* and *E. discors* of Sowerby, for which DeKoninck, in 1881, proposed the genus *Polytropis*. This latter genus is referred to the Turbinidæ by Lindström on account of the nacreous structure of its test and the peculiarities of its operculum. According to Koken, *Polytropis*, as understood by him, extends very far back in time, as it probably includes the "*Pleurotomaria* (?) *Calphurnia*" of Billings,† from the Quebec group of Newfoundland, which is, he says, nearly related to "*Oriostoma globosum*."

In the "Geology of Canada" (1863, p. 444) *Euomphalus rugosus*, which would now be called *Polytropis discors* var. *rugosus*, is recorded as occuring in the Silurian (Upper Silurian) rocks of Port Daniel, in the Baie des Chaleurs, and the *Pleurotomaria princessa* of Billings,‡ from the Lower Helderberg rocks between Cape Gaspé and Cape Rosier is also a *Polytropis*.

Some of the depressed conical, solid, shelly opercula, with numerous narrow coils, that were formerly referred to *Euomphalus* by English authors, are now known to belong to species of this genus. Such opercula are not uncommon in the Guelph formation at Elora and Durham, and two of these are represented on Plates 3 and 7 of the first part of this volume. Five species of *Polytropis* are now known to occur in this formation in Canada, viz., *P. sulcatus* (=*Cyclonema sulcatum*, Hall); *P. macrolineatus* (=*Euomphalus macrolineatus*, Whitfield); *P. crenulatus* (=*Straparollus crenulatus*, Whiteaves); and two which were previously undescribed.

Polytropis sulcatus, Hall. (Sp.)

Plate 13, figs. 9 and 9 a.

Cyclonema sulcata, Hall.....1852. Pal. N. York, vol. II., p. 347, pl. 34, figs. 1, *a-d*.
" " Billings.....1863. Geol. Canada, p. 343, figs. 350, *a-b*.
Cyclonema sulcatum, Whiteaves...1884. This volume, pt. I., p. 18, pl. 3, fig. 5.

*Separat-Abdr. Neuen Jahrb. fur Min. Geol. and Palæont, 1889, Beilageband VI.
†Geological Survey of Canada, Palæozoic Fossils, vol. I., p. 230, figs. 214, *a-b*.
‡ " " " vol. II., pt. 1, p. 59, fig. 29.

Galt, Professor James Hall, 1848 ; Hespeler, T. C. Weston, 1871 ; Durham, J. Townsend, 1878-82 ; Elora, J. Townsend, 1892 and 1893 ; and Belwood, J. Townsend and J. F. Whiteaves, 1893.

The original types of this species, as figured by Hall, are three in number, viz., (1) an imperfect cast of the interior of the shell, with part of the exfoliated test preserved on the lower half of the outer volution ; (2) "a small individual" about nine millimetres in height ; and (3) "an impression of" the "base of the shell in limestone." These give a very imperfect idea of the shape of the shell, and none whatever of the surface markings of the spire and upper portion of the outer volution. The woodcuts of *C. sulcata* in the "Geology of Canada" are mere reproductions of two of Hall's figures of that species, and the specimen from Durham referred to and illustrated in the first part of this volume, does not add much to our knowledge of its characters.

The specimens recently collected at Elora by Mr. Townsend are two in number. Both of these have nearly the whole of the test preserved, and one of them has also a small portion of its operculum still remaining, almost *in situ*, but turned inside out. So much of this operculum is broken off that it is impossible to say whether it was originally solid or hollow inside, but there is enough left to show that it is calcareous, multispiral and not much elevated exteriorly.

The specimens collected at Belwood by Mr. Townsend and the writer, are sharply defined natural moulds of the exterior of four different shells, and gutta-percha impressions of these moulds, such as the one figured in Plate 13, together with the two testiferous examples from Elora, give the following new information about the species. A specimen of average size is about thirty millimetres in height, and twenty-five in maximum breadth. The volutions are five or six in number, rounded and ventricose, but depressed and flattened above in such a way as to form a shoulder with a narrow band between it and the suture. In the centre of the base of the outer volution there is a narrow but rather deep umbilical depression, but no portion of any of the inner volutions is exposed. The upper portion of each of the last three volutions is marked by a few spiral raised lines, and their central and lower portions are encircled by narrow ridges. Upon the lower half of the last volution of the spire of the specimen figured there are four spiral ridges, and upon the central and basal portions of the outer volution of another specimen, there are as many as ten or eleven spiral ridges, the three around the umbilical depression being more prominent and distant than any of the others. The volutions, also, are everywhere crossed by crowded and oblique minute raised lines.

Polytropis macrolineatus, Whitfield. (Sp.)

Euomphalus macrolineatus, Whitfield....1878. Ann. Rep. Geol. Surv., Wiscons., for 1877, p. 82.
" " " ....1882. Geol. Wiscons., vol. IV., p. 294, pl. 18, figs. 5 and 6.
" " Whiteaves...1884. This volume, pt. 1, p. 20, pl. 3, fig. 6.

Elora, T. C. Weston, 1867 : a specimen with such an unusually high spire as to suggest the idea that the "*Holopea (?) occidentalis*" of Nicholson, which has been found only at Elora, may have been based upon a cast of the interior of a shell of this species. Durham, J. Townsend, 1882 : the original of the figure on Plate 3 of the first part of this volume. These two specimens were identified with *Euomphalus macrolineatus*, in 1884, on the authority of Professor Whitfield, to whom they were submitted for examination. That species was referred to *Polytropis* by Koken in 1889, in a foot-note to page 425 of the paper previously quoted.

Polytropis crenulatus, Whiteaves.

Straparollus crenulatus, Whiteaves..1884. This volume, pt. 1, p. 21, pl. 3, figs. 8, 8, *a-b*.

Durham, J. Townsend, 1878-82 : two specimens. These are remarkably similar to a shell that Hall figures on Plate 25, figs. 11 and 12, of the revised edition of the Twentieth Annual Report of the Regents of the State of New York, under the name "*Pleurotomaria (Trochonema) Hoyi*," but bear very little resemblance to the type of that species, as figured on Plate 15, figure 10, of both editions of that report. Moreover, the periphery of *P. Hoyi* is described as "somewhat flattened, with a depressed band truncating the upper angle," whereas that of the Durham specimens is regularly but rather narrowly rounded.

Polytropis Durhamensis. (N. Sp.)

Plate 14, figs. 1 and 2.

Shell of medium size for the genus, subdiscoidal and more than three times as broad as high, spire depressed and scarcely raised above the highest level of the outer volution : suture deeply channelled : last volution gently convex above and below, subangular and obtusely subcarinate at the periphery ; base rather widely but shallowly umbilicated in the centre, the umbilicus occupying more than one-third of the entire diameter and exposing nearly one-half of each of the inner volutions, though its sides slope gradually inwards and its margin is rounded and

very indefinite. Volutions three in number, or possibly four if the apex were preserved, and encircled by narrow spiral ridges, which are everywhere crossed by numerous and crowded transverse striæ. On the last volution there are five spiral ridges, one at the periphery, two on the apical and two on the basal side, but the two above the periphery are much more prominent and distinct than the two which surround the umbilicus. On the last volution of the spire there are two prominent spiral ridges.

Maximum breadth of the largest specimen collected, thirty-four millimetres: greatest height of the same, ten mm.

Edge Mills, near Durham, J. Townsend, 1879-1885: two specimens with the test preserved, and a remarkably well preserved natural mould in dolomite, of the exterior of the apical side of another specimen.

If the angulation and obtuse carination of the periphery of the only two specimens in which that part of the shell is preserved is not abnormal and due to vertical pressure, it would seem that this species is most nearly related to *Polytropis alatus*, the *Oriostoma alatum* of Lindström, figured on Plate 16, figs. 14-19 of his monograph of the Silurian Gasteropoda and Pteropoda of Gotland. The upper side of the specimen represented by fig. 1 on Plate 13 of the present paper is exactly similar to that of the specimen of *Oriostoma angulatum*, Wahlenberg (Sp.) figured by Lindström on Plate 20, fig. 37, of his monograph, but in Wahlenberg's species the shell is planorbiform, with rounded periphery and an extremely wide and open umbilicus. *Straparollus Niagarensis*, Meek,* which is probably also a *Polytropis*, is described as having a discoidal shell, with rounded volutions and an umbilicus in which "almost the entire diameter of the inner volution is exposed."

Polytropis parvulus. (N. Sp.)

Plate 13, figs. 10 and 10 a.

Shell small, depressed turbinate and a little broader than high: spire not much elevated, not so high as the last volution. Volutions three, or perhaps four when the apex is preserved, rounded and ventricose, but flattened and narrowly shouldered at the suture above: suture angular but apparently not channelled: base of the last volution rather narrowly but deeply umbilicated, though the inner volutions are apparently covered over.

Surface marked by narrow spiral ridges, which appear to be crossed by minute and crowded transverse raised lines. On the last volution there are seven spiral ridges visible (and there may be one or two more in the

*Report of the Geological Survey of Ohio, vol. II., pt. 2, 1875, p. 144, pl. 8, fig. 3.

umbilical cavity, which is almost filled with the matrix), but the ridge at the shoulder above is much more prominent and separated on each side by a wider interval than any of the others, and the four which surround the umbilicus are smaller than the three upper ones and placed very close together.

Dimensions of the only specimen known to the writer: maximum height, about ten millimetres; greatest breadth, thirteen mm.

Durham, J. Townsend, 1884: a single specimen with most of the test preserved.

This little shell resembles *Polytropis Wisbyensis* (the *Oriostoma Wisbyense* of Lindström*) from the Silurian rocks of Gotland, in so many particulars, that it may ultimately prove to be only a geographical variety of that species. As far as can be ascertained at present, the principal difference between these two forms seems to be that on the umbilical side of the Canadian shell there are at least five spiral ridges, which are closely disposed and not very prominent, whereas on that side of the shell in the Gotland species there are only two spiral ridges, which are large and distant.

Codonochilus striatus, Whiteaves.

Codonocheilus striatum, Whiteaves..1884. This volume, pt. 1, p. 17, pl. 3, fig. 3.
Codonochilus striatus, Fischer.....1885. Man. de Conchyl., pp. 832-33.

Hespeler, T. C. Weston, 1867, two specimens; Durham, J. Townsend, 1878-85, abundant; Irvine Rocks, Elora, J. Townsend, 1885, three large specimens.

The systematic position of the genus *Codonochilus* is still uncertain, though, as pointed out by Fischer (op. cit.) it is obviously most nearly related to *Scoliostoma*, Braun. Zittel, in the second volume of his "Handbuch der Palæontologie," makes no mention of *Codonochilus*, but places *Scoliostoma* in the family Scalariadæ. Fischer, on the other hand, places *Codonochilus* in the Delphinulidæ, immediately after *Scoliostoma* and its sub-genus *Conchula*, Steininger.

Straparollina Daphne, Billings. (Sp.)

Straparollus Daphne, Billings..1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 160, fig. 145.

Galt, A. Murray, 1847, and R. Bell, 1861; Elora, D. Boyle, 1880; Durham, J. Townsend, 1878-82.

*Silurian Gasteropoda and Pteropoda of Gotland, Stockholm, 1884, p. 167, pl. 17, figs. 26-28 and 45-46.

Only casts of the interior of this shell have yet been obtained. Judging by these the species is provisionally referred to Billings's genus *Straparollina*, though it may prove to be a *Pycnomphalus*.

Straparollus Hippolyta, Billings.

Straparollus Hippolyta, Billings..1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 160, fig. 144, *a-b*.

Galt, E. Billings and John Richardson, 1857, and R. Bell, 1861 ; Elora, T. C. Weston, 1867. This species, also, is still only known from casts of the shell, upon which no trace of the surface markings is preserved.

Holopea, Hall.

The genus *Holopea* was referred to the Littorinidæ by Salter in 1859, and by Lindström in 1884, but to the Turbinidæ by Zittel in 1882. Fischer, in his "Manuel de Conchyliologie," remarks that it is composed of incongruous material, and that it has been circumscribed by Salter and Lindström so as to include some small shells apparently near to the Littorinidæ. Four species of gasteropoda from the Guelph formation of Ontario have been referred to *Holopea*, but two of these, viz., *H. Guelphensis* and *H. occidentalis*, are known only as casts of the interior of the shell, so that their generic position is still uncertain.

Holopea Harmonia, Billings.

Holopea Harmonia, Billings..1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 158, fig. 142.

Galt, John Richardson, 1857 : a single specimen with most of the test preserved on the last volution.

The salient feature in the type and only known specimen of *H. Harmonia*, as described by Billings, is the "wide flat band," which is stated to be "equal to a little more than one-third of the whole height of the whorl," around the middle of the last volution. This "band," however, is merely a very faint lateral compression of the centre of the last volution, but in every other respect the shape of the shell is essentially similar to that of the type of *H. Gracia*.

Holopea Guelphensis, Billings.

Holopea Guelphensis, Billings.....1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 159, fig. 143.
" " " .....1863. Geol. Canada, p. 343, fig. 351.
" " Nicholson....1875. Rep. Pal. Prov. Ont., p. 72, pl. 3, fig. 18.

Galt, A. Murray, 1847; Elora, D. Boyle, 1874; and Durham, J. Townsend, 1878-82: a few casts of the interior of the shell.

This species is very imperfectly characterized, and may be referable to *Polytropis* rather than to *Holopea*.

Holopea Gracia, Billings.

Plate 14, fig. 3.

Holopea Gracia, Billings.....1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 159.
" " Whiteaves .....1884. This volume, pt. 1, pl. 3, fig. 4.

Galt, E. Billings, 1857: a single cast of the interior of the shell. The base of this specimen was originally covered with the matrix, and in the original description of the species it is stated that the umbilicus and surface markings are unknown. This matrix has since been removed and the base of the cast found to be compressed convex exteriorly, and depressed in the centre, with a very narrow umbilicus partially filled by the inner lip below. Remains of the surface markings show that they consist of lines of growth that curve obliquely and somewhat convexly backward above, and concavely backward below. As stated on page 18 of the first part of the present volume, two specimens, which are probably very large individuals of this species, were collected by Mr. Townsend at Durham, between the years 1874 and 1882.

Holopea (?) occidentalis, Nicholson.

Holopea (?) occidentalis, Nicholson..1875. Rep. Pal. Prov. Ont., p. 85, fig. 00.

Elora, Nicholson. This species is not represented in the Museum of the Survey, and the writer has never seen a specimen of it. As stated on page 91, and, judging by the figure, it may have been based upon a cast of the interior of the shell of a large and high-spired variety of *Polytropis macrolineatus*.

Subulites ventricosus, Hall.

Subulites ventricosa, Hall.....1852. Pal. N. York, vol. II., p. 347, pl. 83, figs. 7, *a-b*.
" " Billings.....1863. Geol. Canada, p. 339, fig. 346.
" " Nicholson...1875. Rep. Pal. Prov. Ont., p. 71, pl. 3, fig. 5.

Galt, A. Murray, 1847, and E. Billings, 1857 ; Elora and Durham, J. Townsend, 1878-82 ; Hespeler, Nicholson.

Subulites compactus, Whiteaves.

Subulites compactus, Whiteaves..1884. This volume, pt. 1, p. 16, pls. 3, fig. 2, and 7, fig. 6.

This species was originally described from a single specimen collected at Durham, and there are now three other typical examples of it in the Museum of the Survey, one from Hespeler, one from Elora and one from Durham. Its principal characteristics are the slender, subfusiform contour of the shell, and the nearly cylindrical shape of the somewhat constricted outer volution, which is usually a little narrower than the one that immediately precedes it. The later volutions of the spire, too, are generally much broader than high.

Subulites compactus? Var.

Plate 14, figs. 4 and 5.

Six specimens of a small *Subulites*, collected by Mr. Townsend at Durham and now in the Survey Museum, differ from the type of *S. compactus* in the following particulars. They are still more slender in shape, not most tumid at the mid-length, and the outer volution of each is scarcely contracted but gently convex, a little more so than the one which precedes it. The last volution of the spire and sometimes the last but one, are usually higher than broad. It is doubtful whether these specimens (two of which are figured) should be regarded as a mere variety of *S. compactus*, or as a distinct species.

Opercula

of unknown genera and species.

A. Paucispiral opercula.

Plate 14, fig. 6.

A few paucispiral opercula, like those of recent species of *Natica* or *Littorina*, were collected by Mr. Townsend at Durham in 1884 and 1885.

These are described in some detail in a paper published in the Canadian Record of Science for December, 1891, and entitled "Notes on the occurrence of Paucispiral Opercula of Gasteropoda in the Guelph formation of Ontario." As there stated, they are "rather thin, nearly flat, but slightly concave externally and as slightly convex internally, broadly subovate, about one-fifth longer than broad, obtusely pointed at the end corresponding to the posterior angle of the mouth of the shell whose aperture they closed, *paucispiral* and composed of from two and a half to three rapidly expanding volutions, the nucleus being eccentric."* "Only the outer or concave surface of each of those opercula is exposed to view, the inner side being buried in the matrix." Figure 6 on Plate 14 represents the exterior of the largest and most perfect specimen known to the writer, of natural size. Its maximum length is twenty millimetres, and its greatest breadth sixteen. It is so highly dolomitized that it is difficult to estimate its exact thickness, but at the distance of a millimetre from the edge, at the somewhat truncated termination of the outer volution, its thickness is between one-half and three-quarters of a millimetre, though it seems to increase rapidly inward.

These opercula would seem to have belonged to shells that are referable either to the Naticidæ or to the Littorinidæ. At present there is no satisfactory evidence that the Naticidæ dated as far back in time as the Palæozoic era, but the Littorinidæ are said to be represented in the Silurian period by numerous species of *Holopea*. It has previously been shown that four nominal species of *Holopea* have been described from the Guelph formation in Canada, but the generic relations of *H. Guelphensis* are still very obscure, and it is most probable that *H. occidentalis* is a *Polytropis*

B. Supposed multispiral opercula.

Plate 15, figs. 4, 5, 5 a and 6.

Several specimens of an organism, which may be the operculum of some gasteropod, were collected at Elora and Durham by Messrs. Boyle and Townsend between the years 1878 and 1892. The most perfect of these organisms, such as the specimen represented by figure 4 on Plate 15, are elongate conical, nearly three times as long as broad and truncated at the larger end. Their internal structure, as shown in natural or artificial longitudinal sections, like that represented three times the natural size and somewhat diagrammatically by figure 6 on the same Plate, is very singular. It consists of an extremely elongated, slender, multispiral calcareous and solid central axis (*a*), which is everywhere surrounded by a second and correspondingly slender, solid and tightly enveloping calca-

*Rather than "subcentral," as stated in the paper referred to.

reous coil composed of from twenty to thirty sinistral volutions, in close contact (*b*), and this in its turn is enveloped in a thin calcareous outer layer or sheath (*c*). The volutions of the outer of these two shelly coils are flattened from back to front and narrow at the edges, so that in specimens such as the originals of figs. 5 and 5 *a*, in which the thin outer coating is not preserved, as is usually the case, it is only the outer edges of the volutions that are visible. At the larger end, the outer layer or sheath, when preserved, seems to project very slightly beyond the outer shelly coil and to form a raised rim around it, but in those specimens in which the outer layer is not preserved, the last volution of the outer coil appears to extend a little beyond the central axis, and to be ultimately truncated rectangularly, thus giving the appearance of a comparatively broad depression in the centre of the larger end, as represented by figure 5 *a*.

CEPHALOPODA.

Orthoceras Selwyni, Billings.

Orthoceras Selwini, Billings. 1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 161.

Galt, Dr. R. Bell, 1861 ; a very imperfect cast of part of the interior of the septate portion of the shell. The siphuncle is placed at a short distance from the margin and apparently moniliform, like that of *O. angulatum*, Wahlenberg, as figured by Foord, (figs. 7, *a-f*) on page 71 of the first part of his Catalogue of the Fossil Cephalopoda in the British Museum, but the surface markings are unknown. The only other specimen of this imperfectly characterized species that the writer has seen is an equally badly preserved cast of the interior of part of the septate portion of the shell, collected at Elora by Mr. Townsend and kindly presented to the Museum of the Survey by Mr. B. E. Walker, of Toronto.

Orthoceras crebescens, Hall.

Orthoceras crebescens, Hall		1867.	Twentieth Rep. Reg. N. Y. St. Cab. Nat. Hist., p. 354, pl. 19, figs. 1, 2 and 3.
"	"	Hall & Whitfield	1875. Rep. Geol. Surv. Ohio, vol. II., pt. 2, p. 148, pl. 9, fig. 2.
"	"	Whiteaves	1884. This volume, pt. 1, p. 37.

Hespeler, T. C. Weston, 1871, and Elora, Mr. James Gladstone, 1876 : the two specimens referred to on page 37 of the first part of this volume. Both of these are coarse and imperfect casts of the interior of the shell, upon which no traces of the surface markings are preserved.

Orthoceras medullare, Hall.

Orthoceras medullare, Hall.....1860. Rep. Progr. Geol. Surv. Wiscons. for 1859, p. 4.
" " " .....1867. Twenthieth Rep. Reg. N. Y. St. Cab. Nat. Hist., p. 353, pl. 20 (11), figs. 1 and 2.
" " Whiteaves.1884. This volume pt. 1, p. 37.

Elora, David Boyle, 1876: the specimen referred to on page 37 of the first part of this volume.

Orthoceras Scammoni, McChesney.

Orthoceras columnare, Hall.....1860. Rep. Progr. Geol. Surv. Wiscons. for 1859, p. 4. But apparently not *O. columnare*, Marklin, 1857.
" *Scammoni*, McChesney..1861. New Palæoz. Foss., p. 92. (Teste Hall.)
" *Hoyii*, " .. " " " " "
" *lineolatum*, " .. " " " " "
" *irregulare*, " .. " " " " "
" *angulatum*, Hall .....1867. Twentieth Rep. Reg. N. Y. St. Cab. Nat. Hist., p. 353, pl. 19 (10), figs. 10 and 11. But possibly not *O. angulatum*, Wahlenberg, 1827.
" *columnare*, Hall.....1870. Rev. ed. Twentieth Rep. Reg. N. Y. St. Cab. Nat. Hist., p. 411, pl. 19, figs. 4, 6 and 8.
" *angulatum*, Hall.....1870. Ibid., p. 413, pl. 19, figs. 10 and 11, and pl. 24, fig. 1.
" *orus*, Hall.....1877. In first ed. of S. A. Miller's Am. Pal. Foss., p. 245.
Probably also *Orthoceras Cadmus*, Billings, 1866, Cat. Silur. Foss. Anticosti, p. 83; acc. to Hall.

The specimen of *O. Cadmus* from Elora referred to on page 38 of the first part of the present volume, is a fragment of a longitudinally ribbed and fluted *Orthoceras*, not quite an inch and a half in its maximum length. Although identified with *O. Cadmus* by E. Billings himself, it is difficult to see how this fragment can be satisfactorily distinguished from the *O. Darwini*, Billings, of the Guelph formation, as that species is now understood, or from the *O. bellatulum*, Billings, from the Anticosti group of Anticosti.

A much more perfect specimen, which agrees perfectly with Hall's figures of *O. angulatum*, on Plate 19 of both editions of the Twentieth Regent's Report, was collected by Mr. Thomas G. Connon at the Irvine River, Elora, in 1887. This specimen, which has recently been presented to the Museum of the Survey by Mr. Connon, consists of a piece of the septate portion of the shell about five inches in length, and a

portion of the body chamber about an inch and a half long, but there is a piece missing between them, which, from the rate of tapering, is estimated at nearly two inches in length. Allowing two inches for the missing piece, the specimen, which even then is imperfect at both ends, could scarcely have been much less than eight inches and a half long. It has a considerable portion of the test preserved, especially at the smaller end, and the position of the siphuncle is clearly seen in two nearly transverse fractures. The surface markings consist of narrow and continuous longitudinal ridges, separated by rather wide intervals, and by numerous transverse raised lines between the ridges. The siphuncle is very nearly central.

In the Twentieth Regent's Report, Hall says that his *O. angulatum* "is probably the species described by Mr. McChesney, in a paper published in 1861, under the names *O. Scammoni*, *O. Hoyii*, *O. lineolatum*, *O. irregulare*, *O. Woodworthi*. The last one figured is a fragment less than an inch in length. A gutta-percha cast sent by Prof. Winchell under the name *O. Scammoni*, corresponds very well with specimens referred by me to *O. angulatum*. Should the species prove distinct from the European one, we may select a name from among those above cited." In a foot note to page 412 of the revised edition of that Report, he says also, in effect, that *O. angulatum*, Hall, *O. columnare*, Hall, *O. Scammoni*, McChesney, and *O. Cadmus*, Billings, are all probably the same species, and in the explanation of one of the figures of *O. angulatum*, in the same Report, it is stated that the character of its surface "is precisely like that of *O. cancellatum*, Hall, from the Niagara group of New York, and differs in no essential particular from the minute surface markings of *O. columnare*."

At different times no less than ten names have been given to this species, but, of these, *O. Scammoni*, McChesney, is here provisionally retained on the ground that it appears to be the first that is not pre-occupied. Mr. Foord's figures of English and Swedish specimens of *O. angulatum*, Wahlenberg, on page 71 of the first part of his catalogue of the Fossil Cephalopoda of the British Museum, represent shells that are distinctly curved, with sub marginal siphuncles, but his description of *O. canaliculatum*, Sowerby, applies remarkably well to the large Elora specimen here referred to *O. Scammoni*.

Orthoceras Darwini, Billings.

Orthoceras Darwini, Billings.....1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 161.

Cyrtoceras Myrice, Hall and Whitfield...1875. Geol. Surv. Ohio, vol. II., pt. 2, p. 149, pl. 8, fig. 9.

Orthoceras Darwini, Whiteaves.....1884. This volume, pt. 1, p. 38, pl. 6, figs. 2 and 2 *a*.
Cyrtoceras Myrice, Whiteaves.....1884. Ibid., p. 39, pl. 6, figs. 3 and 3 *a*.
Orthoceras Darwini, Foord.....1888. Cat. Foss. Cephal. Brit. Mus., pt. 1, p. 76, fig. 8.

The type of this species is the abnormally compressed and badly preserved cast of the interior of a shell collected by E. Billings in 1857 at Hespeler (then called New Hope), referred to on page 38 of the first part of the present volume and figured on Plate 6. Two additional specimens, both undistorted and well preserved casts of the interior of the shell, were collected by Mr. Townsend at Durham between the years 1878 and 1882, and one of these is figured on Plate 6 of the first part of the present volume under the name *Cyrtoceras Myrice*. This latter specimen is remarkably similar to Professor Blake's figure (Plate 7, fig. 1) of *O. angulatum* in the first part of his "British Fossil Cephalopoda," which Mr. Foord says represents *O. virgatum*, Sowerby. It seems to the writer that there is very little difference between *O. Darwini*, Billings, *O. bellatulum*, Billings, and *O. virgatum*. Sowerby. In the Museum of the Survey there is a small well preserved fragment of an *Orthoceras*, collected by Dr. R. Bell in 1862 from the Silurian (Upper Silurian) rocks at L'Anse à la Vieille, in the Baie des Chaleurs, which was identified with *O. virgatum*, Sowerby, by E. Billings. The surface ornamentation of this specimen consists of very narrow longitudinal ridges, with extremely fine, numerous and equidistant, transverse raised lines in the rather wide spaces between them, thus producing a cancellated appearance when the specimen is placed in a favourable light.

Orthoceras annulatum, var. Americanum.

Orthoceras annulatum (?), Hall.....1852. Pal. N. York, vol. II., p. 96, pl. 29, fig. 3.
Orthoceras annulatum, Hall.....1852. Ibid., p. 293, pl. 64 and pl. 65, fig. 3.
Orthoceras nodocostatum, McChesney.....1861. New Palæoz. Foss., p. 94, pl. 9, fig. 5.
Orthoceras undulatum, Billings.....1863. Geol. Canada, p. 325.
Orthoceras nodocostatum, McChesney.....1866. Trans. Chicago Ac. Nat. Sc., vol. I., p. 53, pl. 9, fig. 5.
Orthoceras annulatum, Hall.....1867. Twentieth Reg. Rep. N. York St. Cab. Nat. Hist., p. 351, pl. 20, figs. 4-6.
" " " .....1870. Ib., Rev. ed., p. 411, pl. 24, figs. 2-4.
" " Hall and Whitfield.....1875. Geol. Surv. Ohio, vol. II., pt. 2, p. 147, pl. 9, fig. 1.

Orthoceras annulatum, Whitfield.....1882. Geol. Surv. Wiscons., vol. IV., pt. 3, p. 298, pl. 19, fig. 1.
" " Whiteaves.....1884. This volume, pt. 1, p. 38.
Orthoceras annulatum, var. *Americanum*, Foord..1888. Cat. Foss. Cephal. Brit. Mus., pp. 56 and 57.

Hespeler and Elora: the two specimens referred to on page 38 of the first part of this volume.

Mr. Foord (op. cit., p. 57) thinks "that there exist sufficiently well-marked characters in the American form of *O. annulatum* to make it desirable to separate it from the European one," and he accordingly proposes a local designation for the former. "The characters," he says, "by which the variety *Americanum* is distinguished from its European allies reside in the surface ornaments. These consist of transverse elevations, partaking more of the nature of undulations than of ribs, and becoming in some places indistinct or even obliterated. The undulations are generally wider than the spaces separating them, being at a distance of about one-sixth the diameter. The fimbriæ are coarse, as in the variety *crassum*, but with their arches or festoons much wider apart. Three or four only occupy the spaces between the undulations. The longitudinal elevations are sometimes so strong as to cause a nodose appearance; but this is not always the case, as I have a specimen before me in which they are very obscure. The rate of tapering in a somewhat flattened example from Canada, measured along its broader diameter, is 1 in 17."

Gomphoceras septore, Hall.

Gomphoceras septoris, Hall.....1867. Twentieth Rep. Reg. N. Y. St. Cab. Nat. Hist., p. 350, figs. 9 and 10.
Cyrtoceras septoris, Hall and Whitfield..1875. Rep. Geol. Surv. Ohio, vol. II., pt. 2, p. 151.
" " Whiteaves.....1884. This volume, pt. 1, p. 39.

Elora, R. Bell, 1861: the cast of the body chamber referred to on page 39 of the first part of this volume. The six lateral sinuses and azygos dorsal sinus in the aperture of this specimen clearly show that it belongs to that section of the genus *Gomphoceras* which Hyatt has separated under the name *Septameroceras*.* This latter genus is said to be founded upon a species in the Museum of the Geological Survey of Canada, the *Gomphoceras inflatum* of Billings, but *G. inflatum* is a mere manuscript name, which has never been published, attached by Billings to a rough cast of the interior of the body chamber of a shell, with the aperture badly preserved, from the Silurian (Upper Silurian) rocks at L'Anse à la Barbe,

*Genera of Fossil Cephalopods. Proc. Boston Soc. Nat. Hist., April, 1883. vol. XXII., p. 278.

near Port Daniel, in the Baie des Chaleurs. Moreover, it is difficult to see how the specimen thus labelled is to be distinguished from *G. subgracile*, of the same rocks, or from *G. septore*.

Ascoceras Townsendii, Whiteaves.

Ascoceras Townsendi, Whiteaves..1884. This volume, pt. 1, p. 41, pl. 6, figs. 4 and 4 *a*.

The specimen collected by Mr. Townsend at Durham in 1883, and described on page 41 of the first part of this volume, is still the only example of this species that the writer has seen.

Cyrtoceras arcticameratum, Hall.

Cyrtoceras arcticameratum, Hall.....1852. Pal. N. York, vol. II., p. 349, pl. 84, figs. 7, *a-d*.
" " Billings.....1863. Geol. Canada, p. 340.

Galt, A. Murray, 1847, and E. Billings, 1857; Hespeler, E. Billings, 1867. These localities are given on the authority of E. Billings, in the "Geology of Canada," and the names of the collectors and dates at which the specimens were collected, on that of old sheets of printed labels prepared for use in the Museum of the Survey, but the writer has never seen a specimen of this species.

Cyrtoceras Orodes, Billings.

Plate 14, figs. 7, 8 a-b, and 9.

Cyrtoceras Orodes, Billings..1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 162.

Hespeler (New Hope), E. Billings, 1857: an imperfect cast of the interior of the shell. This specimen, which is the type of the species, but which has not previously been figured, is represented on Plate 14. In the original description of *C. Orodes* no mention is made of the siphuncle, but it is evidently exogastric and situated close to the margin of the venter.

Two specimens, which agree with the type of this species in general form, also, very nearly, as far as known, in the relative position of the siphuncle, were collected by Mr. Townsend at Durham between the years 1878 and 1882. One of these, the original of fig. 8, on Plate 14, is a well preserved but slightly distorted specimen of the septate portion of the shell, about three inches in maximum length, and with the test preserved. The surface is nearly smooth, and marked only with very fine and closely disposed transverse striæ and a few more distant and a little

coarser ones. This specimen was carefully ground down on the ventral side in such a way as to give a longitudinal section through the centre of the siphuncle and to show the edges of 22 septa, as represented in fig. 8*a*. These septa are about one millimetre apart at the smaller end, and four millimetres at the larger. Between the septa the siphuncle is not enlarged. The other specimen from Durham (fig. 9), which is a little over two inches and a half in its maximum length, consists of the greater part of the body chamber and the posterior half of the septate portion of the shell, both almost completely covered with the test. The venter and dorsum are very slightly compressed, and each of the beautifully preserved transverse striæ upon the test forms a very faint hyponomic sinus on the median line of the venter.

In 1890 Mr. Townsend obtained at Elora a large but not very well preserved specimen, nearly four inches and a-half in length, which is also belived to be referable to *C. Orodes*. It is somewhat compressed on the venter and dorsum, and its siphuncle is apparently exogastric and almost marginal. It is very similar, in general outline, to large specimens of *Oncoceras Pettiti*, Billings,* from the Niagara limestone at the North Gore, Grimsby, Ontario, but the siphuncle of the latter is inflated between the septa.

Phragmoceras Hector, Billings.

Phragmoceras Hector, Billings ..1862. Geol. Surv. Canada, Pal. Foss., vol. I., pt. 1, p. 163, fig. 147.

Hespeler and Galt, E. Billings, 1857 : one cast of the interior of the shell from each of these localities. The specimen figured by Billings is labelled Galt, not New Hope (or Hespeler as it is now called) as stated in the first volume of the "Palæozoic Fossils," and both specimens show the shape of the aperture.

Hyatt, in his "Genera of Fossil Cephalopods,"† maintains that *Phragmoceras* is a mere synonym of *Gomphoceras*, and divides the latter genus into six genera, based exclusively upon the characters of the aperture. Zittel, on the other hand, in the second volume of his "Handbuch der Palæontologie," places *Gomphoceras* in the family Orthoceratidæ and *Phragmoceras* in the Cyrtoceratidæ. Fischer, in his Manuel de Conchyliologie (1883) regards the two genera as distinct and places both in the Nautilidæ. The characters which have so long been used to distinguish *Phragmoceras* from *Gomphoceras* appear to the writer to be still valid and of more structural and systematic importance than the modifications of the aperture upon which Hyatt's six genera are based.

*Catalogue of the Silurian Fossils of the Island of Anticosti, p. 86.

†Proceedings of the Boston Soc. Nat. Hist., April 4, 1883, vol. XXII, p. 277.

Phragmceras Nestor, var. Canadense.

Phragmoceras Nestor, var. *Canadense*, Whitcaves..1884. This volume, pt. 1, p. 39, pl. 7, figs. 1, 1*a-b*.

Hespeler, Elora and Durham: the three casts of the interior of the shell described and illustrated in the first part of this volume.

Phragmoceras parvum, Hall and Whitfield.

Phragmoceras parvum, Hall & Whitfield..1875. Rep. Geo. Surv. Ohio, vol. II., pt. 2, p. 151, pl. 8, fig. 10.
" " Whiteaves.....1884. This volume, pt. 1, pt. 41, pl. 7, fig. 2.

Durham (not Hespeler, as inadvertently stated on page 41 of the first part of this volume) J. Townsend, 1881: two imperfect casts of the chamber of habitation.

Trochoceras Desplainense, McChesney.

Trochoceras Desplainensis, McChesney..1859. Descr. New. Sp. Foss Pal. rocks, &c., p. 68, pl. 8, fig. 1.
Trochoceras Desplainense, Hall.....1867. Twentieth Rep. Reg. N. Y. St. Cab. Nat. Hist., p. 359, pl. 16, figs. 8-10.
" " Whiteaves....1884. This volume, pt. 1, p. 36, pl. 5, fig. 5.

Hespeler, T. C. Weston, 1867: the two specimens referred to on page 36 of the first part of this volume. One of these shows that the position of the siphuncle is central, as represented by Hall in one of his figures of *T. Desplainense*. Elora, J. Townsend, 1885, a well preserved cast of the interior of the septate portion of the shell, a little more than an inch in its maximum diameter. In this specimen the sutures of the septa curve concavely forward and are everywhere crossed by the rather distant transverse ribs, which are directed obliquely backward, as in *T. Æneas*, Hall, which, however, is flattened on the sides. Professor Hyatt, who has seen these three specimens, thinks that they should be referred to his recently constituted genus *Peismoceras*.*

Discoceras Graftonense, Meek and Worthen. (Sp.)

Lituites Graftonensis, Meek & Worthen..1870. Proc. Ac. Nat. Sc. Philad., vol. XXII., p. 51.
" " " " ..Geol. Surv. Ill., vol. VI., p. 507, pl. 25, fig. 1.
" *multicostatus*, Whitfield.....1882. Geol. Wiscons., vol. IV., p. 303, pl. 20, fig. 7.

*Phylogeny of an Acquired Characteristic, p. 500.

Trocholites multicostatus, Whiteaves.....1884. This volume, pt. 1, p. 36, pl. 6, figs. 1 & 1*a*.

Discoceras Graftonense, Hyatt.....1894. Phylog. of an Acquir. Character., p. 501, pl. 8, figs. 21-23.

Elora, Dr. R. Bell, 1861; Hespeler, T. C. Weston, 1867 and 1871; Durham, J. Townsend, 1878-82: a few specimens from each of these localities. An additional and unusually fine specimen collected by Mr. Townsend at Edge Mills, Durham, in 1885, is nearly two inches and a half in its maximum diameter. It shows that the chamber of habitation occupies fully one-half of the outer volution, that the sutures of the septa are crossed by the ribs in much the same manner as those of the preceding species, and that the spaces between the ribs are filled with crowded lines of growth which are parallel to the ribs.

CRUSTACEA.

OSTRACODA.

Leperditia Balthica, var. Guelphica.

Leperditia Balthica (Hisinger) var. *Guelphica*, Jones..1891. Contr. Canad. Micro-Pal., pt. 3, p. 80, pl. 13, figs. 12, *a-b*, and 13, *a-c*.

Durham, J. Townsend, 1884; three single valves: Grand River at Aboyne, near Elora, J. Townsend, 1892; a right valve sixteen millimetres long.

Leperditia phaseolus, var. Guelphica.

Leperditia phaseolus (Hisinger), var. *Guelphica*, Jones..1891. Contr. Canad. Micro-Pal., pt. 3, p. 86, fig. 5.

Durham, J. Townsend, 1884; one right valve: Grand River at Aboyne, J. Townsend, 1892; a large left valve. All the specimens of this and of the preceding species have been kindly determined by Professor T. Rupert Jones, F.R.S.

TRILOBITA.

Calymene Blumenbachii, Brongniart.

Calymene Blumenbachii, Brongniart.....1822. Hist. Nat. Crust. Foss., p. 11, pl. 1, figs. 1*a-d*, and of subsequent British and European authors.

Calymene Niagarensis, Hall.....1843. Geol. Rep. 4th Distr. N York, p. 102, and fig. 3 on p. 101.
Calymene Blumenbachii var. *Niagarensis*, Hall..1852. Pal. N. York, vol. II., p. 307, pl. 67, figs. 11 and 12.
Calymene Blumenbachii, Billings.....1863. Geol. Canada, p. 340.
Calymene Niagarensis, Hall.....1867. Twentieth Rep. Reg. N. York St. Cab. Nat. Hist., p. 334.

On one of the tablets in the Museum of the Survey there are three imperfect and badly preserved specimens of a trilobite collected at Galt, two by A. Murray in 1847, and one by E. Billings in 1857, which were labelled with the name of this species by E. Billings, many years ago. These are evidently the specimens of *C. Blumenbachii* referred to on page 340 of the Geology of Canada. Two of them are coarse casts of the interior of the head and thorax, and one a similar cast of the thorax and pygidium.

Mr. Billings was of the opinion that *C. senaria*, Conrad, *C. Niagarensis*, Hall, and *C. platys*, Green, are synonymous with *C. Blumenbachii*, but Salter, in his Monograph of the British Trilobites, retains *C. senaria* as a distinct subspecies, although he places *C. Niagarensis*, Hall, among the synonyms of *C. Blumenbachii*. Exclusive of the trilobites from the Trenton and Hudson River formations which are generally referred to *C. senaria*, there are in the Museum of the Survey, specimens labelled *C. Blumenbachii* by E. Billings, from the Niagara limestone at Limehouse, Ontario; from the Anticosti group at six different localities on the island of Anticosti; from the Lower Helderberg rocks at Cap Bon Ami, near Dalhousie, New Brunswick; and from the Silurian (Upper Silurian) rocks at Arisaig, Nova Scotia. In the "Geology of Canada" (1863), *C. Blumenbachii* is recorded as occurring also in the Clinton formation at Flamborough West, near Dundas, Ontario; in the Niagara limestone at Thorold and Flamborough West; and in the limestones of the Anticosti Group at the Chatte River in the province of Quebec.

According to Lindström* this species was first described by Brunn in 1781 under the name *Trilobites tuberculatus*, and hence should be called *Calymmene tuberculata* (Brunn), as it is by Friedrich Schmidt† and some other recent writers upon European palæontology.

Ceraurus Niagarensis. Hall.

Ceraurus insignis (Beyrich) Hall..1852. Pal. N. York, vol. II., pp. 300 and 306, pls. 66. fig. 4, and 67, figs. 9 and 10.

*Ofversigt K. Vetenskaps-Ak. Forhandlingar, 1885, p. 63, pl. 16, fig. 9.

†Revision der Ostbaltischen Silurischen Trilobiten, in Mem. l'Ac. Imp. des Sc. de St. Petersbourg, Ser. VII., vol. 42, p. 13, pl. 1, figs. 1-7.

'*Cheirurus insigens* (Beyrich)" Billings..1866. Cat. Silur. Foss. Anticosti, p. 60.
Ceraurus Niagarensis, Hall.....1867. Twentieth Rep. Reg. N. Y. St. Cab. Nat. Hist., p. 376, pl. 21, fig. 10.
" " Whiteaves.....1884. This volume, pt. 1, p. 42.
Probably a variety of *Cheirurus insignis*, Beyrich, which, according to Salter, Mon. British Trilobites, p. 63, is a synonym for *C. bimucronatus*, Murchison, sp.

Hespeler, T. C. Weston, 1867: the two specimens of the glabella referred to on page 42 of the first part of this volume. These and a small cephalon from the Anticosti group at the south west point of that island, a large pygidium and imperfect glabella from the Niagara formation at Grimsby, and six small specimens from rocks of about the same age at Port Daniel in the Baie des Chaleurs, were identified many years ago by Mr. E. Billings with *Cheirurus insignis*, Beyrich. A nearly perfect and well preserved cast of the hypostoma of *C. Niagarensis* was recently collected by Mr. Townsend at Elora and is now in the Museum of the Survey.

Illænus Aboynensis. (N. Sp.)

Plate 15, figs. 7 and 8.

Cephalon broadly rounded in front, truncated behind, broader than long, and broadest posteriorly, moderately convex, most prominent a little in advance of its mid-length and somewhat flattened behind. Eyes of medium size, moderately prominent, each situated at a distance of about eight millimetres from the lateral and from the posterior margin; dorsal furrows indistinctly defined both posteriorly and centrally, but each furrow curves concavely forward and outward and terminates in a rather large shallow depression or pit at a short distance from the anterior margin. Facial suture not clearly seen in the only specimen collected: surface markings and characters of the genal angles unknown.

Pygidium not at all three lobed, regularly convex, but flatter and much more narrowly rounded than the cephalon.

The few specimens collected are too imperfect to admit of very exact measurements, but the cephalon and pygidium figured are both of the natural size.

Aboyne, near Elora, J. Townsend, 1892: An imperfect cast of the cephalon and casts of two detached pygidia.

Although based upon rather imperfect material, this trilobite seems to be quite distinct from any of the known species of *Illænus*. Its most salient character would appear to be the large depression at the anterior end of each of the dorsal furrows upon the cephalon.

PROETUS. (Species undeterminable.)

Durham, J. Townsend, 1882 : a single well preserved cast of a pygidium, which the writer has not been able to identify with any known species. This pygidium is nearly semicircular in outline, with a narrow, flat, smooth margin. Its axis is prominent, conical and marked with ten annulations, while the pleural ribs on each side are about nine in number.

EURYPTERIDA.

EURYPTERUS BOYLEI, Whiteaves.

Eurypterus Boylei, Whiteaves. 1884. This volume, pt. 1, p. 42, pl. 7, fig. 3.

Elora, David Boyle, 1881 : the specimen described and figured in the first part of this volume.

PALÆOZOIC FOSSILS.

VOL. III.

3. Systematic list, with references, of the fossils of the Hudson River or Cincinnati formation at Stony Mountain, Manitoba.

By J. F. Whiteaves.

In a letter written by Sir James Hector, dated Fort Carlton, December 14th, 1857, and published in the official report of Captain Palliser's Exploring Expedition,* the following passage occurs :—"At Stony Hill, about fifteen miles north-west from the Upper Fort, there is an isolated bluff of limestone, rising from the plain level to the height of eighty feet. The south and western exposures are abrupt and water worn, it having been at one time an island; and indeed, during the great floods which several times inundated the settlement, it has been one of the few spots upon which the inhabitants can take refuge, reaching it by means of boats. The beds of limestone are horizontal or nearly so, and are slightly different from those at Fort Garry in their mineral aspect, having a more crystalline fracture and the colour being of a reddish hue. No fossils can be discovered in newly fractured portions, but on the weathered surfaces a few obscure remains of fossils are to be seen projecting along with siliceous and gritty particles from a dull floury surface."

On the occasion of a short visit to this locality (now more generally known as Stony Mountain) in 1875, Dr. R. W. Ells noticed that pieces of limestone and shale thrown out while excavating for the foundation of the provincial penitentiary then in course of construction there, were full of fossils in a remarkably fine state of preservation, and made as large a collection of them as the time at his disposal would admit. Lists of most of the species represented in this collection and in one made at the same place by Dr. R. Bell in 1879, were contributed by the writer to the Report of Progress of this Survey for 1878-79 (pp. 49 and 50C), published in 1880, and it was there stated that "a large portion of the mass of Stony Mountain consists of limestones, with clayey partings, which are identical, both in their lithological and palæontological characters, with the well known

*Papers relative to the Explorations by Captain Palliser of that portion of British North America which lies between the north branch of the River Saskatchewan and the frontier of the United States, and between the Red River and the Rocky Mountains. London, 1859, page 21.

rocks of the Hudson River or Cincinnati group of southern Ohio and elsewhere." At the summit of the mountain these limestones pass into rich cream coloured, yellow or greyish white dolomites, but, as the writer had then seen no fossils from the latter, no opinion was expressed as to their age. A collection of the fossils of this locality, made by Mr. T. C. Weston in 1884, consists of about twelve species from these dolomites, which it will be convenient to distinguish as the upper beds, and of an unusually large number of those of the immediately underlying impure limestones or lower beds. This collection and a small series of fossils from the upper beds, obtained by Mr. Tyrrell in 1888, show that the fauna of the upper beds, and hence that of the whole of the rocks at Stony Mountain, are probably referable to the Hudson River or Cincinnati formation, which has not yet been definitely recognized at any other locality in Manitoba.

The Polyzoa and Ostracoda contained in Dr. Ells's and Mr. Weston's collections have been identified or described by Mr. E. O. Ulrich in the second part of the "Contributions to the Micro-Palæontology of the Cambro-Silurian rocks of Canada," published by this Survey in 1889, but no complete list of the fossils from Stony Mountain has yet been prepared. The present paper is an attempt to supply this deficiency, and consists of a systematic list of all the species from that locality which are now represented in the Museum of the Survey. As many of these fossils are common and well known species, it is not thought desirable to give an exhaustive list of synonyms of each, but only such references as are likely to be useful to students of Canadian geology.

ALGÆ.

Bythotrephis (like *B succulens*, Hall).

Cfr. *Buthotrephis succulens*, Hall..1847. Pal. N. York, vol. I., p. 62, pl. 22, figs. 2, *a-b*.

A single specimen, which is too imperfect to be determined satisfactorily but which agrees fairly well with the orginal description of this species, was collected from the summit of the upper beds by Mr. J. B. Tyrrell in 1889.

CŒLENTERATA.

ANTHOZOA.

STREPTELASMA RUSTICUM, Billings. (Sp.)

Streptelasma corniculum, Edw. & Haime..1851. Mon. Polyp. Foss. Terr. Palæoz., p. 398, pl. 7, figs. 4, 4 *a*, and 4 *b*. But probably not *S. corniculum*, Hall.

Petraia rustica, Billings.....1858. Rep. Progr. Geol. Surv. Canada for 1857, p. 168.

Streptelasma corniculum, Nicholson.....1875. Rep. Pal. Prov. Ont., p. 26.

" " Rominger.....1876. Geol. Surv. Mich., Palæont., Foss. Cor. p. 151 (pars). The specimens from the Hudson River formation only.

Lower beds, Dr. R. W. Ells, 1875, and T. C. Weston, 1884: several specimens of a small coral, which appears to be a broad, short form of this species. Upper beds, T. C. Weston, 1884: apparently not so common.

STREPTELASMA RUSTICUM, var. TRILOBATUM. (Var. nov.)

Corallum resembling that of the preceding species, but still broader at the summit and longitudinally trilobate, the lobes being broad and rounded, and the furrows between them comparatively narrow and not very deep.

Lower beds, T. C. Weston, 1884: twelve good specimens. Upper beds, T. C. Weston, 1884: one specimen.

FAVOSITES PROLIFICUS, Billings.

Favosites prolificus, Billings..1866. Geol. Surv. Canada, Cat. Silur. Foss. Anticosti, p. 6.

Lower beds, Dr. R. W. Ells, 1875, (one large specimen) and T. C. Weston, 1884, (three smaller specimens). Four small specimens which are also probably referable to this species, were collected in the upper beds by Mr. Weston in 1884. The large specimen collected by Dr. Ells is labelled "*Favosites prolificus*" in Mr. Billings's own handwriting. It is fully ten inches in its maximum diameter but nowhere quite three inches in height. Its corallites are polygonal, nearly uniform in size and average about two millimetres in diameter. The tabulæ are very numerous, complete and placed close together. The mural pores, which were first noticed by Mr. Lambe, are very well preserved and situated close to

the angles of the corallites. It is doubtful, however, whether *F. prolificus* should be retained as a distinct species or as a mere local variety of *F. Gothlandicus*.

Protaræa vetusta, Hall.

Porites? vetusta, Hall.....1847. Pal. N. York, vol. I., p. 71, pl. 25, figs. **5**, *a-b*.
Protarœa vetusta, Edw. & Haine..1851. Mon. Polyp. Foss. Terr. Palæoz.., p. 208, pl. 14, figs. 6 and 6 *a*.

Lower beds, T. C. Weston, 1874: a rather small but perfect and well preserved specimen.

HYDROMEDUSÆ.

Beatricea undulata, Billings.

Beatricea undulata, Billings..1857. Geol. Surv. Canada, Rep. Progr. 1853-56, p. 344, and (1865) Can. Nat., Sec. Ser., vol. II., p. 405, fig. 1.

Upper beds, T. C. Weston, 1884, three specimens, and A. M. Charles, 1884, one specimen.

Beatricea nodulosa, Billings.

Beatricea nodulosa, Billings.....1857. Geol. Surv. Canada, Rep. Progr. 1853-56, p. 344.
" " Nicholson...1866. Mon. Brit. Stromatop., p. 86, pl. 8, figs. 1-8.

Upper beds, T. C. Weston, 1884: one silicified specimen, which appears to be referable to this species, though its internal structure is almost obliterated.

ECHINODERMATA.

CRINOIDEA.

Glyptocrinus. (Species undeterminable).

Lower beds, T. C. Weston, 1884: a piece of a column only, about four inches and a half in length, which is referred to this genus solely on account of its resemblance to the column of *G. ramulosus*, as figured by E. Billings on plate VII. (figs. 2, *a-f*) of the fourth decade of "Canadian Organic Remains," published by this Survey.

MOLLUSCOIDEA.

POLYZOA.

Proboscina auloporoides, Nicholson. (Sp.)

Alecto auloporoides, Nicholson.....1875. Rep. Geol. Surv. Ohio, vol. II., pt. 2, p. 267, pl. 25, figs. 2 and 2, *a-b*.
Proboscina auloporoides, Ulrich.....1889. Geol. Surv. Canada. Contr. Micro-Palæont. Cambro-Silur. rocks, &c., vol. I., pt. 2, p. 28.
Stomatopora auloporides, S. A. Miller.1889. N. Am. Geol. and Palæont., p. 325.

Lower beds, T. C. Weston, 1884: "a small and rather badly preserved fragment."

Proboscina frondosa, Nicholson. (Sp.)

Alecto frondosa, Nicholson.....1875. Rep. Geol. Surv. Ohio, vol. II., pt. 2, p. 266, pl. 25, figs. 3 and 3, *a-b*.
Proboscina frondosa, Ulrich.....1889. Geol. Surv. Canada, Contr. Micro Palæont. Cambro-Silur. rocks, &c., vol. I., pt. 2, p. 28.
Stomatopora frondosa, S. A. Miller..1889. N. Am. Geol. and Palæont., p. 325.

Lower beds, T. C. Weston, 1884: a single specimen.

Monticulipora parasitica, var. plana.

Monticulipora parasitica, var. *plana*, Ulrich..1889. Geol. Surv. Canada, Contr. Micro-Palæont. Cambro-Silur. rocks, &c., vol. I., pt. 2, p. 28.

Lower beds, T. C. Weston, 1884: one specimen.

Homotrypella gracilis, Nicholson. (Sp.)

Chætetes gracilis, Nicholson.....1874. Quart. Journ. Geol. Soc. Lond., vol. XXX., p. 504, pl. 29, figs. 7 and 7 *a*.
" " " .....1875. Rep. Geol. Surv. Ohio, vol. II., pt. 2, p. 198, pl. 21, figs. 8, and 8, *a-b*.
" " " .....1876. Ann. and Mag. Nat. Hist., Ser. 4, vol. 28, p. 90, pl. 5, fig. 13.
Monticulipora (Heterotrypa) gracilis, Nicholson..1881. Struct. and Aff. Genus Monticulipora, &c., p. 125, fig. 20., and pl2, figs. 1 and 1, *a-b*.

Batostomella gracilis, Ulrich.....1889. Geol. Surv. Canada, Contr. Micro-Palæont. Cambro-Silur. rocks, &c., vol. I., pt. 2, p. 35.

Homotrypella gracilis, Ulrich.....1893. Bryozoa Lower Silur. Minn. (in vol. III. Final Rep. Geol. and Nat. Hist. Surv. Minn.), p. 228.

Lower beds, T. C. Weston, 1884: "several fragments."

Bythopora delicatula, Nicholson. (Sp.)

Chætetes delicatulus, Nicholson..1875. Rep. Geol. Surv. Ohio, vol. II., pt. 2, p. 199, pl. 21, figs. 9 and 9, *a*.

" " Whiteaves.1880. Geo. Surv. Canada, Rep. Progr. 1878-79, p. 49C.

Bythopora (?) delicatula, Ulrich.1889. Geol. Surv. Canada, Contr. Micro-Palæont. Cambro-Silur. rocks, &c., p. 36.

Lower beds, Dr. R. W. Ells, 1875: one specimen.

Bythopora striata, Ulrich.

Bythopora striata, Ulrich..1889. Geol. Surv. Canada, Contr. Micro-Palæont. Cambro-Silur. rocks, &c., p. 36.

Lower beds, Dr. R. W. Ells, 1875: one specimen.

Petigopora scabiosa, Ulrich.

Petigopora scabiosa, Ulrich..1889. Geol. Surv. Canada, Contr. Micro-Palæont. Cambro-Silur. rocks, &c., p. 34.

Lower beds, Dr. R. W. Ells, 1875, one specimen, and T. C. Weston, 1884, two specimens.

Monotrypella quadrata, Rominger. (Sp.)

Chætetes quadrata, Rominger.....1866. Proc. Philad. Acad. Nat. Sc., p. 116.

Chætetes rhombicus, Nicholson.....1874. Quart. Journ. Geol. Soc. Lond., vol. XXX., p. 507, pl. 29, figs. 11, *a-b*.

" " " .....1875. Rep. Geol. Surv. Ohio, vol. II., pt. 2, p. 201, pl. 21, figs. 12 and 12, *a*.

" " " .....1876. Ann. & Mag. Nat. Hist. Ser. 4, vol. XVIII., p. 86, pl. 5, figs. 1, *a-b*.

Monticulipora rectangularis, Whitfield..1878. Ann. Rep. Geol. Surv. Wiscons. for 1877, p. 70.

" " " .1882. Geol. Wiscon., vol. IV., p. 249, pl. 11, figs. 11 and 12.

Monticulipora (Monotrypa) quadrata, Nicholson..... ..1881. Structure and Aff. Genus Monticulipora, &c., p. 179, fig. 36.
Monotrypella quadrata, Ulrich. .. ..1889. Geol. Surv. Canada, Contr. Micro-Palæont. Cambro-Silur. rocks, &c., vol. I, pt. 2, p. 36.

Lower beds, T. C. Weston, 1884: "several fragments."

Batostoma Manitobense, Ulrich.

Batostoma Manitobense, Ulrich..1889. Geol. Surv. Canada, Contr. Micro-Palæont. Cambro-Silur. rocks, &c., p. 33, pl. 9, figs. 3, 3, *a-c*.

Lower beds, T. C. Weston and A. McCharles, 1884: "several small examples."

Arthroclema angulare, Ulrich.

Arthroclema angulare, Ulrich..1889. Geol. Surv. Canada, Contr. Micro-Palæont. Cambro-Silur. rocks, &c., p. 45.
" " " ..1890. Geol. Surv. Illinois, vol. VIII., p. 641, pl. 29, figs. 6, *a-b*.

Lower beds, Dr. R. W. Ells, 1875, and T. C. Weston, 1884: "several segments."

Helopora Harrisii, James.

Helopora Harrisii, James..1883. The Palæontologist, No. 7, p. 59, pl. 2, figs. 2*a-b*.
" " Ulrich..1889. Geol. Surv. Canada, Contr. Micro-Palæont. Cambro-Silur. rocks, &c., p. 45.

Lower beds, Dr. R. W. Ells, 1875, and T. C. Weston, 1884: "a number of very slender segments."

Sceptropora facula, Ulrich.

Sceptropora facula, Ulrich..1888. Am. Geologist, vol. I., p. 229.
" " " ..1889. Geol. Surv. Canada, Contr. Micro-Palæont. Cambro-Silur. rocks, &c., p. 46, figs. 2, *a-d*.

Lower beds, Dr. R. W. Ells, 1875, and T. C. Weston: "detached egments," abundant.

Ptilodictya Whiteavesii, Ulrich.

Ptilodictya Whiteavesii, Ulrich..1889. Geol. Surv. Canada, Contr. Micro-Palæont. Cambro.Silur. rocks, &c., p. 44, pl. VIII., figs. 1, 1, *a-e*.

Lower beds, T. C. Weston and A. McCharles, 1884 : one comparatively large and two small specimens.

Dicranopora fragilis, Billings. (Sp.)

Ptilodictya fragilis, Billings..1886. Geol. Surv. Canada, Cat. Lower Silur. Foss. Anticosti, p. 9.

Stictopora fragilis, Whitfield..1882. Geol. Wiscons., vol. IV., p. 253, pl. 2, fig. 24.

Dicranopora fragilis, Ulrich..1889. Geol. Surv. Canada, Contr. Micro-Palæont. Cambro-Silur. rocks, &c., p. 40.

Lower beds, T. C. Weston, 1884 : "several segments, more less complete."

Dicranopora emacerata, Nicholson. (Sp.)

Ptilodictya emacerata, Nicholson..1875. Ann. & Mag. Nat. Hist., Ser. 4, vol. XV., p. 179, pl. 14, figs. 5, *a-b*.

" " " ..Report Geol. Surv. Ohio, vol. II., pt. 2, p. 261, pl. 25, figs. 5 and 5, *a-b*.

Dicranopora emacerata, Ulrich. ..1889. Geol. Surv. Canada, Contr. Micro-Palæont. Cambro-Silur. rocks, &c., p. 40.

Lower beds, T. C. Weston, 1884 : "a single imperfect segment."

Goniotrypa bilateralis, Ulrich.

Goniotrypa bilateralis, Ulrich..1889. Geol. Surv. Canada, Contr. Micro-Palæont. Cambro-Silur. rocks, &c., p. 41, figs. 1, 2 and 3, and pl. 9, fig. 1.

Lower beds, Dr. R. W. Ells, 1875, and T. C. Weston, 1884 : seven or eight detached segments.

Pachydictya hexagonalis, Ulrich.

Pachydictya hexagonalis, Ulrich..1889. Geol. Surv. Canada, Contr. Micro-Palæont. Cambro-Silur. rocks, &c., p. 42, pl. 9, figs. 2, 2, *a-c*.

Lower beds, T. C. Weston, 1884 : one specimen.

BRACHIOPODA.

DINOBOLUS. (Species indeterminable.)

Upper beds, T. C. Weston, 1884: a large but very imperfect single valve, the maximum breadth of which is nearly two inches and a half. Not a vestige of the umbo or beak, but only the anterior and least instructive half of the valve is preserved.

STROPHOMENA INCURVATA (?) Shepard.

Producta incurvata, Shepard....1838. Am. Journ. Sc. and Arts, vol. XXXIV., p. 144, figs. 1 and 2.
Orthis incurvata, Castelneau....1843. Essai sur le Syst. Silur. de l'Ameriq. Septentr., p. 38.
Strophomena convexa, Owen.....1844. Geol. Expl. Iowa, Wiscons. and Ill., p. 70, pl. 17, fig. 2.
Leptæna filitexta, Hall.....1847. Pal. N. York, vol. I., p. 3, pl. 31B, figs. 3 *a-f*.
Strophomena filitexta, Billings..1856. Canad. Nat. and Geologist, vol. I., p. 203, figs. 1 and 2.
" " " ..1863. Geol. Canada, p. 164, fig. 142.
Strophomena incurvata (Shepard), Winchell & Schuchert.....1893. Lower Silur. Brach. Minn., p. 385, pl. 30, figs. 36-40.

Lower beds, T. C. Weston, 1884: a specimen showing only the exterior of the dorsal valve, so that according to Mr. Schuchert, by whom it has been examined, it is doubtful whether it should be referred to this species, or to *S. neglecta*, James.

STROPHOMENA FLUCTUOSA, Billings.

Strophomena fluctuosa, Billings.....1860. Canad. Nat. and Geol., vol. V., p. 57.
" " " .....1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 123, figs. 102, *a-b*.
" " " .....1863. Geol. Canada, p. 209, fig. 207.
" " Hall.....1892. Pal. N. York, vol. VIII., pt. 1, p. 251, pl. 11A, figs. 4 and 5.
" " Winchell & Schuchert..1893. Lower Silur. Brach. Minn. p. 395, pl. 31, figs. 14-17.

Lower beds, Dr. R. W. Ells, 1875, a dorsal valve, showing the characteristic shape and surface markings; and T. C. Weston, 1884, a dorsal valve with the inner surface exposed and showing all the characters of the interior of that valve.

RAFINESQUINA CERES, Billings. (Sp.)

Strophomena Ceres, Billings..1860. Canad. Nat. and Geol., vol. V., p.54.
" " " ..1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 119.

Probably a variety of *R. alternata* (Conrad).

Lower beds, T. C. Weston, 1884: two perfect and several imperfect specimens.

LEPTÆNA NITENS, Billings. (Sp.).

Strophomena nitens, Billings..1860. Canad. Nat. and Geol., vol. V., p. 53.
" " " ..1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 118, figs. 97 and 97 *a*.

Lower beds, Dr. R. W. Ells, 1875, and T. C. Weston, 1884: abundant.

On page 413 of "the Lower Silurian Brachiopoda of Minnesota," * by N. H. Winchell and Charles Schuchert, the following passage occurs. "In Anticosti *Strophomena nutans*, Billings, occurs, which as far as external characters are concerned, appears to be identical with specimens from Wilmington, Illinois, examined by one of the writers. The interiors of these show them to be a species of *Leptæna*, Dalman, and they are apparently closely related to *L. unicostata*." The specimens of *S. nitens* from Anticosti in the Museum of the Survey do not show any of the characters of the interior of either valve, but, in a perfect example of that species from Charleton Point, there is a single rib, larger than any of the others, in the median line of the ventral valve, as in the typical form of *L. unicostata*.

ORTHIS (DINORTHIS) PROAVITA, Winchell and Schuchert.

Orthis subquadrata, Whiteaves (as of Hall)..1880. Geol. Surv. Canada, Rep. Progr. 1878-79, p. 50 C.
Orthis proavita, Winchell & Schuchert.....1892. Amer. Geologist, vol. IX., p. 290.
" " " .....1892. Bull. Minn. Ac. Nat. Sc., vol. III., p. 332, pl. 5, figs. 18-21.
" " " .....1893. Lower Silur. Brach. Minn., p. 431, pl. 32, figs. 51-57.

Lower beds, Dr. R. W. Ells, 1875, Dr. R. Bell, 1879, and T. C. Weston, 1884: abundant, large and well preserved. Upper beds, T. C. Weston, 1884: numerous good casts of the interior of one or both valves. The late Mr. E. Billings, who had seen the specimens collected by Dr. Ells at Stony Mountain, regarded them as a coarsely ribbed variety of *Orthis subquadrata*, Hall.

*Extracted from vol. III., of the Final Report of the Minnesota Geological Survey

Orthis (Dalmanella) testudinaria, Dalman.

Orthis testudinaria, Dalman...1828. Kongl. Svenska Vet.-Acad. Handl. for 1827, p. 115, pl. 2, fig. 4.
" " Conrad...1839. Ann. Rep. N. Y. Geol. Surv., p. 63.
Orthis striatula, Emmons.....1842. Geol. N. York, Rep. Second Distr., p. 394, fig. 3.
Orthis testudinaria (?) Emmons.1842. Ibidem, p. 404, fig. 4.
Orthis testudinaria, Hall.....1847. Pal. N. York, vol. I., p. 117, pl. 32, fig. 1, and p. 288, pl. 79, fig. 4.
" " Billings...1856. Canad. Nat. and Geol., vol. I., p. 40, fig. 1.
" " " ...1863. Geol. Canada, p. 165, fig. 144.
(And of numerous North American and European palæontologists.)

Lower beds, Dr. R. W. Ells, 1875, Dr. R. Bell, 1879, and T. C. Weston, 1884: abundant. Upper beds, T. C. Weston, 1884: numerous natural casts of the interior of the valves.

Rhynchotrema inæquivalvis, Castelneau. (Sp.)

Spirifer inæquivalvis, Castelneau....1843. Essai sur le Systeme Silur. de l'Ameriq. Septentr., p. 40, pl. 14, fig. 8.
Atrypa increbescens (partim), Hall...1847. Pal. N. York, vol. I., pp. 146, 289, pl. 33, figs. 13, *a-h*.
Rhynchonella increbescens (partim), Billings.....Canad. Nat. and Geol., vol. I., p. 207, figs. 11-14.
Rhynchonella increbescens, Billings...1863. Geol. Canada, p. 18, fig. 153.
Rhynchotrema inequivalvis, Winchell & Schuchert.....1893. Lower Silur. Brachiop. Minn., p. 459, pl. 34, figs. 9-25.

Upper beds, T. C. Weston, 1884: well preserved natural casts of the interior of two perfect shells.

Rhynchotrema capax, Conrad. (Sp.)

Atrypa capax, Conrad.....1842. Journ. Ac. Nat. Sc. Phil., vol. VIII., p. 264, pl. 14, fig. 21.
Atrypa increbescens (partim) Hall.....1847. Pal. N. York, vol. I., p. 146, pl. 33, figs. 13 *i*, and 13, *k-y*.
" " " Billings....1856. Canad. Nat. and Geol., vol. I, p 207, figs. 15-16.
Rhynchonella increbescens (partim) Hall...1862. Geol. Wiscons., vol. I., p. 55, figs. 5-7.
Rhynchonella capax, Billings.....1863. Geol. Canada, p. 211, figs. 213, *a-c*.
Rhynchotrema capax, Winchell and Schuchert.....1893. Lower Silur. Brachiop. Minn., p. 462, (which see for a complete list of synonyms of this species) pl.34,figs.30-3

Lower beds, Dr. R. W. Ells, 1875, Dr. R. Bell, 1879, and T. C. W es ton, 1884: large, abundant and well preserved. Upper beds, T. C. Weston, 1884: several fine natural casts of the interior of shells of this species.

Rhynchonella Anticostiensis, Billings.

Rhynchonella Anticostiensis, Billings.....1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 142, figs. 119, *a-c*.
" " " .....1863. Geol. Canada, p. 211, figs. 212, *a-c*.
Rhynchonella (?) Anticostiensis, Winchell & Schuchert.....1893. Lower Silur. Brachiop. Minn., p. 464, figs. 34, *a-c*.

Lower beds, T. C. Weston, 1884: five specimens with the test preserved. Upper beds, T. C. Weston, 1884: three natural casts of the interior of the shell.

MOLLUSCA.

PELECYPODA.

Byssonychia obesa, Ulrich.

Byssonychia obesa, Ulrich..1893. Rep. Geol. Surv. Ohio, vol. VII., p. 630, pl. 45, figs. 10-12.

Lower beds, T. C. Weston, 1884: a cast of the interior of the closed valves, which has been identified with this species by Mr. Ulrich.

Plethocardia. (Sp. nov. ?)

"Like *P. suberecta*, Ulrich, but anterior side too imperfect for certainty. On the other hand, the general aspect is decidedly like that of *Whitella megambona*, Whitfield, sp." Ulrich, in letter dated April 4, 1894.

Lower beds, T. C. Weston, 1884: an imperfect cast of the interior of a specimen with the valves closed.

GASTEROPODA.*

Pleurotomaria bicincta, Hall. (Sp.)

Murchisonia bicincta, Hall.....1847. Pal. N. York, vol. I., p. 177, pl. 38, figs. 5 *a-h*, but not *M. bicincta*, McCoy, 1844.

*All the species of Gasteropoda in this list are represented in the Survey collection by mere casts of the interior of the shell.

Murchisonia bicincta, Salter .....1859. Geol. Surv. Canada, Canad. Org. Rem., Dec. 1, p. 19, pl. 4, figs. 5, 6 and 7. But not *M. bicincta*, McCoy.

Murchisonia Milleri, Hall.....1877. In first ed. of S. A. Miller's Amer. Palæoz. Foss.. p. 244.

Pleurotomaria bicincta (Hall) Lindström..1884. Silur. Gastrop. and Pterop. Gotland, p. 106, pl. 8, figs. 15-25.

Lower beds, T. C. Weston, 1884: five specimens which appear to be referable either to this species, or possibly to *M. modesta*, Billings, from the Hudson River formation of the Island of Anticosti.

Pleurotomaria. (Species uncertain.)

Lower beds, T. C. Weston, 1884: three badly preserved casts of the interior of shells, either of which may be briefly described as nearly lenticular, three times as broad as high, with a very slightly elevated spire, an acutely angulated periphery, and an umbilicus occupying about one-third of the diameter of the base. Similar specimens, from Division 1 of the Anticosti Group, at Junction Cliff, Anticosti, in the Museum of the Survey, are labelled "*Pleurotomaria acuta*, Sowerby," apparently on the authority of the late Mr. E. Billings. The writer, however, has failed to find any mention of that species in the second edition of Morris's "Catalogue of British Fossils" (1854), in Dr. Bigsby's "Thesaurus Siluricus" (1868), or in the first volume of Etheridge's "Fossils of the British Islands (1888), but the name *P. acuta* was given to an English Carboniferous fossil by Professor John Phillips in 1836, in the second volume of the "Geology of Yorkshire."

Murchisonia bellicincta, Hall.

Murchisonia bellicincta, Hall.....1847. Pal. N. York, vol. I., p. 179, pl. 39, figs. 1, *a-c*.

" " Billings....1863. Geol. Canada, p. 183, fig. 177.

" " Nicholson..1875. Rep. Pal. Prov. Ont., p. 18, and p. 19, fig. 7 *a*.

Lower beds, T. C. Weston, 1884: several very imperfect specimens.

Murchisonia gracilis, Hall.

Murchisonia gracilis, Hall.....1847. Pal. N. York, vol. I., p. 181, pl. 39, figs. 4, *a-c*.

" " Salter.....1859. Geol. Surv. Can., Can. Org. Rem., Dec. 1, p. 22, pl. 5, fig. 1.

" " Billings....1863. Geol. Canada, p. 183, fig. 178.

" " Nicholson..1875. Rep. Pal. Prov. Ont., p. 18, & p. 19, fig. 7*c*.

Lower beds, Dr. R. W. Ells, 1875 (one specimen), and T. C. Weston, 1884 (six specimens).

Bellerophon bilobatus, Sowerby.

Bellerophon bilobatus, Sowerby..1839. In Murchison's Silur. Syst., p. 643, pl. 19, fig. 13.
" " Emmons..1842. Geol. N. York, pt. 2, p. 393, and p. 392, fig. 6.
" " Hall.....1847. Pal. N. York, vol. I., p. 184, pl. 40, figs. 3, *a-d*.
" " Billings...1863. Geol. Canada, p. 184, figs. 180, *a-b*.

Lower beds, T. C. Weston, 1884 : four small specimens, two of which are much distorted.

Cyrtolites compressus, Conrad.

Phragmolites compressus, Conrad..1838. Ann. Rep. N. York St., p. 119.
Cyrtolites compressus, Hall.....1847. Pal. N. York, vol. I., p. 188, pl. 40, figs. 2, *a-f*.
" " Whiteaves..1893. Can. Rec. Sc., vol. V., p. 323.

Lower beds, T. C. Weston, 1884 : five specimens. This species has been collected also from the (Galena) Trenton limestone at Lower Fort Garry by Dr. R. Bell in 1880, and at East Selkirk by A. MacCharles in 1884.

Cyclora minuta, Hall.

Cyclora minuta, Hall..1845. Am. Journ. Sc. and Arts, vol. XLVIII., p. 294.

Lower beds, T. C. Weston, 1884 ; one specimen, which has been identified with this species by Mr. E. O. Ulrich.

Trochonema umbilicatum, Hall. (Sp.)

Pleurotomaria umbilicata, Hall.....1847. Pal. N. York, vol. I., pp. 43 and 175, pls. 10, figs. 9, *a-b*, and 38, figs. 1, *a-g*.
Trochonema umbilicata, Salter.....1859. Geol. Surv. Can., Can. Org. Rem., Dec. 1, p. 27, pl. 6, fig. 3.
" " Billings.....1863. Geol. Canada, p. 145, fig. 92.
Trochonema umbilicatum, Whiteaves.....1893. Can. Rec. Sc., vol. V., p. 323.

Lower beds, T. C. Weston, 1884 : several specimens. In Manitoba, *T. umbilicatum* has also been collected from the (Galena) Trenton at the Dog's Head, Lake Winnipeg, by T. C. Weston in 1884, and at Snake, Berens and Commissioner's Islands, in that lake, by D. B. Dowling and L. M. Lambe in 1890.

CEPHALOPODA.

Orthoceras Selkirkense, Whiteaves.

Orthoceras Selkirkense, Whiteaves..1892. Trans. Royal Soc. Canada, vol. IX., sect. 4. p. 82, pl. 8, figs. 2, 2, *a-b*.

Lower beds, T. C. Weston, 1884: a crushed and badly preserved specimen which appears to be referable to this species.

Ascoceras. (Species undeterminable).

Lower beds, Dr. R. W. Ells, 1875: an imperfect and badly preserved cast of the interior of a shell belonging to this genus.

Litoceras insigne, Whiteaves.

Apsidoceras insigne, Whiteaves...1890. Trans. Royal Soc. Canada, vol. VII., sect. 4, p. 82, pl. 17.

Lower beds: the type of the species, a large specimen, which was kindly presented to the Museum of the Survey in 1889 by the Manitoba Historical and Scientific Society. This specimen is probably not an *Apsidoceras*, as it was at one time supposed to be, and is here provisionally referred to *Litoceras* on the ground that it is clearly congeneric with the *Nautilus Hercules* of Billings, which Hyatt has recently referred to that genus, though with a query.*

CRUSTACEA.

OSTRACODA.

Leperditia subcylindrica, Ulrich.

Leperditia subcylindrica, Ulrich....1889. Geol. Surv. Canada, Contr. Micro-Pal. Cambro-Silur. rocks, &c., pt. 2, p. 49, pl. 9, figs. 4, *a-b*.

Lower beds, Dr. R. W. Ells, 1875, or T. C. Weston, 1884: one "complete carapace."

*Phylogeny of an Acquired Characteristic, p. 480.

Aparchites minutissimus, Hall. (Sp.)

Leperditia (Isochilina) minutissima, Hall.....1871. Descr. New. Spec. Foss. Hudson R. Gr., &c., p. 7.
" " " ".....1872. 24th Reg. Rep. N.Y. St. Cab. Nat. Hist., p. 231, pl. 8, fig. 13.
" " " Hall & Whitfield..1875. Rep. Geol. Surv. Ohio, vol. II., pt. 2, p. 102, pl. 4, fig. 4.
Aparchites minutissimus, Ulrich.....1889. Geol. Surv. Canada, Contr. Micro-Pal. Cambro-Silur. rocks, &c., pt. 2, p. 49.

Lower beds, Dr. R. W. Ells, 1875: the right valve figured by Mr. Ulrich.

Primitiella unicornis, Ulrich.

Leperditia unicornis, Ulrich...1879. Journ. Cincinn. Soc. Nat. Hist., vol. II., p. 10, pl. 7, fig. 4.
Aparchites unicornis, Ulrich..1889. Geol. Surv. Canada, Contr. Micro-Pal. Cambro-Silur. rocks, &c., pt. 2, p. 50, pl. 9, fig. 11.
Primitiella unicornis, Ulrich..1894. Lower Silur. Ostrac. Minn., p. 649, pl. 43, figs. 75-77.

Lower beds, the single valve referred to in Mr. Ulrich's Report published by this Survey.

Primitia lativia, Ulrich.

Primitia lativia, Ulrich..1889. Geol. Surv. Canada, Contr. Micro-Pal. Cambro-Silur. rocks, &c., pt. 2, p. 50, pl. 9, figs. 8 and 8*a*.

Lower beds, R. W. Ells, 1875, and T. C. Weston, 1884; several single valves.

Primitia (?) (? Beyrichia) parallela, Ulrich.

Primitia ? (? Beyrichia) parallela, Ulrich..1889. Geol. Surv. Canada, Contr. Micro-Pal. Cambro-Silur. rocks, &c., pt. 2, p. 51, pl. 9, figs. 7 and 7*a*.

Lower beds, T. C. Weston, 1884: two imperfect valves.

Eurychilina Manitobensis, Ulrich.

Eurychilina Manitobensis, Ulrich..1889. Geol. Surv. Canada, Contr. Micro-Pal. Cambro-Silur. rocks, pt. 2, p. 53, pl. 9, figs. 10 and 10 *a*.

Lower beds, Dr. R. W. Ells, 1875, one valve showing the exterior; and T. C. Weston, 1884, one valve showing the interior.

Tetradella quadrilirata, var. simplex.

Beyrichia quadrilirata, Hall & Whitfield..1875. Rep. Geol. Surv. Ohio, vol. II., pt. 2, p. 105, pl. 4, figs. 6 and 7.
Strepula quadrilirata, Ulrich .....1889. Geol. Surv. Canada, Contr. Micro-Pal. Cambro-Silur. rocks, &c., pt. 2, p. 54, pl. 9, fig. 12.
Tetradella quadrilirata, Ulrich.....1890. Journ. Cincinn. Soc. Nat. Hist., vol. XIII., p. 122.
" " " .....1894. Lower Silur. Ostrac. Minn., p. 679, pl. 46, figs. 1-11.

Lower beds, T. C. Weston, 1884: a single valve, the type of the variety *simplex*, Ulrich.

Tetradella lunatifera, Ulrich.

Strepula lunatifera, Ulrich.....1889. Geol. Surv. Canada, Contr. Micro-Pal. Cambro-Silur. rocks, &c., pt. 2, p. 56, pl. 9, figs. 14 *a-b*.
Tetradella lunatifera, Ulrich...1890. Journ. Cincinn. Soc. Nat. Hist., vol. XIII., p. 112.
" " " ...1894. Lower Silur. Ostrac. Minn., p. 680, figs. 51 *a-b*, and pl. 46, figs. 12-14.

Lower beds, Dr. R. W. Ells, 1875: a single valve.

On page 48 of the second part of the "Contributions to the Micro-Palæontology of the Cambro-Silurian rocks of Canada, published by this Survey in 1889, a specimen from the lower beds, collected by Mr. Weston in 1884, is referred by Mr. Ulrich to *Bythocypris cylindrica* (Hall), but, on page 688 of his memoir on the Lower Silurian Ostracoda of Minnesota, published in 1894, Mr. Ulrich states that he is "now fully convinced" that this identification is incorrect.

TRILOBITA.

Calymene callicephala, Green.

Calymene callicephala, Green.....1832. Monogr. Trilobites N. America, p. 30, cast 2.
Calymene senaria, Meek.....1873. Geol. Surv. Ohio, Palæont., vol. I., p. 173, pl. 14, figs. 14, *a-f*.
Calymmene callicephala, Clarke..1894. Lower Silur. Trilobites Minn., p. 699.

Lower beds, T. C. Weston, 1884 : the cephalon, minus the free cheeks, of a very small specimen, which is referred to this species with some doubt. It is most probably identical with the species so common in the Hudson River or Cincinnati formation of Ohio, for which, according to Dr. Clarke, the name *C. callicephala* must be retained, but it may possibly be referable to the *C. senaria*, Conrad, of the Trenton limestone. Its anterior margin seems to be regularly rounded, rather than shovel shaped.

Cheirurus Icarus, Billings.

Cheirurus Icarus, Billings.....1859. Canad. Nat. and Geol., vol. V., p. 67.
" " " .....1863. Geology of Canada, p. 219, fig. 231.
Ceraurus Icarus, Meek .....1873. Geol. Surv. Ohio, Palæont., vol. I., p. 162, pl. 14, figs. 11, *a-c*.
Cheirurus Icarus, (Billings), Whiteaves..1880. Geol. Surv. Canada, Rep. Progr. for 1878-79, p. 50 C.

Lower beds, Dr. R. Bell, 1879, one pygidium, and T. C. Weston, 1884, two pygidia.

Encrinurus raricostatus, Walcott.

Encrinurus raricostatus, Walcott.....1877. Adv. sheets Thirty-first Reg. Rep. N.Y. St. Cab. Nat. Hist., p. 16.
" " " .....1879. Thirty-first Reg. Rep. N.Y. St. Cab. Nat. Hist., p. 69.
" " Safford & Vogdes....1887. Proc. Acad. Nat. Sc. Philad., p. 167, fig. 2.

Lower beds, T. C. Weston, 1884 : one pygidium, and portions of two glabellæ that may be referable to this species, which was based upon a pygidium only.

PLATE IX.

Unless otherwise stated, all the figures are of natural size.

MONOMERELLA DURHAMENSIS (page 57).

Figure 1. The larger portion of the specimen described, showing the cardinal area of the pedicle valve and the cast of the interior of the brachial valve. The other part of this specimen is represented on Plate XV., fig. 1.

RHINOBOLUS GALTENSIS (?) Billings. Var. (page 61).

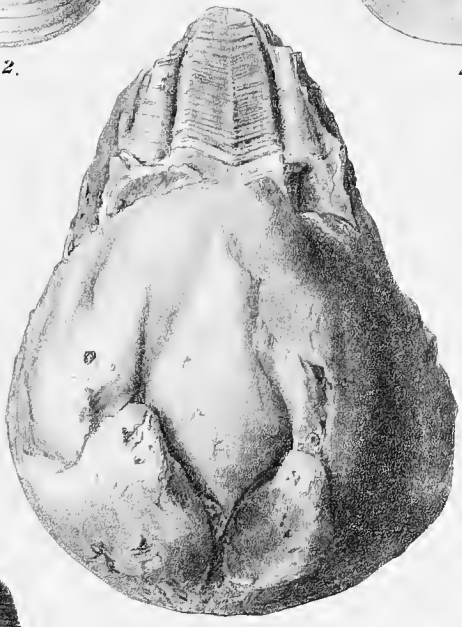
Figure 2. Exterior of the pedicle valve of the only specimen known to the writer
" 2*a*. Interior of the same.

PENTAMERUS OCCIDENTALIS, Hall (page 65).

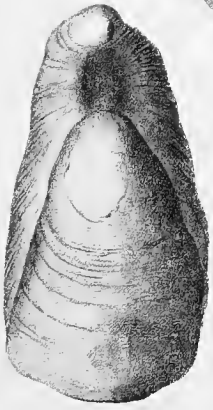
Figure 3. Dorsal view of an unusually perfect specimen of this species.
" 3*a*. Lateral view of the same.

2.

2a.



1.



3.

3a.

PLATE X.

TRIMERELLA OHIOENSIS, Meek (page 54).

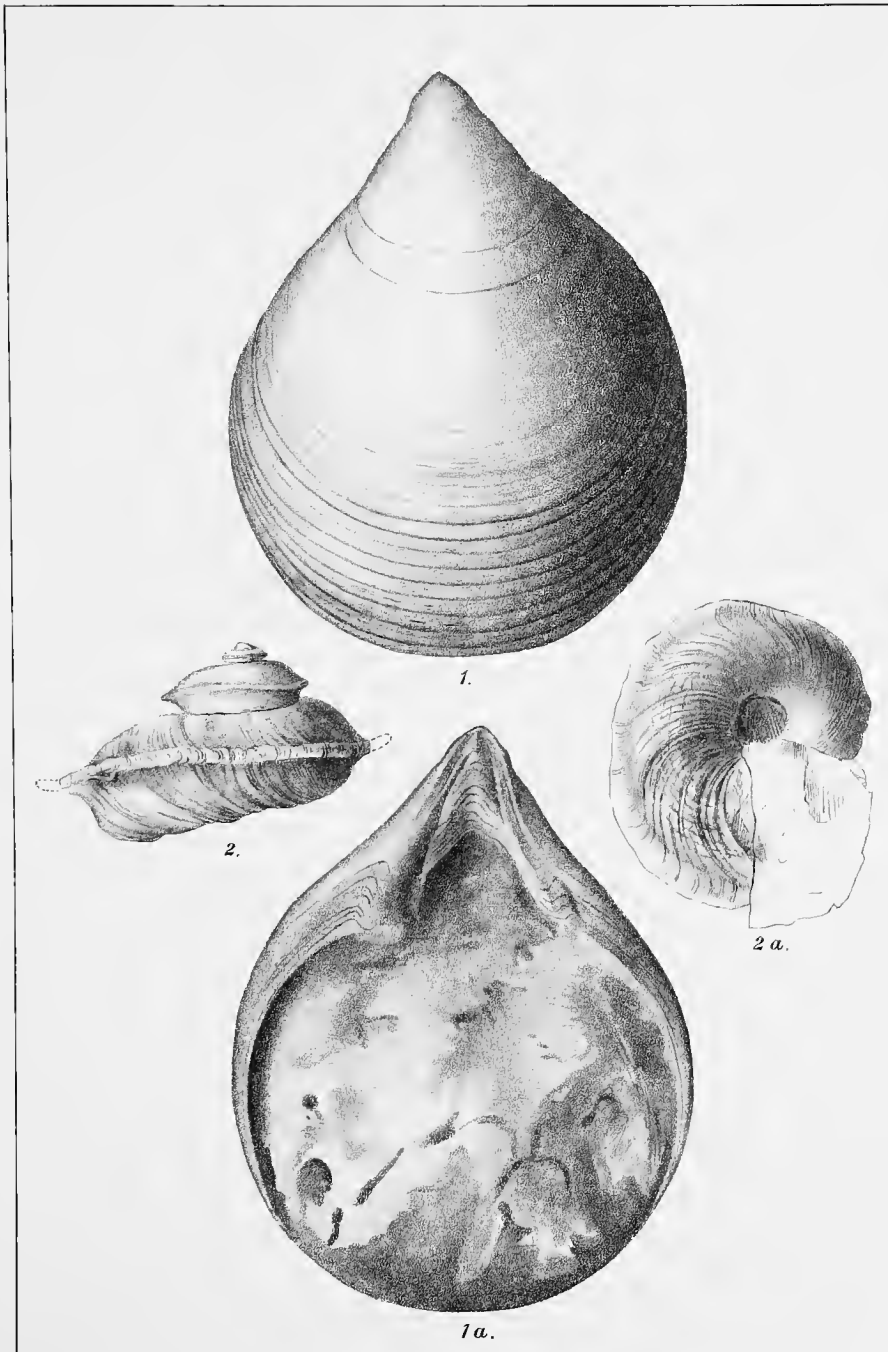
Figure 1. Exterior of an unusually perfect and well preserved pedicle valve, from Durham, supposed to be referable to this species.

" 1*a*. Interior of the same.

PLEUROTOMARIA HALEI, Hall. Var. (page 73).

Figure 2. Lateral view of a specimen from Durham, showing the height of the spire, and position and comparative prominence of the alate slit band.

" 2*a*. Umbilical side of the same.



1.

2.

2 a.

1 a.

PLATE XI.

CAPULUS CANADENSIS (page 69).

Figure 1. Cast of the interior of the shell of the only specimen known to the writer, as seen from above.

PLEUROTOMARIA VALERIA, Billings (page 71).

Figure 2. View of a gutta percha impression of a natural mould of the apical side of a specimen from Durham.

" 3. View of a similar impression of the umbilical side of a specimen from Belwood.

PLEUROTOMARIA VELARIS (page 72).

Figure 4. Lateral view of the type and only known specimen of this species.

" 4*a*. Umbilical side of the same.

PLEUROTOMARIA ELORA, Billings (page 74).

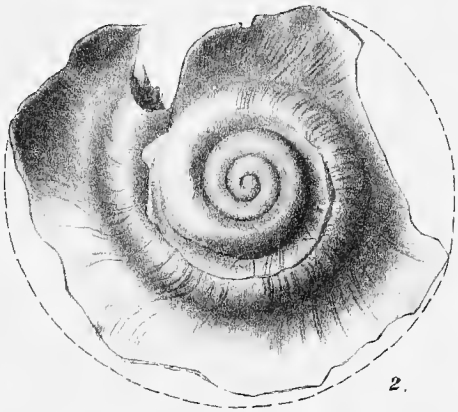
Figure 5. Gutta percha impression of a natural mould of the apical side of a specimen from Durham, showing portions of some of the peripheral spines.

" 6. Umbilical side of a specimen from Aboyne, showing six long peripheral spines and part of another.

PLEUROTOMARIA GALTENSIS, Billings (page 75).

Figure 7. Lateral view of a gutta percha impression of a natural mould of a specimen of this species, from Belwood.

1.

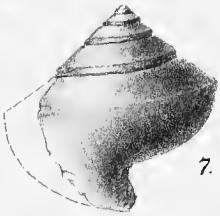


2.

4a.

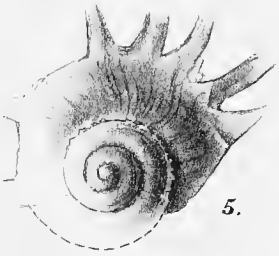
4.

3.



7.

6.



5.

PLATE XII.

PLEUROTOMARIA DEIOPEIA, Billings (page 75).

Figure 1. Side view of the type of this species, from Elora.

" 1*a*. Portion of the exterior of the test, three times the natural size, to show the surface markings.

PLEUROTOMARIA VIOLA, Billings (page 76).

Figure 2. Umbilical side of the type of this species, from Galt.

MURCHISONIA. Species uncertain. (page 79).

Figure 3. One of the specimens from Durham referred to in the text.

MURCHISONIA TURRITIFORMIS, Hall (page 84).

Figure 4. Side view of an unusually well preserved specimen of this species, from Elora.

MURCHISONIA BIVITTATA, Hall (page 82).

Figure 5. Gutta percha impression of a natural mould of the exterior of a shell of this species, from Belwood.

" 6. Natural and longitudinal section of the upper part of a shell of this species, from Belwood, showing the transverse, concave, calcareous partitions of the earlier volutions of the spire.

LOXOPLOCUS SOLUTUS (page 84).

Figure 7. Side view of an impression in wax from a natural mould of the exterior of a shell of this species, from Elora.

" 8. Wax impression of a similar mould of a specimen from Belwood.

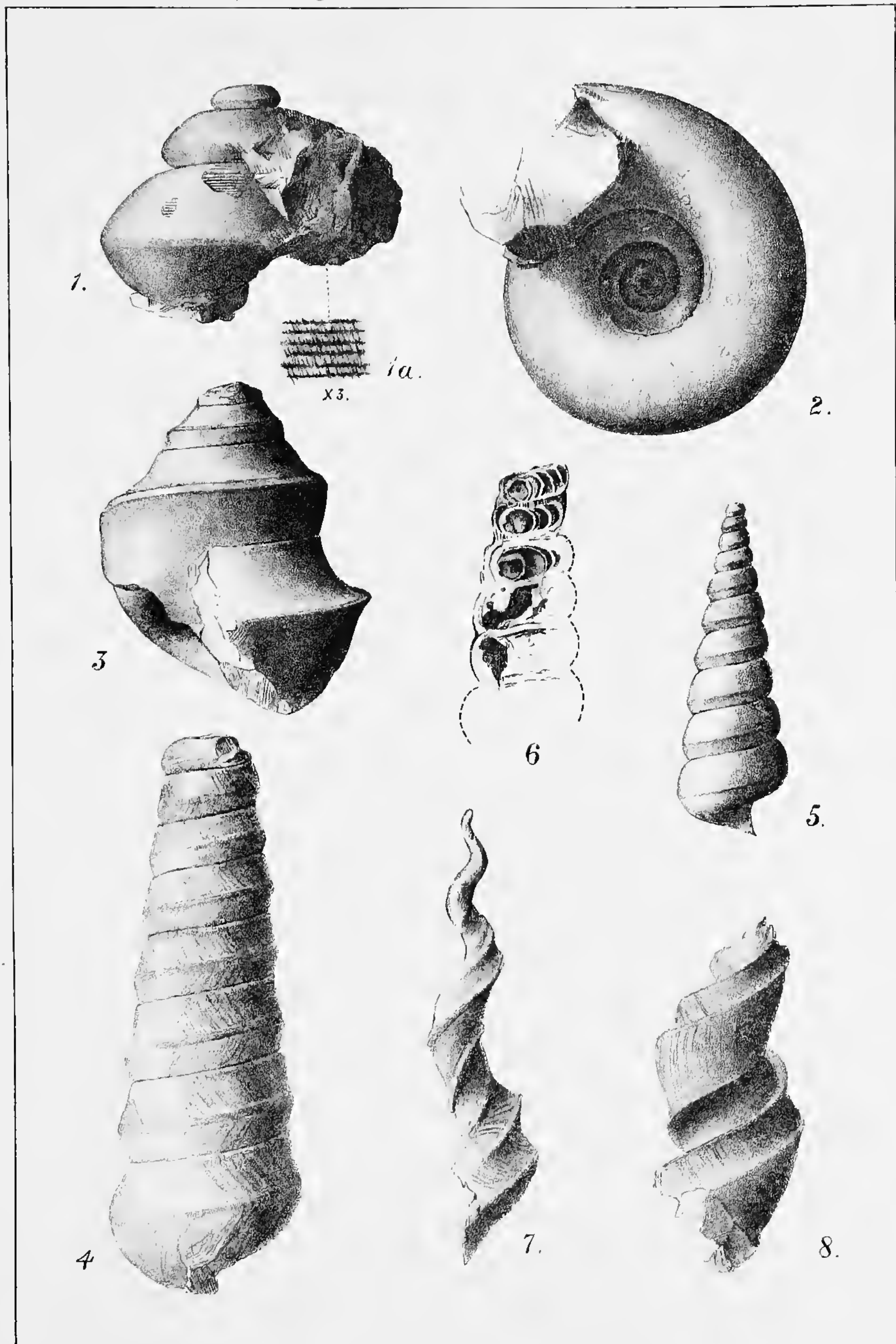

1.
1a.
x3.
2.
3
6
5.
4
7.
8.

PLATE XIII

EUOMPHALUS INORNATUS (page 85).

Figure 1. Cast of the interior of a shell of this species, from Durham.

LOXONEMA MAGNUM, Whitfield. Var. (page 87).

Figure 2. Side view of a specimen from Elora.

PYCNOMPHALUS SOLARIOIDES, Hall. Sp. (page 88).

Figure 3. Apical side of a cast of the interior of a shell of this species, from Durham.

" 3*a*. Lateral view of the same.

" 4. Wax impression of a natural mould of the exterior of the umbilical side of a shell of this species, from Belwood, shewing the thickening of the lip on the columellar side of the almost closed umbilicus.

" 5. Umbilical side of a cast of the interior of a specimen from Belwood, shewing that the umbilicus is deep and rather wide, when no vestige of the test or of the spiral ridge around the umbilicus is preserved.

" 6. Vertical section of a specimen from Durham, shewing the test of the inner side of the volutions, and the very prominent spiral ridge around the umbilicus.

" 7. Umbilical side of a cast of the interior of the shell from Durham, with the umbilicus almost filled by the base of the spiral ridge and a cast of the remainder of the ridge.

" 8. Umbilical side of a similarly preserved but smaller specimen from Durham.

POLYTROPIS SULCATUS, Hall. Sp. (page 89).

Figure 9. Gutta percha impression of a natural mould of the exterior of a shell of this species, from Belwood.

" 9*a*. Umbilical side of the same.

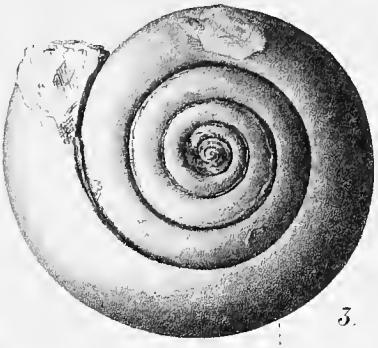
POLYTROPIS PARVULUS (page 92).

Figure 10. The type and only known specimen of this species, from Durham.

" 10*a*. Umbilical side of the same.

1.

2.



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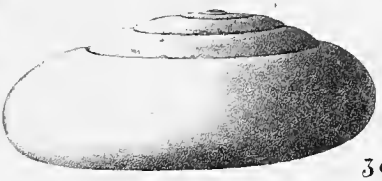

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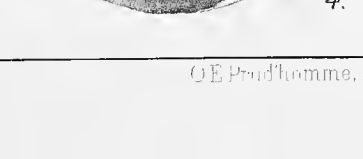

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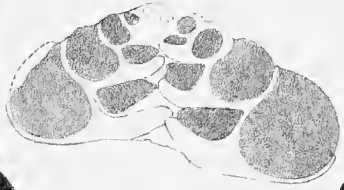

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9.

10 a.

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PLATE XIV.

POLYTROPIS DURHAMENSIS (page 91).

Figure 1. Gutta percha impression of a natural mould of the exterior of the apical side of a shell of this species, from Durham.

" 2. Umbilical side of a specimen with the test preserved, from Durham.

HOLOPEA GRACIA, Billings, (page 95).

Figure 3. Umbilical side of the original type of this species, from Galt.

SUBULITES COMPACTUS? Var. (page 96).

Figure 4. A small specimen from Durham, twice the natural size.

" 5. Another specimen from the same locality.

PAUCISPIRAL OPERCULUM (page 96).

Figure 6. Exterior of the largest and most perfect specimen known to the writer.

CYRTOCERAS ORODES, Billings, (page 103).

Figure 7. Ventral view of the original type of this species, from Hespeler. The dotted lines indicate the position of the siphuncle.

" 7*a*. Outline of a transverse section of the same, showing the position of the siphuncle.

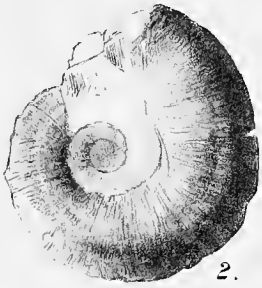
" 8. Dorsal view of a specimen from Durham, supposed to be referable to this species, with the test preserved, to shew the surface markings.

" 8*a*. Ventral view of the same, ground down to show the septa and siphuncle.

" 8*b*. Outline of transverse section of the same, at the larger end.

" 9. Ventral view of another specimen from Durham, also supposed to be referable to this species, with the test preserved, and showing the faint hyponomic sinuses of the incremental striæ of the test.

1.



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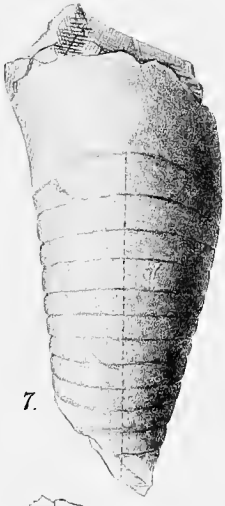

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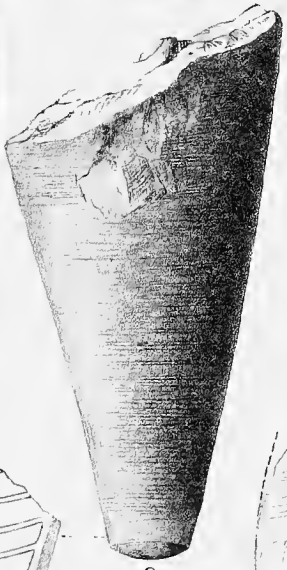

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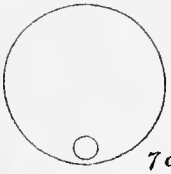

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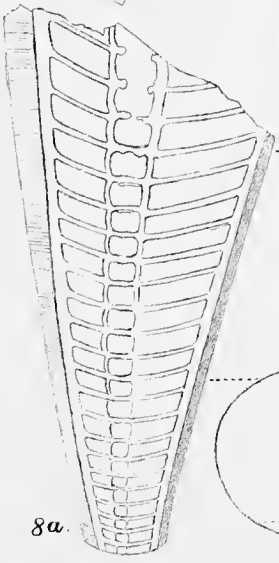

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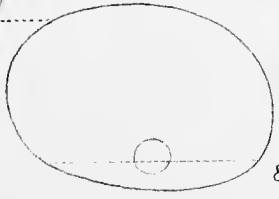

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9.

PLATE XV.

Monomerella Durhamensis (page 57).

Figure 1. Interior of the brachial valve, drawn partly from the actual test preserved on the smaller portion of the specimen represented on Plate IX, fig. 1, and partly from a gutta percha mould of the cast of the interior of that valve.

Rhinobolus Galtensis, Billings. Sp. (page 59).

Figure 2. Interior of the brachial valve, from a gutta percha mould of the cast of the interior of that valve, from Galt, represented upside down by figure 152, on page 168, of the first volume of the "Palæozoic Fossils."

Ilionia Galtensis (page 68).

Figure 3. An unusually perfect and well preserved left valve of this species, drawn from a gutta percha impression of a natural mould of the exterior of that valve, from Elora.

Supposed Multispiral Opercula (page 97).

Figure 4. Side view of one of these supposed opercula, from Elora, with the thin calcareous outer layer or sheath preserved.

" 5. Similar view of a large specimen, from Elora, with the outer layer not preserved.

" 5*a*. View of the larger end of the same.

" 6. Longitudinal section of one of these opercula, three times the natural size, and slightly restored: *a*, the narrow, solid, multispiral, central axis; *b*, a second slender, solid and tightly enveloping calcareous coil; and *c*, the thin outer layer or sheath.

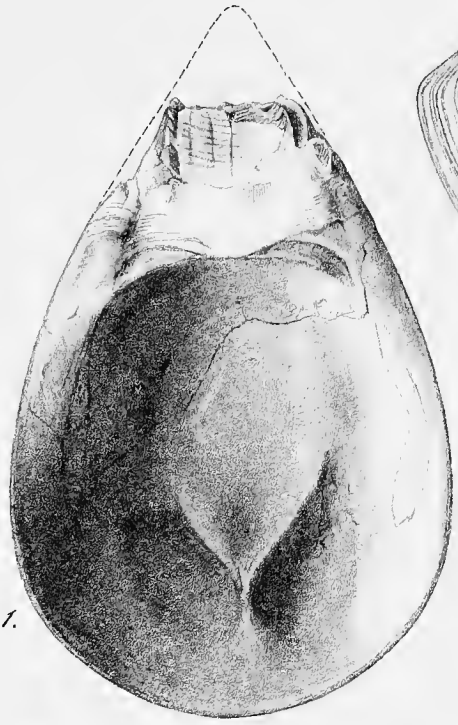
Illænus Aboynensis (page 108).

Figure 7. Imperfect cephalon of this species, from Aboyne, near Elora.

" 8. Pygidium of the same.

Pleurotomaria Townsendii (page 77).

Figure 9. Side view of the most perfect specimen known to the writer, drawn from a wax impression of a natural mould of the exterior of a specimen from Durham, the slit band from the mould itself.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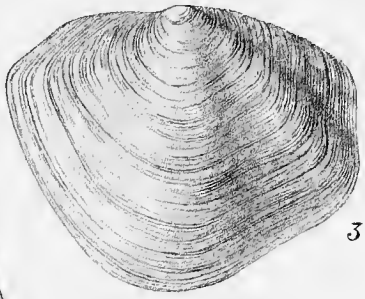
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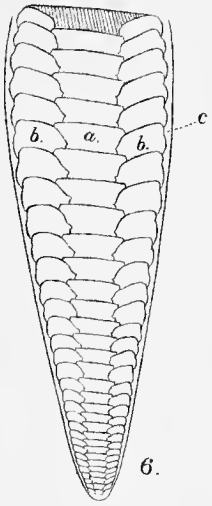

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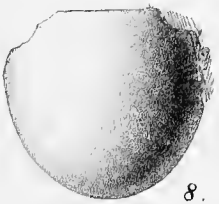
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GEOLOGICAL SURVEY OF CANADA

GEORGE M. DAWSON, C.M.G., LL.D., F.R.S., DEPUTY HEAD AND DIRECTOR

PALÆOZOIC FOSSILS

VOL. III., PART III.

4. The fossils of the Galena-Trenton and Black River formations of Lake Winnipeg and its vicinity

BY

J. F. WHITEAVES, F.G.S., F.R.S.C., ETC.

Palæontologist and Zoologist to the Survey

OTTAWA

PRINTED BY S. E. DAWSON, PRINTER TO THE QUEEN'S MOST EXCELLENT MAJESTY

APRIL, 1897

No. 615.

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No. 615.

The present report, which constitutes the third part of the third volume of "Palæozoic Fossils" now in course of publication by this Survey, consists of a systematic list of all the species from the Galena-Trenton and Black River formations of Lake Winnipeg and its vicinity, in the Museum of the Survey, with descriptions and illustrations of such as seem to be new.

The drawings for the figures and plates illustrating this report have been made from nature by Mr. L. M. Lambe, F.G.S.

GEORGE M. DAWSON.

Geological Survey of Canada,
Ottawa, 16th February, 1897.

PALÆOZOIC FOSSILS.

VOL. III.

4. The Fossils of the Galena-Trenton and Black River formations of Lake Winnipeg and its vicinity.

By J. F. Whiteaves.

The existence of highly fossiliferous limestones on the western shore of Lake Winnipeg and in the Red River valley north of the United States boundary line has long been known to geologists.

On Lake Winnipeg these limestones appear to have been first observed north of the Saskatchewan, in 1819, by Sir John Richardson, when accompanying the members of the first Franklin expedition, as naturalist, on their journey to the polar sea.

In the early part of the "Narrative" of this expedition, it is stated that the party entered Lake Winnipeg, from Norway House, on the night of the seventh of October, 1819, that they spent some time in examining the north and part of the north-west shores of the lake on the eighth and on the morning of the ninth of October of that year, that they sailed for the Saskatchewan at two p.m. on the ninth of October, and reached the mouth of that river, preparatory to its ascent, on the midnight following.

In another publication,* Richardson says that the strata at the First and Second Rocky Points on the west shore of Lake Winnipeg, north of the Saskatchewan, "contain many gigantic Orthoceratites, some of which have been described by Mr. Stokes in the Geological Transactions." These Orthoceratites, therefore, would seem to have been collected upon the eighth or ninth of October, 1819, though Dr. Fitton, in an appendix to the narrative of Captain Back's Arctic Land Expedition, says that they were collected in 1820.

However this may be, in an Appendix to the Narrative of Franklin's first expedition, Richardson says that cliffs of bluish and yellowish grey limestone "appear on the west side of Limestone Bay, and continue to bound the lake as far as the mouth of the Saskatchewan, and, as we have

*Journal of a Boat Voyage through Rupert's Land to the Arctic Sea, vol. I. (London, 1851), p. 65.

been informed, down the whole of its western shore." This limestone, he adds, "which extends over a vast tract of country, probably belongs to the great series of limestone formations under the green sand and above the new red sandstone." In another part* of this Appendix, he states that Professor Jameson, who had been requested to "examine the specimens of limestone collected on the shores of Lake Winnipeg and in the Cumberland House district, obligingly sent the following note:—The specimens of limestone received from you contain examples of the following fossil organic remains:

1. Limestone with *encrinites*. The encrinites are in fragments.
2. Limestone with *orthoceratites*.
3. Limestone with *terebratulæ*.
4. Limestone with *caryophyllites*.
5. Limestone with *lingulæ*.

These fossils would seem to intimate that the rocks in which they are contained belong to the Mountain limestone formation, by many referred to the transition, by others to the oldest or deepest part of the secondary class of rocks."

On Franklin's second expedition to the shores of the polar sea, in 1825-27, which Richardson also accompanied as naturalist, the party proceeded *via* Fort William, the Lake of the Woods, Lake Winnipeg and the Saskatchewan, and touched at Dog Head, Stony Point, Cat Head, Broken Canoe Point, Wicked Point, Egg Island and Long Point, in 1825, before reaching the Saskatchewan. Richardson's Appendix (Appendix No. 1) to the narrative of this expedition contains a very full and graphic description of the "Limestone of Lake Winipeg." The fossils obtained during this expedition are there stated to have been examined by Mr. Stokes and Mr. James de Carle Sowerby, "who found amongst them *terebratulites, spirifers, maclurites* and *corallines*," but it is nowhere stated where these fossils were collected. The *Maclurites* is said to belong "to the same species with specimens from Lakes Erie and Huron and also from Igloolik," and to be "perhaps referable to the *Maclurea magna* of Lesueur." Mr. Sowerby, also, is said to have determined a shell, which occurs "in great abundance in the strata at Cumberland House, about 120 miles to the westward of Lake Winnipeg, to be the *Pentamerus Aylesfordii*."

In the early part of Captain Back's Arctic Land Expedition to the mouth of Great Fish River, the party which he commanded entered Lake Winnipeg from Norway House, in 1833, and left by the Saskatchewan, as Franklin's party had done in 1819. Dr. Fitton, in Appendix

* In a foot note to page 506, which was omitted in its proper place and printed on the last page of the volume.

No. 4 to the "Narrative" of this expedition, gives a general description of some "Orthocerata of a peculiar kind" collected near the First and Second Rocky Points on the north-west shore of Lake Winnipeg, where similar specimens had previously been collected by Richardson, and says that from this locality "there is also one specimen, which, though not in good preservation, is doubtless a *Catenipora*, or chain coral, a genus characteristic of the older transition limestones, in which beds also Orthocerata are common."

Up to the year 1851, the limestones of Lake Winnipeg were regarded, at least by some geologists, as of Carboniferous age, for Edwards & Haime, in their "Monographie des Polypiers Fossiles des Terrains Paléozoïques," published in that year, described and figured a fossil coral from Lake Winnipeg as a Carboniferous species, under the name *Lithostrotion Stokesi*. But, in the first volume of the Journal of a Boat Voyage through Rupert's Land to the Arctic Sea, published also in 1851, Richardson states that the whole of the coast on the north-west side of Lake Winnipeg is occupied by the Black River limestone. No reasons are given for this statement, but a little further on in the same volume the occurrence of a species of *Receptaculites*, supposed by Dr. S. P. Woodward to be closely related to the *R. Neptuni* of Defrance, and of large Orthocerata at Pine Island Lake, are said to point to the existence of the Birdseye and Trenton limestones in that neighbourhood. The *Receptaculites* of the Winnipeg limestones, which Etheridge subsequently identified with *R. occidentalis*, Salter, in Palliser's Report and in Sir James Hector's paper "On the Geology of the Country between Lake Superior and the Pacific Ocean,"* is now known to be, not that species, but the *R. Oweni*, Hall, of the Galena limestone.

During the Canadian exploring expedition to the Assiniboine and Saskatchewan, in 1858, in charge of Professor Henry Youle Hind, the party made a geological survey of the west coast of Lake Winnipeg from Deer Island to Cat Head. They examined the rock exposures at Deer Island, Grindstone Point, Punk Island, Limestone Cave Point, and Cat Head, and collected a few fossils at each of these localities. In the official Report upon this expedition, published at Toronto in 1859, it is stated that "the formations which have been recognized on Lake Winnipeg and in the valley of Red River are the Chazy, Bird's-eye and Trenton formations and the Hudson River group." "Fine exposures of the Chazy formation" are said "to occur on Punk Island and along the west coast north of Big Grindstone Point as far as the Cat Head;" Sir John Richardson is quoted as the authority for the statement that the whole of the

* Quarterly Journal of the Geological Society of London, vol. XVIII., p. 425, London, April, 1861.

coast on the north-west side is occupied by the Black River and Trenton limestones; and the Hudson River group is said to appear in cliffs twenty feet high at the Stone Fort (now called Lower Fort Garry) on the Red River and near the rapids.

The fossils collected by Professor Hind and Mr. Fleming from the limestones and sandstones of Lake Winnipeg, as identified or described by E. Billings in this Report, are as follows:—From Punk Island, two species of fucoids "resembling forms which occur in the Chazy sandstone"; "columns of a large *Glyptocrinus* allied to *G. ramulosus*"; "two specimens of a plaited *Rhynchonella* a little smaller than *R. plena*"; a new species of *Modiolopsis* described under the name *M. parviuscula*, but not figured; a *Pleurotomaria* "allied to *P. rotuloides*, Hall"; "a *Maclurea* allied to *M. Logani*, Salter, but with more slender whorls," and a small *Serpulites* "which much resembles the large species from the Chazy limestone." From Grindstone Point, a coral "allied to *Columnaria alveolata*"; columns of a large *Glyptocrinus*, the same as those from Punk Island; and plates of a *Glyptocystites* "closely allied to *G. multiporus*." From Cat Head, a new species of *Orthoceras*, described and figured under the name *O. Simpsoni*. From Limestone Point (now known as Clark's Point) about eleven miles north of the mouth of the Little Saskatchewan, *Trochonema umbilicatum* (Hall), and a *Maclurea* like that from Punk Island. According to Mr. Billings, the occurrence of *Modiolopsis parviuscula*, *Trochonema umbilicatum*, the *Maclurea* and *Glyptocystites* "are quite sufficient to show that the localities where they have been collected are Lower Silurian, and most probably about the age of the Black River and Chazy limestones." Fortunately, most of these fossils are still preserved in the Museum of this Survey.

The occurrence of limestone "in situ" in the Red River valley, at or near the locality now known as Lower Fort Garry, was noticed by Major Long in 1823, during his expedition to the source of the St. Peter's River. Keating, in the second volume (page 75) of his narrative of that expedition, published two years later, says of this limestone that it is a "horizontal secondary rock, such as probably lies under these prairies." "We observed," he adds, "in the limestone no organic remains, although it probably contains some."

The fossiliferous character of these limestones seems to have been first discovered by D. Dale Owen in July, 1848, for in chapter 4, pages 180 and 181 of his Report of a Geological Survey of Wisconsin, Iowa and Minnesota, published at Philadelphia in 1852, the following passage occurs: "About twenty miles below the mouth of the Assiniboine, near Lower Fort Garry, solid ledges of limestone are exposed, of a light buff colour, sometimes mottled, spotted or banded with light brown. Imme-

diately opposite the Fort, a considerable amount of rock has been quarried and used in the construction of the building. In these beds I succeeded in finding several well-defined and characteristic fossils, sufficient to establish without the least doubt, the age of the Red River limestones. They are, *Favosites basaltica; Coscinopora sulcata;* hemisphærical masses of *Syringopora;* a *Conularia;* a small, beautiful, undetermined species of *Pleurorhynchus, Ormoceras Brongniartii; Pleurotomaria lenticularis (?); Leptæna alternata. Leptæna plano-convexa (?); Calymene senaria;* and several specimens of the shield of *Illœnus crassicauda.* Many of these are identically the same fossils which occur in the lower part of F. 3, in Wisconsin and Iowa, in the blue limestones of Indiana, Ohio, Kentucky and Tennessee, and also in the Lower Silurian of Europe. The *Coscinopora* is precisely the same as the coral which is particularly characteristic of the lower beds of the Upper Magnesian limestone of Wisconsin. The specimens of *Favosites basaltica* cannot be distinguished from those which abound in the Upper Magnesian limestones of Wisconsin and Iowa, and the Lower Coralline beds of the Falls of the Ohio. It is also worthy of note that these limestones of Red River, like their equivalents in Iowa and Wisconsin, are highly magnesian, containing from seventeen to forty per cent of the carbonate of that alkaline earth." In an appendix to this Report, two new species of fossil mollusca, viz., *Pleurotomaria muralis* and *Pleurorhynchus antiqua,* are either described and figured, or merely figured. The first of these is said to occur in the Upper Magnesian limestone (F. 3) though, in a subsequent tabular list of fossils, it is referred, perhaps inadvertently, to the Lower Magnesian limestone or Calciferous (F. 2). In this tabular list the Upper Magnesian limestone (F. 3) is subdivided into F. 3 A (the Trenton), F. 3 B (the Galena, Utica and Hudson River group), and F. 3 C (the Coralline and Pentamerus beds, the Clinton and Niagara.) Of the other fossils from Lower Fort Garry, in this list, two (and one, "*Orthoceras vertebrale,*" with a query) are referred to F. 3A; four to F. 3B; and one *(Coscinopora sulcata)* to the horizon of the Niagara limestone in F. 3 C.

The official Report of Captain Palliser's Explorations in British North America in 1857-60 contains the following list* of the fossils collected at Lower Fort Garry by Sir James Hector, apparently in July, 1857, and determined by Mr. Salter.

"MAGNESIAN LIMESTONE, LOWER FORT GARRY.

Cyathophyllum.
Columnaria alveolata, Hall.
Ormoceras Lyoni, Stokes.
Favistella. (Favosites basaltica, Owen.)
Receptaculites occidentalis, Salter.
Strophomena plano-convexa.
Strophomena euglypha.
Orthis biforata, var. lynx.
Spirifer elegantula.
Maclurea.
Rhynchonella increbescens, Hall.

* With the typographical errors corrected

A similar list, but with the name of *Strophomena euglypha* omitted, is contained in Sir James Hector's paper "On the Geology of the Country between Lake Superior and the Pacific Ocean," &c., published in 1861, in the seventeenth volume of the Quarterly Journal of the Geological Society of London.

The geology of Lake Winnipeg and its immediate vicinity has been studied in detail by Mr. J. B. Tyrrell and Mr. D. B. Dowling, of this Survey, in 1889, 1890 and 1891. Preliminary accounts of the progress of these investigations have been published in the Summary Reports of the Survey for those years and a joint report upon the work of these three seasons is now being prepared. Mr. Tyrrell's conclusions as to the sequence and correlation of the palæozoic rocks of this region, form an introduction to a paper entitled "Three Deep Wells in Manitoba," published in the ninth volume of Transactions of the Royal Society of Canada. In this introduction, all the limestones of the Red River valley in Manitoba (except those at Stonewall, which, it is stated, may belong to the Niagara limestone, and those at Stony Mountain, which are clearly referable to the Hudson River group), and of the western side of Lake Winnipeg are referred to the Trenton formation, and the sandstones of Punk and Deer Islands, Grindstone Point, etc., to the Chazy (St. Peter's) formation. In this connection, however, it may be remarked that, so far, no fossils of any kind have yet been detected in the sandstones which are supposed to be referable to the Chazy (St. Peter's) formation, except at their summit, in passage beds which probably represent the Birdseye and Black River limestones. As elsewhere stated,* "there is, at present, no satisfactory palæontological evidence for the existence of the Chazy formation, or its equivalent, in Manitoba," or the immediate neighbourhood of Lake Winnipeg. In a paper published in the "Ottawa Naturalist" for June, 1895, Mr. Dowling subdivides the Winnipeg and Red River limestones, in descending order, into the "Upper Mottled limestones," the "Cat Head limestones," and the "Lower Mottled limestones," and calls the sandstones of Punk and Deer islands, etc., the "Winnipeg sandstones."

The occurrence of rocks of presumably the same age as the Winnipeg limestones at several localities on the Nelson River, Keewatin, had previously been recorded by Dr. Bell in the Report of Progress of this Survey for 1878-79. Rocks containing similar fossils were discovered by Mr. Tyrrell near Doobaunt Lake, in latitude 62° 44′, and longitude 100°, in 1893; at Sturgeon Lake, north-east of Cumberland House, on the Saskatchewan River, and at Fort Churchill, on the west side of Hudson's Bay, in 1894, as noted by him in the Summary Report of this Survey for

* Transactions of the Royal Society of Canada for 1889, vol. VIII., sect. 4, p. 83.

1895; and at Minago and Wekusko lakes, in the District of Saskatchewan, in 1896.

Somewhat extensive collections of the fossils of the limestones and sandstones of Lake Winnipeg and the Red River valley were made by Dr. R. Bell in 1879 and 1880, by T. C. Weston in 1884, by J. B. Tyrrell in 1889 and 1890, by D. B. Dowling and L. M. Lambe in 1890, and by D. B. Dowling in 1890 and 1891. The authorities of the United States National Museum at Washington have kindly lent to the writer, for examination and comparison, all the fossils from the limestones of the Red River valley in their collection, and several fossils of much interest collected at East Selkirk and Lower Fort Garry by A. McCharles in 1884, were presented by him to the Museum of the Survey. The fossils collected by Dr. Bell from the Winnipeg limestones have been reported upon, provisionally, by the writer, in the Reports of Progress of this Survey for 1878-79 and 1879-80, and, since then, papers descriptive of some of the most remarkable species in these collections have been published in the Transactions of the Royal Society of Canada for 1889 and 1891, and in the Canadian Record of Science for July, 1895.

The last part of this volume contains a systematic list of all the fossils from the Hudson River formation at Stony Mountain that are represented in the Museum of the Survey. In the present paper it is intended to supplement this list with a similar one, as complete as possible, and with descriptions and illustrations of such species as may seem to be new, of the fossils of all the Cambro-Silurian rocks in the Lake Winnipeg district, that are believed to be older than the Hudson River formation, with the exception of a small but interesting series of Stromatoporoids, which has yet to be studied. Most of the specimens are from limestones which most probably represent the whole of the Utica and Trenton formations, inclusive of the Galena, though they hold several fossils elsewhere supposed to be restricted to the Hudson River group, but some are from the few feet of passage beds already referred to, which are presumed to represent the Birdseye and Black River limestone, immediately beneath the limestones and at the summit of the sandstones. It is thought desirable to consider the fossils of these limestones separately from those of the transition beds, and to commence with the former. The state of preservation of most of the fossils from these limestones is, however, by no means favourable to their accurate specific or generic determination. Most of the brachiopoda have no portion of the hinge area of either valve preserved, and nearly all of the mollusca and crustacea are represented by mere casts of the interior of the shell or crust.

One of the most striking features in the fossils of the Winnipeg and Red River limestones is the large size to which many of the specimens

attain, though this is more particularly the case with the Cephalopoda. Thus, one of the Receptaculitidæ *(Receptaculites Oweni)*, which is abundant in these limestones, is known to attain to a size of twelve or even twenty inches in diameter. Some specimens of a simple Cyathophylloid coral *(Streptelasma robustum)* from Lower Fort Garry are nearly seven inches in length, as measured along the convex curve, and nearly five inches in height. A brachiopod from the same locality *(Rafinesquina lata)* is rather more than three inches in length at the hinge line, and a specimen of *Strophomena incurvata* from East Selkirk is fully double the usual size of that species. One of the gasteropods *(Maclurea Manitobensis)* of these limestones is sometimes as much as eight inches and a half in diameter, and another (the *Hormotoma Winnipegensis* of this Report) is eight inches long. The "gigantic Orthoceratites" noticed by Sir John Richardson on the west side of Lake Winnipeg, have already been referred to, but these are from localities north of the Saskatchewan. South of that river, at Dog Head, specimens of Orthoceratites (probably of *Endoceras subannulatum)*, four feet and a half or even six feet in length, and imperfect at both ends, were observed by Mr. Lambe in 1890. A siphuncle of *Endoceras crassisiphonatum*, which is also imperfect at both ends, is nearly three feet long. A specimen, which appears to be a cast of the anterior end of the body chamber of a specimen of a *Potericeras* (probably *P. nobile)*, recently collected by D. B. Dowling and L. M. Lambe at Berens Island, and showing the infolding of the lip, is seven inches across. Rough casts of the interior of spirally coiled discoidal or nearly discoidal shells, apparently allied to *Barrandeoceras*, from several localities on the west shore of Lake Winnipeg, are nearly or quite two feet across. Lastly, a free cheek of a trilobite, *Asaphus (Isotelus) gigas*, from Cat Head, indicates a specimen that must have been twenty inches in length when alive; and other similar examples could be given.

The writer is much indebted to Mr. E. O. Ulrich, of the Geological Survey of Minnesota, for valuable information in regard to the polyzoa, pelecypoda and some of the gasteropoda that are enumerated or described in this report; to Mr. Charles Schuchert, of the United States National Museum, for assistance in the determination of some critical species or peculiarly preserved specimens of Strophomenidæ; to Professor T. Rupert Jones for the description and drawings of *Aparchites parvulus;* and to the proprietors of "Palæontographica" for permission to reproduce the figures of *Aulocopina Winnipegensis* in that publication.

LIST OF SPECIES.

A.—From the limestones.

ALGÆ.

CHONDRITES (BYTHOTREPHIS) PATULUS.

Chondrites patulus, Whiteaves.....1896 (Jan. 17th). Canad. Rec. Sc., vol. VI., No. 7, p. 387.

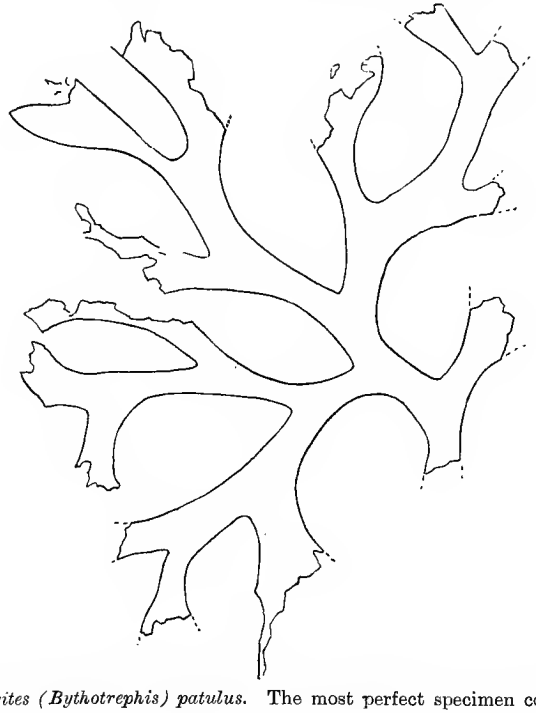

Fig. 5. *Chondrites (Bythotrephis) patulus.* The most perfect specimen collected, from Inmost Island, of the natural size.

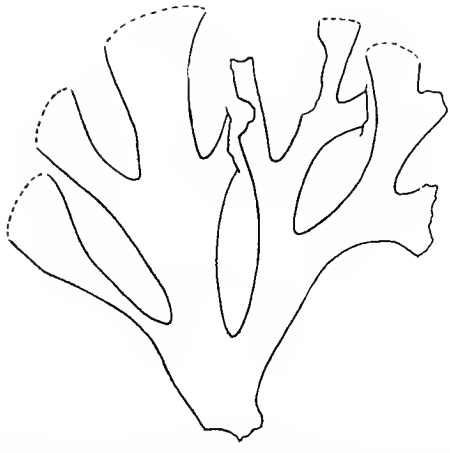

Fig. 6. *Chondrites (Bythotrephis) patulus.* Another specimen, from the same locality. Natural size.

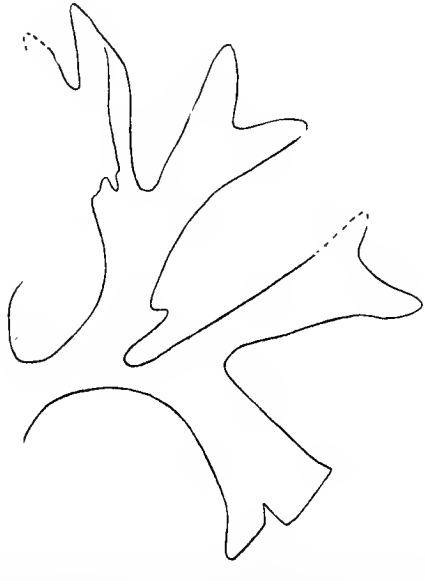

Fig. 7. *Chondrites (Bythotrephis) patulus.* Imperfect specimen, also from Inmost Island, showing one of the terminal bifurcations of the thallus. Natural size.

*Thallus frondose, continuous, spreading widely in the same plane, and consisting, as now preserved, of a thin, uniformly flat expansion, devoid of midrib or veins, which is doubly deeply and widely trifurcate, with the secondary divisions again once or twice cleft at their summits; the undivided and partially divided portions narrow below, widening above and widest at the commencement of each division, averaging from three to four millimetres in breadth in the narrowest places, and from fourteen to fifteen mm. in the widest. Base of attachment unknown; minute structure not preserved.

Inmost or Birch Island, Kinwow Bay, Lake Winnipeg, T. C. Weston, 1884: four good specimens, consisting of well defined, rather dark brown, ferruginous impressions upon pieces of pale buff-coloured limestones, and seven similar but very imperfect ones.

In the present state of our knowledge, it would seem that *Bythotrephis*, (Hall)† can scarcely be satisfactorily distinguished from *Chondrites* (Sternberg). Goeppert,‡ though he retains the name *Bythotrephis* for *B. flexuosa* and *B. succulenta*, as described and figured by Hall, is careful to state that he does so provisionally, on account of the absence of satisfactory evidence on this point, and says that the only difference between *Bythotrephis* and *Chondrites* is the flatter habit of the thallus of the former, a character which, he adds, is not always seen in Hall's figures of species of *Bythotrephis*. Geinitz and Liebe§ say that no essential difference can be recognized between the two genera, and claim that Goeppert also is of the same opinion.

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*Most of the descriptions of species that have been previously described by the writer in other publications, have been either partially or wholly rewritten for this Report.

† Originally spelled *Buthotrephis*.

‡ Ueber die Fossile Flora der Silurischen, der Devonischen und Unteren Kohlenformation oder des Sogenannten Uebergangsgebirges, 1859, p. 452.

§ Ueber ein Æquivalent der Takonischen Schiefer Nordamerika's in Deutschland, &c., p. 18.

CHONDRITES (BYTHOTREPHIS) CUNEATUS. (N. Sp.)

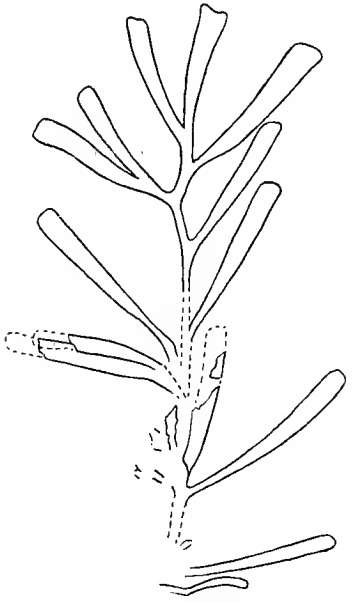

Fig. 8. *Chondrites (Bythotrephis) cuneatus.* One of the most perfect specimens known to the writer, from Cat Head, Lake Winnipeg, and of the natural size.

Thallus frondose, continuous, devoid of midrib or veins, compressed, almost flat, and consisting of a nearly straight and rather narrow central axis, with both terminal and lateral, simple or deeply bifurcate, divergent, elongated and narrowly wedge-shaped divisions, at short but irregular intervals. The central axis does not much exceed three millimetres in breadth, in any of the specimens known to the writer, and the terminal and lateral divisions average from three-quarters of an inch to about an inch in length, and from three to four millimetres in breadth at their subtruncate apices. Base of attachment unknown; minute structure not preserved.

Apparently not uncommon at Cat Head, Lake Winnipeg, where well defined but not quite perfect specimens, in a similar state of preservation to those of *C. patulus*, were collected by T. C. Weston in 1884; and three miles west of Cat Head, where a few good specimens were obtained by D. B. Dowling and L. M. Lambe in 1890.

These fossils bear a certain general resemblance to the *Sphenothallus angustifolius* of Hall, as figured on Plate 68 of the first volume of the Palæontology of the State of New York, and the writer has long been under the impression that they might possibly represent a local variety

of that species. Quite recently, however, Mr. R. Ruedemann has published a paper (in the "American Geologist" for 1896) in which he adduces arguments to prove that the specimen upon which *S. angustifolius* was based is not a plant, but a number of imperfect shells of a sessile *Conularia* (probably *C. gracilis*, Hall) with thickened margins and a bulbous base, attached to the cast of the interior of another shell (*Trocholites*). However this may be, an original drawing of the type of *T. angustifolius*, kindly forwarded by Mr. Ruedemann, shews that there is no real resemblance between that specimen and the fossils from Cat Head.

Chondrites cupressinus, Whiteaves.

Plate 17, fig. 1.

Chondrites cupressinus, Whiteaves.....1896. Canad. Rec. Sc., vol. VI., p. 388.

"Thallus frondose, continuous, and consisting of a long, slender and extremely narrow rhachis, with numerous short, crowded and variously-divided lateral ramifications; base of attachment unknown. The rhachis is flat, erect, nearly straight, and scarcely more than half a millimetre in its maximum breadth. The lateral ramifications are linear, pinnately partite, or possibly verticillate, opposite, divergent, and spreading outward and a little upward. They decrease very gradually in length from below upward, and are either doubly bifurcate, bifurcate with both of the ultimate ramifications trifurcate, or bifurcate with one of the ultimate branchlets trifurcate and the other single.

Cat Head, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: one specimen, which has been split longitudinally down the centre into two pieces of nearly equal size.

To the naked eye this specimen has much the appearance of the polypary of a recent hydroid, and especially of that of the well known *Sertularia cupressina*, L., which Professor Allman now refers to *Thuiaria*. When viewed under an ordinary simple lens, however, it has obviously more the aspect of a plant, although its minute tissues are not preserved. There are no indications of any corneous or chitinous structures, of articulations, of a central virgula, as in the Graptolitidæ, or of marginal hydrotheca, as in the hydroids and graptolites."

Chondrites gracillimus, Whiteaves.

Plate 17, fig. 2.

Chondrites gracillimus, Whiteaves.....1896. Canad. Rec. Sc., vol. VI., p. 389.

"Thallus frondose, continuous, pinnately partite, with a slender rhachis, which is nearly a millimetre in breadth about the mid-height,

but narrower at and near the base and apex, and apparently flattened, with no indications of a central axis or virgula. Lateral ramifications simple, unbranched, narrower than the rhachis, averaging about one millimetre apart, the longest about fifteen mm. in length, divergent in the same plane outward and a little upward, but showing no traces of hydrothecæ or cell openings on their margins; basal attachment unknown.

Inmost Island, Kinwow Bay, Lake Winnipeg, T. C. Weston, 1884: one well defined and nearly perfect specimen, though its minute structure is not preserved.

This specimen is so similar in general shape to some of the Devonian and Carboniferous species of *Plumalina* that the writer has long been under the impression that it could be referred to that genus. It is also equally similar in general shape to the *Buthograptus laxus* of Hall, from the Trenton shales of Wisconsin. According to S. A. Miller,* *Ptilophyton*, Dawson, is a synonym of *Plumalina*, and the writer is informed by Sir J. W. Dawson that he has recently ascertained that *Buthograptus laxus* is exactly congeneric with *Ptilophyton*. In Hall's original description of *Plumalina*† the specimens described are said to have a 'well-preserved corneous structure,' and Whitfield has shown that the lateral branches of *Buthograptus laxus* are articulated. Under a lens, the specimen from Inmost Island shews no indication of corneous structure, and its lateral ramifications are apparently continuous with the rhachis. It would, therefore, seem to be the most prudent course to refer it provisionally to the genus *Chondrites*. Whether viewed with or without a lens, it has so many characters in common with *C. cupressinus* that practically the only difference between them is, that the one has long and undivided pinnæ or lateral ramifications, and the other short and much divided ones."

RECEPTACULITIDÆ.

Receptaculites Oweni, Hall.

Coscinopora sulcata, D. D. Owen (but not of Goldfuss)..... .. ..1844. Rep. Geol. Expl. Iowa, Wiscons. and Ill., p. 40, pl. 7, fig. 5.

Receptaculites Oweni, Hall.....1861. Rep. Progr. Geol. Surv. Wiscons., p. 13.

" " " .....1862. Rep. Progr. Geol. Surv. Wiscons., p. 46, fig. 2, and p. 429.

" " Meek and Worthen...1868. Geol. Surv. Ill., vol. III., p. 302, pl. 2, fig. 3.

Receptaculites Oweni Whitfield .....1882. Geol. Wiscons., vol. IV., p. 239, pl. 10, fig. 7.

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* North American Geology and Palæontology, 1889, p. 136.

† Canadian Naturalist and Geologist, vol. III., p. 175.

Receptaculites occidentalis (partim), Hinde...1884. Quart. Journ. Geol. Soc. Lond., vol. XL., p. 842.
Receptaculites Oweni, Winchell and Schuchert.1895. Geol. Minn., Final Rep., vol. III., pt. 1. plate F, figs. 1-4.

In the Red River valley this species has been collected at Lower Fort Garry by D. Dale Owen in 1848, by Sir James Hector in 1857, by Donald Gunn in 1858, by Dr. R. Bell in 1880,* and by T. C. Weston in 1884; at East Selkirk by A. McCharles in 1884, and by L. M. Lambe in 1890. On Lake Winnipeg it has been collected at Washow Bay by T. C. Weston in 1884; at Little Black Island,† Swampy Harbour, by J. B. Tyrrell in 1889, and by D. B. Dowling and L. M. Lambe in 1890; at Big Island by Mr. Tyrrell in 1889; and at Sturgeon and Black Bear islands by Messrs. Dowling and Lambe in 1890. In Keewatin it has been collected at the second and third rapids of the Nelson River by Dr. R. Bell in 1879, and in the District of Saskatchewan, on the east side of Sturgeon Lake, by Mr. Tyrrell in 1894.

Dr. G. J. Hinde (op. cit.) has expressed the opinion that *R. Oweni*, Hall, is merely a synonym of *R. occidentalis*, Salter. On the other hand, according to Dr. Winchell and Mr. Schuchert (op. cit.), "on account of the greater size attained by *R. Oweni*, and the plates of the inner surface having twelve canals, instead of four, as in *R. occidentalis*, a central knob on each headplate of the spicules on the outer surface of the former, should be sufficient to distinguish this species."

Ischadites Iowensis, Owen. (Sp.)

Orbitolites reticulata, Owen.....1844. Geol. Rep. Iowa, Wiscons. and Ill., pl. 18, fig. 7.
Selenoides Iowensis, Owen.....1852. Rep. Geol. Surv. Wiscons., Iowa and Minn., p. 587, pl. 2B, fig. 13.
Receptaculites (Selenoides) Iowense, Hall....1861. Rep. Superint. Geol. Surv. Wiscons., p. 14.
Receptaculites fungosum, Hall.....1861. Ibid., p. 15.
Receptaculites globulare, Hall.....1861. Ibid., p. 16.
Receptaculites Iowensis, Billings.....1865. Geol. Surv. Canada, Pal. Foss., vol. I., p. 385, fig. 364.
" " " .....1865. Canad. Nat. and Geol., ser. 2, vol. II., p. 191, fig. 11.
Receptaculites globularis, Meek and Worthen.1868 (?) Geol. Surv. Ill., vol. III., p. 301, pl. 2, figs. 2, *a-b*.
Receptaculites, sp.? Meek and Worthen.....1868. Ibid., p. 301, pl. 2, figs. 1, *a-b*.

* The specimens collected by Dr. Bell in 1880 and labelled "St. Andrews, Manitoba," were all collected within about a mile north or south of Lower Fort Garry, which is on the west side of the Red River, in the parish of St. Andrews.

† A small island close to, but a little to the west of, Berens or Swampy Island, and ten miles north-east of Cat Head.

Ischadites Kœnigii (partim), Hinde.....1884. Quart. Journ. Geol. Soc. Lond., vol. XL., p. 836.
Ischadites Iowensis, Winchell and Schuchert.1895. Geol. Minn., Final Rep., vol. III., pt. 1, p. 64, pl. F, figs. 5 and 6.
Receptaculites globularis (Hall), Whitfield...1895. Mem. Am. Mus. Nat. Hist., vol. I., pt. 2, p. 44, pl. 5, fig. 7.
Receptaculites fungosus (Hall), Whitfield....1895. Ibid., p. 45, pl. 5, figs. 5 and 6.

In the Peter Redpath Museum at Montreal there is an imperfect and badly preserved specimen of this species, which is labelled as having been collected at Lower Fort Garry by Professor J. H. Panton. The only other Canadian specimen of *I. Iowensis* that the writer has seen is the "weathered section through a specimen" from "the Trenton limestone at Ottawa," represented by fig. 364 on page 385 of the first volume of the "Palæozoic Fossils," which is still preserved in the Museum of the Survey.

Pasceolus gregarius? Billings.

Pasceolus gregarius, Billings.....1866. Geol. Surv. Canada, Cat. Silur. Foss. isl. Anticosti, p. 72.
Cfr. *Cyclocrinus Spaskii* (Eichwald). F. Roemer.....1876. Lethæa geognost., vol. I., Atlas, pl. 3, fig. 21*a*.

A few specimens which can scarcely be distinguished by any external character from the types of *Pasceolus gregarius* in the Museum of the Survey, or from *Cyclocrinus Spaskii*, as figured by F. Roemer, in the Atlas to the first volume of the Lethæa Geognostica, were collected at Lower Fort Garry, at Dog Head and Inmost Island, Lake Winnipeg, by T. C. Weston in 1884; at Jack Head Island by D. B. Dowling and L. M. Lambe in 1890; and on the west shore of Lake Winnipeg north of the Saskatchewan and opposite the north end of Selkirk Island by D. B. Dowling in 1891. Most of the specimens are mere casts of the interior of the organism, which shew nothing of the minute structure. One specimen has a portion of the thin investing integument preserved, but it shews only a transverse section of the integument, the outer surface being completely covered by the matrix. The casts are small sphærical bodies, about an inch in diameter, and marked externally with numerous minute hexagonal facets, about one millimetre in diameter. In some these facets are slightly convex, with a narrow flat border, and indications of a small tubercle in the centre of each, when examined with a lens, but in others the outer margin of each facet is raised and the central portion depressed.

It would seem to be doubtful whether *Pasceolus gregarius* can be satisfactorily distinguished from *Cyclocrinus Spaskii*, especially in view of the facts that the types of the former are from the Island of Anticosti, and

that *C. Spaskii* has been recorded as occurring on the "Silurian" rocks of that island, by Dr. G. J. Hinde in a paper "On the Structure and Affinities of the Family of the Receptaculitidæ," &c., in the Quarterly Journal of the Geological Society of London for 1884.

PORIFERA.

Aulacopella Winnipegensis, Rauff.

Plate 16, figs. 1-3.

Aulacopella Winnipegensis, Rauff.....1895. Palæontographica, (Stuttgart) vol. XLIII., p. (393) 269, pl. 24, figs. 4-6, and fig. 124 on p. (394) 270.

Cat Head, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890 : one specimen, the type of the species.

The following is a free translation, which has been revised by Dr. Rauff, of the original description of *A. Winnipegensis*, with the references to the figures altered to suit those in this publication.

This remarkable sponge is distinguished by its singular form from all other Aulocopidæ, and in that respect stands in the same relation to them as the Cretaceous *Siphonia (Hallirhoa) costata* does to the other Siphoniæ.

Plate 16, fig. 1, shews the upper side of the fragment, whose boundary on the right hand side is formed by the broken surface. The smooth parts are the mineral fillings up of originally empty spaces; p is the Paragaster, while G 1, G 2, and G 5, are mineral wedges, shaped like the segments of an orange, whose inner edges are almost parallel to the longitudinal axis of the sponge, in an almost perpendicular direction from the summit to the base. The under side of the sponge is concave (as seen in fig. 9 on the next page) whereas the summit is convex. Between the wedges of sediment (G 1, G 2, and G 5) is situated the body skeleton, which is divided into a number of strong ribs or rays, traversed by thick, arched exhalent canals (aporrhysen) which appear upon the outer surface of the strongly weathered and probably worn fragment (Plate 16, fig. 1, as interrupted grooves.

A vertical section through the middle of one of the rays is shown in the woodcut (Fig. 9), which represents both the vertically fractured surface and a section through the longitudinal axis of the Paragaster.

The Paragaster is deep; it reaches nearly down to the point from which the skeleton fibres (Skelet-radiant) radiate, and occupies about two-thirds the entire height of the sponge. The exact point from which

Fig. 9. *Aulacopella Winnipegensis.* Vertical section through the middle of one of the rays to the centre of the sponge. The fibres and canals of the skeleton partly restored, though their course in the greater part of the original can be clearly followed.

these fibres radiate could not indeed be actually observed, but its position is so clearly indicated by the convergence of the fibres that the possible deviation from its true position, as represented in the figure, cannot amount to more than one or two millimetres. I have not been able to find distinct inhalent canals, though it is possible that they may have disappeared in consequence of the complete and unfavourable silicification* which the body skeleton has undergone. The basal surface

* The rock is a most peculiar, very uniform, fine grained, siliceous limestone. The grains, which for the most part measure from 30 to 60 micromillimetres, consist of well defined calc spar rhomboids, which are so closely embedded in an isotropic siliceous mass that the rock effervesces but weakly with acids, in spite of the amount of lime that it contains. This sediment is completely free from other organisms, such as sponge spicules, which are often found distributed throughout siliceous limestones. The whole silicified sponge body is free from calcareous matter, and is altered, not to an isotropic silica, but into a compact cryptocrystalline chalcedony.

adheres inextricably to the matrix, as shown in the woodcut. We must therefore conclude that this surface was originally concave, or else we must suppose that the basal concavity was caused by an alteration of its original form previous to fossilization, a view which is not borne out by the regular contour of the specimen.

A transverse section half way up through the fragment gives the appearance represented between A and C on figure 1 of Plate 16. This figure, considered in connection with the woodcut, proves that the skeleton fibres, in each of the radial rays, are pinnately arranged on both sides of a vertical median plane, and that these fibres diverge upward and downward as well as to the right and left. The distance between the axes of the fibres would measure from 0·35 to 0·50 mm. Of an integument layer I could find no traces.

Although the skeleton has undergone a secondary silicification, and has therefore for the most part become obliterated, there is no doubt that, in structure and dimensions, it corresponds with that of *Aulocopium* or the American *Zittelella*.

Figures 2 and 3 of plate 16 are attempts at a restoration of this sponge, the diagrams being one-third the natural size. Figure 2 shews a side view, and figure 3 a basal view of the organism, as it is supposed to have been when entire. The sponge had the form of a cog-wheel, with a diameter of at least 150 millimetres and a height of 75 mm., from whose conical hollow axis (about 40-50 mm. in diameter) eight radial rays proceed, which are 15-20 mm. thick and 50 mm. long at the midheight. From the mouth of the Paragaster, surface furrows radiate downward over the convex summit and upper surface of the rays. The naked basal surface is concave. In each ray the skeleton fibres are symmetrically arranged to a radial vertical median plane.

Trichospongia hystrix. (N. Sp.)

Plate 17, fig. 3.

The foregoing name is proposed provisionally for a single specimen of a sponge, in which the main portion of the body skeleton is represented by a light brown or pale ferruginous impression or stain on the flat surface of a piece of limestone, with its margin outlined by a darker tint. This impression is rather narrowly elongated, about five times as long as high, with the base nearly straight but slightly convex in the middle, the summit still straighter, and the two ends narrowly rounded. Lying across it are numerous, exceedingly narrow, straight and apparently simple spicules, which project beyond the summit and ends to a maximum distance of eight millimetres. Exclusive of the projecting spicules,

the impression which is supposed to represent the body skeleton is forty-five millimetres in length, and nine in its maximum height or depth.

The specimen figured, which is the only one known to the writer, was collected at Cat Head, Lake Winnipeg, by D. B. Dowling and L. M. Lambe in 1890.

COELENTERATA.

HYDROZOA.

CLIMACOGRAPTUS BICORNIS, Hall.

Graptolithus bicornis, Hall.	1847.	Pal. N. York, vol. I., p. 268, pl. 73, figs. 2, *a-s*.
Climacograptus bicornis, Hall	1865.	Canad. Org. Rem., Dec. 2, p. 112.
Graptolithus bicornis (Hall), Billings.....	1863.	Geol. Canada, p. 200, fig. 193.
Climacograptus bicornis (Hall), Miller.	1889.	N. Amer. Geol. and Palæont., p. 178, fig. 153.

South-east side of Elk Island, Lake Winnipeg, Dr. A. R. C. Selwyn, 1872: one specimen, from a loose piece of limestone.

THAMNOGRAPTUS AFFINIS. (Nom. prov.)

Fig. 10. *Thamnograptus affinis.*
The only specimen collected, of the natural size.

Perhaps a var. of *T. capillaris*, Hall.

Cfr. *Thamnograptus capillaris*, Hall .....1859. Pal. N. York, vol. III., p. 520.

Polypary extremely thin and slender, its main axis linear and almost straight, its branches simple, not perceptibly narrower than the main axis, rather irregularly disposed, but apparently divergent upward and outward at a very acute angle when not obviously distorted. Sicula and hydrothecæ unknown.

Cat Head, Lake Winnipeg, T. C. Weston, 1884: a single specimen which is imperfect at both ends. All the branches on its right hand side look as if they had been abruptly and abnormally bent backward near the main axis, and then forward or forward and outward, prior to fossilization.

With only one specimen for comparison, and that one partially distorted, it is impossible to be at all certain whether this fossil is merely a local variety of *T. capillaris* or a distinct species. As compared with Hall's original figure of *T. capillaris*, the specimen from Cat Head would seem to differ in the much more acutely angular divergence of its branches from the main axis, and in the circumstance that these branches do not, apparently, bear any short secondary branches.

Inocaulis Canadensis. (N. Sp.)

Plate 17, fig. 4.

Polypary large, thin, nearly flat or slightly undulated, widely expanded and composed of very numerous narrow radiating branches, which diverge or divide, reunite and anastomose in every direction, at short and frequent intervals, in such a way as to form a close and finely meshed network. Meshes longer than wide, varying in outline from subrhomboidal to almost lanceolate, and usually pointed at one or both ends. Branches averaging from about one-fifth to one-third of a millimetre in breadth, though the largest are as much as two-thirds of a millimetre broad, and apparently bearing on their celluliferous surface two or three longitudinal rows of rounded cell apertures or pores, with intervals between them of about twice their length or more, though the only specimen which shews this feature is very imperfectly preserved. Surface markings not clearly ascertainable, base of attachment and free extremities of the branches unknown.

A few large but imperfect specimens of this graptolite were collected in or around Lake Winnipeg, at Inmost Island, Kinwow Bay, by T. C. Weston in 1884; at Cat Head by D. B. Dowling and L. M. Lambe in 1890; and at Clark's Point, about eleven miles north of the Little Saskatchewan, by D. B. Dowling in 1891. The largest of these specimens is three inches high, nearly two inches and a half broad, and was evidently much larger than this when entire.

This species is provisionally referred to *Inocaulis*, Hall, because it would seem to be most nearly related to the *I. arbuscula* of Ulrich* from the Hudson River or Cincinnati group of Ohio, which is still retained in that genus by Dr. Gurley in his recent paper on North American

*Journal of the Cincinnati Society of Natural History, vol. II., 1879, p. 28, pl. 7, figs. 27 and 27*a*.

Graptolites,* though Mr. Joseph F. James asserts that it is undoubtedly a *Dictyonema.*† It seems to be a much larger species than *I. arbuscula*, with branches apparently devoid of the "strong, prong-like projections rising from the sides at variable intervals," which are said to characterize that species, forming a more complete network, with very numerous, fine meshes. Mr. Ulrich, to whom one of the best specimens from Inmost Island was submitted, thinks that it is quite distinct from his *I. arbuscula*, and that a new genus, near to *Dictyonema*, ought perhaps to be constituted for the reception of these two species. In the absence of any knowledge of the base of attachment of *I. Canadensis*, it is not at all clear to the writer how it can be separated generically from *Rhizograptus*, Spencer.

ACTINOZOA.

ALCYONARIA.

HALYSITES CATENULARIA, L., var. GRACILIS.

Catenipora gracilis, Hall.....1851. In Foster & Whitney's Geol. Land Distr. Lake Superior, pt. 2, p. 212, pl. 29, figs. 1, *a-b*.

Halysites catenularia, Whiteaves.....1880. Geol. Surv. Canada, Rep. Progr., 1878-79, p. 45 c.

" " " .....1881. Geol. Surv. Canada, Rep. Progr., 1879-80, p. 57 c.

Original description of *Catenipora gracilis:*

"Coral massive or hemispheric; cells quadrangular or suboval; walls thin; interspaces rarely thicker than the walls; arranged in a single series, in wide, irregular reticulations.

"This species differs from the *C. escharoides* in the almost quadrangular form of the cells and the extremely thin walls, the reticulations are wider and the whole aspect less solid than in that species. From *C. agglomerata* it differs essentially in the form and arrangement of the cells.

"This species occurs in the green shales near the upper part of the Hudson River group, and so far as I know is the first time that a species of this genus has been found in the Lower Silurian series.

"Eastern shore of Green Bay, Wisconsin."

Mr. L. M. Lambe, who has recently made a special study of Canadian specimens of *Halysites*, thinks that *Catenipora gracilis*, Hall, is a stratigraphic variety of *Halysites catenularia*, and characteristic of the Galena-Trenton limestone of Lake Winnipeg and its vicinity, and of the

*Journal of Geology, Chicago, vol. IV., 1896, p. 99.

†Journal of the Cincinnati Society of Natural History, vol. XIV. (1891) p. 153.

Hudson River formation of Anticosti and Ontario. The chief peculiarities of this variety, Mr. Lambe thinks, are "the marked regularity of the corallites, their sides being flattened,—and the absence of the tubules between them."

It is most probably a specimen of this variety of *H. catenularia* that was collected on the west shore of Lake Winnipeg, north of the Saskatchewan, by Captain Back in 1833, and referred to in Dr. Fitton's Appendix No. 4 to Back's Narrative of the Arctic Land Expedition to the mouth of the Great Fish River," &c., as "doubtless a *Catenipora* or chain coral."*

More recently specimens of this coral have been collected by members of the staff of the Geological Survey of Canada at the following localities: In the Red River valley, at Lower Fort Garry, by T. C. Weston in 1884, and at East Selkirk by T. C. Weston in 1884 and by L. M. Lambe in 1890. In or around Lake Winnipeg, at Dog Head and Big Grindstone Point, by T. C. Weston in 1884; at Little Black Island by J. B. Tyrrell in 1889, and D. B. Dowling and L. M. Lambe in 1890; at Black Bear and Jack Head islands by D. B. Dowling and L M. Lambe in 1890; at Little Tamarack and Commissioners (Cranberry) islands, and one mile west of Bull Head by D. B. Dowling in 1890; and at Cat Head by D. B. Dowling in 1891.

Tetradium fibratum, Safford.

Tetradium fibratum, Safford.....1856. Am. Journ. Sc. and Arts, ser. 2, vol. XXII., p. 237.
" " Billings.....1863. Geol. Canada., p. 139, figs. 71, *a-b*.
" " S. A. Miller.....1889. N. Am. Geol. & Palæont., p. 206, figs. 224 and 225.

In the Redpath Museum at Montreal, until quite recently, there were two specimens of this species, but which are probably portions of the same corallum, labelled as having been collected at East Selkirk by Professor J. H. Panton. Through the kindness of Sir J. W. Dawson, one of these specimens has since been presented to the Museum of the Survey.

ZOANTHARIA.

Columnaria alveolata, Goldfuss.

Columnaria alveolata, Goldfuss.....1826. Petref. Germ., vol. I., p. 72, pl. 24, figs. 7, *a-c*.
Columnaria multiradiata, Castleneau.....1843. Sil. Syst. de l'Amer. Septentr., p. 44, pl. 19, fig. 1.

* The typical form of the chain coral had previously been collected (probably for the first time in North America) at Drummond Island, Lake Huron, by Dr. J. J. Bigsby in 1819 or 1820, and the fact is recorded on page 204 of the first volume of the second series of the Transactions of the Geological Society of London, published in 1824.

Favistella stellata, Hall..... 1847. Pal. N. York, vol. I., p. 275, pl. 75, fig. 1, but not *Columnaria alveolata*, Hall, ibid., p. 47.

Columnaria alveolata (pars), Edwards & Haime..... 1851. Mon. Polyp. Foss. Terr. Palæoz., p. 309.

Columnaria Gothlandica, Edwards & Haime..1851. Ibid., p. 309, pl. 14, figs. 2 and 2*a*.

Favistella stellata, Nicholson..... 1875. Rep. Pal. Prov. Ont., p. 23, and Geol. Surv. Ohio, Palæont., vol. II., p. 185.

Columnaria stellata, Rominger..... 1876. Geol. Surv. Mich., Foss. Corals, p. 90, pls. 34, fig. 3, and 28, fig 1.

Columnaria alveolata, Nicholson..... 1879. Tabul. Corals Palæoz. Per., p. 195, pl. 10, figs. 1 and 1*a*. Not *Columnaria alveolata* of McCoy, Hall, Billings or Rominger.

Lower Fort Garry, Dr. R. Bell, 1880: two specimens of a variety approaching *C. Blainvillei*, Billings, in which the average diameter of the larger corallites is about three millimetres. East Selkirk, A. McCharles, 1884, one specimen of the typical form, and L. M. Lambe, 1890, three similar specimens. Jack Head Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: one specimen, with the larger corallites averaging four mm. and a-half in their longest diameters. In all these specimens the longer septa reach to the centre of the corallites.

This coral appears to have been previously collected at Lower Fort Garry by D. Dale Owen in 1848, and by Sir James Hector in 1857. It is probably the *Favosites basaltica* of Owen's list of Lower Fort Garry fossils, on page 181 of his Report of the Geological Survey of Wisconsin, Iowa and Wisconsin, published in 1852, and the "*Favistella (Favosites basaltica* of Owen)" of the list of fossils from the same locality on page 245 of Captain Palliser's official report. Mr. Lambe recognizes it in a small collection of fossils made by J. B. Tyrrell at Doobaunt Lake in 1893. It appears to be abundant at Fort Churchill, Hudson's Bay, where a number of specimens were collected by Mr. Tyrrell in 1894, from a small exposure of dolomite; and it has since been collected at Wekusko (Herb) Lake, and at Hill's Lake, Minago River, in the district of Saskatchewan, by Mr. Tyrrell, in 1896.

Diphyphyllum Stokesi, Edwards and Haime. (Sp.)

Plate 17, figs. 5 and 5, *a-b*.

Lithostrotion Stokesi, Edwards and Haime..1851. Mon. Polyp. Foss. Terr. Paléoz., p. 440, pl. 20, fig. 2.

Probably "*Sarcinula (?) obsoleta*," Hall....1851. In Foster & Whitney's Rep. Geol. Land Distr. Lake Superior, pt. 2, p. 213, pl. 29, figs. 2, *a-b*.

The following is the original description of "*Lithostrotion Stokesi*": "Polypiérites cylindriques, parallèles, assez espacés, présentant de forts bourrelets d'ou partent des expansions murales unissant entre eux les individus. Ces expansions ne sont pas toujours complètes, mais elles ne paraissent jamais affecter la forme de tubes de connexion. Les planchers sont bien développés. Nous avons pu compter 36 cloisons très-minces, qui nous ont semblé peu inégales et peu développées. Le diamètre des polypiérites est de 5 ou 6 millimètres. CARBONIFÈRE. *Amérique du Nord:* Lac Wennipeg. Coll. Stokes." This species was probably referred to *Lithostrotion*, by Edwards & Haime, rather than to *Diphyphyllum*, because the rocks from which it was collected were then supposed to be of Lower Carboniferous age. In the description quoted, it will be observed that there is no mention of any styliform columella, like that of *Lithostrotion*, in the centre of the corallites, and there is no indication of any such structure in the original figure of *L. Stokesi*.

A few well preserved specimens, which agree very well with the description and figure of *L. Stokesi*, also with Hall's illustrations and vague diagnosis of his "*Sarcinula (?) obsoleta*," but which are clearly referable to the genus *Diphyphyllum*, as now understood, were collected at Lower Fort Garry by Donald Gunn in 1858, and by T. C. Weston in 1884. These specimens consist of large portions of colonies of fasciculated corallites, with few connecting processes between them. The corallites average from six to eight millimetres in diameter, and are covered externally by a thin, transversely striated epitheca. When the epitheca is worn off or broken away, as it often is, the surface of the corallites underneath it is marked with fine linear longitudinal grooves, corresponding to the septa within. The internal structure of the corallites consists of twenty-two long septa, alternating with as many shorter ones, and of the usual transverse tabulæ characteristic of *Diphyphyllum*.

STREPTELASMA ROBUSTUM, Whiteaves.

Plate 18, figs. 1 and 1*a*.

Streptelasma corniculum? Hall. Large and robust variety. Whiteaves..... . .....1886. Geol. Surv. Canada, Rep. Progr., 1879-80, p. 57.

Streptelasma robustum, Whiteaves.... ... 1896. Canad. Rec. Sc., vol. VI., p. 391.

"Corallum simple, elongate conical, usually rather strongly curved, though some specimens are not so much curved as others, very large for the genus, attaining to a length of seven inches as measured along the curve of the convex side, to a height of nearly five inches, and to a breadth or width of nearly two inches and a quarter at the summit. In some adult or nearly adult specimens the sides are so much compressed

(perhaps abnormally so) that the convexly arched region is obtusely angulated in the centre, longitudinally; in some young specimens this region is distinctly flattened, but others are circular in outline in transverse section, or as seen from above. Septa alternately long and short, varying in number in large specimens from 160 to 170 in all, the longer ones extending to the centre at the bottom of the calyx. Surface marked with transverse wrinkles and numerous fine striæ of growth in well-preserved specimens, but often so much worn, apparently prior to fossilization, as to be almost smooth.

"Longitudinal sections through the centre of large specimens show that the calyx is not very deep, and that its cavity occupies but a small proportion of the entire length. Below the calyx the corallum is filled with strongly developed and apparently thickened septa, with well-marked dissepiments between them, and these septa, with their dissepiments, unite in the centre in such a way as to form a large irregularly reticulated pseudo-columella, which projects" slightly "above the centre of the base of the calyx, as a boss of irregular shape, but with a narrowly rounded summit.

"This fine coral is especially abundant, and attains to a large size in the Red River valley, at Lower Fort Garry and East Selkirk, Manitoba, where it was collected by Dr. R. Bell in 1880, by T. C. Weston and A. McCharles in 1884, by L. M. Lambe in 1890, and by D. B. Dowling in 1891."

On the western side of Lake Winnipeg a few comparatively small and very imperfect specimens, which may be referable to this species, were collected at Deer Island by T. C. Weston in 1884, at Little Black Island by J. B. Tyrrell in 1889, at Jack Head and Snake islands by D. B. Dowling and L. M. Lambe in 1890, at Dog Head, Dancing Point, Little Tamarack and Selkirk islands, and on the main shore opposite the north end of Selkirk Island and north of the Saskatchewan by D. B. Dowling in 1891. Most of the specimens from these localities appear to widen out much more rapidly, at a short distance from the pointed base, than any of the eastern examples of *S. corniculum* do, but a single specimen from Little Black Island approaches very near to that species.

A small specimen, which is probably also referable to *S. robustum*, was collected at the junction of the Little and Great Churchill rivers by Dr. R. Bell in 1889.

When fully grown this species can be readily distinguished from *S. corniculum* by its very much larger size and more robust habit of growth. It seems to bear somewhat the same kind of relationship to *S. corniculum* that the *Receptaculites Oweni* of the Cambro-Silurian rocks of the west does to the eastern fossil known by the rather inappropriate name of

R. occidentalis, and that *Hormotoma Winnipegensis* of the same rocks does to the eastern *M. bellicincta*.

Protaræa vetusta, Hall.

Porites? vetusta, Hall		1847.	Pal. N. York, vol. I., p. 71, pl. 25, figs. 5, *a-b*.
Porites vetusta, Edwards and Haime		1851.	Mon. Polyp. Foss. Terr. Paléoz., p. 208, pl. 14, figs. 6 and 6 *a*.
" "	Nicholson	1875.	Geol. Surv. Ohio, Palæont., vol. II., p. 221.
" "	"	1875.	Rep. Pal. Prov. Ont., p. 9.
" "	Hall	1882.	Eleventh Rep. St. Geol. Indiana, p. 378, pl. 49, fig. 4.
" "	Winchell and Schuchert	1895.	Geol. Minn., Final Rep., vol. III., pt. 1, p. 94, pl. G., figs. 24 and 25.

Little Black Island, Lake Winnipeg, J. B. Tyrrell, 1889 : one specimen, a little more than an inch in its maximum diameter, and about a millimetre thick.

Protaræa (vetusta ? var.) magna.

Plate 18, figs. 2, 3 and 3*a*.

Corallum large, attaining to a maximum diameter of at least six inches and forming crusts from five to fifteen millimetres thick, on or around other organisms such as corals or Orthoceratites. Calyces closely contiguous, extremely shallow, about two millimetres in diameter, rounded polygonal, but very indistinctly defined, the centre of each occupied with a group of from five to seven minute tubercles. Septa about twelve in number, short, wedge-shaped, and perhaps crenulated at their summits. When the surface is slightly ground down and examined with a lens the closely grouped tubercles in the centre of each calyx have somewhat the appearance of a spongiose pseudo-columella.

Transverse and vertical sections, if correctly interpreted by the writer, shew that the entire corallum is composed exclusively of compact sclerenchyma, consisting of a close aggregation of minute tubes which are nearly uniform in size and extent from the base to the summit of the organism, and that the calyces are mere shallow depressions of the surface of this mass of sclerenchyma. Transverse sections through the calyces shew that there are from three to six sclerenchymatous tubes between two closely adjacent calyces, and similar sections below the calyces exhibit only a dense mass of minute sclerenchymatous tissue, composed of tubes that are irregularly four to six sided. In longitudinal sections these tubes are seen to be frequently rather flexuous and somewhat twisted together. They are invariably filled with the matrix, but in some of

them transverse diaphragms or tabulæ can be detected with the aid of a lens.

Lower Fort Garry, Dr. R. Bell, 1880, one specimen completely surrounding the body chamber of a large Orthoceratite, which measures two inches and three-quarters in diameter at the larger end and upwards of four inches in length,—and T. C. Weston, 1884, four specimens, one partly encrusting a colony of the *Chætetes perantiquus* of this Report, and the others detached from the organisms to which they were originally adherent.

These specimens would seem to indicate a well marked local variety of *P. vetusta*, or perhaps a distinct species, which differs from the ordinary form of *P. vetusta* chiefly in its much greater size and thickness. They very closely resemble the *Coccoseris Ungerni* of Eichwald, as described and figured in the "Lethæa Rossica,"* but the calyces of *C. Ungerni* are represented as a line and a half, or three mm. in diameter. Lindström, however, in his "Index to the Genera of Palæozoic Corals,"† regards *Protarœa* and *Coccoseris* as distinct and "well-established" genera. In this "Index," *Stylarœa* of Von Seebach is stated to be synonymous with *Coccoseris*. *Protarœa Verneuili* of Edwards and Haime‡ is said to have calyces three millimetres in diameter, with twenty septa in each.

Favosites prolificus, Billings.

Favosites prolificus, Billings..... .....1865. Canad. Nat. and Geol., Second Series, vol. II., p. 429.
" " .....1866. Geol. Surv. Canada, Cat. Silur. Foss. Isl. Anticosti, p. 6.
" Whiteaves..... .....1895. This vol., pt. 2, p. 113.
Cfr. *Favosites aspera* (d'Orbigny) Edwards & Haime..... ... .1854. Brit. Foss. Corals, p. 257, pl. 60, figs. 3 and 3*a*, and of other European authors.

Several specimens of a large coral, which appear to be referable to this species, were collected at East Selkirk by Dr. R. Bell in 1880, and by T. C. Weston and A. M. McCharles in 1884; also at Lower Fort Garry, by T. C. Weston and A. McCharles in 1884. In the writer's judgment they are essentially similar, in every respect, to the specimen from Stony Mountain referred to on page 113 of the second part of this volume, as being "labelled *Favosites prolificus* in Mr. Billings's own handwriting." They are either subhemispherical colonies, or large portions of such colonies, the largest of which is a little more than six inches in diameter, by about two inches and a-half in height, and sometimes

* Volume I., part 1, p. 442, Atlas, pl. 25, figs. 4, *a-c*.

† Bihang Till K. Svenska Vet.-Akad. Handlingar (Stockholm, 1883), Band 8, No. 9, pp. 12 and 8.

‡ Monographie des Polypiers Fossiles des Terrains Paléozoïques (Paris, 1851), p. 209

flattened at the summit. The corallites of which they are composed are usually hexagonal but sometimes pentagonal tubes, nearly equal in size, and the largest average from two millimetres and a quarter to two mm. and a half in diameter. The spiniform septa are very short, and the mural pores would seem to be placed in the angles of the corallites, though they cannot be seen distinctly in any of the specimens, as the corallites are nearly always either filled, or their walls lined, with minute crystals of calcite. The tabulæ are complete, numerous and placed at a distance of one millimetre apart. A single specimen of a coral which is probably only a variety of this species, and in which the corallites average about a millimetre in diameter, was collected at Wicked Point, Lake Winnipeg, by D. B. Dowling, in 1891.

In the second part of this volume it is stated that "it is doubtful whether *F. prolificus* should be regarded as a distinct species or as a mere local variety of *F. Gothlandica*," but if all the specimens from Stony Mountain, East Selkirk, and Lower Fort Garry that are here referred to *F. prolificus* are correctly determined, it would appear that *F. prolificus* is most probably synonymous with *F. aspera*. In Great Britain, according to Edwards and Haime, both *F. Gothlandica* and *F. aspera* occur at as low a geological horizon as the Caradoc sandstone.

Calapœcia Canadensis, Billings.

Hemispherical masses of *Syringopora*.

D. Dale Owen.....1852. Rep. Geol. Surv. Wiscons., Iowa and Minn., p. 181.

Calapœcia Canadensis, Billings.....1865. Canad. Nat. and Geol., Sec. Ser., vol. II., p. 426.

Probably = *Calapœcia Huronensis*, Billings.

Cfr. *Calapœcia Huronensis*, Billings.....1865. Canad. Nat. and Geol., Sec. Ser., vol. II., p. 426.

Columnopora cribriformis, Nicholson...1874. Geol. Mag., vol. I., p. 253.

" " " ...187 . Rep. Pal Prov. Ont., p. 25.

" ...1875. Rep. Geol. Surv. Ohio, vol. II., pt. 2, p. 187.

Houghtonia Huronica, Rominger.....1876. Geol. Surv. Mich., Foss. Corals, p. 17, pl. 3, fig. 3.

Lower Fort Garry, D. Dale Owen, 1848, Dr. R. Bell, 1880, and T. C. Weston and A. McCharles, 1884; East Selkirk, T. C. Weston and A. McCharles, 1884. At Lake Winnipeg a few imperfect specimens, which appear to be referable to this species, were collected from the basal beds of the limestone at Big Grindstone Point, by Mr. Weston, in 1884, and by Mr. Tyrrell in 1889, at Punk Island by Mr. Weston in 1884, and at Deer Island by Mr. Tyrrell in 1889. Two small but characteristic specimens of this species were collected at the junction of the Little and

Great Churchill Rivers, Keewatin, by Dr. Bell in 1879; it is represented in a small collection of fossils from the vicinity of Doobaunt Lake, made by Mr. Tyrrell in 1893; and a badly preserved specimen of it was collected at Wekusko (Herb) Lake by Mr. Tyrrell in 1896.

The genus *Calapœcia* was first proposed and defined (in 1865) by E. Billings, who regarded it as consisting of three species, which he described under the names *C. Canadensis*, *C. Huronensis*, and *C. Anticostiensis*. In 1866, however, in a foot-note to page 33 of his Catalogue of the Silurian Fossils of the Island of Anticosti, Mr. Billings says of *Calapœcia Anticostiensis* that "it appears to be congeneric with *Syringophyllum organum (Sarcinula organum)*." Lindström, in 1883, made *Columnopora*, Nicholson, a synonym of *Calapœcia*, and Nicholson had previously (in 1879) regarded *Houghtonia* of Rominger as a synonym of *Columnopora*.

The writer has long been convinced that *Columnopora cribriformis*, Nicholson, is identical with *Calapœcia Huronensis*, and that the latter cannot be satisfactorily distinguished, even as a mere stratigraphical variety, from *Calapœcia Canadensis*. Mr. Billings admits that *C. Huronensis* is closely allied to *C. Canadensis*, but claims that the former "has the corallites in general more slender," and that it "presents a different aspect." In the original descriptions it is stated that the corallites of *C. Canadensis* are "about one line, usually a little more, in diameter, and generally in contact though still remaining circular," but that those of *C. Huronensis* are "somewhat less than one line in diameter, with a few others much smaller between them." In one of the specimens of *C. Huronensis*, from Cape Smyth, in the Museum of the Survey, most of the corallites are certainly a little larger than those of *C. Canadensis*, and perhaps a little farther apart, but this is not the case with other specimens of *C. Huronensis* from the same locality. The specimens from the Red River valley and Lake Winnipeg correspond almost equally well with the descriptions of either, but, upon the whole, in the mere size of their corallites, perhaps a little better with the character of *C. Canadensis* than with those of *C. Huronensis*.

In a letter dated October 10th, 1885, Professor Nicholson (to whom one or more examples of each of the nominal species of *Calapœcia* had been sent by the writer, for comparison with specimens of *Syringophyllum)* states that he had arrived at the following conclusions in regard to them: "(1.) My *Columnopora cribriformis* is identical, both generically and specifically, with *Calapœcia Huronensis*, Billings. My name must, therefore, be abandoned. It is quite probable that *Calapœcia Canadensis*, Billings, is also the same as *C. Huronensis*, but, the specimens being silicified in the former, I am not sure of this. (2.) *Calapœcia*

Anticostiensis, Billings, is not generically separable from *Syringophyllum*, and must stand as *Syringophyllum Anticostiense*, Billings, sp. (3.) Having obtained lately much material of *S. organum*, Linn., in Russia, I have worked out the genus *Syringophyllum*, and find it to be an ally of *Chonostegites*, E. & H., and *Thecostegites*, E. & H. Indeed, I am doubtful if *Syringophyllum* and *Chonostegites* can be regarded as generically separable at all. These genera, viz., *Syringophyllum*, *Chonostegites* and *Thecostegites* are all related to *Syringopora*, and form a kind of intermediate group between the Favositidæ and Syringoporidæ.

ECHINODERMATA.

CRINOIDEA.

No crinoids with any portion of the calyx preserved have yet been collected in place from the Winnipeg or Red River limestones, so far as the writer is aware, though a good specimen of an apparently new species of *Saccocrinus*, with the dorsal cup and portions of the arms preserved, in a loose piece of limestone probably of Silurian (Upper Silurian) age, was picked up at Cat Head by Dr. Selwyn in 1873.

A few badly preserved portions of columns of apparently two or three genera of crinoids were collected at Inmost Island by T. C. Weston in 1884; at the same island and at Snake Island by D. B. Dowling and L. M. Lambe in 1890; and at Cat Head by Mr. Dowling in 1893. Most of these are scarcely determinable, even generically, but some of those from Inmost Island appear to be referable to *Glyptocrinus* or *Schizocrinus*.

CYSTOIDEA.

Glyptocystites. (Species undeterminable.)

A few calyx plates of a species of *Glyptocystites*, which Mr. E. Billings said are "closely allied to his *G. multiporus*," were collected by Professor Hind in 1858, at Grindstone Point, as previously stated on page 132, and similar plates were collected at the same locality by Mr. Weston in 1884, and by Mr. Tyrrell in 1889. Detached calyx plates and specimens apparently referable to the same species, with the whole or part of the column and two or three of the plates of the basal portion of the calyx preserved, though the whole of their outer surface is much water worn, were collected at Deer Island by Mr. Tyrrell in 1889.

ASTEROIDEA.

An imperfect and obscure specimen of a protasteroid starfish was collected at Cat Head by D. B. Dowling and L. M. Lambe in 1890, on the

same small piece of limestone as the type of *Trichospongia hystrix*. Mr. Schuchert, who has seen this starfish, in a letter to the writer dated Jan. 21, 1897, states that "it cannot be described specifically, but that generically it appears to be a *Tœniaster*."

VERMES.

ANNELIDA.

SERPULITES DISSOLUTUS, Billings.

Serpulites dissolutus, Billings ....1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 56.

Punk Island, Lake Winnipeg, Professor H. Y. Hind, 1858, an imperfect but fairly well preserved specimen, which seems to be essentially similar to the types of *S. dissolutus* in the Museum of the Survey. It is about an inch and three-quarters in length, but imperfect at both ends, and one millimetre and a half in its maximum breadth. The surface of *S. dissolutus* was described as apparently smooth, but, when examined with a lens the "elevated wire-like margin on each side of the central depression" of the specimen from Punk Island is seen to be marked with minute transverse undulations, which are not so clearly visible in eastern examples of *S. dissolutus*. In the twentieth chapter of Professor Hind's Report on the Canadian Exploring Expedition to the Assiniboine and Saskatchewan (page 87) Mr. Billings says that "a small Serpulites appears to be common at Punk Island; it much resembles the large species of the Chazy limestone," but this chapter was written four years before *S. dissolutus* was described.

ARABELLITES. (Species undeterminable.)

Little Black Island, Lake Winnipeg, J. B. Tyrrell, 1889: a well-preserved portion of a jaw. This specimen has been kindly examined by Dr. G. J. Hinde, who has made a special study of the teeth and jaws of the Annelida of the Palæozoic rocks, and who thus reports upon it in a letter to the writer dated June 22nd, 1894. "It is too fragmentary for positive determination, but it seems to have had a prominent anterior hook, about half of which remains, and a long row of subequal minute teeth on the crest of the plate. So far as I can judge, it belongs to the genus *Arabellites*, forms of which are figured in the Quarterly Journal of the Geological Society of London, vol. xxxv., pl. 18, figs. 13-19, also in vol. xxxvi., pl. 14, and in the Transactions of the Royal Swedish Academy of Science, Sept. 13, 1882 (Kongl. Sv. Vet. Akadem. Handl., Band 7, No. 5). But the portions wanting in your specimen prevent any close comparison with the forms already described."

MOLLUSCOIDEA.

POLYZOA.

Stomatopora Canadensis. (N. Sp.)

Plate 18, figs. 4 and 4*a*.

Zoarium adnate, consisting of frequently branching, uniserially arranged zoœcia. Zoœcia slender, clavate, each about 0·6 mm. in diameter at the proximal or narrow posterior end, increasing gradually in size to 0·3 mm. at the rounded anterior end, and averaging about 1 mm. in length. Apertures small, circular, nearly terminal, about 0·8 mm. in diameter.

Little Black Island, Lake Winnipeg, J B. Tyrrell, 1889: one specimen.

Mr. E. O. Ulrich, who has examined the specimen upon which this species is based, thinks that it is "most nearly related to *S. Proutana*, Miller,* but that it has much larger zoœcia." He is of the opinion that it is quite distinct from *S. inflata* (the *Alecto inflata* of Hall†), and that in *S. arachnoidea* (*Aulopora arachnoidea*, Hall ‡) "the zoœcia are smaller and less constricted proximally."

Pachydictya magnipora, Ulrich.

Pachydictya magnipora, Ulrich.....1889. Geol. Surv. Canada, Contr. Micro-Pal. Cambro-Silur. rocks, etc., p. 43.

Lower Fort Garry (St. Andrews), Dr. R. Bell, 1880: the type and only specimen known to the writer.

Pachydictya acuta, Hall. (Sp.)

Stictopora (?) acuta, Hall.....1847. Pal. N. York, vol. I., p. 74, pl. 26, figs. 3, *a-b*.
Ptilodictya acuta, Billings.....1863. Geol. Canada, p. 158, fig. 121, and p. 941.
" " Nicholson.....1875. Rep. Pal. Prov. Ontario, p. 12, fig. 3.
Pachydictya acuta, Ulrich.....1886. Fourteenth Ann. Rep. Geol. and Nat. Hist. Surv. Minn., p. 67.
" " " .....1889. Geol. Surv. Canada, Contr. Micro-Pal. Cambro-Silur. rocks, etc., p. 44.
" " " .....1893. Lower Silur. Bryoz. Minn. (advance copies from Final Rep. Geol. Minn., vol. III., pt. 1) p. 155, pl. 8, figs. 11-17, and pl. 9, fig. 7.

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*Journal Cincinnati Society of Natural History, vol. V., pt. 2, p. 39. See also Ulrich's Lower Silurian Bryozoa of Minnesota, p. 117, pl. 1, figs. 8-12.

† Palæontology of the State of New York, vol. I. (1847), p. 77, pl. 26, figs. 7, *a-b*. See also Ulrich's Lower Silurian Bryozoa of Minnesota, p. 117, pl. 1, figs. 13-21.

‡ Palæontology of the State of New York, vol. I., p. 76, pl. 26, figs. 6, *a-c*.

Lower Fort Garry (St. Andrews), Dr. R. Bell, 1880: one specimen, associated with the preceding species and *Monticulipora Wetherbyi*, Ulrich.

Phylloporina Trentonensis, Nicholson. (Sp.)

Retepora Trentonensis, Nicholson ... .1875. Geol. Mag., vol. II., p. 37; and Rep. Pal. Prov. Ont., p. 15, pl. 2, figs. 4, and 4, *a-b*.
" " Whiteaves .....1881. Geol. Surv. Canada, Rep. Progr. 1879-80, p. 58c.
Phylloporina Trentonensis, Ulrich..... ..1889. Geol. Surv. Canada, Contr. Micro-Pal. Cambro-Silur. rocks, etc., p. 47.
" " " .....1890. Geol. Surv. Illinois, vol. VIII, p. 639, pl. 53, figs. 1, and 1, *a-c*.

Lower Fort Garry (St. Andrews), Dr. R. Bell, 1880: one good specimen.

Phylloporina. (Species undeterminable.)

Lower Fort Garry, D. B. Dowling, 1881: a fragment of the lower portion of the zoarium of a species which is apparently distinct from *P. Trentonensis*, and which may be undescribed. Mr. Ulrich, who has examined this specimen, writes as follows in regard to it:—"On comparison with my *P. variolata*, which it resembles most, it proves to be a stronger species, with larger and even more irregular fenestrules. It is much stronger and much less regularly fenestrated than *P. reticulata*, Hall. The position of the species seems to be intermediate between the Black River *P. Halli*, Ulrich (a species with stronger branches and more rounded fenestrules) and the Cincinnati *P. variolata*. *P. Trentonensis*, Nicholson, belongs to quite a difierent section of the genus."

Monticulipora Wetherbyi, Ulrich.

Monticulipora Wetherbyi, Ulrich.....1882. Journ. Cincinn. Soc. Nat. Hist., vol. V., p. 239, pl. 10, figs. 4-4 *b*.
" " " .... 1889. Geol. Surv. Canada, Contr. Micro-Pal. Cambro-Silur. rocks, etc., pt. 2, p. 30.
" " " .....1893. Lower Silur. Bryoz. Minn., p. 218, pl. 15, figs. 7 and 8.

Lower Fort Garry (St. Andrews), Dr. R. Bell, 1880: two specimens growing upon the zoarium of *Pachydictya magnipora*.

Mesotrypa Selkirkensis. (N. Sp.)

Plate 19, figs. 1 and 1 *a*.

Zoarium forming expansions of as much as half an inch in thickness: surface characters unknown, the few specimens yet collected being buried in the matrix, with only the broken edges exposed. Zoœcia, as seen in

transverse sections or by grinding down the surface, polygonal: mesopores smaller and more distinctly angular, either occupying the interstices of the zoœcia or forming numerous isolated clusters or maculæ, which are irregular in shape but nearly equidistant, their maximum diameter being about one millimetre and their distance apart averaging about four mm.: acanthopores apparently absent. Longitudinal sections shew that the zoœcia are provided with about thirty continuous and usually straight or slightly concave diaphragms in the space of five mm., and that the diaphragms in the mesopores are nearly twice as close together as those of the zoœcia, but otherwise similar to them.

East Selkirk, L. M. Lambe, 1890: a few remarkably well preserved but imperfect specimens.

These specimens seem to indicate a new species, which appears to differ from *M. Quebecensis* (= *Diplotrypa Quebecensis*, Ami*), by its nearly equidistant and clearly defined maculæ or clusters of mesopores, and from *M. infida*, Ulrich, † by the same character, coupled with the absence of acanthopores.

Diplotrypa Westoni, Ulrich.

Diplotrypa Westoni, Ulrich.....1889. Geol. Surv. Canada, Contr. Micro-Pal. Cambro-Silur. rocks, etc., pt. 2, p. 30, pl. 8, figs. 4, and 4, *a-b*.

Big Island, Lake Winnipeg, T. C. Weston, 1884: one specimen, the type of the species, which latter is said to be "very nearly related to the European *Diplotrypa petropolitana* (Pander)."

Bythotrypa laxata, Ulrich.

Fistulipora (?) laxata, Ulrich.....1889. Geol. Surv. Canada, Contr. Micro-Pal. Cambro-Silur. rocks, etc., pt. 2. p. 37, pl. 8, figs. 2, and 2*a*.

Bythotrypa laxata, Ulrich.....1893. Lower Silur. Bryoz. Minn., p. 325, pl. 28, figs. 21-25.

Lower Fort Garry (St. Andrews), Dr. R. Bell, 1880: one large specimen.

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*Canadian Record of Science, vol. V. (1893), p. 100; and, Ulrich, 1893, Lower Silurian Bryozoa of Minnesota, p. 259, and figs. 15, *e-f*, on p. 248.

† Lower Silurian Bryozoa of Minnesota, p. 258, pl. 17, figs. 1-8.

BRACHIOPODA.

Lingula Iowensis, Owen.

Lingula Iowensis, Owen ..... 1844. Geol. Rep. Iowa, Wiscons. and Ill., p. 70, pl. 15, fig. 1.
Lingula quadrata ? Owen..... 1851. Geol. Rep. Wiscon., Iowa and Minn., pl. 2 B, fig. 8.
" " Hall ..... 1862. Geol. Wiscons., vol. I, p. 46, fig. 1, and p. 435.
" " Meek and Worthen.... 1868. Geol. Surv. Illinois, vol. III., p. 305, pl. 2, fig. 4.
Lingulella Iowensis, Whitfield ..... 1882. Geol. Wiscons., vol. IV., p. 242, pl. 9, fig. 1.
Lingula Iowensis, Hall.... .. .... 1892. Pal. N. York, vol. VIII., pt. 1, p. 8, pl. 1, fig. 14.
" " Winchell and Schuchert..1893. Lower Silur. Brach. Minn. (advance copies from Final Rep. Geol. Minn., vol. III., pt. 1,) p. 349, pl. 29, figs. 19-22.

South-east side of Elk Island, Lake Winnipeg, Dr. A. R. C. Selwyn, 1872; three specimens "from loose fragments of limestone:" and two miles south of Whiteway (or Dog Head) Point, on the same lake, D. B. Dowling, 1891; one specimen.

The following observations upon the affinities of this species are made by Professor Winchell and Mr. Schuchert in their memoir on "the Lower Silurian Brachiopoda of Minnesota." "*Lingula quadrata*, as identified by Hall, * and Billings, † we regard as identical with *L. rectilateralis*, Emmons. ‡ This species occurs in the Trenton, Utica slate and Loraine groups of New York and eastern Canada, and differs but slightly, if any, from *L. Iowensis*, Owen. The characteristic striated hinge areas of *L. Iowensis*, Owen, and *L. Cincinnatiensis*, Hall and Whitfield, have not been observed in *L. rectilateralis*, Emmons. Should these parts eventually be discovered in the latter species, *L. Iowensis*, Owen, will give place to *L. rectilateralis*, as the latter has two years' priority over the former. Professor Hall in 1847 ** regarded Emmons's species as a synonym of *L. quadrata*, Eichwald, while Whitfield †† regarded this form as identical with *L. Iowensis*, Owen." "We have seen four specimens of typical *Lingula quadrata*, Eichwald, from Esthonia, in the collection of Mr. Ulrich, and these prove beyond a doubt that none of the American forms identified with this species are correctly named. The Russian species is larger, with very strongly convex valves and a more narrowly

* Palæontology of New York, vol. I. (1847), p. 96, pl. 30, fig. 4, and p. 285, pl. 79, fig. 1.
† Canadian Naturalist and Geologist, 1856, vol. I., p. 318, fig. 8.
‡ Geology of New York; Report of the Second District (1842), p. 399, fig. 6.
** Loc. cit., p. 285.
†† Loc. cit., p. 242.

rounded anterior margin than in *L. Iowensis*, *L. rectilateralis*, or *L. Cincinnatiensis*, Hall and Whitfield."

On the other hand, M. Friedrich Schmidt, of St. Petersburg, who visited the Museum of the Survey on the second and third of October, 1891, and carefully examined the specimens identified by E. Billings, expressed the opinion (which the writer took down in writing, at the time, from his dictation) that the Anticosti specimens labelled *Lingula quadrata*, Eichwald, are exactly similar to Eichwald's types, and that two specimens from the Trenton limestone near Montreal that are similarly labelled, may be correctly named.

LINGULA ELONGATA, Hall.

Lingula elongata, Hall.....1847. Pal. N. York, vol. I, p. 97, pl. 30 fig. 5.
" " Billings.....1863. Geol. Canada, p. 161, fig. 135.

Inmost Island, Kinwow Bay, Lake Winnipeg, T. C. Weston, 1884: a flat piece of limestone with one surface strewn with numerous valves of a small *Lingula*, which agrees very well with Hall's description and figure of *L. elongata*, but which is almost intermediate in size between that species and *L. riciniformis*. Two of the most perfect of these valves measure respectively, the one 10·5 mm. in length by 6 mm. in breadth, and the other 8·5 mm. by 5·5. All of them shew the "narrow depressed line" which "extends along the length of the shell, from the beak, more than half way to the base," which constitutes part of the original description of *L. elongata*. According to Messrs. Winchell and Schuchert,* *L. elongata*, Hall, differs in being twice the size of *L. riciniformis*, but if this is the only difference between these two forms, the former could very well be the adult state of the latter, though Hall's figures give one the impression that *L. riciniformis* is a proportionately less elongated shell and with more convex sides than *L. elongata*.

LINGULA OBTUSA, Hall.

Lingula obtusa, Hall.....1847. Pal. N. York, vol. I., p. 98, pl. 30, figs. 7, *a-c*.
" " Billings.....1863. Geol. Canada, p. 161, fig. 137.

Cat Head, Lake Winnipeg, T. C. Weston, 1884: one nearly perfect and beautifully preserved specimen and two very bad ones. The only one that is well preserved is nearly flat, a little broader in advance of the midlength than behind it, and therefore slightly more ovate than oval in outline. Its surface markings consist of crowded and prominent, minute

* Lower Silurian Brachiopoda of Minnesota, p. 344.

and acute, laminar concentric ridges, not unlike those of *L. Hurlburti*, N. H. Winchell, from the Galena limestone of Minnesota. It (the Cat Head specimen) resembles figure 7*b*, on plate 30 of the first volume of the Palæontology of New York, more than figure 7*a* on the same plate, but is more narrowly rounded in front than the former and not quite so obtuse at the beak. As compared with the representation of *L. obtusa* on page 161 of the "Geology of Canada," it is not quite so much elongated in proportion to its breadth, and more obtuse at the beak. It is remarkably similar to specimens from the Utica slate near Collingwood, in the Museum of the Survey, which appear to have been identified with *L. obtusa* by E. Billings. Mr. Schuchert, who has examined this specimen, writes that "in form it is not *L. Hurlburti*," but that it "approaches it in surface characters. It is more in harmony," he adds, "with *L. obtusa* or small *L. Cobourgensis*."

Dinobolus parvus, Whitfield.

Dinobolus parvus, Whitfield.....1882. Geol. Wiscons., vol. IV., p. 347, pl. 27, figs. 8-10.
Dinobolus (?) parvus, Winchell and Schuchert. 1893. Lower Silur. Brach. Minn., p. 356, figs. 27, A-D.

West shore of Lake Winnipeg, north of the Saskatchewan and opposite the north end of Selkirk Island, eight well preserved casts of the interior of separate valves; and Stonewall, Manitoba, a similar specimen but from rocks that may be referable to the Hudson River group, all collected by D. B. Dowling in 1891. Similar but not so well preserved specimens have since been collected from loose pieces of rock on the west bank of the Churchill River, at Fort Churchill, Hudson's Bay, by J. B. Tyrrell in 1894.

Clitambonites diversa, Shaler. (Sp.)

Orthisina diversa, Shaler.....1865. Bull. Mus. Comp. Zool., Cambridge No. 4, p. 67.
Orthisina Verneuili, Billings.....1866. Geol. Surv. Canada, Cat. Silur. Foss. Anticosti, pp. 43 and 74.
Hemipronites Americanus, Whitfield.....1877. Ann. Rep. Geol. Surv. Wisconsin, p. 72.
" " " .....1882. Geol. Wisconsin, vol. IV., p. 243, pl. 10, figs. 15-17.
Streptorhynchus Americanus, Miller.....1889. N. Am. Geol. and Palæont., p. 378.
Clitambonites Americanus, Hall.....1892. Pal. N. York, vol. VIII., p. 232, pl. 15A, figs. 1-8.
" " Winchell and Schuchert.....1893. Lower Silur. Brach. Minn., p. 378, pl. 30, figs. 11-17.

Western shore of Lake Winnipeg, two miles south of Dog Head, D. B. Dowling, 1891: one imperfect but fairly characteristic specimen.

"This widely distributed species was first described by Shaler as *Orthisina diversa.*" A year later Billings identified it as *O. Verneuili*, Eichwald, at the same time regarding Shaler's species as synonymous with it. On the other hand, Shaler has since referred *Orthisina Verneuili*, Billings, to his species, in which he is correct. On comparison with the European species, as illustrated by de Verneuil,* it is seen that the American species is wider along the hinge-line, the ventral area much less incurved and elevated, with finer striæ and a narrow sinus in the dorsal valve. These differences are sufficient to distinguish the two species." Winchell & Schuchert, op. cit., p. 380.

In the Museum of the Survey there are eight specimens on exhibition in the cases, which were identified with *Orthisina Verneuili* by E. Billings, and which are still so labelled. Four of these are from the Trenton limestone at Ottawa, three are from the same formation at Jessup's Rapids on the Bonnechere, and one is from Division 1 of the "Anticosti group" at Gamache Bay, Anticosti. All of these specimens were carefully examined in 1891 by M. Friedrich Schmidt, who informed the writer that the Anticosti example labelled *O. Verneuili* agrees with Eichwald's types of that species, but that the specimens from the Trenton limestone are more like *O. Wesenbergensis*, Pahlen,† and that they differ from the true *O. Verneuili.*

ANASTROPHIA (?) HEMIPLICATA, Hall. (Sp.)

Atrypa hemiplicata, Hall.....1847. Pal. N. York, vol. I., p. 144, pl. 33 fig. 10.
" " Billings..... 1856. Canad. Nat. and Geol., vol. I., p. 208, figs. 20-23.
Pentamerus hemiplicatus, Billings..... 1859. Canad. Journ., vol. IV., p. 316.
" " Hall.....1859. Twelfth Rep. N. York St. Cab. Nat. Hist., p. 66.
Camarella hemiplicata, Billings.....1863. Geol. Canada, p. 168, figs. 154, *a-c.*
Anastrophia (?) *hemiplicata*, Winchell and Schuchert.....1893. Lower Silur. Brach. Minn., p. 382, pl. 30, figs. 29-31.

Deer Island, Lake Winnipeg, T. C. Weston, 1884, one adult specimen of a small form of this species, and J. B. Tyrrell, 1889, an apparently immature example.

STROPHOMENA INCURVATA, Shepard.

Producta incurvata, Shepard.....1838. Am. Journ. Sc. and Arts, vol. XXXIV., p. 144, figs. 1 and 2.
Orthis incurvata, Castelneau.....1843. Essai sur le Syst. Silur. de l'Amér. Septentr., p. 38.

* Russia and the Ural Mountains, vol. II., pls. 11 and 12.
† Monogr. *Orthisina.* Mém. l'Académie de St-Petersbourg, 1878.

Strophomena convexa, Owen..... 1844. Geol. Expl. Iowa, Wiscons. and Ill., p. 70, pl. 17, fig. 2.
Leptæna filitexta, Hall..... 1847, Pal. N. York, vol. I., p. 111, pl. 31B, figs. 3, *a*, *f*.
Strophomena filitexta, Billings..... 1856. Canad. Nat. and Geologist, vol. I., p. 203, figs. 1 and 2
Strophomena incurvata, Winchell and Schuchert..... 1893. Lower Silur. Brach. Minn., p. 385, pl. 30, figs. 36-40.

Several specimens of this species were collected at Lower Fort Garry by Dr. R. Bell in 1880, and by T. C. Weston in 1884. At East Selkirk, in 1884, Mr. Weston obtained an unusually large ventral valve of *S. incurvata*, which is about seventy millimetres broad at the hinge line, and forty-four mm. long. On Lake Winnipeg the species has been collected at Kinwow Bay, and at Birch or Inmost Island, in Kinwow Bay, by T. C. Weston in 1884, and by D. B. Dowling and L. M. Lambe in 1890; also at Cat Head and Big Sturgeon Island by D. B. Dowling and L. M. Lambe in 1890.

Characteristic examples of *S. incurvata* had previously been collected by Dr. R. Bell in 1879, on the Nelson River, Keewatin, at the Limestone Rapids, 100 miles up, at the second and third rapids, and at the first Birch Brook. Some of these are referred to, under the name *Strophomena filitexta*, Hall, on page 470 of Appendix 1 to Dr. Bell's Report, in the Report of Progress of this Survey for 1878-79.

Strophomena rugosa (Rafinesque Ms.), Blainville.

Strophomena rugosa (Rafinesque) Blainville. 1825. Malacol. and Conchyliol., vol. I., p. 513, pl. 53, figs. 2 and 2*a*.
Strophomenes rugosa, Defrance..... 1827. Dict. Sc. Naturelles, vol. I., p. 151, and Atlas.
Leptæna planumbona, Hall..... 1847. Pal. N. York, vol. I., p. 112, pl. 31, figs. 4, *a-e*.
Strophomena rugosa, King..... 1850. Brit. Perm. Foss., p. 103.
Strophomena planumbona, Hall..... 1862. Geol. Wiscons., vol. I., p. 54, fig. 7.
Strophomena (Hemipronites) planumbona, Meek..... 1873. Rep. Geol. Surv. Ohio, vol. I., p. 79, pl. 6, figs. 3, *a-h*.
Streptorhynchus (Strophomena) elongata, James..... 1874. Cincinn. Quart. Journ. Sc., vol. I., p. 240.
Hemipronites planumbona, S. A. Miller..... 1875. Ibidem, vol. II., p. 45.
Streptorhynchus planumbonus, S. A. Miller.. 1877. Am. Pal. Foss, p. 134.
Streptorhynchus elongata, Mickleborough and Wetherby..... 1878. Journ. Cincinn. Soc. Nat. Hist., vol. I., p. 76.
Strophomena planumbona, White..... 1880. Second Ann. Rep. Indiana Bur. Statist. and Geol., p. 483, pl. 2, figs. 13 and 14.
" " " ..... 1881. Tenth Rep. Indiana St. Geologist, p. 115, pl. 2, figs. 13 and 14.

Streptorhynchus planumbona, Hall .....1883. Second Ann. Rep. N. York St. Geologist, pl. 39, figs. 15-17, and pl. 42, figs 8-9.
Strophomena planumbona (partim) Shaler...1887. Mem. Kentucky Geol. Surv., p. 13, pls. 4 and 5.
Strophomena rugosa, Hall.....1892. Pal. N. York, vol. VIII., pt. 1, p. 247, figs. 13 and 14.
Strophomena planumbona or *rugosa*, Hall....1892. Ibidem, p. 251, pl. 9, figs, 15-17, and pl. 11A, figs. 8 and 9.
Strophomena rugosa, Winchell and Schuchert. .....1893. Lower Silur. Brach. Minn., p. 390, pl. 31, figs. 4 and 5.

Lower Fort Garry, T. C. Weston, 1884: one specimen.

An excellent summary of the various names that have been applied to this and to the preceding species is given by Professor Winchell and Mr. Schuchert, in their Lower Silurian Brachiopoda of Minnesota, from which the preceding list of synonyms is quoted.

STROPHOMENA RUGOSA, var. SUBTENTA.

Strophomena subtenta, Conrad.....1841. Fifth Ann. Rep., N. York Surv., p. 37 (undefined).
Leptæna subtenta, Hall ..... 1847. Pal. N. York, vol. I., p. 115, pl. 31B, figs. 9, *a-b*.
Strophomena subtenta, Billings.....1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 132, and fig. 109 on p. 130.
Strophomena (Hemipronites) plicata (James), Meek .....1873. Rep. Geol. Surv. Ohio, vol. I., pt. 2, p. 81, pl. 6, figs. 4, *a-b*.
Strophomena subtenta, Whiteaves.....1880. Geol. Surv. Canada, Rep. Progr, 1878-79, p. 47C.
Strophomena rugosa var. *subtenta*, Winchell and Schuchert.....1893. Lower Silur. Brach. Minn., p. 393.

Limestone Rapids, 100 miles up the Nelson River, Keewatin, Dr. R. Bell, 1879: two good specimens.

STROPHOMENA TRILOBATA, Owen. (Sp.)

Leptæna trilobata, Owen..... .... 1852. Geol. Surv. Wiscons., Iowa and Minn., p. 584, pl. 2, figs. 17 and 18.
Strophomena trilobata, Miller .... 1877. Amer. Pal. Foss., p. 138.
" " Winchell & Schuchert. 1893. Lower Silur. Brach. Minn., p. 395, pl. 31, figs. 12 and 13.

East Selkirk, L. M. Lambe, 1890: one large and well preserved but imperfect dorsal valve.

On Lake Winnipeg a few characteristic specimens of this species have been collected at the following localities: At Bull Head, Big Grindstone Point and Elk Island, by T. C. Weston, in 1884; at Deer Island by J. B. Tyrrell in 1889; at Snake and Jack Head islands by D. B. Dowling and L. M. Lambe in 1890; at the mouth of the Little Saskatchewan River

and at Little Tamarack Island by D. B. Dowling in 1890; at Clark's or "Limestone" Point, eleven miles north of the mouth of the Little Saskatchewan, at an exposure eight miles north of Clark's Point, and on the west shore of the lake, north of the Saskatchewan and opposite the north end of Selkirk Island by D. B. Dowling in 1891. Nearly all the specimens from these localities are dorsal valves in various states of preservation. They are here referred to Owen's species, which has not yet been satisfactorily illustrated, mainly on the authority of Mr. Charles Schuchert, to whom three of the best specimens were sent for comparison, and who regards them as "typical examples of *Strophomena trilobata*, as found in the upper Mississipi valley."

STROPHOMENA. (Species uncertain.)

A few dorsal valves of a *Strophomena*, whose specific relations are at present uncertain, were collected at Lower Fort Garry by Dr. Bell in 1880 and by Mr. Weston in 1884. So far as can be ascertained from their imperfect state of preservation, these specimens would appear to be intermediate in their characters between *S. trilobata* and *S. Hecuba*, Billings.* In the dorsal valve of *S. trilobata* the visceral disc is flattened and the remainder of the valve bent abruptly inward at an obtuse angle, at about one-third of the length from the beak to the nasute anterior extremity, while that of *S. Hecuba* is ventricose and evenly convex. These dorsal valves from Lower Fort Garry are tumid and gibbous a little behind the midlength, when viewed laterally, and neither obtusely angulated posteriorly, as in *S. trilobata*, nor uniformly convex as in *S. Hecuba*. They may possibly indicate or represent a nasute local variety of *S. incurvata*.

STROPHOMENA BILLINGSII, Winchell and Schuchert.

Strophomena reeta, Billings ....1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 130, figs. 108, *a-c*. But apparently not *S. recta*, Conrad, 1843.

Strophomena Billingsi, Winchell & Schuchert. 1893. Lower Silur. Brach. Minn., p. 397, figs. 32, *a-e*.

East Selkirk, Manitoba, T. C. Weston, 1884: four specimens, on two small pieces of limestone.

RAFINESQUINA DELTOIDEA, Conrad. (Sp.)

Strophomena deltoidea, Conrad.....1839. Third Ann. Rep. Geol. Surv. N. York, p. 64.

" " " . ...1841. Fifth Ann. Rep. Geol. Surv. N. York, p. 37.

* Vide Geological Survey of Canada, Palæozoic Fossils, vol. I., p. 126, fig. 104.

Strophomena deltoidea, Vanuxem.....1842. Geol. N. York, Rep. Third District, p. 46, fig. 2.
" " Emmons.....1842. Ibidem, Rep. Second District, p. 389, fig. 2.
Strophomena camerata, Conrad.....1842. Journ. Ac. Nat. Sc. Philad., vol. VIII., p. 254, pl. 14, fig. 5.
Leptæna camerata, Hall.....1847. Pal. N. York, vol. I., p. 106, pl. 31 A, figs. 2, *a-b*.
Leptæna deltoidea, Hall.....1847. Ibidem, p. 106, pt. 31 A, fig. 3, *a-e*.
Strophomena deltoidea, Billings.....1863. Geology of Canada, p. 163, fig. 141.
Streptorhynchus (*Strophonella*) *deltoidea*, Hall.1883. Second Ann. Rep. N.Y. St. Geol., pl. 42, figs. 1, 2, 4 (but not 3).
Rafinesquina deltoidea, Hall.....1892. Pal. N. York, vol. VIII., pt. 1, pl. 9 A, figs. 1, 2, 4.
" " Winchell & Schuchert.1893. Lower Silur. Brach. Minn., p. 403, pl. 31, figs. 30 and 31.

Washow Bay, Lake Winnipeg, T. C. Weston, 1884: one ventral valve.

RAFINESQUINA ALTERNATA (Conrad, Ms.) Emmons.

Leptæna alternata, Conrad.....1838. Second Ann. Rep. N.Y. Geol. Surv., p. 115 (undefined).
Strophomena alternata, Conrad.....1838-41. Ibidem, Third Rep., p. 63; Fourth Rep., p. 201; and Fifth Rep., p. 37 (undefined).
Strophomena alternata, Emmons.....1842. Geol. N. York, Rep. Second District, p. 395, fig. 3.
Orthis Huronensis, Castelneau.....1843. Ess. sur le Syst. Silur. de l'Amérique Septentr., p. 37, pl. 14, fig. 6.
Orthis plana, Castelneau (not Pander) .....1843. Ibidem, p. 38. pl. 14, fig. 1.
Strophomena angulata? Owen.....1844. Geol. Expl. Iowa, Wiscons. and Ill., pl. 18, figs. 1, 3.
Leptæna alternata, Hall.....1847. Pal. N. York, vol. I, pp. 102 and 286, pl. 31, figs. 1, *a-n*; pl. 31A, figs. 1, *a-i*; and pl. 79, figs. 2, *a-l*.
Strophomena alternata, Billings.....1856. Canad. Nat. and Geol., vol. I., p. 204, figs. 3 and 4: and of numerous subsequent U. S. and Canadian palæontologists.
Rafinesquina alternata, Hall.....Pal. N. York, vol. VIII., pt. 1, p. 281, pl. 8, figs. 6-11.
" " Winchell and Schuchert.....1893. Lower Silur. Brach. Minn., vol. III., pt. 1, p. 404, (which see for a complete list of synonyms of this species), pl. 31, figs. 32-34.

Lower Fort Garry,—where specimens were collected by D. Dale Owen in 1848, by Dr. R. Bell in 1880, and by T. C. Weston in 1884,—and East Selkirk, where specimens were collected by A. McCharles in 1884. On Lake Winnipeg it was collected at Inmost or Birch Island, in Kinwow Bay, by D. B. Dowling and L. M. Lambe in 1890, and in Keewatin it had previously been collected on the Nelson River sixty miles from its

mouth, and at the Limestone Rapids, one hundred miles up, by Dr. R. Bell in 1879.

Rafinesquina Leda, Billings. (Sp.)

Strophomena Leda, Billings. .....1860. Canad. Nat. and Geol., vol. V., p. 55.
" " " .....1862. Geol. Surv. Canada, Pal. Foss., vol. I, p. 120, figs. 98 and 99.
Brachyprion Leda, Shaler.....1865. Bul. Mus. Comp. Zool., Cambridge (Mass.), vol. I., p. 63.
" " Hall and Clarke.....1892. Pal. N. York, vol. VIII., (Brachiopoda 1), p. 288, fig. 21.

One fairly characteristic ventral valve of the typical form of this species was collected at Deer Island, Lake Winnipeg, by Mr. J. B. Tyrrell in 1889. The following remarks upon this rather peculiar shell are made by Messrs. Hall and Clarke, on page 288 of the eighth volume of the Palæontology of the State of New York: "There is a small number of species, the incipient members of the genus *Stropheodonta*, in which the delthyrium is open, or but partially covered, as in some of its later forms, the crenulations are confined to a very limited extent on either side of the deltidium, and upon one of these forms, *Strophomena Leda*, Billings, from the Anticosti group, Professor Shaler has proposed to found the genus Brachyprion. To the same group belong the *Strophomena Philomela*, Billings, from the *Pentamerus oblongus* beds of Anticosti, and Professor Shaler has described two other species from Anticosti, *Brachyprion ventricosum* and *B. geniculatum*. These features can scarcely be regarded as of generic value, but the group is an interesting one on account of its being the precursor of the fuller development of those characters upon which the genus *Stropheodonta* was originally founded."

Rafinesquina lata, Whiteaves.

Plate 19, figs. 2-5.

Rafinesquina lata, Whiteaves.... .....1896. Canad. Rec. Sc., vol. VI., p. 392.

"Shell large, adult specimens measuring as much as three inches along the hinge line, deeply concavo-convex, much broader than long, and broadest at the hinge line: cardinal angles produced. Ventral or pedicle valve strongly convex exteriorly, usually regularly arched from back to front, most prominent and in some specimens gibbous and even obtusely subangular about the midlength, with the visceral disc flattened obliquely, in others most tumid in the umbonal region posterior to the midlength, its beak moderately prominent, its cardinal area wide and about four millimetres and a quarter in height, with a broadly triangular deltidium in the centre. Dorsal or brachial valve deeply concave, closely following

the curvature of the ventral, its cardinal area about one mm. and a quarter in height, and its beak apparently small.

"Surface of both valves marked with very numerous and closely disposed, thread-like radiating raised lines or minute ridges. In the only well preserved dorsal valve known to the writer these radii are very nearly equal in size, but upon the ventral valves of several specimens they are unequal in size and irregular in their disposition. In some places the larger radii alternate with the smaller ones, but in others there are from two to four, or even more, of the smaller radii between two of the larger ones. In addition to these radii, the visceral disc of the ventral valve of some specimens is marked with comparatively coarse, undulating, concentric but somewhat interrupted corrugations.

"Hinge dentition and characters of the interior of both valves unknown, but an imperfectly preserved cast of the interior of the shell of a ventral valve" from Cat Head "shews that the flabellate diductors of that valve are very similar in shape to those of *R. alternata*, as figured by Hall on Plate 8, figure 10, of the eighth volume of the 'Palæontology of the State of New York,' though their external margins are very much less distinctly defined."

"Apparently not uncommon" "at Lower Fort Garry—where it was collected by Do ald Gunn in 1858, by Dr. R. Bell in 1880, by T. C. Weston in 1884, and D. B. Dowling in 1891, and at East Selkirk—where specimens were obtained by T. C. Weston and A. McCharles in 1884. From the limestones of Lake Winnipeg it has so far been collected only at Cat Head (by T. C. Weston in 1884 and D. B. Dowling in 1891), and at Jack Head Island (by D. B. Dowling and L. M. Lambe in 1890).

"Altogether, the writer has seen fourteen specimens of this shell, three of which show the characters of the hinge area of both valves fairly well though the beak of the dorsal valve cannot be seen in either, as it is either broken off or buried under the matrix. The ventral aspect of these specimens is remarkably similar to that of the fossil figured by Professor Winchell and Mr. Schuchert on Plate 31, figures 35 and 36 of the 'Lower Silurian Brachiopoda of Minnesota,' as *Rafinesquina alternata*, var. *loxorhytis*, but which, Mr. Schuchert has recently informed the writer, he now regards as a form of *R. Kingii*, the *Strophomena Kingii* of Whitfield. Mr. Schuchert, however, who has seen all the specimens from Manitoba upon which the preceding description is based, states that their hinge areas are always nearly three and even four times as high as those of the Minnesota specimens of *R. Kingii* which he has studied, and regards this as a valid distinction between them. Professor Whitfield, also, who has seen some of the most perfect Manitoba specimens of *R. lata*, regards them as specifically distinct from his *Strophomena Kingii*, on the ground that the umbones of ventral valves of the

former are more full, and the valves themselves proportionately more convex than those of *S. Kingii.*"

LEPTÆNA UNICOSTATA, Meek and Worthen. (Sp.)

Strophomena unicostata, Meek and Worthen..1868. Geol. Surv. Illinois, vol. III., p. 335, pl. 4, fig. 11.
" " Whitfield .....1882. Geol. Wisconsin, vol. IV., p. 262, pl. 12, fig. 14.
Leptæna unicostata, Winchell and Schuchert.1893. Lower Silur. Brach. Minn., p. 411, pl. 32, figs. 6-9.

Lower Fort Garry, T. C. Weston, 1884: one specimen.

On Lake Winnipeg a few specimens have been collected at Kinwow Bay by T. C. Weston in 1884; at Cat Head by D. B. Dowling and L. M. Lambe in 1890; at Inmost or Birch Island by D. B. Dowling and L. M. Lambe in 1890; at Clark's Point by D. B. Dowling in 1891; on the west shore north of the Saskatchewan and opposite the north end of Selkirk Island by D. B. Dowling in 1891; and at the First Limestone Point on the west shore north of the Saskatchewan by D. B. Dowling in 1891.

Keewatin, Limestone Rapids 100 miles up the Nelson River, Dr. R. Bell, 1879: one ventral valve.

PLECTAMBONITES SERICEA, Sowerby. (Sp.)

Leptæna sericea, Sowerby.....1839. In Murchison's Silur. Syst., pl. 19, figs. 1 and 2.
Strophomena sericea, Conrad.....1840. Third Ann. Rep. Geol. Surv. N. York, p. 201.
" " Emmons.....1842. Geol. N. York, Rep. Third District, p. 47.
Leptæna sericea, Hall.....1847. Pal. N. York, vol. I., pp., 110 and 287, pl. 21B, fig. 2, and pl. 79, fig. 13.
" " " .....1852. Ibidem, vol. II., p. 59, pl. 21, fig. 1.
" " Billings.....1856. Canad. Nat. and Geol., vol. I., p. 41, fig. 2.
" " " ..... 1863. Geol. Canad., p. 163, fig. 139: and of many subsequent writers on U. S. and Canadian fossils.
Plectambonites sericea, Hall..... ....1892. Pal. N. York, vol. VIII., pt. 1, pl. 15, figs. 25-29.
" " Winchell and Schuchert. .....1893. Lower Silur. Brach. Minn., p. 414, pl. 32, figs. 10-12.

This well known species has been collected at Lower Fort Garry by Dr. A. R. C. Selwyn in 1872, and by Mr. Weston in 1884. At Lake Winnipeg it has been collected on Elk Island by T. C. Weston in 1884; at Inmost or Birch Island, in Kinwow Bay, by T. C. Weston in 1884,

and by D. B. Dowling and L. M. Lambe in 1890; on Snake Island by Messrs. Dowling and Lambe in 1890; and from Dog Head by Mr. Lambe in 1890. In 1879 it was collected by Dr. R. Bell at the Limestone Rapids of the Nelson River, in the district of Keewatin.

Orthis tricenaria, Conrad.

Orthis tricenaria, Conrad.....1843. Proc. Ac. Nat. Sc. Philad., vol. I., p. 333.
Orthis disparilis, Conrad.....1843. Ibidem, p. 333.
Orthis testudinaria(?) Owen.....1844. Geol. Expl. Iowa, Wiscons. and Ill., pl. 15, fig. 11.
Orthis tricenaria, Hall.....1847. Pal. N. York, vol. I., p. 121, pl. 32, figs. 8, *a-d*.
Orthis disparilis, Hall.....1847. Ibidem, p. 119, pl. 23, figs, 4, *a-d*.
" " Billings.....1859. Canad. Nat. and Geol., vol. IV., p. 440, fig. 20.
Orthis tricenaria, Salter.....1859. Canad. Org. Rem., Dec. I., p. 39, pl. 9, figs. 1-4.
" " Hall.....1862. Geol. Wiscons., vol. I., p. 42, figs. 8-11.
Orthis disparilis, Hall.....1862. Ibidem, p. 435.
" " Billings.....1863. Geol. Canada, p. 130, figs. 60, *a-b*.
Orthis tricenaria, Billings.....1863. Ibidem, p. 167, figs. 151, *a-b*.
" " Hall.....1883. Second Ann. Rep. N. York St. Geologist, pl. 35, figs. 1-5.
" " Walcott.....1884. Mon. U. S. Geol. Surv., vol. VIII., p. 74, pl. 11, fig. 4.
" " Hall.....1892. Pal. N. York, vol. VIII., pt. 1, pp. 191, 193, 221, 228, pl. 5, figs. 9-12.
Orthis disparilis, Hall.....1892. Ibidem, pp. 191, 221, 228.
Orthis tricenaria, Winchell and Schuchert..1893. Lower Silur. Brach. Minn., p. 418, pl. 32, figs. 18-23.

Lake Winnipeg, at Deer Island, from the basal beds of the limestone, T. C. Weston, 1884, and J. B. Tyrrell, 1889; at Inmost or Birch Island, and three miles west of Cat Head, D. B. Dowling and L. M. Lambe, 1890; and at Cat Head, D. B. Dowling, 1891.

Orthis (Dinorthis) pectinella (Emmons) Hall.

Orthis pectinella, Emmons.....1842. Geol. N. York, Rep. Second Distr. p. 394, fig. 2 (not defined).
" " Hall.....1847. Pal. N. Y., vol. I., p. 123, pl. 32, figs. 10, *a-c*.
" " var. *semiovalis*, Hall.....1847. Ibidem, p. 124, pl. 32, figs. 11, and 11, *a-b*.
" " Billings.....1856. Canad. Nat. and Geol., vol. I., p. 205, fig. 5.
" " Rogers.....1858. Geol. Pennsylv., vol. II., p. 818, fig. 602.
" " Billings.....1863. Geol. Canada, p. 165, figs. 147, *a-c*.
Orthis Charlottæ, N. H. Winchell.....1880. Eighth Rep. Geol. and Nat. Hist. Surv., Minn., p. 67.

Orthis pectinella, Hall.....1883. Second Ann. Rep. N. York St. Geol., pl. 34, figs. 39 and 40.
" " var. *semiovalis*, S. A. Miller.1889. N. Am. Geol. and Palæont., p. 359.
Dinorthis pectinella, Hall.....1892. Pal. N. York, vol. VIII., pt. 1, pp. 195, 222 and 228, pl. 5, figs. 27-33.
Orthis (Dinorthis) pectinella, Winchell and Schuchert.....1893. Lower Silur. Brach. Minn., p. 424, pl. 32, figs. 31-34.

Lake Winnipeg, at the north end of Punk Island, D. B. Dowling, 1890: one imperfect but characteristic ventral valve.

Orthis (Dinorthis) subquadrata, Hall.

Orthis subquadrata, Hall.....1847. Pal. N. York, vol. I., p. 126, pl. 32 A, fig. 1.
" " " .....1862. Geol. Wiscons., vol. I., p. 54, figs. 1 and 2.
" " Billings.....1863. Geol. Canada, p. 165, figs. 146, *a-b*.
" " Meek.....1873. Rep. Geol. Surv. Ohio, vol. I., pt. 2, p. 94, pl. 9, fig. 2: and of subsequent writers on N. Amer. palæontology.
Orthis (Plœsiomys) subquadrata, Hall.....1892. Pal. N. York, vol. VIII., pt. 1, pp. 194, 197, and 222, pl. 5 A, figs. 17-19.
Orthis (Dinorthis) subquadrata, Winchell and Schuchert .....1893. Lower Silur. Brach. Minn., p. 428, pl. 32, figs. 46-50.

Lake Winnipeg, at Little Black Island, and Snake Island, D. B. Dowling and L. M. Lambe, 1890; on the west shore, north of the Saskatchewan and opposite the north end of Selkirk Island,—and at the First Limestone Point north of the Saskatchewan, D. B. Dowling, 1891.

Orthis (Dinorthis) proavita? Winchell and Schuchert.

Orthis proavita, Winchell and Schuchert....1892. (April 1). Amer. Geol., vol. IX., p. 290.
" *petræ*, Sardeson.....1892. (April 9). Bull. Minn. Ac. Nat. Sc., vol. III., p. 332, pl. 5, figs. 18-21.
Orthis (Dinorthis) proavita, Winchell and Schuchert.....1893. Lower Silur. Brach. Minn., p. 431, pl. 32, figs. 51-57.
Orthis (Dinorthis) proavita, Whiteaves.....1895. This volume, pt. 2, p. 120.

A few imperfect natural moulds of the exterior of shells of a coarsely ribbed subquadrate *Orthis*, which are possibly referable to this species, were collected by Mr. Dowling in 1891 at Dancing Point and Selkirk Island, Lake Winnipeg, also on the west shore of the lake opposite the north end of Selkirk Island. Gutta percha squeezes from these moulds are essentially similar in form and sculpture to specimens of the large variety of *O. proavita* from Stony Mountain, but none of these squeezes shew any portion of the hinge area, or anything but the sculpture and general outline of imperfect detached valves.

ORTHIS (DALMANELLA) TESTUDINARIA, Dalman.

Orthis testudinaria, Dalman .....1828. Kongl. Svenska Vet-Akad. Handl. for 1827, p. 115, pl. 2, fig. 4.
" " Conrad .....1839. Ann. Rep. N. York Geol. Surv., p. 63.
Orthis striatula, Emmons.. .. ..1842. Geol. N. York, Rep. Second Distr., p. 394, fig. 3.
Orthis testudinaria (?) Emmons.....1842. Ibidem, p. 404, fig. 4.
Orthis testudinaria, Hall ... ...1847. Pal. N. York, vol. I., p. 117, pl. 32, figs. 1, *a-l*.
" " Billings .....1856. Canad. Nat. and Geol., vol. I., p. 40, fig. 1.
" " " .....1863. Geol. Canada, p. 165, figs. 144, *a-c*. And of numerous European and N. Am. palæontologists.
Dalmanella testudinaria, Hall..... 1892. Pal. N. York, vol. VIII., pt. 1., pp. 190 and 206, pl. 5B, figs. 1-4.
Orthis (Dalmanella) testudinaria, Winchell and Schuchert..... .....1893. Lower Silur. Brach. Minn., p. 441, pl. 33, figs. 17-22.

Lower Fort Garry, Dr. R. Bell, 1880, and T. C. Weston, 1884: a few badly preserved specimens. In this connection it may be noted that M. Friedrich Schmidt expressed the opinion that the specimens in the Museum of the Survey from the Trenton limestone at St Johns, P.Q., at Ottawa, at Jessups' Rapids on the Bonnechere, and at the Bay of Quinté, which E. Billings identified with this species, are the same as the Russian form called *Orthis testudinaria*, Dalman.

PLATYSTROPHIA BIFORATA, Schlotheim (Sp).

Terebratulites biforatus, Schlotheim.....1820. Petrefactenkunde, p. 265. For a full list of European synonyms of this species see Davidson's Mon. Brit. Silur. Brach., pt. VII., p. 268, under the name *Orthis biforata*.
Spirifer Sheppardi, Castelneau..... .....1843. Essai sur le Syst. Silur. de l'Amer. Septentr., p. 42, pl. 14, fig. 15.
Delthyris brachynota, Hall.....1843. Geol. N. York, Rep. Fourth Distr., p. 70, fig. 6.
Orthis and *Delthyris*, Owen.....1844. Geol. Expl. Iowa, Wiscons. and Ill., pl. 15, figs. 3 and 7.
Delthyris lynx, Hall (partim—but not of Eichwald). .. ..1847. Pal. N. York, vol. I., p. 133, pl. 32D, fig. 1.
Orthis biforata, Billings.....1856. Canad. Nat. and Geol., vol. I., p. 206, figs. 6-10.
Orthis lynx, Billings. ....1863. Geol. Canada, p. 167, fig. 149.
Platystrophia regularis, Shaler.... .....1865. Bull. Mus. Comp. Zoology, p. 67.
Platystrophia lynx, Hall.....1892. Pal. N. York, vol. VIII., pt. 1, pp. 202 and 223, pl. 5B, fig. 10.

Platystrophia biforata, Winchell and Schuchert..... 1893. Lower Silur. Brach. Minn., p. 455 (which see for a fuller list of synonyms of N. Amer. specimens of this species than it is thought necessary to quote here), pl. 33, figs. 49-52.

Abundant at Lower Fort Garry, where it was collected by Sir James Hector in 1857, by Dr. R. Bell in 1880, and by Mr. Weston in 1884.

Lake Winnipeg, at Big Grindstone Point, where a small but nearly perfect ventral valve was collected by Mr. Weston in 1884.

All the specimens from Manitoba that the writer has seen (like those from the Galena and Trenton shales of Minnesota described by Winchell and Schuchert) belong to the small and typical form of this species, and not to the "large and globose variety *lynx*, as defined by Meek," in the first volume of the Palæontology of Ohio.

Platystrophia biforata, var. crassa.

Orthis (*Platystrophia*) *crassa*, James (non-Lindström)..... 1874. Cincinnati Quart. Journ. Sc., vol. I., p. 20.
Orthis dentata, Miller..... 1875. Ibidem, vol. II., p. 27.
Orthis centrosa, Miller..... 1889. N. Am. Geol. and Palæont., p. 356.
Platystrophia crassa, Hall..... 1892. Pal. N. York, vol. VIII., pt. 1, p. 223.
Platystrophia biforata, var. *crassa*, Winchell and Schuchert..... 1893. Lower Silur. Brach. Minn., p. 458, pl. 33, figs. 55 and 56.

Lake Winnipeg, at Little Black Island and at the south end of Snake Island, D. B. Dowling and L. M. Lambe, 1890: one good specimen from each of these localities.

Rhynchotrema capax, Conrad. (Sp.)

Atrypa capax, Conrad..... 1842. Journ. Ac. Nat. Sc. Philad., vol. VIII., p. 264, pl. 14, fig. 21.
Atrypa increbescens (partim), Hall..... 1847. Pal. N. York, vol. I., p. 146, pl. 33, figs. 13 *i*, and 13, *k-q*.
" " Billings..... 1856. Canad. Nat. and Geol., vol. I., p. 207, figs. 15 and 16.
" " Hall..... 1860. Thirteenth Rep. N. Y. St. Cab. Nat. Hist., p. 66, figs. 6, 7, 9-11.
Rhynchonella increbescens (partim), Hall.... 1862. Geol. Wiscons., vol. I., p. 55, figs. 5-7.
Rhynchonella capax, Billings..... 1863. Geol. Canada, p. 211, figs. 213, *a-c*. And of several other subsequent writers on N. Am. Palæontology.
Rhynchotrema capax, Winchell and Schuchert..... 1893. Lower Silur. Brach. Minn., p. 462, pl. 34, figs. 30-34.

Lake Winnipeg, at the mouth of the Little Saskatchewan, Dr. R. Bell, 1874, one specimen, and D. B. Dowling, 1880, two specimens; about five miles north of Clark's Point, D. B. Dowling, 1891, two specimens; Big Grindstone Point, J. B. Tyrrell, 1889, one specimen; Selkirk Island, north of the Saskatchewan, D. B. Dowling, 1891, one specimen; west shore of the lake, opposite the north end of Selkirk Island, D. B. Dowling, 1891, two specimens; and First Limestone Point north of the Saskatchewan, D. B. Dowling, 1891, two specimens.

An imperfect but characteristic example of this species was collected by Dr. R. Bell, in 1879, from a loose piece of limestone at Fort Churchill, Hudson's Bay.

RHYNCHOTREMA INÆQUIVALVIS, Castelneau. (Sp.)

Spirifer inæquivalvis, Castelneau.....1843. Essai sur le Syst. Silur. de l'Amér. Septentr., p. 40, pl. 14, fig. 8.
Atrypa increbescens (partim), Hall..... 1847. Pal. N. York, vol. I., pp. 146 and 289, pl. 33, figs. 13, *a-h*.
Rhynchonella increbescens (partim), Billings.1856. Canad. Nat. and Geol., vol. I., p. 207, figs. 11-14.
" " Billings..... 1863. Geol. Canada, p. 168, fig. 153.
Rhynchotrema inæquivalvis, Winchell and Schuchert.....1893. Lower Silur. Brach. Minn., p. 459, pl. 34, figs. 9-25.

Lower Fort Garry, Dr. R. Bell, 1880: two specimens.

Punk Island, Lake Winnipeg, Professor H. Y. Hind, 1858: two specimens. A specimen which is probably referable to this species, but which has the beak of the ventral valve broken off, was collected at Cat Head, Lake Winnipeg, by Mr. Weston in 1884.

RHYNCHONELLA ANTICOSTIENSIS. Var.

Rhynchonella Anticostiensis? Whiteaves....1880. Geol. Surv. Canada, Rep. Progr., 1878-79, p. 47 c.
Cfr. *Rhynchonella Anticostiensis*, Billings...1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 142, figs. 119, *a-c*.
" " " " ...1863. Geol. Canada, p. 211, figs. 212, *a-c*.
Cfr. *Rhynchonella(?) Anticostiensis*, Winchell and Schuchert..... 1893. Lower Silur. Brach. Minn., p. 464, figs. 34, *a-c*.
Compare also *Atrypa subtrigonalis*, Hall....1847. Pal. N. York, vol. I., p. 145, pl. 33, figs. 12, *a-c*.

Several specimens of a shell which the writer is convinced is a rather large local variety of *Rhynchonella Anticostiensis*, were collected at Lower Fort Garry by the late Mr. Donald Gunn in 1858, by Dr. R. Bell in 1880, and by Mr. Weston in 1884; also at the First Limestone Rapids, 100 miles up the Nelson River, Keewatin, by Dr. R. Bell in 1879.

In all the specimens of this north-western variety that the writer has seen, the ventral valve is longer than broad, or at least as long, and its beak is prominent, erect or prolonged, and narrowly conical, whereas the ventral valve of *Rhynchotrema inæquivalvis*, Castelneau (=*increbescens*, Hall) is almost always broader than long, and its beak short and incurved. This variety of *Rhynchonella Anticostiensis* differs from the typical form of that species in being a little larger, and proportionately rather broader in advance of the midlength. The eastern specimen of *R. Anticostiensis* figured by Billings, which is as large as any the writer has seen from Anticosti, is 17 millimetres long, as measured along the median line, and 15 mm. in its greatest breadth. Two average adult examples of the north-western variety of that species, from Lower Fort Garry, measure,—the one 19 mm. in length by 17·75 mm. in its greatest breadth, —and the other 20 mm. in length by 20 mm. in breadth. Some of the specimens from Lower Fort Garry approach rather closely to *Atrypa subtrigonalis*, Hall, but the antero-lateral angles of the former are more broadly rounded. The characters of the interior of the typical *R. Anticostiensis* are still entirely unknown, but casts of the interior of the closed valves of the north-western variety shew the impression of a mesial septum, which commences at the beak and extends about half way to the anterior margin, in the dorsal valve.

Zygospira recurvirostra, Hall. (Sp.)

Atrypa recurvirostra, Hall.....1847. Pal. N. York, vol. 1., p. 140, pl. 33, figs. 5, *a-d*.
Rhynchonella? recurvirostra, Hall.....1859. Twelfth Rep. N. Y. St. Cab. Nat. Hist., p. 66.
Rhynchonella recurvirostra, Billings.....1863. Geol. Canada, p. 168, fig. 152.
Anazyga recurvirostra, Davidson.....1882. Suppl. Brit. Silur. Brach., p. 129.
Zygospira recurvirostra, Winchell and Schuchert.....1893. Lower Silur. Brach. Minn., p. 466, pl. 34, figs. 38-41.

Inmost or Birch Island, Kinwow Bay, Lake Winnipeg, T. C. Weston, 1884, three specimens; and Big Sturgeon Island, D. B. Dowling and L. M. Lambe, 1890, one specimen.

Cyclospira bisulcata, Emmons. (Sp.?)

Orthis bisulcata, Emmons.....1842. Geol. N. York, Rep. Second Distr., p. 396, fig. 4. But not described.
Atrypa bisulcata, Hall.....1847. Pal. N. York, vol. I., p. 139, pl. 33, fig. 3.
Camarella bisulcata, Miller.....1877. Amer. Pal. Foss., p. 107.
Cyclospira bisulcata, Winchell and Schuchert.....1893. Lower Silur. Foss. Minn., p. 470, pl. 34, figs. 49-54.

Elk Island, Lake Winnipeg, T. C. Weston, 1884, abundant; also Deer Island, T. C. Weston, 1884, one specimen, and J. B. Tyrrell, 1889, one specimen.

MOLLUSCA.

PELECYPODA.

PALÆOPTERIA. (Gen. nov.)

Shell small, aviculoid in outline, both ears being well developed and the left valve more convex than the right: hinge dentition consisting of minute elongated thin laminar teeth, nearly parallel with and close to the cardinal margin, on both sides of the beaks.

The specimens upon which this genus is based are all casts of the interior of separate valves, and the slightly divergent hinge teeth are represented by their imprints, which are scarcely visible to the naked eye. When carefully examined with a lens, however, these casts show the impressions of two anterior and two posterior teeth in the right valve, and of two anterior and apparently three posterior teeth in the left valve. The genus is here proposed at the suggestion of Mr. Ulrich, who has examined the specimens, and who thinks that their hinge dentition is more like that of the Macrodontidæ than any pterineoid hinge known to him.

PALÆOPTERIA PARVULA. (N. Sp.)

Plate 20, figs. 1, 2 and 3.

Shell inequilateral, oblique, with a small anterior wing and a larger and more obtusely angular posterior alation, and varing in outline from obliquely or elongated subovate to somewhat rhomboidal. Anterior side shorter than the posterior: anterior end, inclusive of the wing, longest at the hinge line, rather acutely subangular above, narrowing obliquely inward and sometimes a little concave at the midheight, and ultimately curving convexly, obliquely and abruptly, inward and downward, to the ventral margin below: posterior end, also inclusive of the alation, obtusely angular at its junction with the cardinal margin above, obliquely truncated and slightly concave at about the midheight, narrowly rounded and somewhat produced below: ventral margin broadly rounded: cardinal margin long and straight: beaks incurved, elevated slightly above the hinge line, and placed a little in advance of the midlength.

Surface markings unknown, though on some of the specimens there are a few concentric plications preserved, which are most distinct anteriorly.

Dimensions of an average specimen, the original of fig. 1 : maximum length, 5·8 mm. ; height at the midlength, 5·2 mm.

Inmost or Birch Island, Kinwow Bay, Lake Winnipeg, where a few specimens were collected by Mr. Weston in 1884 and by Messrs. Dowling and Lambe in 1890.

A cast of the interior of the left valve of a shell which is probably referable to this species, in a loose piece of limestone, was collected by Mr. Dowling in 1890, at Reindeer Island, Lake Winnipeg. This specimen, which is represented by fig. 3, on plate 20, is much larger than the specimens from Inmost Island, much more produced at the base posteriorly, and has a comparatively shorter posterior wing.

Byssonychia intermedia, Meek and Worthen. (Sp.)

Ambonychia intermedia, Meek and Worthen.1868. Geol. Surv. Ill., vol. III, p. 306.
Byssonychia intermedia, Ulrich ... .1894. Lower Silur. Lamell., Minn. (advance copies fr. Geol. Minn., Final Rep., vol. III., pt. 2) p.499, pl. 35, figs. 23-26.

In the United States National Museum there is a single specimen of the right valve of a shell, which Mr. Ulrich has recently identified with this species, labelled "Lower Fort Garry, Charles L. Anderson, No. 5214."

Modiolopsis parviuscula, Billings.

Modiolopsis parviuscula, Billings..... ...1859. In Hind's Rep. Assinib. and Saskatch. Expl. Exped., p. 186.

"This species closely resembles *M. modiolaris* (Conrad) but is always much smaller. It is transversely elongate, anterior extremity small, rounded, half the width of the posterior ; the latter obliquely truncate and somewhat straight from the end of the hinge line for rather more than half the width, then rounded at the lower posterior angle. Hinge line straight or a little arched, full three-fourths the whole length of the shell. The umbones are less than one-fifth the length from the anterior extremity. The valves are moderately convex, obscurely and obliquely carinate from the umbones towards the lower posterior angle. In many specimens the ventral margin is concave near the anterior extremity, as if for the purpose of a byssus. Surface with obscure concentric undulations of growth. Length of large specimen, one and a half inch. In general they are a good deal smaller."

"This shell so much resembles *M. modiolaris* that I have long hesitated as to the propriety of giving it a separate name. It is very widely distributed, since we have specimens from Lake Winnipeg at Punk Island, from the Pallideau Islands in Lake Huron, where it occurs in

strata which hold fossils of the Chazy, Black River and Trenton limestones, and from near Cornwall and the Island of Montreal in the Chazy."—E. Billings (op. cit.).

In the Museum of the Survey there are three specimens of *M. parvius. cula* which are labelled as having been collected by Professor H. Y. Hind at Punk Island in 1858, but, although from the typical locality, they are all so imperfect and so badly preserved that their characters are indefinite and their specific relations obscure. It has been found impracticable to make a satisfactory drawing of either of these specimens, as their original outlines are not sufficiently distinct, and the writer has seen no others from the Lake Winnipeg region.

Modiolopsis angustifrons. (N. Sp.)

Plate 20, fig. 4.

Shell moderately elongated, nearly twice as long as high, slightly arcuate, very narrow, in the direction of the height, anteriorly, and expanded in the same direction posteriorly, the greatest height being at a short distance from the posterior end: valves moderately convex, most prominent on the broadly rounded, oblique, posterior umbonal slope, in front of which there is an abrupt concave inflection or shallow constriction. Anterior side very short, narrow in the direction of its breadth or thickness as well as height, and rounded at the end: posterior side much longer than the anterior and rather more than twice as high: posterior end obliquely subtruncate above, rounded and somewhat produced below: ventral margin, or margin of the valves in the byssal region, shallowly concave a little in advance of the midlength: hinge line nearly straight and gently ascending behind the beaks, occupying rather more than one-half of the entire length of each valve: umbones broad, depressed in the middle but tumid behind: beaks depressed, incurved, inclined forward, and placed at a short distance from the anterior end.

Surface markings unknown, though the well preserved and perfect cast of the interior of both valves upon which the preceding description is based, is marked by numerous small concentric plications, which are most strongly marked on the upper part of the valves and behind the beaks.

Dimensions of the only specimen collected: greatest length, 47·5 mm.; maximum height, 26·5 mm.: greatest height in front of the beaks, 12 mm.; approximate thickness of the two valves when closed, about 16 mm.; length of hinge line behind the beaks, between 28 and 30 mm.

Lower Fort Garry, T. C. Weston, 1884: a cast of the interior of a specimen with the valves widely open.

The most salient characteristics of this species are the pinched or constricted anterior end, and the concavely arched margin of the valves in the byssal region. The surface markings appear to be essentially similar to those of *M. concentrica.*

Orthodesma affine. (N. Sp.)

Plate 20, fig. 5.

Shell elongated, nearly three times as long as high, and highest behind, valves strongly compressed and very inequilateral. Anterior side very short and narrowly rounded: posterior side much longer than the anterior, increasing gradually and very slightly in height and depth posteriorly, though the cardinal margin behind the beaks and the posterior half of the ventral margin are not far from parallel: posterior end more broadly rounded than the anterior: ventral margin nearly straight or slightly concave anteriorly and at the midlength, but faintly convex posteriorly: cardinal border, behind the beaks, slightly ascending outward, almost straight but very slightly convex: beaks probably small, depressed and appressed, evidently placed very near to the anterior end.

Hinge dentition unknown, muscular impressions not distinctly defined.

Maximum length of the only specimen collected, 59·4 mm.; greatest height, 21 mm.; height at midlength, 19 mm.

West side of Selkirk Island, Lake Winnipeg, D. B. Dowling, 1891: a cast of the interior of both valves, in a loose piece of limestone. The beaks are broken off, but in every other respect the cast is nearly perfect. The specimen seems to indicate a species which is most nearly related to *O. curvatum* of Hall and Whitfield,* from the Hudson River group of Ohio, but which differs therefrom in its flatter valves, more obscure umbonal slopes, more evenly and less obliquely rounded posterior extremity, and, more particularly, by its proportionately shorter and much broader (or rather, higher) anterior side.

Vanuxemia. (Species undeterminable.)

Little Tamarack Island, D. B. Dowling, 1890: an imperfect cast of the interior of both valves of a specimen, which, Mr. Ulrich thinks, represents an undetermined species of the *V. Hayniana* section of the genus.

Ctenodonta astartæformis, Salter.

Ctenodonta astartæformis, Salter..... ...	1859.	Geol. Surv. Canada, Can. Org. Rem., Dec. 1, p. 39, pl. 8, fig. 7.
" " Billings	1863.	Geol. Canada, p. 175, figs. 164, *a-b.*

* Report of the Geological Survey of Ohio, vol. II., pt. 2, p. 95, pl. 2, fig. 6.

Big Sturgeon Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: a cast of the interior of both valves, from a loose piece of limestone.

Ctenodonta subnasuta, Ulrich.

Ctenodonta subnasuta, Ulrich .....1894. Lower Silur. Lamellibr. Minn., p. 585, pl. 42, figs. 34-36.

Cat Head, Lake Winnipeg, D. B. Dowling, 1891: a well-preserved cast of the interior of a left valve. Considering the section of the genus to which this species belongs, the strength and definition of the muscular scars, pallial line, and hinge denticles, and in fact the whole characters of the cast, would seem to shew that it was made by an adult shell and not by a young specimen of *Ctenodonta* (or *Tellinomya*) *ovata*, Hall. In the Cat Head specimen the denticles bend toward and not away from the beak.

Clinopistha (?) antiqua. (N. Sp.)

Plate 20, fig. 6.

Shell equivalve, compressed convex but lightly inflected above and behind the subangular posterior umbonal slopes, elongate, about twice as long as high, and rather narrowly subelliptical. Anterior side longer and broader in the direction of its height than the posterior, its extremity somewhat narrowly rounded, posterior side short and truncate or subtruncate at the end: umbones depressed, beaks incurved, and placed a little behind the midlength.

Surface markings unknown, as the test is not preserved, but the cast of the interior of both valves is nearly smooth and marked only with a few faint concentric striæ of growth.

Hinge dentition unknown, though the test appears to have been very thin and the hinge practically edentulous. Immediately behind the beaks there are indications of a short external ligament. Pallial line and anterior muscular impression unknown, but the posterior muscular impression seems to have been shallow, rather large, subovate or somewhat wedge-shaped in outline and longer than high.

Length of the most perfect specimen collected, 31 mm.; height of the same, at the midlength, 15 mm.

Inmost or Birch Island, Kinwow Bay, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: a perfect but not very well preserved cast of the interior of a specimen with both valves widely open. An imperfect natural mould of the exterior of a specimen which is probably referable to this species, had previously been collected at the same locality by Mr. Weston in 1884.

At first sight the more perfect of these two specimens has the general appearance of a *Ctenodonta*, and its marginal outline is somewhat like that of *C. dubia* (Hall) as figured by E. Billings on page 175 of the "Geology of Canada." On closer examination, however, its hinge would seem to have been practically edentulous, and therefore very different to that of *Ctenodonta*. The shell, also, has much the aspect of a small, narrow species of *Thracia*, but in that genus the left valve is always flatter than the right, and the ligament internal. The species is here provisionally referred to *Clinopistha*, at the suggestion of Mr. Ulrich, but it may represent a new generic type, which at present there are not sufficient data to define. In the preceding description of the characters of the species, the shorter, narrower and truncated or subtruncated portion of the shell is regarded as the posterior side, and *vice versa*, in accordance with what are presumed to be its natural homologies.

Rhytimya recta. (N. Sp.)

Plate 20, fig. 7.

Shell elongated, more than twice as long as high, and very inequilateral: valves compressed laterally, most convex but not very prominent along the very oblique and indistinctly defined posterior umbonal slope and shallowly inflected above it. Anterior side extremely short, its margin sloping obliquely and rapidly downward and outward in the lunular region, most prominent and forming a narrowly rounded or somewhat pointed junction with the ventral margin, at a little below the midheight: posterior side about five times as long as the anterior: posterior end obliquely truncated, and forming an obtusely pointed junction with the ventral margin, which is nearly straight or but very slightly convex for the greater portion of its length: cardinal margin, behind the beak, straight, horizontal and almost parallel with the ventral border: umbones compressed and slightly depressed both laterally and vertically, beaks incurved, placed very near to the anterior end, but not quite terminal.

Surface of the cast marked with irregularly disposed but continuous concentric striæ or lines of growth, and by a few short faint undulations, parallel to them, on the posterior umbonal slope.

Hinge dentition and muscular impressions unknown.

Dimensions of the only specimen known to the writer: maximum length, 38 mm.; height, at the midlength, 15·2 mm.

A perfect and tolerably well preserved cast of the interior of the right valve of a specimen of this species was collected by Mr. Dowling in 1890 from a loose piece of limestone at Reindeer Island, Lake Winnipeg.

The marginal outline of this specimen would seem to be sufficiently different from that of the *R. compressa* and *R. convexa* of Ulrich, as figured on plate 56 of the seventh volume of the Report of the Geological Survey of Ohio, to justify its separation from either, as a distinct species. Thus, in *R. compressa* the anterior side is proportionately longer and more broadly rounded than that of *R. recta*, and the posterior end of the former is less pointed below. In *R. convexa* the anterior side is also much longer than that of *R. recta*, the cardinal margin of the former is more arched and its posterior end is represented as more produced below.

Conocardium antiquum, D. Dale Owen. (Sp.)

Pleurorhynchus antiqua, Owen..... .....1852. Geol. Rep. Wiscons., Iowa and Minn., Table 2B, fig. 19.
Conocardium antiquum, S. A. Miller.... 1883. Amer. Pal. Foss., second edit., p. 310.
" " " .....1889. N. Amer. Geol. and Palæont., p. 472.

Lower Fort Garry, Owen, 1848. "This small and delicately formed *Pleurorhynchus* is, I believe, the first of the genus that has been discovered in this country in rocks of Lower Silurian age." Owen. Only one specimen would seem to have been obtained, which is badly figured, and the species has never been described.

Edmondia (?) vetusta. (N. Sp.)

Plate 20, fig. 8.

Shell small, moderately convex, obliquely subovate, a little longer than high and very inequilateral. Anterior side short, its margin abruptly contracted both above and below and narrowly rounded or narrowly subtruncated at the end: posterior side longer and broader (in the direction of its height) than the anterior: posterior end obliquely subtruncate and somewhat contracted above, rather narrowly rounded and moderately produced below: ventral margin broadly rounded, but more convex posteriorly than anteriorly, most prominent behind the midlength and straighter in front: cardinal margin, behind the beaks, very short, faintly convex and slightly ascending: beaks moderately prominent, incurved and placed considerably in advance of the midlength.

Surface marked by concentric lines of growth, and on some specimens, when viewed with a lens, there are obscure indications of close set, minute radiating striæ. Hinge dentition not known with any degree of certainty, but probably edentulous. On each side of the umbones there is a long and narrow, widely divergent slit or groove, at a short distance from the cardinal border and not far from parallel with it. Muscular impressions not distinctly defined, though the scar of the anterior adductor seems to have been vertically elongated.

Dimensions of one of the largest specimens known to the writer, the cast of the interior of a right valve figured: length 12·2 mm.; height, 10·3 mm.; estimated thickness of a cast of both valves, 5 mm.

Casts of the interior or moulds of the exterior of one or both valves of shells of this species are abundant at Inmost Island, Kinwow Bay, Lake Winnipeg, where they were collected by T. C. Weston in 1884 and by D. B. Dowling and L. M. Lambe in 1890.

In the preceding description the shorter and narrower portion of each valve is regarded as the anterior side, and the longer and broader as the posterior, but it is by no means clear that these terms, as thus used, represent the true homologies of the shell. It may be that the shorter is the posterior side and *vice versa*.

This curious little shell is referred provisionally to the genus *Edmondia*, at the suggestion of Mr. Ulrich, who, in a letter to the writer, dated May 8th, 1896, make the following remarks upon specimens of it that had been sent to him for examination and comparison: "After a most careful investigation and comparison, I fail to find, despite my earnest wish to do so, the remotest difference between this Manitoba Trenton shell and the most typical Devonian and Carboniferous species of *Edmondia!* The agreements are as follows: (1) the hinge is edentulous; (2) there is an internal plate in each valve beneath the beak, which extends posteriorly and leaves in the cast (as your specimens show very clearly) a long narrow sharp slit or fissure running nearly parallel with and a short distance within the cardinal margin; (3) the muscular scars have the same position and form, and the anterior one, which is vertically elongated, sends up an obscure furrow to the front side of the beak; (4) the surface of the casts exhibit obscure traces of radiating lines; and (5) the rounded form and short anterior end. Considering these important agreements, together with the fact that the material at hand shows no differences, I do not see that you can do otherwise than refer the species to *Edmondia*."

In some manuals of palæontology or conchology *Edmondia* is said to be restricted to the Permian and Carboniferous systems, but Hall * has recently described and figured several species from the Devonian rocks of the United States, and Zittel † says that it ranges in time from the Silurian to the Dyas (Permian).

GASTEROPODA.

Tetranota bidorsata, Hall. (Sp.)

Bucania bidorsata, Hall.....1847. Pal. N. York, vol. I., p. 186, pl. 40, figs. 2, *a-g*.

Tetranota bidorsata, Ulrich and Scofield..1897. Geol. Minn., Final Rep., vol. III., pt. 2, p. 877, pl. 65, figs. 10-18.

* In the Palæontology of New York, vol. V., pt. 1, Lamellibranchiata 2.

† Handbuch der Palæontologie, vol. II., p. 128.

Inmost Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: a well preserved cast of the interior of the shell of a small specimen, which is about eleven millimetres in its longest diameter. A badly preserved but otherwise similar cast was collected by Mr. Dowling, in 1891, on the west shore of Lake Winnipeg, north of the Saskatchewan and opposite the north end of Selkirk Island.

Salpingostoma Buellii, Whitfield. (Sp.)

Bucania Buellii, Whitfield.....1878. Ann. Rep. Geol. Surv. Wiscons. for 1877, p. 76.
Bucania (Tremanotus?) Buellii, Whitfield..1882. Geol. Wiscons., vol. IV., p. 224, pl. 6, figs. 12-14.
Salpingostoma Buellii, Ulrich and Scofield..1897. Geol. Minn., Final Rep., vol. III., pt. 2, p. 900, pl. 67, figs. 34-37, and (?) 38.

Lower Fort Garry, Dr. R. Bell, 1880, one specimen; and Commissioners (formerly called Cranberry) Island, Lake Winnipeg, D. B. Dowling, 1890, one specimen; both of which are badly preserved casts of the interior of the shell.

Conradella. (Species uncertain.)

A single specimen of a small *Conradella*, which the writer once thought could be identified with *C. compressa* (the *Phragmolites compressus* of Conrad), but which is much too imperfect to be satisfactorily compared with the nearly related and very critical species recently described by Ulrich and Scofield in the second part of the third volume of the Final Report of the Geology of Minnesota,—was collected at Lower Fort Garry by Dr. R. Bell in 1880.

Pleurotomaria muralis, D. D. Owen.

Pleurotomaria muralis, Owen. ... .1852. Rep. Geol. Surv. Wiscons., Iowa and Minn., p. 581, pl. 2, fig. 6.
" " Whiteaves.....1893. Canad. Rec. Sc., vol. V., p. 319.

" Specific characters.—Obtusely conical, convolutions five to six, with nearly vertical sides, like a spiral wall; upper surface of the whorls deeply channelled and doubly carinated; undulating striæ, transverse to the convolutions. Height about two-thirds of the width.

"From the Magnesian limestones (F. 3) of Red River of the North," at Lower Fort Garry. Owen.

P. muralis appears to have been based upon a single specimen with the whole of the umbilical side covered by the matrix, so that only the characters of the apical side are known. A natural mould of the exterior, with part of the test adherent thereto, of the apical side of a specimen

collected by Dr. R. Bell in 1879 at the Limestone Rapids, 100 miles up the Nelson River, Keewatin, and a very badly preserved specimen collected by Mr. Dowling in 1891 at Dog Head, Lake Winnipeg, are both possibly referable to this meagrely described and badly figured species.

Pleurotomaria Stokesiana. (N. Sp.)

Plate 20, figs. 9 and 9a.

Shell, or rather cast of the interior of the shell, subconical, a little broader than high, spire short, umbilicus narrow, nearly or perhaps quite closed when the test is preserved. Volutions about four, though only three are preserved in the few specimens known to the writer, those of the spire flattened obliquely above, with a shallow spiral groove or constriction at the midheight, and obtusely angulated near the suture below: outer volution, as viewed dorsally, higher than the spire, more than twice as broad as high, bluntly angulated at about its midheight, with a shallowly concave spiral groove just above the angle and convex below, umbilical region rather flattened: slit-band not clearly shewn but apparently occupying the summit of the spiral angulation.

Surface marked with three small but distinct spiral ridges above the angulation, and with traces of similar but much less distinct ones below, the whole crossed by faint transverse lines of growth.

West shore of Lake Winnipeg, north of the Saskatchewan, and opposite the north end of Selkirk Island, D. B. Dowling, 1891: two imperfect casts of the interior of the shell.

The specific name suggested for this shell is intended as a tribute of respect to the memory of the late Charles Stokes, who was one of the first to describe some of the fossils of the Winnipeg limestones. The only North American fossil from a similar or nearly similar geological horizon that would seem to be at all closely comparable with it, is *Cyclonema percarinatum*,* the *Pleurotomaria percarinata* of Hall,† but that species is represented as being higher than broad and as encircled with fewer, much more prominent and differently arranged spiral ridges.

Pleurotomaria (?) margaritoides. (N. Sp.)

Plate 20, fig. 10.

Shell very small, turbinate, subglobose, about as broad as high, spire short, umbilicus very narrow in the cast and apparently almost or quite closed when the test is preserved. Volutions probably about four, though only three are preserved in the single specimen known to the

* Geology of Wisconsin, vol. IV., p. 211, pl. 5, fig. 15.

† Palæontology of New York, vol. I., p. 177, pl. 38, fig. 4.

writer, those of the spire rounded, the outer one rounded, ventricose, much broader than high, and higher than the spire: suture distinctly defined.

Surface, as indicated by a gutta percha impression of a natural mould of the exterior of the test, marked with numerous, extremely fine (or thin) spiral raised lines or minute ridges. On the dorsal side of the outer volution, when viewed with a lens, these ridges are seen to be unequal in size, the larger ones usually alternating with one or two smaller ones. There are about twenty of the larger ridges in this region, and these, although placed rather close together, are not quite equidistant. On a cast of the interior of the shell there are indications of the larger revolving ridges, and in addition to these there is a faint narrow spiral groove, with an obtuse peripheral carination immediately under it, which may represent the slit-band, at about the midheight of the outer volution. On the surface of the gutta percha impression, however, the middle of the supposed slit-band, when viewed with a lens, is seen to be encircled with a minute spiral ridge.

Maximum breadth of the specimen described, six millimetres; probable height of the same, when perfect, about equal to the breadth.

Inmost Island, Kinwow Bay, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: an imperfect but well preserved cast of the interior of the shell and a sharply defined natural mould of the exterior of the same. The figure on Plate 20 is drawn from a gutta percha impression of this mould.

Although many of the spiral lines on this mould are so small as to be invisible without the aid of a lens, no clear indications of any of the lines of growth can be detected. It is quite uncertain whether the shell was really provided with a slit-band or not, and consequently whether it should be referred to *Pleurotomaria* or *Cyclora*. Its shape is not very unlike that of *Cyclora minuta*, Hall, as figured by Meek,* but the surface of that species is described and represented as smooth.

Liospira Americana, Billings. (Sp.)

Pleurotomaria lenticularis, Hall..... ....1847. Pal. N. York, vol. I., p. 172, pl. 37, figs. 6, *a-d*.
Pleurotomaria Americana, Billings.....1860. Canad. Nat. and Geol., Vol. V., p. 164, fig. 7.
" " " ..... 1863. Geol. Canada, p. 184, fig. 179.
Liospira Americana, Ulrich and Scofield....1897. Geol. Minn., Final Rep., vol. III., pt. 2, p. 996.

A few casts of the interior of shells of this species were collected at Punk Island by Professor H. Y. Hind in 1858; at Cat Head and at Inmost

* Geological Survey of Ohio, Palæontology, vol. I., p. 152, pl. 13, figs. 7, *a-c*.

or Birch Island, by T. C. Weston in 1884 ; at Dog Head by L. M. Lambe in 1890 ; and at Commissioners (or Cranberry) Island, by D. B Dowling in 1890.

Liospira persimilis, Ulrich and Scofield.

Liospira persimilis, Ulrich and Scofield.....1897. Geol. Minn., Final Rep., vol. III., pt. 2, p. 998, pl. 82, figs. 39-41.

Reindeer Island, Lake Winnipeg, D. B. Dowling, 1890: one specimen, from a loose piece of limestone.

Liospira angustata, Ulrich and Scofield.

Liospira angustata, Ulrich and Scofield.....1897. Geol. Minn., Final Rep., vol. III., pt. 2, p. 997, pl. 68, figs. 35-37, and pl. 69, figs. 1 and 2.

Inmost or Birch Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: one specimen of the variety with obtuse periphery.

Hormotoma gracilis (?) Hall. (Sp.)

Murchisonia gracilis, Hall. .... 1847. Pal. N. York, vol. I., p. 181, pl. 39, figs. 4, *a-c*.
" " Salter.. ....1859. Geol. Surv. Canada, Can. Org. Rem., Dec. I., p. 22, pl. 5, fig. 1.
" " Billings . .....1863. Geol. Canada, p. 183, fig. 178.
" " Nicholson.....1875. Rep. Pal. Prov. Ont., p. 18, fig. 7, *c*.
Hormotoma gracilis, Ulrich and Scofield....1897. Geol. Minn., Final Rep., vol. III., pt. 2, p. 1014, pl. 70, figs. 18-36.

Snake Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: four casts of the interior of shells which are doubtfully referred to this species. A similar cast of the interior of a shell which is possibly also referable to this species had previously been collected sixty miles up the Nelson River, Keewatin, by Dr. B. Bell in 1878.

Hormotoma Winnipegensis. (N. Sp.)

Plate 21, fig. 1.

Shell elongated, more than twice as long as broad, very large and attaining to a length of fully eight inches: spire, as viewed dorsally, much higher or longer than the last volution: apical angle of one of the largest and least compressed specimens in the Survey collection, 36°.

Volutions about nine, the later ones much broader than high, the breadth of the last but one being nearly or quite twice its height, moderately convex, but somewhat compressed at their midheight; suture distinct but not deeply impressed.

Surface markings of the later volutions consisting of a broad, flat slit-band near their midheight or midlength, and of low, rounded, riblike plications or wrinkles of growth, which converge very obliquely backward to the slit-band.

The foregoing description is based upon two large specimens, with considerable portions of the test preserved, collected at Little Black Island (not at Berens or Swampy Island proper)* by D. B. Dowling and L. M. Lambe in 1890. The larger of these specimens, which is figured, is fully eight inches in length and very much flattened in the dorso-ventral direction. The smaller, which is upward of seven inches in length, is slightly compressed in the same direction. They both differ from *Murchisonia major*, Hall,† in their very much larger size, and from *M. teretiformis*, Billings,‡ in their much less ventricose volutions, more lightly impressed suture, and in their coarser and more rib-like wrinkles of growth.

Comparatively small specimens, which are apparently referable to the same species and which rarely exceed four inches and a half in length, had previously been collected at two localities on the Nelson River, Keewatin, by Dr. R. Bell in 1879; at Dog Head and Jackfish Bay, Lake Winnipeg, by T. C. Weston in 1884; at Little Black Island by J. B. Tyrrell in 1889; at Little Tamarack and Commissioners' islands and at a point off Moose Creek, near Snake Island, Lake Winnipeg, by D. B. Dowling in 1890. All of these specimens are slightly compressed, and most of them are mere casts of the interior of the shell.

Solenospira pagoda (Salter), var. occidentalis.

Shell resembling *S. pagoda* (the "*Eunema? pagoda* of Salter) || in shape, and in the circumstance that its volutions are encircled with four spiral ridges, but differing therefrom in its much greater size and proportionately broader slit-band.

The type of *S. pagoda*, as figured by Salter, is twenty-four millimetres in length, and its outer volution is nearly eight mm. broad. In the only specimen of the var. *occidentalis* known to the writer, the length is about fifty-nine mm., the breadth of the last volution nineteen mm. and a half, though the whole specimen is laterally and abnormally compressed, and the slit-band, near the aperture, is three mm. and a half broad.

* Little Black Island is very close to Berens Island, and connected with it by a bar or reef.

† In Foster & Whitney's Report on the Geology of the Lake Superior Land District, pt. 2, p. 209, pl. 26, figs. 1, *a-c*.

‡ Geological Survey of Canada, Rep. Progr., 1853-56, p. 298.

|| Geological Survey of Canada, Canadian Organic Remains, Decade 1, 1859, p. 30, pl. 6, fig. 5.

Little Black Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: one specimen which is unfortunately not well enough preserved to be figured satisfactorily.

The genus *Solenospira* has recently been constituted by Messrs. Ulrich and Scofield (in their monograph of the "Lower Silurian Gastropoda of Minnesota") * for the reception of a group of *Murchisonia*-like shells, of which *Eunema* (?) *pagoda* and *E. prisca* of Salter, are the types. According to Mr. Ulrich, in a letter dated May 12th, 1896, "they have a notched aperture like *Hormotoma* and *Lophospira*, and are widely different from *Eunema strigillata*, Salter, which is nothing more than a high-spired *Trochonema*. *Solenospira* is distinguished from *Hormotoma* by the strong revolving ridges and great width of band."

Maclurea (Maclurina) Manitobensis, Whiteaves.

Plate 20, fig. 11.

Maclurea Manitobensis, Whiteaves.....1890. Trans. Royal Soc. Canada, vol. VIII., sec. 4, p. 75, pl. 12, and pl. 13, figs. 1 and 2; and (1893) Canad. Rec. Sc., vol. V, p. 324.

Maclurina Manitobensis, Ulrich & Scofield..1897. Geol. Minn., Final Rep., vol. III, pt. 2, p. 1041.

Amended description.—Shell large, attaining to a maximum diameter of eight inches and a half, and consisting of about five somewhat slender volutions, which increase rather slowly in size: outer volution nearly always distinctly angulated at the periphery. Flat side faintly depressed in the centre in some specimens and as faintly raised in others: volutions, as viewed on this side, very shallowly concave in the centre and slightly raised on their outer margins: suture lightly impressed. Convex side moderately prominent (the greatest thickness or depth varying in different examples from two-fifths to one-third the maximum diameter): somewhat conical or subhemispherical, the outer volution obliquely flattened and narrowing very rapidly, but in a few specimens somewhat convexly, from the periphery to the umbilical margin: umbilicus deep, conical, and moderately wide: aperture obliquely and rather narrowly subtrapeziform: outer lip apparently simple: test thick.

Surface of the test on the flat side marked with irregularly disposed, but for the most part distant, transverse linear grooves or periodic arrests of growth, each of which curves gently backward in a shallowly convex curve, and occasionally with a few striations which run parallel to them. In the specimen figured on Plate 13, fig. 1, of the eighth volume of Transactions of the Royal Society of Canada, which is little less than four inches in its greatest diameter, and in which the whole of the test is

* Published in volume III., part 2, of the Final Report of the Geology of Minnesota.

preserved on the flat side, there are six of these periodic arrests of growth on the outer volution, while the inner whorls are perfectly smooth. In larger but similarly preserved specimens these arrests of growth, which are not sufficiently deep to produce any impressions on the casts, are somewhat more numerous and disposed at still more unequal intervals. On the convex side the test is ornamented with rounded spiral ribs of nearly equal size, and these are crossed by straight, transverse costæ, in such a way as to present a somewhat nodulous appearance.

"The foregoing description is intended to apply only to those specimens in which the greater part of the test is preserved. The condition in which the species is usually obtained is that of mere casts of the interior of the shell. In these, the slender early whorls are often broken off, the suture, on the flat side, is deeply excavated or channeled, and, on the convex side, a large portion of the inner whorls is visible in the umbilicus. The whole of the thick test between the volutions is sometimes removed in these casts, in which case the volutions are completely separated.

"In Appendix 1 to the Narrative of Franklin's Second Expedition to the Shores of the Polar Sea, under the heading 'Limestone of Lake Winipeg,' the discovery, among other fossils, of specimens of a *Maclurea* which is most probably identical with the present species, on the western shore of that lake, in 1825, is thus referred to by Sir John Richardson:—'Professor Jameson enumerates *terebratulæ*, *orthoceratites*, *encrinites*, *caryophyllitæ* and *lingulæ*, as the organic remains in the specimens brought home by Captain Franklin on his first expedition. Mr. Stokes and Mr. James De Carle Sowerby have examined those which we procured on the last expedition, and found amongst them *terebratulites*, *spirifers*, *maclurites* and *corallines*. The maclurites belonging to the same species with specimens from Lakes Erie and Huron, and also from Igloolik, are perhaps referable to the *Maclurea magna* of Le Sueur.'

"A few casts of the interior of shells which are certainly referable to *M. Manitobensis* were collected by Mr. John Fleming in 1858" at Limestone or "Clark's Point, Lake Winnipeg, eleven miles north of the Little Saskatchewan, and by Prof. H. Youle Hind, in the same year, at Deer Island, near Grindstone Point and at Punk Island, on the same lake. These specimens, which are still in the Museum of the Survey, are referred to by Mr. E. Billings, in chapter 20 of Prof. Hind's report, as belonging to a species of *Maclurea*, 'allied to *M. Logani*, Salter, but with more slender whorls.'

"Since then the species has been collected at the following localities, but the first specimens known to the writer in which any considerable portion of the test is preserved, were obtained in 1884 by Mr. T. C. Weston at Pike Head and Kinwow Bay, Lake Winnipeg, and by Mr. McCharles at East Selkirk. Between Fort Alexander and the mouth of the Red River,

Dr. R. Bell, 1874. At the second and third rapids of the Nelson River, Keewatin, Dr. R. Bell, 1879. Elk Island, Big Island, Grindstone Point, Washow Bay, Bull Head Bay, Dog Head, Pike Head or Jackfish Bay, and Kinwow Bay, all in or on Lake Winnipeg; T. C. Weston, 1884. East Selkirk, T. C. Weston, and A. McCharles, 1884. North end of Big Island, Big Grindstone Point" and Little Black Island, "Lake Winnipeg, J. B. Tyrrell, 1889." Little Black Island, Sturgeon, Snake and Black Bear islands, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890; Dog Head, L. M. Lambe, 1890. Commissioners, Little Tamarack and Punk islands, Grindstone Point, Selkirk Island, and west shore of Lake Winnipeg, north of the Saskatchewan, and opposite the north end of Selkirk Island, D. B. Dowling, 1891. East side of Sturgeon Lake, District of Saskatchewan, J. B. Tyrrell, 1894.

"It is one of the most abundant and characteristic fossils of the Galena-Trenton limestone of Manitoba, and, according to Messrs. Weston, Tyrrell, Dowling and Lambe, it always occurs with the flat side uppermost in the rock.

Fig. 11. *Maclurea Manitobensis.*—Inner side of an operculum, supposed to be that of a large specimen of this species, from Jack Fish [illegible] Island. Natural size.

"In 1890 Messrs. Dowling and Lambe collected an operculum, which is probably that of a large specimen of this species, at Jack Fish Island, opposite the mouth of Jack Fish River, Lake Winnipeg. "This operculum, which is represented in outline in the wood-cut, is a little more than four inches in height or depth, and not quite three inches in its maximum breadth. Its outer surface is completely buried in the matrix, the inner surface only being exposed. In the wood-cut the side indicated by the letter A clearly corresponds to the outer side of the shell, and the concave side opposite,—B,—to the inner or columellar side. The side marked C corresponds to the flattened spiral side of the shell, and that marked D to the inner wall of the umbilicus. The margins of the sides C and B, whose junction forms the 'nuclear angle,' are thickened, but the edges of the other two sides are very thin. This thickening of the sides C and B is immediately followed by a shallow depression in the nuclear region, but the inner side of the operculum is otherwise nearly flat. The surface markings of this side consist of numerous concentric raised lines of growth, but there are no clear indications of any "internal projections for the attachment of muscles." Although the opercula of *M. Logani*, Salter, and *M. crenulata*, Billings, are known to be provided with well developed" projections or "muscular processes on the inner side, this is by no means always the case in other species of the genus. On page 238 of the first volume of the "Palæozoic Fossils" of Canada, E. Billings distinctly states that there are no muscular processes on the inner side of the operculum of his *M. oceana*, and on page 243 of the same volume he figures opercula of two other species of *Maclurea*, from Cape Norman, Newfoundland, in which there are no muscular processes on that side. In the Museum of the Geological Survey at Ottawa there are two opercula from the Calciferous of the Mingan Islands, which were referred by E. Billings, with some doubt, to the *M. matutina* of Hall. There are no processes on the inner side of these opercula."

According to Messrs. Ulrich and Scofield (op. cit., p. 194), their genus *Maclurina* (which the writer prefers to regard, for the present, as a subgenus) is proposed for "the reception of shells heretofore classed as *Maclurea*, but differing from the typical form of the genus in wanting the projections for the attachment of muscles on the inner side of the operculum." "*Maclurea Manitobensis*, Whiteaves, the operculum of which is figured and described by Whiteaves in the Canadian Record of Science for April, 1893, is regarded as the type of the new genus." "In this species the nucleus is at the junction of the lower and inner margin of the operculum, and we believe the same is true of *M. cuneata* and *M. subrotunda* of Whitfield, which, with Whiteaves's species, are all that at the present time it seems safe to refer to *Maclurina*."

TROCHONEMA UMBILICATUM, Hall. (Sp.)

Pleurotomaria umbilicata, Hall ....1847. Pal. N. York, vol. I., pp. 43 and 175, pl. 10, figs. 9, *a-b*, and pl. 38, figs. 1, *a-g*.
Trochonema umbilicatum, Salter.....1859. Geol. Surv. Canada, Can. Org. Rem., Dec. I., p. 27, pl. 6, fig. 3.
" " Billings.....1863. Geol. Canada, p. 145, fig. 92.
" " Ulrich and Scofield.1897. Geol. Minn., Final Rep., vol. III., pt. 2, p. 1047, pl. 77, figs. 1-8.

A few specimens which have been identified with this species by E. Billings, and which are still in the Museum of the Survey, were collected at Limestone (now known as Clark's) Point, on the west shore of Lake Winnipeg, about eleven miles north of the Little Saskatchewan, by Mr. John Fleming in 1858. These specimens, however, are distorted and badly preserved casts of the interior of shells, which are difficult to distinguish from those of closely related species. Similar casts have been collected at the same locality by D. B. Dowling in 1890, and at an exposure on the Little Saskatchewan River, one mile from Lake Winnipeg, by Dr. R. Bell in 1875. Single specimens, which are too imperfect to be determined specifically, but which are probably referable either to this species or the next, were collected at Lower Fort Garry and at Dog Head by T. C. Weston in 1884; at Little Black and Snake islands by D. B. Dowling and L. M. Lambe in 1890; and at Commissioner's Island by Mr. Dowling in 1890.

TROCHONEMA ECCENTRICUM, Ulrich and Scofield.

Trochonema eccentricum, Ulrich and Scofield..... .....1897. Geol. Minn., Final Rep., vol. III., pt. 2, p. 1049, pl. 77, figs. 17 and 18.

A distorted specimen, but with most of the test preserved, which agrees very well with the description and figures of this species, was collected from a loose piece of limestone on the south end of Reindeer Island, Lake Winnipeg, by D. B. Dowling, in 1890.

TROCHONEMA NIOTA, Hall. (Sp.)

Pleurotomaria niota, Hall .....1861. Geol. Surv. Wiscons., Rep. Progr. 1861, p. 33; and Whitfield (1895), Mem. Am. Mus. Nat. Hist., vol. I., pt. 2, p. 60, pl. 8, fig. 11.
Trochonema niota, Ulrich and Scofield.....1897. Geol. Minn., Final Rep., vol. III., pt. 2, p. 1052, pl. 76, figs. 16-18.

A cast of the interior of a shell which agrees fairly well with Professor Whitfield's and with Ulrich and Scofield's recent figures of this species, was collected at Stony Point, a little to the north of Jackfish River, on the west shore of Lake Winnipeg, by Mr. Weston in 1884. Two similar

but badly distorted and much less perfect specimens, which are probably referable to the same species, were collected by Mr. Weston at Dog Head (a little farther to the south-east), also in 1884.

EUNEMA STRIGILLATUM, Salter.

Eunema strigillata, Salter..... 1859. Geol. Surv. Canada, Can. Org. Rem., Dec. 1, p. 29, pl. 6, fig. 4.
" " Billings..... ... 1863. Geol. Canada, p. 145, fig. 88.

Lower Fort Garry, T. C. Weston, 1884 : a single specimen, with the test preserved, which seems to agree better with the description and figures of this eastern species, than with those of the nearly related *Trochonema (Eunema) Salteri* of Ulrich and Scofield.* The spire of this specimen is comparatively high and narrow, and the transverse lines of growth on the dorsal surface of the outer volution are nearly straight, but curved slightly forward at the base.

SUBULITES. (Species uncertain.)

An imperfect cast of the interior of the shell of a small and very slender species of *Subulites*, which is similar in shape to the *S. pergracilis* of Ulrich and Scofield,† but which shews no evidence of a sutural band, was collected on the west shore of Lake Winnipeg, north of the Saskatchewan, and opposite the north end of Selkirk Island, by D. B. Dowling in 1891.

FUSISPIRA INFLATA, Meek and Worthen. (Sp.)

Subulites inflatus, Meek and Worthen.....1870. Proc. Ac. Nat. Sc. Philad., p. 47; also (1875) Geol. Surv. Ill., vol. VI., p. 495.
Fusispira ventricosa, Hall..... .....1871. Twenty-fourth Rep. N. Y. St. Cab. Nat. Hist., p. 229, pl. 8, fig. 6.
" " Whitfield.....1882. Geol. Wiscons., vol. IV., p. 245, pl. 9, fig. 2.
Fusispira inflata, Ulrich and Scofield..... .1897. Geol. Minn., Final Rep., vol. III., pt. 2, p. 1075, pl. 80, figs. 17 and 18.

Casts of the interior of shells of this species are abundant at many of the limestone exposures in the Red River Valley, on the western shore of Lake Winnipeg, and on some of the islands in that lake. Specimens of it have been collected by Mr. Weston in 1884 at Lower Fort Garry; at Bull's Head, Dog Head, Big Grindstone Point, Big and Elk islands, Lake Winnipeg; by Mr. Tyrrell in 1889, at Little Black Island; by Messrs. Dowling and Lambe in 1890 at Little Black, Snake and Black Bear islands; by Mr. Dowling in 1890 at Commissioners and Punk islands; and by Mr. Lambe in the same year at Dog Head.

* Geology of Minnesota, Final Report, vol. III., pt. 2, p. 1053, pl. 77, figs. 42-43.
† Ibidem, p. 1072, pl. 81, figs. 12-15.

Fusispira elongata, Hall.

Fusispira elongatus, Hall .....1871. Twenty-fourth Rep. N. Y. St. Cab. Nat. Hist., p. 229, pl. 8, fig. 5.

" *elongata*, Whitfield.....1882. Geol. Wiscons., vol. IV, p. 245, pl. 9, fig. 3.

A few imperfect casts of the interior of shells of this species were collected at Lower Fort Garry by Dr. R. Bell in 1880 and by Mr. Weston in 1884.

Loxonema Winnipegense, Whiteaves.

Loxonema Winnipegense, Whiteaves.....1893. Canad. Rec. Sc., vol. V., p. 326.

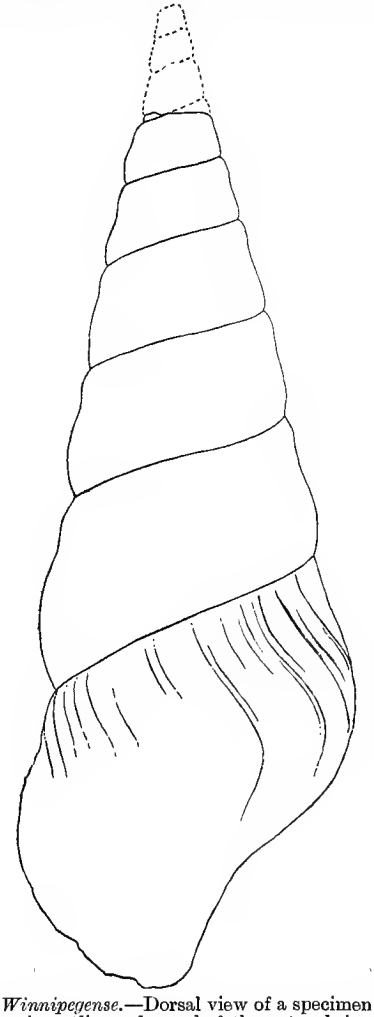

Fig. 12. *Loxonema Winnipegense.*—Dorsal view of a specimen from Stony Point, Lake Winnipeg, in outline only, and of the natural size. The earlier volutions restored from another specimen.

"Shell large, attaining to a length of upwards of five inches, terebriform, elongated and nearly three times as long as broad: spire, as measured on the dorsal side, occupying not quite two-thirds the entire length: apical angle 27°. Volutions ten, allowing for" a possible apical one, which is not preserved in any of the specimens collected, "increasing slowly in size and obliquely compressed, the later ones slightly constricted above and moderately inflated below, those of the spire much broader than high: suture distinctly impressed: outer or last volution a little higher than broad, moderately convex but scarcely ventricose in the middle and narrowing abruptly into the somewhat pointed base.

"Surface of the spire nearly smooth, that of the last volution marked only with a few flexuous lines of growth, which curve gently and concavely backward above, and still more gently forward below.

"Four fine large specimens of this species, each with nearly the whole of the test preserved, have been collected at as many different localities on or in Lake Winnipeg." Two of these specimens were collected by Mr. Weston in 1884, one at Stony Point and one at Jack Fish Bay; one by Mr. Tyrrell in 1889 at Little Black Island, and one by Mr. Dowling in 1891 at Dog Head.

"Nine volutions are preserved in the most perfect of these specimens, the slender apex of each being broken off. In the perfect shell there must have been at least ten and probably as many as eleven volutions. The species is of considerable interest on account of its strikingly close similarity to some of the most typical Jurassic species of *Pseudomelania*."

PTEROPODA.

Conularia asperata, Billings..

Plate 21, figs. 2 and 2 a.

Conularia asperata, Billings.....1866. Geol. Surv. Canada, Cat. Silur. Foss. Isld. Anticosti, p. 21.

Cfr. *Conularia formosa*, Miller and Dyer...1878. Journ. Cincinn. Soc. Nat. Hist., vol. I, p. 38, pl. 1, figs. 12 and 12*a*.

A few good specimens, which seem to be essentially similar to the type of *C. asperata* from Macastey Bay, Anticosti, were collected from limestone exposures at Cat Head by T. C. Weston in 1884 and by D. B. Dowling in 1891; also at Inmost or Birch Island, in Kinwow Bay, by T. C. Weston in 1884; and by D. B. Dowling and L. M. Lambe in 1890. Similar specimens were collected from loose pieces of limestone at Reindeer Island by D. B. Dowling in 1890, and at Big Sturgeon Island by D. B. Dowling and L. M. Lambe in the same year.

In the type of *C. asperata* from Anticosti, and in all the specimens of that species from Lake Winnipeg that the writer has seen, each of the

obliquely transverse ridges on the flattened sides of the test bears a row of minute tubercles, and the narrow linear depressions or grooves between the tuberculose ridges are marked with fine, longitudinal and parallel raised lines. It seems highly probable that *C. formosa* is synonymous with *C. asperata.*

CEPHALOPODA.

ENDOCERAS ANNULATUM, Hall. Var.

Endoceras annulatum, Hall. Var. Whiteaves. 1891 Trans. Royal Soc. Canada, vol. IX., sect. 4, p. 77, pl. 5, figs, 1 and 1 a.

Between the second and third rapids of the Nelson River, Keewatin, Dr. R. Bell, 1879: a cast of the interior of the septate portion of the shell and two fragments. The most perfect of these specimens, the one figured in the Transactions of the Royal Society of Canada, differs from the type and only known specimen of *E. annulatum*, as described and figured by Hall (which is also a septate cast), in the much more oblique disposition of its annular ridges, each of which passes obliquely over three of the septa. In transverse sections, the outlines of both shell and siphuncle of the Nelson River specimens are broadly elliptical, but this appearance is probably due to the abnormal compression to which they have been subjected.

ENDOCERAS SUBANNULATUM, Whitfield.

Endoceras (Camerocceras) subannulatum, Whitfield.....1882. Geol. Wiscons., vol. IV., p. 230, pl. 7, figs. 15 and 16.

Endoceras subannulatum, Whiteaves .....1891. Trans. Royal. Soc. Canada, Vol. IX., Sect. 4, p. 77, pl. 5, figs. 2 and 2*a*.

"Numerous examples of a large annulated *Endoceras*, which in many respects agree fairly well with Professor Whitfield's description of this species, have been collected in the valley of the Red River, on the western shore of Lake Winnipeg and on many small islands in that lake. Specimens in which the annulations of the exterior are preserved were obtained at East Selkirk by Dr. Bell in 1880, by Messrs. T. C. Weston and A. McCharles in 1884 and by Mr. L. M. Lambe in 1890; at Grindstone Point, Lake Winnipeg, by Mr. Weston in 1884, and by Mr. J. B. Tyrrell in 1889; near Cat Head, by Mr. Donald Gunn in 1853;" at Little Black Island by Mr. Tyrrell in 1889, and by Messrs. Dowling and Lambe in 1890; at Snake, Jack Head, Little Black, and Big Sturgeon islands, by Messrs. Dowling and Lambe in 1890. "Very large but badly preserved specimens, which probably belong to the same species but which do not show the characteristic surface ornamentation, were col-

lected at Lower Fort Garry, and at Dog Head, Lake Winnipeg, by Mr. Weston in 1884; at Big Island, by Mr. Tyrrell in 1889; at Black Bear Island (near Snake Island), by Messrs. Dowling and Lambe in 1890; and at Commissioners (or Cranberry) Island by Mr. Dowling in 1890."

"The largest specimen in which any considerable portion of the test is preserved is the one from East Selkirk collected by Mr. McCharles, the posterior moiety of which is represented by fig. 2, on Plate 5" of the ninth volume of Transactions of the Royal Society of Canada. "It is upwards of seventeen inches and a half in length, three inches and a half in thickness at the smaller end and about four and a quarter at the larger. It is septate throughout, and its transverse annulations are comparatively narrow, there being five to an inch. The largest specimens without the test are upwards of two feet in length, and imperfect at both ends, while a large fragment, which, however, has been abnormally compressed, is eight inches in breadth by about fifteen in length. All of these also are septate throughout, and, so far, not a trace of the chamber of habitation can be found in any of the specimens from Manitoba. This is the more remarkable when it is borne in mind that the Wisconsin specimen of *E. subannulatum* figured by Professor Whitfield, which is represented as only two inches in breadth at the larger end, has no less than three inches and three-quarters of the body chamber preserved and only about an inch and three-quarters of the septate portion of the shell.

"In *Endoceras annulatum* the septa are stated to be 'more approximated than the annulations,' but in the present species the opposite is the case, the sutures of the septa being usually about twice as far apart as the breadth of the annulations. In the Manitoba specimens, which may possibly prove to be distinct from the typical *E. subannulatum*, there is a considerable amount of variation in the proportionate thickness of the annulations. Some medium-sized ones, a little less or a little more than two inches in thickness, have as few as three or four annulations to the inch and others as many as six. The annulations, although always rounded at the summit, are by no means always 'low,' as described by Professor Whitfield, but are often so prominent as to give a strongly ribbed appearance to the shell, and the concave spaces between them are not infrequently broader than the annulations themselves.

"Detached siphuncles of this species are by no means rare in Manitoba, the largest known to the writer (from Big Sturgeon Island) being fifteen inches and a-half in length, nearly one inch and a quarter thick at its smaller end, and two inches and an eighth at its larger. The very large and apparently single siphuncular sheath is elongated, conical and rather thin walled, the test of the wall being about half a millimetre thick. The endosiphon has not been observed."

ENDOCERAS (NARTHECOCERAS) CRASSISIPHONATUM, Whiteaves.

Endoceras crassisiphonatum, Whiteaves.....1891. Trans. Royal Soc., vol. IX., sect. 4, p. 79, pl. 6, figs. 1-4, and pl. 7, fig. 1.

Narthecoceras (Endoceras) crassisiphonatum, Hyatt ..... 1895. Amer. Geol., vol. XVI., p. 3.

"Siphuncle (the only part of the shell known) very long and thick, attaining apparently to a length of considerably more than four feet, circular in transverse section, nearly cylindrical, but alternately slightly swollen and as slightly constricted at distant but regular intervals, the constrictions, which cross the siphuncle somewhat obliquely, being probably caused by the overlapping of the posterior portion of the necks of the septa; increase in thickness very slow but regular, at the rate, so far as known, of three-tenths of an inch per foot; septa unknown, though the distances apart of the annular siphuncular constrictions and their obliquity seem to indicate that the septa also were widely distant, and the siphuncle itself either marginal or submarginal. Endosiphon narrow and nearly cylindrical posteriorly, but widening irregularly and gradually anteriorly. At the anterior end of the thickest specimen collected (which is represented in outline on Plates 6, fig. 4, and 7, fig. 1" of the paper in which the species was originally described) "the diameter of the endosiphon is a little more than half that of the siphuncle." "In another specimen (the original of figure 3 on Plate 6" of the same paper) "the interior of the narrow posterior end of the siphuncle appears to be portioned off by a few transverse concave dissepiments.

"Collected at Lower Fort Garry by Mr. Donald Gunn in 1858; and at East Selkirk by Dr. R. Bell in 1880, by Messrs. McCharles and Weston in 1884, and by Mr. Lambe in 1890.

"The most perfect specimen in the Survey collection, which it will be convenient to designate as No. 1, and which is represented in outline, one-fourth of the natural size, on Plate 6, fig. 1," of the paper already referred to, "was collected at East Selkirk by Mr. McCharles. Its actual length is three feet all but an inch, and it is obviously imperfect at both ends. It is the only specimen known to the writer in which the increase in thickness is very obvious. At the smaller end its maximum thickness is an inch and a tenth, and at the larger end just two inches. Its rate of increase, therefore, as already remarked, is three-tenths of an inch per foot.

"Another large fragment, collected by Mr. Lambe at East Selkirk, which is represented in outline, of natural size, on plate 6, fig. 1" of the paper quoted, "and which may be indicated as specimen No. 2, is about eight inches in length by two inches and three and a half-tenths in its maximum thickness at one end and not appreciably more at the

other. Judging by its thickness, No. 2 could very well have formed part of the anterior end of No. 1, and both are from the same locality. At the rate of taper of three-tenths of an inch per foot, it is estimated that specimen No. 1 would have to be eight inches longer anteriorly than it now is before it could be as thick as No. 2. This would give thirty-five inches for No. 1, eight for No. 2 and eight for the interval between them, or a total of four feet and a quarter for the siphuncle only, which, even then, would be imperfect at both ends.

"In their proportionate thickness and probably submarginal position, as well as in the irregularity and gradual expansion of their endosiphons, these siphuncles seem to agree better with those of *Endoceras* than with those of *Orthoceras* proper. Although no clearly defined sheath or sheaths have yet been detected in them, they appear to be most nearly related to that section of the genus *Endoceras* which Professor Hyatt has differentiated under the name *Sannionites*, Waldheim, and in this view of their affinities the writer's opinion was endorsed by Professor Hyatt," who, however, has since indicated a new genus of Endoceratidæ, which he proposes to call *Narthecoceras*, and based upon these siphuncles and those of *Orthoceras Simpsoni*, Billings. Specifically, these siphuncles also seem to differ from those of *O. Simpsoni* in their huge size and proportionate thickness, but more especially in their more rapid increase in thickness, though this increase is still so very gradual as to be not readily appreciable in the comparatively short fragments that are usually obtained."

ENDOCERAS (NARTHECOCERAS) SIMPSONI, Billings. (Sp.)

Orthoceras Simpsoni, Billings ....1859. In Hind's Rep. Assinib. and Saskatch. Expl. Exped., p. 186, pl. 1, fig. 1.
" " Whiteaves.....1891. Trans. Royal Soc. Canada, vol. IX., sect. 4, p. 80, pl. 7, figs. 2 and 2*a*, and pl. 8, fig. 1.
Narthecoceras (*Endoceras*) *Simpsoni*, Hyatt..1895. Amer. Geol., vol. XVI., p. 3.

"The type of this species, which is still preserved in the Museum of the Geological Survey, was collected by Professor H. Youle Hind in 1858 at Cat Head, on the western shore of Lake Winnipeg, and is thus described by the late E. Billings. The specimen is a portion of the siphuncle, nine inches and one-fourth in length, eleven lines at the larger extremity, and ten at the smaller. It is nearly cylindrical, with a broad, shallow constriction above and below each of the narrow annulations which mark the attachment of the septa. There are eight of these septal rings at the following distances from each other, commencing at the smaller extremity: Between the 1st and 2nd, fourteen lines; 2nd and 3rd, twelve lines; 3rd and 4th, ten and a half lines; 4th and 5th, thirteen and a

half lines; 5th and 6th, fifteen lines; 6th and 7th, thirteen and a half lines; 7th and 8th, twelve and a half lines. The annulations are nearly at right angles to the length, and we must infer from this fact either that the septa are scarcely at all concave, or that the siphuncle must be central or very nearly so. If in an orthoceratite the septa are flat, then, no matter whether the siphuncle be central or not, the septal annulations must be at right angles, but if the septa are concave then the annulations will be oblique if the siphuncle be at all removed from the centre. My impression is, that this is a large orthoceratite with distant septa and a nearly central siphuncle, since the annulations have a scarcely perceptible obliquity.

"It is one of those species in which the siphuncle became gradually filled with a solid calcareous animal secretion, with the exception of a narrow cylindrical channel along the centre. This central canal is clearly indicated in the specimen and has a diameter of nearly two lines.

"Dedicated to Sir George Simpson, Governor of the Hudson's Bay Company."

Since this description was published, a few specimens of siphuncles with very similar characters to those of *O. Simpsoni*, and which are therefore probably referable to that species, have been collected at each of the following localities in or on Lake Winnipeg: Dog Head, T. C. Weston, 1884, and L. M. Lambe, 1890; Little Black Island, J. B. Tyrrell, 1889, and D. B. Dowling and L. M. Lambe, 1890; Snake Island, Messrs. Dowling and Lambe, 1890; and Commissioners Island, D. B. Dowling, 1890.

Some of the specimens from these localities are much longer and of course proportionately thicker than the type from Cat Head, but the increase in thickness in all of them is so slow as to be scarcely appreciable. In the type, the septal annulations certainly cross the siphuncle at nearly right angles, as described by Mr. Billings and as represented in his figure, a reproduction of which, in outline, is given on Plate 7, fig. 2, of the ninth volume of Transactions of the Royal Society of Canada, but in the majority of specimens there referred to *O. Simpsoni*, which have been collected since, this is by no means always the case. Thus, in a specimen from Dog Head, which is nearly two feet long and a portion of which is represented in outline on Plate 7, fig. 3, of the volume just referred to, the septal rings cross the siphuncle somewhat obliquely.

The only specimen, presumably referable to this species, in which any remains of the septa and outer shell are preserved, as well as the siphuncle, is the large fragment from Little Black Island, represented in outline by fig. 1 of Plate 8 of the volume cited. This specimen, which is about four inches in length and not quite three inches and a half in breadth, has been worn down on one side in such a way as to give a natural and

longitudinal section of the shell, showing the edges of the septa and the lateral margins next to the test, as well as the siphuncle. The latter is seen to be eccentric and sublateral but not quite marginal, and to occupy, at its thickest part, rather more than one-third of the entire diameter. As exposed in this section, the septa are seen to be rather deeply concave internally, but the nature of the markings of the exterior of the test is still unknown.

Actinoceras Richardsonii, Stokes.

Actinoceras Richardsonii, Stokes.....1840. Trans. Geol. Soc. Lond., ser. 2, vol. V., pt. 3, p. 708, pl. 59, figs. 2 and 3.
? Ormoceras Brongniarti, D. Dale Owen.... 1852. Geol. Rep. Wiscons., Iowa and Minn., p. 181.
Actinoceras Lyoni, Whiteaves (non Stokes)..1880. Geol. Surv. Canada, Rep. Progr., 1878-79, pp. 460 and 480 of Appendix 1.
Actinoceras Richardsoni, Foord.....1888. Cat. Foss. Cephal. Brit. Mus., pt. 1, p. 172.
" " Whiteaves.....1891. Trans. Royal Soc. Canada, vol. IX., sect. 4, p. 83, pl. 9, figs. 1, 2 and 2*a*.

Western shore of Lake Winnipeg, "near the First and Second Rocky Points," north of the Saskatchewan, where specimens were collected by Sir John Richardson on Franklin's first expedition in 1814, and subsequently by Captain Back in 1832. Specimens have since been collected by Mr. Dowling, in 1891, at nearly or possibly the same place, viz., on the west shore of Lake Winnipeg, opposite the north end of Selkirk Island, and at the north end of that island; also at Clark's or Limestone Point, eleven miles north of the mouth of the Little Saskatchewan. It is apparently abundant at Lower Fort Garry, where it was collected by D. Dale Owen in 1848, by Sir James Hector in 1857, by Donald Gunn in 1858, by Dr. R. Bell in 1879 and 1880, and by T. C. Weston and A. McCharles in 1884. It occurs also at East Selkirk, where it was collected by Mr. Weston and Mr. McCharles in 1884.

This species is represented in the Museum of the Survey by a fine series of specimens from the Red River valley. These shew that the rate of tapering in some specimens is rather more rapid than has generally been supposed. Thus, in the original of fig. 1, on Plate 8, of the ninth volume of Transactions of the Royal Society of Canada, in a length of four inches the maximum diameter of the shell increases from thirty-seven millimetres at the smaller end to sixty at the larger. The outline of a transverse section is usually circular, except when the specimen has been abnormally compressed. The surface markings consist of rather regularly disposed transverse and imbricating striæ. The septa, as described by Mr. Foord, are "four lines distant where the shell has a diameter of three inches," and arch strongly forward and outward.

The very large submarginal and nummuloidal siphuncle varies in its proportionate size in different specimens, though its maximum diameter is usually more than half that of the shell. It is very strongly inflated between the septa, and both acutely and narrowly constricted at the places where they join it. In the longitudinal section of a specimen of this species represented by fig. 2 of Plate 9 of the volume referred to, the posterior segment of the siphuncle is thirty-six millimetres in maximum breadth and nine in height, while the last perfect segment anteriorly is forty-seven mm. in its greatest breadth by ten in height. The endosiphon and the lateral tubuli which proceed from it are all well shown in this and in similar sections.

Figures 3 and 3*a* on Plate 9 of the volume cited represent the apical extremity of what appears to be an abnormally flattened specimen of this species, in which the outline of a transverse section at the larger end (fig. 3*a*) is elliptical and not circular.

Actinoceras Bigsbyi? Bronn.

Orthocerœ.....Bigsby..... .... 1824. Trans. Geol. Soc. Lond., ser. 2, vol. I., p. 198, pl. 25, figs. 1 and 2 (but not 3).

Actinoceras Bigsbyi, Bronn.. .....1837. Lethæa Geogn., Bd. I., p. 98, taf. 1, f. 8 (after Bigsby).

" " Stokes ... .1840. Trans. Geol. Soc. Lond., ser. 2, vol. V., pt. 3, p. 707.

Actinoceras Lyoni, Stokes..... ...1840. *Ib.*, p. 707, pl. 59, fig. 1.

" " Castelnau.....1843. Syst. Silur. de l'Amer. Septentr., p. 32, pl. 17, figs. 1, *a-b*.

Ormoceras tenuifilum, Hall..... 1847. Pal. N. York, vol. I., p. 55, pls. 15, 16, and 17, figs. 1, *a-b*. Teste E. Billings, in Geol. Canada, 1863.

Ormoceras Lyonii, Hector . .. .1861. Quart. Jour. Geol. Soc. Lond., vol XVII., p. 439 (Salter's determination).

Orthoceras Bigsbii, Billings.....1863. Geol. Canada, p. 149, figs. 109, *a-b*, and Appendix, p. 949.

Orthoceras (*Actinoceras*) *Bigsbyi*, Barrande...1874. Syst. Silur. de la Bohême, vol. I., Texte 3, p. 734, and pl. 231, figs. 4 and 5 (copied from Dr. Bigsby) and pl. 437, figs. 10-16.

Orthoceras (*Ormoceras*) *tenuifilum*, Barrande.1874. *Ib.*, p. 754, pl. 237, figs. 5-7.

Actinoceras Bigsbyi, Foord.....1888. Cat. Ceph. Brit. Mus., p. 168.

" " Whiteaves.....1891. Trans. Royal Soc. Canada, vol. IX., sec. 4, p. 84, pl. 10, fig. 2.

One of the species of fossils collected by Sir James Hector in 1857 at Lower Fort Garry was identified by the late Mr. Salter with *Ormoceras Lyonii*, which Mr. Foord includes among the synonyms of *Actinoceras Bigsbyi*, Bronn. Specimens, which the writer has referred to *A. Bigsbyi*, have since been collected in the Red River valley, at East Selkirk, by A. McCharles in 1884; and on or around Lake Winnipeg, at Little

Black Island, by J. B. Tyrrell in 1889 and by D. B. Dowling and L. M. Lambe in 1890; at Big Sturgeon Island by Mr. Dowling and Mr. Lambe in 1890; and at the mouth of the Fisher River by Mr. Dowling in 1891.

Although part of the test is preserved on some of the specimens from these localities, it is invariably so much worn or weathered as to shew no trace of the "longitudinal, undulated, thread-like lines" which suggested to Hall the specific name *tenuifilum*. The surface markings, however, are rarely preserved in specimens of *O. Bigsbyi* from the Black River or Trenton limestones of the provinces of Ontario or Quebec.

The siphuncles of the specimens from Lake Winnipeg and the Red River valley, which are here referred to *A. Bigsbyi*, are quite different in their contour to those of *A. Richardsonii*. In the former the siphuncle consists of prominent annular ridges, with deeply and obliquely excavated grooves between them, and the latter of a single series of large anchylosed nummuloidal discs, with rounded edges. A portion of a siphuncle, from Snake Island, Lake Winnipeg, which is crushed almost flat but somewhat obliquely, and which may represent an extreme form of *A. Bigsbyi*, has the annular ridges low and rounded and the grooves or constrictions between them unusually broad and shallow. The longitudinal section of a specimen from Little Black Island represented on Plate 10, fig. 2, of the ninth volume of Transactions of the Royal Society of Canada, "shews the opening of the large foramen directly into the endosiphon posteriorly, and some of the lateral canals or tubuli, which radiate first outward and then outward and forward, from the endosiphon. Not a vestige of the chamber of habitation of this species, nor of that of *A. Richardsoni*, has yet been discovered."

The types of *Actinoceras Bigsbyi* are from Thessalon Island, Lake Huron, where they were collected by Dr. Bigsby in 1820. In the "Geology of Canada" (1863), specimens which were identified by E. Billings with *A. Bigsbyi* (under the name *Orthoceras Bigsbii*) are recorded as occurring, in Ontario, on Campement d'Ours Island, on the Palladeau, Manitoulin and Lacloche Islands and on Snake Island, in Lake Huron,—at Loughborough, Dickson's Mills, near Pakenham and Cornwall; in Quebec, at Point Claire (on the island of Montreal,) Montreal, St. Ambroise and Lake St. John. The specimens from Montreal are from the Trenton limestone, but all the others from the localities just cited, in the provinces of Ontario and Quebec, are from the Black River limestone.

ACTINOCERAS ALLUMETTENSE, Billings. (Sp.)

Orthoceras Allumettense, Billings.... ....1857. Geol. Surv. Canada, Rep. Progr. 1853-56, p. 331.
" " Barrande .....1870. Syst. Silur. de Bohême, vol. II., pl. 436, figs. 6-9.
" " Barrande .....1874. Ibid. texte III, p. 729.

Actinoceras Allumettense, Whiteaves.....1891. Trans. Royal Soc. Canada, vol. IX. sect. 4, p. 85, pl. 10, figs. 3 and 3*a*.

Lower Fort Garry, Dr. R. Bell, 1880: a single specimen, a longitudinal section of which is figured in the publication last cited. The specimen is a little more than six inches in length, by nineteen millimetres in its maximum diameter at the smaller end and thirty-six at the larger. It was identified with the present species, with some confidence, after a careful comparison with four of Billings's types of *O. Allumettense*, from Paquette's Rapids, on the Ottawa River. A specimen collected by Messrs. Dowling and Lambe at Black Bear Island, Lake Winnipeg, in 1890, which consists of a natural but much weathered longitudinal section of the shell, about eight inches in length, in a piece of limestone, is also probably referable to this species.

A. Allumettense seems to be intermediate in its characters between *Actinoceras* and *Sactoceras*, and should, perhaps, be referred to the latter genus rather than to the former. Still, in the *Orthoceras Richteri* of Barrande, which is stated by Professor Hyatt to be the type of his genus *Sactoceras*, the height and breadth of the siphuncular segments, which are moniliform rather than nummuloidal, are represented as nearly equal, whereas in *A. Allumettense* these segments are nearly twice as broad as high, and therefore more nearly nummuloidal.

Actinoceras (Deiroceras) python, Billings. (Sp.)

Orthoceras Python, Billings .....1857. Geol. Surv. Canada, Rep. Progr. 1853-56, p. 335.

Actinoceras (Deiroceras) python, Hyatt.....1883. Proc. Boston Soc. Nat. Hist., vol. XXII, p. 273.

Clark's Point, on the west shore of Lake Winnipeg, about eleven miles north of the mouth of the Little Saskatchewan, D. B. Dowling, 1890: a natural mould of part of a siphuncle, shewing four of the "subglobular or oval expansions" characteristic of this species.

Actinoceras (Sactoceras ?) Canadense, Whiteaves.

Sactoceras Canadense, Whiteaves.....1891. Trans. Royal Soc. Canada, vol. IX., p. 85, pl. X., figs. 1, *a-c*.

Orthoceras Canadense, S. A. Miller.....1892. First Appendix to N. Am. Geol. and Palæont., p. 697. But not *Orthoceras Canadense*, Billings, 1857, which, however, is a synonym of *Huronia vertebralis*, Stokes.

"Shell narrowly elongated, rather slender, somewhat fusiform, cylindro-conical and increasing very slowly in thickness from the posterior end to a short distance beyond the midlength, thence narrowing slightly to the aperture; length about six times greater than the maximum thickness;

dorsal and ventral regions compressed, though perhaps abnormally so, the outline of a transverse section through the thickest part, near to the body chamber, being broadly elliptical. Septate portion, in the only specimen known to the writer, occupying about two-thirds of the entire length, and divided into seventeen chambers, its apical extremity obtusely pointed; chamber of habitation nearly cylindrical, though its maximum diameter is about six millimetres greater at its commencement posteriorly than at the aperture. Surface markings unknown. Septa shallowly concave externally in the dorsal and ventral regions, their distance apart averaging about one-third the maximum diameter, except the two or three last formed, which are rather closer together. Siphuncle, as seen in a longitudinal section of the specimen, eccentric, submarginal, very large and much swollen between the septa posteriorly, but ultimately much diminishing in size towards the chamber of habitation. At the apex, posteriorly, nearly the whole of the first chamber is filled up with the first segment of the siphuncle, which is twelve millimetres in its maximum diameter. In the next five or six chambers, the siphuncular segments fill the greater part of the space, and average from fifteen to sixteen millimetres in their maximum diameter, after which the siphuncle decreases so rapidly in size that in the fourth chamber from the body chamber, the maximum diameter of the segment therein contained is only five mm. Dimensions of the specimen figured and described; total length, about nine inches, or 23 cm.; greatest thickness, 36 mm.; length of the septate portion of the shell, as measured in the median line of the section, 14·6 cm.; greatest diameter of the body chamber, 35 mm. posteriorly and 29 mm. anteriorly."

Little Black Island, Lake Winnipeg, J. B. Tyrrell, 1889: one nearly perfect cast of the interior of the shell, with the whole of the siphuncle and septa well preserved.

"The internal structure of this species is essentially similar to that of the *Orthoceras docens* of Barrande, which Professor Hyatt regards as an aberrant member of his genus *Sactoceras*, but the external contour of these two shells seem to be quite different. The remarks which Professor Hyatt makes upon *S. docens*, however, are quite as applicable to the Canadian species. In reference to the former, he states that 'it is a transition form' but we place it in this genus because at an age when an *Actinoceras* would have the rosettes large and perfect, this species begins to lose them, and the siphon decreases also. The reduction of the siphon is a degradational senile shrinkage, and it occasions the loss of the rosettes. M. Barrande views this old stage of the siphon as a return to the tubular siphon, but in our opinion we cannot call this a tubular siphon. As a matter of fact it is a modified nummuloidal siphon, as may be seen by comparison with others."

Orthoceras Winnipegense, Whiteaves.

Orthoceras Winnipegense, Whiteaves.. .. ..1891. Trans. Royal Soc. Canada, vol. IX., sect. 4, p. 82, pl. 8, figs. 4 and 4, *a-b*.

"Shell narrowly elongated, somewhat fusiform, very slightly inflated in advance of the midlength; outline of transverse section nearly rounded but approaching to elliptical. Septate portion cylindro-conical, and increasing very slowly in thickness; chamber of habitation broadly but shallowly constricted in the middle, and a little narrower at the aperture than at its commencement. Surface markings unknown, though the interior of the test is marked by closely disposed and exceedingly minute, transverse raised lines. Septa, as shown in the longitudinal section represented by fig. 4b," on Plate 8, of the ninth volume of Transactions of the Royal Society of Canada, "seven millimetres and a half apart at the smaller end, and eight mm. at the larger, as measured at their broadest part, next to the siphuncle; siphuncle slightly eccentric, narrow, almost cylindrical, but faintly constricted at the septa."

Little Black Island, Lake Winnipeg, two specimens; and south end of Berens or Swampy Island, about eight miles from Little Black Island, one specimen; all three collected by Messrs. Dowling and Lambe in 1890.

The specimen from Little Black Island, which is figured on Plate 8, figure 4, of the publication already referred to, has about three inches of the chamber of habitation preserved and a little more than three and a-half of the septate portion. The specimen from Berens Island, which is septate throughout but imperfect at both ends, is five and a-half inches in length, by about thirty-six millimetres in its maximum diameter at the larger end and twenty-nine at the smaller.

Orthoceras magnisulcatum, Billings.

Orthoceras magnisulcatum, Billings.....1857. Geol. Surv. Canada, Rep. Progr. 1853-56, p. 330.

A characteristic specimen of this species, which was previously known only from a fragment an inch and a-half long, from the Hudson River formation at Charleton Point, Anticosti, was recently given to Mr. Tyrrell at Selkirk, Manitoba. The colour of the matrix shews that this specimen, which consists of a portion of the body chamber and of eight septa, is probably from the limestones of the Red River Valley or Lake Winnipeg, but the exact locality at which it was collected is unfortunately unknown.

Orthoceras Selkirkense, Whiteaves.

Orthoceras Selkirkense, Whiteaves.....1891. Trans. Royal Soc. Canada, vol. IX., sect. 4, p. 82, pl. 8, figs. 2 and 2, *a. b.*

"Shell very nearly cylindrical, but increasing in thickness at the rate of about one millimetre in two inches, and slightly compressed, the outline of its transverse section being rounded elliptical, with the larger diameter about one-fourth larger than the smaller. Surface marked with narrow but very prominent distant annulations, or transverse raised ridges, separated by flat intervals, which are about half as broad as the maximum diameter of the tube, and transversely costulate where the test is well preserved. Septa remote, each of the larger annulations of the test marking the commencement of a new septum, and shallowly concave internally, as seen in longitudinal sections through the centre of the tube; siphuncle rather large, placed near the margin of one of the flattened sides, and slightly contracted at the septa. Chamber of habitation unknown.

"The largest specimen collected is not quite five inches in length. At a distance of a little more than half an inch from its smaller extremity its maximum diameter is twenty-five millimetres, and at about a quarter of an inch from its larger end the greatest thickness is twenty-seven millimetres.

"East Selkirk, Manitoba; two specimens, both collected in 1884, one by Mr. T. C. Weston and the other by A. McCharles."

Orthoceras anellus, Conrad.

Orthoceras anellus, Conrad.....1843. Proc. Ac. Nat. Sc. Philad., vol. I., p. 334.
Orthoceras anellum, Hall.....1847. Pal. N. York, vol. I., p. 202, pl. 43 figs. 6 *a.-f.*
" " Whitfield.....1882. Geol. Wiscons., vol. IV., p. 226 7, fig. 13.
Orthoceras anellus, Clarke.....1897. Geol. Minn., Final Rep., vol. III. pt. 2, p. 784, pl. 43, figs. 22 and 23.

West shore of Lake Winnipeg, about five miles north of Clark's Point, and sixteen north of the mouth of the Little Saskatchewan, D. B. Dowling, 1891. one badly preserved and abnormally compressed specimen.

Tripteroceras Lambii, Whiteaves. (Sp.)

Gonioceras Lambi, Whiteaves.....1891. Trans. Royal Soc. Canada, vol. IX., sect. 4, p. 86, pl. II, figs. 1 and 1 *a-b*.
Triptoceras Lambi, Clarke.....1897. Geol. Minn., Final. Rep., vol. III., pt. 2, p. 793, pl. 56, figs. 1 and 2.

"Shell large, its body chamber unknown, the septate portion elongated, compressed conical, but increasing very slowly in size, strongly compressed on the dorsum and venter and broadly expanded at the sides, which are ultimately sharply angulated; lateral diameter a little more than twice the dorso-ventral, the exact proportions being as two to five; outline of

transverse section nearly lenticular, though the venter is a little flatter than the dorsum. Surface markings unknown. Septa rather closely approximated, their sutures averaging from ten to eleven millimetres apart on the median line of the dorsum, each suture being broadly concave on the dorsum and venter, and produced into a large obtusely pointed saddle on each of the lateral angles. Siphuncle ventral, marginal, strongly inflated between the septa, but very small proportionately, its thickest portion occupying not much more than one-seventh the maximum diameter of the tube. The constrictions between the siphonal inflations are very deep, and, when viewed in longitudinal section, appear as narrow incisions which cut obliquely backward and inward, on each side, thus giving a very peculiar appearance to the siphuncle.

"Approximate dimensions of the specimen described: length rather more than ten inches; maximum diameter, at the smaller end, five inches, the corresponding diameter at the larger end being six inches and a half."

East Selkirk, L. M. Lambe, 1890: a single specimen of the septate portion of the shell. Wekusko Lake, District of Saskatchewan, J. B. Tyrrell, 1896, a specimen which is also septate throughout, imperfect at both ends, and which measures about a foot in length, by seven inches and three-quarters at the larger end. Two specimens from the Galena limestone of Minnesota have recently been identified with this species by Dr. John M. Clarke.

Tripteroceras semiplanatum, Whiteaves. (Sp.)

Orthoceras semiplanatum, Whiteaves.....1891. Trans. Royal Soc. Canada, vol. IX., sect. 4, p. 81, pl. 8, figs. 3 and 3*a*.

Shell compressed subcylindrical, increasing very slowly in thickness (at the rate, so far as can be ascertained, of three millimetres and a half in a length of five centimetres), nearly planoconvex in transverse section, one side being broadly and very gently convex and the other nearly flat, the shorter of the two diameters of the tube being about one-third less than the longer, and the lateral margins narrowly rounded. Surface markings unknown; sutures of the septa shallowly concave on the flattened side, slightly convex on the other and closely approximated, the seven anterior chambers together measuring half an inch, on the median line of the flattened side; siphuncle small, cylindrical, placed close to the margin of the convex side.

"Lower Fort Garry, Dr. R. Bell, 1880: an imperfect and not very well preserved cast of the interior of the shell, not quite three inches and a half in length, and showing two inches and four-tenths of the body chamber, with about an inch of the septate portion. The species

resembles the *O. planoconvexum* of Hall, from the Trenton limestone of Wisconsin, in its planoconvex transverse section and in the close approximation of its septa, but differs therefrom in its much less rapid increase in thickness, less compressed sides, and, more particularly, in the entirely different position of its siphuncle, which latter, in *O. planoconvexum*, is said to be "centrally situated on the flattened side."

Ascoceras costulatum, Whiteaves.

Plate 22, fig. 1.

Ascoceras costulatum, Whiteaves.....1896. Canad. Rec. Sc., vol. VI., p. 394.

"Shell large, elliptic-subovate, longer than broad, and broadest in advance of the midlength, the neck or anterior prolongation of the body chamber being broken off in the only specimen known to the writer; outline of transverse section in the broadest part apparently elliptical, the dorsum and venter being compressed and the sides slightly expanded.

"Surface transversely but rather finely ribbed, the ribs averaging from seven to nine in the length of one centimetre, and rather closer together near the aperture than in the more expanded portion.

"Sigmoidal septa apparently three in number, though their distances apart on the dorsum cannot be ascertained. The suture, however, which forms the line of demarcation between the decurrent extremity of the body chamber and the septate portion, on both sides, is clearly defined. It shows that the body chamber extends as far backward as to within about half an inch from the blunted pointed posterior end, that it is dilated or produced laterally, toward the dorsum, for a short distance posteriorly, and concavely constricted for a much longer distance anteriorly."

Little Black Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: a badly preserved cast of the interior of the shell, with one side much worn, but with portions of the test preserved on both the venter and dorsum.

"This species bears some resemblance to *A. Bohemicum* of Barrande, particularly in size and in the general style of its surface markings. The ribs or riblets of this Bohemian species, however, are represented as finer and very much more numerous. Thus, according to Lindström, in *A. Bohemicum* there are as many as twenty-two riblets in a length of five millimetres, and hence, presumably, forty-four to a centimetre, but in the present species there are only from seven to nine ribs to a centimetre. Among Canadian species, *A. costulatum* would seem to be nearest to *A. Canadense*, Billings, the type of Hyatt's genus *Billingsites*, and hence may be referable to that genus. The surface markings of *A. Canadense*, however, are still unknown, or at least not preserved in any of the specimens in the Museum of the Geological Survey."

POTERIOCERAS NOBILE, Whiteaves.

Poterioceras nobile, Whiteaves..... . ...1889. Trans. Royal. Soc. Canada, vol. VIII., sect. 4, p. 77, pl. 14, fig. 1.

"Shell very large, attaining to a length of upwards of seven inches, straight, subturbinate, about one-third longer than broad, and broadest a little in advance of the midlength, considerably inflated but slightly compressed, one side being flatter than the other, so that the outline of a transverse section through the broadest part would be nearly elliptical, and the" supposed "dorso-ventral diameter about one-fourth greater than the lateral. Septate portion increasing rather rapidly in size from the apex: body chamber rather large, occupying more than one-third but less than half the entire length, and narrowing gradually and somewhat convexly to the aperture: character of the aperture unknown, though, as far as can be made out in the most perfect specimen collected, it appears to have been simple and entire, as well as apparently rather large and subovate in outline.

"Sutures, or outer edges of the septa, nearly straight all round, parallel, and, in the specimen figured, placed at a distance of eight millimetres apart at or near the (imperfect) posterior end, while the four nearest to the body chamber appear to have been about fourteen millimetres apart. In places where the test has been broken off and the cast of the interior exposed, the septa are often seen to be coarsely crenulated. Surface markings and shape and position of the siphuncle unknown.

Dimensions of the most perfect specimen known to the writer (in which, however, about two chambers are broken off at the posterior end):—length, 177 millimetres; maximum dorso-ventral (?) diameter, 124 mm.; greatest lateral diameter (approximately) about 98 mm.

"East Selkirk, Manitoba, T. C. Weston, 1884: one badly preserved and somewhat distorted but otherwise nearly perfect specimen, and a large fragment of another, consisting of the greater part of the septate portion of the shell. Lower Fort Garry, Manitoba, T. C. Weston, 1884: one very imperfect specimen, consisting also of most of the chambered portion of the shell." Very large specimens, which are possibly referable to *P. nobile*, are indicated by two worn casts of the anterior extremity of the body chamber collected in 1890, the one, which is seven inches broad, by Messrs. Dowling and Lambe at Berens or Swampy Island, and the other, which is six inches broad, by Mr. Dowling at Commissioners Island. Both are broadly ovate or ovately subcircular in a full front view, and both shew the infolding of the lip, which seems to be characteristic of the genus.

"This species is provisionally referred to *Poterioceras*, on account of its supposed simple and entire aperture, but it may prove to be a true *Gomphoceras*.

"The genus *Poterioceras* was thus originally defined by M'Coy:—'Shell fusiform, short; mouth contracted; siphuncle dilated between the chambers, eccentric. Distinguished from the true *Orthoceratites* by its short fusiform contour, and contracted mouth.' This diagnosis is accompanied by a small diagram, which shews that, although the body chamber narrows rapidly from its commencement up to the aperture, yet the aperture itself is simple and entire, and neither T-shaped or lobate as in *Gomphoceras*, nor contracted in the middle and expanded at both ends as in *Phragmoceras*.

"The validity of the genius *Poterioceras* is not recognized by Barrande, Fischer, Zittel and others, who place the name among the synonyms of *Gomphoceras*. On the other hand, in the first part of his Monograph of the British Fossil Cephalopoda," Professor J. F. Blake "accords full generic rank to *Poterioceras* on the ground that 'the only species described by M'Coy, as well as his diagram, indicates a genus with the form of a *Gomphoceras* without its peculiar aperture.' In the same volume, Professor Blake contends that *Oncoceras*, Hall, is synonymous with *Poterioceras*, and states that Professor Hall's "actual type, as well as others which have been referred to the genus, in no respects differ from M'Coy's genus. To this contention the present writer feels compelled to demur, as the statement by which it is supported seems to be at variance with the known facts of the case. If the genus *Poterioceras* is to be retained at all, in the sense in which it was defined by M'Coy, the name will probably have to be restricted to those straight *Gomphoceras*-like shells in which the aperture is simple and entire, and it is in accordance with this definition of its character that the name will be used in the present paper. In *Oncoceras*, on the other hand, the shell is always distinctly curved and inflated in a peculiar manner in advance of the midlength, while its body chamber is transversely constricted just behind the aperture. According to Professor Hall the aperture of *Oncoceras* is constricted, but as Mr. E. Billings asserts that it is oval,* the constriction referred to by Hall may have been meant to refer to that immediately behind the aperture."

In the outline drawing of the type of the species on Plate 14 of the seventh volume of Transactions of the Royal Society of Canada, although the contour and exact dimensions of the original are correctly represented, the sutural lines are slightly restored and the supposed outline of the aperture, on one side of the specimen, is indicated by a dotted line.

Poterioceras apertum, Whiteaves.

Poterioceras apertum, Whiteaves. . . . . .1889. Trans. Royal Soc. Canada, vol. VII., sect. 4, p. 78, pl. 14, figs. 2-4; and (1891) ibid., vol. IX., p. 87, pl. 11, figs. 2 and 3.

* Geological Survey of Canada, Rep. Progr. 1853-56, p. 311.

Shell much smaller than that of the preceding species, straight, though in some specimens there is a scarcely perceptible curvature at the apical end, varying in contour from ovately subfusiform to rather narrowly subovate, about one-third longer than broad in the largest and most perfect specimen known to the writer, and somewhat compressed, so that the outline of a transverse section in the broadest part would be elliptical or ovately subelliptical: body-chamber truncated transversely at the anterior end. Septate portion narrowly rounded at the apex in some specimens, but more pointed in others, compressed conical and increasing rather rapidly in size: body-chamber occupying about one-third of the total length, and narrowing very gently and in some specimens somewhat convexly towards and up to its anterior termination: aperture apparently large, simple, open, and not much narrower than the posterior part of the body-chamber: lip infolded.

The surface markings are very imperfectly preserved, but the test appears to have been nearly smooth and marked only with a few faint lines of growth.

Sutures almost straight and parallel, the last two, at least, being coarsely crenulated: siphuncle inflated between the septa, placed near the margin and a short distance from the middle of one of the flattened sides.

The dimensions of the largest specimen collected (the original of Plate 14, section 4, fig. 2, of the seventh volume of Transactions of the Royal Society of Canada) are as follows:—length, 124 millimetres (or nearly five inches); maximum breadth, seventy-four mm.; greatest diameter from the siphonal to the antisiphonal side, fifty-eight mm. In the specimen represented by fig. 3 on the same plate, the length along the median line is sixty-six millimetres, the maximum breadth forty-seven mm., and the greatest diameter from the siphonal to the antisiphonal side, forty mm.

Dog Head, Lake Winnipeg, T. C. Weston, 1884, and D. B. Dowling, 1891; Little Black Island, J. B. Tyrrell, 1889, and D. B. Dowling and L. M. Lambe, 1890; and Cat Head, Messrs. Dowling and Lambe, 1890: a few specimens from each of these localities.

This species possesses many characters that are common to it and to the brevicone Orthoceratites for which Professor Hyatt has constituted the genus *Rizoceras*, but it differs materially from that group or genus in the circumstance that its body chamber always narrows distinctly from its commencement to the aperture. From *P. nobile* it seems to be readily separable by its much smaller size, more slender contour, and more compressed sides.

In Professor Blake's original description of *P. intortum* * (which, by the way, seems to be very closely allied to *P. apertum*) the following

* On page 187 of the first part of his "Monograph of the British Fossil Cephalopoda," ondon, 1882.

sentence occurs: "The shell thickens near the aperture, but at last a sudden inbending takes place to an opening much smaller than the general section. This may, of course, be an abnormal feature." The thickening of the shell towards the aperture and its "sudden inbending" are so well shown in the two specimens of *P. apertum* from Little Black Island, represented on Plate 11, section 4, of the ninth volume of Transactions of the Royal Society of Canada, that these characters can scarcely be considered as accidental or even abnormal. The original of fig. 2, on this plate, is slightly and rather irregularly worn down in the siphonal region, in such a way as to give a natural and longitudinal section of the whole shell, very near to the surface. Posteriorly, the weathering of this specimen exposes six or seven of the septa and five segments of the very eccentric siphuncle. Anteriorly, it gives a section of the whole of the body chamber, and, more particularly, of the thickening and inbending of the test at the aperture, though in this particular specimen the thickening and inbending happen to be very slight. The specimen whose aperture only is represented by fig. 3 on the same plate is so weathered as to give a natural and longitudinal section of part of the shell, but the section of the aperture is nearly through the centre of the latter. In this specimen the thickening and infolding of the test at the aperture are strongly marked, the test being fully six millimetres thick at its recurved extremity, and the aperture appreciably diminished in size by the infolding of the lip.

As stated elsewhere,* in the original description of this species, of *Oncoceras magnum*, *O. gibbosum* (Whiteaves not Hall, = *O. Whiteavesii*, Miller) and *Cyrtoceras Manitobense*, their convex sides were inadvertently designated as dorsal and their straighter sides as ventral, in accordance with the old terminology. In the amended descriptions of these species in this Report, the use of such terms as ventral, dorsal and the like is purposely avoided, as it is not quite clear which is really the venter and which the dorsum of either.

Poterioceras gracile, Whiteaves.

Poterioceras gracile, Whiteaves.....1892. Trans. Royal Soc. Canada, vol. IX., sect. 4, p. 87, pl. 12, figs. 4 and 4, *a-b*.

"Shell fusiform, strongly compressed, straight and rather slender, flattened conical and obtusely pointed posteriorly, thickest at the mid-length, where it is very gently convex, thence narrowing gradually and very slightly towards the aperture, which apparently is simple and broadly truncated; immediately behind the aperture there is a faint annular constriction: siphonal and antisiphonal regions narrowly rounded;

* In a foot note to page 102, sect. 4, of the eighth volume of Transactions of the Roya Society of Canada.

sides compressed, somewhat expanded, especially at the midlength and anteriorly; chamber of habitation occupying about one-third of the entire length, which latter is more than twice but less than three times the maximum breadth; outline of transverse section, in the thickest part, elliptical, with the longer axis of the ellipse not quite twice the length of the shorter; surface showing indications of fine transverse costæ, though the exterior of the test is not very well preserved. Septa rather closely approximated and averaging about three millimetres apart; siphuncle nearly marginal, moniliform, and slightly inflated between the septa, the maximum breadth of each siphuncular segment being one-third less than its height or depth."

Approximate dimensions of the only specimen known to the writer: length, eighty-six millimetres; greatest breadth, thirty-three mm.; maximum diameter at a right angle to the breadth or length, nineteen mm.

Little Black Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: one specimen, which is almost if not quite equilateral in its broadest aspect.

Oncoceras magnum, Whiteaves.

Oncoceras magnum, Whiteaves.....1889. Trans. Royal Soc. Canada, vol. VII., sect. 4, p. 79, pl. 15, fig. 1.

Shell large, slightly compressed, somewhat fusiform and contracted at both ends, but convexly curved, prominent, tumid and gibbous near the midlength, on the antisiphonal side, and nearly straight on the opposite or siphonal side; outline of transverse section in the thickest part broadly elliptical or subovate. Septate portion broadening rather slowly, on the antisiphonal side, to a point a little in advance of the midlength, after which it narrows somewhat more rapidly to the commencement of the body chamber. On the siphonal side the margin of the septate portion is shallowly concave posteriorly and slightly convex anteriorly. Body chamber oblique, short, occupying about one-third the entire length, contracted and obliquely truncated anteriorly. At its commencement posteriorly the body chamber is broad and bounded by a rather deep, obliquely transverse groove, which is almost parallel to the septa nearest to it; in front of this groove the chamber narrows rapidly, but at first convexly, towards the aperture, behind which there is a broad and shallowly concave constriction. Shape of the aperture not certainly known, but it appears to have been simple, entire, subovate and rather narrow.

Sutures nearly straight but slightly arched posteriorly; oblique anteriorly, rather wide apart on the antisiphonal side, and faintly convex on its median line,—much closer together on the siphonal side and slightly concave on its median line: siphuncle inflated between the septa, nummuloidal, and placed very near to the margin of the straighter side.

Surface markings unknown.

Approximate dimensions of the most perfect specimen known to the writer, which is imperfect at the posterior end: 180 millimetres, or a little more than seven inches; maximum breadth, from the siphonal to the antisiphonal side, 106 mm.

This specimen, which is figured in the seventh volume of Transactions of the Royal Society of Canada, is a cast of the interior of the shell, collected by Mr. W. Chesterton at East Selkirk and presented to the Museum of the Survey in 1888 by the Historical and Scientific Society of Manitoba. A larger but less perfect specimen in the Museum of the Survey was collected at East Selkirk in 1884 by Mr. T. C. Weston.

ONCOCERAS (MAGNUM? var.) INTERMEDIUM.

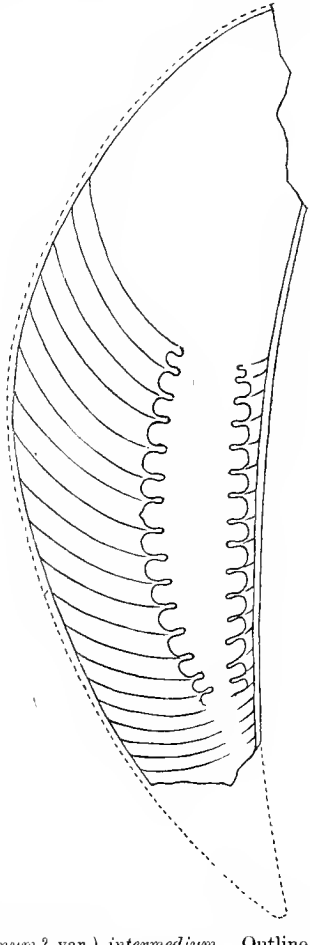

Fig. 13. *Oncoceras* (*magnum*? var.) *intermedium*. Outline of a longitudinal section of the only specimen known to the writer, one-half the natural size.

Shell elongated, slightly curved, narrowly subfusiform, but much narrower at the posterior than at the anterior end: antisiphonal side gently convex and broadly arched: siphonal side almost straight but faintly concave.

Septate portion conical: septa, as seen in a longitudinal section, rather closely approximated, the sutures of the last twelve or fourteen averaging from five to six millimetres apart: siphuncle large, occupying nearly one-half the entire diameter in the broadest part, but narrowing rather abruptly near the body chamber, nummuloidal, expanded between the septa and placed near the margin of the concave side.

Surface markings unknown.

Little Black Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: one specimen, which is much narrower in proportion to its length than *O. magnum* and not nearly so prominent or gibbous on the antisiphonal side, but it is doubtful whether it should be regarded as a mere variety of that species or as a distinct species.

Oncoceras Whiteavesii, Miller.

Oncoceras gibbosum, Whiteaves.....1889. Trans. Royal Soc. Canada, vol. VII., sect. 4, p. 80, pl. 15, figs. 2 and 3. But not *O. gibbosum*, Hall, 1852.

" *Whiteavesii*, Miller.....1892. First Append. to N. Amer. Geol. and Palæont., p. 697.

Shell resembling that of *O. magnum* in form, though perhaps a little broader in proportion to its length, also in the characters of its interior, but apparently always differing therefrom in its very much smaller size. Thus, the smallest specimen of *O. magnum* known to the writer must have been at least eight inches in length when perfect and the largest fully eleven, whereas in the present species, out of twenty-seven specimens collected, the smallest could not have been much more than three inches and a half long when perfect and the largest four and a half. These two series of specimens, too, do not seem to be connected by any intermediate gradations in size. The surface markings of *O. magnum* are still unknown, but the surface of the test of the septate portion of *O. Whiteavesii* is marked with very small, low, faint, closely and regularly disposed, straight, transverse ribs.

Big Island, Washow Bay, Bull Head Bay, and Pike Head, Lake Winnipeg, T. C. Weston, 1884: three specimens from Pike Head and one from each of the other localities.[1] Little Black Island, Lake Winnipeg, J. B. Tyrrell, 1889, seven specimens, and D. B. Dowling and L. M. Lambe, 1890, ten specimens. Little Tamarack Island, Commissioners' Island, and Clark's Point, Lake Winnipeg, D. B. Dowling, 1890: one specimen from each of these localities. North end of Big Island, D. B. Dowling, 1891: one specimen.

Cyrtoceras Manitobense, Whiteaves.

Cyrtoceras Manitobense, Whiteaves.....1889. Trans. Royal Soc. Canada, vol. VII., sect. 4, p. 80, pl. 13, figs. 3 and 4, and pl. 15, fig. 4.

Shell very slightly curved, slender, elongated and narrowly subfusiform, moderately inflated a little in advance of the mid-length, though the siphonal side, in a full lateral view, is much more convexly curved than the antisiphonal; posterior extremity narrower and more pointed than the anterior; body chamber short, occupying less than one-third of the entire length, and narrowing gradually to the somewhat obliquely truncated anterior end; aperture rather large, simple and open, with a broad and shallowly concave constriction immediately behind it, but only on the antisiphonal side; outline of a transverse section through the broadest part ovate, the siphonal side being narrower than the antisiphonal.

On the septate portion of most of the specimens collected, the surface of the test is marked by low, rounded, longitudinal ribs, but in some flattened fragments from Inmost Island, which are apparently referable to this species, there are very distinct transverse crenate raised lines between the ribs.

Sutural lines concavely arched on the sides, produced into moderately elevated and simple saddles on the siphonal side, and into similar but less prominent saddles on the antisiphonal side. Siphuncle placed at a short distance from the margin of the convex side. In the longitudinal section of a specimen from Bull's Head figured on Plate 15 of the seventh volume of Transactions of the Royal Society of Canada, the siphuncle appears to be very slightly expanded between the septa.

Dimensions of the most perfect specimen collected: actual length along the median line of one of the sides, 129 mm.; estimated total length of the same, when perfect, 133·5 mm.; maximum diameter of the same, from the siphonal to the antisiphonal side, 34·5 mm.; greatest lateral diameter 31·5.

Big, Deer and Punk islands, Big Grindstone Point, Bull's Head, Dog Head and Pike Head, Lake Winnipeg, T. C. Weston: two nearly perfect specimens, one from Big Island and one from Bull's Head, those from the other localities being for the most part only pieces of the posterior and septate portion of the shell.

Deer Island, Lake Winnipeg, J. B. Tyrrell, 1889: the most perfect specimen known to the writer.

A fine specimen of a *Cyrtoceras*, collected by Dr. R. Bell in 1879 at the second rapid of the Nelson River, Keewatin, may also be referable to *C. Manitobense*, though it differs somewhat from that species in the size,

shape and position of its siphuncle. As seen in a longitudinal section, the siphuncle of the Nelson River specimen is nummuloidal, expanded, about twice as broad as high between the septa, and placed at a distance not much less than its maximum breadth from the margin of the side of the convex curve.

Cyrtoceras laticurvatum, Whiteaves.

Cyrtoceras laticurvatum, Whiteaves.....1896. Canad. Rec. Sc., vol. VI., p. 365.

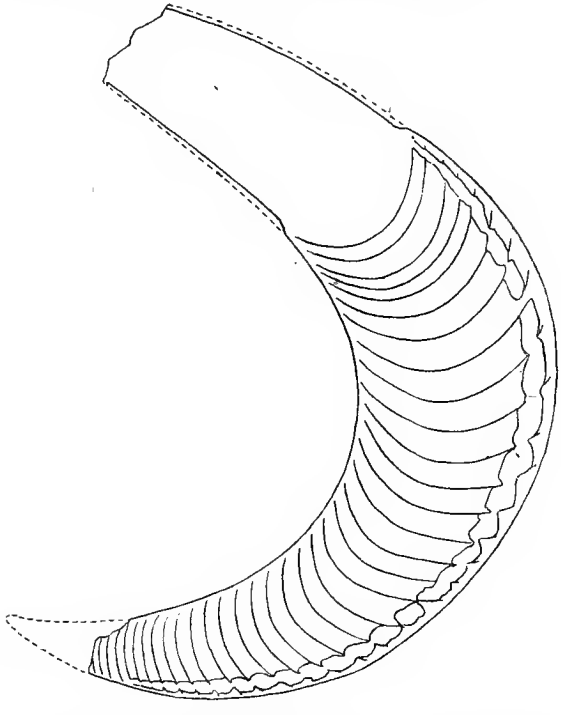

Fig. 14. *Cyrtoceras laticurvatum.* Outline of a longitudinal section of a specimen from Little Black Island, one-half the natural size.

"Shell large (attaining to a length of about twelve inches, as measured along the convex and presumably ventral curve), narrowly fusiform and broadest at a short distance from the body chamber, elongated, slender and so much curved as to form a broad semicircular arch, which is straighter anteriorly than posteriorly: sides compressed, the outline of a transverse section of the broadest part being elliptical: body chamber compressed cylindrical, more than twice as long as broad, and occupying about one-third of the entire length.

"Surface markings unknown, though there are indications of faint longitudinal ribs on one of the casts.

"Longitudinal sections shew that the septa (thirty-five of which can be counted in one specimen) are strongly concave and about seven or eight millimetres apart near the body chamber, but much closer together at the posterior end, also that the siphuncle is almost cylindrical, but slightly contracted at the septa," "and placed at a distance about equal to its own breadth from the margin of the convex (ventral) side."

Little Black Island, Lake Winnipeg, J. B. Tyrrell, 1889 (four specimens), and D. B. Dowling and L. M. Lambe, 1890 (three specimens). Jack Fish Island, Lake Winnipeg, Messrs. Dowling and Lambe, 1890 (one specimen), Commissioners or Cranberry Island (one specimen), and Point off Moose Creek, eight miles southwest of Whiteway Point (one specimen), D. B. Dowling, 1890. All the specimens from these localities are mere casts of the interior of the shell, but the septa and siphuncle are usually well preserved.

Eurystomites plicatus, Whiteaves.

Eurystomites plicatus, Whiteaves..... .....1896. Canad. Rec. Sc., vol. VI., p. 395.

Plate 22, fig. 2

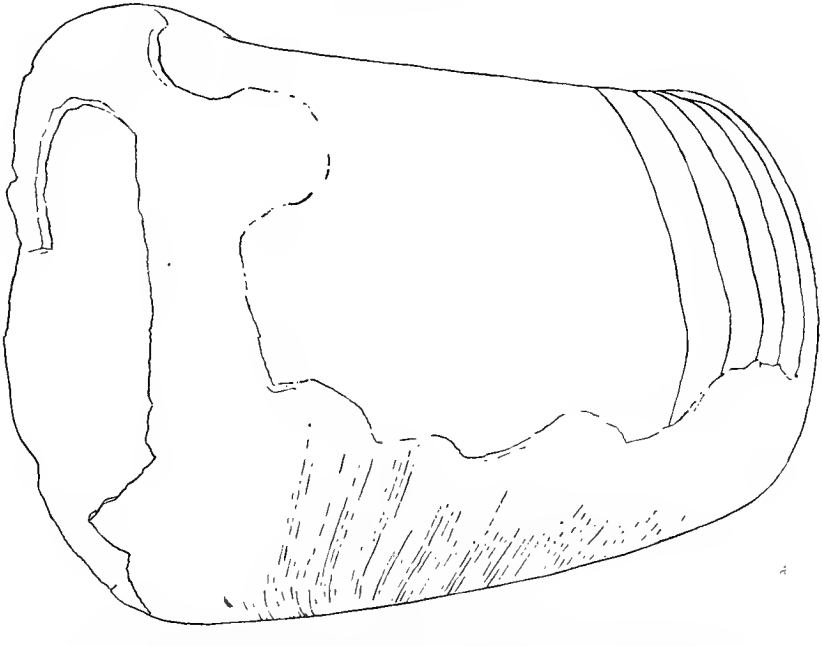

Fig. 15. *Eurystomites plicatus.* Outline of the convex, outer and probably ventral side of a specimen from Little Black Island, shewing the body chamber and five of the septa. Natural size.

"Shell involute, volutions apparently one and a half, coiled closely on the same plane but without embracing, strongly compressed on the venter and dorsum and increasing very slowly in the ventro-dorsal diameter, but

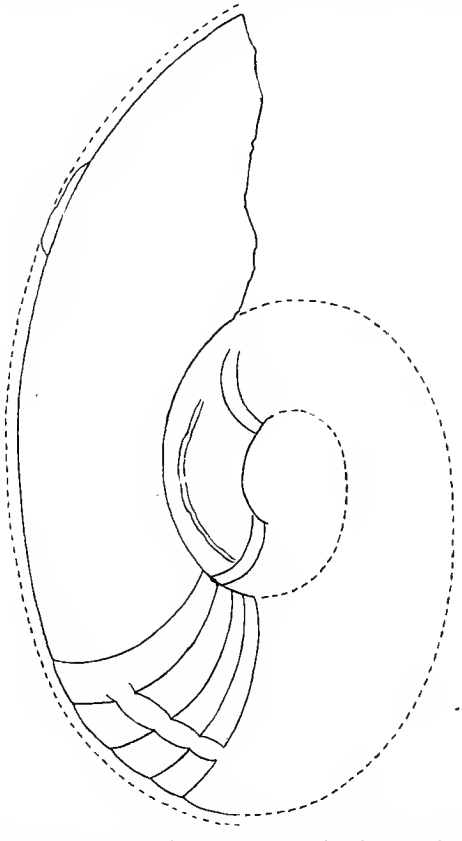

Fig. 16. *Eurystomites plicatus.* Outline of a longitudinal section through the same specimen, showing the shape and position of the siphuncle, and the apparent decollation of the earlier volutions. Natural size.

expanding and widening rapidly at the sides, which are rounded and gibbous, the outline of a transverse section of the chamber of habitation near the aperture being broadly reniform, with the lateral diameter about three times greater than the dorso-ventral, and the dorsum impressed by a shallow and rather narrow furrow of contact: umbilical perforation large and deep.

"Surface marked with rather broad, low, rounded, flexuous, transverse plications, and crowded striæ parallel to the plications, both between and upon them.

"A longitudinal section through the centre of one of the specimens shews that the cut edges of the concave septa are about two millimetres

apart on the dorsum, and seven mm. on the venter, near the body chamber, that the siphuncle is placed about half-way between the centre and the venter, and that it is almost cylindrical. but slightly constricted at or near each of the septa."

Little Black Island, Lake Winnipeg, J. B. Tyrrell, 1889, two specimens, and D. B. Dowling and L. M. Lambe, 1890, two specimens.

"These are referred to the genus *Eurystomites*, Schröder, on the authority of Professor Hyatt, to whom one of the most perfect specimens was sent for examination. In a letter recently received, Professor Hyatt says of this specimen: 'The suture has a decided broad ventral lobe and lateral lobes, and internally there is an impressed zone showing a true close coiled nautilian form. The siphuncle is ventrad of the centre, small and with delicate walls.' *Nautilus Hercules* of Billings, from the Hudson River formation of the Island of Anticosti, which Hyatt doubtfully refers to the genus *Litoceras*, has a broad flattened venter and a similar kind of coiling to that of *E. plicatus*, but both sides of the outer volution of *Nautilus Hercules* are distinctly angular."

Discoceras Canadense. (N. Sp.)

Plate 22, figs. 3 and 3*a*.

Shell discoidal, whorls three, coiled apparently in the same plane, or very nearly so, in close contact but with little or no overlapping, the outer one, where least distorted, slightly compressed at the sides and rounded on the venter or periphery, so that the outline of a transverse section would be broadly elliptical or nearly circular: umbilicus wide, open and shallow, exposing nearly the whole of the inner volutions: body chamber occupying about one-half of the outer volution.

Surface of the two outer volutions marked by rather prominent simple ribs or rib like folds, which curve obliquely backward and form a series of deeply angular sinuses on the venter, and are separated by rather broad, concave grooves. Inner volution nearly smooth, marked only with fine and crowded transverse striæ.

Siphuncle placed near the margin of the inner and probably dorsal side: sutures of the septa unknown.

Maximum diameter of the most perfect specimen collected: two inches and a half.

Little Black Island, Lake Winnipeg, J. B. Tyrrell, 1889, one specimen; and Commissioners (or Cranberry) Island, D. B. Dowling, 1890, the specimen figured. The slight lateral flattening observable on both of them is apparently abnormal and probably due to compression subsequent to their fossilization.

This species is placed in the genus *Discoceras* solely on a count of the dorsal position of its siphuncle, and at the suggestion of Professor Hyatt, who has seen one of the specimens. Externally it is very similar, especially in the style of its surface markings, to the fossil from Lorette, in the province of Quebec, which Mr. A. H. Foord described and figured under the name *Trochoceras Halli* on page 42, figs. 4, *a-b*, of the second part of his Catalogue of the Fossil Cephalopoda of the British Museum, but in specimens from several localities in that province, in the Museum of the Survey, which are apparently referable to *T. Halli*, the siphuncle is placed on the venter.

Trochoceras (?) McCharlesii, Whiteaves.

Trochoceras McCharlesii, Whiteaves.....1889. Trans. Royal Soc. Canada, vol. VII., sect. 4, p. 81, pl. 16.

"Shell very large (the only specimen known to the writer, which is septate throughout, having a maximum diameter of ten inches and a-half) and composed of about three apparently separate but closely contiguous volutions, which are circular in transverse section, and which increase rather slowly in size: they are also slightly asymmetrical and enrolled on very nearly but not quite the same plane, the spire being sunk a little below the highest level of the outer whorl.

"Surface of the outer volution marked by very numerous, close-set, rounded and flexuous ribs, which are rather narrow but unequal in size, with an average breadth of about three millimetres." Across the sides the ribs curve obliquely and convexly backward and outward, and on the periphery each rib makes a broad, shallowly concave and backwardly directed sinus.

On and near the periphery or venter, the only place where they happen to be visible, the sutural lines run parallel with the ribs on the test, though the former are placed much further apart, the average distance between them being about nineteen millimetres. Position of the siphuncle unknown.

The specimen upon which this species was based was collected at East Selkirk by Mr. A. McCharles in 1884. About one-third of this specimen has been broken off, but the part remaining presents a very instructive transverse section of the shell at a right angle to the direction of the volutions. A considerable portion of the test is well preserved on the outer volution, and in those places where the test has been accidentally removed, the characters of the septa are well shown. The two inner whorls are not nearly so well preserved as the outer volution, and the asymmetry and separation of all three are best exhibited in the transverse section afforded by the specimen.

A few specimens showing traces of a similar surface ornamentation, which are therefore possibly referable to this species, were collected at Little Black Island, Lake Winnipeg, by J. B. Tyrrell in 1889, and by D. B. Dowling and L. M. Lambe in 1890. One of these is a rough cast of one side of the greater part of the outer volution (with a small portion of the test preserved) about twenty-seven inches in length, as measured along the middle of the side and following its curve, the septate portion occupying about nine inches thereof posteriorly. This specimen, which appears to have been abnormally compressed laterally, is about four inches and three-quarters in its dorso-ventral diameter posteriorly and about five inches anteriorly. It is regularly curved posteriorly, but straighter anteriorly. Another is a rough cast of one side of an almost straight but very slightly curved and much more slender specimen, which is sixteen inches in length, as measured along the middle of the gentle curve of the side, and two inches and three quarters in its dorso-ventral diameter at about the midlength. A third is a mould of the exterior of one side of the outer volution, upwards of six inches in diameter, and shewing posteriorly impressions of fine transverse ribs, but much worn and indefinite anteriorly. In another large fragment from this locality the ribbing is unusually fine and the ribs average scarcely a millimetre in breadth. All four, however, are much too imperfect and too badly preserved to be satisfactorily determined.

In addition to these, a few coarse and very imperfect casts of large nautilian or gyroceran shells, which represent at least two and perhaps more species, but which shew no indications of the position of the siphuncle, nor any trace of the surface markings, and which cannot at present be determined even generically, were collected at Dog Head by Mr. Weston in 1884, and at Clark's Point and the mouth of the Little Saskatchewan by Mr. Dowling in 1890. In most of these specimens, if not in all, the sutures of the septa appear to curve concavely backward on each of the sides, and probably form single, convex saddles on the periphery, whereas in *Trochoceras McCharlesii* the sutures curve convexly forward on the sides, and concavely backward on the periphery.

CRUSTACEA.

OSTRACODA.

Aparchites Whiteavesii, Jones.

Aparchites Whiteavesii, Jones.....1889. Ann. and Mag. Nat. Hist., ser. 6., vol. III., p. 384, pl. 17, fig. 10, and woodcuts 5 and 6 on p. 385.

Lower Fort Garry (in the parish of St. Andrews), Dr. R. Bell, 1880: a cast of the interior of both valves.

A "subglobular Leperditioid Ostracod, with strong dorsal angles fore and aft, and a steep postero-dorsal and more gentle antero-dorsal slope, the former falling into a bolder curve than the latter; and with the ventral outline almost semicircular. The ventral and end margins of the united valves are thick and bevelled inwards, and slightly fluted there." Professor T. Rupert Jones (op. cit.).

Aparchites parvulus, Jones. (Sp. nov.)

Plate 22, figs. 4, *a-c*.

"The specimen figured is an *Aparchites*, and it is related to *A. subovatus*, Jones, from the Lower Silurian strata of Dufton, Westmoreland,* and of Girvan, Scotland.† It has not, however, exactly the same outline as any of the figured specimens, and it is decidedly more convex along the median line than any of them. It is elongate-ovate in shape; smooth, cream-coloured, in a soft, whitish limestone. The difference above mentioned lead me to regard it as a distinct species, which I name *Aparchites parvulus*.

"It is too narrow and too convex for *Aparchites Billingsii*, Jones,‡ and very much smaller, being only three millimetres long by one mm. and a half high." Professor Jones, in a letter to the writer, received 4th July, 1896.

Little Black Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: a single right valve.

For the preceding description and the drawings reproduced on Plate 22 (figs. 4, *a-c*), the writer is indebted to Professor Jones.

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*Quarterly Journal of the Geological Society of London, vol. XLIX. (1893), p. 292, pl. 12, figs. 7 and 8.

†Ibidem, p. 297, pl. 13, figs. 4 and 5.

‡Annals and Magazine of Natural History, Series 5, vol. VIII. (1881), p. 345 (*Leperditia*), pl. 20, figs. 9, *a-b*.

Aparchites Billingsii, the *Leperditia Billingsii* of Jones, which was supposed by its describer to be from the "Lower Silurian (Trenton ?) strata near (to the west of) Lake Winnipeg and north of Lake Superior," is distinctly stated in Mr. S. J. Dawson's Report* to have been collected from the "limestone of Lake Winnipegoos" (*i.e.*, Lake Winnipegosis), and is therefore either a Devonian or Silurian (Upper Silurian) species.

TRILOBITA.

CALYMENE SENARIA, (Conrad) Owen.

Calymene senaria, (Conrad) Owen.... .....1852. Rep. Geol. Surv. Wiscons., Iowa and Minn., p. 181.

Lower Fort Garry, D. Dale Owen, 1848. No specimens of this species have yet been recognized in any of the Survey collections of fossils from the Winnipeg or Red River limestones, though it is possible that the cephalon, minus the free cheeks, of a very small trilobite from the Hudson River formation at Stony Mountain, which was referred to the *Calymene callicephala* of Green, with some doubt, on page 128 of this volume, may be referable to *C. senaria*.

ASAPHUS (ISOTELUS) SUSÆ, Whitfield.

Asaphus Susæ (Calvin, M. S.) Whitfield.....1882. Geol. Wiscons., vol. IV., p. 236, pl. 5, fig. 3, and pl. 10, fig. 8.

Isotelus Susæ, Clarke, 1894..... ....1894. Lower Silur. Trilob. Minn. (advance copies fr. Geol. Minn., Final Rep., vol. III., pt. 2), p. 708, figs. 10 and 11.

Cfr. *Asaphus platycephalus*, as figured by E. Billings in Geol. Canada (1863), p. 184, fig. 183; and in Cat. Silur. Foss. Isl. Anticosti (1866), p. 24, fig. 7.

Lower Fort Garry, T. C. Weston, 1884; East Selkirk, A. McCharles, 1884; and Inmost or Birch Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: one specimen from each of these localities. The most perfect of these is the fine doubled up specimen from East Selkirk kindly presented by Mr. McCharles, which shews most of one of the large and very prominent eyes, but only very small portions of the crust are preserved on any of them. A doubled up specimen of *A. Susæ*, labelled "Selkirk Settlement,† Donald Gunn (No. 1176)," and belonging to the United States National Museum, has also been lent to the writer, for comparison, by the authorities of that institution. Each of these specimens agrees perfectly with the original description and figures of *A. Susæ*, especially in the very broadly rounded outer margins of the glabella and pygidium, and three of them show the rounding of the

* "Report on the Exploration of the Country between Lake Superior and the Red River Settlement," Toronto, 1859, p. 18.

† Practically the same place as Lower Fort Garry.

genal angles very clearly. Still, it is most probable that *A. Susœ* is nothing more than a broad, short form of the *Isotelus gigas* of De Kay, the *Asaphus platycephalus* of Canadian and some United States palæontologists. The writer can see practically no difference between *Isotelus Susœ*, as figured by Dr. Clarke on page 708 of the "Lower Silurian Trilobites of Minnesota," and *Asaphus platycephalus*, as previously figured by E. Billings in the "Geology of Canada" and in the "Catalogues of the Silurian Fossils of the Island of Anticosti."

A glabella collected at Little Black Island by Mr. Tyrrell in 1889, which is four inches in length but imperfect laterally, and very broadly rounded in front, may have formed part of a very large specimen of *A. Susœ*.

ASAPHUS (ISOTELUS) GIGAS, De Kay.

? Asaphus platycephalus, Stokes		1822.	Trans. Geol. Soc. Lond., ser. 2, vol. I., p. 208, pl. 27.
Isotelus gigas, De Kay		1824.	Ann. Lyc. Nat. Hist. N. York, vol. I., p. 174, pl. 12, fig. 1, and pl. 13, fig. 1.
" "	Green	1832.	Mon. Trilob., pp. 67 and 68.
" "	Vanuxem	1842.	Geol. Rep. N. York, p. 46, fig. 1.
" "	Emmons	1842.	*Ib.*, p. 389, fig. 1.
" "	Conrad	1843.	Proc. Ac. Nat. Sc. Philad., vol. I., pp. 330 and 331.
" "	Hall	1847.	Pal. N. York, vol. I., p. 231, pls. 60, figs. 7, *a-i*; 61, figs. 3, *a-m*, and 4, *a-c*; 62, figs. 1, *a-e*; and 63.
" "	Emmons	1855.	Amer. Geol., vol. I., pt. 2, p. 215, pl. 16, fig. 12.
? Asaphus platycephalus, Billings		1863.	Geol. Canada, p. 184, fig. 183, and p. 218, fig. 229.
" "	"	1866.	Geol. Surv. Canada, Cat. Silur. Foss. Isl. Anticosti, p. 24, fig. 7.
? Asaphus platycephalus, Billings		1870.	Quart. Journ. Geol. Surv. Lond., vol. XXVI., p. 479, pl. 31, figs. 1-6, and pl. 32, figs. 1 and 2.
Isotelus gigas, Miller		1877.	Amer. Pal. Foss., first ed., p. 219.
Asaphus gigas, Miller		1889.	N. Amer. Geol. and Palæont., p. 531.
Isotelus gigas, Clarke		1894.	Lower Silur. Trilob. Minn., p. 701.

Dr. John M. Clarke, who has recently studied an extensive series of specimens of *Isotelus gigas* and *I. maximus (megistos)* from the Trenton limestone of the state of New York, says that he is convinced that the only valid distinction between these forms is the absence of cheek spines in the one and their presence in the other. He also adopts the name *Isotelus gigas* in preference to *Asaphus platycephalus*, on the ground that "none of the figures given by Stokes shew the structure of the genal angles, and it is therefore wholly a matter of presumption whether his specimens were of the same character as those afterwards fully described and illustrated by De Kay." (Op. cit. supra., p. 706.)

Most of the trilobites from the Winnipeg and Red River limestones have scarcely any portion of the crust preserved, and the specimens referable to *Asaphus* or *Isotelus* in particular are often so imperfect that it is scarcely possible to ascertain whether they had genal spines or not. In addition to the four specimens here identified with *Asaphus (Isotelus) Susæ*, which are probably not sufficiently distinct from *I. gigas*, an imperfect left free cheek of a large *Isotelus*, with the genal angles distinctly rounded, which appears to be referable to *I. gigas*, was collected at Cat Head by D. B. Dowling and L. M. Lambe in 1890. This specimen must have been about twenty inches in length when entire. The maximum diameter of the eye is twenty millimetres, and the breadth of the cheek, immediately below the eye, is four inches and a half.

Several small specimens of an *Isotelus*, which do not show the characters of the genal angles at all clearly, but which are also probably referable to *I. gigas*, were collected at Cat Head by Mr. Weston in 1884, and by Messrs. Dowling and Lambe in 1890; at Kinwow Bay by Mr. Weston in 1884; and at Inmost or Birch Island by Mr. Weston in 1884 and by Messrs. Dowling and Lambe in 1890. The largest of these specimens are from three and a half to four inches in length. One of the specimens from Inmost Island is nearly entire, though most of the test is exfoliated, and one from Cat Head is a natural mould of the exterior of the dorsal surface of an entire specimen. In each of these, the cranial shield and pygidium are narrowly rounded or somewhat pointed in the middle. Two of the specimens from Inmost Island are separate glabellæ; two, cephalic shields with the lower surface exposed and showing the doublure, one with the hypostoma in place; and one is a small separate hypostoma.

Asaphus (Isotelus) maximus, Locke.

Isotelus maximus, Locke .... 1838. Second Ann. Rep. Geol. Surv. Ohio, p. 246, fig. 8 and 9.
Isotelus megistos, Locke ....1841*. Trans. Amer. Assoc. Geol. and Nat., p. 221, pl. 6.
Asaphus megistos, Billings. ....1863. Geol. Canada, p. 184, fig. 182, and p. 951.
" " " ....1866. Geol. Surv. Canada, Cat. Silur. Foss. Isl. Anticosti, p. 26.
Isotelus maximus, Clarke ....1894. Lower Silur. Trilob. Minn., p. 701, and fig. 5 on p. 703.

An imperfect free cheek of a huge trilobite which may be referable to this species, with a well developed spine at the genal angle, was collected at Cat Head by D. B. Dowling and L. M. Lambe in 1890. Although imperfect at both ends the actual length of this free cheek is upward of seven inches.

* But, in the "Report of the Geology of Ohio," vol. I. (1873) p. 159, Meek gives 1842 and 1843 as the dates on which the species was described under this name.

A badly preserved mould of the exterior of the dorsal surface of a nearly entire specimen of a small trilobite, which is also probably referable to *I. maximus*, and which has a short cheek spine at each of the genal angles, was collected near the First Limestone Point on Lake Winnipeg, north of the Saskatchewan, in a loose piece of limestone, by Mr. J. B. Tyrrell in 1890. The length of this specimen is one inch and three quarters.

Two doubled up and nearly entire specimens, which are probably referable to this species, though no vestige of the genal spines is preserved in either, were collected by Mr. Weston in 1884, one at Big Grindstone Point, Lake Winnipeg, and the other at Dog Head, on that lake. In both of these specimens, but especially in the one from Dog Head, the cephalic shield and pygidium are almost triangular in outline, with the apices obtusely pointed, and the sides nearly straight.

Illænus Americanus, Billings.

Illœnus Americanus, Billings.....1859. Canad. Nat. and Geol., vol. IV., p. 371.
Illœnus taurus, Hall.....1861. Geol. Surv. Wiscons. Rep. Progr., p. 49.
Illœnus Americanus, Billings.....1865. Geol. Surv. Canada, Pal. Foss., vol. I, p. 329, figs. 316, *a-d*.
Illœnus taurus, Meek and Worthen .....1868. Geol. Surv. Illinois, p. 320, pl. 3, fig. 2.
Illœnus crassicauda (Hall and D. Dale Owen) Whiteaves.....1881. Geol. Surv. Canada, Rep. Progr. 1879-80, p. 58c.
Illœnus Americanus, Clarke.....1894. Lower Silur. Trilob. Minn., p. 714, figs. 20-23.

This is probably the "*Illœnus crassicauda*" of Dr. D. Dale Owen's list of fossils collected at Lower Fort Garry in 1884, and quoted on page 133 of this report. Of late years, casts of the interior of the cephalic shield or pygidium of an *Illœnus*, which agree very well with the descriptions and figures of *I. Americanus*, have been collected at Lower Fort Garry by Dr. R. Bell in 1880, by Mr. Weston in 1884 and by Mr. Dowling in 1891, also at East Selkirk by Mr. McCharles in 1884. Similar or more nearly complete specimens were collected at Washow Bay, Lake Winnipeg, by Mr. Weston in 1884, at Little Tamarack Island by Mr. Dowling in 1890 and at Black Bear Island by Messrs. Dowling and Lambe in 1890.

Bumastus Trentonensis (Emmons) Clarke.

Illœnus Trentonensis, Emmons.....1842. Geol. N. York, Rep. Second Distr., p. 390, fig. 3.
Illœnus Milleri, Billings.....1859. Canad. Nat. and Geol., vol. IV., p. 375, fig. 10.
" " " .....1863. Geol. Canada, p. 151, fig. 112.

Bumastus Trentonensis (Emmons) Clarke . . .1894. Lower Silur. Trilob. Minn., p. 718 p. 719, figs. 30 and 31 ; p. 720, figs. 32 and 33 ; and p. 721, figs. 34 and 35.

A few specimens of this species, mostly detached glabellæ or pygidia, were collected at Lower Fort Garry (St. Andrews) by Dr. R. Bell in 1879 and 1880; at East Selkirk by T. C. Weston in 1884 and by L. M. Lambe in 1890; also at Little Black Island, Lake Winnipeg, by J. B. Tyrrell in 1889, and by D. B. Dowling and L. M. Lambe in 1890. A cast of the interior of the crust of a nearly entire but rolled up specimen of a trilobite belonging to the U. S. National Museum, and labelled "Rapids N. Red River (loose), D. Gunn, No. 4260," is evidently a medium sized or rather small specimen of *B. Trentonensis*. The specimen from "St. Andrews" referred to on page 58 c of the Report of Progress of this Survey for 1879-80, as *Bumastes Barriensis*, is a large example of *B. Trentonensis* with only the thoracic segments and the pygidium preserved. The supposed new species of *Stricklandinia* in the list of St. Andrew's fossils on that page is now known to be a *loose* example of a *Pentamerus* since described as *P. decussatus*, * and the "*Thecia*, Nov. Sp.," and "*Eridophyllum*, Nov. Sp.," of that list are the *Protarœa* (*vetusta*, var.) *major*, and *Diphyphyllum Stokesii* of this Report.

Bronteus lunatus, Billings.

Bronteus lunatus, Billings. . . . . .1857. Geol. Surv. Canada, Rep. Progr. 1853-56, p. 338.
" " " . . . . . .1863. Geol. Canada, p. 188, fig. 187.
" " Clarke . . . . . .1894. Lower Silur. Trilob. Minn., p. 725, fig. 43.

Inmost or Birch Island, Kinwow Bay, Lake Winnipeg, T. C. Weston, 1884 : a perfect and well preserved pygidium.

Three obscure fossils, which are portions of tails of a very large and undescribed species of *Bronteus*, but which are too imperfect for description, were collected at Cat Head by D. B. Dowling and L. M. Lambe in 1890.

Pterygometopus callicephalus, Hall. (Sp.)

Phacops callicephalus, Hall. . . . . 1847. Pal. N. York, vol. I., p. 247, pl. 65, figs. 3, *a-i*.
Pterygometopus callicephalus, Clarke . . . . . .1894. Lower Silur. Trilob. Minn., p. 731, figs. 51 and 52.

East Selkirk, A. McCharles, 1884: two pygidia, which were kindly presented by him to the Museum of the Survey.

* In the Canadian Record of Science for April, 1891, vol. IV., p. 295, pl. 3, figs. and 4

Cheirurus pleurexanthemus, Green.

Ceraurus pleurexanthemus, Green .....1832. Mon. Trilob. N. Amer., p. 83, cast 33, pl. 3, fig. 10.
" " Hall.....1847. Pal. N. York, vol. I., p. 242, pl. 65, figs. 1, *a-n*, and pl. 66, figs. 1, *a-h*.
Cheirurus pleurexanthemus, Billings.....1863. Geol. Canada, p. 188, fig. 188.
Ceraurus pleurexanthemus, Walcott.. .....1881. Bull. Mus. Comp. Zool. Harvard Coll., vol. VIII., p. 211, pl. 5, figs. 1-6.
" " Clarke.....1894. Lower Silur. Trilob. Minn., p. 734.

A few specimens which have since been identified with this well known eastern species were collected at Lower Fort Garry (St. Andrews) by Dr. Bell in 1880, and by T. C. Weston and A. McCharles in 1884; also at East Selkirk by Mr. McCharles in 1884. A badly preserved cast of a glabella, which is also apparently referable to *C. pleurexanthemus*, was collected at Big Sturgeon Island, Lake Winnipeg, by D. B. Dowling and L. M. Lambe in 1890.

Staurocephalus. (Species undeterminable.)

Two specimens of the spherical anterior termination of the glabella of a species of *Staurocephalus*, each followed by a short and not very deep transverse constriction, were collected by Mr. Weston in 1884, the larger one at Lower Fort Garry and the smaller at East Selkirk. In the larger one the spherical portion is five millimetres broad, and about a quarter of a millimetre less in length.

Lichas (Platymetopus) cucullus.

Lichas cucullus, Meek and Worthen.. .....1865. Proc. Ac. Nat. Sc. Philad., vol. XVII., p. 266.
" " " " " .....1868. Geol. Surv. Ill., vol. III., p. 299, pl. 1, figs. 6, *a-c*.
Platymetopus cucullus, Clarke.....1894. Lower Silur. Trilob. Minn., p. 746, figs. 66 and 67.

?=Lichas Trentonensis, Conrad.

Cfr. *Asaphus? Trentonensis*, Conrad.. .. . 1842. Journ. Ac. Nat. Sc. Philad., vol. VIII., pt. 2, p. 277, pl. 16, fig. 16; and
Platynotus Trentonensis, Hall..... .. 1847. Pal. N. York, vol. I., p. 235, pl. 64, figs. 1, *a-e*.

East Selkirk, A. McCharles, 1884: three heads, which are now in the Museum of the Survey. These agree very well with the descriptions and figures of *Lichas* or *Platymetopus cucullus*, but, on the other hand, they can scarcely be distinguished from heads from the Trenton limestone at Hull, Que., which are believed to be referable to *Lichas Trentonensis*. "The slight concavity of the median lobe of the glabella" of *L. cucullus* "on its posterior slope, which gives it a peculiar subconical protuberance,"

is the character mainly relied upon by Dr. Clarke to distinguish that species from *L. Trentonensis*, but it is doubtful whether this distinction between these two forms can be maintained.

LICHAS (CONOLICHAS) CORNUTUS, Clarke.

Conolichas cornutus, Clarke.....1894. Lower Silur. Trilob. Minn., p. 749, figs. 72 and 73.

Lower Fort Garry (St. Andrews), Dr. R. Bell, 1880: a well preserved and characteristic though imperfect pygidium. The identification of this specimen has been corroborated by Dr. Clarke.

HARPES. (Species undeterminable.)

Deer Island, Lake Winnipeg, J. B. Tyrrell, 1889: a crushed and distorted specimen, which is too imperfect to admit of a satisfactory specific determination or description.

INCERTÆ SEDIS.

SOLENOPORA COMPACTA, Billings. (Sp.)

Stromatopora compacta, Billings.....1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 55.

Tetradium Peachii, Nichelson and Etheridge.1877. Ann. and Mag. Nat. Hist., ser. 4, vol. XX., p. 166.

Solenopora spongioides, Dybowski.....1877. Die Chætetiden der ostbaltisch. Silur. form., p. 124, taf. 2, figs. 11, *a-b*.

Tetradium Peachii, Nicholson and Etheridge.1880. Mon. Silur. Foss. Girvan distr. Ayrs., p. 31, pl. 1, fig. 3, and pl. 2, figs. 1, *a-b*.

Tetradium Peachii, var. *Canadensis*, Foord..1883. Geol. Surv. Canada, Contr. Micro-Pal. Silur. rocks, &c., p. 24, pl. 6, figs. 1, and 1, *a-f*.

Solenopora compacta, Nicholson and Etheridge.....1885. Geol. Mag., Dec. 3, vol. II., p. 529, pl. 13, figs. 1-11.

A few well preserved and characteristic specimens of *S. compacta* were collected by Mr. Weston in 1884 at Big, Deer and Punk islands, at Big Grindstone Point, at Washow Bay, and at Dog Head, Lake Winnipeg.

The systematic position of this well known species, which is so abundant in the Trenton limestone at Ottawa and other localities in eastern Canada, is still an open question. Zittel, in the first volume of his Handbuch der Palæontologie, published in 1883, places it, with doubt, with some other genera, at the end of the Cyclostomata, in the Bryozoa; and Nicholson & Lyddeker, in the first volume of their Manual of Palæontology, published in 1889, refer it provisionally to the Hydrozoa. More recently, however, Dr. A. Brown, in a paper published in the Geological Magazine for April and May, 1894, claims that it is a calcare-

ous alga, on the ground that "no recent cœlenterate has zooidal tubes as minute, or nearly as minute, as those of *Solenopora*. Its structure is," he says, "truly cellular and not tubular." In the same paper, Professor H. A. Nicholson is quoted as saying: "We cannot refer it to the Hydrozoa, for we are not acquainted with any hydrozoon, living or extinct, with which *Solenopora* could be compared. It shows no features in its minute structures which remind us of the hydrocorallines, and it assuredly presents no structural resemblance to any known type of the Stromatoporoids."

CHÆTETES PERANTIQUUS. (N. Sp.)

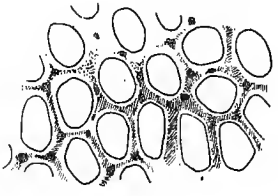


Fig. 17.

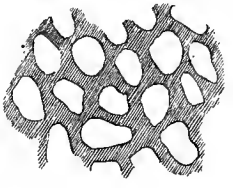


Fig. 18.

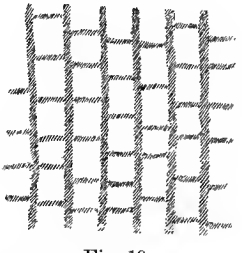


Fig. 19.

Figs. 17, 18 and 19. *Chætetes perantiquus.*—Fig. 17, transverse section of part of the specimen described, close to the surface and above the uppermost transverse diaphragm, ×10; fig. 18, transverse section of part of the same specimen, lower down and below the uppermost diaphragm, ×16; and fig. 19, longitudinal section of a part of the same, ×10.

Corallum, as indicated by a single and imperfect specimen, forming a large undulating expansion or crust, which is slightly and irregularly convex above, shallowly and irregularly concave below, and from three to seven millimetres thick. Corallites of one kind only, in complete contact throughout their entire length, and averaging a little more than half a millimetre in their longer diameter, and a little less than half a mm. in their shorter. As seen in transverse sections near the surface, such as that represented by fig. 17, the corallites are variable but for the most part nearly oval or almost circular in outline, with a depressed space or groove round each, and with single minute interspaces between them. The two features last named, however, are purely superficial, for

transverse sections made lower down (fig. 18) shew that the walls of adjoining corallites are completely amalgamated and solid below the calyces. Longitudinal sections (fig. 19) shew that the corallites are provided with complete and rather distant traverse diaphragms or tabulæ.

Lower Fort Garry, T. C. Weston, 1884: one imperfect specimen about two inches and a half by two inches in diameter, with part of its upper surface covered with a colony of *Protarea* (*vetusta ?* var.) *magna*.

This species is referred to the genus *Chætetes* on the authority of Mr. Ulrich, who has carefully examined the specimen upon which it is based, and who was the first to recognize its structural characters and generic position. It is of special interest as occurring at such a low geological horizon. Its more minute surface characters are somewhat similar to those of *Chætetes tumidus*, as represented by Milne Edwards and Haime, on Plate 45, fig. 3*b*, of their Monograph of the British Fossil Corals, published by the Palæontographical Society. The exact systematic position of *Chætetes* has yet to be ascertained. In a letter recently received, Mr. Ulrich expresses the opinion that it is not a polyzoon or bryozoon, but a coral, and it is in accordance with this view that the preceding description was written, and the terms "corallum" and "corallites" used rather than zoarium and zoœcia. He is inclined to think that *Chætetes* is most nearly related to *Labechia*.

B.—From the passage beds at the top of the Lower Sandstones.

ALGÆ.

Licrophycus Ottawaensis, Billings.

Licrophycus Ottawaensis, Billings..... .1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 99, fig. 87.

Punk Island, Lake Winnipeg, Professor H. Y. Hind, 1858, one specimen, and D. B. Dowling, 1890, two specimens. Grindstone Point (two specimens) and Deer Island (two specimens), Lake Winnipeg, T. C. Weston, 1884.

ECHINODERMATA.

CRINOIDEA.

GLYPTOCRINUS. (Species undeterminable.)

Portions of the column of a crinoid which the late Mr. E. Billings believed to be "allied to *Glyptocrinus ramulosus*" were collected by Professor Hind in 1858 at Punk Island and Grindstone Point. Similar but rather more slender portions of columns, with the "large projecting joints" farther apart, were collected by Mr. Weston in 1884 at Grindstone Point. These latter specimens are very similar to the columns of *Schizocrinus nodosus*, as figured by Professor James Hall on Plate 27 of the first volume of the "Palæontology of New York."

VERMES.

ANNELIDA.

SERPULITES DISSOLUTUS, Billings.

Serpulites dissolutus, Billings..... .... 1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 56.

Deer Island, J. B. Tyrrell, 1889: a fragment, about an inch long, which appears to be conspecific with the specimen collected by Professor Hind at Punk Island, and referred to on page 160.

MOLLUSCOIDEA.

POLYZOA.

RHINIDICTYA MUTABILIS, Ulrich.

Stictopora mutabilis (partim), Ulrich.....1886. Fourteenth Ann. Rep. Geol. and Nat. Hist. Surv., Minn., p. 66.
Stictopora mutabilis, var. *minor*, Ulrich.....1886. Ibidem, p. 67.
Rhinidictya mutabilis, Ulrich.....1893. Bryoz. Lower Silur., Minn. (advance copies fr. Geol. Minn. Final Rep., vol. III., pt. 1) p. 125, pl. 6, figs. 2-6, and 12, 13; pl. 7, figs. 10-23, and 25-28; and pl. 8, figs. 1-3.

Deer Island, Lake Winnipeg, J. B. Tyrrell, 1889: four specimens, which have been identified with this species by Mr. Ulrich, who has examined all the specimens collected of this and of the two following species.

RHINIDICTYA. (N. Sp.)

Deer Island, J. B. Tyrrell, 1889: a fragment of a zoarium, in reference to which Mr. Ulrich writes as follows. "It is a new species of *Rhinidictya* which I suggest that you call *R. obliqua*. Its zoœcia are

larger than in any species of the genus except my *R. grandis*, in which they are of about the same size. The obliquity of the apertures, which is very marked, is the principal external distinctive feature." The specimen, however, is too imperfect to admit of a sufficiently detailed description of the distinctive characters of the species.

ESCHAROPORA RAMOSA? Ulrich, Var. (or N. Sp.?)

Deer Island, J. B. Tyrrell, 1889: two specimens of a small branching *Escharopora*, which Mr. Ulrich writes is either a "new variety of *E. ramosa*, or possibly a new species, differing from the *E. ramosa* in its smaller size and narrower and more rapidly divergent branches. The surface is not sufficiently preserved for finer comparisons, but the diagonal arrangements of the zoœcial apertures and the pointed base point very certainly to *Escharopora*."

BRACHIOPODA.

STROPHOMENA TRILOBATA, Owen. (Sp.)

For references to publications in which this species is described, see page 169.

Deer Island, J. B. Tyrrell, 1889: one small dorsal valve.

ORTHIS (DALMANELLA) TESTUDINARIA, Dalman.

References to publications in which this species is described are given on page 177.

Deer Island, D. B. Dowling, 1890: one specimen.

MOLLUSCA.

PELECYPODA.

CYRTODONTA CANADENSIS, Billings.

Cyrtodonta Canadensis, Billings.....1858. Geol. Surv. Canada, Rep. Progr., 1857, p. 182, figs. 8-10.
" " " .....1863. Geol. Canada, p. 148, fig. 106.

A cast of the interior of the right valve of a *Cyrtodonta*, which is much too imperfect to be determined specifically, was collected at Big Grindstone Point, Lake Winnipeg, by T. C. Weston in 1884. About six miles to the south-west of this locality, at Little Grindstone Point, eighteen specimens, which are also clearly referable to Billings's genus *Cyrtodonta*, were collected by D. B. Dowling in 1891. All of these have a considerable portion of the test preserved, but most of its outer surface is covered or obscured by the tenacious matrix. Some of them have essentially the same marginal outline as *C. Canadensis*, and are probably referable to that species; others have an unusually prominent

posterior alation and may be nearer to Ulrich's *C. grandis*, but most of them are too imperfect and badly preserved to be determined specifically.

PTEROPODA.

CONULARIA. (Species undeterminable.)

A few fragmentary specimens, collected at Deer Island by Mr. Tyrrell in 1889, are probably referable to the genus *Conularia*, but none of them are sufficiently well preserved to be determined specifically, though they appear to be quite different to the *C. asperata* of the Winnipeg limestones.

CRUSTACEA.

OSTRACODA.

APARCHITES TYRRELLII, Jones.

Aparchites Tyrrellii, Jones.....1891. Geol. Surv. Canada, Contr. to Canad. Micro-Pal., part 3, p. 62, pl. 13, figs. 14, *a-c*.

The types and only known specimens of this species were collected at Great Black Island, near Big Island, Lake Winnipeg, by Mr. Tyrrell in 1889.

ERRATA.

Page 151—Line 2 from the top, for "regularity" read "angularity."

Page 155—Line 6 from the top, for "*Porites*" read "*Protarœa*."

PLATE XVI.

Unless otherwise stated, all the figures are of the natural size.

AULACOPELLA WINNIPEGENSIS (page 145).

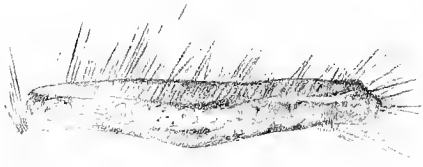
Figure 1. Upper side of the specimen upon which the species is based. *A-B*, represents a broken surface; *P*, the mineral deposit in the Paragaster; G^1, G^2 and G^5, the wedge-shaped fillings up, by the matrix, of spaces that were originally empty; and *A-C*, a transverse section of part of the specimen, at the midheight.

" 2. Restoration of the upper surface of the sponge, one-third the natural size.

" 3. Restoration of the base of the same, also one-third the natural size.

1.

2.



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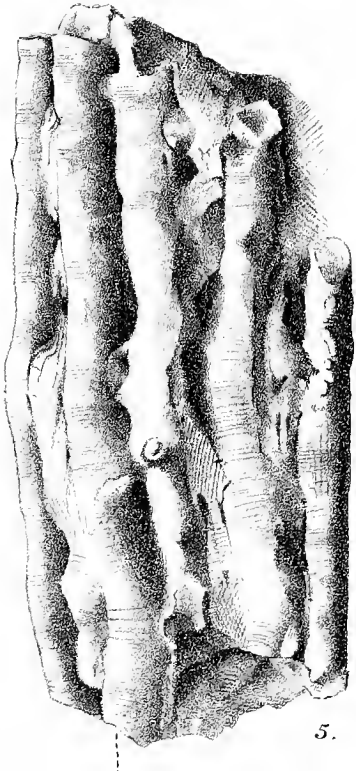

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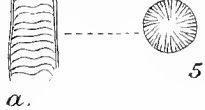


5 a. 5 b.

PLATE XVIII.

STREPTELASMA ROBUSTUM (page 153).

Figure 1. Side view of a nearly perfect specimen of this species from the Red River valley in Manitoba, presented to the Museum of the Survey by the Smithsonian Institution.

" 1*a*. Longitudinal section of the same, to shew the internal structure.

PROTARÆA (VETUSTA? var.) MAGNA (page 155).

Figure 2. Portion of the upper surface of a colony of this species, magnified three times, to shew the shallow calices, wedge-shaped septa, and small tubercles in the centre of each calyx.

" 3. Longitudinal section of a portion of a corallum of this species, magnified eight times.

" 3*a*. Transverse section of the same, also eight times the natural size.

STOMATOPORA CANADENSIS (page 161).

Figure 4. Zoarium of the specimen described.

" 4*a*. The same, four times the natural size.

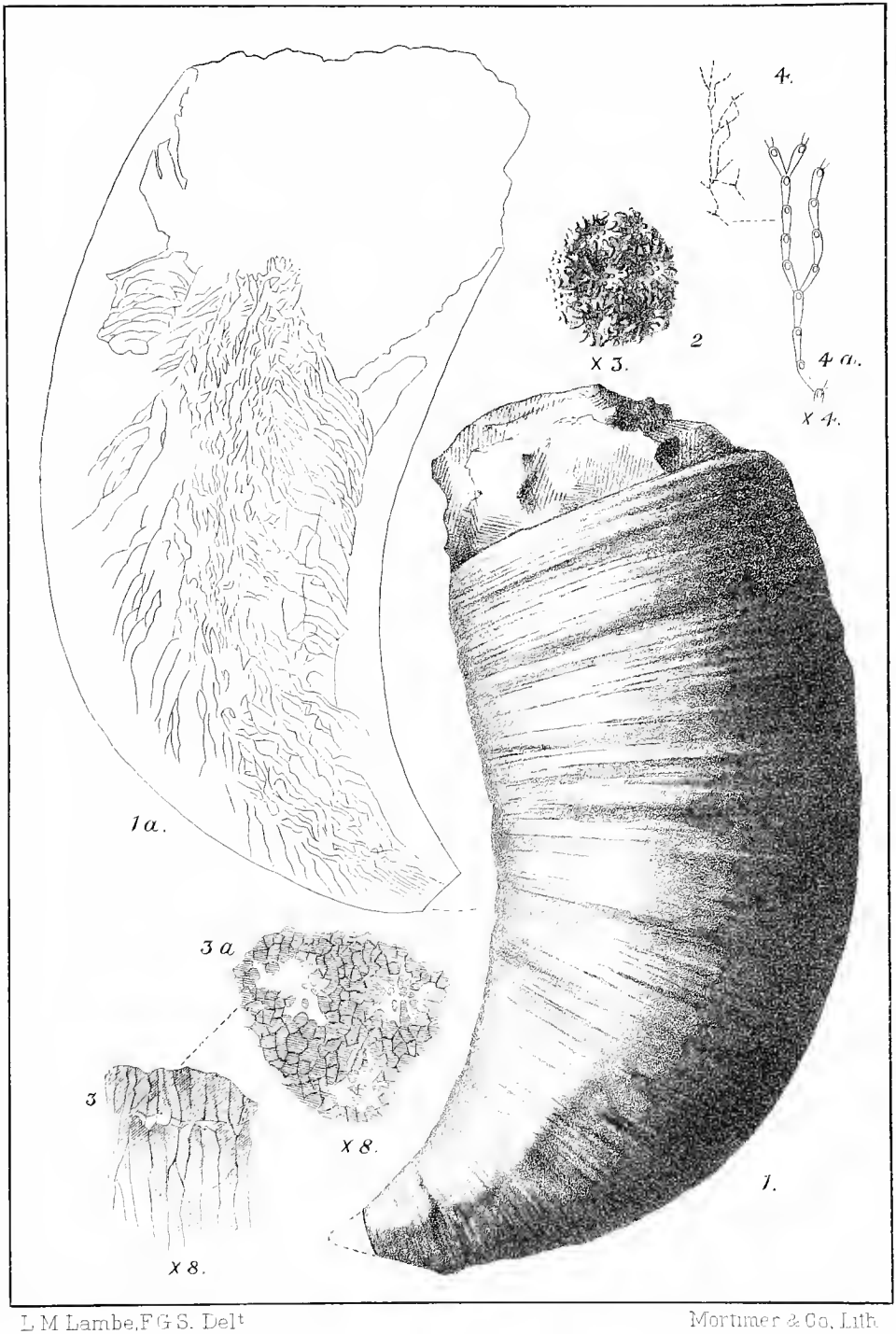

4.
4 a.
x 4.
x 3.
2
1 a.
3 a
3
x 8.
x 8.
1.

PLATE XIX.

MESOTRYPA SELKIRKENSIS (page 162).

Figure 1. Transverse section of a portion of a specimen of this species, magnified fifteen times.

" 1*a*. Longitudinal section of a portion of a specimen, also magnified fifteen times.

RAFINESQUINA LATA (page 172).

Figure 2. View of a specimen with most of both valves preserved, shewing the dorsal valve and part of the ventral. The hinge areas of both valves, and the cardinal extremities, restored in outline from other specimens.

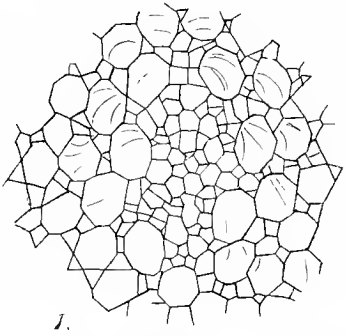
" 2*a*. Outline of a transverse section of the same in the median line, shewing the relative convexity of the ventral valve and concavity of the dorsal valve.

" 2*b*. Portion of surface markings of the dorsal valve of the same, magnified three times.

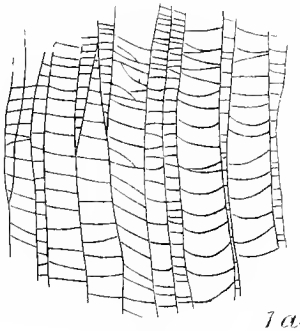
" 3. An imperfect ventral valve, with coarse corrugations on the visceral disc.

" 4. Unusually perfect cast of the interior of a ventral valve of a specimen from the Red River valley in Manitoba, loaned by the Smithsonian Institution, and shewing most of the marginal outline.

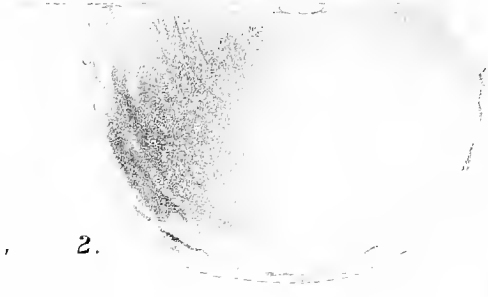
" 5. Portion of the surface markings of a ventral valve, magnified three times.



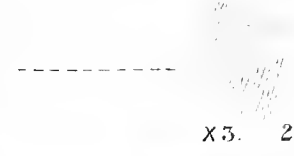
1. x 15.



1a. x 15.

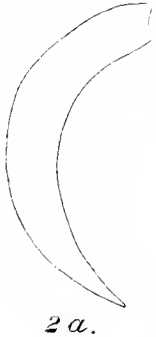


2. x 3.

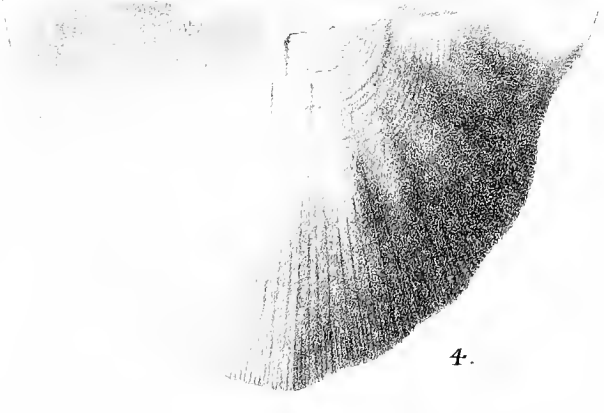


2b.

3.



2a.



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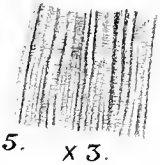

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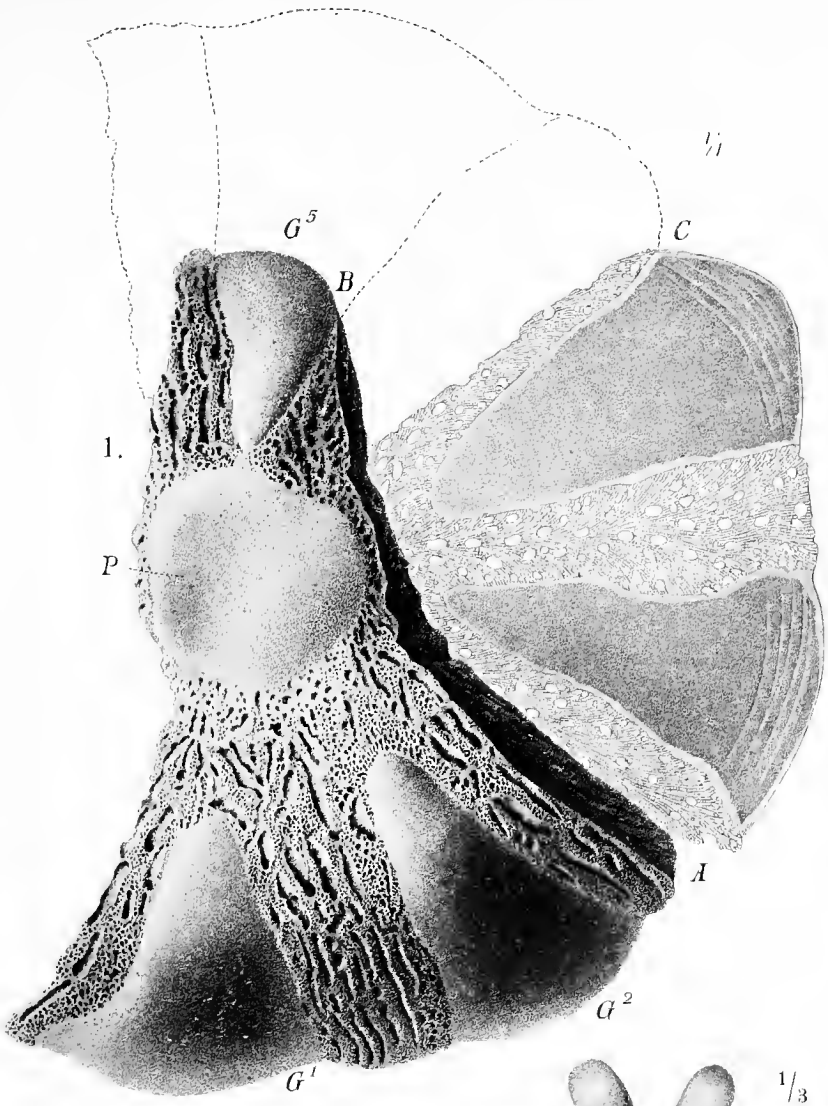

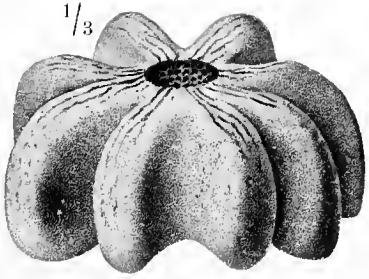

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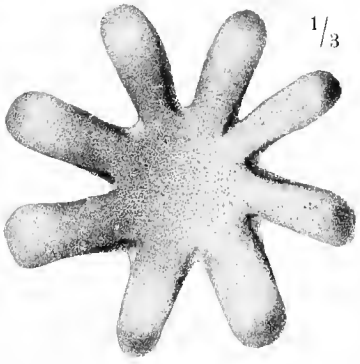


3.

PLATE XVII.

CHONDRITES CUPRESSINUS (page 141).

Figure 1. The specimen upon which the description of this species is based.

CHONDRITES GRACILLIMUS (page 141).

Figure 2. The type and only known specimen of this species.

TRICHOSPONGIA HYSTRIX (page 147).

Figure 3. The only specimen that the writer has seen.

INOCAULIS CANADENSIS (page 149).

Figure 4. A large but imperfect specimen of this species, from Inmost Island.

DIPHYPHYLLUM STOKS II (page 152).

Figure 5. Portion of a colony of this species, from Lower Fort Garry.
" 5*a*. Longitudinal section of part of one of the corallites of the same, shewing the tabulæ.
" 5*b*. Transverse section of one of the corallites, shewing the number and comparative length of the septa.

PLATE XX.

PALÆOPTERIA PARVULA (page 181).

Figure 1. Side view of a cast of the interior of a small right valve, twice the natural size.

" 2. Outline of the cardinal region of the cast of another right valve, six times the natural size, and shewing the impressions made by the hinge teeth.

" 3. Side view of a cast of the interior of a large left valve supposed to be referable to this species, twice the natural size.

MODIOLOPSIS ANGUSTIFRONS (page 183).

Figure 4. Side view of the type and only known specimen of this species, shewing the left valve.

ORTHODESMA AFFINE (page 184).

Figure 5. Side view of the specimen described, shewing the right valve.

CLINOPISTHA ANTIQUA (page 185).

Figure 6. Side view of the only specimen known to the writer.

RHYTIMYA RECTA (page 186).

Figure 7. Side view of a cast of the interior of a right valve of this species.

EDMONDIA (?) VETUSTA (page 187).

Figure 8. Side view of a specimen of this species, twice the natural size.

PLEUROTOMARIA STOKESIANA (page 190).

Figure 9. Dorsal view of the most perfect specimen collected, which is a cast of the interior of the shell, twice the natural size.

" 9*a*. Basal view of the same.

PLEUROTOMARIA MARGARITOIDES (page 190).

Figure 10. Dorsal view of a gutta percha squeeze of a natural mould of the exterior of a shell of this species, three times the natural size.

MACLUREA (MACLURINA) MANITOBENSIS (page 194).

Figure 11. View of a specimen from Little Black Island, with most of the test preserved on the convex side.

1.

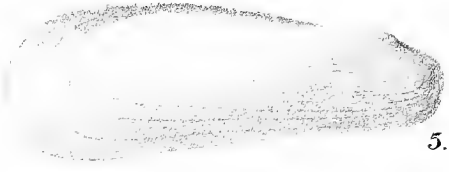
X 2.

2.

3.

X 2.

4.



5.

6.

7.

8.

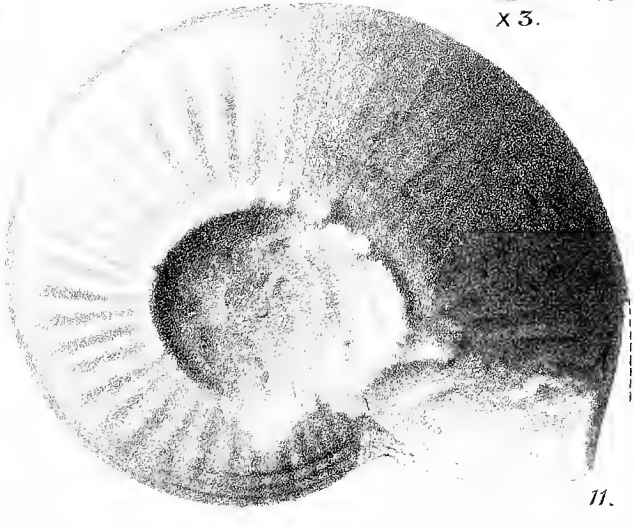
X 2.

10.

X 3.

9.

X 2.



11.

9 a.

X 2.

PLATE XXI.

HORMOTOMA WINNIPEGENSE (page 192).

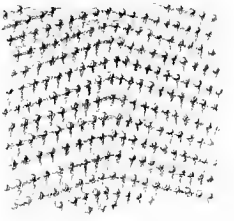
Figure 1. View of a large but much compressed specimen, from Little Black Island.

CONULARIA ASPERATA (page 201).

Figure 2. Side view of a specimen from Cat Head.

" 2*a*. Portion of the sculpture of another specimen from the same locality, four times the natural size.

2.



2 a.

x 4

1.

L.M.Lambe, F.G.S Del.

Mortimer, Lith.

PLATE XXII.

ASCOCERAS COSTULATUM (page 215).

Figure 1. View of the ventral side of the only specimen collected, shewing most of the decurrent extremity of the body chamber, and portions of the septa.

EURYSTOMITES PLICATUS (page 225).

Figure 2. Side view of an imperfect specimen of this species from Little Black Island, shewing the surface ornamentation of part of the outer volution.

DISCOCERAS CANADENSE (page 227).

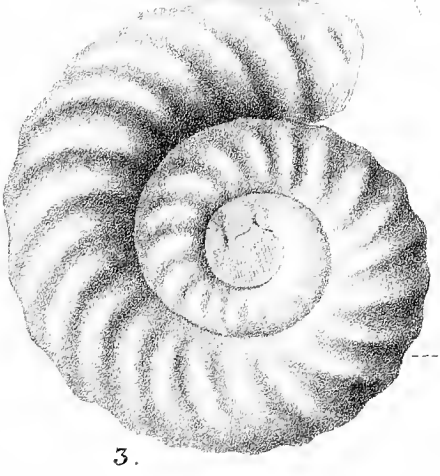
Figure 3. Side view of the most perfect specimen collected.
" 3*a*. Outline of transverse section of the same, shewing the position of the siphuncle.

APARCHITES PARVULUS (page 230).

Figure 4*a*. Side view of right valve, in outline, and magnified five diameters.
" 4*b*. Ventral outline of the same.
" 4*c*. Edge outline of the same.

1.

2.



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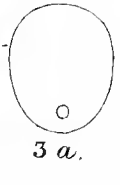
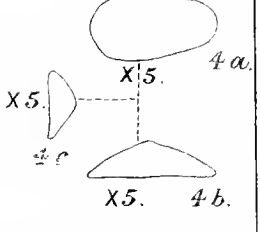


3 a.



GEOLOGICAL SURVEY OF CANADA

A. P. LOW, B.Sc., Deputy Head and Director.

PALÆOZOIC FOSSILS

VOL. III, PART IV (AND LAST).

5. *The Fossils of the Silurian (Upper Silurian) rocks of Keewatin, Manitoba, the north eastern shore of Lake Winnipegosis, and the lower Saskatchewan River.*

6. *The Canadian species of Plectoceras and Barrandeoceras.*

7. *Illustrations of seven species of fossils from the Cambrian, Cambro Silurian, and Devonian rocks of Canada.*

8. *Revised list of the fossils of the Guelph formation of Ontario.*

With Appendix, consisting of a list of errata, and an index to the volume.

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No. 950.

This, the fourth and concluding part of the third volume of "Palæozoic Fossils," published by this Survey, consists, as indicated more fully on its title page, of four papers. Three of these are descriptive of palæozoic fossils from various localities in the Dominion, and are illustrated by eight text figures and twenty plates. The fourth paper is a revised list of the fossils of the Guelph formation of Ontario. These four papers are supplemented by an Appendix, which consists of a list of errata in this and in previous parts, with an index to the whole volume.

For permission to reprint the two text figures of *Steganoblastus Ottawaensis* from the third part of the "Treatise on Zoology", edited by Dr. E. Ray Lankester, and for clichés of the original blocks, the Survey is indebted to the courtesy of the publishers, Messrs. Adam and Charles Black, of Soho Square, London, England.

A. P. LOW.

GEOLOGICAL SURVEY OF CANADA,
OTTAWA, June 23rd, 1906.

PALÆOZOIC FOSSILS.

VOL. III.

5. The Fossils of the Silurian (Upper Silurian) rocks of Keewatin, Manitoba, the north eastern shore of Lake Winnipegosis, and the lower Saskatchewan River.

By J. F. Whiteaves.

A. FROM KEEWATIN.

A. 1.—FROM THE ATTAWAPISKAT RIVER.

Collected by Dr. R. Bell in 1886.

The exposures of fossiliferous limestone on the lower portion of this river are described on pages 27G and 28G of Dr. Bell's "Report on an exploration of portions of the At-ta-wa-pish-kat and Albany rivers, Lonely Lake to James Bay," which forms part of the Annual Report of this Survey for 1886, New Series, vol. II. The fossils were collected at Rainy Island (N. Lat. 53° 05′, W. Long. 84° 23′) and seventeen to thirty miles below Rainy Island. Those from the first of these localities are referred to on page 27G, and those from the second on page 28G, of Dr. Bell's Report. In that report, the few and for the most part fragmentary fossils from each of these localities were provisionally stated to be probably of Devonian age. But, the subsequent receipt of a fine series of fossils from similar rocks on the Ekwan River, collected by Mr. Dowling in 1901, has convinced the writer, as elsewhere stated,* that not only the fossiliferous limestones of the Attawapiskat, but also those of the Fawn River (or branch of the Severn), are of Silurian age.

ANTHOZOA.

Tetracoralla.

Zaphrentis Stokesi, Edwards and Haime.

Zaphrentis Stokesi, Milne Edwards and Haime...1851. Polyp. Foss. Terr. Palæoz., p. 330, pl. 3, fig. 9.
" " Billings.....1866. Catal. Silur. Foss. Anticosti, p. 34.
" " Nicholson..... 1875. Palæont. Ont., pp. 43 and 58.

* In the Ottawa Naturalist for October, 1902, vol. XVI, No. 7, p. 139.

Zaphrentis Stokesii, Rominger. .... 1876. Geol. Surv. Mich., Fossil Corals, p. 144, pl. 51, three figs. in lower row.

Zaphrentis Stokesi, Lambe..... ....1900. Contr. Canad. Palæont., vol. IV, pt. II, p. 120, pl. 9, figs. 1, 1 *a*, and 2.

Rainy Island: one fragment (Lambe).

The types of *Z. Stokesi* are from Drummond Island, Lake Huron. In Canada the species is recorded as having been collected from the Niagara limestone at Cabot's Head, Georgian Bay, Lake Huron; at Isle of Man (Burnt Island) Lake Timiscaming, and at the north end of that lake; also from divisions Nos. 3 and 4 of the Anticosti group at four localities on that island.

HEXACORALLA.

FAVOSITES GOTHLANDICUS, Lamarck.

Favosites Gothlandica (Lamarck) Lambe.....1899. Contr. Canad. Palæont., vol. IV, pt. I, p. 3, pl. I, fig. 1.

Seventeen to thirty miles below Rainy Island: one specimen, which has been identified with this species by Mr. Lambe.

This is the Silurian coral, with spiniform septa and mural pores in or near the angles of the corallites, that Mr. Lambe identifies with *F. Gothlandica*, and the same remark applies to all the specimens that are referred to under this name in this paper. The Devonian specimens, with septal squamulæ, that were identified with *F Gothlandica* by E. Billings, Professor H. A. Nicholson, and the writer, are now referred to *F. basalticus* (Goldfuss), *F. Alpenensis*, Winchell, or *F. Billingsii*, Röminger.

HYDROZOA.

STROMATOPORIDÆ, genus and species undetermined.

Rainy Island: one fragment.

BRACHIOPODA.

STROPHEODONTA (BRACHYPRION) sp. indet.

Rainy Island: a small single valve of a species apparently rather similar to the fossil from the Niagara formation of the Western United States which Hall refers to *Strophodonta profunda* in the Twentieth Regents Report, and figures on Plate 13 (4), but which Winchell and Marcy seem to have previously described and figured as *Strophomena Niagarensis*. As Mr. Schuchert suggests that this western fossil may not be the same as the eastern Rochester shale species, it will be convenient in this paper to refer to the former as *Stropheodonta Niagarensis*. The valve from Rainy Island is moderately convex, and marked with minute crowded radii, of two sizes, also with faint corrugations at the hinge line.

Seventeen to thirty miles below Rainy Island: a large but very imperfect valve, that seems also to be rather nearly related to *S. Niagarensis*, but that may be distinct from the Rainy Island specimen. The former is proportionally more convex, and tumid or geniculate at or about the midlength, and its sculpture is slightly different from that of the latter.

Orthis, sp. indet.

Seventeen to thirty miles below Rainy Island: three imperfect and badly preserved specimens of an apparently rather coarsely ribbed species.

Meristina (?) expansa, Whiteaves.

Plate 27, figs. 6, 6 *a*, and 7.

Meristina (?) expansa, Whiteaves .....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F., p. 45.

"Shell tumid, regularly and rather strongly biconvex, transversely subelliptical and always a little wider than long; front margin of the valves not at all sinuated; surface entirely devoid of any kind of ribs.

"Ventral valve with a rather depressed though slightly prominent umbo, and an incurved beak.

"Dorsal valve with a much more depressed umbo and a smaller beak.

"Surface markings of the exterior of the test unknown, those of its exfoliated inner layer consisting of numerous, close-set and very minute, concentric raised lines, as well as of a few rather distinct concentric lines of growth; structure of the test fibrous.

"Characters of the interior of the valves unknown, though there is clearly a long mesial septum in the ventral valve, and apparently a similar one in the dorsal."

Seventeen to thirty miles below Rainy Island: four comparatively large and four small specimens. Ekwan River: two large specimens and one small one.

"These specimens are mere casts of the interior of the closed valves, with small portions of the inner layer of the test attached to some of them. It is by no means clear whether the beak of the ventral valve of any of them is perforate or not. They are provisionally and very doubtfully referred to *Meristina*, on account of their general resemblance in external form to the European *M. tumida*, but it may be that they should rather be referred to *Meristella* or *Reticularia*. They seem to differ from *Reticularia septentrionalis* in their uniformly, transversely and broadly subelliptical contour, and in the more depressed umbo of the ventral valve of each."

MOLLUSCA.

GASTEROPODA.

LOPHOSPIRA, sp. indet.

Rainy Island: one very imperfect and badly preserved cast of the interior of the shell of a species of this genus. Limestone rapid, Fawn River: two similar casts.

EUOMPHALUS, sp. indet.

Rather large; much wider than high, outer whorl rounded subquadrate in transverse section; spire slightly elevated; umbilicus very wide but shallow.

Rainy Island: four casts of the interior of a possibly undescribed species of this genus.

CEPHALOPODA.

ACTINOCERAS KEEWATINENSE, Whiteaves.

Plate 30, figs. 7 and 8.

Actinoceras Keewatinense, Whiteaves. ... 1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F., p. 54.

"This is a provisional name for some peculiar, obliquely subnummuloidal and presumably submarginal siphuncles, or portions of siphuncles, somewhat resembling those of *A. cochleatum* (Schlotheim). They are longicone and increase very slowly in thickness, nearly circular in transverse section, and encircled, at more or less regular intervals, by narrow and rather deep, obliquely transverse constrictions. Between these constrictions the siphuncle is laterally compressed and but slightly expanded, while its tranverse diameter is from two to three times as great as the distance between the constrictions.

"The surface markings of these siphuncles consist of fine, close-set longitudinal striæ," and their internal structure is as represented by fig. 8 on Plate 30.

Rainy Island: three fine and rather slender specimens. The best of these, "which shows ten of the siphuncular constrictions, is three inches and nearly a half in length, by twelve millimetres in diameter near the smaller end, and twenty two near the larger. In this specimen the width of the siphuncle is about twice as great as the distances between the constrictions. In another equally slender but shorter specimen from the same locality, which shows seven siphuncular constrictions, the width of the siphuncle is nearly three times as great as the distance between the constrictions, at the smaller end; and only twice as great as at the larger." Similar specimens have since been found on the Ekwan and Winisk rivers.

The only other fossil Cephalopoda collected on the Attawapiskat by Dr. Bell are (1) a rough cast of the interior of part of the shell of a slender, longicone orthoceratite; and (2) a fragment of the mould of the exterior of a large straight, subcylindrical shell, shewing four distant linear longitudinal grooves; both from Rainy Island.

A 2.—FROM THE EKWAN* RIVER.

Collected by Mr. D. B. Dowling in 1901.

The fossils from this and the next locality have been enumerated or described in Appendix I to Mr. Dowling's "Report on an exploration of Ekwan River, Sutton Mill Lakes, and part of the west coast of James Bay," which forms Part F of vol. XIV of the Annual Report of this Survey, published in October, 1904. Most of the letter press which relates to these fossils is reprinted from that Appendix, but the twenty three new species described therein are here illustrated for the first time.

Commencing at thirty-five miles from its mouth, there are five exposures of limestone on the Ekwan, from which these fossils were collected. These exposures are scattered over an interval in which the last is forty miles from the first, and are as follows.

Lower rapid.
Middle rapid.
Foot of portage road.
Portage road at falls.
Upper rapid.

Although these limestones are flat lying and presumably gradually ascending, they seem to hold much the same kind of fossils.

ANTHOZOA.

Tetracoralla.

Zaphrentis Stokesi, Edwards and Haime.

Portage road at falls, two specimens; and upper rapid, one specimen (Lambe).

Pycnostylus Guelphensis, Whiteaves.

Pycnostylus Guelphensis, Whiteaves .....1884. This volume, pt. I, p. 3, pl. 1, figs. 1, 1*a* and 1*b*; and (1895) pt. II, p. 49.
" " Lambe..... .1900. Contr. Canad. Palæont., vol. IV, pt. II, p. 132, pl. 10, figs. 4 and 4*a*.

Foot of portage road, one specimen; and portage road at falls, one specimen (Lambe).

*Formerly written "Equan."

PYCNOSTYLUS ELEGANS, Whiteaves.

Pycnostylus elegans, Whiteaves .....1884. This volume, pt. 1, p. 4, pl. 1, figs. 2 and 2 *a*; and (1895) pt. II, p. 49.
" " Lambe..... ... .1900. Contr. Canad. Palæont., vol. IV, pt. II, p. 133.

Portage road at falls: one specimen (Lambe).

HEXACORALLA.

FAVOSITES GOTHLANDICUS, Lamarck.

Foot of portage road, five specimens; portage road at falls, one specimen; and upper rapid, one specimen (Lambe).

FAVOSITES HISINGERI, Edwards and Haime.

Lower rapid, one specimen: foot of portage road, one specimen; and portage road at falls, one specimen (Lambe).

OCTOCORALLA.

HALYSITES CATENULARIA, L.

"The typical form, as identified by United States and Canadian palæontologists, under this name or that of *Catenipora escharoides*, Lamarck, and *C. agglomerata*, Hall." Lambe.

Foot of portage road: one specimen that, according to Mr. Lambe, is like specimens from the Niagara and Guelph formations of Ontario, and from Division 4 of the Anticosti group of Anticosti.

LYELLIA SUPERBA, Billings. (Sp.)

Trematopora superba, Billings.....1866. Cat. Silur. Foss. Anticosti, p. 93.
Lyellia superba, Lambe ..... 1899. Contr. Canad. Palæont., vol. IV, pt. 1, p. 87, pl. 5, figs. 4, 5 & 5 *a*.

Portage road at falls: one specimen (Lambe).

HYDROZOA.

STROMATOPORIDÆ, genus and species undetermined.

Portage road at falls: two fragments.

ECHINODERMATA.

CRINOIDEA, genera and species undetermined.

Foot of portage road: two portions of finely annulated columns, which are circular in section and perforate by a pentalobate axial canal.

Portage road at falls: a cast of the interior of a dorsal cup, that shews little more than its general shape, and the impress of a few large hexagonal plates.

POLYZOA.

Fenestella subarctica, Whiteaves.

Plate 23. The only figure.

Fenestella subarctica, Whiteaves..... .....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F., p. 39.

"Zoarium spreading, somewhat fan-shaped, but probably funnel-shaped when perfect. Branches very slender, carinated on the celluliferous face, and averaging from a fourth to a third of a millimetre in thickness. Bifurcations very infrequent in the only specimen collected, occurring at intervals of five mm. or more. Interstices much wider than the branches. Dissepiments about one mm. apart, or four and a half to five in the space of five mm. Fenestrules longer than wide, irregular in shape but usually somewhat rectangular, nearly or quite a mm. long, and approximately about half as wide as long. Zoœcial apertures circular, in two ranges, opening somewhat laterally, twenty in each range in the space of five mm., and three to four on each side in the length of a fenestrule, closely disposed but separate, slightly irregular in their distribution, sometimes alternate on the two sides of the keel, sometimes opposite, their margins indenting the borders of the fenestrules. Under a highly magnifying simple lens, the keel appears to be minutely spinose in places."

"Portage road at falls : one fairly good specimen."

"Mr. R. S. Bassler, of the United States National Museum, to whom the writer is indebted for critical suggestions in regard to the structural peculiarities and affinities of this species, and of those of a *Phœnopora* from Sutton Mill Lakes, writes that the zoœcial apertures of this *Fenestella* 'seem unusually large, but this is due to the removal of the outer investment of the zoarium.'"

BRACHIOPODA.

Trimerella Ekwanensis, Whiteaves (nom. emend.)

Plate 24, fig. 7 ; and pl. 25, figs. 1 and 2.

Trimerella Equanensis, Whiteaves ....1902. Ottawa Naturalist, vol. XVI, p. 141, pl. 2, figs. 1 & 2; and pl. 3, fig. 1.

"Shell rather large, attaining to a length of upwards of three inches. Pedicle valve flattened somewhat obliquely, most convex and deepest at a short distance from the beak, nearly as wide as long, broadly rounded in front, more narrowly rounded at the sides, and obtusely pointed behind, the umbo and beak being moderately produced, their lateral margins meeting at an angle of about 98°, and the beak gently incurved. Characters of the interior of this valve unknown.

"Brachial valve regularly but moderately convex, most prominent externally at or about the midlength, a little wider than long, broadly rounded in front and less so at the sides, as in the pedicle valve, but abruptly contracted at the umbo, which is narrowly rounded and but slightly produced, while its beak is strongly incurved and recurved. Casts of the interior of this valve are marked with a longitudinal, linear, median groove, that represents the median plate and that extends from the umbo almost to the front margin, also with a lateral and slightly divergent lin ear groove, on each side, that extends from the umbo to a little beyond the midlength.

"Surface of both valves marked only with a few distinct concentric lines of growth."

Portage road at falls: "one imperfect and badly preserved specimen with both valves *in situ*, a nearly perfect pedicle valve, three imperfect brachial valves with most of the test preserved, and a cast of the interior of a large brachial valve.

"Judging by these specimens, this species would appear to belong to the group of *T. acuminata* rather than to that of *T. grandis*, though it seems to be always much shorter and wider than *T. acuminata*, *T. Ohioensis* or *T. Lindstrœmii*. The marginal contour of its brachial valve is not very unlike that of *T. Lindstrœmii*, but in the latter this valve is represented as flattened anteriorly to the umbo, and its pedicle valve has quite a different outline, the umbo being proportionately broader laterally, and the beak straight rather than incurved.

Trimerella borealis, Whiteaves.

Plate 25, figs. 3 & 3 *a*.

Trimerella borealis, Whiteaves..... .... 1902. Ottawa Naturalist, vol. XVI, p. 142, pl. 3, figs. 2 & 3.

"Shell unknown; cast of the interior of both of the closed valves small, compressed, not far from circular in marginal outline, but a little wider than long.

"*Supposed pedicle valve*" (Fig. 3 *a*). "On the cast of the interior of this valve there are five linear grooves, of unequal length, that radiate forward and outward from the umbo. The middle one, that corresponds to the median plate, extends as far forward as a little past the midlength, the two next to it, on either side, are a little shorter, and the two outer ones shorter still.

"*Supposed brachial valve*" (Fig. 3). "On the cast of the interior of this valve there are two flattened conical casts of the platform vaults in the umbonal region, and between them there is a median, longitudinal linear groove, that is, however, widest posteriorly and that represents the median

plate. Each of these casts of the platform vaults is bounded externally by a short but deeply impressed linear groove, and the groove that represents the median plate extends from the umbo to within a very short distance from the front margin.

"The only specimen collected is not sufficiently perfect to admit of exact measurements, but the two figures are of the natural size.

Lower rapid : "one imperfect and slightly distorted cast of the interior of both valves.

"The specimen would seem to indicate a much smaller species than the preceding, with different markings on the interior of at least one of its valves, and a much less produced umbo on the brachial valve. It can be scarcely be mistaken for any other American species of *Trimerella*."

STROPHEODONTA (BRACHYPRION) sp. indet.

Very similar to the "*Strophomena Niagarensis*" of Winchell & Marcy, the *Strophodonta profunda* of Hall, as figured and described in the Twentieth Regents Report of the State of New York, but with the surface markings essentially like those of *S. varistriata*, var. *arata*. Radii thin and distant, with smooth spaces between them.

Foot of portage road : one well preserved but imperfect ventral valve.

PLECTAMBONITES TRANSVERSALIS, Wahlenberg. (Sp.)

Anomites transversalis, Wahlenberg . .... 1821. Act. Soc. Upsaliensis, vol. III, p. 64.
Strophomena elegantula, Hall... ... . 1843. Geol. N. York, Rep. Fourth Distr., p. 72, fig. 1.
Strophomena transversalis, Hall.....1843. Idem, p. 105, fig. 4.
Leptæna transversalis, Hall.....1852. Pal. N. York, vol. II, p. 256, pl. 53, fig. 5.
" " Billings.....1856. Canad. Nat. & Geol., vol. I, p. 138, pl. 2, figs. 14 & 15.
Plectambonites arca & tenera, Shaler.....1865. Bull. Mus. Comp. Zool., vol. IV, p. 64.
Plectambonites transversalis, Hall & Clarke..1892. Pal. N. York, vol. VIII, pt. I, p. 298, pl. 15, figs. 34-36.

Foot of portage road : two imperfect but characteristic ventral valves.

In the Museum of the Survey there are specimens of this species from the Clinton and Niagara formations at Grimsby, Dundas and Hamilton, Ont.; from Divisions 2, 3 and 4 of the Anticosti group, four miles west of Jupiter River, at East Point, and at the Jumpers, Anticosti ; also from the Silurian (Upper Silurian) rocks at Lake Temiscouata, N. B.

ORTHIS, sp. indet.

Upper rapid : one half of the ventral valve of a very small, rather coarsely ribbed and probably undescribed species of *Orthis*, allied to *O. Davidsoni*.

Camarotœchia Ekwanensis, Whiteaves.

Plate 25, figs. 4, 4 *a*, and 4 *b*.

Camarotœchia Ekwanensis, Whiteaves.....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 42.

"Shell small, moderately convex, transversely subelliptical and wider than long.

"Ventral valve with an extremely small, narrow, erect or straight beak, behind; and a well defined mesial sinus, that extends backward to about the midlength in front; the whole surface of the valve marked with thirteen rather distant, angular radiating ribs, three in the mesial sinus and five on each side

"Dorsal valve with a still smaller beak, and with a fold corresponding to the mesial sinus of the ventral, its surface marked with twelve angular ribs, four on the fold and four on each side of it.

"Hinge area and interior of the valves unknown.

"Portage road at falls: one well preserved cast of the interior of the closed valves.

This small rhynchonelloid may possibly prove to be an extreme variety of *C. neglecta* (the *Atrypa neglecta*, Hall, of the second volume of the Palæontology of the State of New York) from which it seems to differ chiefly in its transversely and rather narrowly subelliptical marginal outline.

Atrypa reticularis, L.

Foot of portage road: two small specimens.

Glassia variabilis? Var.

Plate 26, figs. 6, 6 *a*, and 6 *b*.

Cfr. *Glassia variabilis*, Whiteaves .....1904. Geol. Surv. Canada, Ann. Rep., vol XIV, pt. F, p. 42.

Foot of portage road: one specimen, that is doubtfully referred to this species. It does not show any vestige of the spiralia or of any of the other characters of the interior of the shell. It is perhaps a little more convex than the typical form from the Winisk River, and the sinus in its ventral valve seems to be a little deeper proportionately. In these respects the specimens from the Ekwan and Fawn rivers are more like the *Atrypa subovata* of Sowerby, and those from the Winisk are more like the *A. compressa* of the same author, both of which are now regarded as forms of *Glassia subovata*. The original description of *G. variabilis* is reprinted on page 273, and the typical form of the species is illustrated on Plate 26, figs. 3, 4 and 5.

SPIRIFER CRISPUS? Hisinger. Var.

Plate 27, fig. 1.

Shell apparently similar, in size and general shape, to the *S. crispus*, as described and figured by European and American palæontologists, but with narrow and angular, not broad and rounded ribs.

Middle rapid : one specimen.

SPIRIFER (?) sp. indet.

Portage road at falls, one specimen ; and foot of portage road, one specimen ; both casts of the interior of ventral valves that are possibly referable to *S. radiatus*, Sowerby, but that are much too imperfect and too badly preserved to be satisfactorily determined, even generically.

RETICULARIA SEPTENTRIONALIS, Whiteaves.

Plate 27, figs. 2, 3, 4 and 5.

Reticularia septentrionalis, Whiteaves.....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 44.

"Shell strongly biconvex, but often with a faint, shallow, narrow longitudinal groove or depression in the median line of each valve ; varying in outline in different specimens from subovate or somewhat pentagonal and a little longer than wide, to not far from circular and as wide as long, but always abruptly contracted and attenuate in the umbonal region behind ; front margin of the valves straight and entirely devoid of a mesial fold or sinus.

"Ventral valve with a narrow but prominent or produced umbo, a depressed, incurved and acute beak, and an extremely small delthyrium.

"Umbo and beak of the dorsal smaller and less prominent.

"Most of the specimens are little more than mere casts of the interior of the closed valves. Their surface is entirely devoid of ribs of any kind, and at first sight would seem to be marked only with concentric lines of growth. But, upon closer examination, numerous, obscure, close-set and very slightly raised concentric lines, or faint and minute, low, rounded ridges, can be detected on portions of the exfoliated test that happen to be preserved, and the shell structure, under a lens, is seen to be fibrous.

"Characters of the interior of the valves unknown, though there are indications of a median septum in each.

"Lower rapids, one specimen ; middle rapid, one specimen ; and portage road at falls, four specimens.

"This large and nearly smooth species is provisionally referred to the genus *Reticularia* on account of its general resemblance to *R. modesta* (Hall), and *R. perplexa* (McChesney) which is the *Spirifer lineatus* of

Shumard and other American palæontologists, but not of Martin ; though it may prove to be a *Martinia.*"

RETICULARIA (?) sp. indet.

" Foot of portage road : two specimens, each of which has the whole of the dorsal valve and most of the ventral preserved, though the umbo and beak of the latter are broken off. Both are transversely subelliptical in outline and wider than long, and both have a rather shallow marginal sinus in the ventral valve. They are entirely ribless, but the better preserved one of the two is finely and nodosely cancellated by numerous, close set, minute concentric ridges, that are crossed by similar radiating ones.

" At the portage road at the falls a specimen, with the same general shape and with a similar sinus in the vental valve, was collected, but it is so much worn that its surface markings are quite obliterated, and the beak of the ventral is so imperfect that it is impossible to tell whether it was originally perforate or not. This specimen seems to correspond fairly well with E. Billings' figures of *Athyris Blancha,* from the Silurian rocks of Maine, which Hall and Clarke refer to *Meristina,* but which Schuchert says is a *Meristella.*"

MERISTINA (?) EXPANSA, Whiteaves.

Portage road at falls, one specimen ; and foot of portage road, an unusually large but imperfect specimen.

The original description of this species is reprinted on page 245, ante.

MOLLUSCA.

PELECYPODA.

AMBONYCHIA UNDULATA, Whitfield. (Sp.)

Plate 28, fig. 4.

Leptodomus undulatus, Whitfield..... .1878. Ann. Rep. Geol. Surv. Wiscons. for 1877, p. 81 ; & (1880) Geol. Wiscons., vol. IV, p. 293, pl. 18, figs. 1 & 2.

Ambonychia undulata, Whiteaves.... .....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 46.

"Portage road at falls, an imperfect left valve ; and foot of portage road, a nearly perfect and very convex right valve.

" Both of these specimens are marked with " strong, regularly rounded concentric undulations." Mr. E. O. Ulrich, who has kindly examined the five specimens of pelecypoda from the Ekwan River collected by Mr. Dowling, and to whom the writer is indebted for some critical suggestions

in regard to them, thinks that *Leptodomus undulatus* is an *Ambonychia* allied to *A. planistriata*, Hall, and that the former had fine surface radii.

AMBONYCHIA SEPTENTRIONALIS, Whiteaves.

Plate 28, fig. 5.

Ambonychia septentrionalis, Whiteaves.....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 46.

"Shell obliquely and acuminately subovate or subrhomboidal, very inequilateral, rather strongly convex, most prominent in the umbonal region of each valve. Anterior side very short, abruptly truncated, or rather inflected, and flattened; posterior side a little longer, broadly rounded at its extremity and forming a subangular junction with the hinge line above. Umbones prominent, tumid but rather narrow; beaks incurved, anterior, and almost if not quite terminal; hinge line straight behind the beaks, equal to about two thirds of the greatest length of the valves beneath.

"Surface marked with a few faint and obscure concentric undulations and lines of growth, also by extremely minute radiating lines. Test very thin.

"Hinge dentition and muscular impressions unknown.

"Portage road at falls: a cast of the interior of both valves, with part of the test preserved.

"This shell is rather similar to the *A. affinis* of Ulrich from the Middle Galena of Minnesota and Illinois, both in its shape and surface markings. But, in the former the posterior end is more broadly rounded and not so much produced below, and the radiating raised lines of the surface are much more minute."

MYTILARCA PERNOIDES, Whiteaves.

Plate 27, fig. 8.

Mytilarca pernoides, Whiteaves.....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 47.

"Shell compressed convex, rather obliquely subovate and very inequilateral, or broadly mytiloid and subalate behind. Anterior side very short, truncated or abruptly inflected above and rounded below; posterior side a little longer, its outer margin truncated somewhat obliquely and forming an angular or subangular junction with the cardinal border above, but rounded below. Cardinal border behind the beaks straight, its entire length equal to fully two thirds or more of the greatest length of the valves below; hinge area large; umbones apparently not very prominent; beaks appressed, incurved and almost terminal.

"Surface marked with a few impressed and concentric striæ of growth; test rather thick.

"Hinge with both cardinal and lateral teeth; muscular impressions unknown.

"Portage road at falls: one testiferous left valve.

"Mr. Ulrich thinks that this shell is "closely related to, if not quite the same as, *Ambonychia aphœa*, Hall," from the Niagara limestone of Illinois, which he (Mr. Ulrich) referred to *Mytilarca* in 1894, in the seventh volume of the Reports of the Geological Survey of Ohio. *A. aphœa*, however, was based upon a mere cast, which does not show the proportionate length of the hinge line, the size of the cardinal area, nor the surface markings, so that it is scarcely possible to make a satisfactory comparison between it and the specimen from the Ekwan River."

Ctenodonta subovata, Whiteaves.

Plate 27, figs. 9 and 9 *a*.

Ctenodonta subovata, Whiteaves..... .1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 47.

"Shell small, inequilateral, moderately convex, subovate and one fourth longer than high. Anterior (?) side short and rounded; posterior (?) side produced, a little longer, and more narrowly rounded at its outer termination; ventral margin gently convex; superior border sloping abruptly downward in front of the beaks and much more gradually so behind them; umbones small and moderately prominent: beaks also small, incurved and placed in advance of the midlength; ligament external, short, placed on the shorter end of the hinge line.

"Surface faintly, very minutely and concentrically striated.

"Hinge dentition and muscular impressions unknown.

"Dimensions of the only specimen collected: maximum length, twenty millimetres; greatest height, fifteen mm. and a quarter; maximum thickness, ten mm. and a quarter.

"Portage road at falls: one testiferous specimen, with both valves.

"The homologies of the shell of *Ctenodonta* are unknown, and it is not at all clear which is the anterior and which the posterior side of this species. If the shorter is the posterior side, as in *Nucula* and as would seem to be indicated by the position of the ligament, then the beaks of this species are placed a little behind the midlength and *vice versa*.

"In outline this shell agrees very nearly with my *C. simulatrix* and less closely with *C. Albertina*, but these species had the ligament on the longer, instead of the shorter end of the hinge." Ulrich.

GASTEROPODA.

PLEUROTOMARIA (or EUOMPHALOPTERUS) sp. indet.

Upper rapid: five badly preserved casts of the interior of the shell of a widely umbilicated species of *Pleurotomaria* or *Euomphalopterus*, with a very low, obtuse spire. These specimens are very similar in shape to casts of *Pleurotomaria Valeria*, Billings, which is an *Euomphalopterus*, but the outer whorl of each is not so distinctly keeled at the periphery.

EUOMPHALOPTERUS, sp. indet.

Foot of portage road: a specimen with the upper half of the shell completely worn away, the basal half, which is all that is left, being narrowly umbilicated and showing part of a peripheral alation.

MEGALOMPHALA ROBUSTA, Whiteaves.

Plate 28, figs. 9 and 9 *a*; and pl 29, fig. 1.

Megalomphala robusta, Whiteaves..... ..1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 48.

"Shell large for the genus, strongly convex but deeply and rather widely umbilicated on both sides, the umbilicus occupying about one half of the entire diameter though its margin is not very distinctly defined. Whorls at least three and perhaps more, increasing very rapidly in size and laterally expanding, coiled closely on the same plane and everywhere in close contact, but with little or scarcely any overlapping; their periphery encircled by a continuous slit-band; exposed portions of the inner ones truncated almost vertically but somewhat obliquely on each side. Outer whorl rounded on the periphery in some specimens, faintly and obtusely subangular in others, distinctly subangular round the umbilical margin on both sides, the umbilical wall being steep but somewhat oblique. Slit-band narrow, in half grown specimens moderately elevated and bounded on each side of its summit by a spiral raised line, but this minute double keel becomes obsolete on the outer half of the last volution, in adult shells. Outline of transverse section near the aperture subreniform and much wider than high in some specimens but somewhat triangular and nearly or quite as high as wide in others; outer lip not preserved in any of the specimens collected, but apparently not abruptly expanded; apertural slit unknown.

"Surface of most of the specimens collected marked only with curved, transverse striæ of growth, but in one specimen the markings consist of small narrow, thin transverse ridges, with flat spaces between them.

"Portage road at falls: seven specimens, all of which are imperfect at the aperture. The largest is seventy-two millimetres in its maximum diameter.

"The generic name *Megalomphala*, Ulrich, 1897, is, however, too close to *Megalomphalus*, Brusina, 1871."

SALPINGOSTOMA BOREALE, Whiteaves.

Plate 28, figs. 10 & 11.

Salpingostoma boreale, Whiteaves.....1904. Geol. Surv. Canada, Ann. Rep. vol. XIV, pt. F, p. 49.

Shell small, consisting of three rounded volutions that are a little wider than high and coiled on the same plane, in close contact, with little or no overlap, or at least closely contiguous if not actually in contact; umbilicus wide and open, exposing most of the inner whorls. Aperture trumpet shaped, lip widely and abruptly expanded.

"Surface marked with minute rounded spiral ribs, that are crossed by small, crenate, lamellose raised ridges. The slit-band is not well shown in either of the few specimens collected, but it seems to be narrow, and continuous, at least at some distance behind the aperture.

"Middle rapid, foot of portage road, and portage road at falls; one specimen from each of these localities. The largest of these specimens, though only twenty-three millimetres, or less than an inch, in its maximum diameter, has an abruptly expanded aperture. The other two are obviously immature shells, each about eleven mm. in its greatest diameter. In one of them the posterior half of the earliest volution is free from, and not quite in contact with that which immediately succeeds it.

"It is only in the continuity of the slit-band that this species and shells of this genus are supposed to differ from *Tremanotus*, or as Dr. Paul Fischer spells it, *Trematonotus*."

EUOMPHALUS, sp. indet.

Lower rapid: a cast of the interior of the outer half of the outer volution of the shell, apparently of a typical *Euomphalus*, which is flattened above, rounded, transversely undulated, and not very widely umbilicated below.

GYRONEMA SPECIOSUM, Whiteaves.

Plate 29, fig. 2.

Gyronema speciosum, Whiteaves.....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 50.

"Shell quite large for the genus, imperforate, turbinate, a little higher or longer than wide, spire slightly higher than the outer whorl. Whorls

six or seven, rounded, ventricose; aperture widely subovate, not far from circular, lip thin and simple.

"Surface marked with numerous and rather close-set small spiral ridges, that are crossed by still more numerous, more close-set and minute, transverse raised lines. On the last whorl but one there are about eight of these spiral ridges, and on the last or outer one there are not less than twelve and probably as many as fifteen.

"Portage road at falls: two specimens. The larger of these was probably about forty-five millimetres high or long, when perfect, and its maximum width is thirty-five mm."

GYRONEMA DOWLINGII, Whiteaves.

Plate 29, fig. 3.

Gyronema Dowlingii, Whiteaves.....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 50.

"Shell turbinate, higher or longer than wide, spire elevated, volutions rounded and ventricose; umbilicus almost or quite closed. Lower whorls of the spire marked with three rather distinct, acute and prominent spiral keels. Outer whorl encircled by four comparatively large spiral keels and by a few much smaller spiral ridges, or minute raised lines. Between the second and third spiral keels there are three close set, low and rounded, minute spiral raised lines, and there are indications of a few small spiral ridges in the umbilical region, below the lowest of the four large spiral keels.

"Portage road at falls: one imperfect specimen with the apical whorls broken off, but with the test preserved on the last two whorls of the spire and on part of the outer whorl.

"A rather smaller species than the preceding and with very different sculpture. It is somewhat similar in shape to the *Cyclonema sulcatum* of Hall, from the Guelph formation of Ontario (which is probably a *Gyronema* rather than a *Polytropis).* But the whorls of *G. Dowlingii* are not shouldered above, its suture is not channelled, and its outer volution is encircled by only four large spiral keels. *G. Dowlingii* is still more closely allied to, but apparently quite distinct from, the *Cyclonema carinatum* of Sowerby, as figured by Lindström in his monograph of the Silurian Gastropoda and Pteropoda of Gotland, which Ulrich says is a *Gyronema.*"

GYRONEMA BREVISPIRA, Whiteaves.

Plate 29, fig. 4.

Gyronema brevispira, Whiteaves.....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 51.

"Shell rather small, turbinate conical and wider than high; spire shorter than the outer volution. Whorls four or five, those of the spire

obliquely compressed; last whorl of the spire angulated and carinated below, next to the suture; outer whorl obliquely compressed above, rounded and almost imperforate below, the umbilicus being represented by a minute, short and very narrow chink behind the columellar lip; aperture ovately subcircular; lip thin and simple.

"Surface encircled by small narrow and acute spiral keels. On the last whorl but one there are five of these keels, and on the outer whorl eleven.

"Portage road at falls: two specimens."

Loxonema, sp. indet.

Foot of portage road, a specimen of a small, slender species, with six whorls preserved; and, upper rapid, a much more imperfect but otherwise similar specimen. Portage road at falls: a fragment of a larger shell, with apparently similar characters, but with only two of the whorls preserved.

Orthonychia obtusa, Whiteaves.

Plate 29, figs. 5, & 5 *a*.

Orthonychia obtusa, Whiteaves.....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 51.

"Shell straight, conical, slightly compressed at the sides, but more so on the right than on the left side, and moderately elevated, the height being less than the maximum length at the aperture or base Apex erect, bluntly pointed and rather eccentric; base with two faint, obscure, shallow undulations on the right side. Aperture and outline of transverse section at and near the base, subovate but somewhat irregular in outline; lip shallowly undulated on the right side.

"Surface markings unknown, though casts of the interior are quite smooth, and the exterior of large pieces of the thin and presumably inner layer of the test, that happen to be preserved, is marked with numerous, irregular and often not continuous, fine concentric striæ. Muscular impressions unknown.

"Foot of portage road: two specimens, which are very different in shape to any species of *Orthonychia* or *Ptatyceras* that the writer is acquainted with.

Platyceras compactum, Whiteaves.

Plate 29, fig. 6.

Platyceras compactum, Whiteaves.....1904. Geol. Surv. Canada, Ann, Rep., vol. XIV, pt. F, p. 52.

"Shell turbinate, imperforate, a little wider than high, spire small and short. Whorls certainly three and probably as many as four or five in perfect specimens (the apex being broken in both of those collected)

rounded, closely coiled and increasing rapidly in size; outer whorl inflated and expanded, with two faint low rounded spiral plications near and at the aperture in young specimens, and from three to four in adult ones.

"Surface marked with numerous, close-set, transverse lines of growth, that are flexuous where they cross the spiral plications.

"Portage road at falls: one apparently adult and one half grown specimen. The former, which is well preserved and nearly perfect, is thirty five millimetres wide, and was probably about thirty mm. high when perfect, allowing two mm. for a small piece broken off at the apex.

Diaphorostoma perforatum, Whiteaves.

Plate 29, figs. 7, & 7*a*.

Diaphorostoma perforatum, Whiteaves.....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 52.

"Shell depressed turbinate, much wider than high; spire short, raised very little above the highest level of the outer whorl; base narrowly but deeply umbilicated. Whorls five, increasing rapidly in size, those of the spire flattened above and rounded below; the outer one rounded and ventricose, but depressed at the suture above; umbilical margin rounded and very indistinctly defined. Aperture rounded subovate, pointed above and slightly insinuated on the columellar side by the encroachment of the preceding whorl, wider and rounded below; lip thin and simple; characters of the columella not well shown in the only specimen collected.

"Surface marked with numerous close-set, nearly straight and very minute transverse raised lines, that are scarcely visible without the aid of a lens; also by a few larger and more distant impressed lines of growth.

"Middle rapid: one nearly perfect specimen, with the test preserved.

"This shell seems to be referable to the genus *Platyostoma*, Conrad (1842), but Lindström asserts that this name is preoccupied by Klein in 1753, by Meigen in 1803, and by L. Agassiz in 1829. For this reason Dr. Paul Fischer (in 1885) proposed to distinguish Conrad's genus by the name *Diaphorostoma*, though Lindström maintains that both *Platyostoma*, Conrad, and *Strophostylus*, Hall, are mere synonyms of *Platyceras*. Fischer explicitly states that the only difference between *Diaphorostoma* and *Strophostylus* is the obliquely folded columella of the latter, while Eastman, in the first volume of his translation of Zittel's "Text-book of Palæontology," quotes *Strophostylus*, Hall, as as synonym of *Platyostoma*, Conrad."

STROPHOSTYLUS AMPLUS, Whiteaves.

Plate 30, figs. 1, and 1 *a*.

Strophostylus amplus, Whiteaves.....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 53.

"Shell imperforate, subglobose, widely expanded and slightly depressed, about as wide as high, spire small and very short. Whorls four, increasing very rapidly in size, those of the spire rounded; the outer one moderately convex as viewed dorsally, expanded widely in the direction of its height, widest above the midheight and rather narrowly rounded at the base; suture distinctly impressed; aperture very large, apparently widely subovate; outer lip thin and simple; characters of the columella not well shown in either of the specimens collected; posterior portion of the outer lip extended considerably so as to embrace part of the preceding whorl.

"Surface marked with fine transverse striæ of growth, which are curved convexly forward parallel to the outer lip.

"Portage road at falls: three specimens, which do not show the exact shape of the aperture at all well. The interior of each is completely filled with stone, so that the inner edge of the columella is covered, but in one of the specimens there are indications of a flexuous longitudinal groove just behind the columella."

STROPHOSTYLUS INFLATUS, Whiteaves.

Plate 30, figs. 2 and 3.

Strophostylus inflatus, Whiteaves.....1904. Geol. Surv. Canada, Ann. Rep., vol XIV, pt. F, p. 53.

"Shell subglobose, naticoid, imperforate, about as wide as high, spire short. Whorls probably four in perfect specimens, though not more than three are preserved in the most perfect specimen collected, increasing rapidly in size, the outer one inflated and ventricose, most convex at about its midheight; aperture not well shown in the specimen described, but apparently subovate; outer lip thin and simple, its posterior portion apparently not so extended as to embrace part of the previous whorl.

"Surface marked with obliquely transverse lines of growth.

"Portage road at falls: a cast of the interior of the shell of a large specimen with small portions of the test preserved, from which the foregoing description was made, and two small specimens; also a large testiferous specimen (fig. 3) that is probably referable to this species, though its outer whorl is considerably compressed laterally."

STROPHOSTYLUS FILICINCTUS, Whiteaves.

Plate 30, figs. 4, 5 and 6.

Strophostylus filicinctus, Whiteaves.....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 54.

"Shell depressed turbinate and wider than high, spire rather short, less than half as high as the outer whorl, as viewed dorsally. Whorls six or perhaps seven, rounded but slightly flattened at the suture above, increasing rapidly in size, the outer one strongly inflated, ventricose and imperforate at the base. Aperture subcircular, lip thin and simple.

"Surface marked with extremely minute and close set, low, rounded, spiral raised lines, and by fine transverse striæ of growth. On the last volution but two of one specimen there are nineteen of these spiral raised lines, and four and a half in a millimetre. On the outer whorl of an apparently adult specimen, and near the aperture, there are three spiral raised lines to a mm.

"Portage road at falls: two specimens, with the minute surface markings well preserved. One of these (fig. 6) is a testiferous specimen with nearly the whole of the spire preserved, but with the outer whorl almost completely broken off; and the other (fig. 4) a cast of the interior of the last two whorls of the shell of an adult specimen, with a small piece of the test preserved, at and near the aperture. Beside these there are four specimens that are probably referable to this species, though none of them show any trace of the minute spiral lines upon the exterior of the test. Three of these are from the portage road at the falls, and one from the foot of the portage road.

"This species would seem to be congeneric with *Cyclonema cancellatum* of Lindström, from the Silurian rocks at Gotland, which Ulrich says is a *Strophostylus*."

CEPHALOPODA.

ENDOCERAS (or NANNO) sp. indet.

Portage road at falls: two fragments of siphuncles, or of a siphuncle, that are presumed to be referable to either *Endoceras* or *Nanno*, on account of their resemblance, in a general way, to specimens collected at Kingston Mills, Ont., in 1902, by Dr. R. W. Ells, Mr. W. A. Johnston, and the writer.

ACTINOCERAS KEEWATINENSE, Whiteaves.

Plate 30, figs. 7 & 8.

Upper rapid: two distorted fragments.

Kionoceras cancellatum, Hall. (Sp.)

Orthoceras cancellatum, Hall.... . .....1852. Pal. N. York, vol. II, p. 292, pl. 63, figs. 1, & 4 *a*, *b*; and pl. 65, figs. 4 *a*, *b*.

Orthoceras columnare, Hall.....1860. Rep. Progr. Geol. Surv. Wiscons., p. 4; & (1867) Twentieth Rep. N.Y. St. Mus. Nat. Hist., p. 351; but not *O. columnare*, Marklin, 1857.

Orthoceras Scammoni, *O. Hoyii*, *O. lincolatum*, & *O. irregulare*, McChesney.....1861. Descr. New Foss. Pal. Rocks of the Western States, pp. 92-94; teste Hall.

Orthoceras Woodworthii, McChesney.....1865. Idem., pl. 7, fig. 7; teste Hall.

Orthoceras Cadmus, Billings .....1866. Cat. Silur. Foss. Anticosti, &c., p. 83.

Orthoceras angulatum, Hall .....1867. Twentieth Rep. N.Y. St. Mus. Nat. Hist., p. 353, pl. 19 (10), figs. 10 & 11; but not *O. angulatum*, Wahlenberg, 1821.

Orthoceras virgatum, Hall.....1867. Op. cit., p. 353; but not *O. virgatum*, Sowerby, 1839.

Orthoceras subcancellatum, Hall.....1877. Miller's Amer. Pal. Foss., First Ed., p. 245.

Orthoceras orus, Hall..... .....1877. Idem., p. 245.

Kionoceras cancellatum, Whiteaves.....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 55.

" Portage road at falls, two fragmentary specimens, the largest less than two inches in length; and middle rapid, two similar fragments; all of which seem to be referable to this species. Each of these specimens is a portion of a longicone orthoceratite, with a circular transverse section, a central or nearly central siphuncle, and marked with narrow longitudinal ridges, separated by wider grooves or intervals, with minute, close-set, transverse, raised lines between them. Specimens with similar external characters have been found in the Niagara and Guelph formations at three localities in Ontario and Quebec. These are the *Orthoceras Cadmus*, of Billings, from Grimsby and Elora; a specimen from Elora that the writer has referred to *O. Scammoni;* and a specimen from L'Anse à la Barbe, near Port Daniel, in the Baie des Chaleurs, in the Museum of the Survey, labelled *O. virgatum* by E. Billings.

" *O. Cadmus*, *O. subcancellatum* and *O. orus* are names that have been given to this shell on the assumption that Hall's *Orthoceras cancellatum* is not the same as the *Orthoceratites cancellatus* of Eichwald. Billings, in a paper entitled 'New Species of Fossils from the Clinton and Niagara formations' and published with his 'Catalogues of the Silurian Fossils of the Island of Anticosti', says that his *O. Cadmus* appears to be *O. cancellatum*, Hall, not Eichwald. And in the explanation of fig. 11, of Plate 19 (10) of the Twentieth Regent's Report, Hall says that the character of the surface of impressions of the exterior of specimens from Wisconsin

and Illinois that he figures and refers to *O. angulatum* and *O. virgatum*, is 'precisely like that of *O. cancellatum*, Hall, from the Niagara group of New York, and differs in no essential particular from the minute surface markings of *O. columnare*.' But Dr. Foord has shown that Eichwald's *Orthoceratites cancellatus* is an *Endoceras*, and the specific name *cancellatum* does not appear to be preoccupied in *Orthoceras*, and certainly is not in *Kionoceras*. And if it be objected that 'once a synonym always a synonym', then the next specific name to be selected would seem to be *K.* or (*O.*) *Scammoni*, if Hall's *O. cancellatum* is not the same as the *O. canaliculatum* of Sowerby."

ORTHOCERAS, sp. indet.

Apparently brevicone; longitudinally ridged, ridges unequal in size and irregular in distribution.

Portage road at falls: a fragment that is not sufficiently long to shew conclusively whether it formed part of a brevicone orthoceratite or not.

ORTHOCERAS EKWANENSE, Whiteaves.

Plate 33, figs. 1 & 1 *a*.

Orthoceras Ekwanense, Whiteaves .....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 56.

"Shell increasing rather rapidly in thickness, compressed, elliptical in cross section; surface of the test smooth; septa very close together; siphuncle apparently central, though the internal structure is badly preserved in the only specimen collected.

"Portage road at falls: one specimen, a little over two inches in length, and nearly two inches in its longer diameter at the larger end. Perhaps a *Rizoceras*, which is possibly an inadvertent spelling of *Rhizoceras*."

PHRAGMOCERAS LINEOLATUM, Whiteaves.

Plate 34, figs. 1, 1*a*, 2 & 3.

Phragmoceras lineolatum, Whiteaves.....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 57.

"Shell, or cast of the interior of the shell, apparently essentially similar to that of *P. Nestor*, as described and figured by Hall, in general shape and in that of its aperture, but with the exterior of the test marked with very numerous, closely and regularly disposed, minute transverse impressed lines, that give to the surface a minutely ribbed appearance, under a lens.

"Middle rapid, a cast of the interior of a large body chamber (figs. 1 & 1 *a*); foot of portage road, one good specimen and three fragments;

portage road, at falls, two good specimens (figs. 2 & 3) and one fragment; and upper rapid, a large but imperfect cast of the body chamber and of nine or ten of the chambers between the septa.

"The type of *P. Nestor* is a mere cast of the interior of the shell, with no indications of the surface markings of the test, and in *P. Nestor*, var. *Canadense*, there are remains of rather coarse longitudinal ribs."

CRUSTACEA.

OSTRACODA.

ISOCHILINA or LEPERDITIA, sp. indet.

Upper rapid: a rather large right valve about twelve millimetres long, but with only its interior exposed.

TRILOBITA.

ILLÆNUS, sp. indet.

Middle rapid, one pygidium; foot of portage road, three glabellæ and four pygidia; and portage road at falls; one pygidium. The dorsal furrows of these three glabellæ are well defined, but the shape and position of the eyes, or ocular lobes, are not well shewn in either.

BRONTEUS EKWANENSIS, Whiteaves.

Plate 42, fig. 1.

Bronteus Ekwanensis, Whiteaves.....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 58.

"Pygidium very large, attaining to a length of a little more than four inches and a little longer than wide, longitudinally and broadly subelliptical but truncated anteriorly, its posterior end being rather narrowly rounded and its lateral margin nearly straight on each side anterior to the midlength. Axis moderately convex, inversely subtriangular, longer than wide, with an obtuse apex, occupying more than one-third but less than one-fourth of the entire length of the pygidium and marked with a transverse groove near its anterior margin. Pleural region most prominent at and near the midlength of each of the pleural ribs, decreasing abruptly in convexity outward to the lateral margins of the pygidium, but much more gradually so to its posterior margin; marked by fifteen large flattened convex radiating ribs, with narrow grooves between them; each rib being narrow at and near the axis and wider at some distance from it, though all the ribs fade out at a short distance from the margin and before reaching it. The median rib is shallowly bifurcate posteriorly.

"Surface apparently smooth. Cephalon and thoracic segments unknown.

"Lower rapid, one imperfect pygidium; middle rapid, the largest and most perfect pygidium collected (fig. 1); and foot of portage road, one imperfect pygidium and two fragments."

Bronteus aquilonaris, Whiteaves.

Plate 42, fig. 2.

Bronteus aquilonaris, Whiteaves.....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 58.

"Pygidium of medium size, apparently not exceeding an inch and a half in width, transversely subelliptical and much wider than long, with an almost flat but slightly convex axis, and still flatter pleural region. Axis short, inversely subtriangular, with an obtuse apex and somewhat concave sides, nearly twice as wide as long, almost smooth but marked with one transverse furrow near the anterior margin; median rib a little wider than any of the lateral ribs and bifurcate posteriorly; lateral ribs seven on each side, straight and flattened convex, all of the ribs fading out before reaching the margin.

"Surface apparently smooth. Cephalon and thoracic segments unknown.

"Portage road at falls, three pygidia, each with the axis imperfect; and foot of portage road, one pygidium with the axis well preserved (fig. 2).

"*Bronteus Niagarensis*, Hall, from the Niagara limestone of Ontario, has a much larger pygidium, with the midrib entire and contracted at its midlength, while the lateral ribs are wider and flexuous. *B. acamas*, Hall, from 'limestone of the Niagara group at Wisconsin' and Ontario (which S. A. Miller says is a synonym of *B. occasus* of Winchell and Marcy) has a much larger and more pointed pygidium, with an 'entirely simple' and undivided midrib. *B. insularis* of Billings, from the Anticosti group of Anticosti, is a diminutive species with a pygidium less than half an inch wide and wider than large; while *B. Pompilius*, Billings, from the Silurian (Upper Silurian) rocks at Port Daniel, has a small pygidium with a 'longitudinal median lobe in the axis.'"

Ceraurus Tarquinius, Billings (Sp.).

Cheirurus Tarquinius, Billings.....1863. Proc. Portland Nat. Hist. Soc., vol. I, p. 121, fig. 22.

Portage road at falls, and foot of portage road. At each of these localities two heads were collected, which seem to be essentially similar to the types of *C. Tarquinius*, from Port Daniel, in the Museum of the Sur-

vey, though the characters of the posterior angles of the cephalon of that species are still unknown. In the Ekwan River specimens, the eyes are opposite the second lobe of the glabella, the cheeks are coarsely punctured, and each of the posterior angles of the cephalon ends in a short spine.

E. Billings adopted the name *Cheirurus* in preference to *Ceraurus* for the Canadian species of that genus, and in a list of Lower Silurian fossils in the Geology of Canada (1863) gives 1815 as the date of publication of *Cheirurus*, Beyrich. But, Salter, in his Monograph of the British Silurian Trilobites, and the United States palæontologists, give 1832 as the date of publication of *Ceraurus* by Green, and 1845 as that of *Cheirurus* by Beyrich, and consequently use the former of these names.

In the second part of the third volume of the Final Report on the Geological and Natural History Survey of Minnesota, Dr. J. M. Clarke places *C. Tarquinius* in the same group, or section of the genus, as *C. pleurexanthemus*. But it seems to the writer that the pygidium of a Port Daniel specimen of *C. Tarquinius* is essentially similar to that of *C. Niagarensis* or *C. insignis*, and that it is very different from that of *C. pleurexanthemus*.

A. 3.—FROM SUTTON MILL LAKES.

From the cliff of limestone on the small island in the northern lake. Collected by Mr. D. B. Dowling in 1901.

ANTHOZOA.

Tetracoralla.

Zaphrentis Stokesi, Edwards and Haime.

Four specimens (Lambe).

Hexacoralla.

Favosites Hisingeri, Edwards & Haime.

One specimen (Lambe).

POLYZOA.

Phænopora Keewatinensis, Whiteaves.

Plate 24, figs. 6 & 6 *a*.

Phœnopora Keewatinensis, Whiteaves.....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 40.

"Zoarium bifoliate, branching, consisting of a thin, flattened frond, which is six millimetres wide on an average, but ten mm. wide at a bifur-

cation, and which bifurcates at intervals of about eleven mm. Zoœcia rhombic, a little longer than wide, seven in two millimetres measuring lengthwise, and eight to eight and a half measuring transversely, divided by thin, straight longitudinal partitions, which form their sides and separate them into longitudinal rows. Apertures of the zoœcia obliquely oval.

"Surface marked by arching striæ, which curve convexly forward."

One specimen.

"In regard to this specimen, M. Bassler writes as follows. 'It is a *Phœnopora* closely allied to several Clinton species, but I should regard it as new. In zoœcial structure it is very close to *P. multifida*, Hall, and especially to *P. fimbriata*, James. *P. multifida* has a different zoœcial growth, and slightly larger zoœcia. *P. fimbriata* has about the same zoœcial measurements, but the growth of the zoarium is quite different.'

"Seven other species of *Phœnopora* are known to occur in the Cambro-Silurian and Silurian rocks of Canada. These are: *P. incipiens*, Ulrich, from the Trenton limestone of Montreal; *P. constellata* and *P. explanata*, Hall, also *P. punctata*, Nicholson & Hinde, from the Clinton of Ontario; *P. ensiformis*, Hall, from the Clinton and Niagara formations of Ontario; and *P. excellens* (*Ptilodictya excellens*, Billings) & *P. superba* (*Ptilodictya superba*, Billings) from the Anticosti group of that island."

BRACHIOPODA.

Strophedonta (Brachyprion) sp. indet.

Surface marked with very fine, equal, radiating raised lines.

Three very imperfect specimens.

Camarotæchia Ekwanensis, Whiteaves.

Two specimens, that are probably referable to this species, though the ribs seem to be more rounded, perhaps because the test is exfoliated.

CRUSTACEA.

Trilobita.

Calymene Niagarensis? Hall.

Calymene Niagarensis, Hall .. ..1843. Geol. Rep. Fourth Distr. N.Y., p. 102; and (1852) Pal. N. York, vol. II, p. 307, pl. 67, figs. 11 and 12.

Calymene Blumenbachii, Billings (pars) .... 1863 and 1866. The specimens from the Niagara and Guelph formations of Ontario, and from the Anticosti group of Anticosti, referred to under that name in the Geol. Canada, and Cat. Silur. Foss. Anticosti.

An imperfect head that is probably referable to this species, though it shews little more than a cast of the glabella, which is proportionately wider in front than that of average examples of *C. Niagarensis* from the Anticosti group of Anticosti. The Canadian Calymenes that E. Billings identified with *C. Blumenbachii* are now usually referred to four species, viz., *C. senaria*, Conrad, from the Trenton limestone; *C. callicephala*, Green, from the Hudson River group; *C. Niagarensis*, Hall, from the Niagara, Guelph and Lower Helderberg formations, and from the Anticosti group; and *C. platys*, Green, from the Corniferous limestone.

ENCRINURUS, sp. indet.

One pygidium. The axis of this pygidium is long and slender, with sixteen or seventeen annulations, each of the six anterior ones being minutely tuberculated. There are nine lateral ribs on each side, without any tubercles.

A. 4.—FROM THE WINISK RIVER.

COLLECTED BY MR. W. MCINNES in 1903.

ANTHOZOA.

TETRACORALLA.

STREPTELASMA, sp. indet.

A small slab of limestone, with two specimens in longitudinal and one corallum in transverse section, on its worn and exposed surface. These sections shew only the general shape, which is straight and conical with an obtuse base, and some of the septa, with a few of the dissepiments between them.

From an exposure thirty one miles above the mouth of the river.

HEXACORALLA.

FAVOSITES GOTHLANDICUS, Lamarck.

From the same exposure as the preceding species, two small colonies, on the same piece of limestone; and from an exposure thirty four miles from the mouth of the river, one specimen.

BRACHIOPODA.

TRIMERELLA, sp. indet.

Two worn casts of the interior of pedicle valves, which shew only the general shape, and obscure casts of the platform vaults or umbonal chambers.

From loose blocks at or near the mouth of the river.

STROPHEODONTA (BRACHYPRION) NIAGARENSIS?

(Winchell & Marcy.)

Cfr. *Strophomena niagarensis*, Winchell & Marcy. 1865. Mem. Boston Soc. Nat. Hist., vol. I, p. 92, pl. 2, fig. 9.

Strophodonta profunda, (pars) Hall. 1867. Twentieth Ann. Rep. Reg. Univ. St. N. York, p. 369. pl. 13 (4), figs. 3 and 4.

Two very immature, detached valves of a strophomenoid shell, that correspond very well in all but size, with the descriptions and figures of the exterior of this species. The more perfect of the two, a small ventral valve, is moderately convex, wider than long, and its cardinal angles are produced. Its surface markings consist of fine radiating raised lines, with from two to six still smaller ones between each pair of the larger ones. The characters of the interior are not shewn in either. Both of them are from loose pieces at or near the mouth of the river.

One good sized and fairly well preserved specimen, collected at an exposure ten miles above the mouth of the river, has been kindly compared with typical western specimens of *S. Niagarensis*, by Mr. C. Schuchert. These western shells, Mr. Schuchert thinks, are "more convex, and their larger striæ more prominent, causing the intermediate areas with the finer striæ to be more depressed," but these may be only local peculiarities. At the same locality three other Strophomenoids were collected, which may prove to be varieties of *S. Niagarensis*, but which do not shew the characters of the hinge area, or of the interior of either valve. One is a small ventral, with very fine and equal radiating striæ. The other two are medium sized detached valves that are moderately convex, or tumid, gibbous and geniculate, at about the midlength, wider than long, with the cardinal angles slightly produced, and the front margin nasute. Their surface markings consist of minute, fasciculate, radiating raised lines, with minute punctures between them. According to Mr. Schuchert, *S. Niagarensis* is "closely related to *Strophomena imbrex*, Pander, variety, as identified by Lindström from the Silurian of Gotland," and E. Billings has recognized and recorded *S. imbrex* as occurring in the Hudson River formation at Cape Robert, Anticosti.

A concave dorsal valve from an exposure thirty-one miles above the mouth of the river, may also be referable to *S. Niagarensis*, though it shews only the general shape, and the surface markings of the exterior, but neither the hinge area, dentition, nor any of the characters of the interior.

LEPTÆNA RHOMBOIDALIS, Wilckens (Sp).

Three very small but characteristic specimens in a small loose block of limestone, picked up at or near the mouth of the river.

A full synonymy of American specimens of this widely distributed species, with references, is given on page 240 of Mr. Charles Schuchert's "Synopsis of American Fossil Brachiopoda," published at Washington, in 1897, as Bulletin No. 87 of the United States Geological Survey.

ORTHIS, sp. indet.

From an exposure ten miles above the mouth of the river; a cast of the interior of a ventral valve of a coarse-ribbed species.

CAMAROTŒCHIA (?) WINISKENSIS (N. Sp.)

Plate 25, figs. 5 & 6.

Shell compressed, broadly rounded in front, obtusely angular behind, the larger specimens somewhat pentagonal in marginal outline and a little wider than long, the smaller ones ovately subcircular or widely subovate, and a little longer than wide; front margin of the valves shallowly sinuate.

Ventral valve with a rather obscurely defined shallow median depression, that is obsolete or undeveloped in young specimens, marginal in older ones, and that extends backward to a little beyond the midlength in full grown ones; a nearly straight, rather prominent or produced umbo, and an acute and very slightly incurved beak.

Dorsal valve (of apparently not quite mature individuals) uniformly compressed convex and moderately inflated, its umbo and beak much smaller than those of the ventral.

Surface of both valves marked with numerous, closely disposed and very narrow radiating ribs, with fine grooves between them. In the largest specimen collected, a detached ventral valve some fifteen millimetres wide by twelve mm. and a half long, there are six ribs in the sinus, and fourteen or fifteen on each side.

Hinge area and characters of the interior of the valves unknown.

The foregoing description is based upon three detached ventral valves, that are a little wider than long, and upon two smaller specimens, with both valves, that are a little longer than wide, all from an exposure thirty-four miles above the mouth of the river; but one small specimen from an exposure ten miles above the mouth of the river, is also probably referable to this species.

CAMAROTŒCHIA (?) COALESCENS. (N. Sp.)

Plate 25, fig. 7.

Shell very small, moderately convex, subovate in marginal outline and a little longer than wide, with a shallow sinus or depression at and near

the front margin of the ventral valve, and a corresponding fold in the dorsal.

Umbo of the ventral valve moderately prominent or produced, its beak slightly incurved; umbo and beak of the dorsal much less prominent and smaller.

Surface marked with low, rounded radiating ribs, that are wider than the narrow grooves between them. In the most typical specimens there are four ribs in the sinus of the ventral and eight on each side, with a corresponding number on the dorsal; but in others there are as many as five or six on the fold of the dorsal, and eleven or possibly twelve on each side. In the sinus of the ventral and on the fold of the dorsal two ribs often coalesce near the front margin, a circumstance which has suggested the foregoing specific name.

Hinge area and characters of the interior of the valves unknown.

Dimensions of a typical and perfect ventral valve: maximum height, seven millimetres and a half; greatest width, six mm. and a half.

A few specimens, mostly single valves or portions of valves, on a small piece of limestone from an exposure twenty-four miles above the mouth of the river. One of these specimens, however, is apparently a ventral valve of a very small specimen of *C. Winiskensis*.

Spirifer, sp. indet.

From loose pieces of limestone at or near the mouth of the river: a cast of the interior of the ventral valve of a small specimen, not more than eight millimetres in width, of a *Spirifer*, with a narrow mesial sinus,

Glassia variabilis, Whiteaves.

Plate 26, figs. 3, 4 and 5.

Glassia variabilis, Whiteaves.....1904. Geol. Surv. Canada, Ann. Rep., vol. XIV, pt. F, p. 42.

"Shell very small, strongly compressed and lenticular in outline in transverse section, or moderately convex and varying in marginal outline from nearly circular and sometimes a little wider than long to subovate and a little longer than wide.

"Ventral valve with the front margin either nearly straight and devoid of sinus, or faintly sinuated, or provided with a rather wide but not distinctly defined, shallowly concave but not very deep, mesial sinus, that extends backward to about the midlength. Umbo of the ventral valve small, narrow and not very prominent or produced, its beak slightly incurved and apparently perforate.

"Dorsal valve with the umbo and beak smaller than those of the ventral.

"Surface apparently smooth.

"Spiralia directed toward the dorsal side (Schuchert); jugum, muscular impressions, and hinge dentition unknown.

"Dimensions of a typical and average specimen (from the Winisk River): maximum length, slightly over eight millimetres; greatest width, eight mm. and a half; maximum thickness, four mm.

"Two small loose blocks of limestone from or near the mouth of the Winisk River, collected by Mr. W. McInnes in 1903, are almost exclusively composed of nearly perfect shells of this species, many of which have the spiralia, or internal spiral cones, preserved. Some of the best of these specimens have been examined by Mr. Charles Schuchert, who writes as follows in regard to them in a letter dated March 9, 1904. The spiral cones in the Winisk shell are directed toward the dorsal side, but I cannot see the jugum. For the present I would refer it to *Glassia*. In external characters it is very near to *G. subovata* (Sowerby) but the difference in the spiralia will distinguish them, as the latter has the cones inwardly or medially directed. This difference is certainly of specific value, but for the present I should not regard it as of generic importance, as different genera of the Atrypidæ have the spiralia directed either laterally, medially or dorsally."

MOLLUSCA.

Gasteropoda.

Euomphalus, sp. indet.

A cast of the interior of a specimen of a closely coiled *Euomphalus*, that is perhaps conspecific with a similar cast from the lower rapid of the Ekwan. From an exposure thirty four miles above the mouth of the river.

A cast of the interior of the shell of a species of *Euomphalus* or "*Phanerotinus*", was collected at an exposure ten miles above the mouth of the river. This cast shews little more than that the spire is depressed, and that the whorls, which are flattened above and rounded below, are slender and separate, though spirally coiled. Two smaller but otherwise similar casts were collected by Mr. Low in 1886 at Limestone Rapid on the Fawn River.

Trochonema, sp. indet.

An imperfect cast of the interior of a shell, with a flattened biangular periphery,—that seems to be referable to this genus. From loose pieces of limestone at or near the mouth of the river.

LOXONEMA, sp. indet.

An imperfect cast of the interior of the shell of a rather large species of this genus. From an exposure ten miles above the mouth of the river.

CEPHALOPODA.

ACTINOCERAS KEEWATINENSE, Whiteaves.

A cast of the interior of four chambers of a siphuncle, that is apparently part of a specimen of this species, the types of which are from the Attawapiskat River. The original description of these types is reprinted on page 246 ante, and two of them are figured on Plate 30, figs. 7 and 8.

From loose pieces of limestone at or near the mouth of the river.

CYRTOCERAS, sp. indet.

A badly preserved cast of the interior of the shell of a small, slender and slightly compressed species of this genus. From an exposure thirty-one miles above the mouth of the river.

CRUSTACEA.

TRILOBITA.

BRONTEUS, sp. indet.

A portion of a diminutive cephalon, and a small and imperfect pygidium, on a small loose piece of limestone at or near the mouth of the river.

ENCRINURUS, sp. indet.

A very small pygidium, about three mm. wide and a little more than two long, with only the inner surface exposed. There are three small circular pits, corresponding to as many small tubercles on the exterior, on each of the pleuræ. Also from a small loose piece of limestone picked up at or near the mouth of the river.

A worn cast of the interior of a pygidium of a species of *Encrinurus* was found at an exposure thirty-four miles from the mouth of the river.

A 5. FROM "LIMESTONE RAPID", FAWN RIVER, OR BRANCH OF THE SEVERN.

COLLECTED BY MR. A. P. LOW IN 1886.

The rocks at this locality are described on pages 15F & 18F of Mr. Low's "Preliminary Report on an Exploration of the Country between Lake Winnipeg and Hudson Bay", published in the Annual Report of this Survey

for 1886, New Series, volume II. In that publication it is stated that "the limestones of the Severn and Fawn rivers, as roughly determined from the fossils collected, are not older than the Galena, and may be as new as the Niagara, more investigation is, however, required to fix their precise horizon." Later, in 1899,in an Address by the writer before Section E. of the American Association for the Advancement of Science at Columbus, Ohio, these rocks were stated to be possibly of Devonian age, on the evidence in them of a fragment that was inadvertently referred to *Sphærospongia tessellata*. But, it has since been clear that this fragment is part of a specimen of a species of *Receptaculites*, and that the fossils at Limestone Rapid are of the same age as those already enumerated or described from the Attawapiskat and Ekwan rivers.

SPONGIÆ.

Receptaculites, sp. indet.

A fragment which has been inadvertently and erroneously recorded as part of a specimen of *Sphærospongia tessellata*, in "Contributions to Canadian Palæontology", vol. I, p. 259, as well as in the Address at Columbus,—though its plates are clearly square, whereas most of those of *Sphærospongia* are distinctly hexagonal.

ANTHOZOA.

Hexacoralla.

Favosites Gothlandicus, Lamarck.

Several specimens (Lambe).

Alveolites Niagarensis, Rominger.

Alveolites Niagarensis, Rominger. 1876. Geol. Surv. Mich., Fossil Corals, p. 39, pl. 16, figs. 1 & 2; but not *A. Niagarensis*. Nicholson, 1875, which is apparently not a true *Alveolites*.

" " Lambe. 1899. Contr. Canad. Palæont., vol. III, pt. 2, p. 23.

One specimen (Lambe).

HYDROZOA.

Stromatoporidæ, genus and species uncertain.

One specimen.

ECHINODERMATA.

Crinoidea, genus and species uncertain.

Portions of small annulated columns.

BRACHIOPODA.

Orthis.

An imperfect ventral valve of a very small, rather coarsely ribbed and probably undescribed species of *Orthis*, allied to *O. Davidsoni*; and two fragments of a larger and more finely ribbed species.

Glassia variabilis, Whiteaves.

Plate 26, figs. 7, 8 and 9.

Thirteen specimens, which are probably referable to this species. Three of these are figured on Plate 26. See also page 273 ante.

Rhynchospira Lowi. (N. Sp.)

Plate 25, figs. 8 and 9.

Shell small, somewhat compressed, subcircular and a little wider than long or subovate and longer than wide, but always pointed more or less obtusely behind; surface of both valves radiately ribbed.

Ventral valve rather more convex than the dorsal, its umbo rather obtuse, or not very prominent or produced, and its beak truncated and perforate, the perforation being rather large and circular, or nearly circular, in outline. In the median line there is a slightly greater distance between the two ribs that bound it than between any of the others, but there is no distinct mesial sinus in the ventral valve, nor fold upon the dorsal.

Dorsal valve with an obscure, narrow, longitudinal median depression in the umbonal region, and a small, slightly incurved, and imperforate beak.

Surface of both valves marked with from about ten to sixteen simple or bifurcating, subangular radiating ribs.

Characters of the interior of the valves unknown.

Approximate dimensions of the largest and most perfect specimen known to the writer: length, seven millimetres; greatest width, eight mm.

A few specimens, on two small thin and nearly flat pieces of limestone.

This little shell seems to differ from *Rhynchospira formosa*, (the *Trematospira formosa* of Hall,)* from the Lower Helderberg rocks of the State

* Palæontology of the State of New York, vol. III, pt. 1 (1859) p. 215; and pt. 2 (1861) pl. 36, figs. 2*a-t*; & pl. 95 A, figs. 7–11.

of New York, principally in its very diminutive size, though it may prove to be only a local or stratigraphical variety of that species. *Rhynchospira Electra* (the *Retzia Electra* of E. Billings)* from the Silurian rocks of Maine, has a much more nearly pentagonal contour, and apparently more inflated valves.

MOLLUSCA.

GASTEROPODA.

LOPHOSPIRA, sp. indet.

Two very imperfect and badly preserved casts of the interior of the shell of specimens of a species of this genus. As previously stated, on page 246, a similar cast was collected at Rainy Island, on the Attawapiskat River, by Dr. R. Bell, in 1886.

EUOMPHALUS, or STRAPAROLLUS, sp. indet.

Two imperfect casts.

CEPHALOPODA.

Only two specimens of cephalopoda were collected at this locality. One of these is an obscure fragment of an orthoceratite; and the other a piece of a rather large, slightly curved, subcylindrical siphuncle, with faint, oblique and rather distant constrictions.

B. FROM MANITOBA.

B. 1.—FROM STONEWALL.

COLLECTED BY T. C. WESTON IN 1884, by D. R. DOWLING IN 1891 AND 1902, AND BY J. B. TYRRELL AND W. H. ROBSON in 1897.

ANTHOZOA.

TETRACORALLA.

APHYLLOSTYLUS GRACILIS, Whiteaves.

Plate 24, figs. 1 and 1 *a*.

Aphyllostylus gracilis, Whiteaves..... .....1904. Ottawa Naturalist, vol. XVIII, no. 6, p. 113.

The original descriptions of this genus and species are as follows :—

* Proceedings of the Portland Natural History Society (1863) vol. I, p. 114, pl. 3, fig. 11.

"APHYLLOSTYLUS, gen. nov.

"Corallum consisting of slender, contiguous, subcylindrical corallites, that are circular or nearly circular in transverse section, and that seem to have formed part of a compound, branched, fasciculate, ascending and somewhat spreading colony, essentially as in *Pycnostylus*. Surface markings of the exterior of the corallites unknown.

"The structure of the interior of the corallites consists of conspicuous transverse tabulæ, and of numerous, very minute, spiniform septa. The tabulæ, though irregular in their disposition and in their distances apart, are for the most part complete and continuous. The spiniform septa consist of both longitudinal and transverse rows of close-set, very short, straight and inwardly directed, minute spinules, not very unlike those of a Silurian Favosite, but much smaller and shorter. Where the tabulæ are comparatively far apart, the longitudinal arrangement of the rows of spinules is very obvious, and there are from four to seven spinules in each longitudinal row, between two of the tabulæ. But, in places where the tabulæ are close together, the transverse arrangement of the rows of spinules is more apparent, and there are either one or two transverse rows of spinules between two tabulæ.

"The general shape of the corallites in this genus, their mode of growth and their internal tabulæ, appear to be essentially similar to those of *Pycnostylus*, but in the latter the septa are marginal, well developed, and consist of thin, continuous, longitudinal ridges.

"*Pycnostylus* seems to be most nearly related to *Amplexus*, which is usually referred to the Zaphrentidæ, and it may be that *Aphyllostylus* should also be included in that family.

"APHYLLOSTYLUS GRACILIS, sp. nov.

"Corallites slender, averaging about two or three millimetres in diameter; septal spinules very minute, scarcely visible to the naked eye.

"This genus and species are based upon fragments of colonies, in six small pieces of limestone of Silurian (Upper Silurian) age, from Stonewall, about thirty-one miles west of East Selkirk, collected by J. B. Tyrrell in 1897. Each of these pieces of limestone shows both longitudinal and transverse sections of a few contiguous corallites, upon one or more of its recently broken surfaces. The internal structure of most of these corallites is well preserved, but their mode of branching is nowhere very clearly seen. Two or three similar specimens had previously been collected by the writer in 1888 from loose masses of limestone on the banks of the Fairford River, about six or seven miles below the Hudson Bay post at Fairford, Manitoba."

Hexacoralla.

Favosites Gothlandicus, Lamarck.

Common.

Favosites asper, d'Orbigny.

Favosites alveolaris, Lonsdale..... ....1839. Murchison's Silur. Syst., p. 681, pl. 15 bis, figs. 1, 1*a*, 1*b*, and 2, 2*a*.
Favosites aspera, d' Orbigny.....1850. Prodr. de Paleont, vol. I, p. 49.
" " Milne-Edwards & Haime.1851. Polyp. Foss. Terr. Palæoz., p. 234; and (1855) Brit. Foss. Corals, p. 257, pl. 60, figs. 3 and 3 *a*.
" " McCoy..... .1855. Brit. Palæoz. Foss., p. 20.
Favosites prolificus, Billings.....1865. Canad. Natur., Second Series, vol. II, p. 429; and (1866) Cat. Silur. Foss. Anticosti, p. 6.
Favosites capax (?) Billings.....1866. Cat. Silur. Foss. Anticosti, p. 6.
Favosites Niagarensis, Rominger (non Hall). 1876. Geol. Surv. Michigan, Fossil Corals, p. 22, pl. 5, fig. 1.
Favosites aspera, Lebedeff... .....1892. Obersilurische Fauna des Timan, p. 8, pl. I, figs. 1, *a*, *b*, *c*.
Favosites prolificus, Whiteaves .....1895. This volume, pt. II, p. 113.
Favosites aspera, Lambe .... 1899. Contr. Canad. Palæont., vol. IV, pt. 1, p. 4, pl. 1, fig. 2.

Apparently the most abundant and characteristic fossil at this locality.

BRACHIOPODA.

The inarticulate brachiopoda in the collections from this locality are represented by a cast of the interior of a valve of a small *Dinobolus*, apparently allied to, or possibly identical with, the *D. Conradi* of Hall. The articulata are represented by several, very badly preserved valves of a small shell that may be referable to *Plectambonites*, or *Leptæna*.

MOLLUSCA.

Gasteropoda.

The gasteropoda collected at this locality are all imperfect casts of the interior of the shell, that can not be satisfactorily identified specifically, and in one case not even generically. At least three genera are represented, viz., *Lophospira*, *Trochonema*, and perhaps *Straparollus*.

Cephalopoda.

Spyroceras meridionale. (N. Sp.)

Plate 30, fig. 9.

Shell longicone, slender, slightly curved and somewhat compressed, the outline of a transverse section near the larger end being broadly elliptical and not very far from circular.

Test unknown: surface of the cast of the interior marked with straight, narrow, annular, transverse ribs, that are rather close together at and near the smaller or posterior end, but comparatively distant at and towards the larger, anterior end. At and near the smaller end the ribs are about one millimetre apart at their summits, but at the larger end they are about four mm. apart, and much narrower than the rather shallow grooves between them.

Septation, and shape and position of the siphuncle unknown.

The only specimen known to the writer, which was collected by Mr. Dowling in 1902, is about sixty-five mm. in length. It is seven mm. in diameter at the smaller end, and sixteen and a half at the larger.

Tripleuroceras Robsoni, Whiteaves.

Plates 31 & 32. The only figure in each.

Tripleuroceras Robsoni, Whiteaves.....1898. Ottawa Naturalist, vol. XII, no. 6, p. 123.

Original description: "Shell large, robust, longicone, straight and increasing very slowly in breath and thickness, flattened in the broad siphonal and presumably ventral region, but rounded and much narrower at the sides: characters of the antisiphonal side and nature of the surface markings unknown. Sutures of the septa broadly and concavely arched on the venter, nearly straight where they pass over the sides; the three or four next to the body chamber closer together than those which immediately precede them. Siphuncle marginal, presumably ventral, large, expanded between the septa and apparently nummuloidal.

"Three imperfect and badly preserved casts of the interior of shells of this species, from Stonewall, Manitoba, were presented to the Museum of the Survey in the fall of 1897, two by Mr. W. H. Robson, of Lethbridge, Alberta, and one by Mr. Donald Gunn, of Stonewall. The whole of the antisiphonal and presumably dorsal region of each of these specimens is buried in a very hard dolomitic limestone, so that it is doubtful whether they are referable to Hyatt's genus or not. The two presented by Mr. Robson are septate throughout, and the larger one" which is figured on

Plate 32, "has a nearly cylindrical, septate but possibly adventitious object, like a cast of the interior of the shell of a small *Orthoceras*, some two inches in length and fully half an inch in thickness, exposed in the middle of its siphuncle posteriorly. The one presented by Mr. Gunn" which is figured on Plate 31, "has a considerable portion of the ventral side of the body chamber preserved but the lateral margin on both sides is very imperfect.

"The species seems to differ from the "*Orthoceras (Actinoceras) Beloitense*" of Whitfield,* from the Trenton limestone of Wisconsin, which it resembles in some respects, in its more flattened venter, more concavely arched septa in the ventral region, and in its proportionately larger and apparently nummuloidal siphuncle."

But, in regard to the siphuncle of *T. Robsoni*, it would have been better to say, that its exact shape, size and relative position are not at all clearly shewn in the few specimens yet collected, though it seems to have been marginal and enlarged between the septa.

Cyrtoceras (?) cuneatum. (N. Sp.)

Shell widely arcuate, strongly but rather obliquely compressed, very narrow on the periphery or venter, much wider but narrowly rounded on the dorsum, the outline of the transverse section being ovate cuneate, and the lateral diameter to the dorso-ventral about as three to five.

Septa averaging about six millimetres apart laterally, the sutural lines being shallowly concave on both sides and produced into a narrow pointed saddle on the venter. Siphuncle and test unknown.

The specimen upon which the foregoing description is based is a cast of the interior of part of the septate portion of the shell. It is evidently not a true *Cyrtoceras*, but a probably new generic type, which there is not yet sufficient material to define satisfactorily.

Trochoceras insigne, Whiteaves.

Plate 41. The only figure.

Trochoceras insigne, Whiteaves.....1898. Ottawa Naturalist, vol. XII, p. 124.

Original description. "Shell, or rather cast of the interior of the shell, rather large and attaining to a maximum diameter of fully five inches, dextral and consisting of two slender, closely contiguous volutions that are coiled on very nearly the same plane, and slightly compressed both above and below, so that the outline of a transverse section of the outer volution would be broadly elliptical, with the dorso-ventral diameter a little greater

* Geology of Wisconsin, Vol. IV, p. 226, pl. 8, fig. 1; & pl. 10, figs. 9 & 10.

than the lateral. Surface of the test unknown, that of the cast marked by large, transverse rib-like plications, which are moderately prominent on each of the sides, but obsolete on the periphery or venter,—and by very small, acute, thread-like spiral ridges. The transverse plications are rather distant, slightly flexuous and somewhat sigmoidal on each side of the outer volution, where they are separated by wide and shallowly concave depressions. The small spiral ridges are numerous, comparatively close together, though not very regularly disposed, and in one specimen, at least, rather larger and more prominent on the periphery of the outer volution than on its sides. Sutures of the septa concavely arched on both of the sides, where each suture intersects one, or rarely two, of the transverse plications. Shape and position of the siphuncle unknown.

"The first specimen of this shell that the writer had seen was given to the late Chief Justice Wallbridge by a quarryman at Stonewall and presented to the Museum of the Survey by Prof. E. J. Chapman in 1895. The exact locality from which this specimen was obtained was for a long time doubtful, but there is now every reason for believing that it came from the quarries at Stonewall. At any rate, in the fall of 1897, two specimens, which are known to have been collected at Stonewall, were presented to the Museum, one by Mr. John Gunn, and the other by Mr. W. H. Robson. At the same time, also, Mr. Tyrrell obtained a characteristic fragment of a specimen of this species, *in situ*, at the Stonewall quarries. By far the most perfect of the specimens yet received is the one presented by Mr. Gunn, and figured on Plate 41. It has two entire volutions preserved, which are gyroceran rather than nautilian in their mode of coiling, but very slightly asymmetrical. The inner volution is openly coiled, the apex or initial point being widely eccentric, and there is a large central perforation about an inch and a quarter in diameter.

"These specimens seem to indicate a previously undescribed species, which is here referred provisionally to *Trochoceras* rather than to *Lituites*, until the shape and relative position of its siphuncle be ascertained, when it may have to be transferred to *Plectoceras*, *Peismoceras* or *Discoceras*. It differs from *Lituites Bickmoreanus*, Whitfield (from the Niagara limestone of Indiana) which Hyatt says is a *Plectoceras*, in its more openly coiled inner volution, in its broadly elliptical and not subquadrate cross section, and in its closer transverse plications, which are quite obsolete on the periphery. Professor Whitfield, who has kindly compared two of the best specimens from Stonewall with the types of his species, thinks that the two forms are quite distinct.

B. 2.—FROM DAVIS POINT, LAKE MANITOBA.

COLLECTED BY J. B. TYRRELL AND J. F. WHITEAVES IN 1888.

The section at this locality is thus described on pages 195 and 196E of Mr. Tyrrell's "Report on North-western Manitoba, with portions of Assiniboia and Saskatchewan," in the Annual Report, New Series, Vol. V, pt. 1, of this Survey for 1890–91. Mr. Tyrrell's Report is dated 1892, but the volume of which it forms part is dated 1893.

"North west of the head of the Fairfield River the shore of the lake is generally low, and it is not till the vicinity of Davis Point is reached that the Silurian again makes its appearance. At the southern end of this low exposure, a thin and even-bedded dolomitic limestone crops out of the bank near the water's edge, and many slabs of the same rock are scattered over the shore. No fossils were found in it, but it is doubtless the same band as is exposed at Fairford.

"At the north end of the exposure, and apparently overlying the last mentioned rock is a layer of very thick-bedded limestone, also slightly dolomitic. It is yellow, hard and tough, but not compact like the last, being largely composed of the debris of Stromatoporoids and corals. It weathers white, with a very rough surface." And it is from this upper layer that the following species of fossils were collected.

ANTHOZOA.

TETRACORALLA.

ZAPHRENTIS STOKESI, Edwards & Haime.

One specimen, which Mr. Lambe thinks is most probably referable to this species.

PYCNOSTYLUS GUELPHENSIS, Whiteaves.

Apparently common at this locality, though only a few specimens were collected.

HEXACORALLA.

FAVOSITES GOTHLANDICUS, Lamarck.

Apparently also common at this locality.

HYDROZOA.

(*Clathrodictyon ostiolatum*, Nicholson, and *C. vesiculosum*, Nicholson and Murie, are quoted by Mr. Tyrrell as having been collected at Davis Point

in 1888, on the authority of the late Professor H. A. Nicholson, who, in a letter to the present writer, received June 24, 1889, says that he can "pretty certainly identify" both of these species in the specimens forwarded to him from that locality. But, it is to be noted that Nicholson has nowhere quoted Manitoba as a locality for either of these species, in any of his subsequent publications; and that no specimen of any Stromatoporoid from Davis Point in the Museum of the Survey is labelled with either of these names by him.)

C. FROM THE NORTH-EAST SHORE OF LAKE WINNIPEGOSIS.

COLLECTED BY MR. J. B. TYRRELL IN 1889.

The rocks from which these fossils were collected are described on 153-158E of Mr. Tyrrell's "Report on North-western Manitoba, with portions of Assiniboia and Saskatchewan," published by this Survey.

ANTHOZOA.

HEXACORALLA.

ALVEOLITES LABECHEI, Milne Edwards & Haime.

Alveolites Labechei, Milne Edwards & Haime. 1851. Polyp. Foss. Terr. Palæoz., p. 257; & (1855) Brit. Foss. Corals, p. 262, pl. 61, figs. 6, 6 *a*, & 6 *b*.
" " Billings.....1866. Cat. Silur. Foss. Anticosti, p. 33.
" " Lambe.....1899. Contr. Canad. Palæont., vol. IV, pt. 1, p. 21.

East shore, north of Birch Island: one specimen that is "thought to belong to this species." (Lambe).

BRACHIOPODA.

STROPHEODONTA ACANTHOPTERA, Whiteaves. (Sp.).

Plate 24, figs. 8 and 9.

Strophomena acanthoptera, Whiteaves.....1891. Canad. Rec. Sci., vol. IV, p. 294, pl. 3, figs. 1 and 2.
Stropheodonta acanthoptera, Schuchert.....1897. Synops. Amer. Foss. Brachiopoda, p. 419.

Original description of Strophomena acanthoptera. "Shell varying in outline from broadly semicircular or semioval and regularly rounded in front, to subtrigonal with the front margin produced and somewhat pointed in the centre,—but always broadest at the cardinal margin, which is produced on each side into a long, very slender and slightly curved spine;

length of each cardinal spine a little more than one half of the greatest breadth of either valve without the spines. Ventral valve regularly convex from beak to front, though the nasute forms are most prominent anteriorly along the median line; umbonal region compressed; beak small and raised very little above the general level of the hinge line; area transversely elongated and very narrow in the direction of its height, with a small equilateral foramen in the centre. Dorsal valve concave, with a perfectly straight cardinal margin, an extremely minute beak and a hinge area much narrower than that of the ventral.

"Surface marked by numerous, but comparatively distant and, for the most part simple, radiating raised lines, which increase by intercalation and alternate at unequal distances with from one to five (or perhaps more) shorter and much smaller ones, the whole being crossed by extremely minute and close set concentric striations, and by a few more or less distant lines of growth. Characters of the interior unknown.

"Collected at several localities on the northern portion of the east shore of Lake Winnipegosis, in the district of Saskatchewan and in the adjacent part of the Province of Manitoba by Mr. J. B. Tyrrell in 1889, (but previously found loose in this vicinity by Mr. D. B. Dowling in 1888,) also on the shores and islands of Cedar Lake, and on the Saskatchewan below Cedar Lake, by Mr. J. B. Tyrrell in 1890. At each of these localities it is apparently abundant and often associated with *Isochilina grandis*, var. *latimarginata*, Jones.

"The specimens consist either of natural moulds of the exterior of the shell or of casts of the interior, in a compact fine grained dolomite, and in no case is there any vestige of the actual test remaining. In several of these natural moulds, however, the minutest details of the surface ornamentation are well preserved, and it is from wax impressions made from two of these moulds that the figures" on Plate 24 were drawn.

"The species is apparently most nearly allied to the *Strophomena Leda* of Billings,* from division 3 of the Anticosti group of the Island of Anticosti (which Mr. Billings correlates with the Llandovery of England and with the Clinton of the State of New York), but seems to differ therefrom in its much larger size, and in the greater proportionate length of its cardinal spines. Both it and *S. Leda* are evidently what Professor H. S. Williams† would call 'geological mutations' of the 'race which began in *Strophomena alternata* in the Trenton stage,' but they form a marked exception to his statement that in the American race of the *S. alternata* type, the slender mucronate points at the terminations of the hinge line first appear in the Tully limestone."

*Geological Survey of Canada, Palæozoic Fossils, vol. I, 1865, p. 120, figs. 98 and 99.

†See his paper on "The Cuboides Zone and its Fauna," in Bull. Geol. Soc. America, publishe d May, 1890.

Two other species of brachiopoda are represented in the collections made by Mr. Tyrrell at some of the exposures on the north-east shore of Lake Winnipegosis, or on the islands adjacent thereto. These are:—three very imperfect specimens of a shell like a small *Athyris*; and a few casts of the interior, or moulds of the exterior, of the valves of a small *Camarotœchia*.

MOLLUSCA.

Pelecypoda.

Pterinea occidentalis. (N. Sp.)

Plate 28, figs. 1, 2 and 3.

Shell small, always longer than high, and in some specimens considerably elongated, the main body of each valve in the shorter specimens being compressed convex, while that of the longer ones is strongly and obliquely convex; right valve almost if not quite as convex as the left; anterior wing more abruptly inflected than the posterior.

Anterior side short and consisting usually of a well defined lobe-like wing, that is straight above and rounded obliquely below; posterior side longer and much wider in the direction of its height than the anterior, its lower and non-alate portion broadly rounded at the base, the extremity of its upper and alate portion subtruncate almost vertically in some specimens, and obliquely so in others, the cardinal margin behind the beaks being proportionately longer in some specimens than in others. Hinge line straight and ascending from the anterior to the posterior end, but apparently not very far from horizontal in some specimens; umbones moderately prominent, beaks small, appressed and placed near the anterior end. Surface marked with numerous, regularly disposed and close-set impressed lines.

Hinge dentition and muscular impressions unknown.

Abundant at an exposure on the north-west point of Ami Island, near the north-east shore of Lake Winnipegosis, where most of the specimens are compressed convex and moderately elongated. One of these is represented by figure 1, on Plate 28. Abundant also on the weathered surfaces of small, thin slabs of limestone at the Grand Rapids of the Saskatchewan River, below Old Portage, where the specimens are strongly convex and much elongated. One of these is represented by figure 2 on the same Plate. At both of these localities, the specimens collected are for the most part casts of the interior of the left valve, but a few have either the whole or a part of the test preserved. The testiferous left valve represented by figure 3 on Plate 28, is exposed on the weathered surface of a small slab of limestone (apparently loose) from Swan Lake, at

the head of Shoal River, Manitoba, collected by Mr. Tyrrell in 1889. This valve is associated with several characteristic specimens of *Stropheodonta acanthoptera*.

The specimens from Ami Island and the Saskatchewan upon which this species is based, are those that were referred to *Pterinea aviculoidea*, with a query, in the provisional lists of fossils that accompany Mr. Tyrrell's report. But it has since been apparent that they differ materially from the Wisconsin specimens of that species, as figured by Whitfield, (1) in their different marginal outline, (2) in their more prominent umbones, and (3) in their proportionately larger anterior wing.

Ilionia (?) parvula. (N. Sp.)

Plate 28, figs. 6, 7 and 8.

Shell small, compressed, narrowly and ovately subelliptical, nearly twice as long as high. Anterior side narrowly rounded; posterior side more pointed but not much longer than the anterior; beak small, low, incurved, and placed not far from the midlength.

Surface closely and concentrically ribbed.

Hinge dentition and muscular impressions unknown.

Ami Island, one left valve; and Long Point, two right valves; all of which are figured of the natural size.

This little shell may prove to be only a small form, or perhaps a mere local variety of the *Ilionia (?) costulata*, from the Guelph formation of Ontario, which is described and figured in the first part of this volume. *I. parvula*, however, seems to be uniformly smaller than *I. costulata*, and the beak of the former is placed nearer the midlength. Both of these shells are only provisionally referred to *Ilionia*. They are probably indicative of a new generic type, which there is not yet sufficient material to define satisfactorily.

Gasteropoda.

The gasteropoda in the collections made by Mr. Tyrrell on the northeastern side of Lake Winnipegosis are imperfect and indeterminable casts of the interior, or moulds of the exterior, of the shell of two species of *Murchisonia*, and of one species each of *Pleurotomaria* and *Straparollus*.

CRUSTACEA.

Ostracoda.

Isochilina grandis, var. latimarginata, Jones.

Isochilina grandis, var. *latimarginata*, Jones. 1891. Contr. Canad. Micro-Palæont., pt. III, p. 78, pl. 10, figs. 1, a, b, c; 2, a, b, c; and 3, 4.

Long Point, Lake Winnipegosis, several specimens; also at two localities on the Lower Saskatchewan.

LEPERDITIA HISINGERI, Schmidt.

Leperditia Hisingeri (Schmidt) Jones..... 1891. Contr. Canad. Micro-Palæont., pt. III, p. 82 (which see for the synonymy of European examples of this species) pl. 13, figs. 1 and 9.

Long Point, Lake Winnipegosis: several specimens.

LEPERDITIA HISINGERI, var. FABULINA, Jones.

Leperditia Hisingeri, var. *fabulina*, Jones. 1891. Contr. Canad. Micro-Palæont., pt. III, p. 82, pl. 10, figs. 5 and 7; and pl. 13, figs. 3, 5, and 6.

Long Point, Lake Winnipegosis; and Grand Rapids, Saskatchewan River.

LEPERDITIA HISINGERI, var. GIBBERA, Jones.

Leperditia Hisingeri, var. *gibbera* Jones.....1891. Op. cit. supra, p. 82, pl. 13, fig. 4.

Long Point, Lake Winnipegosis: one left valve.

LEPERDITIA MARGINATA, Schmidt.

Leperditia marginata, Schmidt.....1873. Mém. Academ. Imp. Sci. St.-Pétersbourg, Ser. 7, vol. XXI, No. 2, p. 19, figs. 29-31; and (1883) vol. XXXI, p. 18, pl. 1, figs. 13-19.

" " Jones..... .1891. Contr. Canad. Micro-Palæont., pt. III., p. 86, pl. 10, figs. 6, a, b. and c.

Long Point, Lake Winnipegosis: one specimen.

TRILOBITA.

ACIDASPIS PERARMATA, Whiteaves.

Plate 42, fig. 3.

Acidaspis perarmata, Whiteaves..... ....1891. Canad. Rec. Sc., vol. IV, p. 300, pl. 3, fig. 6.

"Body depressed, very slightly convex, its general outline, apart from the marginal spines, longitudinally subelliptical and a little longer than broad.

"Head about twice as broad as long, occupying one third of the total length, exclusive of the spines on the pygidium: its front margin broadly subtruncate, nearly straight but faintly sinuous and very obscurely three lobed, with a slight indentation on each side of the glabella immediately in front of the anterior termination of each of the ocular ridges: its posterior margin much more distinctly flexuous and curved backward in the centre with a moderately convex curve, and forward with a shallowly con-

cave curve, on each side. Eyes small, placed very near the posterior margin of the head and opposite the most contracted portion of each of the free cheeks: ocular ridges moderately prominent, slightly curved and converging obliquely forward from the eyes to their terminations near the frontal margin, where they are about twice as close together as at their commencement anteriorly. Characters of the glabella unknown. Outer margin of each of the free cheeks somewhat expanded anteriorly and forming a not very prominent rounded lobe, which is armed with eight very short pointed spines—slightly contracted behind the midlength and terminating posteriorly in a straight and pointed genal spine, which is a little shorter than that of the pleura of the first abdominal segment, and diverges outward and backward at an angle of 40° to a line that might be drawn at a right angle to the longitudinal axis.

"Thorax arched upon the axis, depressed and flattened on the pleuræ: composed of nine segments: axis occupying more than one third of the entire breadth without the spines, and narrowing very gradually to the posterior end: its annulations horizontal, subparallel and nearly straight, but faintly sinuous at their margins, both in front and behind. Pleuræ also decreasing very gradually in breadth to the posterior end of the thorax, nearly straight and terminating externally on each side in a long and very slender spine, which is bent backward and outward at an angle of about 57°. The spines increase gradually in length posteriorly, the two spines on the anterior thoracic segment being shorter than the pleuræ from which they proceed, and nearly equal in length to the genal spines immediately in front of them, whereas in the posterior thoracic segment the pleural spines are nearly three times as long as the pleuræ and as the spines on the pleuræ of the anterior thoracic segment.

"Pygidium broad and short, its outer margin broadly rounded and fringed with spines, its inner or anterior margin almost straight and nearly three times as broad as the length of the non-spinose portion along the median line; its axis moderately convex and its pleuræ flat. Axis narrowly rounded posteriorly and terminating just within the margin of the pygidium, apparently bearing two transverse annulations, the posterior unarmed and the anterior bearing a long and very slender primary spine on each of its rounded postero-lateral angles. These primary spines, whose length considerably exceeds that of the united pygidium and thorax, diverge for the greater part of their length at an angle of about 48°, but curve slightly inward at their outer ends. Outer margin of the pygidium armed with four secondary internal spines between the two primaries, and with five secondary external spines on each side of the latter. The four secondary internal spines are moderately close together, nearly equal in length and about one fourth as long as the primaries. The five outer

secondary spines on each side are much closer together than the four inner ones and not more than one-half as long.

"Surface markings unknown.

"Long Point, at the north east angle of Lake Winnipegosis, just outside of the northern boundary of Manitoba, J. B. Tyrrell, 1890: a single and not very well preserved cast of the interior of the dorsal or upper side, in a compact and slightly vesicular dolomite. Although the surface markings are not even faintly indicated, and the characters of the glabella and some of those of the central portion of the thorax are unknown, the whole of the marginal outline of the specimen can be ascertained with considerable accuracy.

"In the elucidation of its characters the writer has been materially assisted by Mr. L. M. Lambe.

"The species appears to be of the type of the *A. Prevostii* of Barrande,* from the Upper Silurian rocks (Etage E.) of Bohemia, but it has a smaller number of short spines on the lateral margins of the two free cheeks, a proportionately broader axis to the thorax, much longer primary spines on the pygidium, and differs from that species in several other particulars."

D.—FROM THE LOWER SASKATCHEWAN.

COLLECTED BY MR. J. B. TYRRELL IN 1889 AND 1890, AND BY MR. D. B. DOWLING IN 1891.

The rocks from which these fossils were collected are described on pages 144-153E of Mr. Tyrrell's Report on North-western Manitoba, etc., already referred to as published by this Survey.

ANTHOZOA.

TETRACORALLA.

PETRAIA (PYGMÆA ? VAR.) OCCIDENTALIS.

Plate 24, figs. 2, 3, 4 and 5.

Cfr. *Petraia pygmæa*, Billings..... .....1862. Geol. Surv. Canada, Palæoz. Foss., vol. I, p. 103, fig. 91; and (1866) Cat. Silur. Foss. Anticosti, p. 33.
" " Nicholson..... ... ..1875. Palæont. Ont., p. 59.
" " Lambe .....1900. Contr. Canad. Palæont., vol. IV, pt. II, p. 106, pl. 6, figs. 6, 6 *a*, and 6 *b*.

* Système Silurien du Centre de la Bohème, Prague et Paris, tome I, 1852, p. 739, pl. 39, figs. 33-41.

Corallum similar to the typical form of *P. pygmœa*, in internal structure and external shape, but apparently always a little larger. The specimens from the Saskatchewan average about ten millimetres in height and occasionally attain to a still larger size, while Anticosti specimens of *P. pygmœa* average only six mm. in height and are not known to exceed ten.

Saskatchewan River, tramway at Grand Rapids, J. B. Tyrrell, 1890 : several specimens, on the weathered surfaces of small pieces of limestone.

Hexacoralla.

Favosites Gothlandicus, Lamarck.

Saskatchewan River, at Roche Rouge, Cross Lake Rapids, and Chemahawin, J. B. Tyrrell, 1890 : a few specimens from each of these localities (Lambe).

Favosites asper, d'Orbigny.

Saskatchewan River, at Roche Rouge, J. B. Tyrrell, 1890 ; and in the *Pentamerus* beds at the Grand Rapids, D. B. Dowling, 1891 ; a few specimens from each of these localities (Lambe).

Alveolites Niagarensis, Rominger.

Specimens, which Mr. Lambe has identified with this species, were collected at Grand Rapids, Roche Rouge, Cross Lake Rapids and Chemahawin, by Mr. Tyrrell in 1890 ; and at the Grand Rapids by Mr. Dowling in 1891.

Halysites catenularia, L.

Saskatchewan River : at the the foot of Grand Rapids ; at Cross Lake Rapids ; at Old Fort Island, Cedar Lake ; on the west shore of Cedar Lake ; and at Chemahawin. At each of these localities specimens were collected by Mr. Tyrrell in 1890.

Halysites compactus, Rominger.

Halysites compactus, Rominger ....1876. Geol. Surv. Mich., Fossil Corals, p. 78, pl. 29, fig. 3.
" " Whiteaves..... .....1884. This volume, pt. I, p. 2.
Halysites agglomeratus, var. *compactus*, Whiteaves.... .....1895. Idem. pt. II, p. 48.
Halysites compacta, Lambe..... ....1899. Contr. Canad. Palæont., vol. IV, pt. I, p. 71, pl. 4, figs. 5, 5 *a*, 6, 7, 8 and 8 *a*.

Saskatchewan River, foot of Grand Rapids, J. B. Tyrrell, 1890 : one specimen (Lambe).

OCTOCORALLA.

LYELLIA AFFINIS, Billings. (Sp.)

Heliolites affinis, Billings.....1865. Canad. Nat., N.S., vol. II, p. 427; and (1866) Cat. Silur. Foss. Anticosti, pp. 5 and 30, fig. 12.
Lyellia papillata, Rominger..... ... 1876. Geol. Surv. Mich., Fossil Corals, p. 15, pl. 2, fig. 3.
" Tyrrell.... ....1892. Geol. Surv. Canada, Rep. N.W. Manitoba, etc., pt. E, pp. 147, 148, and 150.
Lyellia affinis, Lambe.....1899. Contr. Canad. Palæont., vol. IV, pt. 1, p. 84, pl. 5, figs. 1 and 1 *a*.
Propora affinis, Kiær.....1903. Rev. der Mittelsilurischen Helioliti-den, etc., Christiania Videnskabs-Selskabet Skritter. 1. Math. naturv. Klasse, No. 10.

Saskatchewan River; at the foot of Grand Rapids; at the tramway at Grand Rapids; at Roche Rouge and Cross Lake Rapids; J. B. Tyrrell, 1890; and at Grand Rapids, D. B. Dowling, 1891. A few specimens from each of these localities (Lambe).

BRACHIOPODA.

STROPHEODONTA ACANTHOPTERA, Whiteaves. (Sp.)

Saskatchewan River: at the foot of Grand Rapids; at Roche Rouge; at Old Fort Island, Cedar Lake; on the west side of Cedar Lake; below Cedar Lake; and at Chemahawin; J. B. Tyrrell, 1890. Abundant at each of these localities.

LEPTÆNA RHOMBOIDALIS (Wilckens).

Saskatchewan River, at Chemahawin, J. B. Tyrrell, 1890: one ventral valve.

ORTHIS, sp. indet.

Saskatchewan River, at the foot of Grand Rapids, J. B. Tyrrell, 1890: an imperfect small dorsal valve, with extremely narrow ribs, which bifurcate near the anterior margin.

CONCHIDIUM DECUSSATUM, Whiteaves. (Sp.)

Plate 26, figs. 1 and 2.

Pentamerus decussatus, Whiteaves .....1891. Canad. Rec. Sc., vol. IV, p. 295, pl. 3, figs. 3 and 4.
Conchidium decussatum, Hall & Clarke.....1894. Pal. N. York, vol. VIII, pt. 2, p. 235, pl. 65, figs. 1 and 2; and pl. 66, fig. 15.

Original description of Pentamerus decussatus. "Shell large, usually longitudinally and rather narrowly subovate, about one third longer than broad, and broadest a little in advance of the mid-length, but sometimes nearly as broad as long; front margin regularly rounded in most specimens, but somewhat pointed in the centre in others. Ventral valve strongly convex, very tumid, prominent, and rounded or obtusely angulated along the median line, and narrowing rapidly to the margin on both sides, but devoid of a distinctly defined mesial fold, its umbo prominent and rather broad, and its beak so strongly recurved as almost to touch that of the opposite valve. Fissure rather large, triangular, a little higher than broad, completely covered by the recurved beak and visible only when the beak is broken off. Dorsal valve much flatter than the ventral, gently and uniformly convex, or flattened with a faint longitudinal depression in the centre, its beak small, rather narrow and slightly incurved.

"Surface marked by very numerous, closely disposed, rounded and but slightly elevated radiating raised lines, which are crossed by smaller, more close set and irregularly disposed concentric raised lines, as well as by a few distant and more or less imbricating lines of growth. The radiating raised lines, which are rather irregular in their arrangement and unequal in size, increase so rapidly by division that as many as from sixty to one hundred or more of them can be counted around the front margin of an adult specimen, though, on account of its greater convexity, there is always a larger number on the ventral valve than on the dorsal.

"Septum of the ventral valve well developed, comparatively thick but very short, occupying less than one fourth of the entire length in some specimens, but a little longer in others, though rarely or never exceeding one third of the total length. Septa of the dorsal valve thin, feebly developed and almost rudimentary, very slightly divergent and much shorter than the ventral septum. Muscular and vascular impressions unknown. Interior of the valves rather minutely papillose.

"Dimensions of the specimen figured: maximum length, eighty-seven millimetres, greatest breadth, fifty nine mm.; maximum height or depth through the closed valves, fifty-two mm.; amount of recurvature of beak of ventral valve, sixteen mm.

"The only locality in which this species is known to the writer to have been certainly found *in place*, is in a light brownish yellow dolomitic limestone at the foot of the Grand Rapids of the Saskatchewan, where a number of fine specimens were collected by Mr. Tyrrell in 1890. Boulders containing it have been found at several localities in Manitoba, and elsewhere in the central portion of the Dominion. It is almost certainly the shell referred to by Sir John Richardson as a '*Pentamerus*, very like *P.*

Knightii,' which was gathered by Dr. Bigsby 'in 1823' on the Lake of the Woods and presented by him to the British Museum,* as specimens of the shell which I here call *P. decussatus* have since been collected from boulders on the south west shores of that lake by Dr. G. M. Dawson in 1873 and by Dr. A. C. Lawson in 1884. Other localities at which the species has been obtained from boulders are as follows :—Nelson River, about sixty miles above its mouth, Dr. R. Bell, 1879 ; Lower Fort Garry, Dr. R. Bell, 1880 ; Kenogami River, six miles above the mouth of the Bagutchewan, Dr. R. Bell, 1886. Mouth of the Fairford River and Steep Rock Island, Lake Manitoba, J. F. Whiteaves, 1888. North east side of Lake Winnipegosis and Red Deer River near its mouth, J. B. Tyrrell, 1889 ; Virden, Manitoba, C. N. Bell, 1889.

"In Appendix No. 1 to Franklin's 'Narrative of a Second Expedition to the Shores of the Polar Sea, in the years 1825, 1826 and 1827,' "Sir John Richardson says that 'Mr. Sowerby determined a shell, occurring in great abundance in the strata at Cumberland House' ..... 'to be the *Pentamerus Aylesfordii*,' which is regarded by Dr. Davidson as a synonym of *P. Knightii*. Although Cumberland House is 135 miles farther up the Saskatchewan than the locality at which Mr. Tyrrell obtained *P. decussatus* in place, it is by no means improbable that the specimens which Mr. Sowerby determined as *P. Knightii* are really referable to the present species. However this may be, it seems to the writer that *P. decussatus* differs materially from the true *P. Knightii*, especially in the following particulars. The umbo of the ventral valve of the former is narrower and less prominent, while its beak is much less strongly curved; the coarser surface markings of both valves do not consist of comparatively distant and irregular radiating ribs, as in *P. Knightii*, but of close set, irregularly disposed, unequal and not much elevated radiating raised lines ; and the mesial septa of both valves of *P. decussatus* are not more than half the comparative length of those of *P. Knightii*."

The fossil brachiopoda from the Saskatchewan River that were doubtfully and provisionally referred to *Rhynchonella altiplicata*, *Atrypa reticularis*, and *Trematospira formosa*, in Mr. Tyrrell's Report, are too imperfect to be satisfactorily determined.

MOLLUSCA.

PELECYPODA.

PTERINEA OCCIDENTALIS, Whiteaves.

Saskatchewan River, at Grand Rapids below Old Portage, J. B. Tyrrell, 1890 : the specimens referred to on page 287 *ante*, in connection with the original description of this species, which is figured on Plate 28.

*Journal of a Boat Voyage through Rupert's Land and the Arctic Sea, vol. I, foot note to page 62 ; and vol. II, p. 197.

Ilionia (?) parvula, Whiteaves.

Saskatchewan River, below Cedar Lake, J. B. Tyrrell, 1890: an imperfect cast of the interior of a single valve of a shell that seems to be referable to this species, as described on page 288 *ante*, and figured on Plate 28.

Gasteropoda.

Phanerotrema occidens, Hall. (Sp.)

Pleurotomaria labrosa, var. *occidens*, Hall..1864. Eighteenth Rep. Reg. Univ. St. N. York, p. 343.
Pleurotomaria occidens, Hall.....1867. Twentieth Rep. Reg. Univ. St. N. York, p. 364, pl. 15 (6), figs. 11 and 12.
Phanerotrema occidens, Ulrich and Scofield.1897. Geol. and Nat. Hist. Surv. Minn., Final Rep., vol. III, pt. II, p. 952.

Saskatchewan River, at Grand Rapids, below Old Portage, J. B. Tyrrell, 1890: a cast of the interior of a specimen that appears to be referable to this species.

In Mr. Tyrrell's collections from the Saskatchewan, there are, also, fragmentary and indeterminable specimens of several other species of gasteropoda, belonging apparently to the genera *Pleurotomaria*, *Murchisonia*, *Loxonema*, *Euomphalus*, and *Poleumita*.

Cephalopoda.

Spyroceras, sp. indet.

Longicone, slender, straight; test unknown, surface of the cast marked with nearly straight, transverse, annular ribs, and with minute, longitudinal and continuous, raised lines. Characters of the interior of the shell unknown.

Saskatchewan River, at Chemahawin, J. B. Tyrrell, 1890: a portion of a cast of the interior of the shell, nearly forty-five millimetres in length, by about thirteen mm. in width at the larger end.

In some respects this specimen is not unlike the type of *S. meridionale* from Stonewall, described on page 281 and figured on Plate 30 (fig. 9) of this volume, but the Stonewall shell is distinctly curved, and shews no traces of fine longitudinal raised lines.

Gomphoceras parvulum, Whiteaves.

Plate 35, figs. 2, 2 *a*, and 2 *b*.

Gomphoceras parvulum, Whiteaves.....1891. Canad. Rec. Sci., vol. IV, p. 298, pl. 3, figs. 5, and 5 *a*, *b*.

"Shell small, straight, slender, rather more than three times as long as broad, and broadest a little in advance of the midlength; sides slightly compressed, the outline of a transverse section near and at the commence-

ment of the body chamber being ovate : venter narrower than the dorsum and especially so at both ends; lateral outline conical, with the ventral border not much more convex than the dorsal. Septate portion occupying a little more than one-half the entire length, narrowly conical in lateral aspect, pointed posteriorly and about twice as long as it is broad anteriorly. Body chamber crenulated around the base, its outer margins at first nearly straight and almost parallel on both sides as viewed laterally, its anterior termination rounded but much more broadly so on the ventral side than on the dorsal; ventral region at the summit laterally compressed on each side of the aperture. Aperture, as viewed from above, extremely contracted, Y–shaped, with the stem about twice as long as either of the two branches, which diverge from it at an angle of about 115°. The stem is a narrow slit which expands at its outer termination into a narrow and longitudinally elliptical orifice, exactly in a line with the siphuncle, and the branches are similarly narrow divergent slits, each of which widens into a smaller and circular orifice externally.

"Surface markings consisting only, so far as known, of extremely fine transverse striations, which are too minute to be shown in the figure.

"Sutures slightly concave at the sides, closely approximated but rather nearer together posteriorly than anteriorly ; siphuncle marginal and placed in the median line of the venter.

"Approximate dimensions of an average specimen (the one figured) : entire length, thirty eight millimetres; length of the septate portion twenty one mm. ; greatest breadth, twelve mm.

"Grand Rapids of the Saskatchewan below Old Portage, J. B. Tyrrell, 1890 : a number of casts of the interior of the shell, in a pale brownish yellow or nearly white dolomitic limestone.

"A singular little species, apparently well characterized by its diminutive size, ovately conical, slender and nearly equilateral contour, as viewed laterally, and by its narrowly contracted and widely divergent Y–shaped aperture. It is not at all likely to be mistaken for any American species, and is perhaps most nearly related to the *G. clava* of Barrande,* young specimens of which have a very similar marginal outline. The aperture of *G. clava*, however, is regularly T-shaped at all stages of growth, and in the adult stage it seems to differ very widely from the present species, both in its dimensions and in its general contour."

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* Systême Silurièn du Centre de la Bohême, Prague et Paris, tome II, 1865, pl. 77, figs. 6-22, et pl. 92, figs. 10-13.

G. clava is from Etage E. of Bohemia, which is said to be the equivalent of the Lower Ludlow of England.

CRUSTACEA.

OSTRACODA.

ISOCHILINA GRANDIS, var. LATIMARGINATA, Jones.

Cedar Lake, at the north end of Mossy Portage, J. B. Tyrrell, 1889 (not 1890): two loose specimens.

Saskatchewan River: at the Grand Rapids below Old Portage, three specimens; below Cedar Lake, one specimen; at Cross Lake Rapids, one specimen; and at Roche Rouge, several specimens; all collected by J. B. Tyrrell in 1890.

LEPERDITIA HISINGERI, var. FABULINA, Jones.

Saskatchewan River, foot of Grand Rapids, J. B. Tyrrell, 1890: a right and a left valve.

LEPERDITIA HISINGERI, var. EGENA, Jones.

Leperditia Hisingeri, var. *egena*, Jones .....1891. Contr. Canad. Micro.-Palæont., pt. III, p. 82, pl. 12, fig. 8.

Saskatchewan River, at Grand Rapids below Old Portage, J. B. Tyrrell, 1890: a few specimens.

LEPERDITIA PHASEOLUS (Hisinger) Jones.

Leperditia phaseolus (Hisinger) Jones ... ..1891. Contr. Canad. Micro-Palæont., pt. III, p. 85, pl. 13, figs. 7 and 8.

Saskatchewan River, at Roche Rouge, J. B. Tyrrell, 1890: two right valves.

LEPERDITIA WHITEAVESII, Jones.

Leperditia Whiteavesii, Jones..... ...1891. Contr. Canad. Micro-Palæont., pt. III, p. 87, pl. 12, figs. 11, 12, 13, 14, and wood cut fig. 6.

Saskatchewan River: at Old Fort Island, Cedar Lake, one specimen; and at Chemahawin, eight specimens; all collected by Mr. J. B. Tyrrell in 1890.

LEPERDITIA CÆCA, Jones.

Leperditia cæca, Jones .....1891. Contr. Canad. Micro-Palæont., pt. III, p. 88, pl. 12, figs. 6, 7 and 9.

Saskatchewan River: at Grand Rapids below Old Portage, several specimens; and below Cedar Lake, three specimens; J. B. Tyrrell, 1890.

TRILOBITA.

The trilobites in Mr. Tyrrell's collection from the Saskatchewan are represented by a fragment of a rather large species of *Illænus*, from Chemahawin; and by an imperfect cast of the dorsal surface of the pygidium of an *Encrinurus*, from Roche Rouge.

PALÆOZOIC FOSSILS.

VOL. III.

6. *The Canadian species of Plectoceras and Barrandeoceras.*

By J. F. Whiteaves.

The genus *Plectoceras* was first described by Hyatt in 1883, on page 268 of his "Genera of Fossil Cephalopoda," published in the twenty-second volume of the Proceedings of the Boston Natural History Society. In that paper it is placed in the Family Tainoceratidæ, and is described as follows:—

"Plectoceras*, nobis, includes Silurian species having costæ curved posteriorly on the sides and crossing the abdomen as in *Trocholites* and sutures similar, but with ventral saddles. The whorls quadrate, the abdomens narrower than the dorsum and the sides convergent outwards. The siphons are ventral and holochoanoidal. The young are precisely similar in form, smoothness of the shell and striæ of growth, and in sutures to the straight sutured forms of *Trocholites*. Type, *Plect. (Naut.) Jason*, sp., Bill., Canad. Nat., vol. 4, 1859, p. 464, Mus. Geol. Surv. Can."

In the "Phylogeny of an Acquired Characteristic," published in 1894, in the thirty-second volume of the "Proceedings of the American Philosophical Society, pages 499 and 500, the genus, and three of its species are thus described.

"Plectoceras.

"This genus was described in *Genera of Fossil Cephalopods*, page 268, by the author, to include the costated forms similar to *Discoceras*, but having the siphuncle ventrad of the centre.

"The type was *Plectoceras (Naut.) Jason*, sp. Billings. The mode of coiling may be quite close and regular, with perhaps a slight impressed zone or flattened dorsum, or the coil may be open, and sometimes it is very irregular. In several specimens of *Jason* the first whorls may touch, the ephebic volution may be open and free and yet the extremity of the living chamber again come in contact. The umbilical perforation is large

* *Πλεκτός*, twisted or plaited.

and the impressed zone is absent until the whorls come in contact and it is invariably absent in gerontic whorls.

"The species are as follows :

"PLECTOCERAS JASON, sp. Billings. (*Canadian Nat.*, IV, p. 464).

"Type in Museum of Geological Survey at Ottawa. It occurs in the Calciferous * of the Mingan Islands and there are similar forms in the same horizon in Newfoundland.

"PLECTOCERAS OBSCURUM, n. s.

"This species occurs in the Black River fauna in New York, and is quite commonly mistaken for the young of *Eurystomites undatus*, but it has an open gyroceran spiral, the siphuncle is nearer the venter and the costæ are more highly developed and more prominent, and have a distinct character from those of that species.

"PLECTOCERAS BICKMOREANUS, sp. Whitfield (*Bull. Am. Mus.*, New York).

"This species of the Niagara fauna has an open gyroceran whorl, and in the gerontic stage the last whorl is free and in some specimens completely straightened out and lituitean in aspect."

Hyatt's latest views on Fossil Cephalopoda are embodied in the article on Cephalopoda in the first volume of Dr. C. E. Eastman's translation of Zittel's Text Book of Palæontology, published in 1900. In this article (p. 520) *Plectoceras* is made the type of a new family called Plectoceratidæ, and this family and the genera of which it is said to be composed are thus described.

"Family 6. PLECTOCERATIDÆ.

"Gyroceracones, nautilicones, and torticones having annular costæ from the neanic stage until late in life, and in some genera, more or less prominent longitudinal ridges, which usually disappear in the ephebic stage. Siphuncle ventrad of centre.

"*Plectoceras*, Hyatt. Ordovician and Silurian. *Sphyradoceras*, Hyatt (*Peismoceras*, *Systrophoceras*, Hyatt). Silurian and Devonian. The first is gyroceraconic, with some discoidal nautilicones, and the second is almost exclusively torticonic of the trochoceran type."

There appear to be at least three species of *Plectoceras* in Canada, as follows, though the generic position of the one last cited is still uncertain.

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* Mr. Billings, however, describes *Nautilus Jason* as a fossil of the "Chazy limestone." J. F. W.

(1.) Plectoceras Jason, Billings. (Sp.)

Plate 36, figs. 1 and 2.

Nautilus Jason, Billings..... .1859. Can. Nat. and Geol., vol. IV, p. 464.
Plectoceras Jason, Hyatt..... ....1883. Proc. Boston Soc. Nat. Hist., vol. XXII, p. 268; and (1894) Proc. Amer. Philos. Soc., vol. XXXII, p. 498.

Original description of Nautilus Jason. "Discoid, planorbiform, all the whorls exposed in the umbilicus. Section of shell broad oval, the ventral and dorsal sides being depressed convex, the other two sides rounded, the two diameters being to each other as fifteen to seventeen. The tube increases in diameter at such a rate as to give to the coil a diameter of three inches and a half on the completion of the second whorl, at which point the septa are two lines distant from each other in their centres, two and a half lines in the middle of the ventral side, and a little less than one and a half lines on the dorsal or inner side of the whorl. They become gradually more approximate as they approach the apex, so that where the tube is half an inch in diameter they are one line distant in their centres. They are only moderately convex, and their edges cross the ventral aspect in a straight line, but on the sides with a gentle curve towards the apex of the shell.

"The surface exhibits a series of rounded ridges which, starting from the umbilicus, curve backward, and make a deep rounded undulation toward the apex on the ventral aspect. The distance of the ridges from each other along the median ventral line is about five lines, and the intervening spaces are shallow and concave. The surface is also marked with obscure fine striæ, and smaller ridges all parallel with the larger.

"The siphuncle is from one and a half to two lines in diameter, cylindrical, not inflated, and distant about two lines from the outer margin.

"On comparing this species with the figures of *L. undatus* (Emmons) given in the Palæontology of New York, vol. 1, plate 13, we find that our best preserved specimen is exactly the size of figure 1; that the ventral aspect is not angular at the sides, nor do the ridges pass straight across, as shewn in fig. 1 *b*; and that in fig. 3 the septa are more than three lines distant in their centres instead of two lines, as they are in our specimens. The specimen represented on plate 13 *bis* has the septa three and a half lines nearly distant about the completion of the second whorl, while those next the chamber of occupation are more approximate, as they usually are in all the Nautilidæ. Our species therefore, although closely allied, is a distinct species from *L. undatus*.

"Locality and Formation.—Mingan Islands; Chazy limestone."

The foregoing description was evidently based upon three fine and remarkably well preserved specimens from Clear Water Point, in the

Museum of the Survey, the largest of which is fully four inches in its greatest diameter. One of these specimens still bears the original written label; "Mingan. Clear Water Point. L. 1859;" the L. of course meaning Logan. This is the locality referred to on page 134 of the "Geology of Canada" (1863) as the bay "above Clear Water Point," where the lowest part of the Chazy formation is said to be visible. A section of the rocks exposed at this locality is given, part of which is said to consist of twenty feet of "grey nodular limestone with *Columnaria parva*, *Stenopora adhærens*, *Fenestella incepta*, *Orthis piger*, *Strophomena incrassata*, *Ctenodonta nasuta*, *Nautilus Jason*, *Amphion Canadensis*, *Harpes antiquatus*, and *Illœnus globosus*." Clear Water Point is on the north shore of the Gulf of St. Lawrence, opposite to the Mingan Islands.

In the same Museum there are two other specimens of *Plectoceras Jason*. One of these is a large and imperfect but characteristic specimen, labelled as having been collected at St. Charles Island by J. Richardson in 1860; and the other, labelled only "Mingan."

(2.) Plectoceras Halli, Foord. (Sp.)

Plate 35, figs. 3, 4, and 4 *a*.

Inachus undatus (pars) Conrad.....1842. In Emmons' Geol. New York, pt. II, Surv. Second Geol. Distr., p. 394, no. 104, "fig. 2, edge view;" probably, though the figure is diagrammatical and apparently inaccurate.

Lituites undatus, (pars) Hall.....1847. Pal. N. York, vol. I, p. 52, pl. 13, figs. 1 *a* and 1 *b*.

" " (pars) Emmons.....1855. Amer. Geology, pt. II, p. 146, pl. 5, fig. 14 *a*; probably.

Cryptoceras undatum, Chapman.....1857. Canad. Journal, N.S., vol. II, No. X, p. 267; and Annals and Mag. Nat. Hist., Second Series, vol. 20, p. 107.

Lituites undatus, Billings.....1863. Geol. Canad., pp. 156 and 951.

Trocholites undatus, (pars) Hyatt.....1883. Proc. Boston Soc. Nat. Hist., vol. XXII, p. 267.

Trochoceras Halli, Foord.....1891. Cat. Fossil Cephalop. Brit. Mus., pt. II, p. 42, figs. 4 *a*, and 4 *b*.

Plectoceras obscurum, Hyatt.....1894. Proc. Amer. Philos. Soc., vol. XXXII, p. 445.

Plectoceras Halli, Whiteaves.....1903. Ottawa Naturalist, vol. XVII, p. 120.

This is the shell that Dr. Foord separated from the *Lituites undatus* of Hall in 1891, and described and figured under the name *Trochoceras Halli*. The specific characters of *T. Halli* are said to be as follows: "The shell, which is not complete, consists of two volutions; the asymmetry is slight, but quite discernible. The shell increases its diameter about three times in the last volution. The section is distinctly

subquadrate, the ventral side being the broadest, as well as being considerably flattened. The surface is ornamented with oblique, rounded, not very prominent annulations, divided by concave interspaces of about equal width. The annulations bend backward on the ventral side and there form a deep sinus; while on the dorsal or concave side, approaching the umbilicus, they become quite obsolete; the young shell is almost smooth. The entire surface of the test is covered with very fine transverse lines both on the ribs and the interspaces, and there are also obscure traces of longitudinal lines. The septa are a little more than 1 line apart, where the shell has a ventro-dorsal diameter of 6 lines. The siphuncle is not seen." The species is said to be represented in the British Museum collection by two specimens from the Black River limestone at Lorette, and the specimen figured is not much more than two inches in its maximum diameter. These specimens are obviously those that Dr. Bigsby collected at Indian Lorette in 1822, and that Salter referred to *Lituites undatus* in 1853.*

The specimen from Watertown, N.Y., that Hall figures under the name *Lituites undatus* and that Foord includes in his synonymy of *Trochoceras Halli*, is very little more than two inches and a quarter in its greatest diameter. It is No. $\frac{12581}{2}$ of the palæontological department of the New York State Museum at Albany, and has been kindly lent to the writer by Dr. John M. Clarke. It is obviously immature, as the earlier volution and part of the later one are smooth, the oblique rib-like folds, which are five in number on each side, being developed only on the outer portion of the last volution. The venter is flattened and unusually smooth, while the siphuncle is both marginal and ventral. It is most probable that this specimen is the original of the smaller figure of *Inachus undatus*, Conrad, in Emmons' report on the Geology of the Second District of the State of New York.

In 1898 Mr. T. C. Weston visited Lorette, on behalf of this Survey, and succeeded in collecting for its Museum a fine series of unusually large and well preserved specimens, that agree very well with Foord's descriptions of *Trochoceras Halli*, but that give some additional information in regard to its characters. These specimens have been described, and their generic and specific relations discussed in some detail, in two papers, the one entitled "Notes on some Canadian specimens of '*Lituites undatus*,' and the other "Additional Notes on some Canadian specimens of '*Lituites undatus*,'" published in the Ottawa Naturalist for October and December, 1903. The latest results of a study of these and other specimens are embodied in the foregoing synonymy. It is now obvious that the *Trochoceras Halli* of Foord is a *Plectoceras* closely allied to *P. Jason* (Billings) but apparently

* In the Quarterly Journal of the Geological Society of London, vol. IX, p. 86.

distinct thereform, and that it is both generically and specifically identical with the subsequently described *Plectoceras obscurum* of Hyatt.

The latter conclusion is based upon a direct comparison of the specimens of *P. Halli*, collected by Mr. Weston, with the types of *P. obscurum* in the Museum of Comparative Zoology at Cambridge, Mass., kindly lent to the writer by Dr. W. Y. M. Woodworth, in 1903. As elsewhere stated,* the types of *P. obscurum* are three in number, one a comparatively perfect specimen from the Black River limestone at Watertown, N.Y., marked 2077 ; and the others, two fragments from Watertown, each marked 2078. The specimen marked 2077 has nearly the whole of one side worn away, but the other side shews the general shape of the shell and its surface markings very well. It is about three inches and a half in its maximum diameter and consists of two entire whorls. The inner whorls, if there were any, are not preserved. Both sides of the specimen shew that the whorls are at first so closely coiled that the inner half of the outer whorl is in close contact with the one that immediately precedes it, but that its outer half is free and slightly uncoiled. At the anterior end of the shell, the outer whorl is about seventeen millimetres apart from that which immediately precedes it. And it would seem to be the body chamber, which occupies rather less than one half of the outer whorl, that is free and separate. The surface markings are precisely similar to those of the fine specimens of *P. Halli* collected by Mr. Weston at Lorette. On the worn side all the septa but the last are obliterated, and the shape and position of the siphuncle are not at all clearly shewn. A label, in Hyatt's hand writing, however, states that the siphuncle is " marginal and ventral," as it is known to be in *P. Halli.* The two fragments marked 2078 shew neither the external form of the shell, the outline of the transverse section, nor any of the surface markings. One of these is a little more than about one-third of the outer whorl of a specimen which has been worn down in such a manner as to shew a longitudinal section of the body chamber and of the last five septa, which latter average from five to five and a half millimetres in their greatest distance apart. The other shews scarcely anything, except that the venter is much flattened.

Adult or presumably adult specimens of *P. Halli* average about three inches and a quarter in their maximum diameter, and appear to be always smaller than full grown individuals of *P. Jason.* The former, too, are more closely coiled, the rib-like folds on the outer volution are more numerous and much narrower proportionately, while the siphuncle is quite marginal. The characters of the external aperture are well shewn in some of the specimens of *P. Halli* collected by Mr. Weston. The lip is thin and simple, and its outer margin is exactly parallel with the flexuous,

* Ottawa Naturalist, vol. XVII, pp. 161 and 162.

rib-like folds and raised lines of growth that cross the outer volution, both of which are nearly straight on the dorsum, curved obliquely and convexly backward on each side, and deeply and concavely sinuate on the venter.

In a large number of specimens there is some diversity in the mode of coiling, and in the surface ornamentation. The volutions are always rather closely coiled, but they may be either separate but closely contiguous throughout, or partly in contact and partly free. In some specimens the volutions are most distant posteriorly, and in others anteriorly. But, in any case, there is no impressed zone or contact furrow on the dorsum.

On the outer volution, the oblique, rib-like folds are most prominent in the ventral and ventrolateral region, but in some large specimens from Lorette there is a narrow, shallow longitudinal depression in the median line of the venter, upon which some of these ribs or folds are more or less obsolete. And, as before stated, in the small specimen from Watertown that Hall figures as "*Lituites undatus*," the whole of the flattened venter is practically smooth. The sutural lines of the Lorette specimens are nearly straight, and the siphuncle is cylindrical, ventral and marginal.

In the Museum of the Survey there are specimens of *Plectoceras Halli* from the following localities in the Province of Quebec. Falls of the St. Charles River, Indian Lorette; collected by Logan and Richardson in 1852, by Ami and Giroux in 1888, and by Weston in 1898. St. Ambroise, four miles north of Indian Lorette; and Lac Oureau river (the Naquereau river of the "Geology of Canada") above the mouth of the Rivière Rouge and S. W. of Joliette; collected by Logan and Richardson in 1852. Also, three miles west of Napierville, south of Montreal, collector and date not stated. From Ontario, a few specimens of *P. Halli* have recently been collected at two localities near Ottawa by Walter R. Billings and J. E. Narraway.

By one alias or another, this species has long been regarded as a characteristic fossil of the Black River limestone of the State of New York by Emmons and Hall, and of the Province of Quebec by E. Billings and Foord. But, it is to be noted that the limestone at the falls of the St. Charles River, Lorette, where it is most abundant, was said to be of Trenton age by Bigsby and Salter in 1853, and by Ells in 1888, though Ells says that the beds at the foot of the fall "have a Black River facies in their lowest portion."

(3.) Plectoceras (?) undatum, Conrad. (Sp.)

Plate 37. The only figure.

Inachus undatus (pars) Conrad.... .... 1842. In Emmons' Geol. New York, Pt. II, Surv. Second Geol. Distr., p. 394, no. 104, fig. 1.

Lituites undatus (pars) Hall.....1847. Pal. N. York, vol. I, p. 52, pl. 13, fig. 1; and pl. 13 *bis*, the only figure.

Lituites undatus (pars) Emmons.....1855. American Geology, Pt. II, p. 146, pl. 5, fig. 14.

Trocholites undatus (pars) Hyatt.....1883. Proc. Boston Soc. Nat. Hist., vol. XXII, p. 267.

Eurystomites undatum, Hyatt.....1894. Proc. Amer. Philos. Soc., vol. XXXII, p. 445.

The type of this species, as now restricted, is a specimen from the Black River limestone at Watertown, N.Y., collected more than sixty years ago by Dr. Crawe, of that city. This specimen is the original of Emmons' larger figure of *Inachus undatus* in the report on the Geology of the Second District of the State of New York; and of Hall's representation of *Lituites undatus* on Plate 13, fig. 1, of the first volume of the Palæontology of the State of New York. It is about three inches and a half in its maximum diameter, but is very imperfect anteriorly. Only one side of this fossil is preserved, and all that the specimen shews is the general shape of the shell and some of the coarser surface markings, but there are no indications of the siphuncle. Another specimen from Watertown, collected by Dr. Crawe, which is figured by Hall (op. cit., pl. 13 *bis*) is fully six inches in its maximum diameter, though part of the body chamber is broken off. It also gives no information as to the shape or relative position of the siphuncle. Both of these specimens are in the American Museum of Natural History at New York City.

It is still doubtful to which genus of Cephalopoda this species should be referred. *Inachus* was long ago rejected for it, as being preoccupied in Crustacea and for other reasons. It is equally clear that it is not a *Lituites*, and that it does not even belong to the family Lituitidæ. Hyatt regarded it as a *Trocholites* in 1883, but ultimately abandoned this view and placed it in *Eurystomites* in 1894. On Plate 5, figs. 1 and 2, of the "Phylogeny of an Acquired Characteristic," a small specimen from Poland, Herkimer County, State of New York, is figured under the name *Eurystomites undatus*. This specimen, which is in the Walcott collection in the Museum of Comparative Zoology at Cambridge, Mass., has been kindly lent to the writer by Mr. Samuel Henshaw. It is about forty-three millimetres, or about an inch and three quarters, in its maximum diameter. One whorl and a half are preserved; these are in close contact, widely elliptical in cross section, and wider laterally than in a dorsoventral direction. On the earlier half of the outer whorl the test is marked with numerous, close-set and minute, transverse raised lines, which are straight in passing over the venter. But on the latter half of this volution, the lines of growth are curved convexly on each side, and concavely backward on the venter. The sutural lines are nowhere ex-

posed, and the siphuncle is ventral and marginal. It is difficult to see how two of the large specimens figured by Hall as *Lituites undatus*, or the small specimen from Poland that Hyatt figures as *Eurystomites undatus*, can be distinguished generically from *Plectoceras*.

All the specimens from the Province of Quebec that were formerly identified with *Lituites undatus* are *Plectoceras Halli*. The only specimen that the writer has seen, that was certainly collected in Canada and that is probably referable to *Plectoceras undatum* (or, as Hyatt calls it, to *Eurystomites undatus*) is the original of the figure on Plate 37. It was obtained, a few years ago, from the Black River limestone exposed in an excavation for a sewer in a street not far from Queen's College, Kingston, and has recently been acquired for the Museum of this Survey, in exchange, from the authorities of Queen's University. It is a cast of the interior of the septate portion of the shell, five inches and a half in its maximum diameter, with fragments of the test attached. Its outer volution is subquadrate in transverse section, and the sutural lines are nearly straight on the sides, but shallowly concave on the venter or periphery, In the Museum of Queen's University there are two large specimens of *P. undatum* (or *Eurystomites undatus)* that are supposed to have been collected from the Black River limestone at or near Kingston, but it is not at all certain where either of them are from.

If a *Plectoceras*, *P. undatum* is obviously a much larger species than *P. Jason* or *P. Halli*.

Eurystomites plicatus, nobis, from the Galena-Trenton formation of Little Black Island, Lake Winnipeg, which is described and figured in the third part of this volume, has much the appearance of a *Plectoceras*, externally, but its siphuncle is known to be "ventrad of the centre."

The genus *Barrandeoceras* also was first described by Hyatt in 1883, in his "Genera of Fossil Cephalopoda," already referred to as having been published in the twenty-second volume of the Proceedings of the Boston Natural History Society. On page 299 of that memoir it is placed in the family Nautilidæ, and is thus described:

"BARRANDEOCERAS, nobis, includes gyroceran and nautilian shells with very large umbilical perforations, and compressed, slightly costated or smooth whorls, generally without an impressed zone, though this is sometimes present. The venter is narrower than the dorsum, the siphon near but above the centre, septa deeply concave, and sutures with ventral saddles, lateral lobes and dorsal saddles, without annular lobes. Type, Barr. (Naut.) natator, sp. Bill. Can. Nat. N.S., vol. 4, Mus. Geol. Surv. Can. The genus also includes the Bohemian forms Barr. (Naut.) Bohemicum, sp. Barr., Vol. 2, Syst. Sil. pl. 32, 53; Sternbergi, ibid., pl. 36, 37;

tyrannus, ibid., pl. 38; Sacheri, ibid., pl. 39. Living chamber is about one-half of a volution in length; it is about three-fourths of a volution in length in the type species."

In 1894, in the "Phylogeny of an Acquired Characteristic" (Proc. Amer. Philos. Soc., vol. XXXII, pp. 450 and 451) the genus is placed in the new family Tarphyceratidæ, and is described as follows :

"BARRANDEOCERAS.

"This genus was described in my *Genera of Fossil Cephalopoda* to include shells having large umbilical perforations, compressed slightly costated or smooth whorls. The venter usually narrower than the dorsum, the whorls barely in contact or with very slight contact furrow, siphuncle near but above centre, septa deeply concave, sutures having usually ventral and dorsal saddles and lateral lobes. This last statement is true of all the forms having the gyroceran mode of coiling, but not of those which have the closer nautilian form. In these there is a slight dorsal lobe and a different form of the paranepionic whorl which may eventually lead to their generic separation.

"The type is *Barrandeoceras (Naut.) natator*, sp. Billings."

Eight species of this genus are enumerated or described by Hyatt in the "Phylogeny," two from the Cambro-Silurian rocks of the Province of Quebec, one from the same formation in the State of New York, four from the Silurian rocks of Bohemia, and one from the Niagara group of Indiana.

At present (1906) four species of *Barrandeoceras* have been recognized as occurring in Canada, two in the Chazy, and two in the Black River limestone.

These are as follows :

(1.) BARRANDEOCERAS NATATOR, Billings. (Sp.)

Plate 39, figs. 1, 1*a*, and 1*b*.

Nautilus natator, Billings.... .....1859. Canad. Nat., vol. IV, p. 466.
Barrandeoceras natator, Hyatt..... .1883. Proc. Boston Soc. Nat. Hist., vol. XXII, p. 299; and (1894) Proc. Amer. Phil. Soc., vol. XXXII, p. 452.

Original description of Nautilus natator. "Discoid planorbiform, all the whorls exposed in the umbilicus. Tube slender, gradually increasing in size, so that on the completion of the fifth whorl the diameter of the coil is four and one fourth inches. Section oval, the dorso-ventral diameter being greater than the lateral in the proportion of about 8 to 6 (?) Septa at the end of fourth whorl, three in about seven lines, measured on the side. Surface and siphuncle unknown.

"The specimen is imperfect; but if it has not been compressed laterally, then, as nearly as I can determine, the dorso-ventral diameter at the end of the fifth whorl is sixteen lines and the lateral twelve; at the fourth whorl five to seven; and it would appear therefore that the third must be scarcely three lines in its greatest diameter.

"I have not seen the first and second whorls, but as there is an empty space nine lines in diameter in the centre of the coil, I presume that they did once exist and occupy that space. The whorls are in contact, but the outer ones are not indented by those next preceding.

"*Locality and Formation.*—Mingan Islands; Chazy limestone.

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

The original label is not preserved and the exact locality from which the specimen was collected is unknown. The label now attached to the tablet upon which it is placed states that it was collected in 1856.

The same specimen is thus described by Hyatt, under the name *Barrandeoceras natator*, in his "Phylogeny of an Acquired Characteristic."

"This species has volutions compressed oval in section, the dorsum somewhat broader than the venter; siphuncle is extracentroventran, even in the neanic stage; septa deeply concave; sutures with dorsal and ventral saddles and the lateral lobes as in other species of the genus.

"The volutions are in contact, but no contact furrow was formed at any age. The contact takes place as in the young of *Estonioceras perforatum*, on the venter of the paranepionic volution.

"The volution in the neanic stage, dorso-ventral diameter 13 mm., has a much narrower venter in proportion to the dorsum than in the adult. The venter was rounded at all stages and also the dorsum. The aneanic and nepionic stage were not present in the original specimen in the Museum at Ottawa, but in following out the same lines it is easily ascertained that the umbilical perforation must have been enormous, at least 15-17 mm. in diameter. The living chamber was somewhat over one-fourth of a volution in length. The whole diameter was about 108 mm. It was reported as having been found in the Chazy limestone."

(2.) Barrandeoceras Minganense, Hyatt.

Barrandeoceras Minganense, Hyatt.....1894. Proc. Amer. Phil. Soc., vol. XXXII, p. 451.

"Loc., Mingan Islands.

"There is a specimen from the Chazy limestone of the Mingan Islands in the collection of the Museum of the Geological Survey at Ottawa which has very similar characters to those of *Barrandeoceras natator*, but is distinct in some of its characters. The living chamber is short and, if complete, about a quarter of a volution in length. It is free and in section

is compressed oval, the abdomen broader than the dorsum, but the centrodorsal (*) diameter is longer than the transverse.

"The siphuncle is nearer the centre, being ventrocentren. The neanic, or perhaps an ephebic stage has slight annulations or raised lines of growth, judging from the marks on the section. This is labelled as coming from the white limestone of Large Island.

"There is no impressed zone at any stage observed. The ephebic stages have a whorl similar to that of *Barrandeoceras convolvans* in the neanic stage, but the abdomen is broader." Hyatt, op. cit. supra.

(3.) Barrandeoceras subcostulatum, Whiteaves.

Plate 38. The only figure.

Barrandeoceras subcostulatum Nom. prov. Whiteaves....1898. Ottawa Naturalist, vol. XII, p. 121.

Cfr. *Lituites convolvans*, Hall (non Hisinger)....1847. Pal. N.York, vol. I, p. 53, pl. 13, figs. 2 and 2 *a*.

Hortholus Americanus, d'Orbigny..1850. Prodr. de Paleont., tome 1, p. 1 (non *Hortholus convolvans*, Montfort, 1808).

Lituites Americanus, S. A. Miller..1889. N. Amer. Geol. and Palæont., p. 442.

Barrandeoceras convolvans, Hyatt..1894. Proc. Amer. Phil. Soc., vol. XXXII p. 451.

" " S. A. Miller.1897. N. Amer. Geol. and Palæont., Second Appendix, p. 771.

Original description of Barrandeoceras subcostulatum. "Shell consisting of about two gyroceran volutions which are coiled loosely on the same plane, but nowhere in close contact, and gradually becoming more eccentric, the outer one slightly compressed both above and below, so that the outline of a transverse section near the aperture would be broadly elliptical, and the dorsoventral diameter a little greater than the lateral.

"Surface of the test distinctly costulate, though in the only specimen that the writer has seen, the ribbing is most clearly defined on the inner volution, where it consists of rather distant but irregularly disposed, small, thin, acutely angular and slightly flexuous transverse ribs or ridges, which are generally much narrower than the very shallow depressions between them, and marked with numerous minute striations parallel to the ribs. Sutures of the septa not clearly indicated; shape and relative position of the siphuncle unknown."

Black River limestone at Wolfe Island near Kingston, the fine specimen, figured, which is fully four inches in its maximum diameter, and which was presented to the Museum of the Survey by Professor James Fowler in 1888.

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* Presumably a typographical error for ventrodorsal.

Lituites convolvans, Hall (non Hisinger) is distinctly included by Hyatt in his genus *Barrandeoceras*, as stated in the foregoing list of its synonyms. The only difference that can be detected between the two specimens of that species that Hall figures, and the type and only known specimen of *B. subcostulatum* is that the former are described and figured as smooth, whereas the surface of the inner whorl of the latter, at least, is distinctly costulate. But, it is only upon well preserved, testiferous specimens that the surface markings are at all clearly shewn, and the two specimens of *B. convolvans* that Hall figures, are mere casts of the interior of the shell.

(4.) BARRANDEOCERAS VAGRANS, Billings. (Sp.)

Plate 40, figs. 1, 1*a*, 2 and 2 *a*.

Gyroceras (Lituites) vagrans. Billings..... 1857. Geol. Surv. Canada, Rep. Progr. 1853-54-55-56, p. 308.

Original description of Gyroceras (Lituites) vagrans. "Shell elongated, tapering at the rate of nearly two lines to the inch; laterally compressed, section elliptical, dorso-ventral diameter greater than the lateral, apparently in the proportion of twelve to eight; about seven inches of the apical extremity of the shell spirally enrolled so as form two whorls not in contact, the interior one of which is one inch in diameter, and the exterior three inches; septa convex, distant one line and a half at a dorso-ventral diameter of one inch.

"The specimen exhibits an artificial polished section passing through the central plane of the whorls, showing clearly the construction of the tube to the apex, where it has a diameter of only one line; some of the septa and almost one-half of the transverse section, but neither the siphuncle, the character of the surface, nor the length of the produced oral extremity is indicated; several specimens still lying imbedded in the rock which are known to me, are in my opinion of this species, and if so, then the free portion was gently curved, and in some individuals at least six inches in length, thus giving thirteen inches as the total length. It is scarcely necessary to observe that from the above materials the generic rank of the fragment cannot be determined with the certainty desirable; the tube is too much curved to come within the definition of *Cyrtoceras*, the whorls too widely separated for *Nautilus* or *Lituites*, and yet, without a view of the aperture we cannot say positively that it is a *Gyroceras*.

"*Formation.*—Black River limestone.

"*Localities.*—La Petite Chaudière Rapids, Ottawa River, and in the outcrop of the Black River limestone, near Mile End, St. Lawrence Street, Montreal."

Of the specimens referred to in this quotation, the only one that the writer has seen is the fossil from La Petite Chaudière that has been rubbed down on one side and polished in such a manner as to exhibit the "artificial polished section" described by E. Billings. This specimen, which is now figured for the first time (figs. 1 and 1*a*) is evidently intended as the type of the species, though it shews little more than the mode of coiling and the lateral compression of the whorls.

Of late years a few imperfect specimens, that are apparently referable to this species, have been collected at La Petite Chaudière, on the Quebec side of the Ottawa River, at Tetreauville, by Mr. W. R. Billings, Mr. J. E. Narraway, and the writer. One of these specimens, the original of figs. 2 and 2 *a* on Plate 40, is an imperfect cast of the interior of the septate portion of the shell. It shews that on the convex exterior of the cast, each of the sutural lines forms a single, widely and very shallowly concave sinus or "lobe" on each side, and a low, simple, undivided and obtusely subangular saddle on the venter. On the dorsum, also, there are indications of a similar saddle. It seems to the writer that the few specimens of *Gyroceras* (or *Lituites*) *vagrans* that have yet been obtained are clearly congeneric with *Barrandeoceras convolvans*, and *B. subcostulatum*.

Figures 3 and 3 *a* were inadvertently printed on Plate 40, because the writer was at first under the impression that the original of both was also a fragment of a specimen of *B. vagrans*. But it soon became apparent that this fragment is a piece of a specimen of a *Cyrtoceras*, and most probably of *C. sinuatum*, Billings, the type of which is a badly preserved cast of the interior of a shell, also from the Black River limestone at La Petite Chaudière. The exterior of this fragment (figure 3) shews that the surface ornamentation consists of narrow, transverse and slightly flexous ribs, with wider spaces between them; and the inner portion (figure 3 *a*) which has been broken in such a way as to exhibit a longitudinal and nearly median section, shews that the siphuncle is placed a little outside of the middle, or, as Hyatt, would have said, somewhat ventrad of the center.

PALÆOZOIC FOSSILS.

VOL. III.

7. Illustrations of seven species of fossils from the Cambrian, Cambro-Silurian, and Devonian rocks of Canada.

By J. F. Whiteaves.

These species have been described, at various times, in the "Canadian Record of Science" or "Ottawa Naturalist." But, four of them have not previously been figured at all, and not one of them has been either described or figured in any of the publications of the Survey.

A. FROM THE CAMBRIAN ROCKS OF BRITISH COLUMBIA.

Anomalocaris Canadensis, Whiteaves.

Anomalocaris Canadensis, Whiteaves .....1892. Canad. Rec. Sci., vol. V, pp. 205 and 206, with the text figure here reproduced.

The following is a copy of the original description of this genus and species:

Anomalocaris. (Gen. nov.)

"Carapace and its appendages unknown or too obscurely indicated for their characters to be defined: body many jointed and consisting of not less than nine to thirteen segments, exclusive of the caudal segment; ventral portion of each of the body segments bearing a pair of slender, narrowly elongated and acutely pointed, simple and probably branchial appendages, of the nature of uropods or foot gills: posterior terminal segment margined with three pairs of caudal spines, one terminal and the other two lateral,—the posterior pair of uropods represented in the wood-cut apparently belonging to a pre-caudal segment whose posterior boundary has been obliterated."

ANOMALOCARIS CANADENSIS, sp. nov.

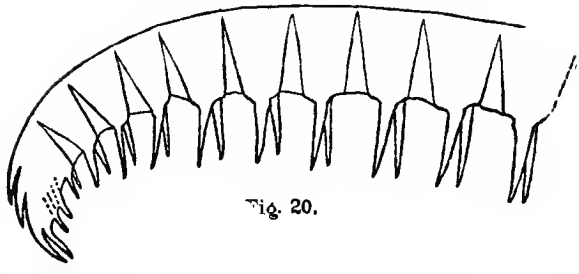


Fig. 20.

Fig. 20. *Anomalocaris Canadensis.*—Outl ne of a specimen in which nine of the abdominal segments are preserved, besides the caudal segment. Natural size.

"Body, inclusive of the tail, elongated, slender, decreasing slowly in size from the anterior to the posterior end, rather strongly curved posteriorly and nearly straight anteriorly, the length of the portion preserved varying in different specimens from nine to ten centimetres (as measured at about the midheight and following the curve of each), and the height or depth at the imperfect anterior end, from twelve to seventeen millimetres, exclusive of the ventral appendages. Body or abdominal segments, which, in all the specimens collected are abnormally flattened laterally, a little higher or deeper than long, broader above than below, the pair of ventral appendages proceeding from each, nearly equal in height or depth to the segment itself. These appendages are straight and prolonged downward at almost a right angle to the main axis of the body, for although there is a slight divergence in each pair, neither are directed distinctly backward nor forward. Between each pair of segments there is evidence of a wedge-shaped or very narrowly triangular lateral area or interval, which is broadest or widest below and does not seem to extend quite to the dorsal margin. At the posterior end the segmentation is very obscurely defined. Caudal spines, which are simple, slender, longitudinally elongated and acutely pointed, averaging six millimetres in length by about one mm. in breadth at the base: the three pairs of spines about equal in length, though the two lateral ones are placed farther forward than the central and terminal pair. Surface markings entirely unknown.

"This genus and species are based upon upwards of fifty specimens collected from a band of shale of Middle Cambrian age, at Mount Stephen, near Field station on the Canadian Pacific Railway. Two of these specimens were collected by Mr. R. G. McConnell, of the Geological Survey of Canada, in 1888, and the remainder by Dr. H. M. Ami, of the same

Survey, in 1891. The species seem to have been somewhat gregarious in its habits when living, for upwards of twenty specimens of it are exposed on the surface of a large slab of shale collected by Dr. Ami at this locality, and fourteen upon that of another. It is associated with numerous species of trilobites, brachiopoda, etc., most of which have been described by Dr. Carl Rominger and Dr. C. D. Walcott. All the specimens of *A. Canadensis* are crushed quite flat laterally and occur as obscurely defined and extremely thin impressions of the body segments, with the tail, the latter usually a little twisted, on each of the surfaces exposed by splitting pieces of the shale.

The generic name *Anomalocaris* (from *ἀνόμοιος*, unlike,—*καρις*, a shrimp, *i.e.*, unlike *other* shrimps) is suggested by the unusual shape of the uropods or ventral appendages of the body segments and the relative position of the caudal spines."

This description was followed by a brief discussion of the supposed relations of *Anomalocaris* to other genera of Phyllocarida, but it is not thought necessary to reproduce this discussion here, as Professor T. Rupert Jones and Dr. Henry Woodward have expressed the opinion* that *Anomalocaris* is probably not a Phyllocarid. The affinities of this genus are still uncertain. In the first volume of his Text Book of Palæontology, published in 1900, Dr. C. R. Eastman places it provisionally in the Family Branchiopodidæ of the Order Branchiopoda.

B. FROM THE CAMBRO-SILURIAN ROCKS OF QUEBEC AND ONTARIO.

B. I. From the Levis formation of Quebec.

Cyrtoceras Quebecense, Whiteaves.

Plate 35, figs. 1 and 1 *a*.

Cyrtoceras Quebecense, Whiteaves.....1898. Ottawa Naturalist, vol. XII, p. 120.

"Shell elongate conical, increasing very slowly in thickness and not much curved; dorsum slightly compressed, venter and sides rounded. Siphuncle large, cylindrical, dorsal and marginal; septa apparently rather closely approximated.

"Length of the only specimen collected, which is imperfect at both ends, about seventy-five millimetres, or three inches; thickness of the same about eleven mm. at the smaller end, and nearly thirty at the larger.

"Levis limestone at Pointe Lévis, opposite Quebec City: a single specimen, which seems to be quite distinct from all the species of *Cyrtoceras*

* In the tenth Report of the Committee on "The Fossil Phyllopoda of the Palæozoic Rocks," in the Report of the British Association for the Advancement of Science for 1893.

from that locality, described by E. Billings in the first volume of 'Palæozoic Fossils.' "

B. 2. From the Trenton limestone of Quebec and Ontario.

Steganoblastus Ottawaensis, Whiteaves

Astrocystites Ottawaensis, Whiteaves.. .....1897. Canad. Rec. Sci., vol. VII, p. 287, with the text figures here reproduced.

Steganoblastus Ottawaensis (inadvertently written *Canadensis*), Whiteaves.....1898. Idem, p. 395.

Steganoblastus Ottawaensis, Bather .....1900. Treatise on Zoology, edited by E. Ray Lankester. Part III, The Echinoderma, pp. 209 and 210, figs. VII, 1 and 2.

The following is a copy of the original figures and description of *Astrocystites*, from the "Canadian Record of Science" for January, 1897, published in July of that year, but with the numbers of the figures altered to suit this publication.

Astrocystites Ottawaensis.

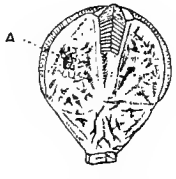


Fig. 21.

Fig. 21*a*.

Fig. 22.

Figs. 21, 21*a*, and 22. *Astrocystites Ottawaensis*. Fig. 21. "Side view of a nearly perfect specimen, shewing the small plates surrounding and perhaps covering the anus, on the left side of one of the ambulacral areas, at A, and the peculiar sculpture of part of the calyx, natural size." Fig. 21 *a*. "Summit view of the same specimen, also of the natural size." Fig. 22. "Radial plate on the left of the anal region of another specimen, twice the natural size, to shew the peculiar shape and sculpture of this plate, also the overlap by the distal portion of one of the ambulacral areas above, and the modification of the upper margin of the plate on the anal side: A—relative position of the anus."

"Body or 'crown' of the organism globose, almost spherical but narrowing rapidly below into a very short, slender column or stem, and somewhat five-sided as seen from above.

"Calyx or dorsal cup broadly conical and entire below the midheight, but divided above into five large, pointed and slightly incurved, sepaloid lobes, with rather oblique and slightly convex sides, by the decurrent portions of the ambulacral areas. The greater part of one of these lobes, as seen at A," in fig. 21, "is occupied with a cluster of minute plates which surround and either partially or wholly cover the anal opening.

"Surface of the calyx marked by small, short, branching grooves, which radiate from the centre and anastomose at the margins of large plates of irregular shape. The exact outlines of some of these plates are not clearly defined in any of the three specimens that the writer has seen, but two of the latter have part of the calyx crushed in such a way as to shew parts of the margins of at least two of the radials and of one of the basals. Judging by these indications of the outlines of the plates and by the peculiar sculpture of others, the composition of the calyx would seem to be essentially as follows. In the undivided and lower moiety of the divided portion there appears to be a circlet of large subpentagonal and presumably basal plates, immediately above the column. On the surface of these plates the branching grooves radiate upward and outward, but not backward, and, consequently, only the front and part of the lateral margins of each of these plates is minutely sinuated. Next to these supposed basal plates and alternating with them there is a circlet of five large radials. These radials are irregular in outline, but their margins are minutely sinuated all round, except in the middle of the summit, where each of these plates is overlapped by the distal portion of the ambulacral area, as shewn in fig. 22. On each side of the anal region the upper and inner portions of the margin of each of the two radials that partially bound it, are slightly modified, as also shewn by fig. 22, in which A represents the relative position of the middle of the anal region. In the upper and lobate portion of the calyx there appears to be a comparatively small and presumably interradial plate, whose outline it is not yet possible to define precisely, in or near the middle of each of four of the lobes, the corres ponding part of the fifth lobe being occupied by the group of small plates which surround and apparently cover the anus.

"The summit or entire surface above the calyx, is exclusively occupied with five large linear lanceolate, radiating ambulacral areas, which extend a little beyond and below the midheight and alternate, at and near the centre, with five small narrowly elongated, subtriangular, almost bottle-shaped plates. The ambulacral areas consist of well defined grooves, which are partially and perhaps in perfect specimens were wholly roofed over with two rows of small, transversely elongated and alternately arranged covering plates, from the centre of the summit, where they interlock and probably cover the presumably subtegminal mouth. In the only specimens known to the writer these plates roof over the ambulacral grooves, from the middle of the summit, for distances varying from one-half to fully two-thirds of the entire length of each groove, but always, at least, as far outward as to the bases of the small alternating subtriangular plates. On some of the ambulacral grooves only eight covering plates can be counted on each side, in a longitudinal direction, but on others there

are as many as fourteen on each side. In the latter case the circumstance that several of the outermost covering plates are crushed down into the ambulacral grooves leads to the inference that the grooves may have been almost or completely roofed over in perfect specimens. A central area at the summit, in which the ambulacral areas or covered inner ends of the ambulacral grooves are everywhere in close contact with the small alternating subtriangular plates, is bounded by the bases of the latter. Outside of this area the ambulacral areas suddenly become more widely divergent, and their grooves are bordered on each side by a prominent raised rim. At the outer end of each of the ambulacral areas, where the covering plates have been removed or are absent, there is a longitudinal row of marginal pores on the inner surface of the raised rim which bounds the groove on both sides, as shewn in fig. 22, and the whole of the outer declivity or downward slope of the rim is transversely corrugated or ribbed.

"When examined with a lens, the whole surface of the calyx, of the covering plates of the ambulacral grooves and of the small subtriangular plates which alternate with the inner ends of the ambulacral areas at the summit, is seen to be densely pitted or perhaps perforated.

"Two specimens of this species, both collected by Mr. John Stewart in 1886 from the Trenton limestone at Division St., Ottawa, are in the Museum of the Geological Survey of Canada, and an imperfect specimen from the same locality has been kindly lent to the writer by Mr. Walter R. Billings. All three of these specimens, when found, were almost completely covered with a very tenacious shaly limestone, and although they have been both carefully and skillfully cleaned, it is just possible that some of the covering plates of the ambulacral grooves may have been accidentally removed in the cleaning. At present, also, it is not possible to ascertain from either, whether the dense pitting of so large a portion of their surface is caused by "conjugate" pores or not. It is only proper to add that the general outlines of the plates of which the calyx is composed in this species, were first suggested to the writer by Mr. W. R. Billings, who, as is well known, has devoted much time to the study of the crinoids and cystideans of the Trenton limestone of the Ottawa valley.

"*Astrocystites* would seem to be most nearly related to *Asteroblastus*, Eichwald, and is probably referable to the same family, though it clearly differs from that genus in several important particulars. Thus, a comparison of the plates of which the calyx is composed in these two genera shews that, although they have much the same shape and style of sculpture, yet those of *Asteroblastus* are both small and very numerous, while those of *Astrocystites* are large and comparatively few in number. The anal region of *Astrocystites*, too, is lateral and well defined, but no indications of

any such region have yet been observed in *Asteroblastus*. The summit, also, is very differently constructed in these two genera. In *Asteroblastus* there is a central oral aperture, immediately surrounded by five apical plates, and the ambulacral areas, which are comparatively broad and short, do not reach to the centre. No traces of the oral aperture are visible anywhere on the summit of *Astrocystites*, the mouth of that genus being apparently subtegminal, and the ambulacral areas, which are long and narrow, extend to the centre, where their covering plates interlock.

"The ambulacral areas of *Astrocystites* are somewhat like those of *Blastoidocrinus*, but, in the latter genus (which is still known only from the few fragments collected by E. Billings from the Chazy limestone of the Island of Montreal and its immediate vicinity, and from the imperfect specimens from the "Orthoceratitenkalk" of Pulkowa, Russia, described and figured by Friedrich Schmidt) the spaces between them are completely filled with the large deltoids, which, according to E. Billings "extend the whole length of the pseudambulacra."

"There are, also, apparently, some points of resemblance between *Astrocystites*, and *Cystoblastus*, Volborth, but in Zittel's description of the latter genus, which is the only one that the writer has access to, there are said to be two pectinated rhombs in the calyx, whereas no traces of such structures have been observed in the dorsal cup of *Astrocystites*.

"In 1874* Schmidt expressed the opinion that *Blastoidocrinus*, *Asteroblastus*, *Mesites* and *Cystoblastus* are all cystidea which may be regarded as intermediate in their characters between that class and the blastoids, and it is quite clear that these are the genera to which *Astrocystites* is most closely allied. 'Blastoids,' writes Dr. Charles Eastman, in the first volume of his Translation of Zittel's Text-book of Palæontology, published in 1896, 'have not been recognized, as such, up to the present time, in strata lower than the Silurian; but it is possible that several genera occurring in the Ordovician of North America and Russia (*Blastoidocrinus*, *Asteroblastus*, etc.), which are now referred to the Cystids, may eventually be transferred to the Blastoidea.' In that event, *Astrocystites* would, of course have to be included in the same category. On the other hand, Etheridge and Carpenter, on page 129 of their 'Catalogue of the Blastoidea in the Geological Department of the British Museum,' published in 1886, say distinctly 'we have no certain evidence of the existence of true Blastoidea anterior to the Upper Silurian period. For we much doubt, as we have explained in the previous chapter, whether the problematical *Blastoidocrinus* from the Lower Silurian of Canada and Russia can properly be referred to this group." Nicholson and Lyddeker, in the

* "Mémoires de l'Académie Impériale des Sciences de St.-Petersbourg, VIIe Série, tome XXI, p. 25."

first volume of their 'Manual of Palæontology,' published in 1889, follow Johannes Muller's classification of the Cystoidæ, and divide the class 'into the three orders, of the Aporitidæ, Diplopo ritidæ and Rhombiferi, according as the calycine plates are imperforate, are pierced by yoked pairs of pores indiscriminately distributed, or have their pores arranged in pore-rhombs.' Of these three orders, *Astrocystites* would seem to be most probably referable to the Diploporitidæ." Figures 21, 21*a* & 22 of this paper are reproductions of original drawings by Mr. L. M. Lambe.

A few months later, in a postscript to this paper, published in the Canadian Record of Science for July, 1897, but which was not issued until January, 1898, the generic name *Astrocystites* was changed to *Steganoblastus*, at the suggestion of Dr. F. A. Bather, who thought that it was too near to *Asterocystis*, Haeckel (1896).

The specimens upon which *S. Ottawaensis* were based have since been studied somewhat exhaustively by Dr. Bather, whose general conclusions thereon are summarized in part III, chapter XII, of the "Treatise on Zoology," edited by Dr. E. Ray Lankaster, and published in 1900. Dr. Bather thinks that *Steganoblastus* is more nearly related to *Edrioaster* than to *Asteroblastus*, and makes it the type of a new family, which he calls Steganoblastidæ, and places in the class Edrioasteroidea of E. Billings. The family and genus are thus described, and the typical species figured (but with other numbers) by Dr. Bather, on pages 209 & 210 of the volume cited.

"Family 4. Steganoblastidæ. Edriasteroidea, with a rigid theca composed of plates relatively larger and thicker than in other families of this class; these include elements comparable to the R R and B B of Blastoidea; B B attached to a stem, probably short; ambulacra descend into the radials. Genus—*Steganoblastus*, Whiteaves (1897, originally described as *Astrocystites*, name preoccupied), Ordovician, Canada" (figs. 23 and 24). "The remarkable resemblance to *Asteroblastus*, insisted on by its founder, suggested the reference of *Steganoblastus* to the Protoblastoidea (Bather, 1899); but the ambulacra are now known to have essentially the same structure as in *Edrioaster*, while the absence of brachioles may be maintained with confidence. Theca piriform, its plates strongly marked with axial folds, and consisting of: B B (5 ?, sutures not clear); R R, 5, alternating with B B, and receiving the distal ends of the ambulacra; interambulacrals, one large one and an uncertain number of smaller ones, in each interradius; 5 slightly pitted plates of spear-head shape, stretching up between the ambulacra to the oral pole and simulating O of Crinoidea or △ of Blastoidea, but perhaps being only proximal covering-plates. The anus pierces one interambulacrum, and slightly disturbs the pentamerous symmetry of the theca. From the mouth 5 ambulacra stretch about half-way down the theca; the adambulacrals (side-

or flooring-plates) appear almost anchylosed, but the pores between them are very clear, and one can trace the original median line of suture; the ambulacrals or covering-plates were stout, at least in the proximal

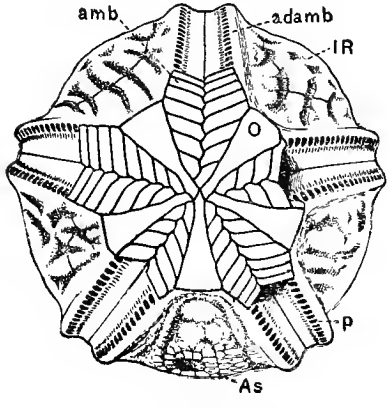


Fig. 23.

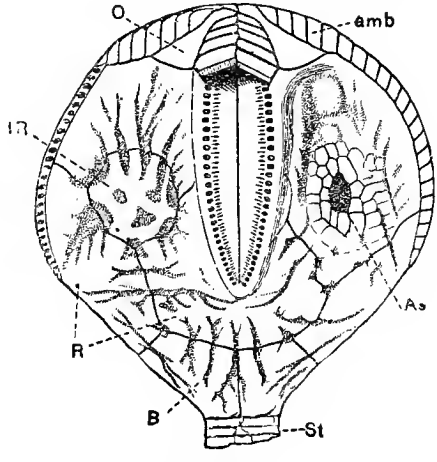


Fig. 24.

Steganoblastus ottawaensis, slightly restored from the type-specimens, and x 3 diam. 23, oral surface; 24, from l. post. radius. *adamb.* adambulacrals or side-plates; *amb*, ambulacrals or covering plates, mostly removed; *As* anus surrounded by small plates; B, basal; I R, large median interradial; O, 5 orals or proximal ambulacrals; *p*, pores between side plates; R. radial; *St*, fragment of stem.

regions, where they seem to have combined with the spear-head plates to form a solid roof over mouth and food-grooves. Stem small, round, with lumen less than half the diameter. Fifty years ago *Steganoblastus* would have been described as a generalized or synthetic type, with Cystid, Blastoid, Crinoid and Asteroid affinities; it is simpler to regard it as a specialized Edrioasteroid, in which features common in stalked genera of other classes have been evolved independently under similar conditions of existence."

Matheria brevis, Whiteaves.

Matheria brevis, Whiteaves.....May, 1903. Ottawa Naturalist, vol. XVII, p. 33, figs. 1 and 1 *a*; and Geol. Mag. for Aug., 1903, N. S., Dec. IV, vol. X, p. 358, figs. 1 and 1 *a*.

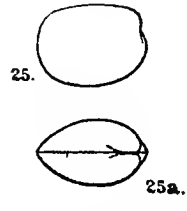
"The genus *Matheria* was described by E. Billings in 1858, in the third volume of the Canadian Naturalist and Geologist. It was based upon a single species, the *M. tener* of Billings, a small lamellibranchiate or pelecypodous bivalve, from the Trenton limestone of Lake St. John, P.Q. *Matheria* appears to be most nearly related to *Cyrtodonta* and

Vanuxemia, and is now included in the family Cyrtodontidæ, Ulrich, of the order Prionodesmacea, Dall. The types of *M. tener*, which were collected by Mr. J. Richardson and Dr. R. Bell in 1857, at Blue Point, on Lake St. John, are still in the Museum of this Survey.

"A second species of this genus, from the Trenton shales of Minnesota, was described by Mr. Ulrich in 1892, under the name *M. rugosa*, in the Nineteenth Annual Report of the Geological and Natural History Survey of Minnesota. And, in his report on the Lower Silurian Lamellibranchiata of Minnesota, published in 1897, in volume three, part two, of the final Report on the Geology of Minnesota, Mr. Ulrich expresses the opinion that the *Modiolopsis recta* of Hall, from the Niagara limestone of Wisconsin and Illinois, is also a *Matheria*.

"In the Museum of the Geological Survey there are a few specimens of a fourth and previously undescribed as well as unfigured species of this genus, from the Trenton limestone of Ottawa, collected many years ago by E. Billings and labelled by him with the manuscript name *Matheria brevis*. This species may now be defined and characterized as follows.

MATHERIA BREVIS.



Matheria brevis. Fig. 25. Side view of the most perfect specimen collected, in outline, and showing the marginal contour of the right valve. Fig. 25 *a*. The same specimen, as seen from above, to show the amount of convexity of the closed valves. Both of these figures are of the natural size.

"Shell small, inflated and regularly convex, but not quite as wide as high, suboval or oblong subquadrate, about one-third longer than high and very inequilateral. Anterior side very short, narrow and consisting of a small rounded lobe below the beaks, on each side; posterior side longer, and a little wider, in the direction of its height; posterior end vertically subtruncate at its midheight, rounding abruptly into the cardinal margin above and into the ventral margin below. Ventral margin gently convex but curving upward more abruptly and rapidly at the posterior than at the anterior end; superior border almost straight and nearly horizontal; umbones depressed, anterior, very nearly but not quite terminal; beaks incurved.

"Surface markings not at all well preserved in either of the specimens collected, but apparently consisting of fine concentric lines of growth. Hinge dentition and muscular impressions unknown.

"Approximate dimensions of the specimen figured: maximum length, fifteen millimetres; greatest height, eleven mm.; maximum width, or thickness through the closed valves, nearly nine mm.

"Trenton limestone, Ottawa, E. Billings: four nearly perfect but badly preserved specimens.

"*M. brevis* can be distinguished at a glance from *M. tener*, *M. rugosa* and *M. recta*, by its comparatively short, tumid and regularly convex valves."

SPYROCERAS BEAUPORTENSE, Whiteaves. (Nom. nov.)

Plate 33, figs. 2 and 2 *a*.

Orthoceras Beauportense, Whiteaves.....1898. Ottawa Naturalist, vol. XII, p. 118.

"Shell rather below the medium size, longicone, straight and tapering so gradually that the few specimens which the writer has seen are almost cylindrical. Surface marked by low, rounded, narrow transverse annulations, with numerous minute and close-set, transverse thread-like raised lines between and upon them, all of which are crossed by small and narrow but comparatively distant longitudinal ribs or ridges. The transverse annulations average from two and a half to three millimetres apart, at their summits, and are separated by shallow depressions nearly twice as wide as themselves. The longitudinal ribs or ridges are equidistant, uniform in size, and, on an average, about one millimetre and a half apart. The crossing of these ribs by the transverse annulations makes a very regular and rectangular reticulation, which is plainly visible to the naked eye, but the crowded transverse raised lines cannot be well seen without the aid of a lens. Internal structure and shape and relative position of the siphuncle unknown.

"Trenton limestone at Parent's quarry, Beauport, near Quebec City, D. N. St. Cyr, 1888: one well preserved testiferous specimen not quite two inches in length and with a considerable portion of its surface buried in the matrix. A similar specimen, but with the whole of the outer surface visible, from the same locality, has been lent to the writer by the authorities of Laval University.

"This finely sculptured shell seems to be closely allied to the *O. pseudocalamiteum* (Quenstedt) Barrande," * which Hyatt says is a *Dawsonoceras*, "but it wants the intermediate longitudinal ridges characteristic of that species." It apparently belongs to Barrande's 'Group 6' of the genus

* Système Silurien de la Bohême, tome II, texte 3, 1874, p. 261, pl. 217, fig. 8; pl. 222, figs. 11 and 12; pl. 228; pl. 236, figs. 11-16; et pl. 361, figs. 15-17.

Orthoceras, which Hyatt includes in his genus *Spyroceras*. Its surface ornamentation "appears to be decidedly different from that of any of the small annulated species of *Orthoceras* from the Trenton limestone of the State of New York described and figured by Hall in the first volume of the Palæontology of that State. *O. bilineatum*, Hall, is a much larger and more robust species, with coarser annulations and two series of longitudinal ridges or linear elevations.

"In *O. clathratum*, Hall, the longitudinal markings are very minute and crowded, and are said to consist of 'sharp elevated lines distant $\frac{1}{48}$ of an inch,' or very little more than half a millimetre apart. There are, also, no comparatively coarse and distant longitudinal ribs or ridges in *O. textile*, Hall, and in that species the transverse annulations are represented as both prominent and angular.

(*Orthoceras Westoni*, which was described in the same paper as *O. Beauportense*, and which has not been figured, is based upon a specimen from the Trenton limestone at Montreal, which the writer now thinks to be part of the siphuncle of an *Endoceras*. The "distant and very obliquely flattened annulations" of the exterior of this specimen are probably septal rings, like those of a *Piloceras*, and the obscure indication of a supposed siphuncle, as exposed in a transverse fracture, is probably part of the endosiphuncle.)

C. FROM THE DEVONIAN ROCKS OF ONTARIO.

Orthoceras Walpolense, Whiteaves.

Plate 33, fig. 3.

Orthoceras Walpolense, Whiteaves.....1898. Ottawa Naturalist, vol XII, p. 125.

"Shell small, longicone, straight, slender and increasing very slowly in thickness, slightly and perhaps abnormally compressed. Test unknown; surface of the cast marked by thin, acute, transverse, annular ridges, which are much narrower than the grooves between them. Septa, and shape of the siphuncle, unknown.

"The largest specimen known to the writer was collected many years ago by J. De Cew in the Corniferous limestone of lot 6, concession 14, of the township of Walpole. It is about eighty-four millimetres ($3\frac{1}{4}$ inches) in length, by six mm. in thickness at the smaller end and about fourteen at the larger. Near the smaller end there are about ten annulations and near the larger end about six, in a length of ten mm. The only other specimen that the writer has seen, is a fragment about an inch and a half in length, from the same formation, and labelled lot 42, concession 1, Cayuga, which is probably referable to this species. It has about eight annulations in a length of ten mm., at the larger end.

"*O. Thestor*, Hall,* is described as having proportionately finer annulations, and *O. Idmon*, Hall, (†) judging from the figure, is almost cylindrical."

ORTHOCERAS HAGERSVILLENSE, Whiteaves.

Plate 33, figs. 4 and 4 *a*.

Orthoceras Hagersvillense, Whiteaves.....1898. Ottawa Naturalist, vol. XII, p. 126.

"Shell of medium size, straight, longicone and increasing slowly in thickness. Surface markings consisting of a fine rectangular reticulation caused by the crossing of numerous equidistant and continuous, minute and close-set, longitudinal ridges, by transverse but otherwise similar ridges. In the only specimen that the writer has seen, the longitudinal ridges are rather less than a millimetre apart at the smaller end, and about a millimetre apart at the larger; while the transverse ridges are slightly closer together, especially towards the larger end. Septa, and shape and position of the siphuncle unknown.

"Corniferous limestone at Hagersville," Ont., collected by the writer in 1890: a slightly distorted specimen, about three inches long, and an inch broad at the larger end, with a considerable portion of its surface buried in the matrix.

"The species seems to be well characterized by the minute reticulation of its surface, though its internal characters are unknown."

* Palæontology of the State of New York, vol. V, pt. 2, p. 302, pl. 82, fig. 18.
† Idem, p. 302, pl. 43, figs. 11 and 12.

PALÆOZOIC FOSSILS.

VOL. III.

8. *Revised list of the fossils of the Guelph formation of Ontario.*

By J. F. Whiteaves.

ANTHOZOA.

Tetracoralla.

Pycnostylus Guelphensis, Whiteaves.

Pycnostylus elegans, Whiteaves.

Zaphrentis. Species undeterminable.

Hexacoralla.

Favosites Gothlandicus, Lamarck.

(Favosites Forbesii, Edwards and Haime.

In his second report on the Palæontology of the Province of Ontario, Professor H. A Nicholson gives Hespeler as a locality for this species, but it is doubtful if this coral has ever been found in the Guelph formation of Ontario. Mr. Lambe, Contr. Canad. Palæont., vol. IV, pt. I, pp. 8-10, regards *F. Forbesii* as a Corniferous fossil, and as a synonym of *F. basalticus*, Goldfuss.)

Favosites Hisingeri, Edwards and Haime.

Favosites polymorphus (Goldfuss) Billings.

Syringopora infundibula, Whitfield.

Springopora infundibula, Whitfield .....1877. Ann. Rep. Geol.Surv. Wiscons., p. 79.
Cystostylus infundibulus Whitfield.....1882. Geol. Wiscons., p. 274, pl. 14, fig. 7.
" " Whiteaves.....1884. This volume, pt. I, p. 2; and (1895) pt. II, p. 49.
Syringopora infundibula, Lambe.....1899. Contr. Canad. Palæont., vol. IV, pt. 1, p. 53.

Octocoralla.

Halysites catenularia, L.

Mr. Lambe (op. cit., p. 68) regards *H. agglomeratus*, the *Catenipora agglomerata* of Hall, as a synonym of *H. catenularia*.

HALYSITES COMPACTUS, Rominger.

This species seems to be quite distinct from *H. agglomeratus* or *H. catenularia.*

HELIOLITES INTERSTINCTUS (L.).

HYDROMEDUSÆ.

HYDROIDA.

CLATHRODICTYON OSTIOLATUM, Nicholson.

CLATHRODICTYON FASTIGIATUM, Nicholson.

LABECHIA. Species undeterminable.

STROMATOPORA GALTENSIS (Dawson).

STROMATOPORA ANTIQUA, Nicholson and Murie.

STROMATOPORELLA. Species undeterminable.

BRACHIOPODA.

TRIMERELLA GRANDIS, Billings.

TRIMERELLA ACUMINATA, Billings.

TRIMERELLA OHIOENSIS, Meek.

TRIMERELLA BILLINGSII, Dall.

TRIMERELLA DALLI, Davidson and King.

RHINOBOLUS GALTENSIS (Billings).

RHINOBOLUS. Species uncertain.

MONOMERELLA PRISCA, Billings.

MONOMERELLA ORBICULARIS, Billings.

MONOMERELLA OVATA, Whiteaves.

MONOMERELLA OVATA LATA, Whiteaves.

MONOMERELLA DURHAMENSIS, Whiteaves.

MONOMERELLA. Species uncertain.

STROPHOMENA. Species undeterminable.

ORTHIS. Species undeterminable.

PENTAMERUS OBLONGUS, Sowerby.

Schuchert (Synops. Amer. Foss. Brachiop., p. 305) regards *P. bisinuatus*, McChesney, as a mere synonym of *P. oblongus.*

CONCHIDIUM OCCIDENTALE, Hall.

Pentamerus occidentalis, Hall..... .....1852. Pal. N. York, vol. II, p. 341, pl. 79, figs. 1 and 2; and of other U.S. and Canadian palæontologists, including the writer, in this volume, pt. II, p. 65.

Conchidium (?) occidentatis, Hall and Clarke. 1894. Pal. N. York, vol. VIII, pt. II, pl. 67, figs. 1-5.
Conchidium occidentale, Schuchert.....1897. Synops. Amer. Foss. Brach., p. 187.

CLORINDA VENTRICOSA (Hall).

Pentamerus (Barrandella) ventricosus, Hall. 1893; and, this volume, pt. II (1895) with the synonymy and references there given.
Barrandella ventricosa, Hall and Clarke.....1894. Pal. N. York, vol. VIII, pt. II, pl. 71, figs. 4-10; and pl. 84, fig. 46.
Clorinda ventricosa, Schuchert.....1897. Synops. Amer. Foss. Brach., p. 185.

This species has been recorded by the late Professor H. A. Nicholson (1875, Rep. Palæont. Prov. Ontario, p. 67) as having been found in the Guelph formation at Hespeler and Elora, but the writer has never seen an authentic Canadian specimen of it.

RHYNCHONELLA PISA, Hall and Whitfield.
ATRYPA RETICULARIS (L).
ATRYPA ASPERA (Schlotheim.)

SPIRIFER RADIATUS (Sowerby).

If Schuchert is correct in stating, on page 402 of his "Synopsis", that the *S. plicatella* of authors = *S. radiatus*, the specimens referred to as *S. plicatella*, on page 62 of the second part of this volume, are probably *S. radiatus*.

SPIRIFER CRISPUS (Hisinger).
WHITFIELDELLA HYALE (Billings).

MOLLUSCA.

PELECYPODA.

MEGALOMUS CANADENSIS, Hall.
MEGALOMUS COMPRESSUS, Nicholson and Hinde.
PTERINEA. Species undeterminable.
AMPHICÆLIA NEGLECTA (McChesney).
CONOCARDIUM. Species undeterminable.
GONIOPHORA CRASSA, Whiteaves.
ILIONIA CANADENSIS, Billings.
ILIONIA (?) COSTULATA, Whiteaves.

Probably a new generic type, but the few specimens collected shew no indications of the hinge line or muscular impressions.

ANODONTOPSIS CONCINNA, Whiteaves.

PROLUCINA GALTENSIS, Whiteaves.

Ilionia Galtensis, Whiteaves.....1884. This volume, pt. I, p. 15, pl. 3, figs. 1, 1 *a*, and 1 *b*, and (1895) pt. II, p. 68, pl. 15, fig. 3.

This species is evidently congeneric with the *Tellina prisca* of Hisinger, which E. Billings referred to *Ilionia*, in his original description of that genus in 1874. Dr. W. H. Dall, however, in 1896, made *T. prisca* the type of his subgenus *Prolucina*, and, in a letter to the writer, dated December 26, 1905, refers to the former as an "undoubted Lucinoid." It would therefore appear that *T. prisca* and *Ilionia Galtensis* are both probably Lucinoids and referable to the subgenus *Prolucina*; and that the name *Ilionia* proper may have to be restricted for the present to *I. Canadensis*, Billings, and *I. sinuata*, (Hall).

GASTEROPODA.

SCENELLA CONICA, Whiteaves.

ARCHINACELLA CANADENSIS (Whiteaves).

Tryblidium Canadense, Whiteaves.....1884. This volume, pt. I, p. 31, pl. 5, figs. 1 and 1 *a*.

Capulus Canadensis, Whiteaves .....1895. Idem, pt. II. p. 69, pl. 11, fig. 1.

Archinacella Canadensis, Ulrich and Scofield.1897. Geol. and Nat. Hist, Surv. Minn., Final Rep., vol. III, pt. II, p. 829.

BELLEROPHON SHELBIENSIS, Clarke and Ruedemann.

Bucania stigmosa (?) Hall. Whiteaves. 1884. This volume, p. I, pt. 34, pl. 5, figs. 3 and 3 *a*; and pl. 8, fig. 4.

Bellerophon. Species undeterminable. Whiteaves. 1895. Idem, pt. II, p. 70.

Bellerophon Shelbiensis, Clarke and Ruedemann. 1903. N. York State Mus., Mem. 5, p. 51, pl. 5, figs. 13–19.

TREMATONOTUS ANGUSTATUS (Hall).

EUOMPHALOPTERUS VALERIA (Billings).

Pleurotomaria Valeria, Billings.....1865. Geol. Surv. Canada., Palæoz. Foss., vol. I, p. 169.

" " Whiteaves....1884. This volume, pt. I, p. 23, pl. 4, figs. 1 and 1 *a*; and (1895) pt. II, p. 71, pl. 11, figs. 2 and 3. Probably = *Euomphalopterus alatus* (Wahlenberg).

EUOMPHALOPTERUS VELARIS. Whiteaves.

Pleurotomaria velaris, Whiteaves .. ..1895. This volume, pt. II, p. 72, pl. 11, figs. 4, and 4 *a*.

EUOMPHALOPTERUS HALEI (Hall). Var.

Pleurotomaria Halei, Hall. Var. Whiteaves. 1895. This volume, pt. II, p. 73, pl. 10, figs. 2 and 2 *a*.

Euomphalopterus Elora (Billings).

Pleurotomaria Elora, Billings..... .. 1862. Geol. Surv. Canada, Palæoz. Foss., vol I, p. 154, fig. 135.
" " Billings.....1863. Geol. Canada, p. 343, fig. 348.
" " Whiteaves... ..... .1895. This volume, pt. II, p. 74, pl. 11, figs. 5 and 6.

This species is here referred to *Euomphalopterus* on the authority of Dr. E. O. Ulrich, who, in a letter to the writer, dated January 20, 1906, writes that it "has all the essential characteristics of that genus." "The only difference," he adds, "that I can see is that the peripheral wing instead of being entire is broken up into a series of spines. These spines may very well represent the 'lunulæ' that, if my memory is not at fault, occur in *E. alatus* between the two thin sheets forming the alation. A subgenus, possibly, should be erected to signalize this departure from the usual type."

Lophospira Conradi (Hall).

Murchisonia Conradi, Hall.....1864. Eighteenth Regent' sRep. New York. St. Cab. Nat. Hist., p. 344, pl. 15 (6), fig. 19.
" " Whiteaves. 1884. This volume, pt. I, p. 27, pl. 4, fig. 6.

This and the three following species are referred to *Lophospira* on the authority of Dr. Ulrich.

Lophospira Xanthippe (Billings).

Murchisonia Xanthippe, Billings .....1862. Geol. Surv. Canada, Palæoz. Foss., vol. I, p. 155, fig. 137.
" " Whiteaves. . ..1895. This volume, pt. II, p. 80.

Lophospira Mylitta (Billings).

Murchisonia Mylitta, Billings.....1862. Geol. Surv. Canada, Palæoz. Foss., vol. I, p. 157, fig. 140.
" " Whiteaves.....1895. This volume, pt. II, p. 79.

Lophospira Hespelerensis, Whiteaves.

Murchisonia Hespelerensis, Whiteaves .... 1884. This volume, pt. 1, p. 24, pl. 41, fig. 3; and (1895) pt. II, p. 79.

Lophospira Guelphica (nom. prov.)

Murchisonia. (Species uncertain). Whiteaves. 1895. This volume, pt. II, p. 79, pl. 12, fig. 3.

Loxoplocus solutus (Whiteaves).

Murchisonia soluta, Whiteaves . .....1884. This volume, pt. I, p. 28, pl. 4, figs. 8 and 8*a*.
Murchisonia tropidophora. Whiteaves..... 1884. Idem, p. 29, pl. 7, figs. 5 and 5*a*.
Loxoplocus solutus, Fischer ... .1885. Man. de Conchyliol., etc., p. 847.
" " Whiteaves .....1895. This volume, pt. II, p. 84, pl. 12, figs. 7 and 8.

Phanerotrema occidens (Hall).

Pleurotomaria occidens, Hall ....1867. Twentieth Reg. Rep. N. York St. Cab. Nat. Hist., p. 364, pl. 15, figs. 11 and 12.
" " Whiteaves... ....1884. This volume, pt. I, p. 23; and (1895) pt. II, p. 77.
Phanerotrema occidens, Ulrich and Scofield..1897. Geol. and Nat. Hist. Surv. Minn., Final Rep., vol. III, pt. II, p. 952.

Liospira perlata (Hall).

Pleurotomaria perlata, Hall..... .....1852. Pal. N. York, vol. II, p. 349, pl., 84, figs. 5 *a*, *b*, *c*.
Pleurotomaria solarioides, Billings (probably by inadvertence) 1863. Geol. Canada, p. 341, figs. 347, *a* and *b*.
Pleurotomaria perlata, Whiteaves .....1884. This volume, pt. I, p. 22; and (1895) pt. II, p. 75.

"In judging of this species I have nothing to build on save Hall's original figures. These pass very well for a large species of *Liospira*. Unless you have material showing differences in the band or elsewhere, I should suggest referring the species to that genus. It is to be noted that Hall recognized its resemblance to *L. lenticularis*." Ulrich, in a letter to the writer, dated January 20, 1906. The species is still only known from mere casts of the interior of the shell.

Eotomaria galtensis (Billings).

Pleurotomaria Galtensis, Billings..... ..1862. Geol. Surv. Canada, Palæoz. Foss., vol. I, p. 154, fig. 136; and (1863) Geol. Canada, p. 334, fig. 349.
" " Whiteaves .....1895. This volume, pt. II, p. 75, pl. 11, fig. 7.
Eotomaria galtensis, Clarke and Ruedemann. 1903. N. York St. Mus., Mem. 5, p. 70, pl. 10, figs. 10-12.

Eotomaria Durhamensis (Whiteaves).

Pleurotomaria Durhamensis, Whiteaves....1884. This volume, pt. I, p. 24, pl. 4., fig. 2; and (1895) pt. II, p. 77.
Eotomaria durhamensis, Clarke & Ruedemann. 1903. N. York St. Mus., Mem. 5, p. 68, pl. 10, fig. 17.

Clathrospira Deiopeia (Billings).

Pleurotomaria Deiopeia, Billings.....1862. Geol. Surv. Canada, Palæoz. Foss., vol. I, p. 155.
" " Whiteaves.....1895. This volume, pt. II, p. 75, pl. 12, fig. 1.

This species is here provisionally referred to the genus *Clathrospira*, at the suggestion of Dr. Ulrich.

Hormotoma Whiteavesii, Clarke and Ruedemann.

Loxonema magnum (Whitfield) Whiteaves. 1884. This volume, pt. I, p. 17.
Loxonema magnum, Whitfield. Var. Whiteaves. 1895. Idem, pt. II, p. 87, pl. 13, fig. 2.
Hormotoma Whiteavesi, Clarke & Ruedemann...1903. N. York St. Mus., Mem. 5, p. 72, pl. 8, figs. 5 and 9.

The memoir last cited is a descriptive and illustrated monograph of the "Guelph Fauna in the State of New York." One of the new species that is described and figured therein is this *Hormotoma*, and its describers say that they "have little doubt that the Guelph shell figured by Whiteaves (specimens are from Galt, Hespeler and Elora) as *Lox. magnum* is specifically identical with, if smaller, than the New York specimens of *Horm. Whiteavesi*." The three specimens from Ontario that were referred to *Loxonema magnum* are badly preserved and do not shew the surface markings, but the numerous Rochester specimens of *H. Whiteavesi* are remarkably well preserved, and shew both the lines of growth and the slit-bard very clearly.

Cœlocaulus, Œhlert.

Cœlocaulus, Œhlert.....1887. Extr. Bull. Soc. d'Etud. Scient. d'Angers, p. 20 (teste Ulrich); non *Cœlocaulis*, Hall, 1887.

Cœlidium, Clarke and Ruedemann.....1903. N. York St. Mus., Mem. 5, pp. 65-67.

Cœlocaulus (?) Vitellia, (Billings).

Murchisonia Vitellia, Billings .....1862. Geol. Surv. Canada, Palæoz. Foss., vol. I, p. 156, fig. 138.

" " Nicholson.....1875. Rep. Pal. Prov. Ont., p. 3, fig. 6.

This shell is rather doubtfully referred to *Cœlocaulus*, on the authority of Clarke and Ruedemann, who on page 67 of their memoir on the Guelph Fauna in the State of New York, imply that *M Vitellia* is a *Cœlidium*, which, as previously stated, is a generic name that they prefer to *Cœlocaulus*. The gutta percha impression of a natural mould of the exterior of the shell of a specimen from Galt, upon which this species was based, does not show whether the axis is perforate or not. To the writer, *M. Vitellia* looks more like a species of *Lophospira*.

Cœlocaulus macrospira (Hall).

Murchisonia macrospira, Hall.....1852. Pal. N. York, vol II, p. 346, pl. 83, fig. 5.

Murchisonia Logani, Hall .....1852. Idem., p. 346, pl. 84, figs. 4 *a* and 4 *b*.

Murchisonia macrospira, Billings.....1863. Geol. Canada, p. 339, fig. 334.

" " Nicholson. .....1875. Rep. Pal. Prov. Ontario, p. 70, pl. 3, fig. 9.

" " Whiteaves.....1884. This volume, pt. I, p. 27, pl. 4, figs. 7 and 7*a*.

Murchisonia Logani. Whiteaves .....1895. This volume, pt. II, p. 80.

Murchisonia macrospira, Whiteaves.....1895. Idem, p. 81.

Cœlocaulus Logani, Ulrich and Scofield.....1897. Geol. and Nat. Hist. Surv. Minn., Final Rep., vol. III, pt. II, p. 1020

Cœlidium macrospira, Clarke and Ruedemann .... 1903. N. York St. Mus., Mem., 5, p. 65, pl. 7, figs. 2-8; and pl. 10, fig. 13.

Cœlocaulus bivittatus (Hall).

Murchisonia bivittata, Hall.. ....1852. Pal. N. York, vol. II, p. 345, pl. 83, figs. 1 *a* and 1 *b*.
" " Billings.... . ... 1863. Geol. Canada, p. 339, fig. 343.
" " Nicholson.... ....1875. Rep. Pal. Prov. Ontario, p. 70, pl. 3, fig. 7, but not fig. 8.
" " Whiteaves .....1895. This volume, pt. II, p. 82, pl. 12, figs. 5 and 6.
Cœlocaulus bivittatus, Ulrich and Scofield.1897. Geol. and Nat. Hist. Surv. Minn., Final Rep., vol. III. pt. II, p. 1020.

Cœlocaulus longispira (Hall).

Murchisonia longispira, Hall.... .....1852. Pal. N. York, vol. II, p. 345, pl. 83, figs. 2 *a* and 2 *b*.
" Nicholson. .... .1875. Rep. Pal. Prov. Ontario, p. 70, pl. 3, figs. 11 and 12.
" " Whiteaves .....1895. This volume, pt. II, p. 83.
Cœlocaulus longispira, Ulrich and Scofield.1897. Geol. and Nat. Hist. Surv. Minn., Final Rep., vol. III, pt. II, p. 1020.

Cœlocaulus turritiformis (Hall).

Murchisonia turritiformis, Hall .....1852. Pal. N. York, vol. II, p. 347, pl. 83, figs. 6 *a* and 6 *b*.
" " Nicholson....1875. Rep. Pal. Prov. Ontario, p. 70, pl. 2, fig. 10.
" " Whiteaves....1884. This volume, pt. 1, p. 26, pl. 4, fig. 5; and (1895) pt. II, pl. 12, fig. 4.
Cœlocaulus turritiformis, Ulrich and Scofield...1887. Geol. and Nat. Hist. Surv. Minn., Final Rep., vol. III, pt. II, p. 1020.

Cœlocaulus Estella (Billings).

Murchisonia Estella, Billings.....1862. Geol. Sur. Canada, Palæoz. Foss., vol. I, p. 157, fig. 139.
" " Whiteaves.....1895. This volume, pt. II, p. 83.

Dr. Ulrich writes that he is "inclined to unite *C. Estella* with *C. turritiformis*."

Turritoma, Ulrich and Scofield.

Turritoma, Ulrich and Scofield..... .. 1897. Geol. and Nat. Hist. Surv. Minn., Final Rep., vol. III, pt. II, p. 959.

Turritoma Boylei (Nicholson).

Murchisonia Boylei, Nicholson..... . .. 1875. Rep. Pal. Prov. Ontario. p. 71, pl. 3, fig. 1.
" " Whiteaves ....1895. This volume, pt. II, p. 81.
Turritoma Boylei, Ulrich and Scofield.....1897. Geol. and Nat. Hist. Surv. Minn., Final Rep., vol. III, pt. II, p. 959.

TURRITOMA CONSTRICTA (Whiteaves).

Murchisonia constricta, Whiteaves..... .. 1884. This volume, pt. I, p. 25, pl. 4, fig. 4; and (1895) pt. II, p. 82.

Turritoma constricta, Ulrich and Scofield.. 1897. Geol. and Nat. Hist. Surv. Minn., Final Rep., vol. III, pt. II, p. 959,

MURCHISONIA BILLINGSANA, Miller.

Murchisonia Hercyna, Billings .... 1862. Geol. Surv. Canada, Palæoz. Foss. vol. I, p. 158, fig. 141; but not *M. Hercyna*, Roemer, 1843.

Murchisonia billingsana, S. A. Miller.....1889. N. Amer. Geol. and Palæont., p. 411.

The best specimens in the Museum of the Survey are the type specimen of *M. Hercyna* figured by E. Billings, which he collected at Galt in 1857, and a slightly smaller one from Elora, collected by Mr. T. C. Weston in 1867. These are the only specimens known to the writer upon which any portion of the test is preserved. Both of them have recently been examined by Dr. Ulrich, who writes as follows in regard to them, in a letter dated April 7, 1906. "As is proved beyond the shadow of a doubt by the peripheral portion of the smaller specimen, this is not a *Murchisonia*, nor even one of the Pleurotomariidæ. It is no less certain that it is congeneric with *Trochus Kolmodini* and *T. Wisbyensis*, Lindström. Indeed it is closely allied specifically to these Gotland shells, especially to the former. Whether Lindström was justified in referring these species to *Trochus*, or not I have not decided, though inclined to doubt it." In the writer's judgment, the reference of *M. Billingsana* to the Linnæan genus *Trochus*, as now defined, would be almost as unsatisfactory as its original reference to *Murchisonia* has proved to be. Its surface markings are remarkably similar to those of *Holopea Harmonia*, Billings.

PLEUROTOMARIA BISPIRALIS, Hall.

In their memoir on the Guelph Fauna in the State of New York, Clarke & Ruedemann regard this species as a *Lophospira*. Ulrich, however, dissents from this conclusion and gives the following reasons for his dissent, in a letter dated January 20, 1906. "*P. bispiralis*, Hall. As figured by Clarke and Ruedemann (pl. 10, figs. 7 and 8) this species cannot justly fall under *Lophospira*. Its relations seem to me to be altogether different, the band as represented being distinctly concave instead of convex. The characters shown in figs. 7 and 8 recall *Eotomaria* on the one hand (whorls too full below) and the aberrant *Plethospiræ* recently distinguished as *Ulrichospira* by Miss Donald. Without good specimens I hesitate to decide its position. Clarke and Ruedemann's figure 6, if the drawing is correct, seems to me to represent something quite different.

The general form, direction of the lines of growth and absence of a distinct, concave band, suggest *Eunema* very strongly. Figure 6 (Clarke and Ruedemann, pl. 10) seems to me to be the true *P. bispiralis*, 7 and 8 apparently something new." Figure 9 on the same plate, which Ulrich does not refer to in these notes, seems to the writer to be also quite different from figure 6.

PLEUROTOMARIA VIOLA, Billings.

In a letter dated April 7, 1906, Dr. Ulrich expresses the opinion that the type of this species, which is figured on Plate 12, fig. 2, of the second part of this volume, is a "*Poleumita* near *P. discors* (Sowerby). It is, however," he writes "as you say, a wretched cast, and better specimens, if you could satisfy yourself that they were really the same species, might show quite different affinities, with *Trochonema*, for instance. My opinion is based (1) on the general form of the shell and whorls, which is not unlike that of the higher varieties of *P. discors*; (2) on the broad retral bend of the under side of the lip; and (3) on the indications, obscure it is true, of revolving ridges."

PLEUROTOMARIA CYCLOSTOMA, Whiteaves.

"This certainly is an extraordinary type, though its relations are not so far to seek as may appear at first sight. Despite the well-developed slit-band, I am still of the opinion that it does not belong to the Pleurotomariidæ. Its nearest relatives, however, are among Gotland species referred to *Pleurotomaria* by Lindström. One of these, (*P. planorbis*, Hisinger) I have already removed to the Euomphalidæ under the new generic name *Hisingeria*. (See Minnesota report). The other relatives are Lindström's *P. prætexta* and *P. togata*. In the *Hisingeria* we have a narrow yet distinct slit-band, but the type is distinguished generically from *P. cyclostoma* by its planorbiform shell and narrower and more simple band. The *P. prætexta* group agrees better with your shell in general aspect and in the position of the carina, that corresponds to the band in *P. cyclostoma*, but the much better developed, and more sharply defined and concave instead of convex character of the band, together with the closed umbilicus on your species, constitutes sufficient ground for generic separation. In short, I would establish a new genus for *P. cyclostoma*, another for *P. prætexta*, et aliis, and provisionally refer both, with *Hisingera*, to the Euomphalidæ. Undoubtedly all of these shells are related to *Euomphalopterus*, which I have referred, I fear erroneously, to the Raphistomidæ." Ulrich, in letter dated March 19, 1906.

PLEUROTOMARIA TOWNSENDII, Whiteaves.

The type of this species, which was described on page 77 of the second

part of this volume, as a "natural mould of the exterior of the shell", etc., would be more correctly described as a well preserved hollow, testiferous specimen, that has been broken longitudinally in such a way as to expose the concave inner surface of about one half of each of the five volutions. Its characters are clearly indicative of a new generic type, which there is not sufficient material to define satisfactorily.

EUOMPHALUS GALTENSIS, Whiteaves.

EUOMPHALUS INORNATUS, Whiteaves.

EUOMPHALUS CIRCINATUS, Whiteaves.

STRAPAROLLUS HIPPOLYTE, Billings.

STRAPAROLLINA DAPHNE, Billings.

POLEUMITA, Clarke and Ruedemann.

Euomphalus (pars) Sowerby. .....1814. Min. Conch., vol. I, p. 97; et auct.
Polytropis, DeKoninck..... .....1881. Faun. Carbonif., vol. II, pt. 3, p. 107. But not *Polytropis*, Sandberger, 1874.
Oriostoma (pars) Lindström.....1884. Silur. Gastrop. and Pterop. Gotland, p. 156. But apparently not *Oriostoma*, Munier Chalmas, 1876. Journ. Conch., vol. XVI, p. 103.
Omphalotrochus, Lindström.... .....1884. Op. cit., p. 156. But not *Omphalotrochus*, Meek, as now understood.
Horiostoma, Fischer ....1885. Manuel de Conchyliologie, etc., p. 813.
Omphalotrochus, Eastman. .....1900. Text-book Palæont., vol. I, p. 447. Not *Omphalotrochus*, Meek. 1864.
Polcumita, Clarke and Ruedemann ... 1903. N. York St. Mus., Mem. 5, p. 59.
Polytropina, Donald (Miss Jane).....1905. Quart. Journ. Geol. Soc. London, vol. LXI, p. 575.

POLEUMITA SULCATA (Hall).

Cyclonema sulcata, Hall.... .....1852. Pal. N. York, vol. II, p. 347, pl. 34, figs. 1, *a-d*.
" " Billings..... ...1863. Geol. Canada, p. 343, figs. 350, *a*, *b*.
Cyclonema sulcatum, Whiteaves.....1884. This volume, pt. I, p. 18, pl. 3, fig. 5.
Polytropis sulcatus, Whiteaves.....1895. Idem, pt. II, p. 89, pl. 13, figs. 9 and 9 *a*.
Poleumita (?) sulcata, Clarke and Ruedemann..1903. N. York St. Mus., Mem. 5, p. 62, pl. 10, figs. 1-4.

As stated on page 259, this species still seems to the writer to be congeneric with the *Cyclonema carinatum* of Lindström (the *Turbo carinatus* of Sowerby) which Ulrich says is a *Gyronema*. Ulrich, however, who is the founder of the genus *Gyronema*, is not of that opinion, and in a letter dated April 13, 1906, writes as follows on this point. "*P. sulcata* is a *Poleumita* and not a *Gyronema* because of its subcircular mouth, the association of opercula with it, the greater directness with which the lines of growth cross the under side of the volutions and the fact that the

strongest of the revolving ridges occur in the umbilical region (comp. *Oriostoma globosum* as figured by Lindström). The features mentioned are not all of generic scope, the last especially indicating specific alliances."

Poleumita macrolineata (Whitfield).

Euomphalus macrolineatus (Whitfield) Whiteaves. 1884. This volume, pt. I, p. 20, pl. 3, fig. 6.
Polytropis macrolineatus (Whitfield) Whiteaves. 1895. Idem, pt. II, p. 91.

But Clarke and Ruedemann think that the Canadian specimens that have been identified with this species can "hardly with safety be referred to the large, very coarsely ridged shell which Whitfield describes as *Euomphalus macrolineatus*, from the dolomites at Manitowoc, Wisconsin."

Poleumita crenulata (Whiteaves).

Straparollus crenulatus, Whiteaves.....1884. This volume, pt. I. p. 21, pl. 3, figs. 8, 8 *a* and 8 *b*.
Polytropis crenulatus, Whiteaves.....1895. Idem, pt. II, p. 91.
Poleumita crenulata, Clarke and Ruedemann...1903. N. York St. Mus., Mem. 5, p. 64, pl. 9, figs. 9, 11, 16–24.

Poleumita Durhamensis, Whiteaves.

Polytropis Durhamensis, Whiteaves...1895. This volume, pt. II, p. 91, pl. 14, figs. 1 and 2.

Poleumita parvula, Whiteaves.

Polytropis parvulus, Whiteaves.....1895. Idem, p. 92, pl. 13, figs. 10 and 10 *a*.

Codonochilus striatus, Whiteaves.

Pycnomphalus solarioides (Hall.)

Loxonema Boydii, Hall.

Holopea Harmonia, Billings.

Holopea Guelphensis, Billings.

Holopea Gracia, Billings.

Holopea (?) occidentalis, Nicholson.

Subulites compactus, Whiteaves.

Cyrtospira ventricosa (Hall).

Subulites ventricosus (Hall) Whiteaves.....1895. This volume, pt. II, p. 96.
Cyrtospira ventricosa, Ulrich and Scofield....1897. Geol. and Nat. Hist. Surv. Minn., Final Rep., vol. III, pt. II, p. 1073.

Opercula.

Several detached multispiral and paucispiral opercula, of unknown genera and species.

Cephalopoda.

Orthoceras crebescens, Hall.

Orthoceras Selwyni, Billings.

Kionoceras cancellatum (Hall).

Kionoceras medullare (Hall).

Orthoceras medullare, Hall.....1860. Rep. Progr. Geol. Surv. Wiscons. for 1859, p. 4; and (1867) Twentieth Rep. Reg. N. York St. Cab. Nat. Hist., p. 353, pl. 20 (11) figs. 1 and 2.

" " Whiteaves.....1884. This volume, pt. I, p. 37; and (1895) pt. II, p. 99.

Kionoceras medullare, Clarke & Ruedemann.1903. N. York St. Mus., Mem. 5, p. 86, pl. 10, fig. 23.

Kionoceras Darwini (Billings).

Orthoceras Darwini, Billings.....1862. Geol. Surv. Canada, Palæoz. Foss., vol. I, p. 161.

Cyrtoceras Myrice, Hall and Whitfield..1875. Geol. Surv. Ohio, Palæont., vol. 2, pt. 2, p. 149, pl. 8, fig. 9.

Orthoceras Darwini, Whiteaves.....1884. This volume, p. 38, pl. 6, figs. 2 and 2 *a*.

Cyrtoceras Myrice, Whiteaves.....1884. Idem, p. 39, pl. 6, figs. 3 and 3 *a*.

Orthoceras Darwini, Foord.....1888. Cat. Foss. Cephal. Brit. Mus., pt. I, p. 76, fig. 8.

" " Whiteaves.....1895. This volume, pt. II, p. 100.

Kionoceras Darwini, Clarke and Ruedemann..1903. N. York St. Mus., Mem. 5, p. 84, pl. 10, fig. 22; pl. 11, fig. 6; and pl. 12, figs. 1-8.

Dawsonoceras annulatum, Sowerby,

var. Americanum, Foord.

Orthoceras annulatum, var. *Americanum*, Foord.....1888. Cat. Foss. Cephal. Brit. Mus., pt. I, pp. 56 and 57.

Orthoceras annulatum, var. *Americanum*, Whiteaves.....1895. This volume, pt. II, p. 101, which see for a list of synonyms of this shell, with references.

Dawsonoceras annulatum, var. *americanum*, Clarke and Ruedemann.....1903. N. York St. Mus., Mem. 5, p. 81, pl. 10, figs. 19-21; and pl. 11, fig. 1.

GOMPHOCERAS SEPTORIS, Hall.

ASCOCERAS TOWNSENDI, Whiteaves.

CYRTOCERAS ARCTICAMERATUM, Hall.

CYRTOCERAS ORODES, Billings.

PHRAGMOCERAS HECTOR, Billings.

PHRAGMOCERAS NESTOR, Hall,

var. CANADENSE, Whiteaves.

PHRAGMOCERAS PARVUM, Hall and Whitfield.

TROCHOCERAS DESPLAINENSE, McChesney.

DISCOCERAS GRAFTONENSE, Meek and Worthen.

CRUSTACEA.

OSTRACODA.

LEPERDITIA BALTHICA, Hisinger,

var. GUELPHICA, Jones.

LEPERDITIA PHASEOLUS, Hisinger,

var. GUELPHICA, Jones.

TRILOBITA.

CALYMENA NIAGARENSIS, Hall.

CERAURUS NIAGARENSIS, Hall.

ILLÆNUS ABOYNENSIS, Whiteaves.

PROETUS. Species undeterminable.

EURYPTERIDA.

EURYPTERUS BOYLEI, Whiteaves.

PALÆOZOIC FOSSILS.

VOL. III.

By J. F. Whiteaves.

APPENDIX.

ERRATA ET CORRIGENDA.

Part I.

Page 5.

Line two from top, for "1871"—read 1867.

Page 7.

Line eleven from top, for "Plate II, fig. 1*a*; and pl. VIII, figs. 3 and 3 *a*."; read—Plate VIII, fig. 3.

Fig. 1*a* on Plate II, and fig. 3 *a* on Plate VIII, as shewn by Hall and Clarke (Pal. N. York, vol. VIII, Brachiopoda I, expl. pl. 4. D, figs. 3 and 4); and as partially stated in part II of this volume, p. 58, represent the exterior and interior of the supposed brachial valve of an undetermined species of *Monomerella*.

Page 37.

Line six from bottom.

And Pt. II, p. 99, line seven from top.

In a letter dated October 30th, 1883, Mr. David Boyle writes that the specimen of *Orthoceras medullare* referred to on page 37 of the first part of this volume, as having been collected by him at Elora in 1876, was "given to him by a stone mason, Mr. G. Sinclair, of Elora, who collected it from a quarry in Guelph town."

Part II.

Page 45.

Line ten from bottom, for "which are neither enumerated or described," read—which are either enumerated or described.

And on the bottom line (foot note) for "Bandet 10," read—Bandet 9.

Page 46.

Line twelve from top, for "in 1878-75," read— in 1878-85.

Page 47.

Line six from top, for "figs. 9, 9 *a-d*," read—figs. 5, 5 *a-d*.

Page 48.

Line nineteen from top, for "1864", read—1884; and, line seventeen from bottom, for "1889", read—1890.

Page 50.

In the list of synonyms of *Favosites Gothlandica*, cancel the references to "Billings. 1859. Canad. Journ., N. S., vol. IV, p. 90"; and to "Nicholson. 1874. Rep. Pal. Prov. Ont., p. 45."

Page 58.

Line twenty from top, for "this volume, pt. I, pl. 8, fig. 3 *a*," read—this volume, pt. I, pl. 2, fig. 1; and pl. 8, fig. 3 *a*.

Line seventeen from bottom, for "Plate 7 fig. 3 *a*," read—Plate 8, fig. 3*a*.

Page 113.

"STREPTELASMA RUSTICUM, Billings (Sp.)"

Mr. Lambe ("Contr. Canad. Palæont., vol. IV, pt. II, p. 114) thinks that these specimens from Stony Mountain should be referred to the *Petraia latuscula* rather than to the *P. rustica* of Billings, and that they should be called *Streptelasma latusculum*. On the other hand, in an unpublished M.S. list of the fossils collected at that locality by Dr. R. W. Ells in 1875, Mr. Billings refers to the Zaphrentidæ as "*Petraia*, two new sp.," and does not identify any of them with his *P. rustica* or *P. latuscula*.

Page 115.

For "HOMOTRYPELLA GRACILIS, Nicholson. (Sp.)"—read:—

BYTHOPORA GRACILIS, Nicholson. (Sp.)

And add to the references:—

Bythopora gracilis, Nickles and Bassler.....1900. Bull. U. S. Geol. Surv., No. 173, p. 185.

Page 116.

For "MONOTRYPELLA QUADRATA, Rominger. (Sp.)"—read:—

RHOMBOTRYPA QUADRATA, Rominger. (Sp.)

And add to the references:—

Rhombotrypa quadrata, Ulrich & Bassler...1904. Smithson. Miscel. Collect. (Quarterly Issue) vol. 47, No. 1470, p. 44.

Page 119.

Line fourteen from top, for "p. 3," read—p. 111.

Page 121.

Line twenty from bottom, for "p. 18," read—p. 168.

Page 122.

For "PLEUROTOMARIA BICINCTA, Hall. (Sp.)" read :—

LOPHOSPIRA BICINCTA, Hall. (Sp.)

And add to the references :—

Lophospira bicincta, Ulrich and Scofield.....1897, Geol. and Nat. Hist. Surv. Minn., Final Rep., vol. III. pt. II, p. 964.

Page 128.

For "CHEIRURUS ICARUS, Billings." read :—

CERAURUS ICARUS, Billings. (Sp.)

And, to the list of trilobites from the "Lower Beds" at Stony Mountain, add the following :—

PTERYGOMETOPUS CALLICEPHALUS, Hall. (Sp.)

A well preserved and nearly perfect cephalon, collected by Professor J. Hoyes Panton in 1884, and now in the Museum of the Survey.

PART III.

Page 151.

Line two from top, for "regularity," read—angularity.

Page 152.

For "DIPHYPHYLLUM STOKESI, Edwards and Haime. (Sp.)" read :—

COLUMNARIA STOKESII, Edwards and Haime. (Sp.)

In 1900, in the second part of his "Revision of the Genera and Species of Canadian Palæozoic Corals" (Contr. Canad. Palæont., vol. IV) Mr. Lambe expressed the opinion that the specimens from Lower Fort Garry that were referred to *D. Stokesi*, are identical with the *Palæophyllum rugosum* of Billings, and that they should be called *Columnaria rugosa*. Three years later (in the second fasciculus of the "Palæontologia Universalis," p, 29 *d*) Dr. Walcott says that there "seems to be no doubt that *Columnaria Thomi*, Hall, and *Diphyphyllum Stokesi*, Whiteaves, are species of *Cyathophyoides*, "which, it may be added, is probably not generically distinct from *Columnaria*. If, however, the specimens from Lower Fort Garry are identical with the "*Lithostrotion Stokesi*" of Milne-Edwards and Haime, from Lake Winnipeg, it would seem that they

should be called *Columnaria Stokesii.*

Page 153.

Line nine from bottom, for "1886," read—1881; and line eight from bottom, for "57," read—57 c.

Page 155.

Line six from top, for "*Porites,*" read *Protarœa.*

Page 183.

Line ten from top, for "original", read—marginal.

Page 193.

For "SOLENOSPIRA PAGODA (Salter) var. OCCIDENTALIS." read:—

ECTOMARIA PAGODA (Salter) var. OCCIDENTALIS.

According to Miss Donald (Quart. Journ. Geol. Soc. Lond., 1899, vol. 55, p. 253) *Solenospira* (Ulrich, 1897) is a synonym of *Ectomaria*, (Koken, 1896).

Page 204.

For "ENDOCERAS (NARTHECOCERAS) CRASSISIPHONATUM, Whiteaves". read:—

NARTHECOCERAS CRASSISIPHONATUM, Whiteaves. (Sp.)

Page 205.

FOR "ENDOCERAS (NARTHECOCERAS) SIMPSONI, Billings. (Sp.)" read:—

NARTHECOCERAS SIMPSONI, Billings. (Sp.)

Page 210.

For "ACTINOCERAS (DEIROCERAS) PYTHON, Billings (Sp.)" read:—

DEIROCERAS PYTHON, Billings. (Sp.)

For "ACTINOCERAS (SACTOCERAS?) CANADENSE, Whiteaves," read:—

PARACTINOCERAS CANADENSE, Whiteaves. (Sp.)

This species is the type of the subgenus *Paractinoceras*, Hyatt, 1900.

Page 213.

For "ORTHOCERAS ANELLUS, Conrad." read:——

SPYROCERAS ANELLUS, Conrad. (Sp.)

In Bulletin 49 of the New York State Museum, Palæontologic papers 2 (December, 1901) p. 39, Ruedemann refers *Orthoceras bilineatum*, Hall,

O. anellus, Conrad, and *O. laqueatum*, Hall, to Hyatt's genus *Spyroceras*.

Page 214.

For "TRIPTEROCERAS SEMIPLANATUM, Whiteaves (Sp.)" read :—

JOVELLANIA SEMIPLANATA, Whiteaves.

The reference of *Orthoceras semiplanatum* to Hyatt's genus *Tripteroceras* has not proved satisfactory, as the siphuncle of the former is known to be cylindrical, while that of the latter is said to be nummuloidal. For the present *O. semiplanatum* may be provisionally referred to *Jovellania*, as redefined by Foord, who says that its siphuncle is "generally nummuloidal" rarely cylindrical.

Page 236.

For "CHEIRURUS PLEUREXANTHEMUS, Green," read :——

CERAURUS PLEUREXANTHEMUS, Green.

INDEX TO GENERIC AND SPECIFIC NAMES IN THE WHOLE VOLUME.

(SYNONYMS IN ITALICS.)

PLATE XXIII.

Unless otherwise stated, the figures in each of these plates are of the natural size, and reproductions of original drawings by Mr. G. S. Barkentin.

FENESTELLA SUBARCTICA (page 249).

The type and only specimen of this species known to the writer, from the Silurian limestone of the Ekwan River, shewing the celluliferous side of an imperfect zoarium, six times the natural size, and slightly restored.

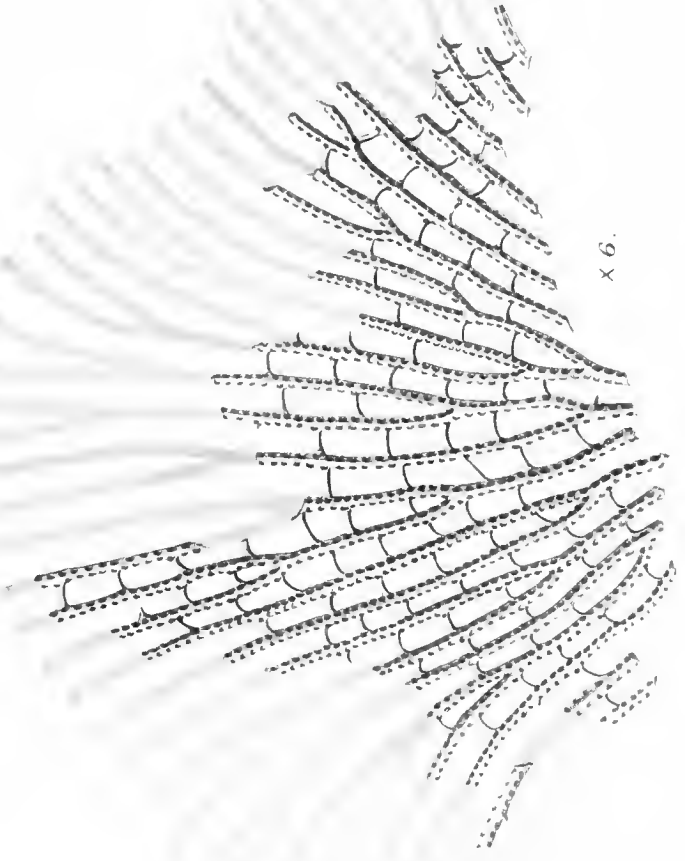

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PLATE XXIV.

APHYLLOSTYLUS GRACILIS (page 279).

Figure 1. Small piece of Silurian limestone from Stonewall, Manitoba, shewing a longitudinal section of part of the corallum of a specimen of this species, the nearly cylindrical shape of the corallites, and the transverse tabulæ.

" 1 *a*. Portion of one of the corallites of the same specimen, six times the natural size, to shew the septal spines on the surface of the interior.

PETRAIA (PYGMÆA ? VAR.) OCCIDENTALIS (page 291).

Figure 2. Summit of a large specimen of this coral, as exposed on the weathered surface of a small piece of Silurian limestone from the Grand Rapids of the Saskatchewan.

" 3. Similar view of a smaller specimen, on the same piece of limestone.

" 4. Side view of another small specimen, from the Grand Rapids, shewing the exterior of the corallum, apparently minus the epitheca.

" 5. Longitudinal section of a small specimen, exposed on the weathered surface of the same piece of limestone as the originals of figs. 2 and 3.

PHÆNOPORA KEEWATINENSIS (page 268).

Figure 6. The type and only known specimen of this species, a fragment of a zoarium, from the Silurian limestone on a small island in the northern Sutton Mill Lake ; twice the natural size.

" 6 *a*. Section of a portion of the same specimen ; six times the natural size.

TRIMERELLA EKWANENSIS (page 249).

Figure 7. Outline of a nearly perfect pedicle valve of a shell of this species, from the Silurian rocks of the Ekwan River, slightly restored, and reduced in size. The vertical line on the right shews the actual length of the valve.

From a drawing by Mr. C. F. King.

STROPHEODONTA ACANTHOPTERA (page 285).

Figure 8. Ventral view of a specimen of this species, shewing the exterior of the whole of the convex ventral valve. The drawing was made from a wax impression of a natural mould of the exterior of a ventral valve, on a loose piece of limestone picked up on the beach on the north-east side of Lake Winuipegosis by Mr. D. B. Dowling in 1888.

" 9. Another specimen of the same species from the Silurian limestone at Long Point, Winnipegosis, collected by Mr. J. B. Tyrrell in 1889.

Both figures of this species are from drawings by Mr. L. M. Lambe.

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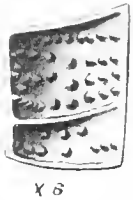

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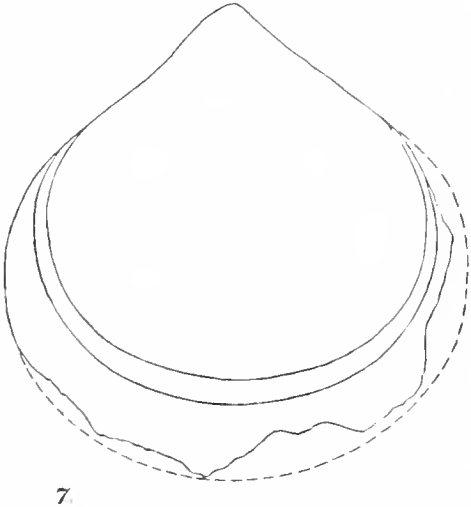
6a. X 6.

X 2. 6.



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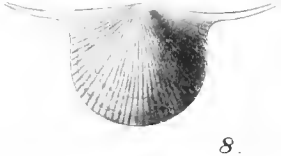

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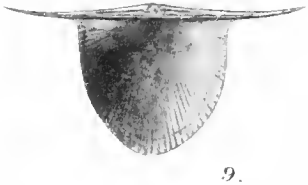

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PLATE XXV.

TRIMERELLA EKWANENSIS (page 249).

Figure 1. Outline of a brachial valve of a specimen of this species, from the Silurian limestone of the Ekwan River, with part of the test preserved and slightly reduced in size. The vertical line on the left shews the actual length.

Figure 2. Outline of a cast of the interior of a large brachial valve of a shell of this species, from the same limestone, slightly restored, and reduced a little in size. The vertical line on the right shews the actual length.

Both of the figures of this species are from drawings by Mr. C. F. King.

TRIMERELLA BOREALIS (page 250).

Figure 3. Outline of the supposed dorsal side of a cast of the interior of both valves of a specimen of this species, from the Ekwan River, shewing the impress of the brachial valve, and slightly restored.

" 3*a* Outline of the supposed ventral side of the same specimen, shewing the impress of the pedicle valve.

The two figures of this species, also, are from drawings by Mr. C. F. King.

CAMAROTŒCHIA EKWANENSIS (page 252).

Figure 4. Dorsal view of the type of this species, a well preserved cast of the interior of both valves of a specimen from the Ekwan River, shewing the shape and surface markings of the dorsal valve, and the beak of the ventral.

" 4*a* Front view of the same specimen, shewing the comparative convexity of both valves, and the well defined sinus in the ventral valve.

" 4*b*. Ventral view of the same specimen. All three figures, three times the natural size.

CAMAROTŒCHIA (?) WINISKENSIS (page 272).

Figure 5. Dorsal view of a small and evidently immature specimen from the Silurian limestone of the Winisk River, with both valves preserved.

Figure 6. Exterior of the ventral valve of a large and apparently adult specimen, also from the Winisk River.

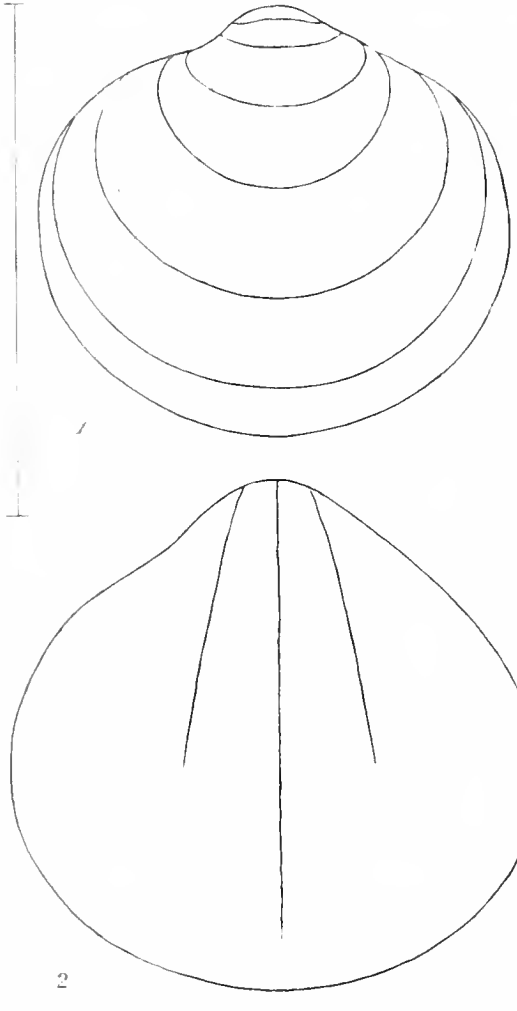
CAMAROTŒCHIA COALESCENS (page 272).

Figure 7. Ventral side of the best specimen of this species known to the writer, from the Winisk River; three times the natural size.

RHYNCHOSPIRA LOWI (page 277).

Figure 8. Dorsal view of a specimen of this species, from the Silurian limestone of the Fawn River, shewing the whole of the dorsal valve, and the umbo and perforate beak of the ventral.

Figure 9. Exterior of the ventral valve of another specimen from the same locality. Both figures twice the natural size.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2


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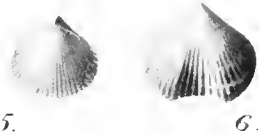
1b.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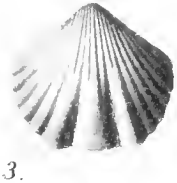
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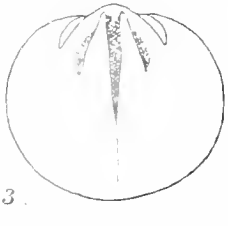
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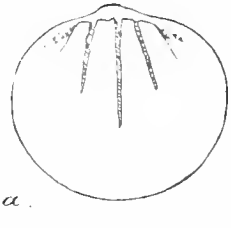

3a.


x 2
8


x 2.
9

PLATE XXVI.

CONCHIDIUM DECUSSATUM (page 293).

Figure 1. Dorsal view of a fine specimen of this species, from the Silurian limestone at the Grand Rapids of the Saskatchewan, shewing the whole of the dorsal valve, and the prominent umbo and recurved beak of the ventral.

Figure 2. Outline of the posterior end of a cast of the interior of both valves of another specimen of this species, shewing the relative convexity of the two valves, the length and other characters of the mesial septum of the ventral valve, and the nature of the two short septa in the dorsal.

Both figures of this species are from drawings by Mr. L. M. Lambe.

GLASSIA VARIABILIS (page 273).

Figure 3. Ventral view of a typical specimen of this species, from the Silurian limestone at the Winisk River.

Figure 4. Dorsal view of another typical specimen, from the same locality.

Figure 5. A specimen from the Winisk River, that has been broken in such a way as to shew a transverse section of the closed valves at about their mid-length, with the direction of the spiralia. All three figures three times the natural size.

GLASSIA VARIABILIS (?) Var. (page 252).

Figure 6. Ventral view of a specimen from the Ekwan River, which may represent a local variety of this species, with a deeper sinus in the ventral valve.

Figure 6 *a*. Front view of the same specimen.

" 6 *b*. Dorsal view of the same. All three figures three times the natural size.

GLASSIA VARIABILIS (page 277).

Figure 7. Dorsal view of a specimen from the Silurian rocks of the Fawn River.

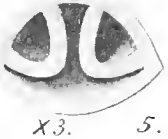
Figure 8. Similar view of another specimen from the same rocks.

Figure 9. Similar view of a third specimen from these rocks.

1

X 3 3

X 3 4



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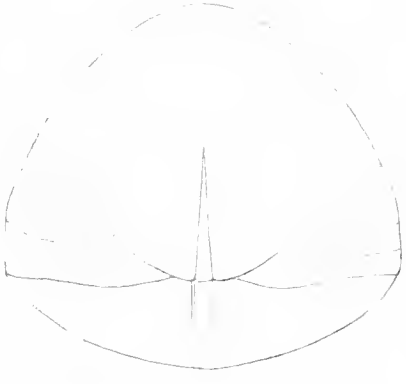

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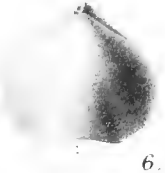

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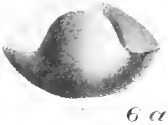

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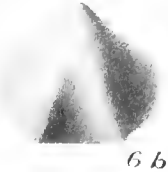


6 b.

7 8 9.

PLATE XXVII.

(With the exception of figure 7, all the specimens figured on this plate are from the Silurian rocks of the Ekwan River.)

SPIRIFER CRISPUS (?) Var. (page 253).

Figure 1. Ventral view of a small *Spirifer*, with narrow and angular ribs, that is thought to be possibly a local variety of *S. crispus*.

RETICULARIA SEPTENTRIONALIS (page 253).

Figure 2. Dorsal view of a large but imperfect specimen of this species, that was evidently a little longer than wide, when perfect.

Figure 3. Dorsal view of a more perfect but rather smaller specimen of this species, that is a little wider than long.

Figure 4. Dorsal view of a nearly perfect but much smaller specimen.

Figure 5. Dorsal view of a still smaller specimen.

MERISTINA (?) EXPANSA (page 245).

Figure 6. Dorsal view of a large and presumably adult specimen of this species.

" 6*a*. Front view of the same specimen, shewing the unequal convexity of the two valves, and the absence of any mesial fold or sinus.

Figure 7. Surface markings of part of the exfoliated test of a rather smaller specimen, from the Silurian rocks of the Attawapiskat River; five times the natural size.

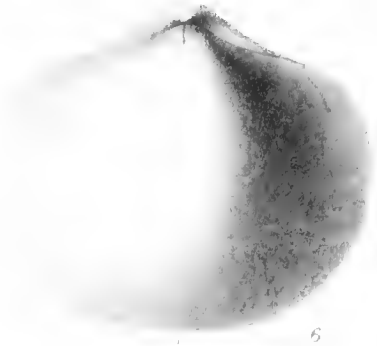
MYTILARCA PERNOIDES (page 255).

Figure 8. Side view of the type and only known specimen of this species, a testiferous left valve.

CTENODONTA SUBOVATA (page 256).

Figure 9. Side view of the only specimen known to the writer.

" 9*a*. The same specimen, as viewed from above, shewing the amount of convexity of the closed valves.



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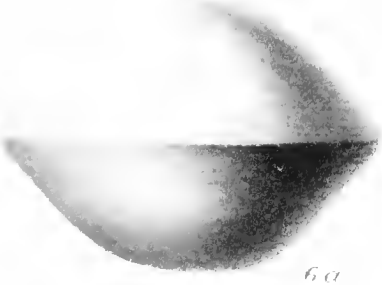

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PLATE XXVIII.

PTERINEA OCCIDENTALIS (page 287).

Figure 1. Side view of a cast of the interior of a left valve of a specimen of this species, from the Silurian limestone at Ami Island, near the north-east shore of Lake Winnipegosis.

Figure 2. Similar view of a cast of the interior of a left valve of a specimen of this species, from the Grand Rapids of the Saskatchewan.

Figure 3. Side view of the testiferous left valve from Swan Lake, at the head of Shoal River, Manitoba, referred to on pages 287 and 288.

AMBONYCHIA UNDULATA (page 254).

Figure 4. Side view of a cast of the interior of a right valve of a specimen of this species, from the Ekwan river limestone.

AMBONYCHIA SEPTENTRIONALIS (page 255).

Figure 5. Side view of the left valve of a cast of the interior of both valves of a shell of this species, from the Ekwan River limestone.

ILIONIA (?) PARVULA (page 288).

Figure 6. Side view of the left valve of a shell of this species, from the rocks exposed at Ami Island.

Figure 7. Side view of a right valve of a shell of this species, from the Silurian rocks at Long Point, Lake Winnipegosis.

Figure 8. Side view of another right valve of a shell of this species, from Long Point.

MEGALOMPHALA ROBUSTA (page 257).

Figure 9. Side view of a large specimen of this species, from the Ekwan River limestone.

" 9 *a*. Peripheral view of the same.

SALPINGOSTOMA BOREALE (page 258).

Figure 10. Peripheral view of the largest specimen collected, from the Ekwan River limestone.

Figure. 11. Side view of a smaller specimen, also from the Ekwan River.

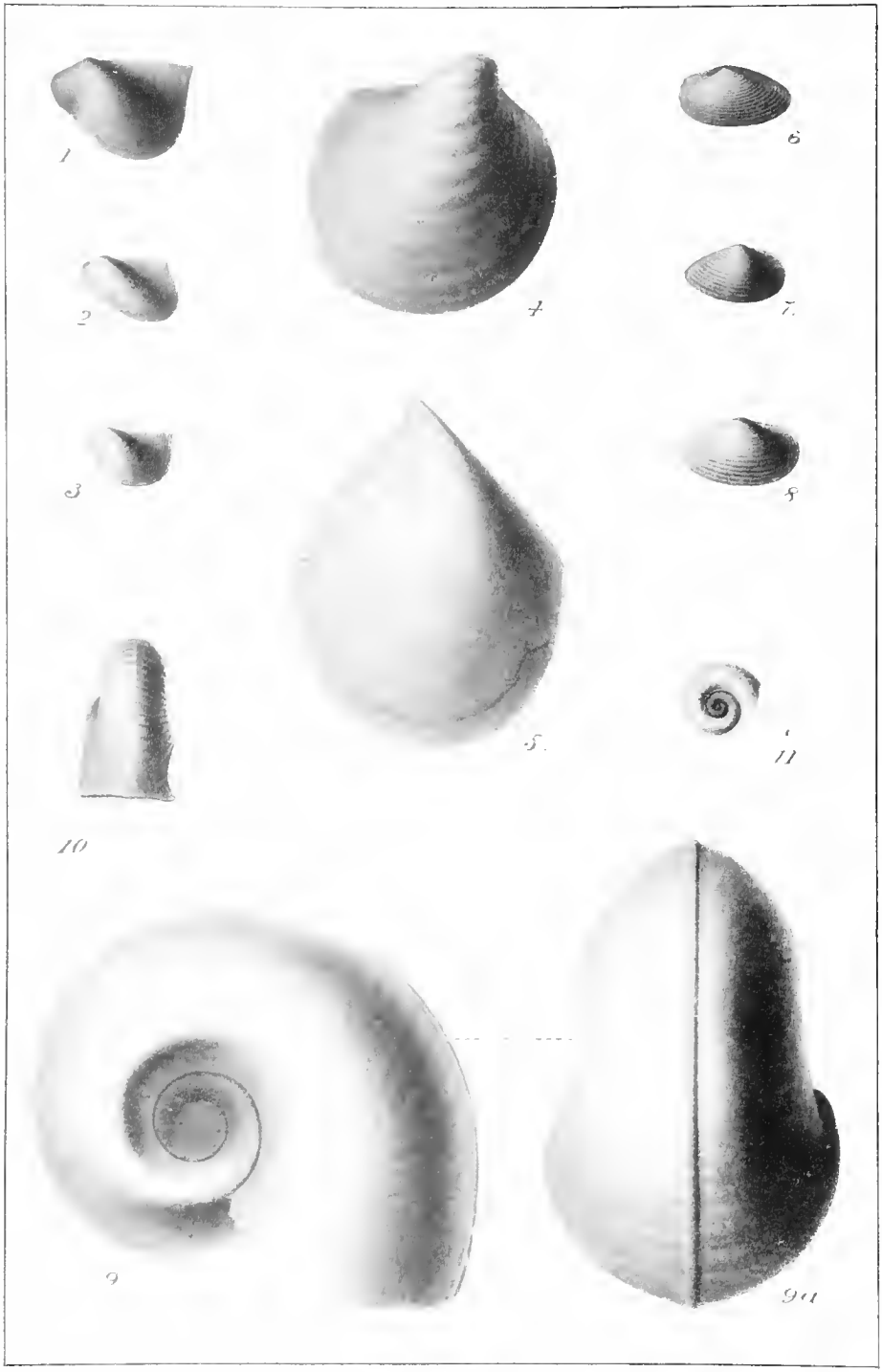
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PLATE XXIX.

(All the specimens figured on this plate are from the Silurian limestone of the Ekwan River.)

MEGALOMPHALA ROBUSTA (page 257).

Figure 1. Side view of the specimen referred to in the description of this species, as shewing the "small, narrow, thin transverse ridges, with flat spaces between them."

GYRONEMA SPECIOSUM (page 258).

Figure 2. Dorsal view of the more perfect of the two specimens collected.

GYRONEMA DOWLINGII (page 259).

Figure 3. Dorsal view of the type and only specimen collected.

GYRONEMA BREVISPIRA (page 259).

Figure 4. Dorsal view of a nearly perfect specimen of this species, very slightly restored.

ORTHONYCHIA OBTUSA (page 260).

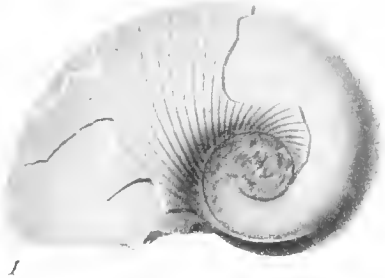
Figure 5. Side view of a specimen of this species.
" 5*a*. Another view of the same.

PLATYCERAS COMPACTUM (page 260).

Figure 6. Dorsal view of the largest and most perfect specimen known to the writer.

DIAPHOROSTOMA PERFORATUM (page 261).

Figure 7. View of the upper half of the shell of the type and only known specimen of this species.
" 7*a*. View of the lower half of the same specimen.



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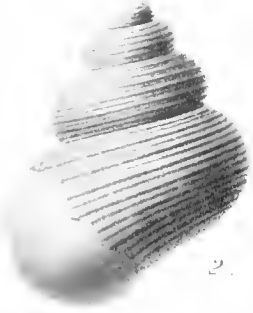

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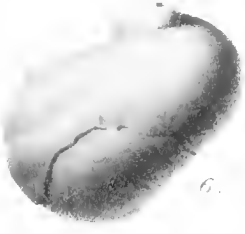

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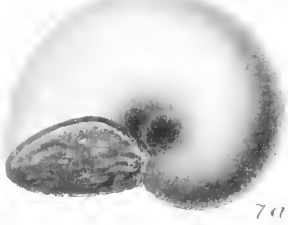


7a.

PLATE XXX.

STROPHOSTYLUS AMPLUS (page 262).

Figure 1. Ventral view of a specimen of this species, from the Ekwan limestone, shewing the large size of the aperture and other characters of the base of the shell.

" 1 *a*. Dorsal view of the same specimen, shewing the small, short spire, and the large outer volution.

STROPHOSTYLUS INFLATUS (page 262).

Figure 2. Dorsal view of the large specimen from the Ekwan River, from which the original description of this species was made.

Figure 3. Similar view of a "large testiferous specimen" from the same locality, that is referred to in the text as "probably referable to this species."

STROPHOSTYLUS FILICINCTUS (page 263).

Figure 4. Dorsal view of an imperfect cast of the interior of a shell of this species, from the Ekwan River, with a small portion of the test preserved at the anterior end of the last volution.

Figure 5. Similar view of a cast of the interior of the shell of a specimen, from the Ekwan, that is probably referable to this species.

Figure 6. Dorsal view of a cast of the interior of the shell of a small specimen of this species, also from the Ekwan River, with a considerable portion of the test preserved.

ACTINOCERAS KEEWATINENSE (page 246).

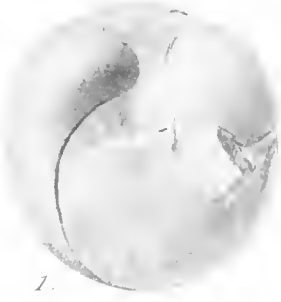
Figure 7. Side view of the best specimen of the siphuncle of this species that the writer has seen, from Rainy Island, in the Attawapiskat River, which shews ten of the siphuncular constrictions.

Figure 8. Longitudinal section of another portion of a siphuncle from Rainy Island, shewing indications of "organic deposits" therein.

SPYROCERAS MERIDIONALE (page 281).

Figure 9. Side view of the type and only known specimen of this species, from Stonewall, Manitoba.

PALÆOZOIC FOSSILS, VOL. I.



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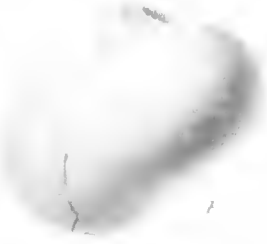

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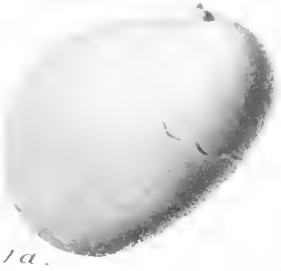

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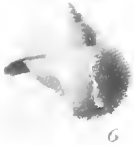

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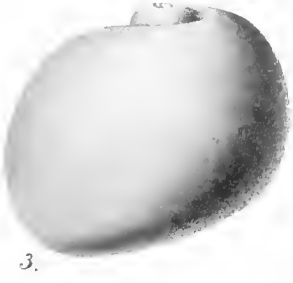

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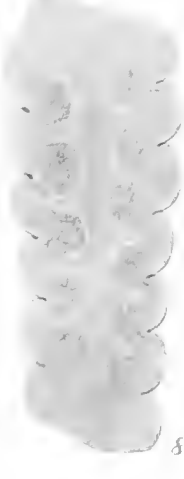

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PLATE XXXI.

TRIPLEUROCERAS ROBSONI (page 281).

Outline of the exposed portion of an imperfect cast of the interior of the shell of a specimen of this species, from Stonewall, presented by Mr. Donald Gunn. This cast has fifteen septal chambers and a considerable portion of the body chamber preserved, and shows the curved sutural lines on the flattened and presumably abdominal side. The figure is very slightly reduced in size, but not more so than by about one-eighth of an inch.

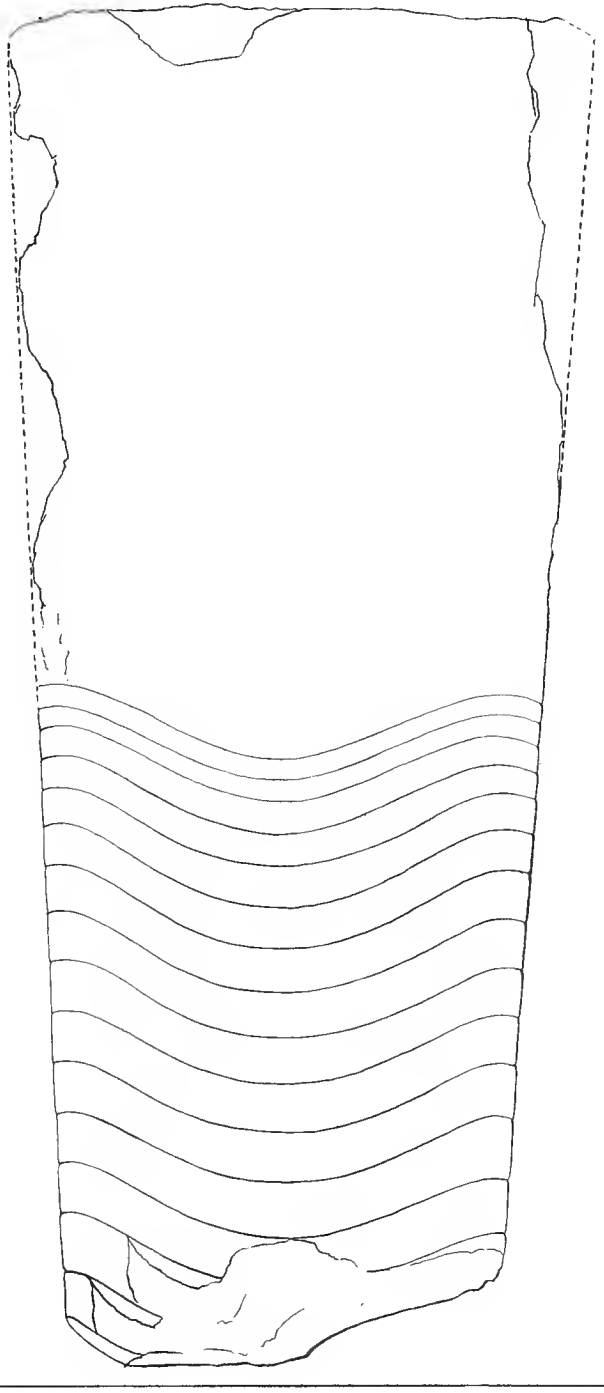

PLATE XXXII.

TRIPLEUROCERAS ROBSONI (page 281).

Outline of a cast of the interior of most of the septate portion of the shell of a large specimen of this species from Stonewall, presented by Mr. W. H. Robson, four-fifths of the natural size. In the original of this figure, twenty-four septal chambers are either wholly or partially preserved, and the curved sutural lines on the flattened and presumably abdominal side are well shown.

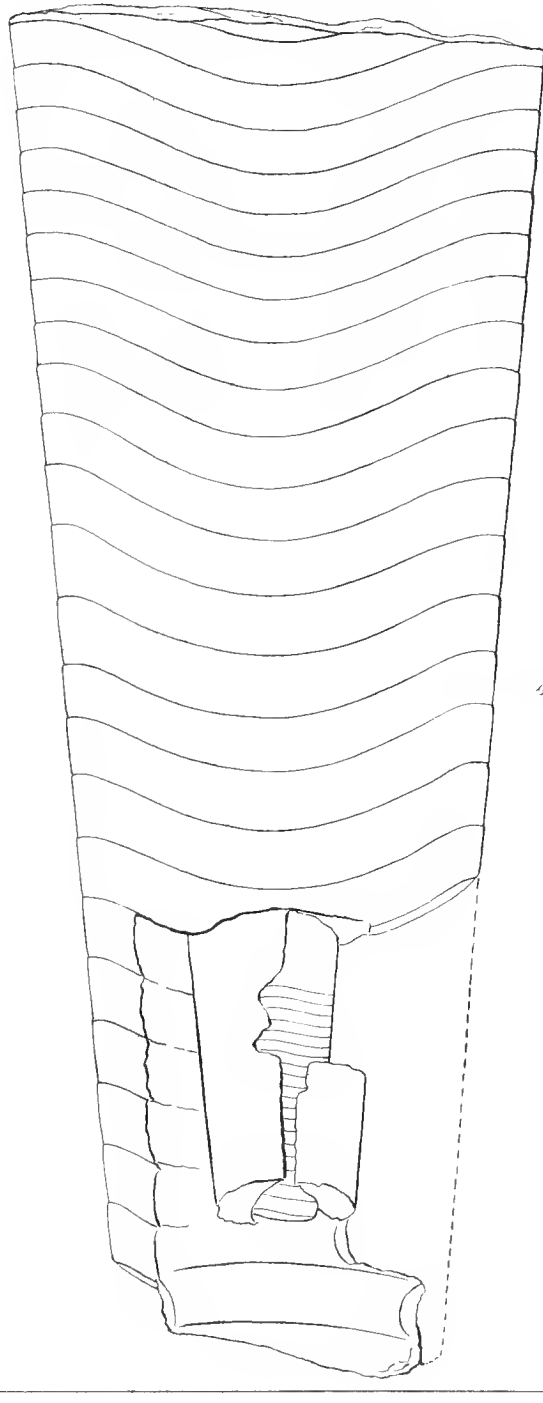
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PLATE XXXIII.

ORTHOCERAS EKWANENSE (page 265).

Figure 1. Side view of the type and only known specimen of this species, from the Ekwan River. At the smaller end a piece has been cut out, but the longitudinal section thus obtained shews only the cut edges of some of the septa, but no traces of the siphuncle.

" 1 *a*. Outline of the larger end of the same specimen, shewing the nearly elliptical shape of the cross section, and the central position of the apparently small siphuncle.

SPYROCERAS BEAUPORTENSE (page 323).

Figure 2. Side view of a specimen of this species, from the Trenton limestone at Beauport, P.Q.

" 2 *a*. Portion of surface of the same specimen; three times the natural size.

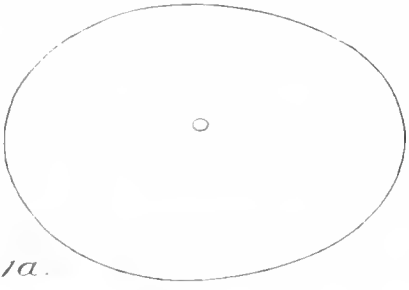
ORTHOCERAS WALPOLENSE (page 324).

Figure 3. Side view of the type and only known specimen of this species, from the Corniferous limestone at Walpole, Ont.

ORTHOCERAS HAGERSVILLENSE (page 325).

Figure 4. Side view of the type and only known specimen of this species, from the Corniferous limestone at Hagersville, Ont.

" 4 *a*. Portion of the outer surface of the same; four times the natural size.



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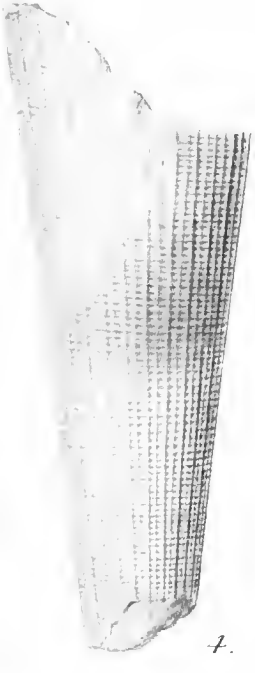

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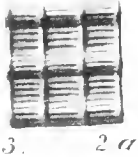

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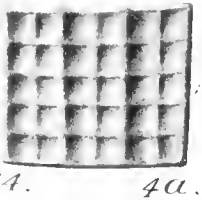


×4. 4a.

PLATE XXXIV.

(All the specimens figured on this plate are from the Ekwan River limestone.)

PHRAGMOCERAS LINEOLATUM (page 265).

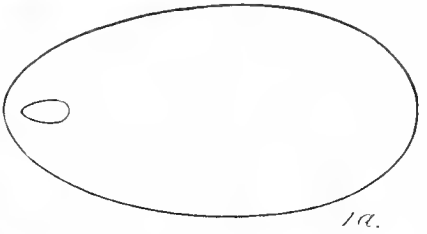
Figure 1. Side view of a cast of the interior of the body chamber of a large specimen of this species.

" 1 *a*. Outline of the smaller end of the same specimen, shewing the narrow, ovately elliptical contour at that end, and the imprint of the dorsal and nearly marginal siphuncle.

2. Side view of a smaller but more perfect specimen of this species, with a considerable portion of the test preserved. Part of the surface markings are represented, five times the natural size.

" 3. Side view of a testiferous fragment of the posterior end of a specimen of this species; twice the natural size.

1.



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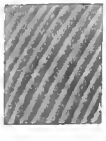


X 5.

X 2. 3.

PLATE XXXV.

CYRTOCERAS QUEBECENSE (page 315).

Figure 1. Side view of the only specimen known to the writer, from the Levis limestone at Pointe Levis.

" 1 *a*. Longitudinal section of a small piece of the narrower end of the same, shewing part of the large, cylindrical, dorsal and marginal siphuncle, and the cut edges of some of the rather closely approximated septa.

GOMPHOCERAS PARVULUM (page 296).

Figure 2. Diagrammatic outline of an entire specimen, the details taken from several specimens, some of which are natural moulds of the exterior, or casts of the interior of the body chamber, and others casts of the interior of the septate portion of the shell ; all from the Silurian limestone at the Grand Rapids of the Saskatchewan.

" 2 *a*. Outline of the anterior end of a wax impression of a natural mould of the exterior of the body chamber of a specimen of this species from Grand Rapids, shewing the Y—shaped aperture.

" 2 *b*. Outline of one of the septa of a specimen of this species, from the same locality,—near the body chamber, to shew the relative position of the siphuncle.

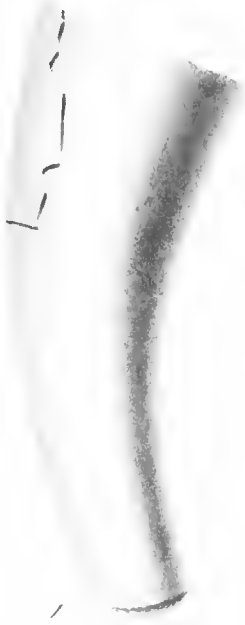
The three figures of this species are from original drawings by Mr. L. M. Lambe.

PLECTOCERAS HALLI (page 302).

Figure 3. Side view of an unusually perfect, well preserved and apparently adult specimen of this species, from the Black River (?) limestone at the Falls of the St. Charles River at Indian Lorette, collected by Mr. Weston in 1898.

" 4. Ventral side of part of the nearly or quite free anterior end of another and rather larger specimen of this species, collected by Mr. Weston at Lorette in 1898, shewing the comparatively deep ventral sinus of the outer lip.

" 4 *a*. Dorsal view of the same specimen, shewing the nearly straight dorsal margin of the inner lip, and a faint dorsal furrow.



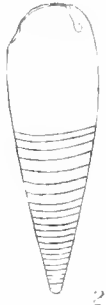


PLATE XXXVI.

PLECTOCERAS JASON (page 301).

Figure 1. Side view of one of the types of this species, from the Chazy limestone at the "bay above Clear Water Point," on the north shore of the Gulf of St. Lawrence, opposite to the Mingan Islands. The test is broken off of most of the body chamber, and that of the inner volution is slightly restored from another specimen.

Figure 2. Longitudinal section through the middle of another of the type specimens, from the same formation and locality, shewing the cut edges of some of the septa, and the shape and relative position of the siphuncle.

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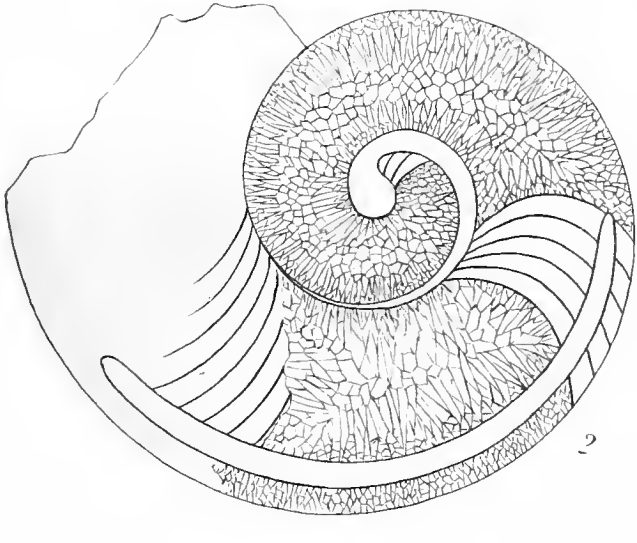

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PLATE XXXVII.

PLECTOCERAS (?) UNDATUM (page 305).

Side view of a cast of the interior of the septate portion of a large shell that is probably referable to this species, from the Black River limestone at Kingston, Ont. This specimen was acquired for the Museum of the Survey in 1902, in exchange, from the authorities of Queen's University.

PLATE XXXVIII.

BARRANDEOCERAS SUBCOSTULATUM (page 310).

Side view of the type and only known specimen of this provisional species, from the Black River limestone at Wolfe Island, near Kingston, which was presented to the Museum of the Survey by Professor James Fowler in 1888.

The figure is a reproduction of a drawing by Mr. F. E. Calderon.

PLATE XXXIX.

BARRANDEOCERAS NATATOR (page 308).

Figure 1. Side view of the type and only known specimen of this species, which is little more than an imperfect cast of the interior of the shell, from the Chazy limestone at the Mingan Islands.

" 1 *a*. Part of the other side of the same specimen, with the test preserved, and shewing the surface markings.

" 1 *b*. Outline of a transverse section of part of the same specimen, shewing the lateral compression, and the position of the siphuncle; V being the venter.

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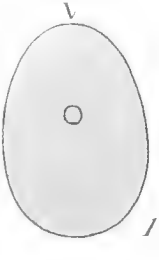
1a



1b

PLATE XL.

(The specimens figured on this plate are from the Black River limestone at La Petite Chaudiere Rapids, on the Ottawa River, near Ottawa city.)

BARRANDEOCERAS VAGRANS (page 311).

Figure 1. Inner surface of the type of this species, which has been rubbed down and polished in such a way as to exhibit an "artificial polished section passing through the central plane of the whorls."

" 1*a*. Outline of a partially restored transverse section of part of the same specimen.

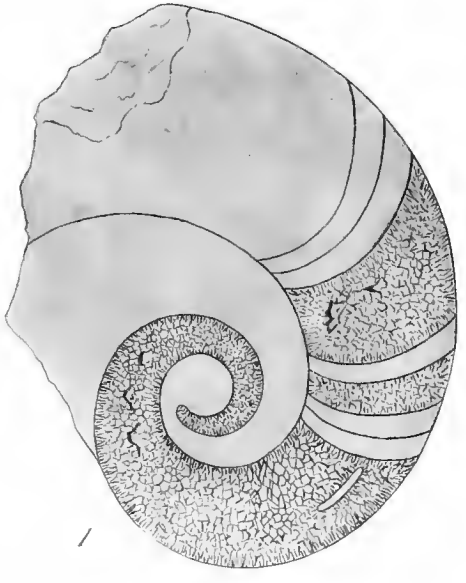
Figure 2. Side view of an imperfect cast of the interior of the chambered portion of the shell of a specimen that is probably referable to this species, shewing many of the sutural lines on its convex surface.

" 2*a*. Portion of the venter of the same, in outline, shewing three of the ventral saddles.

CYRTOCERAS SINUATUM (page 312).

Figure 3. Side view of the exterior of a fragment of a specimen that is probably referable to this species, and that shews the surface markings of the test. (This fragment was figured inadvertently on this plate, when the writer was under the impression that the former was a very imperfect specimen of *Barrandeoceras vagrans*.)

" 3*a*. Inner surface of the same fragment, which has been broken longitudinally and weathered in such a way as to shew the edges of several of the septa, and the shape and relative position of the siphuncle.



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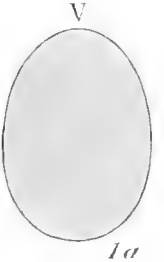

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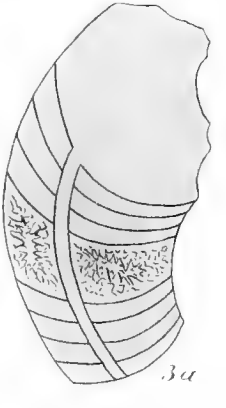

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PLATE XLI.

TROCHOCERAS INSIGNE (page 282).

Side view of the largest and most perfect specimen of this species that the writer has seen, from the quarries at Stonewall, Manitoba. This specimen, which is a well-preserved cast of the interior of the shell, was presented to the Museum of the Survey by Mr. John Gunn in 1897.
From a drawing by Mr. F. E. Calderon.

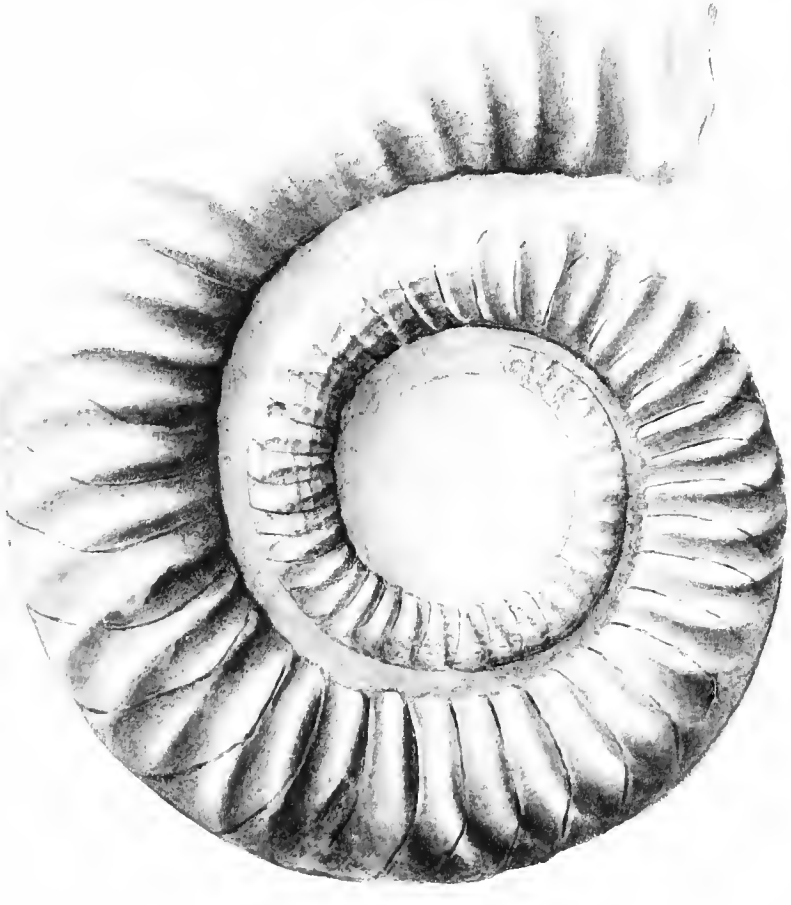


PLATE XLII.

BRONTEUS EKWANENSIS (page 266).

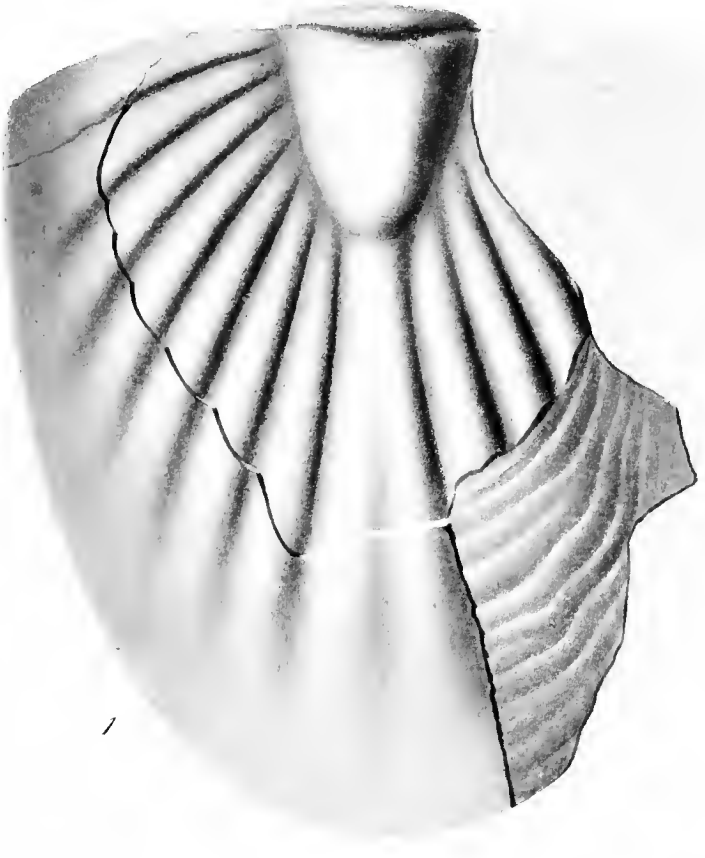
Figure 1. Exterior of the dorsal surface of an imperfect pygidium of a specimen of this species, from the Ekwan River limestone, slightly restored.

BRONTEUS AQUILONARIS (page 267).

Figure 2. Similar view of a nearly perfect pygidium of a specimen of this species, also from the Ekwan River.

ACIDASPIS PERARMATA (page 289).

Figure 3. Slightly restored outline of the entire dorsal surface of the type and only known specimen of this species, from the Silurian limestone at Long Point, Lake Winnipegosis.
From a drawing by Mr. L. M. Lambe.



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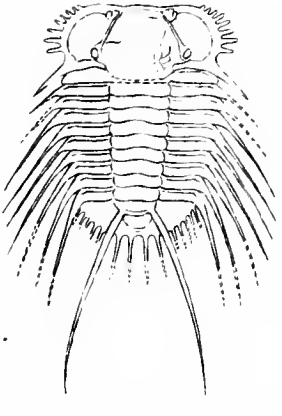

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