

GEOLOGICAL SURVEY OF CANADA.
ALFRED R. C. SELWYN, C.M.G., LL.D., F.R.S., DIRECTOR.

CONTRIBUTIONS

TO

CANADIAN PALÆONTOLOGY.

VOLUME 1.

BY

J. F. WHITEAVES, F.G.S., F.R.S.C., &c.,

PALÆONTOLOGIST AND ZOOLOGIST TO THE SURVEY.

PART IV.

6. The Fossils of the Devonian Rocks of the islands, shores or immediate vicinity of Lakes Manitoba and Winnipegosis.



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The present report, which forms Part IV of Volume I of the "Contributions to Canadian Palæontology," is a memoir "on the Fossils of the Devonian rocks of the islands, shores or immediate vicinity of Lakes Manitoba and Winnipegosis," consisting of 105 pages of text, illustrated by fifteen full page plates. The drawings for these plates were made by Mr. L. M. Lambe, the artist to the Survey, and lithographed by Messrs. Mortimer & Co., of Ottawa.

In the introductory letter to Part III it was stated that the volume would be concluded with Part IV, but, since the paper "on the fossils of the Hamilton formation of Ontario" was published in Part II, so much new material has been obtained, that it is thought desirable to include in this volume, as Part V, a supplement to that paper.

ALFRED R. C. SELWYN.

GEOLOGICAL SURVEY DEPARTMENT,
OTTAWA, December 15th, 1892.

GEOLOGICAL SURVEY OF CANADA.

CONTRIBUTIONS TO CANADIAN PALÆONTOLOGY

VOLUME I.

BY J. F. WHITEAVES.

6. *The Fossils of the Devonian Rocks of the islands, shores or immediate vicinity of Lakes Manitoba and Winnipegosis.*

INTRODUCTION.

The northern extremity of Lake Winnipegosis, it may be well to premise, is in the District of Saskatchewan, but by far the larger portion of that lake and the whole of Lake Manitoba are in the province of Manitoba. The shores of the southern portion of Lake Manitoba are so low and flat as to exhibit no rock exposures, and the area from which the fossils referred to in this report are collected is included between latitudes 51° and 53° N, and longitudes 98° 30' and 101° 10' W.

Prior to the year 1888 but little was known of the fauna of the Devonian rocks of the islands and shores of Lakes Manitoba and Winnipegosis, or of the geographical distribution and stratigraphical relations of these rocks. Up to that date, the little that was known on either of these topics is to be found in Professor H. Youle Hind's official "Report on the Assiniboine and Saskatchewan Exploring Expedition," published at Toronto by the Ontario Government in 1859, and in Mr. (now Dr.) J. W. Spencer's "Report on the country between the Upper Assiniboine River and Lake Winnipegosis and Manitoba," published at Montreal in 1875, in the Report of Progress of the Geological Survey of Canada for 1874-75.

In the earlier of these two publications the existence in Manitoba of rocks of Devonian age was first announced by Mr. E. Billings, on the evidence of a few fossils collected by Prof. Hind at Snake Island, Lake Winnipegosis, and at Manitoba Island, Lake Manitoba, which were presented by or through him to the Museum of the Survey. The fossils from Snake Island, as identified or described by Mr. Billings in the twentieth chapter of Prof. Hind's report, are as follows: *Atrypa reticularis*, L., and its var. *aspera*; *Orthis Iowensis*, Hall; "two small species of *Productus*;" "*Lucina elliptica*, Conrad;" *Lucina occidentalis*, Billings (sp. nov.); two species of *Euomphalus*; "a fragment of a *Loxonema*, most probably *L. nexilis*"; "fragments of *Orthoceras*, *Gomphoceras*, and a species of *Nau-*

tilus or *Gyroceras*." In reference to these Mr. Billings remarks that "although we have none of the characteristic spirifers, corals or trilobites to guide us, yet I think that upon the evidence of the above fossils we can safely say that this locality is Devonian and most probably about the age of the Hamilton group." The fossils from Manitoba Island, he adds, "are mostly the same as those from Snake Island, with the exception of two species of *Chonetes* and fragments of a large fish. There is also here a large *Stromatopora*, probably *S. concentrica*."

The present writer has never seen the specimens referred to by Mr. Billings as "two small species of *Productus*," and as "two species of *Euomphalus*"; but, apart from these, the following is submitted as an amended list of the species obtained by Prof. Hind at Snake Island: *Orthis striatula*, Schlotheim (= *O. Iowensis* of Billings and Meek); *Atrypa reticularis*, L.; *Atrypa reticularis*, var. *aspera*, Schl.; *Paracyclas elliptica*, Hall, non Conrad, of which *Lucina occidentalis*, Billings, which is incorrectly figured by his artist, is only a distorted form, both it and the typical *P. elliptica* being very doubtfully distinct from *P. lirata*, Conrad; *Loxonema*, species undeterminable, the specimen being a mere fragment; *Orthoceras Hindii* (= *Actinoceras Hindii*, Whiteaves, but not a true *Actinoceras*); *Gomphoceras*, species undeterminable; and *Gyroceras submamillatum*, Whiteaves. The four specimens of *Chonetes* collected by Prof. Hind at Manitoba Island, and seventeen precisely similar ones obtained by Mr. Tyrrell and the present writer at the same locality in 1888, are all clearly referable to a single species, which is described and figured in this report under the name *Chonetes Manitobensis*. The exposures of Devonian limestone examined by Prof. Hind are those at Flat Rock Point, Steep Rock Point and Manitoba Island, on or in Lake Manitoba, and at Snake Island, in Lake Winnipegosis.

In 1874 Dr. J. W. Spencer examined several outcrops of Devonian rocks on the shores of Swan Lake, Manitoba, and Lake Winnipegosis, and gave the name of Dawson Bay to the north-western portion of the latter, in honour of Sir J. W. Dawson, the principal of McGill University. About a page and a half (pp. 61-62) of Dr. Spencer's Report is devoted to a general description of Lakes Winnipegosis and Manitoba, and two pages (pp. 67-68) to an account of the "Deposits of Devonian Age" in and around Lake Winnipegosis and Swan Lake. On page 68 he states that "the best localities for fossils, so far as my observation extended, are Warren Island, in Swan Lake, and Points Wilkins and Carrollida, on Dawson Bay. The palæozoic fossils which I collected have been determined by Mr. Billings, who pronounces them all to be of Devonian age. The following were collected from rocks *in situ* at the above localities: *Athyris*, *Cyrtina*, *Atrypa aspera*, *A. reticularis* (Devonian type), *Spirifera* and *Orthis*." The "*Athyris*" of this list is *A. vittata*, Hall, and the

"*Cyrtina*" most probably *C. Hamiltonensis* of Hall. "The following," he says, "were obtained on the western shore of Dawson Bay, from slabs apparently derived from the neighbouring cliffs: *Receptaculites* (?), *Favosites* (2 species), *Syringopora*, *Acerularia profunda* (this occurs in the Hamilton group in Iowa), *Heliophyllum* (like *H. Halli*), *Diphyphyllum*, *Stromatopora*, crinoidal columns, *Gypidula*, *Rhynchonella*, *Atrypa reticularis*, *Athyris*, *Strophomena*, a brachiopod resembling *Stringocephalus*, *Euomphalus*, *Pleurotomaria*, *Bellerophon* and *Phillipsia*." The specimens referred to in this list as "*Receptaculites* (?)" are two worn examples of *Sphaerospongia tessellata*; the two species of *Favosites* are *F. Gothlandica*, var., and *Pachypora cervicornis*; the "*Heliophyllum* like *H. Halli*" is a new species of *Actinocystis*, which will be found described and figured in this report as *A. variabilis*; the "*Gypidula*" is *Pentamerus comis*; the "brachiopod like *Stringocephalus*" is *S. Burtini*; the "*Euomphalus*" is a small species of *Straparollus* here described and figured as *S. fuscinctus*; the "*Bellerophon*" appears to be *B. Pelops*, Hall, and the "*Phillipsia*" a variety of *Proetus Haldemani*. To this list, also, may be added *Orthothetes Chemungensis*, var., and *Conocardium Ohioense*, Meek, which Prof. Whitfield says is the young of *C. trigonale*, Hall, though Prof. Hall himself says that his *C. trigonale* is a synonym of Conrad's *C. cuneus*. Finally, Dr. Spencer says, "among other specimens which had evidently been transported from a greater or less distance, there were *Pentamerus*, *Atrypa reticularis*, *A. aspera*, *Strophomena*, *Chonetes*, *Euomphalus*, &c. The "*Pentamerus*" of this list is a Silurian species, which has since been described by the present writer under the name *P. decussatus*, and which, so far, has only been found *in place* at the foot of the Grand Rapids of the Saskatchewan.

By far the most complete examination of the geology around Lakes Manitoba and Winnipegosis that has yet been made, was effected by Mr. J. B. Tyrrell, M.A., B.Sc., of this Survey, in the summer seasons of 1888 and 1889. All the rock exposures on the islands, shores and immediate vicinity of these two lakes were examined by Mr. Tyrrell, who outlined the boundaries of the belt of Devonian rocks across this tract of country, discovered many new fossils in these rocks, and traced out the horizons in which these fossils occur, as well as the stratigraphical relations of the different bands of limestone to each other and to the Cretaceous rocks by which they are overlaid. In 1888 he discovered a small exposure of rocks of Silurian (Upper Silurian) age at Davis Point, Portage Bay, Lake Manitoba, and in 1889 a large area of rocks of the same age on the north-eastern shore of Lake Winnipegosis. During both these years he was assisted by Mr. D. B. Dowling, B.A.Sc., in a topographical survey of this district and in the collection of fossils, and in the summer of 1888 the present writer had the pleasure of visiting nearly all the fossiliferous ex-

posures in or around Lake Manitoba in company with Mr. Tyrrell. The collections of fossils which Mr. Tyrrell obtained from the Devonian rocks of the neighbourhood of these two lakes on the occasions referred to, and which will form the subject of the present report, are among the largest and most important that have been brought back by any of the Survey explorers for many years. The species represented in these collections are of unusual interest, not only on account of the number of new forms among them, but also as showing the close relations that exist, in so many respects, between the fauna of these rocks and that of the Devonian rocks of Europe. As several of the localities mentioned in this report are not to be found in any of the older maps, it may be mentioned that they are all laid down on the "Geological Map of North-western Manitoba and portions of the districts of Assiniboia and Saskatchewan," recently published by this Survey, and here referred to as Mr. Tyrrell's map.

The whole of the species enumerated or described in this paper appear to be from the Middle or Upper Devonian, in the sense in which these terms have been recently used by Kayser, Tschernyschew and other European writers. By far the larger number are from the *Stringocephalus* zone, and, in order to avoid repetition, a capital s (S) will be prefixed to the names of each of these. According to Mr. Tyrrell, the rocks which are here called Middle Devonian, consist of "a series of dolomites which extend upward from the basal beds at Devils Point, Lake Winnipegosis, to the upper beds exposed on the islands and shores of Dawson Bay, in which *Stringocephalus* is particularly abundant. The Upper Devonian of this district consists of a series of more or less impure limestones, extending from the lowest beds at Onion Point, Lake Manitoba; Snake Island, Lake Winnipegosis, and a few other localities, through the light grey shales" (of the *Cuboides* zone) "on the Red Deer River, &c., to the light pinkish limestones at Point Wilkins."

In the preparation of this paper the writer is indebted to Mr. L. M. Lambe, F.G.S., of this Survey, for valuable assistance in ascertaining the exact character of many of the species, especially the internal structures of the corals and the minute generic and specific features of the Polyzoa; to Dr. Fritz Frech, of Halle, Germany, who paid a short visit to Ottawa in October last, for critical suggestions in regard to the affinities of the *Cyathophyllidæ*; and to Mr. E. O. Ulrich, of Newport, Kentucky, for notes on the specific relations of some of the Polyzoa.

The classification followed, as in previous parts of this volume, is mainly that adopted by Dr. Karl Zittel in his "Handbuch der Palæontologie," but the corals are arranged in conformity with Dr. Frech's memoir on the *Cyathophyllidæ* and *Zaphrentidæ* of the German Middle Devonian*

* Palæontol. Abhandl. herausgeg., von W. Dames & E. Kayser. Berlin, 1836. Vol. III pt. 3.

and the Polyzoa or Bryozoa in accordance with Mr. Ulrich's recently published monograph of the "Palæozoic Bryozoa," in the eighth volume of Reports of the Geological Survey of Illinois.

DETERMINATIONS AND DESCRIPTIONS OF SPECIES.

RECEPTACULITIDÆ.

(S.) SPHÆROSPONGIA TESSELLATA, Phillips. (Sp.)

Plate 33. All the figures.

- Sphæronites tessellatus*, Phillips. 1841. Pal. Foss. Dev., Cornw. & W. Somers., p. 135, pl. lix, fig. 49.
- Echinosphærites tessellatus*, Murch., De Verneuil & Keyserling. 1845. Geol. Russ., &c., vol. II, p. 381, pl. xxvii, fig. 7.
- Sphæronites tessellatus*, Bowerbank. 1845. Ann & Mag. Nat. Hist., p. 299.
- “ “ Austin. “ Ib., p. 406.
- Proboscis of crinoid. G. & F. Sandberger. 1850-56. Verstein des Rhein. Schicht. —Syst., pp. 384, 385.
- Sphærospongia tessellata*, Pengelly. 1861. Geologist, vol. IV, p. 340, pl. v.
- Pasceolus tessellatus* et *Rathii*, Kayser. 1875. Zeitschr. der. deutsch. Geol. Gesellsch., p. 780, t. xx.
- Polygonosphærites tessellatus*, F. Roemer. 1880. Leth. Pal. vol. I, p. 297, fig. 54.
- “ “ Zittel. 1880. Handb. der Palæont., vol. I, p. 106.
- Dictyophyton gerolsteinense*, F. Roemer. 1883. Zeitschr. der. deutsch. Geol. Gesellsch., vol. XXXV, p. 706, fig. b.
- Sphærospongia tessellata*, Hinde. 1884. Quart. Journ. Geol. Soc. Lond., vol. XL, p. 840, pl. xxxvii, figs. 1, 1a—c.

Two badly worn and loose specimens of a fossil which E. Billings referred with doubt to the genus *Receptaculites**, were collected by Dr. J. W. Spencer in 1874, on the western shore of Dawson Bay, Lake Winnipegosis. On examining these specimens in the spring of 1888, the writer became convinced that they are identical with the *Sphærospongia tessellata*, Phillips, (sp.) as described and figured by Dr. G. J. Hinde and others. A single specimen of the same species was collected by Mr. A. P. Low, in 1886, at the Limestone rapids of the Fawn branch of the Severn River.

In July, 1888, four tolerably good specimens of *S. tessellata* were obtained by Mr. J. B. Tyrrell and the writer on the north-west shore of Lake Manitoba, at Pentamerus Point. Two of these specimens were

* Geol. Surv. Canada, Rep. Progr. 1874-75, 1875, p. 68.

loose, but the other two were found in place, in a pale yellowish-brown coloured or nearly white dolomite of Devonian age, associated with *Stringocephalus*.

In 1889, a large number of specimens of a *Sphaerospongia*, which, in the writer's judgment, are undoubtedly identical with *S. tessellata*, were collected by Messrs. Tyrrell and Dowling at several localities on the shores and islands of Dawson Bay, especially on its south-eastern shore, at a point four or five miles north of the mouth of Shoal River, called Whiteaves Point on Mr. Tyrrell's map. These specimens, some of which are in unusually fine condition, were obtained in place, from a partly compact and partly vesicular dolomite, also holding *Stringocephalus*. The originals of all the figures on plate xxxiii are from Dawson Bay.

At this locality the specimens are more or less curved or twisted, especially near the base, the most curved specimen collected being that represented by fig. 6. They vary considerably in shape, size and proportions, but they all enclose a large central cavity. In some specimens the contour is subpyriform (figs. 1, and 10) and the height not much greater than the maximum breadth. Others, again, are subconical (fig. 9), arcuate and club-shaped (fig. 6), or even almost cylindrical (fig. 4), and the latter, of course, are much higher than broad.

The details of their structure have been carefully studied by Mr. L. M. Lambe. He finds "that, with the exception of a basal circlet and a very small area at the summit, the whole of the outer surface of the organism consists of close fitting hexagonal plates, which are slightly convex on their outer surface, arranged in alternating vertical rows, and that each plate has a small rounded elevation or tubercle in the centre, as described and figured by Phillips, Hinde and others. In addition to the central elevation, each of the hexagonal plates in the Dawson Bay specimens is marked by a few lines of growth parallel to the periphery, as shown in fig. 2.

The base of the organism is entirely, closed, pointed and composed of four longitudinally elongated, five-sided plates, as represented in figs. 5 and 5a. These basal plates are marked with sculpture lines similar to those of the hexagonal plates, but in each of the basals the central or subcentral portion is developed into a comparatively large protuberance.

The external characters of the summit are not yet satisfactorily known, but in the only specimen in which any portion of it is preserved (fig. 1) the appearance is as there indicated, and there are no indications that the summit was covered by hexagonal plates.

The interior of the fossil presents the appearance of a number of interlocking, hollow cruciform 'spicules,' each of which has its central and undivided portion anchylosed to the centre of the inner surface of one of the hexagonal plates. The four rays of each 'spicule' lie in a plane parallel

to that of the plate of which they form a part, and project considerably beyond its margin, but in two of the rays the general direction is vertical, and in the other two horizontal or lateral. All the rays are thickened at their junction with each other, striated longitudinally, and taper gradually to an acute point. The horizontal or lateral rays are longer than the vertical, and the former are curved slightly inward and downward. The distal rays, or those vertical rays which are directed forward, incline slightly inward, and the proximal rays, or those vertical rays which are directed backward, incline as slightly outward.

The rays of the 'spicules' of immediately adjacent plates interlock in a very regular manner, as shown by Dr. Schluter in his figure of *S. megaraphis** and as specially indicated in fig. 1 a, of plate xxxiii, in which the dotted lines represent the relative position of the hexagonal plates. The distal ray of each 'spicule' passes behind or inside of the proximal ray of the 'spicule' immediately above it. The lateral rays of each 'spicule' pass between the distal and proximal rays of the 'spicules' lying to the right and left of it, while the right lateral ray of each 'spicule' passes above the left lateral ray of the corresponding 'spicule' in the second row to the right of it.

In the narrow portion next to the base the 'spicules' appear to be partially amalgamated and are less clearly defined, so that this part of the fossil often presents a longitudinally ribbed appearance, the ribs being rounded or flattened and convergent posteriorly.

At the summit the distal rays of the last two or three 'spicules' in each longitudinal row are prolonged and convergent and ultimately meet together at its apex. These prolonged summit rays are hollow and flattened laterally and the central summit area formed by them is about fourteen millimetres broad at the base, in the only specimen (fig. 1.) in which it is preserved.

In attempting to free the organism from the matrix, the rock in these specimens from Dawson Bay often carries with it the outer covering of hexagonal plates. The result of the fracture of these plates from the 'spicules' of which they formed a part, is shown in fig. 1 a. When the rays of the 'spicules' are not present, which is often the case, their original shape and position are indicated by corresponding moulds of their exterior in the matrix. The spaces between the spicules, also, are represented by raised ridges crossing each other at right angles and directed diagonally across the specimen, thus giving the peculiar reticulated appearance shewn in figs. 1 and 4.

The maximum breadth of the largest specimen collected, which is too imperfect to show the height, is fifty six millimetres. The most perfect

* Zeitschr. der Deutsch. geol. gessellsch., 1887, vol. XXXIX, pl. i, fig. 6.

specimen is forty mm. high and twenty eight mm. in its maximum breadth. In the central portion of this specimen the dimensions of the rays of the 'spicules,' as measured from the centre of each 'spicule,' are as follows: length of the proximal rays, 3.5 mm., length of the horizontal or lateral rays 5.5 mm.; thickness of the rays at their bases 9 mm. The dimensions of the four basal plates shown in figs 5 and 5a are, length 4.5 mm., breadth 3.0 mm. The subcylindrical specimen represented by fig. 4 is rather more than 35 mm. in height, and 12.5 mm. in its greatest breadth."

This species is the type of Pengelly's genus *Sphærospongia*, which was first characterized in 1861, and of Ferdinand Roemer's genus *Polygonosphaerites*, which was published in 1880. It is still doubtful which of these names should be retained, the first having been given on the hypothesis that the organism was originally a sponge, and the second on the assumption that it was not. Of late years Phillips' species has been referred to *Sphærospongia* by Dr. G. J. Hinde in 1884 (op. cit.) and by Dr. Clemens Schluter in 1887*, but to *Polygonosphaerites* by Zittel in 1883†, and by Herr Rauff‡, as well as by Professors Nicholson and Lydeker in 1889§. Dr. Hinde claims that it is a Lyssakine Hexactinellid sponge, but Herr Rauff maintains that it and the Receptaculitidæ are not silicious organisms, but that their skeletons were originally calcareous and the silicious specimens mere pseudomorphs, or the result of subsequent silicification. The group therefore, he concludes, cannot be referred to the Hexactinellid sponges, and its systematic position is still entirely uncertain. In the present Report, however, the generic term *Sphærospongia* is still retained, though not without some hesitation, on the ground that the hypothesis that the type of the genus was not a sponge, has not yet been conclusively proved.

A specimen of a *Sphærospongia* which appears to be indistinguishable from the present species, has been figured under the name *S. cornucopiæ*, Goldfuss (Sp.)|| by Dr. Schluter, who states that it was recorded (aufgeführt) by Goldfuss in 1832 as occurring in the Devonian rocks of the Eifel and named by him *Scyphia cornucopiæ*. The volume in which the latter name was first indicated is inaccessible to the writer, but it would seem that the species was never properly characterized by Goldfuss, and hence that his specific name cannot be accepted as prior to Phillips', for, on page 30 of Davidson's Monograph of the British Devonian Brachiopoda the following passage occurs. "In 1833" (according to Dr. Schluter this

* Zeitschr. der Deutsch. geol. Gesellsch., Berlin, vol. XXXIX, p. 13, pl. 1, figs. 1 and 2.

† Handbuch der Palæontologie, vol. I, p. 728.

‡ Zeitschr. der Deutsch. geol. Gesellsch., Berlin, vol. XL, p. 609.

§ Man. Palæont., 1889, vol. II, App., pp. 1563-64.

|| Zeitschr. der Deutsch. geol. Gesellsch., 1887, vol. XXXIX, pl. 1, figs. 1 and 2.

should be 1832) "Goldfuss appended a list of fossils to Von Dechen's translation of Sir Henry de la Beche's 'Manual of Geology' and introduced a number of new names without description or illustration, and has thus furnished us with another instance of the confusion that can be created by the pernicious effect of manuscript names."

SPONGIÆ.

(S.) *ASTRÆOSPONGIA HAMILTONENSIS*, Meek and Worthen.

For the synonymy of this species see page 197.

East side of Lake Winnipegosis, on a small island east of the south end of Birch Island, and about four miles north-east of Wade Point: a single six-rayed spicule, which appears to be essentially similar to that represented on plate xxviii (figs. 1 and 1a) of the present volume.

ANTHOZOA.

ZOANTHARIA.

CYATHOPHYLLUM, Goldfuss.

Group of *Cyathophyllum heterophyllum*, M. Edwards and Haime.

CYATHOPHYLLUM VERMICULARE, Goldfuss, var. PRÆCURSOR, Frech.

Plate 35, figs. 1, 1a and 1b.

Astrocyathus vermicularis, Ludwig. 1866. Korallen aus palæolithischen Formation (Palæontographica, vol. XIV.) t. 58.

Cyathophyllum vermiculare, Goldf. mut. n. *præcursor*. Frech. 1886. Die Cyathophylliden und Zaphrentiden des deutschen Mitteldevon, (Palæontol. Abhandl., Dames and Kayser, vol. III) p. 63, pl. ii. (xiv.) figs. 4, 6, 7, 8, 9, 10.

Red Deer River, at the Upper Salt Spring and about five miles from Dawson Bay, Lake Winnipegosis, D. B. Dowling, 1888: one small specimen. Lake Winnipegosis, at the south end, on a small island near Charlie Island (the specimen figured) and at the north end of Snake Island (one specimen); also on the south-west side, at the north side of South Manitou Island (one specimen), and on the south-east side, at Point Brabant (one specimen): J. B. Tyrrell and D. B. Dowling, 1889. Red Deer River, near the Lower Salt Spring, and two or three miles from Dawson Bay (four specimens) and at the Upper Salt Spring, two or three miles farther up the river (six specimens): J. B. Tyrrell, 1889.

The identification of the specimens from these localities with the European coral named above, is given on the authority of Dr. Frech himself, who examined the whole of them carefully during a visit to Ottawa in October, 1881. The individual figured represents a short and broad form of this coral, others being much longer in proportion to their breadth, and more narrowly sub-cylindrical. These latter approach very nearly in form to the *C. Richardsoni*, of the Devonian rocks of the Mackenzie River basin, which belongs to this section of the genus, but according to Dr. Frech, the septa of *C. Richardsoni* are thicker and less numerous than those of his *C. vermiculare*, var. *præcursor*.

Group of *Cyathophyllum ceratites*. Goldfuss.*

CYATHOPHYLLUM DIANTHUS, Goldfuss. Teste Frech.

Cyathophyllum dianthus, Goldfuss. 1826. Petref. German, vol. I., p. 34, pl. xvi. figs. 1 b, c, d, but not figs. 1a-e, nor pl. xv., fig. 13.

“ “ Frech, 1886. Die Cyathophyll. und Zaphrent. des deutschen Mittel-Devon, (in vol. III. of Dames & Kayser's Palæontol. Abhandl.), p. 68, which see for a full list of synonyms of European specimens of this species.

Cyathophyllum cæspitosum, Whiteaves, non Goldfuss. *Pars.* 1891. This volume, p. 200, pl. xxvii., figs. 7 and 8.

Dr. Frech, who has examined the specimens referred to *C. cæspitosum*, Goldfuss, on page 200 of the present volume, thinks that the small mass of loosely aggregated corallites from the Peace River, collected by Professor Macoun in 1875, is conspecific with *C. cæspitosum*, but that the simple, or nearly simple, specimens from the Hay River, collected by Mr. McConnell in 1887, are referable to *C. dianthus*, Goldfuss. A single example of a coral which has precisely the same internal structure as these Hay River specimens of *C. dianthus*, and which differs from them chiefly in having six lateral buds, was collected by Mr. Tyrrell in 1889, at the Lower Salt Spring on the Red Deer River.

CYATHOPHYLLUM WASKASENSE.† (N. Sp.)

Plate 34, figs. 5, 5 a, 6 and 7.

Corallum simple (figs. 5 and 5a), or proliferous and consisting of a single corallite from which as many as from four to six lateral and divergent

* Dr. Frech thinks that the coral from the Hay river, described under the name of *Campophyllum ellipticum* on pages 202 and 203 of the present volume, and figured on plate XXVII (figs. 5 and 6), is a *Cyathophyllum* belonging to this group, and possibly a variety of his *C. Lindströmi*.

† From the Cree name for the Red Deer River, which, according to Mr. Tyrrell, is Waskasew Sipi.

buds proceed (fig. 6), or increasing by calycinal gemination (fig. 7), the simple forms and those from which lateral buds are produced being conical, rather slender and more or less curved or bent. Epitheca faintly ribbed longitudinally, transversely striated and marked also with a few irregularly disposed constrictions and re-elevations, the results of periodic arrests of growth: calyx rather deep, flat at the bottom and with nearly vertical sides: primary septa twenty four, extending about half way to the centre and slightly irregular: secondary septa equal in number to the primaries, but not reaching more than half as far inward. Internal structure, as seen in longitudinal sections, consisting of a very narrow outer zone of vesicular tissue and of a broad inner tabulate area. The vesicles are small and rather regularly disposed, while the tabulæ, which are for the most part complete and regular in their disposition, are very close-set flat in the centre but bent downward at their outer margins.

Red Deer River, at the Upper Salt Spring and about five miles from Dawson Bay, Lake Winnipegosis, J. B. Tyrrell, 1889; abundant. Beardy Island, Dawson Bay, J. B. Tyrrell, 1889: one specimen.

The specimens for which the foregoing name is proposed appear to differ from those which are here referred to *C. dianthus*, in the much greater regularity and completeness of the tabulæ in the central tabulate area.

CYATHOPHYLLUM PETRAIODES. (N. Sp.)

Plate 34, figs. 1, 1a and 2.

Corallum simple, straight or slightly curved, in well preserved specimens attached to some foreign body by a small and partially clasping basal expansion, conical and broadly spreading, the entire height being not much greater than the width at the summit. Outer surface marked with faint longitudinal costæ, also by fine transverse striæ and a few rather coarse wrinkles at irregular intervals. Calyx circular, oblique in some specimens but not in others, subconical but irregular in shape, usually very deep and in most cases excavated to within an extremely short distance of the base: septa about forty five in number and apparently equal in size, consisting of mere ridges, which are acute and moderately prominent in the upper portion of the sides of the cup, but which are much more strongly developed at and towards its base. Internal structure, as shown in longitudinal sections, consisting of vesicular tissue between the septa: tabulæ almost but not entirely absent, a single transverse diaphragm at the bottom of the cup being observable in two out of the ten specimens collected.

Dimensions of the specimen figured: greatest height, thirty nine millimetres, maximum width, twenty nine mm. In another specimen the

greatest height is about forty mm., and the width at the summit thirty two.

Onion Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888 : one specimen.

Small island at the extreme south end of Lake Winnipegosis, J. B. Tyrrell, 1889 : one specimen. Red Deer River, at the Lower Salt Spring (five specimens) and at the Upper Salt Spring (four specimens) : J. B. Tyrrell, 1889.

This species is singularly like a *Petraia*, both in its external shape and internal structure, but it differs from that genus in the development of vesicular tissue between the septa. It resembles the "*Zaphrentis solida*" of Hall and Whitfield, from the Devonian rocks of Iowa, in many respects, but differs therefrom in the almost entire absence of tabulæ. In *Z. solida* the tabulæ are described as "distinct, closely arranged" and "extending half the diameter of the cup." If all the specimens collected by Mr. Tyrrell and the present writer had been of small size, the absence of tabulæ in them might be attributable to their being immature individuals in which these structures were not yet developed, but, as a matter of fact, most of the specimens of *C. petraioides* are considerably larger than the largest known examples of *Z. solida*.

Group of *Cyathophyllum hexagonum*, Goldfuss.*

(S.) CYATHOPHYLLUM ANNA, Whitfield. (Sp.)

Stylostræa Anna, Whitfield. 1882. Ann. N. Y. Acad. Sci., p. 199.
 " " " 1890. Ib., p. 520, pl. vi., figs. 1-5.

Lake Manitoba, on the east side of the Narrows, J. B. Tyrrell, 1888 : one specimen. Dawson Bay, Lake Winnipegosis, at Whiteaves Point (four specimens), and on a small island close to the north-west end of Beardsy Island (six specimens) ; J. B. Tyrrell, 1889. A single specimen of a coral collected by Dr. R. Bell in 1877, from the Long Portage of the Missinaibi River, in the district of Algoma, and referred to in the Report of Progress of this Survey for 1887-88 (page 5, c) as *Cyathophyllum Davidsoni*, has since been found to be referable to the present species.

The generic name *Stylostræa* was proposed by Lonsdale in 1845, for a fossil coral from the Carboniferous rocks of Russia. The type of the genus, which Lonsdale described and figured under the name *S. inconferata*, has since been pronounced to be a *Lithostrotion*, by D'Orbigny, in the "Pro-drome de Paléontologie," published in 1850, and by Edwards and Haime

* Dr. Frech thinks that the *Cyathophyllum arcticum* of Meek, from the Devonian rocks of Alaska and the Mackenzie River district, is synonymous with this species, as suggested by the writer on page 199 of the present volume.

in the "Polypiers Fossiles des Terrains Palæozoïques," published in 1851. Morris, in the second edition of his "Catalogue of British Fossils" (1854), Lindström, in his "Index to the genera of Palæozoic Corals" (Stockholm, 1883), and Etheridge, in the first volume of his "Fossils of the British Islands" (1888), also make *Stylostræa*, Lonsdale, a synonym of *Lithostrotion*, though Zittel, in the first volume of his "Handbuch der Palæontologie" (1876-80), regards it as a synonym of *Diphyphyllum*, but uses the name *Stylostræa*, Fromental, for a Liassic genus of corals belonging to the *Astræaceæ*.

Although they agree perfectly with Professor Whitfield's description and figures of the coral from the Devonian rocks of Ohio which he calls *Stylostræa Anna*, it yet seems to the writer that the specimens collected by Dr. Bell and Mr. Tyrrell are referable to *Cyathophyllum* rather than to *Stylostræa*, and that they are very nearly related to the *C. rugosum* of Hall. From the last named species they seem to differ only in the circumstance that their septa only reach about half way to the centre and that they are not continued, as carinations, on the upper surface of the tabulæ.

(S.) CYATHOPHYLLUM PROFUNDUM, Hall. (Sp.)

Acervularia profunda, Hall. 1858. Rep. Geol. Surv. Iowa, vol. I, pt. 2, p. 477, pl. i, figs. 7a b, c.

"Western shore of Dawson Bay, from slabs apparently derived from the neighbouring cliffs," J. W. Spencer, 1874 : two or three specimens in which the internal structure of the corallites is beautifully preserved. These were identified with the present species by E. Billings, on page 68 of the Report of Progress of this Survey for 1874-75.

Since then, precisely similar specimens have been collected "in place" by J. B. Tyrrell, at Lake Manitoba, on the east side of the Narrows, in 1888, and by Messrs. Tyrrell and Dowling, at Lake Winnipegosis, on three islands in the southern part of Dawson Bay, and on the Red Deer River at the Lower Salt Spring, in 1889. In each of these, the average maximum diameter of the adult corallites is from thirteen to fifteen millimetres, and the number of their septa from thirty eight to forty.* Some of the septa extend to the centre and others not quite so far, but these latter are of varying length and do not regularly alternate with the former. There are no tabulæ, the spaces between the septa being filled with vesicular tissue, the general direction of the vesicles being upward and outward.

According to Dr. Rominger, † "the corals described under the name

* Prof. Hall says that there are from forty one to forty six septa in full grown individuals of his *Acervularia profunda*.

† Geol. Surv. Michigan, Fossil Corals, p. 106.

Acervularia Davidsoni and *Acerv. profunda*, which latter," he considers "merely as a variety of the former, are in structure identical with *Cyathophyllum rugosum*." "The genus *Acervularia* is represented as having its central portion of the polyp cells surrounded by an internal wall, but neither the above-mentioned corals nor the typical forms of the genus *Acervularia* (*Cyath. pentagonum* and *Cyath. ananas* of Goldfuss) exhibit an internal wall. In the circumference of the abrupt inner cell-pits of all these forms a sort of annular demarkation is conspicuous in transverse sections, because the shorter ones of the alternately larger and smaller radial lamellæ terminate there with somewhat thickened edges, but they never combine into a closed, ring-like wall." While following Dr. Rominger in regarding *Acervularia profunda* as a *Cyathophyllum*, and Dr. Frech, who has seen the specimens collected by Messrs. Tyrrell and Dowling, in referring them to the group of *C. hexagonum*, it is thought desirable to retain Hall's specific name for these specimens, as they correspond much better with his description and figures of *A. profunda* than with those of *A. Davidsoni*.

CYATHOPHYLLUM PROFUNDUM. (Var.)

Plate 34, figs. 4 and 4a.

Corallum large, composite, massive, in the only specimen known to the writer depressed subspherical: corallites polygonal or rounded polygonal, intimately united throughout their length, and separated only by a single and extremely thin wall, unequal in size, the adult ones averaging from seventeen to nineteen millimetres in their maximum diameter. Calyces shallowly concave externally, the abruptly and not very deeply excavated central portion occupying rather more than one-half of the entire diameter of each corallite; septa as many as fifty four in number in the largest corallites; at the bottom of the cup and below it many of the septa reach to the centre, the others being shorter but very unequal in length. Internal structure, as shown in longitudinal sections, consisting of fine vesicular tissue between the septa, their being no tabulæ nor arched carinæ.

South end of Snake Island, Lake Winnipegosis, J. B. Tyrrell, 1889: a single colony, about six inches in length, five in breadth and two and a half in height, a portion of which is figured. The specimen seems to indicate or represent a local variety of *C. profundum*, in which the adult corallites are larger, their septa more numerous and the interseptal vesicles proportionately smaller and more numerous than those of the typical form. Dr. Frech thinks that the specimen is very nearly related to the *C. hypocrateriforme* of Goldfuss.

Group of *Cyathophyllum* (*Blothrophyllum*) *decorticatum*, Billings.

CYATHOPHYLLUM ATHABASCENSE. (Var.)

Plate 34, figs. 8 and 8a.

Cyathophyllum Athabascense, Whiteaves. 1891. This volume, p. 202, pl. xxxii, figs. 1, 1a, b.

Lake Winnipegosis, on the south western shore of Cameron Bay, J. B. Tyrrell, 1889: a single and perfect specimen, which appears to be a mere variety of this species. It differs from the types from the Devonian rocks of the Athabasca River only in having its central area occupied by flexuous, irregularly disposed but for the most part continuous tabulæ, rather than by large interseptal dissepiments, and in its narrower vesiculose peripheral zone, the inner margin of which is more clearly defined.

(S.) COLUMNARIA (CYATHOPHYLLOIDES) DISJUNCTA. (N. Sp.)

Plate 34, figs. 3, 3a and 3b.

Corallum composite, consisting apparently of a colony of cylindrical, straight or flexuous, ascending or erect corallites, which are separate but sometimes partially in contact, and more or less closely aggregated: diameter of the corallites averaging about five millimetres, their mural investment single and external. Surface markings of the corallites unknown, though in transverse sections there are indications of longitudinal ribs corresponding to the septa within. Calyces deep, with erect sides: primary septa thirteen, simple, neither crenulated nor denticulated, very thin, laminar and extending to the centre at and below the bottom of the cup: secondary septa similar in number and structure to the primaries, but reaching only half way to the centre. The only internal structures, besides the septa, are rather distant, thin and laminar horizontal diaphragms, which partake partly of the nature of tabulæ and partly of dissepiments. These diaphragms either form almost continuous floors across the corallites (at intervals of from one to two millimetres apart) and thus resemble tabulæ, except that their continuity appears to be interrupted by the septa, or they are disconnected and not on the same plane and thus partake more of the nature of dissepiments, though they are never curved.

Pentamerus Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888. South-west shore of Dawson Bay, Lake Winnipegosis, at the mouth of Steep Rock River, J. B. Tyrrell, 1889. At each of these localities a few comparatively large portions of a single colony were collected,

in which the corallites are everywhere surrounded by hard compact dolomite, though their interior is quite free from the matrix. The specimens present good longitudinal and transverse sections of the corallites, which show the internal structure of the latter admirably, but the surface markings of the corallites are nowhere visible, and the exact mode of growth of the whole corallum is uncertain.

This species differs from the typical forms of *Columnaria* in its cylindrical, separate, and probably fasciculated corallites, and belongs to an aberrant section of that genus, for which Dybowski has proposed the name *Cyathophylloides*. It is clearly congeneric, and may even prove to be conspecific, with the *Cyathophylloides Rhenanum* of Frech, from the Devonian rocks of the Eifel, which Dr. Frech informs the present writer is also a *Columnaria*. Around Lakes Manitoba and Winnipegosis, too, *C. disjuncta* has, so far, been found invariably associated with *Stringocephalus Burtini*, as *C. Rhenanum* is at Paffrath.

(S.) AMPLEXUS, OR DIPHYPHYLLUM. (Sp.)

Plate 35, figs. 2 and 2a.

A number of fragmentary specimens of a species of *Amplexus*, *Pycnostylus* or *Diphyphyllum* were collected by Mr. Dowling in 1889, on the western shore of Dawson Bay, on two small points, one two miles and a half and the other four miles and a half north of the mouth of the Red Deer River. These specimens do not show conclusively whether the entire corallum was originally composite or simple, the surface markings are unknown, as are also the characters of the calyces. On the other hand, the internal structure of the corallites (or corallum) is well preserved and clearly shown in numerous natural sections. The specimens consist of straight or flexuous cylindrical tubes, which average about five millimetres in length, are imperfect at both ends and imbedded in compact or vesicular dolomite. The interior of these tubes is composed of a very narrow outer or peripheral and septate zone and of a broad central tabulate area. The outer zone appears to be bounded internally by an inner wall. The septa, which are equal in length and thirty two in number, all extend from the outer to the supposed inner wall, and terminate on the inner surface of the latter, in some cases as continuous and slightly raised longitudinal ridges, in others as linear rows of minute tubercles, both modifications being observable in the same tube. The interseptal spaces between the outer and inner wall are traversed by small dissepiments. In the central tabulate area, which occupies about four fifths of the entire diameter, the tabulæ are for the most part flexuous and irregular in their shape and disposition, the distances between them varying from half a

millimetre to two millimetres. Most of the tabulæ are complete and stretch completely across from one side of the inner wall to the other, but they sometimes inosculate and occasionally one or two incomplete ones are intercalated between two of the others.

Dr. Frech, who has examined the specimens collected by Mr. Dowling, is of the opinion that they belong to the genus *Amplexus* and that they are nearly related to the *A. Hercynicus* of A. Römer, from the Stringocephalus limestone of Germany. Dr. Frech thinks that the supposed inner wall of the tubes, represented on Plate 35, fig. 2a, is caused by the cutting of the curved tabulæ. On the other hand, there are clearly dissepiments between the specimens from Dawson Bay, which are stated to be wanting in *Amplexus*, and there is a remarkably close resemblance, in size, shape and internal structure, between these specimens and the *Diphyphyllum stramineum* of Billings, which Dr. Rominger says is both congeneric and conspecific with the *Eridophyllum Simcoense* of the same author, and which therefore should be called *D. Simcoense*. In the actual types of *D. stramineum*, however, the central area of the corallites is not separated from the peripheral cycle by an internal wall (as pointed out by Dr. Rominger), the septa are unequal in length and extend much farther inward than do those of the Dawson Bay specimens, and the tabulæ are straighter and more regular in their disposition.

(S.) ACTINOCYSTIS VARIABILIS. (N. Sp.)

Plate 35, figs. 3 and 3a.

Corallum simple, slightly curved, varying in shape from broadly turbinate and widely expanding, with the breadth at the summit exceeding the height, to cylindro-conical and somewhat contracted at the summit; outer surface apparently almost smooth and marked only with a few transverse wrinkles; calyx rather deep, conical, narrow at the base; septa about eighty five in number, extending from the exterior to within a short distance from the centre, but feebly developed, thin, and rarely, if ever, quite straight, their regularity being frequently disturbed by ankylosis with the walls of the interseptal vesicles. Internal structure, apart from the septa, essentially the same as that of *Cystiphyllum*, and consisting exclusively of coarse vesicular tissue. The vesicles are very large in the central area and diminish gradually in size towards the periphery. As viewed in longitudinal sections, they appear as lenticular cells which radiate obliquely upward and outward from the centre of the coral.

"Western shore of Dawson Bay," Lake Winnipegosis, "from slabs apparently derived from the neighbouring cliffs," J. W. Spencer, 1874: one small specimen, which was referred to by E. Billings as a "*Heliophyllum*

(like *H. Halli*"), and which bears a considerable resemblance to that species externally, though its internal structure has since been found to be quite different.

South-east shore of Lake Winnipegosis, a few miles north of Point Brabant, and west shore of the same lake, at a small point north-west of Fox Point, J. B. Tyrrell, 1889: one specimen from each of these localities. South-east shore of Dawson Bay, Lake Winnipegosis, at Whiteaves Point (two specimens), and on a small island two miles west of this point (one specimen); J. B. Tyrrell, 1889. West side of Dawson Bay, at the south end of Rowan Island, D. B. Dowling, 1889: one specimen.

(S.) FAVOSITES GOTHLANDICA, Lamarck. (Var.)

Cfr. *Favosites Billingsii*, Rominger. 1876. Geol. Surv. Mich., Foss. Corals, p. 28.

Favosites Gothlandica, var. *Billingsii*, Nicholson. 1879. Tab. Cor. Palæoz. Per., p. 55, pl. 1, fig. 6.

Cfr. also *Favosites Hamiltoniæ*, Hall. 1876. Illustr. Devon. Foss., pl. xxxiv, figs. 1-9.

Western shore of Dawson Bay, Lake Winnipegosis, Dr. J. W. Spencer, 1874: one loose and imperfect specimen.

Lake Manitoba, at Monroe and Pentamerus Points, J. B. Tyrrell and J. F. Whiteaves, 1888. Dawson Bay, Lake Winnipegosis; on the south-east side at Whiteaves Point; on four small islands at the south and south-east end of the bay; also on the south-west side, about five miles south of Salt Point, and on a small point east of Steep Rock River; J. B. Tyrrell, 1889. A few specimens, which seem to be intermediate in their characters between the typical *F. Gothlandica* and the var. *Billingsii*, and which can scarcely be distinguished from the *F. Hamiltoniæ* of Hall, were collected at each of these localities.

Most of the specimens are well preserved portions of large colonies, but one large and nearly perfect example is a depressed expansion of irregular form, which measures about eleven inches in length, seven inches and a half in breadth and five inches in height. In each specimen the corallites are polygonal (not rounded polygonal) and most of them are nearly equal in size, their average diameter being about three millimetres. The septa are represented by rather short, rounded and apparently very fragile spines, which are usually broken off. The mural pores are disposed in one or two (rarely three) longitudinal rows on each of the prismatic faces of the corallites, and where there are two rows the pores are sometimes alternate and at others opposite. The tabulæ are complete, continuous and rather regularly disposed, but they do not show the "marginal punctiform depressions" which Dr. Rominger describes as one of the characters of *F. Billingsii*.

(S.) PACHYORA CERVICORNIS, DeBlainville. (Sp.)

For a list of the synonyms of this species, with references, see page 206 of the present volume.

Lake Manitoba, on the east side of the narrows, near Manitoba Island; on the north-west side, at Big Sandy Point, Monroe, Pentamerus and Onion Points; and on the north-east side, north of Steep Rock Point, J. B. Tyrrell and J. F. Whiteaves, 1888: more or less abundant at each of these localities.

Dawson Bay, Lake Winnipegosis, on five small islands at the south end or south-east side, also on its western shore at five localities between the mouths of the Steep Rock and Red Deer Rivers, and on two small points immediately north of the Red Deer River, J. B. Tyrrell and D. B. Dowling, 1889: a few specimens from each of these localities.

PACHYORA, OR ALVEOLITES. (Sp. Undet.)

Red Deer River, at the Upper Salt Spring, and about five miles from Lake Winnipegosis, D. B. Dowling, 1888: two specimens, but obtained abundantly on the same river, at the Upper and Lower Salt springs, by J. B. Tyrrell in 1889. A few specimens also were collected by Mr. Tyrrell in 1889 at several localities in the southern portion of Lake Winnipegosis, as at the south end of Snake Island, the north side of South Manitou Island and Point Brabant, also at two localities on the south-west side of Dawson Bay.

The specimens from these localities consist of rather small or medium sized corals, with much the same general shape and proportions as *Pachyora polymorpha*. The stems are cylindrical, widely and doubly bifurcating, with an average diameter of about eight or nine millimetres in the thickest part. The corallum in each seems to differ from that of *P. polymorpha* in the much greater obliquity with which its corallites open outward to the surface; also, in the circumstance that their apertures are frequently transversely semielliptical, semilunar, or sub-triangular, and broader than high, with the lower lip of each distinctly projecting. In most respects, these specimens agree remarkably well with the published descriptions and figures of *Alveolites cryptodens*, Billings, and even with the types of that species in the Museum of the Survey, but the throats of their corallites are almost invariably filled with dolomite, and shew no traces of the three internal ridges or "longitudinal crests" which are so characteristic of *A. cryptodens*.

(S.) ALVEOLITES VALLORUM, Meek.

- Alveolites vallorum*, Meek. 1868. Trans. Chicago Ac. Sc., vol. I., p. 86, pl. xi, fig. 9.
 " " Rominger. 1876. Geol. Surv. Michigan, Foss. Corals, p. 41,
 pl. xvii, fig. 3.

Lake Winnipegosis, from the basal beds of the Upper Devonian at the north end of Snake Island (one specimen); also, from the Stringocephalus zone at three localities on the south-west side of Dawson Bay (two or three specimens from each), and on three small islands in the southern portion of Dawson Bay (a few specimens from each); J. B. Tyrrell, 1889.

The specimens of *A. vallorum* from the Hay, Mackenzie and Peace Rivers referred to on page 207, have the outer surface of the corallum well preserved, but the structure of the interior of the corallites is more or less obliterated by crystallization, the corallites being completely filled with matrix. In the specimens from Lake Winnipegosis, however, which do not occur in shale, but in a compact or vesicular dolomite, the exterior of the corallum is not so well preserved, but the corallites are nearly free from the matrix throughout their length. The corallites are laterally compressed, and their apertures vary in outline from narrowly elongated or somewhat crescentic to polygonal, and in their greatest diameter from half a millimetre to a millimetre and a half. The septal spines are well developed, but apparently very fragile. As many as from six to eight rows of these can be counted, though with difficulty, but there do not appear to be ever as many as twelve rows, as there are said to be in *A. squamosus*. The tabulæ are complete and offer rather regularly disposed. Of the lateral or marginal mural pores, about ten can be counted in the space of five millimetres.

HYDROMEDUSÆ.

HYDROIDA.

(S.) STROMATOPORA. Sp.

(Cfr. *Stromatopora Bücheliensis*, Bargatzky, sp.)

- Caninopora Bücheliensis*, Bargatzky. 1881. Die Stromatoporen des Rheinschen Devons, p. 62.
Stromatopora Bücheliensis, Nicholson. 1886. Mon. Brit. Stromatoporoids, Pt. I, p. 23, pl. x, figs. 5-7.
 " " Nicholson. 1891. *Ib.*, Pt. III., p. 186, pl. xxiii, figs. 4-7.

Lake Winnipegosis, on two small islands in Dawson Bay, one on the south-east side of the bay, and the other at its southern end, J. B. Tyrrell, 1889: a single specimen from each island.

The whole of the Stromatoporoids collected by Messrs. Tyrrell and Dowling in 1888 and 1889, from the Devonian rocks of Lakes Manitoba and Winnipegosis, were sent (in January, 1890) to Prof. H. A. Nicholson, who has since reported on them in a paper published in the "Annals and Magazine of Natural History" (London, England) for April, 1891. According to Prof. Nicholson, on page 313 of this paper, these two specimens in particular "have the general aspect of *Stromatopora Bücheliensis*, Barg., sp., and are probably referable to this species. Unfortunately, the specimens in question are dolomitized, and their internal structure is so far altered that this reference cannot be regarded as free from doubt."

STROMATOPORA. Sp.

(Cfr. *Stromatopora Hüpschii*, Bargatzky, sp.)

Caunopora Hüpschii, Bargatzky. 1881. Die Stromatoporen des Rheinischen Devons, p. 61.

Stromatopora Hüpschii, Nicholson. 1886. Mon. Brit. Stromatoporoids, Pt. I, p. 50, figs. 6 a, b, and pl. x., figs. 8 and 9; also *Ib.*, Pt. III. (1891), p. 176 (which see for a complete list of the synonyms of this species, with references), pl. xxii., figs. 3-7.

Lake Winnipegosis, at the south end of Snake Island (one specimen), and on a small island on the south-east side of Dawson Bay (one specimen); J. B. Tyrrell, 1889.

In reference to these two specimens Dr. Nicholson writes (*op. cit.*, p. 314) that they "belong to a species of *Stromatopora* in many respects similar to *S. Hüpschii*, Barg. Structurally these specimens agree with the latter common European and British type, and differ from *S. Bücheliensis*, Barg., in their coarse skeleton-fibre, the lax reticulation of the skeleton, and the loose spreading form of the astrophizæ. The internal structure of these specimens is, however, very poorly preserved, and it would be rash to refer them unreservedly to *S. Hüpschii*."

A single specimen of a Stromatoporoid collected by Dr. R. Bell in 1877, at the Long Portage of the Missinaibi River, is also doubtfully referred by Prof. Nicholson to *S. Hüpschii*.

(S.) ACTINOSTROMA EXPANSUM, Hall and Whitfield. (Sp.)

Stromatopora expansa, Hall and Whitfield. 1873. Twenty-third Reg. Rep. N. York St. Cab. Nat. Hist., p. 226, pl. ix., fig 9.

Actinostroma expansum, Nicholson. 1891. Ann. and Mag. Nat. Hist. vol. VII., sixth series, p. 316, pl. x, figs. 1 and 2.

Lake Winnipegosis, at a small island on the south-east side of Dawson Bay, J. B. Tyrrell, 1889: two specimens.

(S.) ACTINOSTROMA TYRRELLII, Nicholson.

Actinostroma Tyrrellii, Nicholson. 1891. Ann. and Mag. Nat. Hist., vol. VII, sixth series, p. 317, pl. viii, figs. 4 and 5, and wood cut, fig. 1.

Lake Winnipegosis, at five localities on the shore and islands of the southern portion of Dawson Bay, J. B. Tyrrell and D. B. Dowling, 1889; apparently not uncommon and in fine condition at each of these localities.

(S.) ACTINOSTROMA FENESTRATUM, Nicholson.

Actinostroma fenestratum, Nicholson. 1889. Mon. Brit. Stromatopoids, Pt. II, p. 146, pl. xvii, figs. 8 and 9.

“ “ Nicholson. 1891. Ann. and Mag. Nat. Hist., vol. VII, sixth series, p. 322, pl. x, figs. 3 and 4.

Lake Manitoba, north-west side, at Pentamerus Point, three miles and a half north of the mouth of Crane River, J. B. Tyrrell and J. F. Whiteaves: several specimens. Lake Winnipegosis, on two small islands at the southern end of Dawson Bay; also on the south-western shore of Dawson Bay, a little to the west of Salt Point, and at the south end of Rowan Island, in the western portion of the bay, J. B. Tyrrell, 1889: one specimen at each locality.

ECHINODERMATA.

CRINOIDEA.

(S.) CTENOCRINUS. (Sp.)

Cfr. *Ctenocrinus decadactylus*, (Goldf. sp.) G. and F. Sandberger. 1850-56. Die Versteiner. des Rheinischen syst. in Nassau, p. 396, pl. xxxv, fig. 15.

Cfr. also, *Ctenocrinus typus*, (Bronn.) Zittel. Handbuch der Palæontologie, vol. I, p. 372, fig. 260.

Although portions of the stems of crinoids are not infrequent in the Devonian rocks of Lakes Manitoba and Winnipegosis, only two specimens have as yet been obtained in which any portion of the calyx or dorsal cup is preserved. These were collected by Mr. Tyrrell in 1889, one on a small island on the east side of Dawson Bay and the other on a small island at the south end of the bay. The more perfect of these two specimens has ten of the calycinal plates preserved and not quite two inches of the column. Each of these calycinal plates is hexagonal, slightly convex externally, smooth in the centre, but crenulated round the margin. The column is thick, averaging about seventeen millimetres, or about three

quarters of an inch, in diameter, circular and annulated, with one or two flat articulations usually alternating with a single raised and moderately prominent one. In some portions of columns, however, from the same localities, the raised articulations bear rounded and much elevated tubercles. Both of the specimens are far too fragmentary to be identified, even generically, but they bear a striking resemblance to the *C. decadactylus*, as figured by the Sandbergers, and to the *C. typus*, as figured by Zittel, though some palæontologists regard *Ctenocrinus* as synonymous with *Melocrinus*.

VERMES.

SPIROBIS OMPHALODES, Goldfuss.

Serpula omphalodes, Goldfuss. 1826-33. Petref. Germ., vol. I, p. 235, pl. lxxvii, fig. 3.

Spirorbis omphalodes, Nicholson. 1874. Rep. Palæont. Prov. Ont., p. 121, fig. 54a.

“ “ Whiteaves. 1891. This volume, p. 209, pl. xxviii, figs. 3, 4, 4a, 5, and 5a.

Dawson Bay, Lake Winnipegosis, at a small island on the east side (one specimen on a piece of a crinoidal column), and at Point Wilkins, on the south-west side (several examples, attached to the shells of brachiopoda); also on the Red Deer River, at the Upper Salt Spring, five miles from Dawson Bay (one specimen on a simple *Cyathophyllum*); J. B. Tyrrell, 1889.

At each of these localities the specimens are rather more closely coiled and consequently more narrowly umbilicated than the types described by Goldfuss, but they agree very well with Ferdinand Roemer's figures of *S. omphalodes*, on plate xxxi of the Atlas to the first volume of the *Lethæa Geognostica*.

POLYZOA.

LEPTOTRYPA QUADRANGULARIS, Nicholson. (Sp.)

Chætetes quadrangularis, Nicholson. 1874. Geol. Mag., N. Ser., Dec. 2, vol. I, p. 58, and Rep. Palæont. Prov. Ont., p. 61, fig. 18.

Paleschara quadrangularis, S. A. Miller. 1889. N. Am. Geol. & Palæont., p. 177 (under *Chætetes*).

“ “ Whiteaves. 1891. This volume, p. 213.

Leptotrypa quadrangularis, Ulrich. 1890. Geol. Surv. Illinois, vol. VIII, p. 455.

Red Deer River, half a mile above the Lower Salt Spring and about two or three miles from Dawson Bay, J. B. Tyrrell, 1889: one specimen attached to a valve of *Atrypa reticularis*.

PINACOTRYPA MARGINATA. (N. Sp.)

Plate 36, figs. 1, 1a & 1b.

Zoarium explanate, forming thin, flattened or flexuous, subcircular expansions, from three quarters of an inch to an inch in their maximum diameter. Under surface covered with an extremely thin laminar epitheca: upper surface consisting of a broad central celluliferous area, surrounded by a projecting lateral expansion of the epitheca, which is entirely devoid of cells. Celluliferous area marked with large star-shaped maculæ, whose centres are about six mm. apart. Outer and noncelluliferous expansion variable in breadth, its upper surface marked by longitudinal and nearly parallel raised lines of unequal size, which in some specimens are interwoven with a few similar but concentric lines. Zoecia (or autopores) at first recumbent but ultimately erect, very short, cylindrical, about a third of a millimetre broad at their summits, arranged in subparallel lines which radiate from the maculæ, but very closely disposed, and in some cases almost touching each other: orifices of the zoecia frequently closed by flat opercula, and surrounded in each case by a thin, slightly elevated and apparently granulose peristome. Interspaces very narrow, occupied by a single series of polygonal interstitial cells or mesopores (over whose apertures a thin smooth calcareous membrane or "roof" is usually stretched) except on the maculæ, where they are disposed in small clusters. Lunarium nearly or quite obsolete. Microscopic sections show that the interstitial cells or mesopores are comparatively large, and placed one over the other, even in the maculæ, so as to form tabulated tubes, and not vesicular tissue as in *Fistulipora*.

Lake Winnipegosis, at a small island on the south-east side of Dawson Bay, J. B. Tyrrell, 1889: seven specimens. Also on a small island on the east side of Lake Winnipegosis and east of the south end of Birch Island, J. B. Tyrrell, 1889; two specimens, loose.

This species is referred to *Pinacotrypa* rather than to *Fistulipora* or *Lichenalia*, on the authority of Mr. E. O. Ulrich, who, in a letter to the present writer, dated 23rd September, 1891, makes the following remarks on two of the best specimens collected by Mr. Tyrrell, which were sent to him for examination: "This is a remarkable form which I think may be safely described as a new species of *Pinacotrypa*. The general expression of the surface is much as in several species of *Fistulipora*, but the constant nummiform shape is distinctive. The chief peculiarity, however, is the longitudinal striation of the basal lamina. This is a very remarkable feature, and one quite unknown to me. The cells are smaller and the maculæ more distinct than in *P. elegans*, the *Fistulipora elegans* of Rominger."

(S.) CYSTODICTYA HAMILTONENSIS, Ulrich.

Plate 36, figs 2, 2a and 2b.

Cystodictya Hamiltonensis, Ulrich. 1890. Geol. Surv. Illinois, vol. VIII, p. 493, pl. xlii, fig. 4, and pl. xliii, fig. 1.

Monroe Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: seven specimens. Lake Winnipegosis, at a small island on the east side of Dawson Bay, D. B. Dowling, 1888: three specimens. The species has since been collected by Messrs. Tyrrell and Dowling in 1889, on the east side of Dawson Bay, at Whiteaves Point, and on three small islands adjacent thereto, on the west side, at Rowan Island, also (*loose*) on the east side of Lake Winnipegosis at a small island east of the south end of Birch Island.

The specimens from these localities were first identified with this species by Mr. L. M. Lambe.

(S.) FENESTELLA VERA, Ulrich.

Plate 36, figs. 3 and 3a.

Fenestella vera, Ulrich. 1890. Geol. Surv. Illinois, vol. VIII, p. 535, pl. xlv, figs. 1 and 1a, and pl. liv, fig. 3.

Dawson Bay, on two small islands near Whiteaves Point, three specimens on one of these islands, and one specimen on the other; also on the east side of Lake Winnipegosis, at a small island east of the southern extremity of Birch Island (a small fragment); J. B. Tyrrell, 1889.

These specimens agree very well with Mr. Ulrich's description and figures of *F. vera*, but they are not sufficiently well preserved to show the "very minutely granulose" surface of "both branches and dissepiments," said to be characteristic of that species. Only the outer or non-celluliferous side is exposed in any of these specimens, but the shape, number and disposition of the zoecia has been clearly ascertained by scraping away small portions of the exterior. The identifications of the specimens here referred to this and to the preceding species have been verified by Mr. Ulrich.

(S.) FENESTELLA, Sp.

(Cfr. *Fenestella dispanda*, Hall.)

Plate 36, fig. 4.

Fenestella dispandus, Hall. 1886. Rep. St. Geol. for 1885, adv. sheets, Expl., pl. xlv, figs. 1-4.

Fenestella dispanda, Hall. 1887. Pal. N. York, vol. VI, p. 114, pl. xlv, figs. 1-4.

Dawson Bay, Lake Winnipegosis, on the south-east side, at Whiteaves Point (two specimens) and on the west side, at the south end of Rowan Island, also on the east side of Lake Winnipegosis at a small island opposite Birch Island, three specimens; J. B. Tyrrell and D. B. Dowling, 1889.

The specimens from these localities agree fairly well with Hall's figures of *F. dispanda*, but their identification with that species is doubtful, owing to the contradictory nature of the measurements given in its description. They differ from the specimens here referred to *F. vera*, in their straggling mode of growth, striated noncelluliferous surface, large oblong fenestrules, and in their more slender branches and dissepiments.

(S.) POLYORA (POROSA ? var.) MANITOBOENSIS.

Plate 36, fig. 5.

Cfr. Fenestella porosa, Hall. 1881. Trans. Albany Inst., vol. X, abstract, p. 26.

Fenestella (Polypora) porosa, Hall. 1883. Rep. St. Geol. for 1882, Expl., pl. 31, figs. 1-6.

“ “ “ “ 1887. Pal. St. N. York, vol. VI, p. 163, pl. xxxviii, figs. 1-6.

Zoarium infundibuliform, rather widely expanding, irregularly and shallowly undulated. Branches slender, usually zigzag when the fenestrules are alternate, but occasionally straight where they are opposite and appearing externally, on the noncelluliferous side, as smooth (?) slightly angular longitudinal ridges, which are a little broader than the transverse noncelluliferous dissepiments. Fenestrules large, a little longer than wide, elliptical or approaching to hexagonal in outline and averaging about .8 mm. in length and .6 mm. in width. In a distance of six millimetres there are four fenestrules as measured longitudinally, and six as measured transversely. Cell apertures disposed in from two to four alternating longitudinal rows, about four of these apertures in each row to the length of a fenestrule.

Monroe Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: four specimens. Dawson Bay, Lake Winnipegosis, on three small islands, two on the south-east side and the other in the southern portion of the bay, also on its eastern shore, at the second point north of the mouth of the Red Deer River, J. B. Tyrrell and D. B. Dowling, 1889: a few specimens from each of these localities.

In each of these it is only the noncelluliferous outer surface that is exposed, the characters of the zoëcia having been ascertained by scraping down small portions of the branches. The close affinity of these specimens to the *P. porosa* of Hall was suggested to the writer by Mr. Ulrich.

From that species they appear to differ principally in their much more slender branches and dissepiments, more hexagonal fenestrules, and in the greater extent to which the arrangement of the zœcia in two rows prevails.

BRACHIOPODA.

(S.) DISCINA. (Sp. Indet.)

Western shore of Dawson Bay, at the first small point north of the mouth of the Red Deer River, D. B. Dowling, 1889 : two casts of the upper valve, which are too badly preserved to admit of determination or accurate description. Both are small and nearly circular in basal outline, with a depressed apex, which is nearly central in one of the specimens and slightly excentric in the other.

CHONETES LOGANI, var. AURORA, Hall.

- Chonetes Logani*, var *Aurora*, Hall. Pal. St. N. York, vol. IV, pt, 1, p. 137, pl. xxii, figs. 16-28.
 “ “ “ Williams. 1880. Bull. Geol. Surv. Am., vol., I, pp. 490 and 491, pl. xii, figs. 10 and 11.
 “ “ “ Whiteaves. 1891. This volume, p. 215, pl. xxix, figs. 2 and 2a.

Red Deer River, half a mile above the Lower Salt Spring, J. B. Tyrrell, 1889 : abundant.

CHONETES MANITOBIENSIS. (N. Sp.)

Plate 37, figs. 1, 1a and 2.

Shell small, concavo-convex, strongly compressed, transversely semielliptical, about twice as broad as long and broadest at the hinge line : cardinal extremities angular and very slightly produced : sides rounded in front : anterior margin nearly straight or but faintly convex in the centre. Ventral valve compressed convex, its cardinal border armed on each side of the beak with three or four slender and widely divaricating spines, which increase in length outward : its beak inconspicuous, minute and not projecting, its hinge area narrow, with a small triangular fissure. Dorsal valve shallowly concave, its beak minute and its hinge area narrower than that of the ventral.

Surface marked with very minute radiating raised lines, which increase in number at variable distances from the beaks, by bifurcation, trifurcation or intercalation, so that around the outer margin as many as from seventy

to a hundred can be counted under a lens. In addition to these, the exterior of well preserved specimens is marked with exceedingly fine and close-set, concentric raised lines. Interior of the valves minutely papillose. Muscular impressions unknown.

The dimensions of two average specimens are as follows: of one, maximum length nearly ten millimetres, greatest breadth, nineteen; of another, length ten mm. and a quarter, breadth twenty.

Rather abundant at the north end of Manitoba Island, in Lake Manitoba, where it was collected by Prof. H. Y. Hind in 1858 and by J. B. Tyrrell and the present writer in 1888.

This small *Chonetes* seems to differ from the *C. carinata* (or *coronata*) of Conrad, as described and figured by Prof. Hall in the fourth volume of the Palæontology of the State of New York, in its uniformly smaller size, flatter and more transversely elongated valves, finer sculpture and in the greater length and smaller number of the spines on the cardinal margin of the ventral valve. According to Prof. Hall, a careful measure of the radiating striæ on numerous specimens of *C. carinata* from the State of New York "shows that they range from nine to fifteen striæ in the space of two tenths of an inch," while specimens from Illinois gave from nine to twelve in the same space. In three average examples of *C. Manitobensis*, from twenty to twenty two radiating raised lines were counted in a corresponding space.

C. Manitobensis is also very closely allied to the *C. striatella* of Dalman, from the Silurian (Upper Silurian) of Europe, and to the *C. Hardrensis* of Phillips, from the English Devonian. Of the former it may prove to be a local and stratigraphical variety, and from the latter (as described by Davidson) it seems to differ chiefly in the circumstance that its radiating "striæ" are not minutely spinose.

(S.) PRODUCTELLA PRODUCTOIDES, var. MEMBRANACEA.

Leptæna membranacea, Phillips. 1841. Pal. Foss. Cornw., Dev. and W. Somerset, p. 60, pl. xxv, fig. 101.

Strophalosia productoides, (Murchison, 1840) Davidson. 1865. Mon. Brit. Dev. Brach., p. 97, pl. xix, figs. 18-21; also, this volume, p. 216, pl. xvi, figs. 1 and 2.

Monroe Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: six specimens.

In the first part of the eighth volume of the Palæontology of the State of New York, just published, (p. 317) Professor Hall follows Professor King in referring the typical form of this species to *Productella* rather than to *Strophalosia*, and this view has been adopted here, as equally applicable to the var. *membranacea*.

PRODUCTELLA SUBACULEATA, Murchison. (Sp.)

- Productus subaculeatus*, Murchison. 1840. Bull. Soc. Géol. de France, vol. XI, p. 255, pl. ii, fig. 9.
- Leptæna fragaria*, J. de C. Sowerby. 1840. Tran. Geol. Soc. Lond., 2nd. ser., vol. V, p. 704, pl. lvi, fig. 5.
- “ “ Phillips. 1841. Pal. Foss. Cornw., Dev. and W. Somerset, p. 59, pl. xxv, fig. 100.
- Productus subaculeatus*, Davidson. 1865. Mon. Brit. Dev. Brach., p. 99, (which see for a full list of references to European publications in which this species is described or referred to) pl. xx, figs. 1 and 2.
- Productella subaculeata*, Hall. 1867. Pal. St. N. York, vol. IV, p. 154, pl. xxxiii, figs. 4 and 5.

A few specimens of this well known European species were collected at each of the following localities. North end of Manitoba Island and Onion Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888. At twelve localities on Lake Winnipegosis; i. e., at the south end, on Snake and another small island; on the south-west side, at Point Brabant; on the north-west side, at Devils Point and in Cameron Bay; also on the shore and islands of the south-eastern, southern and south-western portions of Dawson Bay: J. B. Tyrrell, 1889. Red Deer River near and between the Upper and Lower Salt springs, and Hog Island in Swan Lake, Manitoba: J. B. Tyrrell and D. B. Dowling, 1889.

ORTHIS (SCHIZOPHORIA) STRIATULA, Schlotheim.

For a list of synonyms of this species, with references, see page 218 of the present volume.

Snake Island, Lake Winnipegosis, Prof. H. Y. Hind, 1858: Upper Salt Spring, Red Deer River, Prof. Macoun, 1881.

ORTHIS (SCHIZOPHORIA) MANITOBENSIS. (Nom. prov.)

Plate 37, figs. 3, 3 a, 4, 5 and 5 a.

Shell rather small, resupinate, transversely subelliptical or subquadrangular, a little broader than long: thickness through the closed valves about one third less than their maximum breadth: hinge area a little more than one half of the entire breadth; front margin rather deeply sinuated in the centre. Ventral valve much flatter than the dorsal, with a concave sinus at and near the front margin, its hinge area apparently broader in the direction of its height than that of the dorsal, and its beak prominent but nearly straight. Dorsal valve strongly convex, its umbonal

and central region tumid, its umbo rather prominent, and its beak incurved and slightly recurved.

Surface markings consisting of fine, subequal and closely disposed, radiating raised lines, which increase in number by bifurcation, trifurcation and intercalation, and are crossed by a few irregularly disposed, but for the most part distant, concentric striæ of growth. Around the outer margin of the dorsal valve figured (fig. 3), about 136 radiating raised lines can be counted, and in a still larger dorsal valve, which is not figured, about 150 were counted.

Three casts of the interior of the dorsal valve of a shell which is probably referable to this species, from the local base of the Middle Devonian at Devils Point, Lake Winnipegosis (figs. 5 and 5 a) shew two linear grooves, which probably represent the impressions made by the brachial processes, diverging on each side of the umbo, also a minute and very short slit, which widens into a small subcircular or subrhomboidal perforation in the apex of the beak. Muscular impressions not clearly defined in any of the specimens collected.

Of the two testiferous specimens figured, the one showing the dorsal valve only (fig. 3) is thirteen millimetres long and sixteen broad, while the one drawn to shew the front margin (fig. 4) and relative convexity of the two valves, is nineteen mm. broad and eleven mm. and a half in depth or thickness, though it is too imperfect posteriorly to show the exact length.

Dawson Bay, Lake Winnipegosis, on the east side, at Whiteaves Point, and on two small islands in its immediate vicinity; on a small island about three miles north of Salt Point, and, on the west side, at the first small point north of the mouth of the Red Deer River, J. B. Tyrrell and D. B. Dowling, 1889: one to three specimens from each of these localities, most of the former being detached dorsal valves, the only example with both valves preserved being very immature.

The specimens for which the foregoing provisional name is suggested may prove to be only a small local variety of of the typical *O. Iowensis* of Hall, as originally described and figured in the Geology of Iowa, but not of the large northern form which has been referred to that species. They seem to differ from the typical *O. Iowensis* chiefly in their much smaller size and more quadrangular form; also, though this may be due to their being highly dolomitized, in the apparent absence of the "tubular openings" on the surface of the radiating striæ, and of "fine pores or punctæ over the entire surface," which are said to be characteristic of *O. Iowensis*.

(S.) ORTHOTHETES CHEMUNGENSIS, Conrad. (Sp.)

- Strophomena Chemungensis*, Conrad. 1842. Journ. Acad. Nat. Sc. Phil., vol. VIII, p. 257.
- “ *bifurcata*, Hall. 1842. Geol. Rep. Fourth Distr. N. York, p. 266, fig. 2.
- “ *arctostriata*, Hall. 1842. Ibid., p. 266, fig. 3.
- “ *pectinacea*, Hall. 1842. Ibid., p. 266, fig. 4.
- Orthis perversa*, Hall. 1857. Tenth Reg. Rep. N. York St. Cab. Nat. Hist., p. 137.
- “ *inequalis*, Hall. 1858. Geol. Surv. Iowa, vol. I, pt. 2, p. 490, pl. ii, figs. 6, a-c.
- “ *pravus*, Hall. 1858. Ib., p. 490.
- Streptorhynchus Pandora*, Billings. 1860. Canad. Journ., N. S., vol. V, p. 266, figs. 12 and 13; and Geol. Canada, 1863, p. 369, fig. 384.
- Orthisina arctostriata*, Hall. 1860. Thirteenth Reg. Rep. N. York St. Cab. Nat. Hist., p. 80.
- “ *alternata*, Hall. 1860. Ib., p. 81.
- Streptorhynchus Chemungensis*, Hall. 1867. Pal. St. N. York, vol. IV, p. 67, pls. iv, ix and x.
- “ “ “ (Var. A.) *Streptorhynchus Pandora*, Billings.
- “ “ “ (Var. B.) *S. arctostriata*, Hall.
- “ “ “ (Var. C.) *S. perversa*, Hall.
- “ “ “ (Var. D.) *S. pectinacea*, Hall.
- Streptorhynchus Pandora*, Nicholson. 1874. Pal. Prov. Ontario, p. 70.
- Hemipronites Chemungensis*, var. *arctostriata*, Meek. 1877. Geol. Expl. Fortieth Par., vol. IV, p. 117, pl. xiii, figs. 7, 16.
- Streptorhynchus Chemungensis*, Walcott. 1884. Pal. Eureka distr. Nevada, p. 117, pl. xiii, figs. 7, 16.
- Orthothetes Chemungensis*, Hall. 1892. Pal. St. N.Y., vol. VIII, pt. 1, p. 255.

Devils Point, Lake Winnipegosis, in the lowest beds of the Middle Devonian (six specimens); on the east side of Dawson Bay, Lake Winnipegosis, in the Stringocephalus zone, at Whiteaves' Point (two specimens), and on a small island about two miles north of this point (two specimens); J. B. Tyrrell, 1889.

According to Mr. C. D. Walcott (op. cit.) in the State of New York this species “ranges from the Upper Helderberg up into the Chemung group, and in the Eureka district” of Nevada “from the base to the summit of the Devonian limestone.”

STROPHODONTA ARCUATA, Hall.

- Strophodonta arcuata*, Hall. 1858. Geol. Surv. Iowa, vol. I, pt 2, p. 492, pl. iii, figs. 1 a, b, c, and 2 a, b, e, f.

Lake Winnipegosis, on a small island at the extreme southern end of the lake, (one specimen), and on the east side of Dawson Bay, on a small

island about two miles north of Whiteaves Point, (one specimen); J. B. Tyrrell, 1889. Red Deer River, half a mile above the Lower Salt Spring and two or three miles from Dawson Bay, (one perfect specimen), and at the Upper Salt Spring (abundant); J. B. Tyrrell, 1889.

(S.) STROPHODONTA INTERSTRIALIS, Phillips. (Sp.)

Plate 37, fig. 6.

Orthis interstitialis, Phillips. 1841. Pal. Foss. Dev., Cornw., and W. Somerset, p. 61, pl. xxv, fig. 103.

Leptaena interstitialis, Schnur. 1853. In Dunker & Von Meyer's Palæontographica, vol. III, p. 222, pl. xli, fig. 2.

Leptaena interstitialis, Davidson. 1864-65. Mon. Brit. Dev. Brach., p. 85, pl. xviii, figs. 15-18; also, Suppl. (1882-84) pl. iii, fig. 21.

East side of Dawson Bay, Lake Winnipegosis, on a small island about two miles north of Whiteaves Point, (three well preserved ventral valves, one of which is figured), and on another small island about the same distance to the south-west of that point (two similar specimens); J. B. Tyrrell, 1889.

These specimens are obviously much more like Davidson's figures of *Leptaena interstitialis* than they are to Hall's illustrations of the very closely allied *Strophodonta inaequistriata* of Conrad, in the fourth volume of the Palæontology of the State of New York. Prof. H. S. Williams, of Cornell University, Ithaca, to whom three of the best of these specimens were sent, for comparison, thus writes concerning them. The ventral valve figured "is a good representative of the *Leptaena interstitialis*, Phillips, as it appears at Lummaton, in South Devonshire. I have compared it with good specimens identified by Davidson. Our *Strophodonta inaequistriata*, *S. Patersoni* and *S. Cayuta* are allied forms, but your specimens are closer to the Lummaton forms than to either of our New York species." Davidson's figure of *L. interstitialis* on plate iii of the "Supplement to the British Devonian Brachiopoda," leave no doubt on the mind of the present writer that Phillips' species belongs to Hall's genus *Strophodonta*.

(S.) SPIRIFERA FIMBRIATA, Conrad.

Delthyris fimbriata, Conrad. 1842. Jour. Ac. Nat. Sc. Phil., vol. VIII, p. 263.

Spirifera fimbriata, Billings. 1861. Canad. Journ., N. Ser., vol. VI, p. 257, figs. 68-70.

" " Hall. 1858. Geol. Surv. Iowa, vol. I, pt. 2, p. 505, pl. iv, figs. 5 a-e.

" " Hall. 1867. Pal. St. N. York, vol. IV, p. 214, pl. xxxiii, figs. 1-21.

Spirifera fimbriata, Nicholson. 1874. Pal. Prov. Ont., p. 82.

Not *Spirifera fimbriata*, Morton. 1836. Am. Journ. Sc. and Arts, vol. XXXIX, p. 149.

Spirifera Conradana, S. A. Miller. 1883. Am. Pal. Foss., Second Ed., p. 298.

“ “ “ “ 1889. N. Am. Geol. and Palæont., p. 372.

Monroe Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: one perfect but not very well preserved dorsal valve. A single specimen of this species was also collected by Mr. J. B. Tyrrell or Mr. D. B. Dowling in 1889, at each of the following localities on or near Lake Winnipegosis: in the southern portion of the lake at a small island off Weston Point; in the *Stringocephalus* zone at several exposures in the eastern, south-western and western shore of Dawson Bay; on two small islands on the east side of the bay, and at the south end of Rowan Island, on its west side; also, in the *Cuboides* zone on the Red Deer River, half a mile below the Lower Salt Spring.

SPIRIFERA (MARTINIA) RICHARDSONII, Meek.

Plate 37, fig. 7.

Spirifera (Martinia) Richardsonsii, Meek. 1868. Trans. Chicago Ac. Sc., vol. I, p. 104, pl. xiv, fig. 2.

Lake Winnipegosis, at Point Brabant (two casts of the interior of ventral valves), and at Devils Point (two specimens); also, in Dawson Bay at a small point half a mile north of the mouth of Bell River (two specimens); at the head of a small bay about three miles south of Point Wilkins (several small specimens); and on the Red Deer River near the Lower Salt Spring; J. B. Tyrrell and D. B. Dowling, 1889. At each of these localities the specimens collected are small and rarely exceed half an inch in diameter. They are all a little longer than broad, nearly smooth, with an undeveloped or very feebly developed mesial fold and sinus.

In 1888 Mr. Dowling collected numerous specimens of a small *Spirifera*, which is probably referable to the present species, on the south-west side of Dawson Bay, at the second point north of the Red Deer River. These specimens (one of which is figured) are invariably hollow and imbedded in a vesicular dolomite in such a way as to show the character of the interior of the valves only, the spiral coils and hinge teeth being beautifully preserved. The hinge teeth of the ventral valve are slightly curved and diverge rapidly outward and forward. The shelly cones consist of only five loosely coiled, separate and rather distant, apparently smooth volutions, on each side.

CYRTINA HAMILTONENSIS, Hall.

- Cyrtia Hamiltonensis*, Hall. 1857. Tenth Rep. Reg. N. York St. Cab. Nat. Hist., p. 166.
- “ “ Billings. 1861. Canad. Journ., N. Ser., vol. VI, p. 262, figs. 80-82.
- “ “ Billings. 1863. Geol. Canada, p. 384, figs. 415 a-c.
- Cyrtina Hamiltonensis*, Hall. 1867. Pal. St. N. York, vol. IV, p. 268, pl. xxvii, figs. 1-4, and pl. xlv, figs. 26-33 and 38-52.
- “ “ Meek. 1868. Trans. Chicago Ac. Sc., vol. I, p. 99, pl. xiv, figs. 5, 7 and 10.
- “ “ Nicholson. 1874. Rep. Pal. Prov. Ontario, p. 83.
- “ “ Walcott. 1884. Pal. Eureka, distr. Nevada, p. 147.
- “ “ Whiteaves. 1891. This volume, p. 226.

Onion Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888 : four specimens. A few characteristic examples of this species also were collected by Messrs. Tyrrell and Dowling in 1889 at each of the following localities : Lake Winnipegosis, at the north end of Snake Island, at a small island off Weston Point, on the north, south-east and south-west side of South Manitou Island and at Point Brabant ; on the south-west side of Cameron Bay, and in Dawson Bay on a small island to the south-west of Whiteaves Point, at Point Wilkins, and at the head of a small bay south of Point Wilkins ; at the C. P. R. crossing of Mossy River, Man. ; on the Red Deer River at its mouth, and at the Lower and Upper Salt springs ; at Rosebush Island in Swan Lake, and at the lowest crossing of the Swan River ; also, *loose*, on the east side of Lake Winnipegosis, at a small island east of the south point of Birch Island.

In this district only one specimen of *C. Hamiltonensis* has been found in the Stringocephalus zone, but it appears to be everywhere abundant throughout the Upper Devonian.

ATHYRIS VITTATA, Hall.

- Athyris vittata*, Hall. 1860. Thirteenth Rep. Reg. N. York St. Cab. Nat. Hist., p. 89.
- “ “ Hall. 1867. Pal. St. N. York, vol. IV, p. 289, pl. xlvi, figs. 1-4.

Warren Island (possibly the Rose Island of Mr. Tyrrell's map), Swan Lake, Manitoba, J. W. Spencer, 1874 ; six specimens.

Dawson Bay, Lake Winnipegosis, in the Upper Devonian rocks at Point Wilkins, and at an exposure about two miles south of Point Wilkins ; also on Rose and Hog Islands in Swan Lake, J. B. Tyrrell and D. B. Dowling, 1889 : apparently not uncommon at each of these localities. Most of the specimens collected are nearly perfect, but none of them show any of the characters of the interior of the valves. The mesial fold

and sinus are rather feebly developed in each, and these specimens from Manitoba correspond much better with examples of *A. vittata* from the Hamilton shales of Muscatine and Scott counties, Iowa, kindly forwarded for comparison by Professor Calvin, than with the specimen from the Falls of the Ohio figured by Professor Hall.

(S.) *ATRYPA RETICULARIS*, L.

Plate 37, fig. 8.

For a full list of synonyms of this species, with references, see Davidson's "Monograph of the British Devonian Brachiopoda," page 53, the same author's "British Silurian Brachiopoda," p. 129, or Hall's "Palæontology of the State of New York, vol. IV, pt. 1, p. 316.

"Flat Rock Bay" and north end of Manitoba Island, Lake Manitoba, and Snake Island, Lake Winnipegosis; Prof. H. Y. Hind, 1858. Point Wilkins, on the west side of Dawson Bay, Lake Winnipegosis, and Warren Island, Swan Lake, Manitoba; J. W. Spencer, 1874. Found also, more or less abundantly, in nearly all the outcrops of Devonian limestone on the shores, islands and immediate vicinity of Lakes Manitoba and Winnipegosis examined by Messrs. Tyrrell, Dowling and the present writer in 1888 and 1889. Common throughout the whole series, but most abundant above the Stringocephalus zone.

In the Devonian rocks of the Mackenzie River district, as stated on page 230 of the present volume, the typical *A. reticularis* and its variety *aspera* are connected by numerous specimens which show intermediate gradations between the finely ribbed and coarsely plicated forms. On Lakes Manitoba and Winnipegosis, the two varieties, which almost always occur together, are remarkably constant to their respective characters. At each of these lakes the specimens of *A. reticularis* often have the broad "marginal fringe" or "foliated expansion" of the ventral valve preserved entire, but, as the matrix in which they occur is a hard dolomite, it is very difficult to reduce such specimens to a portable size without injuring them. The marginal fringe of the specimen figured (from Pentamerus Point, Lake Manitoba) is nearly an inch and three-quarters broad, and the shell has a maximum breadth of about four inches and a-half.

(S.) *ATRYPA RETICULARIS*, var. *ASPERA*, Schlotheim.

For a list of the synonyms of this shell, with references, see page 229 of the present volume.

Localities, collectors and dates practically the same as those for the preceding species. Common also throughout the whole series.

(S.) RHYNCHONELLA PUGNUS, Martin.

The synonymy of this species has already been given on pages 230 and 231.

Pentamerus Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888 ; and Dawson Bay, Lake Winnipegosis, at the mouth of the Red Deer River, J. B. Tyrrell, 1889 : one small but characteristic specimen from each of these localities.

(S.) PENTAMERUS COMIS, Owen.

Atrypa comis, Owen. 1852. Rep. Geol. Surv. Wisc., Iowa and Minn., p. 583, pl. iii A, fig. 4.

Pentamerus occidentalis, Hall. 1858. Geol. Iowa, vol. I, pt. 2, p. 514, pl. vi, figs. 2a-c. Not *Pentamerus occidentalis*, Hall, 1852. Pal. St. N. York, vol. II, p. 341, pl. lxxix, figs. 1 a-s, and 2.

Pentamerus galeatiformis, Meek and Worthen. 1866. Rep. Geol. Surv. Illinois, vol. II, p. 325 (foot-note).

Gypidula occidentalis, Hall. 1867. Pal. St. N. York, vol. IV, p. 380, pl. lviii A, figs. 1-8.

Pentamerus comis, Meek and Worthen. 1868. Geol. Surv. Illinois, vol. III, p. 428, pl. xiii, figs. 6a-c.

“ “ Walcott. 1884. Pal. Eureka distr. Nevada, p. 159, pl. iii, figs. 4 and 7 ; pl. xiv, figs. 15, 15a, b ; and pl. xv, figs. 5, 5a, b.

“Western shore of Dawson Bay, from slabs apparently derived from the neighbouring cliffs,” J. W. Spencer, 1874 : several single and for the most part ventral valves. Lake Manitoba, on the north-west side in the Stringocephalus zone, at Monroe and Pentamerus points, abundant, and on the east side, at Steep Rock Point, one specimen : J. B. Tyrrell and J. F. Whiteaves, 1888. South-west and west shores of Lake Winnipegosis, at Weston Point and a small island off Weston Point ; at Devils Point (in the beds beneath the Stringocephalus zone) ; and on the west side of Pelican Bay, J. B. Tyrrell, 1889 : a few specimens from each of these localities. Abundant also at many exposures of the Stringocephalus zone on the islands and shores of Dawson Bay, where it was collected by Messrs. Tyrrell and Dowling in 1889.

Next to *Atrypa reticularis* and its variety *aspera* this is the commonest species of brachiopoda in the Devonian rocks of this district, where it is usually found associated with *Stringocephalus*.

(S.) STRINGOCEPHALUS BURTINI, DeFrance.

Stringocephalus Burtini, DeFrance. 1827. Dict. des Sc. Nat., vol. LI, p. 102, and Atlas, pl. lxxxv, figs. 1 and 1a.

Terebratula porrecta, Sowerby. 1827. Min. Conch., pl. 576, fig. 1.

- Stringocephalus Burtini*, Davidson. 1865. Mon. Brit. Dev. Brach., p. 11, (which see for a complete list of synonyms of this species, with references) pl. i, figs. 18-22, and pl. ii, figs. 1-11.
- “ “ Whiteaves. 1890. Trans. Royal Soc. Canada, vol. VIII, Sect. 4, p. 93, pl. iv, figs. 1-9; and (1891) this volume, p. 235, pl. xxix, figs. 10, 10a, 11 and 11a.

Western shore of Dawson Bay, Lake Winnipegosis, J. W. Spēncer, 1874: a loose and imperfect cast of the interior of a very young shell. Lake Manitoba, at Monroe and Pentamerus Points, J. B. Tyrrell and J. F. Whiteaves, 1888: a few very large but imperfect and badly preserved specimens at each of these localities. South-west shore of Lake Winnipegosis, at Weston Point, J. B. Tyrrell, 1889: one imperfect cast. Collected abundantly and often in fine condition by Messrs. Tyrrell and Dowling, on six of the islands in Dawson Bay, and at eight more or less widely separated exposures around its shores.

The specimens from these localities have been described in some detail and illustrated in the eighth volume of “Transactions of the Royal Society of Canada.”

(S.) TEREBRATULA SULLIVANTI, Hall.

Plate 37, figs. 9, 9a and 10.

Terebratula Sullivanii, Hall. 1867. Pal. St. N. York, volume IV, p. 387, pl. lx, figs. 5-10 and 68.

Lake Manitoba, at Monroe and Pentamerus Points, J. B. Tyrrell and J. F. Whiteaves, 1888: one good specimen at each of these localities. Dawson Bay, Lake Winnipegosis, on the south-east side, at Whiteaves Point and on three small islands in its immediate vicinity,—on a small island about three miles north of Salt Point, and on its south-eastern shore, about two miles west of Salt Point, J. B. Tyrrell and D. B. Dowling, 1889: collected rather sparingly at each of these localities, but most abundantly at Whiteaves Point, where eleven fine specimens were obtained, most of which are nearly perfect.

In some of these the anterior margin is simply truncated in the centre, and such specimens are essentially similar in external form to the example of *T. Sullivanii* from the Corniferous limestone of Cayuga (Ont.) represented by Prof. Hall on Plate lx, fig. 68, of the fourth volume of the “Palæontology of the State of New York.” Others, again, are rather deeply emarginate in front, with a shallow mesial sinus in *both* valves, as in the original of figs. 9 and 9a on Plate xxxvii of this volume. The internal loop, which is seen only in one specimen, in which it is imperfect and obscured by a crystalline deposit, seems to have been originally both short and narrow.

PELECYPODA.

(S.) PTERINEA LOBATA. (N. Sp.)

Plate 38, figs. 1-4.

Shell inequivalve, compressed at the sides, though the main body of the left valve, apart from the two wings, is moderately convex : marginal outline subovate, the length being about one-fourth greater than the height : outer margin of the valves in adult specimens shallowly but distinctly lobate. Anterior side short, its wing comparatively large, pointed and projecting, and the lower part of its margin, beneath the wing, rounding abruptly into the base, at least in the immature specimen represented by fig. 3, but apparently somewhat produced above and sinuate below in adults, as in the original of fig. 1, which shows indications also of what seems to have been a byssal sinus, below the anterior ear of the right valve. Posterior side longer than the anterior : the outline of the former not satisfactorily shewn in any of the full or even half-grown specimens collected, though in the largest individual (fig. 1) it appears to be longest and obtusely pointed a little below the middle, beneath which it narrows rapidly into the base below, in two shallowly concave curves, with a slight prominence between them. Posterior wing of the adult shell elongated, its exact contour unknown, but, in the left valve of a very young shell which may possibly be referable to this species (fig. 4), the posterior alation is concave at its outer margin, and the posterior end rounded and somewhat produced below. Beaks rather small, scarcely raised above the highest level of the hinge line and placed a little in advance of the mid-length.

Central portion of each valve marked by from five to seven, usually six, rounded and slightly nodulous radiating plications, which broaden rapidly outward and project a little beyond the front margin as rounded lobes, with a shallowly concave sinus between each pair. The spaces between the plications and the posterior wing also, are marked with narrow radiating ridges, and the concentric markings consist of numerous, more or less close-set, raised lines, which seem to be most prominent on the posterior wing of the left valve. Hinge dentition and muscular impressions unknown.

Dawson Bay, Lake Winnipegosis,—on the south-east side, at Whiteaves Point, and on a small island between that point and Salt Point ; on the south-west shore, at a small point about two miles east of the mouth of Steep Rock River, and at an exposure about two miles west of Salt Point, J. B. Tyrrell, 1889 : one or two imperfect and not very well preserved specimens from each of these localities.

Although in rather poor condition, these specimens are obviously very

dissimilar to any of the known species of *Aviculidæ* from the Devonian rocks of North America or Europe. Their lobate outer margin, in the adult state, gives them a certain general resemblance to *Tridacna*, but they seem to indicate a new generic type, which cannot be satisfactorily defined until the characters of the interior of the valves are ascertained.

(S.) ACTINOPTERIA BOYDII, Conrad.

For the synonymy of this species, with references, see page 239.

Pentamerus Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: four specimens. Dawson Bay, Lake Winnipegosis, on the south-east side, on a small island to the north of Whiteaves Point, D. B. Dowling, 1888: one specimen. South-west side of Lake Winnipegosis, on a small island off Weston Point, one specimen: J. B. Tyrrell, 1889. Dawson Bay,—on the south-east side, at Whiteaves Point (one specimen) and on a small island north of that point (abundant); on a small island half way between Whiteaves and Salt Points (two specimens); on the west shore, at the first small point north of the mouth of the Red Deer River (abundant) and on the second small point north of the same river (nine specimens): J. B. Tyrrell and D. B. Dowling, 1889.

Two or three additional species of *Aviculidæ* are indicated in the collections made by Messrs. Tyrrell and Dowling, but the specimens in each case are mere casts of the interior of the shell, which are too imperfect and badly preserved to admit of their being identified or described.

(S.) GOSSELÉTIA. (Sp.)

South-west shore of Dawson Bay, Lake Winnipegosis, about two miles west of Salt Point, J. B. Tyrrell, 1888: a single cast of the interior of the closed valves of a species of this genus, which although evidently undescribed, is too imperfect to be properly characterized.

(S.) MYTILARCA INFLATA. (N. Sp.)

Plate 38, figs. 5, 6 and 6a.

Shall small to medium sized, mytiloid, straight, strongly inflated: length,* from the beaks to the opposite extremity, about one third greater than the maximum height or dorso-ventral diameter: thickness through the closed valves a little greater than their height. Valves equal, tumid in the ventral region, most prominent and subangular on each of the

*Dr. Paul Fischer (*Manuel de Conchyliologie*, p. 963) calls this the height and the dorso-ventral diameter the length.

umbonal slopes, thence inflected rather abruptly and more or less convexly inward on the ventral side and obliquely compressed or narrowing convexly and more gradually on the dorsal. Ventral border straight for the greater part of its length: postero-dorsal margin moderately elevated, most prominent and faintly subangular a little behind the midlength: hinge line short, oblique: posterior or anal margin broadly and obliquely rounded, though its junction with the end the farthest removed from the beaks is either narrowly rounded or somewhat pointed: umbones prominent, much narrower in their dorso-ventral than in their lateral diameter: beaks terminal, curved strongly inward and slightly forward.

Surface markings and characters of the interior of the valves unknown. The casts of the interior of the valves, however, are marked with a few, irregularly disposed but for the most distant lines of growth or concentric wrinkles.

In the largest specimen collected (the original of fig. 5) the maximum length is thirty-eight millimetres, the greatest height twenty-one mm., and the thickness through the closed valves is estimated at twenty mm., but in other specimens, such as the one represented by figs. 6 and 6 a, the greatest thickness considerably exceeds the maximum height.

Pentamerus Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: ten specimens, most of which are very small. Dawson Bay, Lake Winnipegosis,—on two small islands off Whiteaves Point (two specimens from one island and one from the other),—on the south-west shore about two miles west of Salt Point (two specimens, one unusually large, the original of fig. 5), and on the west shore at the mouth of the Red Deer River (three specimens): J. B. Tyrrell, 1889.

In this species the greatest height of the valves is invariably a little behind the midlength, the dorsal margin being longer than the anal. In this and in some other respects the largest specimen collected (fig. 5) differs materially from the *M. gibbosa* of Hall, to which it otherwise bears a certain general resemblance. Other and smaller specimens of *M. inflata* approach nearer to some of the shorter varieties of *M. carinata*, Hall, in lateral outline, but the former are never as distinctly angulated on the umbonal slope as the latter are said to be. According to Dr. Frech, **Mytilarca*, Hall, is exactly synonymous with *Myalina*, and, if this be the case, the present species will have to be called *Myalina inflata*.

(S.) MYALINA TRIGONALIS. (N. Sp.)

Plate 38, figs. 7, 7a and 7b.

Shell of medium size, subcuneiform in lateral outline, truncated some-

* Zeitschr. der Deutsch geol. Gesellsch., 1888, vol. XL, p. 363.

what obliquely at the posterior end and distinctly triangular in transverse section: length nearly twice as great as the maximum height, and about one-third greater than the maximum breadth. Valves broader than high, most prominent and strongly angulated on each of the ventral umbonal slopes, and flattened in the ventral region, the outline of which, as seen in full front view (as in fig. 7 a) is ovate cordate: sides (see fig. 7) obliquely compressed, faintly and longitudinally depressed next each ventral umbonal slope, then slightly elevated in the same direction, in such a way as to form a low, rounded and obscure dorsal umbonal ridge, which becomes obsolete at a short distance from the posterior end, in each valve, and ultimately narrowing abruptly into the dorsal margin. Hinge line short, oblique: dorsal margin long, nearly straight, but slightly bent a little in advance of the midlength, at first divergent from the anterior margin at an angle of about 55° but afterwards nearly parallel with it, the greatest height of the valves being at the junction of the dorsal margin with the truncated posterior end, which is obtusely pointed below. Umbones prominent: beaks terminal, incurved and slightly recurved.

Surface marked only with concentric lines of growth, which are rather irregularly disposed. Characters of the interior of the valves unknown.

Dimensions of the only specimen collected: maximum length, thirty-one millimetres; greatest height, sixteen mm.; maximum breadth, twenty-one mm. and a half.

West side of Dawson Bay, at the first small point north of the mouth of the Red Deer River, D. B. Dowling, 1889: one nearly perfect specimen.

This interesting shell seems to be congeneric with the so-called "*Cardium dimidiatum*" of Goldfuss,* which the late Ferdinand Roemer doubtfully referred to *Mytilus*† and Tschernyschew‡ to *Mytilarca*. The two species may, however, be readily separated, even at a glance, by the great difference in their lateral contour.

(S.)

MODIOMORPHA ATTENUATA.

Modiomorpha attenuata, Whiteaves. 1890. Trans. Royal Soc. Canada, vol. VIII, Sect. 4, p. 96, pl. v, figs. 1 and 1a. (Separate copies.)

South-east side of Dawson Bay, Lake Winnipegosis, at Whiteaves Point, J. B. Tyrrell, 1889: "one nearly perfect cast and three very imperfect casts of the interior of the shell." The specimen upon which the

* Petref. Germ., vol. II, p. 284, pl. clx, fig. 14.

† Lethoea Geognost., vol. I, Atlas, pl. xxix, figs. 3a, b, and ex. pl.

‡ Die Fauna des Mittleren und Ober. Devon am West Abh. des Urals., 1887, Mem. du Com. Geol., vol. III, p. 47, pl. vii, fig. 11.

species was mainly based would, if perfect, have slightly exceeded seven inches in length.

(S.) MODIOMORPHA COMPRESSA. (N. Sp.)

Plate 38, figs. 8 and 9.

Shell subelliptical, moderately elongated, nearly twice as long as high, and very inequilateral: valves strongly compressed laterally, very gently convex, and most prominent on the oblique posterior umbonal slope of each valve, and broadly but shallowly depressed in front of these slopes. Anterior side short and narrowly rounded: posterior side much longer than the anterior, its outer margin obliquely truncated above and narrowly rounded below: dorsal margin nearly straight or very gently convex, ascending slightly behind and ultimately forming an obtusely subangular junction with the posterior end: ventral margin nearly straight and faintly concave in the centre in some specimens, but somewhat convex in others: umbones broad, compressed and depressed: beaks curved inward and forward, placed very near to the anterior end, but not quite terminal.

Surface markings not satisfactorily shown, all the specimens collected being mere casts of the interior of the valves. A small portion of the test, which happens to be still adherent to the posterior end of one of these casts (fig. 8) is, however, marked by two or three concentric raised lines. Anterior muscular impression nearly circular, comparatively large, and situated close to the anterior margin. Pallial line distinctly impressed, entire and parallel to the ventral margin. Posterior muscular impression and characters of the hinge dentition unknown.

The specimens are all too imperfect to admit of an accurate statement of their dimensions, but both of the figures are of natural size.

Shores of Dawson Bay, Lake Winnipegosis, at Whiteaves Point (three specimens), and about two miles east of Salt Point (two specimens); J. B. Tyrrell, 1889.

This shell has much the same lateral outline as the *M. altiforme* of Walcott*, from the Lower Devonian of Nevada, but the former is strongly compressed at the sides and the latter as strongly convex.

MODIOMORPHA TUMIDA. (N. Sp.)

Plate 38, figs. 10 and 10 a.)

Shell of medium size, ovately subelliptical, rather less than twice as long as high, and highest a little behind the midlength: valves tumid and

* Palæont. Eureka distr. Nevada, 1884, p. 169, pl. v., fig. 9.

strongly inflated in the umbonal region, but obliquely compressed in the antero-ventral: anterior side short, narrow and abruptly rounded or somewhat pointed: posterior side broader and much longer than the anterior, its extremity rather narrowly rounded, but rather more broadly curved below than above: cardinal margin nearly straight immediately behind the beaks, thence rising into a short and not very prominent, obtusely angular alation about half way between the beaks and the posterior end (at least, in the largest specimen collected, the original of fig. 10), and ultimately sloping very gradually downward: ventral margin gently convex posteriorly, but straight anteriorly: umbones rather broad: beaks curved inward and forward, placed near the anterior end. Surface concentrically striated. Hinge dentition and muscular impressions unknown.

Maximum length of the specimen figured, fifty-five millimetres; greatest height of the same, thirty-two mm.

Lake Winnipegosis, on the south-west side, at a small island off Weston Point (five specimens), and on the southern shore of Dawson Bay, at the second small point east of the mouth of Bell River (two specimens); J. B. Tyrrell, 1889.

(S.) MODIOMORPHA PARVULA. (N. Sp.)

Plate 38, fig. 11.

Shell very small, averaging from a little over half an inch to three-quarters of an inch in length, about one-third longer than high, and highest at the posterior termination of the cardinal margin. Valves moderately convex, most prominent and subangular on each of the posterior umbonal slopes, but obliquely compressed on the antero-ventral and post-erodorsal sides of these slopes. In some specimens there is a shallowly concave depression immediately in front of the umbonal slope. Anterior side narrow and very short, forming a small abruptly rounded lobe below and in front of the beak: posterior side longer and broader than the anterior, its outer margin curved convexly and more or less obliquely downward above, and ultimately forming a somewhat pointed junction with the base below: cardinal margin rather long, straight and very gently ascending behind the beaks: ventral margin nearly straight, but slightly concave in the centre: beaks minute, depressed, curved inward and forward, anterior, very nearly but not quite terminal.

Surface nearly smooth, marked only with fine concentric striae, or minute lines of growth. Anterior muscular impression large, placed close to the anterior margin, and below the beaks. Posterior muscular impression, pallial line and hinge dentition unknown.

Maximum length of the specimen figured, fourteen millimetres; greatest height of the same, nine mm.

Lake Winnipegosis, on the north-west side, at Devils Point (a cast of the interior of both valves); on the south-west side of Dawson Bay, two miles west of Salt Point (one specimen with the test preserved), and on the west side of Dawson Bay, at the first small point north of the mouth of the Red Deer River (nine casts of the interior of the partly open or displaced valves); J. B. Tyrrell and D. B. Dowling, 1889.

Some of these specimens are more obliquely truncated posteriorly and more pointed at the base, than is the case with the original of fig. 12. Such individuals bear a rather close resemblance, both in lateral outline and in size, to some forms of the *Modiella pygmæa* of Conrad, as figured by Hall*, but in that species the valves are much more convex proportionately, and not at all angulated on the posterior umbonal slopes.

(S.) SPATHELLA SUBELLIPTICA. (N. Sp.)

Plate 38, fig. 12.

Shell rather small, narrowly subelliptical, rather less than twice as long as high, but a little higher behind the midlength than in front of it, and very inequilateral. Valves usually tumid and strongly convex in the umbonal region, but narrowing rather rapidly into the ventral and posterior margins: anterior side narrow, very short and rounding abruptly into the ventral margin: posterior side broader and much longer than the anterior, its extremity narrowly rounded: cardinal line occupying about one half of the entire length, nearly straight, but very slightly ascending posteriorly: ventral margin nearly straight, slightly convex and almost parallel with the dorsal margin: beaks small, depressed, incurved, anterior and very nearly but not quite terminal.

Surface marked with concentric striæ and raised lines of growth, which latter are most prominent posteriorly. Hinge dentition and muscular impressions unknown.

Maximum length of the specimen figured, twenty-five millimetres and a half; greatest height of the same, fourteen mm.

Pentamerus Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: a nearly perfect specimen, which, however, is much less convex in the umbonal region than usual. Western shore of Dawson Bay, Lake Winnipegosis, on the second small point north of the mouth of the Red Deer River, D. B. Dowling, 1889: eight specimens, two of which are nearly perfect, and upon which the foregoing description is based. A very imperfect specimen from the north side of South Manitou Island, in Lake Winnipegosis, and an equally imperfect one from an exposure a mile above the Lower Salt Spring on the Red Deer River, both collected by Mr. Tyrrell, in 1889, are probably referable to the present species.

* Pal. St. N. York, vol. V, pt. 1, Lamellibr., 2, p. 514, pl. lxxvi, figs. 9-20.

A few badly preserved specimens of a shell, which may be a variety of *S. subelliptica*, were collected by Mr. Tyrrell, in 1889, at a small island off Weston Point, Lake Winnipegosis. They differ from the typical form chiefly in being almost exactly twice as long as high, and in the circumstance that their posterior umbonal slopes are obscurely or very faintly subangular.

S. subelliptica is obviously congeneric with *Spathella ventricosa*, the *Orthonota ventricosa* of White and Whitfield, as figured by Hall*, and differs from that species only in being much shorter in proportion to its height. It may prove to be identical with the *Cypricardites uralicus* of Tschernyschew.†

(S.) GONIOPHORA PERANGULATA, Hall, var.

Plate 39, figs. 1 and 1a.

Sanguinolites perangulatus, Hall. Prelim. Notice Lam. Shells, p. 35.

Goniophora perangulata, Hall. 1883. Pal. St. N. Y., vol. V, pt. 1, Plates and Explanations, p. 12, pl. xxxiv, figs. 1-7.

“ “ Walcott. 1884. Pal. Eureka distr. Nevada, p. 171, pl. xv, fig. 10.

“ “ Hall. 1885. Pal. St. N. York, vol. V, pt. 1, Lamellibr., 2, p. 293, pl. xxxiv, figs. 1-6, and pl. xlii, figs. 1 and 2.

Dawson Bay, Lake Winnipegosis, two miles west of Salt Point, and on one of the small islands east of Salt Point, J. B. Tyrrell, 1889: a somewhat imperfect cast of the interior of the partly open valves, from each of these localities.

These two specimens, which are rather doubtfully referred to *G. perangulata*, appear to be in some respects intermediate in their characters between that species and *G. acuta*, Hall, their hinge line, in particular, being apparently longer proportionately than that of *G. perangulata*. In the specimen figured, the posterior half of the dorsal margin is imperfect, but when entire, the dorsal margin was probably regularly arched and moderately convex for the whole of its length, and not flattened somewhat obliquely behind, as represented in fig. 1.

(S.) MACRODON PYGMÆUS. (N. Sp.)

Plate 39, figs. 2 and 3.

Shell decidedly small, usually less than half an inch in length, narrowly elongated, nearly or quite twice as long as high, somewhat trapezoidal and

* Pal. St. N. York, vol. V, pt. 1, Lamellibr. 2, p. 408, pl. lxvi, figs. 41 and 42.

† Die Fauna des Mittl. und Oberer Devon am West—Abh. des Urals. 1887. Mémoires du Comité Géolog., vol. III, p. 50, pl. vii, figs. 4 and 5.

very inequilateral. Valves strongly convex in the umbonal region, both posteriorly and anteriorly, but slightly depressed in the centre below: posterior area obliquely and abruptly compressed.

Anterior side very short, angular above and rounding both rapidly and abruptly inward into the ventral margin below: posterior side much longer and a little broader than the anterior, its extremity obliquely truncated or subtruncated above and narrowly rounded below: cardinal border nearly straight behind the beaks, in some specimens (as in fig. 3) nearly parallel with the ventral margin, in others (as in fig. 2) ascending and subalate posteriorly: ventral margin almost straight but faintly concave in the centre and rounding upward very abruptly at each end: umbones prominent and comparatively broad: beaks depressed, curved inward and slightly forward.

Surface markings consisting apparently of concentric and lamellose lines of growth. Muscular impressions unknown: hinge dentition for the most part unknown, though in the cast of the interior of the left valve represented by fig. 2, there are impressions of two of the thin, laminar and elongated posterior teeth parallel to the hinge line.

Maximum length of one of the most perfect specimens collected (the right valve represented by fig. 3), ten millimetres, greatest height of the same, inclusive of the beaks, five mm. and a quarter.

A large mould of the exterior of the right valve, however, which is not figured but which gives the only information available about the surface markings of the test, is a little over fourteen millimetres in length.

Lake Winnipegosis, on the north-western shore, at Devils Point, in the Upper Devonian (four single valves); and in the Stringocephalus zone at Dawson Bay, on the south-east side, on a small island to the south-west of Whiteaves Point (one right valve), and on the south-west side, at the mouth of Steep Rock River (the left valve represented by fig. 2): J. B. Tyrrell, 1889.

All the specimens from these localities, except the solitary mould of the exterior of a right valve already referred to, are perfect and well preserved casts of the interior of the right or left valve. The species is perhaps most nearly related to, but probably distinct from, the *M. parvus* of White and Whitfield,* from the yellow sandstone at Burlington, Iowa, which Dr. White regards as the lowest member of the Lower Carboniferous in the Mississippi valley.

* Proc. Boston Soc. Nat. Hist., 1882, vol. VIII, p. 299.

NUCULA LIRATA, Conrad.

- Nucula lirata*, Conrad. 1842. Journ. Ac. Nat. Sc. Phil., vol. VII, p. 250, pl. xv, fig. 7.
 “ “ Hall. 1870. Prelim. Not. Lamellibr. Shells, 2, p. 3.
 “ “ “ 1883. Pal. St. N. York, vol. V, pt. 1, Plates and Explanations, pl. xlv, figs. 17-27.
 “ “ “ 1885. Pal. St. N. York, vol. V, pt. 1, Lamellibr., 2, p. 316, pl. xlv, figs. 5, 11, 15, 17-22, 24, 25, and pl. xciii.

North side of Manitoba Island, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: two or three badly preserved single valves.

(S.) NUCULA ? MANITOBENSIS. (N. Sp.)

Plate 41, fig. 1.

Shell rather small, ovately trapezoidal, about one-third longer than high and very inequilateral. Valves gibbous, tumid in the umbonal region and above, but obliquely compressed and somewhat depressed in the centre below: anterior side (assuming it to be a *Nucula*)* much longer than the posterior, its outer margin obliquely subtruncate above and forming an obtusely pointed junction with the base below: posterior side extremely short, its margin concave immediately under the overhanging beaks and narrowly rounded below; cardinal margin gently convex, curving rather rapidly downward posteriorly: ventral margin nearly straight for the greater part of its length, but curving upward abruptly at both ends: umbones broad, depressed, anterior, terminal: beaks curved inward, forward and a little downward.

Surface apparently almost smooth and marked only with faint concentric striæ of growth. Hinge dentition and muscular impressions unknown.

Length of the largest specimen collected, nine millimetres; greatest height of the same, six mm. and a half.

Dawson Bay, Lake Winnipegosis, on a small island north of Whiteaves Point, and on its south-western shore, at an exposure about two miles west of Salt Point, J. B. Tyrrell, 1889: a single right valve from each of these localities:

As the characters of the interior of the valves of this species are entirely unknown, it is quite uncertain to what genus it should be referred. It is here provisionally regarded as a *Nucula* on account of its general resemblance, in external form, to some varieties of the *N. varicosa* of Hall, as figured on Plates xlvi and xciii, of vol. V, Pt. 1, (Lamellibr., 2) of the

* Dr. S. P. Woodward (Manual of the Mollusca., p. 269) says that in *Nucula* the umbones are “turned to the short, posterior side.”

Palæontology of the State of New York. The present species, however, may readily be distinguished from *N. varicosa*, by its much smaller size, more trapezoidal contour and by the apparent absence of "strong varices of growth."

NUCULITES, Sp.

Plate 39, fig. 4.

An imperfect cast of the interior of a single valve of a small and apparently undescribed species of *Nuculites* was collected by Mr. J. B. Tyrrell and the present writer in 1888, on the north shore of Manitoba Island. The specimen, which is not more than five millimetres in length, is too imperfect for specific description, but it shows clearly the impression of the "vertical clavicular ridge just anterior to the beaks," which is so characteristic of the genus. The general contour of this specimen is not very dissimilar to that of the *N. oblongata* of Hall (from the Hamilton group of the State of New York), but that species attains to a length of from twenty-four to thirty-five mm., and is much more obtusely pointed at the longer and so-called posterior end.

(S.)

KEFERSTEINIA SUBOVATA.

Megalodon subovatus, Whiteaves. 1890. Trans. Royal Soc. Canada, vol. VIII, Sect. 4, p. 97, pl. v., figs. 2, 2a, 3 and 3a. (Separate copies.)

Cameron Bay, Lake Winnipegosis, on the south-west side, three miles south of Graves Point (one small cast): Dawson Bay, in the same lake, on Beardy Island (one small cast), on the south-west shore, two miles west of Salt Point (six specimens), four miles west of that point (several specimens, some with the test preserved), and a few miles farther west, at the first small point east of the mouth of Steep Rock River (four large casts); also on the west shore, at the mouth of the Red Deer River (two specimens): J. B. Tyrrell, 1889.

A left valve of a small bivalve shell from Pentamerus Point, Lake Manitoba, and a cast of the interior of both valves of an equally small specimen from Onion Point, on the same lake, both collected by Mr. Tyrrell and the writer in 1888, are probably immature examples of this species.

K. subovata was originally "referred to the genus *Megalodon* on account of its strong resemblance in internal structure to the *M. truncatus* and *M. rhomboidalis* of Goldfuss, from the Devonian rocks of the Eifel." It was, however, stated (op. cit. pp. 97 and 98) that, in each of these shells the "hinge seems to be constructed on a somewhat different plan to that

of the type of the genus, the *M. cucullatus* of Sowerby," and that a new genus or subgenus would probably have to be constituted for the reception of the little group of species, including the present one, of which *M. truncatus* is the type. For this new genus the name *Kefersteinia* has been recently proposed by Professor M. Neumayr, in a paper published since his death by the Royal Academy of Sciences of Vienna.*

On the other hand, it is only proper to add that, so far back as 1851, Grünewaldt† claimed that the *Megalodus truncatus* of Goldfuss is a *Myophoria*. Dr. Frech, also, in a paper upon *Mecynodon* and *Myophoria*,‡ places Goldfuss's species in the group of *Myophoria lævigata* and maintains that it belongs to the older Trigoniadæ. Dr. Frech thinks that all the species figured by Hall under the name *Schizodus*, on Plate lxxv of vol. V, pt. 1 (Lamellibr., 2) of the Palæontology of the State of New York, belong to the genus *Myophoria* and that the name *Schizodus* should be restricted to the Permian species. According to this view, the fossil from the Hay River, which is referred to *Schizodus Chemungensis* on page 241 of the present volume and figured on Plate xxx, figs. 5 and 5a, would also be a *Myophoria*, but it may be a *Kefersteinia*, and not very improbable even an immature example of *K. subovata*.

(S.) MECYNODON. (Sp.)

(Cfr. *M. Eifeliensis*, Frech.)

Mecynodon eifeliensis, Frech. 1889. Zeitschr. der Deutsch. geolog. Gesellsch., vol. XLI, p. 130, pl. xi, figs. 7 and 7a.

Dawson Bay, Lake Winnipegosis, at the mouth of the Red Deer River, J. B. Tyrrell, 1889: a cast of the interior of the left valve of a species of *Mecynodon*, which, although too imperfect to be determined specifically, is believed by Dr. Frech, who has seen the specimen, to be at least closely related to his *M. eifeliensis*.

ANODONTOPSIS AFFINIS. (N. Sp.)

Plate 40, figure 6.

Shell small, rather narrowly subelliptical, about one-third longer than high and very inequilateral. Valves compressed convex: posterior area gently inflected and indistinctly defined, as the faint angulation on the posterior side of the umbones becomes obsolete and disappears about half

* Beitr. zu Einer Morphol. Eintheil. der Bivalven. Denkschr. der Math.-Naturwiss. Schafft. cl. der Kaiserl. Ak. der Wissenschaft. Wien, 1891. Vol. LVIII, p. 88.

† Zeitschr. der Deutsch. geol. Gesellsch., 1851, vol. III, p. 252.

‡ Ib., 1889, vol. XLI, p. p. 127-138.

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way between the beaks and the postero-basal margin. Anterior side short, its margin regularly rounded: posterior side much longer than the anterior, its extremity obliquely subtruncated above and narrowly rounded below: ventral margin gently convex anteriorly and nearly straight but slightly ascending posteriorly: cardinal margin curving very abruptly downward in front of the beaks, nearly straight, with a slight downward declination, behind them, and ultimately curving obliquely and rapidly downward and outward posteriorly: umbones depressed and compressed: beaks small, incurved, with a forward inclination, placed near the anterior end but not quite terminal.

Surface markings and muscular impressions unknown. In the specimen figured, which is the cast of the interior of a left valve, the existence of a long and thin lateral tooth in that valve seems to be indicated by a narrow longitudinal groove which runs parallel with and close to the cardinal margin for the whole of its length behind the beaks.

Length of the left valve figured, sixteen millimetres: greatest height of the same, ten mm.

Devils Point, Lake Winnipegosis, J. B. Tyrrell, 1888: a single but very perfect cast of the interior of both valves, which are widely open and partially detached.

This little shell seems to be very closely related to the *Anodontopsis concinna* of the Guelph limestone of Ontario*, but the valves of the former are much narrower in proportion to their height, more pointed posteriorly, and their posterior umbonal slopes are much less distinctly angulated.

(S.) PARACYCLAS ANTIQUA, Goldfuss. (Sp.)

Plate 39, fig. 6.

Lucina antiqua, Goldfuss. 1834-40. Petref. Germ., vol. II, p. 226, pl. cxlvi, figs. 7a, b.

Devils Point, Lake Winnipegosis (three specimens); also in the Stringocephalus zone at Dawson Bay, on the same lake, on the south-west side, two miles west of Salt Point (one specimen), on the west side, at the mouth of Steep Rock River (three specimens), and at the first small point north of the Red Deer River (one specimen): J. B. Tyrrell and D. B. Dowling, 1889.

Seven of these specimens are well defined moulds of the exterior of the closed valves and one is a cast of the interior. The figure is taken from

* Geol. and Nat. Hist. Surv. Canada, Pal. Foss., vol. III, (pt. 1.) p. 12, pl. ii, fig. 4, and pl. vii, figs. 4 and 4a.

a wax impression of one of these moulds, in which the valves are thirty millimetres in length and nearly thirty-two in height.

The writer has failed to find a single character by which these specimens from Lake Winnipegosis can be satisfactorily distinguished from the *Lucina antiqua*, of the Devonian rocks of the Eifel, as described and figured by Goldfuss. The phrase "umbonibus postmedianis" of the original description of that species, it is true, is not applicable to any of the specimens collected by Messrs. Tyrrell and Dowling, but in Goldfuss's figures of *L. antiqua*, the umbones and beaks are represented as placed a little in advance of the midlength.

Judging by the descriptions and figures of both, it is difficult to see upon what grounds the *Paracyclas Ohioensis* of Meek is separated from *P. antiqua*. Each of the eight specimens from Lake Winnipegosis is characterized by the "strongly oblique sulcus, extending from the back part of the beaks to the upper part of the posterior margin," on the "posterior dorsal slope of each valve," which Mr. Meek relies upon as the distinguishing feature of *P. Ohioensis*, but which is equally characteristic of *P. antiqua*.

PARACYCLAS ELLIPTICA, Hall.

Paracyclas elliptica, Hall. 1843. Geol. Surv. N. York, Rep. Fourth Distr., p. 171, pl. lxxvii, fig. 2.

Lucina (Paracyclas) elliptica, var. *occidentalis*, Hall and Whitfield. 1882. Twenty-fourth Reg. Rep. N. York St. Mus. Nat. Hist., p. 189.

Paracyclas elliptica, Hall. 1883. Pal. St. N. York, vol. V, pt. 1, Plates and Explanations, pl. lxxii, figs. 23-30.

" " 1885. Pal. St. N. York, vol. V, pt. 1, Lamellibr., 2, p. 440, pl. lxxii, figs. 23-33, and pl. xcvi, fig. 18.

A few specimens of the large and typical form of this species were collected by Messrs. Tyrrell, Dowling and the present writer, in 1888 and 1889, at Onion Point, Lake Manitoba, and at many of the exposures on the shores and islands of Lake Winnipegosis.

PARACYCLAS ELLIPTICA, var. OCCIDENTALIS, Billings.

Plate 39, figs. 7-10.

Lucina occidentalis, Billings. 1859. In Hind's Rep. Assinib. and Saskatch. Expl. Exped., p. 187, wood-cut, figs. 1b, c.

Lucina elliptica, Billings, as of Conrad. 1859. *Ib.*, p. 187, wood-cut, fig. 1d.

Paracyclas Billingsana, S. A. Miller. 1883. Am. Pal. Foss., Second Ed., p. 311.

In 1858, Professor H. Youle Hind collected two lamellibranchiate shells, which are still in the Museum of the Survey, from the Devonian

rocks at Snake Island in Lake Winnipegosis. Both of these were figured by Mr. E. Billings (op. cit. p. 187), who regarded one as identical with *Lucina elliptica*, Conrad. (sic), and described the other as a new species, under the name *Lucina occidentalis*. To the present writer these two specimens appear to be merely somewhat distorted individuals of the same species, the one referred to *L. elliptica* being abnormally compressed in the direction of its height, and that described as *L. occidentalis* in the direction of its length. Similar specimens collected by Messrs. Tyrrell and the present writer, at Manitoba Island and Onion Point, Lake Manitoba, in 1888, and by Messrs. Tyrrell and Dowling abundantly at most of the exposures on the shores or islands of Lake Winnipegosis, in 1889, are almost exactly intermedial in their characters between *P. elliptica*, Hall, and *P. lirata*, Conrad. They perfectly resemble the latter species both in size and shape, but their "concentric undulations of growth" are rounded and flattened, not prominent and subangular as in *P. lirata*. It is highly probable, however, that *P. elliptica* is only a variety of *P. lirata*.

Both the typical form and the var. *occidentalis* of Billings (not of Hall and Whitfield) are most abundant in the argillaceous limestones above the Stringocephalus zone, and at the local base of the Upper Devonian.

In his latest description of *P. elliptica*, Prof. Hall points out that it is "subject to great variation in form from compression," a statement which is equally applicable to the specimens from Lake Winnipegosis, four of which are represented on plate xxxix. Fig. 8 on that plate represents the type of *L. occidentalis*, Billings, the wood-cut of that shell in Prof. Hind's report being neither as accurate nor as characteristic as could be wished. Fig. 7 represents a specimen from Dawson Bay, which is quite free from distortion or compression. In the original of fig. 10, which is from the Red Deer River, at the Upper Salt Spring, the compression in the direction of the height has reached its maximum, while in the original of fig. 9, which is also from the Red Deer River, the compression has obviously been oblique.

(S.) PARACYCLAS. (Sp. Undt.)

Plate 39, figs. 5 and 5a.

Three specimens of a large and apparently undescribed species of *Paracyclas* were collected by Mr. Dowling, in 1889, on the western shore of Dawson Bay, at the first small point north of the mouth of the Red Deer River. Two of these are casts of the interior of the shell, and one is a natural mould of the exterior of the closed valves, but all three are too imperfect and too badly preserved to admit of identification or description. The figures on plate xxxix are taken from a wax impression of the

mould of the exterior, but the ventral margin is slightly restored from the lines of growth. The shell seems to have been larger and more globose than *P. elliptica*, but the wax impression from which the figures were made does not give a clear idea of the shape of the valves, or of their surface markings.

(S.) CONOCARDIUM OHIOENSE, Meek.

Conocardium Ohioense, Meek. 1871. Proc. Ac. Nat. Sc. Philad., p. 9.

“ “ Meek. 1873. Geol. Surv. Ohio, vol. I, pt. 2, p. 203, pl. xviii, fig. 9, and wood-cut a on p. 204.

“ “ Hall. 1883. Pal. St. N. York, vol. V, pt. 1, Plates and Expl., pl. lxviii, figs. 2 and 3.

“ “ Hall. 1885. Pal. St. N. York, vol. V, pt. 1, Lamellibr., 2, p. 411, pl. lxviii, figs. 2 and 3.

“Western shore of Dawson Bay,” Lake Winnipegosis, “from slabs apparently derived from the neighbouring cliffs,” J. W. Spencer, 1874: four specimens.

Monroe Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: four specimens. Dawson Bay, at Whiteaves Point, and about two miles west of Salt Point, J. B. Tyrrell, 1889: one specimen from each of these localities.

Most of the specimens obtained at these localities are small and obviously immature, but a single and nearly perfect specimen, collected by Dr. Spencer, is fourteen millimetres in length and nine millimetres in height. In this individual “the body of the shell,” as stated by Hall, in his description of *C. Ohioense*, “is marked by about six strong radiating plications on the ventricose portion of the valve, and on each side by more numerous and smaller plications. The interspaces between the ribs are marked by lamellose concentric striæ.”

Some palæontologists are of the opinion that *C. Ohioense* is only the young of the *C. trigonale* of Hall, which Professor Hall now regards as a synonym of *C. cuneus*, Conrad.

(S.) CARDIOPSIS TENUICOSTATA. (N. Sp.)

Plate 40, figs. 1 and 2.

Shell of medium size, moderately convex, subcircular or ovately subcircular, inequilateral and a little longer than high. Umbones prominent, beaks incurved, inclined forward and placed in advance of the midlength; superior border nearly straight but slightly concave in the centre, behind the beaks; ligamental area narrowly lanceolate in outline, as viewed from above.

Surface marked with numerous fine and closely disposed rounded or flattened radiating ribs, which are crossed by concentric striæ of growth. Muscular impressions and hinge dentition unknown.

Dawson Bay, Lake Winnipegosis, about two miles west of Salt Point, and at the mouth of the Red Deer River, J. B. Tyrrell, 1889: one imperfect left valve from each of these localities.

The radiating costæ of the larger of these two valves (fig. 1) are about one millimetre broad in their thickest part, and those of the smaller (fig. 2) less than half a millimetre in breadth. In the absence of any knowledge of the hinge dentition of the valves this species is here provisionally referred to *Cardiopsis*, on account of its resemblance in external characters to the *C. radiata* of Meek and Worthen, as figured by Hall,* but it may be a *Pararca*. It differs, however, from *C. radiata* in its more nearly circular outline, and in the position of its beaks, which are not placed nearly so far forward.

Three casts of the interior of a shell, collected by Mr. Tyrrell, in 1889, at Whiteaves Point, in Dawson Bay, are also probably referable to *C. tenuicostata*, though they show no traces of the radiating ribs characteristic of the exterior of its test.

(S.) CYPRICARDELLA BELLISTRATA, Conrad. (Sp.)

Plate 40, figs. 4 and 5.

- Microdon bellistriata*, Conrad. 1842. Journ. Ac. Nat. Sc. Phil., vol. VII, p. 247, pl. xiii, fig. 12.
 " " Hall. 1843. Geol. Surv. N. York, Rep. Fourth Distr., p. 196, fig. 2.
 " " Hall. 1873. Twenty-third Reg. Rep. N. Y. St. Cab. Nat. Hist., pl. xiv, fig. 8.
Eodon bellistriatus, S. A. Miller. 1877. Cat. Am. Pal. Foss., p. 244.
Microdonella bellistriata, Ehlert. 1881. Mem. Geol. Soc. France, 3rd Ser., vol. II, p. 27, pl. iv, figs. 4a, 4b.
Microdon (Cypricardella) bellistriatus, Hall. 1885. Pal. St. N. York, vol. V, pt. 2, Lamellibr., 2, p. 308, pl. xlii, figs. 17-20; pl. lxxiii, figs. 7-22; and pl. lxxiv, figs. 5-10.
Cfr. Sanguinolaria lamellosa, Goldfuss. 1834-40. Petref. Germ., vol. II, p. 279, pl. clix, fig. 12.

Dawson Bay, Lake Winnipegosis, about two miles west of Salt Point, J. B. Tyrrell, 1889: one mould of the exterior of both valves. Two casts of the interior of a shell which is probably referable to this species, both of which are figured on plate xl, were collected by Mr. Tyrrell, in 1889, in the Upper Devonian shales at Point Wilkins, in Dawson Bay.

* On Pl. lxx, fig. 25, of vol. V, pt. 1, Lamellibr., 2, of the Pal. St. N. York.

(S.) CYPRICARDELLA PRODUCTA. (N. Sp.)

Plate 40, fig. 8.

Shell of medium size, elliptic ovate, about one-third longer than high and very inequilateral; valves compressed convex, moderately inflated, with a faint longitudinal depression immediately above the low, rounded and very indistinctly defined posterior umbonal slope: anterior side extremely short, its margin subtruncated almost vertically below the beaks, as far as the lunule extends, then curving rapidly downward and backward into the ventral margin: posterior side much longer than the anterior, its dorsal and ventral margins broadly and gently convex, and its outer termination narrowly rounded in the centre; umbones compressed and depressed: beaks small, incurved and directed forwards, anterior and nearly, if not quite, terminal: lunule narrowly lanceolate in outline: ligamental area or escutcheon narrow, elongated and well defined.

Surface marked with numerous, close-set and regularly disposed rounded and rib-like concentric plications, which are about equal in breadth to the narrow grooves between them. Hinge dentition and muscular impressions unknown.

Maximum length of the specimen figured, forty-nine millimetres: greatest height of the same, thirty-two mm. and a half.

Dawson Bay, Lake Winnipegosis, at the mouth of Steep Rock River, J. B. Tyrrell, 1889: a mould of the exterior of a left valve, a wax impression of which is figured.

It is just possible that the shell for which the foregoing name is proposed, may prove to be an extreme variety of the preceding species. It seems to most nearly resemble the specimen of *C. bellistriata* from the Chemung Group of the State of New York which Professor Hall figures on plate lxxiv, fig. 5, of volume five, part two (*Lamellibranchiata*, 2) of the *Palæontology* of that state, but in that specimen the beaks are represented as not nearly terminal, the anterior end as considerably produced and the posterior extremity as obliquely truncated above and narrowly rounded below.

(S.) CYPRICARDINIA PLANULATA (?) CONRAD, VAR.

Plate 40, fig. 3.

Cfr. *Pterinea planulata*, Conrad. 1842. Journ. Ac. Nat. Sc. Phil., vol. VIII, p. 251, pl. xiii, fig. 15.

Cypricardinia planulata, Hall. 1870. Prelim. Not. Lamellibr., 2, p. 82.

“ “ “ 1883. Pal. St. N. York, vol. V, pt. 1, Plates and Explanations, pl. lxxix, figs. 1-5.

“ “ “ 1885. *Ib.*, Lamellibr., 2, p. 484, pl. lxxix, figs. 1-5.

Dawson Bay, Lake Winnipegosis, a mould of the exterior of a right valve, from the Stringocephalus zone, and Devils Point, on the same lake, a similar mould of a left valve (a gutta percha impression of which is figured), from the basal beds of the Middle Devonian, both collected by Mr. J. B. Tyrrell in 1889.

The specimen from Dawson Bay, which is not figured, is essentially similar in marginal outline to the *C. planulata* as figured by Hall, but the one from Devils Point is more squarely truncated posteriorly and may not belong to the same species. Both differ from the typical form of *C. planulata* in the much greater number and closer disposition of their "concentric undulations."

(S.) GLOSSITES MANITOBIENSIS. (Nom. prov.)

Plate 40, fig. 7.

Shell of medium size, strongly but perhaps abnormally compressed at the sides, elongate-subelliptical, a little more than twice as long as high, and very inequilateral. Anterior side very short, its margin curving rapidly and somewhat concavely downward and forward from the beaks to about the midheight, then abruptly backward into the base below; posterior side much longer than the anterior, its extremity very obliquely subtruncated above, and produced as well as narrowly rounded below: ventral margin nearly straight in the centre but curving gradually and rather broadly upward at each end: cardinal margin nearly straight, horizontal and almost parallel with the ventral margin for nearly the whole of its distance, behind the beaks: umbones compressed and depressed: beaks curved inward and forward, placed very near to the anterior end but not quite terminal.

Surface marked apparently with rather numerous, somewhat irregularly disposed, narrow and moderately prominent, rounded concentric plications. Hinge dentition and muscular impressions unknown.

Maximum length of the only specimen collected, forty-six millimetres: greatest height of the same, twenty-one mm.

Pentamerus Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: a single imperfect specimen with both valves preserved.

This shell has a considerable similarity, in external form, to the *Glossites lingualis* of the Chemung Group of Pennsylvania, as figured by Hall on Plate xcvi of the first part of the fifth volume (Lamellibranchiata, 2) of the Palæontology of the State of New York, but it may not even belong to the same genus. Professor Hall places *Glossites* in the family *Modiomorphidæ*, but the general aspect of the present species suggests that it is more likely to belong to the family *Solenopsidæ* of Neumayr and that it is nearly related to *Sanguinolites*.

(S.) ORTHONOTA CORRUGATA.

Orthonota corrugata, Whiteaves. 1890. Trans. Royal Soc. Canada, vol. VIII, Sect. 4, p. 98, pl. v, figs. 4, 4a, and 5. (Separate copies.)

Dawson Bay, Lake Winnipegosis, at Whiteaves Point and on two small adjacent islands, also at the mouth of the Red Deer River, J. B. Tyrrell, 1889: a few casts or portions of casts of the interior of the shell, on some of which parts of the test are preserved.

SCAPHOPODA.

-(S.) DENTALIUM. (Sp.)

(Cfr. *D. ANTIQUUM*, Goldfuss.)

Plate 45, figs. 1 and 2.

Dentalium antiquum, Goldfuss. 1841-44. Petref. German., vol. III, p. 2, pl. clxvi, figs. 2a, b, c.

A few specimens of a species of *Dentalium*, which cannot at present be satisfactorily distinguished from *D. antiquum*, were collected by Mr. Tyrrell and the present writer in 1888 at Pentamerus and Monroe Points, on Lake Manitoba, and by Messrs. Tyrrell and Dowling in 1889 at Devils Point and at five localities in or around Dawson Bay, Lake Winnipegosis.

A specimen obtained at Pentamerus Point is two inches and a half long, but one of the specimens from Dawson Bay must have been fully three inches in length when perfect. The surface markings of the whole are not well preserved, but appear to consist of transverse annular striations, which are usually very closely disposed, but in some individuals there are indications also of fine longitudinal striæ. It is only proper to add that the specimens from the localities have much the same shape and surface markings as the *Coleolus crenatocinctus* of Hall*, which Whitfield thinks is a *Dentalium*, but there is at present no satisfactory evidence to show that the transverse striæ of the former are crenate.

GASTEROPODA.

(S.) PALÆACMÆA (?) CINGULATA. (N. Sp.)

Plate 43, figs. 8 and 8a.

Shell small, patelliform, erect, conical, but slightly compressed at the sides, considerably elevated, its height being rather more than half the

* Pal. St. N. York, 1879, vol. V, pt. 2, p. 188, pl. xxxii, figs. 1-3, and pl. xxxii A, figs. 3 and 4.

maximum length at the base : apex placed about one-third nearer to one end than to the other, nearly straight, but curved very slightly towards the shorter end : outline of aperture longitudinally subelliptical.

Surface marked with about fifteen or sixteen regularly disposed and nearly equidistant, extremely narrow and very slightly elevated small annular concentric ridges, with flat or somewhat concave and much broader spaces between them : under a lens, too, there are indications of minute radiating striæ. Muscular impressions unknown.

Height of the only specimen collected, eight millimetres ; length of the same at the base, fourteen mm. ; greatest breadth at base, ten mm.

Dawson Bay, Lake Winnipegosis, at the mouth of the Red Deer River, J. B. Tyrrell, 1889 : one nearly perfect cast of the interior of the shell, with a portion of the mould of the exterior of the test of the same specimen.

As the muscular impressions are unknown, it is doubtful whether this shell should be referred to the *Patellidæ* or to the *Capulidæ*. If it belongs to the former of these two families, the apex is of course anterior to the midlength, but if to the latter then the apex would be posterior. The species is here placed provisionally in the genus *Palæacmæa* on account of its general resemblance in external characters to such shells as the *P. typica* of Hall, from the Potsdam sandstone of the State of New York, and to the *P. annulata* of Barrois*, and *P. Barroisii* of Ehlert† from the Devonian rocks of France. The circumstance that the *P. typica* of Hall was first characterized in the "Twenty-third Report on the State Cabinet" in a paper bearing the general title "Descriptions of Devonian Fossils," would seem to have misled Drs. Fischer and Zittel into the statement that the genus *Palæacmæa* was originally based upon a Devonian species.

(S.) PLEUROTOMARIA GONIOSTOMA.

Pleurotomaria goniostoma, Whiteaves. 1890. Trans. Royal Soc. Canada, vol. VIII, Sect. 4, p. 99, pl. vi, fig. 1. (Separate copies.)

Dawson Bay, Lake Winnipegosis,—at Whiteaves Point,—on a small island a little to the north-west of Beardy Island,—also at exposures four miles west of Salt Point,—near the mouth of Steep Rock River,—and at the mouth of the Red Deer River, J. B. Tyrrell, 1889 : one or two specimens from each of these localities.

* "Faune du calcaire d'Erbray." Mém. Soc. Géol. du Nord, vol. III, 1889.

† "Sur le Dévonien des environs d'Angers." Bull. Soc. Géol. de France, Ser. 3, vol. XVII, p. 774, pl. xix, figs. 3 and 3a.

(S.) PLEUROTOMARIA INFRANODOSA. (N. Sp.)

Plate 41, figs. 2, 2a and 3.

Shell turbinated, spire short: outer volution much expanded laterally, in adult specimens fully twice as broad as high, subangular above and below and shouldered above, its basal portion concavely and obliquely excavated around the narrow but deep central umbilical perforation. Volutions apparently about three, though the apex is broken off in the few specimens collected, those of the spire rounded and ventricose: outer volution truncated very obliquely backward at the aperture, broadly flattened and somewhat concavely depressed above the shoulder, on the apical side, but with a narrow, rounded and moderately elevated spiral prominence next to the suture,—compressed laterally below the shoulder, on the peripheral region, and broadly as well as concavely constricted just above the basal angulation, which, in one specimen at least (figs. 2 and 2a) bears a single series of large tubercles.

Slit band placed at a short distance below, or anterior to, the shoulder of the outer volution. Surface marked with transverse but flexuous striae of growth which curve gently backward to the slit band.

Pentamerus Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: one small specimen, the original of figs. 2 and 2a, with a considerable portion of the test preserved. Dawson Bay, Lake Winnipegosis,—on a small island a little to the north-west of Beardy Island (two characteristic fragments),—at the mouth of Steep Rock River (one large cast of the interior of the shell),—about two miles west of Salt Point (the large cast represented by fig. 3 on Plate xli),—at the mouth of the Red Deer River (two specimens), and at the first small point north of the Red Deer (one fragment): J. B. Tyrrell and D. B. Dowling, 1889.

Not a vestige of the test is preserved on any of the specimens from Dawson Bay. Both this and the preceding species would seem to belong to that group of species of which *Pleurotomaria labrosa*, Hall, is the type, and which Lindström, in his memoir “On the Silurian Gastropoda and Pteropoda of Gothland,” calls the Divisio V, *Incisæ*.

(S.) PLEUROTOMARIA. (Sp. Undt.)

Plate 42, fig. 1.

A single cast of the interior of the shell of a reversed or sinistral species of *Pleurotomaria*, which is represented in outline on Plate xlii., was collected by Mr. Tyrrell or the present writer in 1888, at Pentamerus Point, Lake Manitoba. Not a vestige of the test is preserved on this specimen, so that its specific relations cannot be ascertained. The name

Agnesia has been proposed by De Koninck for sinistral species of this genus, but Lindström has shown that some species are both sinistral and dextral.

RAPHISTOMA TYRRELLII. (N. Sp.)

Plate 41, figs. 5, 5a, 6 and 6 a,b.

Shell nearly flat on the apical side, convexly conical and imperforate below, broader than high, spire very slightly elevated, periphery sharply angulated and minutely crenulated. Volutions four or five, those of the spire flattened above, their sides completely covered by the overlapping of those which succeed them, except at the anterior end of the last volution but one, where a very small portion of the upper part of the side is exposed: outer volution shallowly concave above, its peripheral angulation slightly produced on the apical side, in such a way as to form a minute and not very prominent crenulated spiral ridge. Slit band placed on the peripheral angulation of the outer volution and of about equal breadth on each side of it: on the apical side it is concave, but not separated from the rest of the surface by any distinct bordering lines or line, on the umbilical side it is flat but bounded externally by a very minute spiral impressed line: crescents not distinctly defined, but producing the minute crenulations on the periphery.

Surface nearly smooth, marked only by extremely faint lines of growth, which curve convexly backward to the slit band both above and below.

Onion Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: abundant, associated with *Euomphalus Manitobensis*, which is now known to belong to the genus *Omphalocirrus*, and both forms of *Paracyclas elliptica*. Lake Winnipegosis, at Point Brabant, and on the southwestern shore of Dawson Bay, at two small points, one about half a mile, the other about three miles north of the mouth of Bell River; also, on Swan Lake, near the mouth of Swan River, and on the Red Deer River, at the Lower Salt Spring, D. B. Dowling, 1888: a few specimens from each of these localities. Collected also by Messrs. Tyrrell and Dowling, in 1889, at many other localities in or around Lake Winnipegosis, as on a small island at the extreme south end of the lake, at Weston Point and a small island off that point, at South Manitou Island, on the southwest side of Cameron Bay, and at eight exposures on the islands or shores of Dawson Bay.

Most of the specimens are mere casts of the interior of the shell, but three examples collected at Dawson Bay in 1889 have the whole of the test preserved, and it is from these that the foregoing description was made. These internal casts, as shown by figs. 6, 6a and 6b on Plate xli, are usually broader, flatter and often much larger than the few testiferous specimens yet collected, such as the original of figs. 5 and 5a on the same

plate, and the former are narrowly umbilicated. In testiferous specimens the umbilicus is completely closed by an internal thickening of the shell on that side, the filling of the umbilical cavity being usually the only part of the test left remaining on internal casts.

The species appear to range throughout the whole thickness of the Devonian rocks in this district, but to be more abundant above the *Stringocephalus* zone than in or below it. It appears to be the Canadian representative of the *Raphistoma Bronni* (Goldfuss, sp.) of the Middle Devonian of Germany and Russia, but differs from that species in its imperforate base, and in the absence of two distant spiral keels or ridges on the apical side of the outer volution.

(S.) MURCHISONIA ARCHIACANA. (Nom. Nov.)

Plates 41, fig. 7, and 45, fig. 3.

Murchisonia angulata, var. A, d'Archiac and de Verneuil. 1842. Trans. Geol. Soc. Lond., Ser. 2, vol. VI, p. 356, pl. xxxii, fig. 7; but not *M. angulata*, Phillips, 1836.

A few specimens of a species of *Murchisonia*, which appears to the writer to be identical with *M. angulata*, var. A, of MM. d'Archiac and de Verneuil, were collected by Messrs. Tyrrell and Dowling in 1889 at Weston Point and at five different localities in or around Dawson Bay, Lake Winnipegosis. Most of the specimens are well preserved moulds of the exterior of the shell, in dolomite, and the figure on Plate xli is taken from a gutta percha impression of one of the most perfect of these moulds, in which, however, only a very small portion, if any, of the body volution is preserved. The original of this figure has nine angular volutions preserved, each encircled with a single (not channeled) spiral keel, which is subcentral on all those of the spire, and there is a "second, less evident keel on the last volution." The other specimen figured, in which the body whorl and two of the preceding volutions are preserved, shows that the maximum breadth of the body whorl at the aperture is as much as an inch and a quarter, that the base is strongly convex and almost or quite imperforate, and that the aperture is somewhat rhomboidal in outline. Only one specimen with the test preserved has as yet been obtained at any of the localities visited by Messrs. Tyrrell and Dowling.

In a paper on some Carboniferous species of *Murchisonia**, Miss Jane Donald states that "considerable confusion has arisen with regard to the identification of the *Murchisonia angulata* of Phillips, owing to his having described three distinct species under this name. In 1836, in the 'Geol. Yorks,' vol. II, p. 230, pl. xvi., fig. 16, Phillips figures and describes two

* Quart. Journ. Geol. Soc., Lond., vol. XLIII (1887), pp. 621-23.

different Carboniferous shells as *Rostellaria angulata*; and in 1841, in the 'Pal. Foss. of Devon,' p. 101, pl. xxxix, fig. 189, he figures and describes a Devonian shell as *Murchisonia angulata*, identifying it with the shells previously described as *Rostellaria angulata*, and referring them all to the genus *Murchisonia*, d'Arch. and de Vern. This last shell is evidently quite distinct from those first described, being much smaller, and the keels differently disposed; the only point of resemblance being that both it and the shell figured on the right hand of pl. 'xvi (not xii),' fig. 16, in the 'Geol. Yorks,' are tricarinate." After discussing the relations of the British Carboniferous species of *Murchisonia* to Phillips's *M. angulata*, she goes on to say: "A. d'Archiac and E. de Verneuil and Goldfuss have referred Devonian shells to this species. That of the former differs from both of Phillips's figures; the more rapid increase of the whorls, and the absence of the keels below the band, distinguish it from the right-hand figure, while the whorls are more excavated than those of the left-hand figure. The shell described by Goldfuss, which I have examined in the Bonn Museum, increases more rapidly; the band is formed of two keels placed close together and the whorls are more excavated." Koken,* also, states that the *Muricites angulatus* of Schlotheim (1822) is a *Murchisonia*, but that it is quite different to the *Murchisonia angulata* of d'Archiac and de Verneuil.

Under these circumstances, a new name seems to be required for the species now under consideration, and as L. G. de Koninck has already given that of M. de Verneuil to a Carboniferous species, it may not be inappropriate to dedicate this to the memory of his fellow-labourer, the viscount d'Archiac.

(S.) MURCHISONIA DOWLINGII. (N. Sp.)

Plate 41, fig. 8.

Shell elongated, turreted, very slender and many whorled. Volutions thirteen or more, the first three or four rounded or indistinctly angulated, the remainder strongly angulated and distinctly bicarinated considerably below their midlength, the two prominent spiral keels being placed close together and separated by a narrow but rather deep groove, and the centre of the basal or anterior side of the upper keel encircled by an impressed line: sides of the volutions obliquely flattened and somewhat concave both above and below the two spiral keels, but narrowing much more abruptly inward below them; suture deeply and angularly excavated, its centre occupied by a very fine but deeply impressed line or minute spiral groove.

* Ueber die Entwickel. der Gastrop. vom Cambrian bis zur Trias. Separat-Abdr. aus dem Neuen Jahrbuch für Mineralogie, 1889, Beilageband VI.

Surface nearly smooth, marked only with very faint but close set incremental striæ, which curve very gently backward on the upper or apical side, and rather more strongly forward on the lower side of the two spiral keels, which form the outer boundaries of the slit band : crescents very indistinctly defined, but apparently as closely disposed as the incremental striæ.

Western shore of Dawson Bay, Lake Winnipegosis, at the mouth of Steep Rock River, D. B. Dowling, 1888 : one imperfect but beautifully preserved specimen, with the whole of the test preserved on three of the later volutions. A few sharply defined moulds of the exterior of shells of this species were obtained by Messrs. Tyrrell and Dowling, in 1889, at Weston Point, Lake Winnipegosis ; also at Dawson Bay, in the same lake, at Whiteaves Point, on a small island half way between that point and Salt Point, at exposures two miles west of Salt Point, and on the second small point north of the mouth of the Red Deer River. The figure on plate xli. is taken from a gutta percha impression of one of these moulds.

This species appears to differ from the preceding one in its much more slender form, more numerous volutions, and in the circumstance that its spiral keel is not only double, but placed distinctly below the centre of each volution. The writer desires to associate with it the name of its discoverer, Mr. D. B. Dowling, B. Sc., of the Geological Survey of Canada, who collected many of the specimens mentioned in this report.

(S.) BELLEROPHON PELOPS ? Hall, var.

Plates 42, figs. 2, 2a and 3, and 45, fig. 4.

Cfr. *Bellerophon (Bucania) Pelops*, Hall. 1861. Descr. New Spec., Foss., etc., p. 28.

“ “ “ “ 1862. Fifteenth Reg. Rep. N. Y. St. Cab.

Nat. Hist., p. 56.

“ *Bellerophon Pelops*, Hall. 1876. Illustr. Dev. Foss. Gasterop., pls. xx. and xxv.

“ “ “ 1879. Pal. St. N. York, vol. V, pt. 2, p. 95, pl. xxii, figs. 7-13.

Shell subglobose, body volution ventricose and expanded at the aperture : umbilicus apparently closed at all stages of growth, when the test is preserved, though in young or half grown specimens the closing of the umbilicus is clearly not caused by a “callus of the lip” or columellar expansion : outer lip, in the only adult specimen collected, which is an imperfect cast of the interior, apparently shallowly incised at the outer termination of the slit band and broadly rounded on each side, though in immature examples, such as the original of figs. 2 and 2a on Plate xlii, the slit band seems to end anteriorly in a long and narrow slit : centre of the periphery encircled by a narrow and slightly elevated, flattened slit

band, which is neither grooved in the middle nor margined on both sides by an impressed line or minute keel.

Surface marked with flexuous raised lines which curve gently and convexly forward on each side of the slit band, and backward to the closed umbilicus.

Western shore of Dawson Bay, Lake Winnipegosis, "from slabs apparently derived from the neighbouring cliffs," J. W. Spencer, 1874: one cast of the interior of the shell. Lake Manitoba, at Monroe and Onion Points, and at an exposure a little to the north of Steep Rock Point, J. B. Tyrrell and J. F. Whiteaves, 1888. Lake Winnipegosis,—at Snake Island, at an island off Weston Point, at South Manitou Island, at Point Brabant, and at four different exposures in or around Dawson Bay; also on the Red Deer River, a mile and a half above the Lower Salt Spring: J. B. Tyrrell and D. B. Dowling, 1889. One or at the most two specimens were obtained at each of these localities.

Altogether, nineteen specimens were collected, and, of these, thirteen are mere casts of the interior of immature shells, five are either very small or not fully grown specimens with most of the test preserved, and one, as previously stated, is an imperfect cast of the interior of an adult shell. Not a vestige of the columellar callosity of the inner side of the aperture is preserved in any of them.

The whole of the specimens are so imperfectly preserved that it is doubtful whether they should be regarded as specifically identical with *B. Pelops* or not. The only points in which they seem to differ from that species, as described and figured by Professor Hall, are that they seem to attain to a much larger size when adult, and that the closing of the umbilical cavity on both sides of immature individuals is not caused by a spreading over it of the columellar callus. Small specimens of the species now under consideration are very similar, in shape and sculpture, to the *B. propinquus* of Meek*, from the Corniferous limestone of Ohio, but that species is narrowly umbilicated and its slit band is said to be "furrowed along the middle, so as to present a biangular appearance."

(S.) PORCELLIA MANITOBENSIS. (Nom. Prov.)

Plate 42, figs. 4 and 4a.

Perhaps a var. of *Porcellia striata*, Goldfuss. (Sp.)

Cfr. *Euomphalus striatus*, Goldfuss. 1841-44. Petref. German., vol. III, p. 84, pl. clxxxix, figs. 15, a, b, c.

Pleurotomaria bifida, G. and F. Sandberger. 1850-56. Die Verstein. des Rheinisch. Schichtensyst. in Nassau, p. 185, pl. xxii, figs. 10, 10a, b.

Porcellia striata, Koken. 1889. Ueber die Entwickel. der Gastrop. vom Camb. bis zur Trias: Sep.-Abdr. aus dem Neuen Jahrbuch für Mineralog., &c., Beilageband VI., p. 401.

* Rep. Geol. Soc. Ohio, vol. I, pt. 2 (1873) p. 226, pl. xx, figs. 4a, b.

Shell discoidal, composed of three or four rounded volutions, which appear to be coiled on nearly the same plane and are in contact throughout their entire length, but partially separated on both sides by a deep suture and almost free: umbilicus wide and open, exposing all the inner whorls. Outer volution very slightly expanded at the aperture, in the largest specimen collected (the one figured): its periphery encircled with a narrow slit band, in the form of an obtuse central carina: aperture circular.

Surface very minutely, closely, and transversely but somewhat obliquely costulate on each side of the slit band: test extremely thin.

Maximum diameter of the largest specimen collected, forty millimetres: diameter of its aperture, sixteen mm.

Pentamerus Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: the specimen figured. Dawson Bay, Lake Winnipegosis, at Whiteaves Point (one specimen), at a small island half way between that point and Salt Point (one specimen), at Beardy Island (one specimen) and at the south end of Rowan Island (four specimens); J. B. Tyrrell and D. B. Dowling, 1889.

Of the eight specimens collected, one is small and very imperfect but wholly testiferous, four are casts of the interior of the shell, with portions of the test preserved on either or both sides of the slit band, but not actually upon it, and the rest are sharply defined moulds of the exterior of the shell. The nuclear volution is not preserved in any of these specimens, and in casts of the interior the slit band appears as a narrow rounded and not much elevated spiral ridge with a linear groove on each side of it.

As it is doubtful whether these few and imperfect specimens are or are not actually conspecific with *P. striata*, it is thought desirable to designate the former by a local and provisional name. The only differences, however, that the writer has yet been able to detect between *P. Manitobensis* and *P. striata* are that the former appears to attain to a much larger size than the latter, and to be slightly expanded at the aperture in the adult state.

In the Geological Magazine for May, 1891, Mr. R. B. Newton proposes to change the name *Porcellia* of Léveillé (1835) to *Leveillia*, on account of the circumstance that that of *Porcellia* had been given by Latreille in 1804 to a genus of Isopods. Still, the substitution of a new name for one with which palæontologists have become familiar by long usage, seems to the writer a greater inconvenience than would result from the use of two similar but not identical names, in such widely different divisions of the animal kingdom as the Mollusca and Arthropoda.

(S.) EUNEMA SPECIOSUM. (N. Sp.)

Plate 42, fig. 5.

Shell ovate turbinate, a little longer than broad, base ventricose, imperforate; spire moderately elevated, but shorter than the outer volution, which is encircled with six nodulose ridges or spiral keels. Volutions about five, the two apical ones obliquely compressed, the third and fourth angulated both above and below, and encircled with two distant nodulose spiral ridges, with a shallowly concave oblique depression between them; outer volution bearing one prominent nodulose spiral ridge near the suture, on the apical side,—another a little above or behind its midlength, with a broad, obliquely, flattened and shallowly concave depressed zone between them,—a third, at a short distance below or in advance of the second,—and three similar but smaller and more closely disposed nodulose ridges around the centre of the base; suture angular and deeply impressed; aperture nearly circular; outer lip simple; columellar lip thickened and somewhat reflected below.

Surface marked by transverse but somewhat oblique lines of growth, in addition to the nodulose or tuberculated spiral keels.

Dawson Bay, Lake Winnipegosis, at Whiteaves Point and on two small islands west and south-west of that point, at an exposure about two miles west of Salt Point and at the mouth of Steep Rock River, J. B. Tyrrell and D. B. Dowling, 1889; a few specimens from each of these localities.

Most of these specimen are well preserved moulds of the exterior of the shell, in dolomite, with casts of the interior in place, the intermediate test being absent. Three of the specimens, however, are entirely testiferous. The largest example collected, when perfect, must have been fully ~~1/4~~ inches in length. The nodules or tubercles on the spiral ridges of the later volutions are very feebly developed in half-grown shells, but on the outer volution of adult individuals they are moderately elevated, rounded, conical and placed at distances apart about equal to or a little greater than their own diameters at the base. Casts of the interior of the shell are perforated by a narrow but deep umbilicus.

The species has much the same shape as the *Eunema capitaneum* (= *Turbo capitaneus*, Goldfuss), but in that species the outer volution is encircled by five comparatively large nodulose ridges, which alternate with five rows of smaller tubercles.

(S.) EUNEMA BREVISPIRA. (N. Sp.)

Plate 42, figs. 6 and 7.

Shell turbinated, spire short, about equal in height to one-half of that of the outer volution near the aperture: base ventricose, imperforate: outer

volution encircled by three rows of transversely elongated tubercles. Volutions five, the first, second and third obliquely compressed and the fourth with nearly vertical sides, the third and fourth encircled with two rows of tubercles, one next to the suture above, and the other, which is partially overlapped by each succeeding volution, at the suture below: outer volution considerably inflated, obliquely flattened or concavely constricted above the midheight and ventricose below, encircled with one row of from twelve to fourteen crescentic or spout-shaped, elevated tubercles close to the suture above, with a second row of somewhat similar but much more elongated tubercles a little below the midheight, and with a third row of more feebly developed elongated tubercles around the base, which radiate from its centre. Aperture broadly rounded on the outer side, more narrowly rounded at the base, its columellar side obliquely and concavely emarginate by a slight encroachment of the preceding volution: outer lip simple: columellar lip slightly thickened.

Surface marked by fine transverse striæ or lines of growth, in addition to the rows of tubercles. Casts of the interior of the shell have regularly ventricose volutions with a deeply channelled suture, and the base of each is perforated by a narrow but very deep umbilicus.

Western shore of Dawson Bay, Lake Winnipegosis, at an exposure four miles west of Salt Point (three specimens), and at the mouth of the Steep Rock River (one specimen); D. B. Dowling, 1888. Lake Winnipegosis, on the south-western shore at Weston Point (two specimens), and on the south-eastern shore at Net Point (five specimens),—also in Dawson Bay, at Whiteaves Point (abundant), at exposures two and four miles west of Salt Point (four specimens), on a small island three miles north of that point (one specimen), and at the mouth of the Red Deer River (one specimen); J. B. Tyrrell and D. B. Dowling, 1889.

This species, like the last, is represented almost exclusively by sharply defined moulds of the exterior of the shell, with corresponding casts of the interior, the intermediate test not being preserved. The figures on Plate xlii are drawn from gutta percha or wax impressions of two of these natural moulds. One completely testiferous specimen, however, was obtained at Dawson Bay. In its short spire and ventricose outer volution *E. brevispira* shows a certain amount of similarity to the *E. cœlatum* (= *Turbo cœlatus*, Goldfuss) of the Devonian rocks of the Eifel, but the latter shell is much the smaller of the two, and their sculpture is entirely different.

(S.) EUNEMA SUBSPINOSUM. (N. Sp.)

Plates 42, fig. 8, and 45, fig. 5.

Shell small, turbinated, somewhat conical, a little longer than broad: spire moderately elevated but shorter than the outer volution, base appa-

rently imperforate. Volutions three, or perhaps four, the apex being rather imperfectly preserved in the few specimens collected, increasing rapidly in size, the nuclear ones small and apparently smooth, the last but one obliquely compressed above, rounded below and encircled with six close-set, regularly disposed, fine tuberculated spiral ridges; outer volution much broader than high, broadest near the base, somewhat compressed above, truncated obliquely at the aperture and encircled with six or more spiral rows of tubercles, some of which are spinose or subspinose, especially those on the upper row and those on the lowest: suture deeply impressed.

Surface marked by oblique lines of growth which run parallel to the outer lip. In one specimen, also, there are indications of a minute raised line between each pair of rows of tubercles on the outer volution.

Approximate dimensions of the most perfect specimen collected: height about twelve millimetres; maximum breadth of the outer volution, about ten mm.

Dawson Bay, Lake Winnipegosis, at the mouth of the Red Deer River, D. B. Dowling, 1888, about two miles west of Salt Point, and at the first small point north of the mouth of the Red Deer River, J. B. Tyrrell, 1889: one well preserved mould of the exterior of the shell from each of these localities. The figure represents a gutta percha impression taken from one of these natural moulds.

(S.) EUNEMA CLATHRATULUM. (N. Sp.)

Plate 42, fig. 9.

Shell small, turbinated, somewhat turreted, height a little greater than the maximum breadth, spire rather higher than the outer volution, which is nearly twice as broad as high, base imperforate. Volutions five, increasing much more rapidly in breadth than in height, the first, second and third comparatively slender, the fourth considerably expanded,—the second, third and fourth obliquely compressed above, angular or sub-angular in the centre, and with nearly vertical sides below: suture distinctly defined: outer volution ventricose and much expanded laterally, somewhat flattened at the base.

Surface marked by fine spiral ridges, which are crossed by very numerous, close-set, regularly disposed and nearly straight, minute laminar costulæ, the points where the former are intersected by the latter being minutely tuberculated, when examined under a lens. In the specimen figured, which though unusually perfect, is not more than half grown, there are two or three distant spiral ridges on the last volution but one,

and six or seven on the last, but in larger though less perfect individuals there are nearly if not quite twice this number on the corresponding volutions.

↳Pentamerus Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: a single nearly perfect but not very well preserved testiferous specimen. A few sharply defined moulds of the exterior of shells of this species were collected by Messrs. Tyrrell and Dowling, in 1889, at Dawson Bay, Lake Winnipegosis, on a small island near Beardy Island, at the mouth of Steep Rock River, about two miles west of Salt Point, and at the mouth of the Red Deer River.

ASTRALITES. (Gen. Nov.)

Shell conical, imperforate, flattened at the base, periphery sub-angular, in the only species known fringed with a thin, regularly lobate or sinuate lateral expansion: columella or internal axis encircled with a single, narrow but prominent spiral fold, which is represented by a deep spiral groove in casts of the interior.

The shells for which this new generic name is proposed are essentially similar in their external characters to some recent species of the subgenus *Uvanilla*, of the genus *Astralium*, especially to the *U. unguis* of Mawe, from south-west Mexico. They bear, also, a considerable resemblance to the *Onustus* (*Haliphæbus*) *alatus* of Koken,* from the Devonian rocks of Germany, and to the "alate" *Pleurotomaria*. They differ, however, from *Uvanilla*, *Onustus*, *Pleurotomaria* and any other genus that the writer is acquainted with, in the presence of a conspicuous fold upon the columella.

The peripheral alation of the outer volution of the typical species of this genus is indicated or preserved in only two of the specimens collected. One of these is an unusually perfect and well preserved mould of the exterior of nearly the whole of the upper surface of the shell. Figure 10 on Plate xlii was drawn from a gutta percha impression of this mould, but a still better impression from it, which shows nearly the whole of the upper side of the peripheral alation, and which is represented on Plate xlv, fig. 6, has since been obtained in wax. The other is the testiferous specimen figured on Plate xlii, fig. 10a, in which the upper or apical portion is buried in the matrix and only the base exposed. From these two specimens it is impossible to ascertain whether the peripheral alation is formed of two thin lamellæ which coalesce at their summit and enclose the slit band,—or solid throughout. If it encloses a slit band, the affinities of the genus are probably with the alate species of *Pleurotomaria* for which Ferdinand Roemer proposed the genus *Euomphalopterus*, but if solid, with *Astralium* or the *Onustidæ*.

* Neues Jahrb. für Mineral., Geol. und Palæont., 1889, Beilageband VI, p. 437, pl. xi, figs. 10 and 11.

Plagiothyra, Whidborne,* has a tooth but not a fold on the columellar lip, but the *Littorina alata* of G. and F. Sandberger,† which is probably also a *Plagiothyra*, as it too has a tooth on the columellar lip, is very similar in shape and ornamentation to the type of *Astralites*.

(S.) *ASTRALITES FIMBRIATUS*. (N. Sp.)

Plates 42, figs. 10, 10a, 11 and 11a, and 45, fig. 6.

Shell with a moderately elevated spire, which is about equal in height to the outer volution. Whorls five, those of the spire obliquely compressed, the third and fourth with a sinuous subspinoze frill at the suture below, the outer one sub-angular at the periphery and encircled with a prominent, thin, laminar and flexuous subspinoze keel: base shallowly depressed in the centre: suture indistinct.

Surface of the upper or apical side marked with numerous, close-set and rather regularly disposed spiral raised lines, and with broad faint radiating plications, the centre of that part of the outer volution being partially encircled by a row of about six obscurely defined, low, distant tubercles: lower surface or base marked with fine oblique lines of growth exteriorly, but smooth in the central depression.

In casts of the interior of the shell, the suture is deeply impressed, the periphery narrowly rounded and the base deeply umbilicated.

Pentamerus Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: one very young specimen. Dawson Bay, Lake Winnipegosis, four miles west of Salt Point (two specimens), and at the mouth of the Red Deer River (one specimen), D. B. Dowling, 1888. A few specimens, also, were collected by Mr. J. B. Tyrrell, in 1889, from Dawson Bay, at Whiteaves Point, at the mouth of Steep Rock River, four miles west of Salt Point, and at the mouth of the Red Deer River.

The specimens so far obtained at these localities consist of numerous casts of the interior of the shell, a few moulds of the exterior, in dolomite, and a single testiferous specimen (fig. 10a) in which only the base is exposed. All the internal casts, such as the one represented by figs. 11 and 11a on Plate xlii, show the characteristic spiral groove in the umbilical perforation, caused by the plication of the columella.

(S.) *EUOMPHALUS (STRAPAROLLUS) ANNULATUS*, Phillips.

Plate 43, figs. 1, 1a and 2.

Euomphalus annulatus, Phillips. 1841. Pal. Foss. Cornw., Dev. and W. Somers., p. 138, pl. lx, fig. 170*.

*Mon. Devon. Faun. S. England, vol. I, p. 264.

†Verstein. Rheinisch. Schichtensyst. Nassau, 1850-56, p. 219, pl. xxv, figs. 14, 14a-c.

Euomphalus annulosus, Phillips. 1841. *Ib.*, p. 231.

Euomphalus annulatus, Whidborne. 1891 and 1892. *Devon. Faun. S. of England*, vol. I, pp. 250-51, (which see for a complete list of the synonyms of European examples of this species) pl. xxiv, figs. 6 and 6a.

"Western shore of Dawson Bay, from slabs apparently derived from the neighbouring cliffs," J. W. Spencer, 1874: two or three worn specimens.

Lake Manitoba, at Monroe and Pentamerus Points, J. B. Tyrrell and J. F. Whiteaves, 1888: abundant. A few specimens, also, were collected by Messrs. Tyrrell and Dowling, in 1889, on the eastern and western shores of Dawson Bay, Lake Winnipegosis, and on four small islands in the southern portion of that bay.

One of the specimens collected by Dr. Spencer has the volutions partially uncoiled and approaches *Phanerotinus*, while one of those obtained by Mr. Tyrrell in Dawson Bay, seems intermediate in its characters between *E. annulatus* and *Philoxene serpens*, Phillips (sp.).

On page 257 of the present Report (lines 15 and 16 from the top) the words: "the *Euomphalus* is a small species of *Straparollus* here described and figured as *S. filicinctus*" should be cancelled and the following words substituted:—the *Euomphalus* is *E. annulatus*, Phillips. The writer had given the manuscript name *Straparollus filicinctus* to the specimens collected by Dr. Spencer, before the fourth part of the first volume of Mr. Whidborne's Monograph of the Devonian Fauna of the South of England had been received in Ottawa, but from the detailed description of *E. annulatus* in that memoir, it has since become apparent that they are referable to that species.

EUOMPHALUS (PHANEROTINUS). Sp. Undt.

Plate 43, figs. 3 and 3a.

Lake Winnipegosis, on a small island off Weston Point, J. B. Tyrrell, 1889: a single cast of the interior of the shell. The specimen, which consists of rather less than one complete volution, is fully two inches in its maximum diameter and circular in transverse section. It is not unlike the shell which Goldfuss figures on Plate xcxi, figs. 1a and e, of the third volume of the *Petrefacta Germaniæ*, as *Euomphalus serpula*, DeKoninck, var. *teres*, but which De Koninck considers the typical form of that species. It also closely resembles the large specimen of *Euomphalus (Phanerotinus) laevis* figured by Hall on Plate xvi, fig. 9, of vol. V, pt. 2, of the *Palæontology of the State of New York*, but it may prove to be only a partially uncoiled variety of some at present unknown species, whose volutions are usually in contact.

EUOMPHALUS (CIRCULARIS? Phillips, var.) SUBTRIGONALIS.

Plate 43, fig. 4.

Cfr. *Euomphalus circularis*, Var. Whidborne. 1891. Mon. Dev. Fauna S. England, p. 249, vol. I, pl. xxiv, figs. 9 and 9a.

Shell, or rather cast of the interior of the shell, depressed turbinate, almost discoidal: spire low, in the majority of specimens raised very little above, but occasionally depressed below, the highest level of the outer volution: base obliquely and concavely excavated, as well as widely umbilicated. Volutions about four, though the apex is not preserved in any of the specimens collected, those of the spire depressed convex, the outer one widely expanded, more than twice as broad as high, subtriangular in transverse section, flattened above, laterally compressed on the periphery, subangular at the shoulder above and around the umbilical margin below: umbilicus wide but shallow, exposing the basal side of each of the inner volutions: suture channeled and distinctly defined: aperture ovately subtriangular, narrow and obtusely pointed at the base below.

Surface markings unknown, not a vestige of the test being preserved on any of the specimens collected, which are all mere casts.

It is not practicable to give very accurate proportional dimensions of any of these casts, but the figure on plate xlvii. is of the natural size.

Onion Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: four specimens. Lake Winnipegosis, at its southern extremity, on Charlie and Snake Islands, and at two exposures on the adjacent shore, also in Dawson Bay, on Beardy Island and at Point Wilkins, J. B. Tyrrell, 1889; from one to six specimens at each of these localities. All from the limestone immediately overlying the Stringocephalus zone.

The precise specific relations of these specimens must remain doubtful until examples with at least some portion of the test preserved are collected. In the meantime all that can be said about these casts is that they correspond very well with the description of "decorticated" specimens of one of the varieties of the *Euomphalus circularis* of Phillips figured in the monograph cited above. They are also somewhat similar in shape to the *E. trigonalis*, of Goldfuss, but the outer volution of each is not nearly so sharply angulated either above or below, and their apertures, in consequence, are not so distinctly triangular in outline.

(S.) OMPHALOCIRRUS MANITOBENSIS.

Plate 43, figs. 5, 6 and 7.

Euomphalus Manitobensis, Whiteaves. 1890. Trans. Royal Soc. Canada, vol. VIII, Sect. 4, p. 100, pl. vi, figs. 2, 2a-b and 3, 3a. (Separate copies.)

Shell large, discoidal, concave on both sides, but rather more deeply concave above* than below: spire sunk: umbilicus extremely wide and open. Volutions five when perfect, though the nuclear one is not preserved in any of the specimens collected, in contact but very slightly embracing, coiled on nearly the same plane, those of the sunken spire depressed convex above, the last whorl but one subangular below and encircled on its outer margin with a row of tubercles close to the suture. Outer volution angular or subangular and encircled by from thirteen to nineteen, or, in unusually large specimens, by as many as twenty-six, large, arched and more or less spout-shaped nodes or tubercles at the shoulder above and on the umbilical margin below, the rather broad and comparatively smooth zone between these two rows of nodes being compressed obliquely inward and downward: suture deeply impressed on both sides: aperture subcircular: test apparently rather thick.

Surface marked with flexuous lines of growth, which curve obliquely and concavely forward both above and below and very gently but convexly forward across the zone between the two rows of tubercles on the outer volution. In well preserved specimens these incremental lines are so prominent, numerous and close-set upon the upper surface as to give it a distinctly costulate appearance, while in half-grown testiferous specimens the outer zone between the two rows of tubercles is minutely and densely but very regularly granulose.

Operculum calcareous, moderately thick, nearly flat internally, slightly convex externally, circular in outline and multispiral.

In the Stringocephalus zone at Pentamerus Point, Lake Manitoba, at many exposures on the shores and islands of Dawson Bay, Lake Winnipegosis, and on the Red Deer River, between the Lower and Upper Salt Springs, where it was collected by J. B. Tyrrell, J. F. Whiteaves and D. B. Dowling in 1888 and 1889.

In the limestone immediately above the Stringocephalus zone at Onion (not Monroe) Point, Steep Rock Point and at an exposure north of Steep Rock Point, Lake Manitoba; at Lake Winnipegosis, on its southern shore two miles west of Meadow Portage,—on Charlie, Snake and South Manitou

* As the nucleus is unknown, it is uncertain whether the shell is dextral or sinistral. In the above description it is assumed to be dextral, but, should it prove to be sinistral, the terms "above" and "below," "spire" and "umbilicus," will, of course have to be reversed.

islands and on a small island off Weston Point, at Point Brabant, on the west side of Cameron Bay, and at a few exposures on the shores and islands of Dawson Bay; also, on the Red Deer River at or near the Lower Salt Spring. At each of these localities it was obtained in more or less abundance by Messrs. Tyrrell, Dowling and the present writer in 1888 and 1889.

Most of the specimens from the Stringocephalus zone are natural moulds of the exterior of the shell, with the surface characters fairly well preserved, and it is from wax impressions of several of these moulds (two of which are figured) and from two small testiferous examples, that the foregoing description was made. The specimens from the limestone immediately above the Stringocephalus zone, on the other hand, are mere casts of the interior of the shell, most of which are very badly preserved, together with a few opercula, and it was upon these casts and opercula that the description and figures of *Euomphalus Manitobensis* were based. One of these casts is so broken as to show the operculum in situ, though a little displaced from its natural position, but none of them show the characters of the lower side at all well. Before these angulated and nodose moulds of the exterior of the shell were very critically studied, they were regarded by the writer as not only specifically but also subgenerically distinct from the comparatively rounded, smooth and frequently depressed internal casts for which the name *E. Manitobensis* was proposed, but they are now all regarded as different states of preservation of a single species of *Omphalocirrus*. The angulation and peculiar tuberculation of the outer volution, as seen in moulds of the exterior or in testiferous specimens, is obviously caused by a thickening and plication of the outer layer of the test and does not affect the inner layer, while the depression of many of the internal casts, especially that of the type of *E. Manitobensis* figured in the Transactions of the Royal Society of Canada, is evidently abnormal, as the operculum shows that the aperture must have been circular in outline when undistorted.

The type of the genus *Omphalocirrus* of De Ryckholt (1860) is the *Euomphalus Goldfussi* of d'Archiac and de Verneuil, but in that species the outer volution is angulated and tuberculated on one side only, and the whole shell is more deeply concave above than below. According to Fischer*, *Coelocentrus*, Zittel (1882) is a synonym of *Omphalocirrus*.

(S.) STRAPAROLLINA OBTUSA. (N. Sp.)

Plate 42, figs. 12, 12a and 13,

Shell turbinated, somewhat conical, its height a little greater than its maximum breadth: spire elevated, rather higher than the outer volution,

*Manuel de Conchyliologie, Paris, p. 829.

and obtuse at its apex: base deeply umbilicated. Volutions seven or eight, the earlier or apical ones depressed convex, the later or lower whorls of the spire moderately convex but somewhat compressed laterally,—the outer volution rounded, slightly inflated and gradually expanding, more than twice as broad as high: umbilicus occupying nearly one-half of the total diameter of the base, though the umbilical margin is rounded and very indefinite: suture deeply impressed: aperture apparently sub-circular.

Surface marked by numerous minute spiral raised lines, which are crossed by equally minute but much more numerous and closely disposed flexuous transverse ridges. Under a lens, these latter are seen to curve gently backward on each side of the periphery, where each one forms a shallow sinus, and to be tuberculated at the points where they pass over the spiral lirulæ.

The approximate dimensions of the specimen represented by figs. 12 and 12a, which is a remarkably perfect cast of the interior of the shell, are as follows, as measured in the centre of the dorsal surface: entire height, 18·75 millimetres; height of last volution, 8·7 mm.; breadth of the same, 18 mm.

Pentamerus Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: seven specimens. Dawson Bay, Lake Winnipegosis,—on the southwest shore two miles west of Salt Point,—on the west shore, at the first small point north of the Red Deer River, at the south end of Rowan Island,—and on three small islands in the southern portion of the bay, J. B. Tyrrell and D. B. Dowling, 1889: a few specimens, some with considerable portions of the test preserved, from each of these localities.

This very distinct species is evidently congeneric with the *Straparollina asperostriata*, *S. Circe* and *S. Eurydice* of Billings*, from the Black River limestone of Paquette's Rapids, on the Ottawa River. It is not very dissimilar, in general form, to *S. Eurydice*, but its sculpture is more like that of *S. asperostriata*. The genus is represented in the Lower Cambrian by the *S. remota*, Billings, of the Olenellus zone of Newfoundland, in the "Quebec Group" of that island by *S. pelagica*, Billings, and in the Black River limestone of Canada by the three species already enumerated. In the writer's judgment, the "*Straparollus Daphne*" of Billings, from the Guelph limestone of Ontario, is also a *Straparollina*.

*Described in the Can. Nat. & Geol., 1860, vol. V, pp. 161-62, and figured on p. 144 of the Geol. Canada (1863).

(S.) PSEUDOPHORUS TECTIFORMIS. (N. Sp.)

Plate 44, figs. 1 & 1a.

Shell subconical, spire elevated, outer volution widely expanded, sharply angulated below and truncated very obliquely at the aperture: base flattened, imperforate. Number of volutions unknown, only the outer one and a portion of the last but one being preserved in the most perfect specimen collected, the penultimate one considerably elevated, moderately convex, rounded above, slightly compressed in the centre, and faintly concave next to the suture below. Outer volution nearly three times as broad as high, also rounded above and obliquely compressed below: aperture large and apparently somewhat triangular in outline: outer lip thin, produced above and receding beneath, its lower portion concavely emarginated.

Surface marked with close-set imbricating lamellar striæ of growth, which curve somewhat convexly and very obliquely backward and downward on the apical side of the outer volution, and obliquely but concavely backward below.

Dawson Bay, Lake Winnepigosis, about two miles west of Salt Point, J. B. Tyrrell, 1889: one imperfect specimen with the test preserved. A specimen of essentially similar shape and size, but whose surface is encircled by numerous small spiral ridges, in addition to the oblique lines of growth, and which therefore may not belong to the same species, was collected by Mr. Tyrrell in the same year on a small island in Dawson Day, about half way between Salt and Whiteaves Points.

The name *Pseudophorus* was proposed by Meek in 1873* for an "undescribed group of shells," the type of which is a remarkable species from the Corniferous limestone of Ohio, which he provisionally described and figured under the name *Xenophora?* (*Pseudophorus*) *antiqua*, Meek. This shell, Mr. Meek writes, "is almost certainly not a *Trochita*, because the broad underside does not have the character of a mere spiral lamina within the margin, but is really the lower side of the body volution. It seems to be more nearly related to *Xenophora*, Fischer (= *Phorus*, Montfort) or *Onustus*, Humphrey; but differs from both in not having the habit of attaching foreign bodies around its periphery, as well as in wanting the distinct umbilicus of the latter."

The comparatively elevated form together with the much more convex and almost dome-shaped volutions, of *P. tectiformis*, will at once enable that species to be distinguished from *P. antiquus*.

* Rep. Geol. Surv. Ohio, vol. I, pt. 2, Palæontology, p. 222.

(S.) PLATYCERAS (ORTHONYCHIA) PARVULUM. (N. Sp.)

Plate 43, figs. 9, 10 and 11.

Shell very small for the genus, nearly straight and somewhat conical, but compressed at the sides, unsymmetrical and rather irregular in shape, the posterior dorsal slope being usually more convex than the anterior, height varying in different specimens from a little greater to rather more than one-third greater than the maximum diameter at the base: apex obtusely pointed, almost erect but with a slight forward inclination: aperture narrowly subelliptical, nearly twice as long as high, lip slightly irregular in outline, but always with a deep concave sinus on each side, and produced convexly downward and a little outward in front and behind.

Surface markings consisting apparently of concentric lines of growth, which run parallel to the outer lip. Muscular impressions unknown.

Dimensions of the largest specimen collected: maximum height, twelve millimetres: greatest length at the base, eight mm.: breadth of aperture, five mm.

Dawson Bay, Lake Winnipegosis, on a small island north of Whiteaves Point (one specimen, the original of fig. 11), and on another south-west of that point (two specimens, represented by figs. 9 and 10); J. B. Tyrrell, 1889.

The few specimens collected are all mere casts of the interior of the shell. These appear to represent a small and aberrant or abnormal and previously undescribed species of the subgenus *Orthonychia*, most closely related to the *Platyceras (Orthonychia) conoideum* of Goldfuss, from the *Stringocephalus* limestone of the Eifel and Nassau, as figured by Frech.*

(S.) PLATYOSTOMA TUMIDUM. (N. Sp.)

Plate 43, fig. 12.

Shell subglobose or broadly subovate, imperforate, spire small and very short, raised very little or not at all above the highest level of the outer volution. Volutions apparently about three (though the apex is imperfect in all the specimens collected) rounded, increasing very rapidly in size and closely embracing, by far the greater portion of the earlier ones being covered by the overlapping of those which succeed them: outer volution regularly convex, very ventricose and widely spreading, especially at and near the aperture, a little depressed below the suture, broader

* Zeitschr. der Deutsch. geolog. Gesellschaft, 1891, vol. XLIII, p. 678, pl. xlv, figs. 6, 6a-c.

than high, broadest above the midheight, slightly produced and rather narrowly rounded at the base: aperture apparently not far from circular.

The only surface markings that happen to be preserved consist of rather closely disposed, flexuous and oblique striæ of growth.

Dimensions of the most perfect specimen collected: entire height, as measured from a horizontal line drawn on the same level as the apex, to the centre of the base, twenty-four millimetres: greatest height of the outer volution twenty-two mm.: maximum breadth of the same, twenty-five mm.

Pentamerus Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: three specimens, in each of which most of the test is exfoliated, only a few small fragments of its outer surface being preserved.

This shell has a much narrower and smaller spire than the *P. lineatum* of Conrad, the diminished size of the spire in the former being obviously due to the greater amount of overlap in the outer volutions.

(S.) NATICOPSIS MANITOBENSIS. (N. Sp.)

Plate 45, fig. 7.

Shell imperforate, turbiform, subglobose, a little higher than broad: spire elevated, occupying at least one-fourth, and in some specimens nearly one-third, of the entire height. Volutions about four, convex, regularly rounded and increasing rather rapidly in size, the outer one large and ventricose: aperture subovate: outer lip thin and simple.

Surface markings consisting of numerous, regularly and closely disposed, but very slightly elevated, minute raised lines, or faint and crowded, narrow, thread-like plications, which are too small to be seen without the use of a lens, and which cross the volutions obliquely.

As the nuclear volution is broken off in each of the specimens collected, it is impossible to give very accurate measurements of any of them, but the one figured is represented as twice the natural size, and the largest specimen upon which any of the characteristic surface ornamentation is preserved was probably nearly or quite eighteen millimetres in height when perfect.

Lake Manitoba, at Pentamerus Point (eleven specimens), and Monroe Point (two specimens); J. B. Tyrrell and J. F. Whiteaves, 1888.

It is doubtful whether this species and the next should be referred to *Naticopsis* or *Natica*. The opercula of both of these species are unknown, and there is no evidence that the columellar lip of either was flattened or transversely striated, as in *Naticopsis*, but in the most perfect specimens of both, the aperture is filled with the matrix and the columella almost completely covered. Deshayes and others have maintained that the genus

Natica occurs as far back as the Silurian epoch, and the recent discovery of paucispiral and possibly naticoid opercula in the Guelph limestone of Ontario seems to the writer to afford strong presumptive evidence of the correctness of this conclusion. Still, as the occurrence of the genus *Natica* or of any of its subgenera, in rocks of Palæozoic age, cannot at present be satisfactorily proved, it is thought better to refer this and the next species to *Naticopsis*.

The surface markings of the present species appear to be essentially similar to those of the *Naticopsis equistriata* of Meek,* from the Corniferous limestone of Ohio, and of the *Natica antiqua* of Goldfuss,† from the Devonian rocks of Germany and England. According to Mr. Meek, however, the *Naticopsis equistriata* is less than five millimetres in height, broader than high, with a depressed spire. *Natica antiqua*, also, has a shorter spire than that of *Naticopsis Manitobensis*, and a much more expanded outer volution.

(S.) NATICOPSIS INORNATA. (N. Sp.)

Plate 43, fig. 14.

Shell imperforate, ovately subglobose, the height and breadth being nearly equal, spire short, conical, occupying rather more than one-sixth of the entire height. Volutions about four, increasing rapidly in size, those of the spire obliquely compressed, the outer one large, obliquely expanding and increasing rapidly in height, as well as breadth, toward the aperture, its base narrowly rounded and somewhat produced: aperture subovate, outer lip thin and simple.

Surface nearly smooth, and showing only a few obscure lines of growth.

Dimensions of the largest and most perfect specimen obtained, the one figured: maximum height and greatest breadth, each about twenty-three millimetres and a half: height of spire, as measured on the median line of the dorsal surface, four mm.

Dawson Bay, Lake Winnipegosis, on a small island north north-west of Beardy Island, J. B. Tyrrell, 1889: one nearly perfect specimen, with the test preserved, the original of fig. 14 on plate xliii. A few casts of the interior or moulds of the exterior of shells apparently referable to this species, were collected by Messrs. Tyrrell and Dowling, in 1889, in Dawson Bay, at Whiteaves Point, on a small island three miles north of Salt Point, at the mouth of Steep Rock River, about two miles west of Salt Point, and at the first small point north of the mouth of the Red Deer River.

*Geol. Surv. Ohio, 1873, vol. I, pt. 2, p. 216, wood cuts a, b.

†Petref. Germ., vol. III, 1841-44, p. 117, pl. cxcix, figs. 2 a, b.

The distinguishing features of this species, as compared with those of *N. Manitobensis*, are the shorter and more conical spire of the former, its obliquely expanding outer volution and different surface markings.

LOXONEMA, Phillips.

The most typical species of *Loxonema*, as described by Phillips and others, are no doubt those whose surface is marked by sigmoidally arched costulæ or crowded growth lines, parallel to the outer lip. Still, the fact that Phillips himself, on page 139 of his "Palæozoic Fossils of Cornwall, Devon and West Somerset," included in that genus his own *L. reticulatum*, whose whole surface is stated to be "reticulated by raised longitudinal and spiral threads," evidently shows that he intended the original diagnosis of the genus to be enlarged so as to include those species which are marked also with spiral ridges or keels. The few species collected by Messrs. Tyrrell and Dowling may therefore be arranged in two groups, as follows.

A. Typical and non-reticulate species, whose surface is either marked only with sigmoidal costulæ, or growth lines, parallel to the outer lip, or nearly smooth.

LOXONEMA ALTIVOLVIS. (N. Sp.)

Plate 45, figs. 8 and 9.

Shell rather large, elongate, subulate: volutions compressed laterally, but slightly convex in the middle, the later ones of the spire about as high as broad, the earlier ones unknown: outer volution considerably higher or longer, but apparently not very much broader than the one which immediately precedes it: suture indistinctly defined and devoid of band in the few specimens upon which the test is preserved, but deeply channeled in casts of the interior: aperture subovate, higher than broad, attenuate above and narrowly rounded below.

Surface finely costulate and marked with closely and regularly disposed, slightly flexuous and simple raised lines, which cross the volutions transversely. Upon the later volutions of the spire and upon the upper and central portion of the outer volution, these raised lines are nearly straight or faintly concave, but on the base of the outer volution they curve convexly and rather abruptly backward.

A few imperfect casts of the interior of shells of this species, some with small pieces of the test adhering to them, were collected by Mr. Dowling, in 1888, on the south-west shore of Dawson Bay, at two small points, one half a mile and the other three miles north of the mouth of Bell River. Similar specimens, some a little more perfect and others

mere fragments, were obtained by Messrs. Tyrrell and Dowling, in 1889, at many localities in, on or near Lake Winnipegosis, as, at the south end of the lake, at an exposure two miles west of Meadow Portage, and on Charlie Island; on the south-west side, on a small island off Weston Point and on South Manitou Island; on the south-east side, at Point Brabant; and at the north-west end, in Cameron Bay and at five exposures on the shores and islands of Dawson Bay; also on the Red Deer River, at and near the Upper Salt Spring.

The exact number of volutions in the shell of this species is unknown, as the upper part of the spire is broken off in the most perfect specimens collected. Of the two specimens figured, one (fig. 8) has a considerable portion of the test preserved on three contiguous volutions. The other (fig. 9) is a cast of the interior of a shell of this species, which has been slightly and abnormally compressed in such a way as to make the four or four and a half volutions preserved, appear unusually broad in proportion to their height. The actual height or length of this specimen is two inches and three-quarters, and it is probable that when entire its height slightly exceeded three inches.

The preceding description will no doubt have to be somewhat amended when more perfect specimens shall have been collected, but so far as can be ascertained at present, this species of *Loxonema* seems to differ from any of those from the Devonian rocks of North America, England or Europe that the writer can find described, in its laterally flattened volutions, crossed by densely disposed and nearly straight costulae.

(S.) *LOXONEMA PRISCUM*, Munster. (Sp.)

Plate 44, fig. 2.

Melania prisca, Munster. 1840. Beitr., pt. 3, p. 83, pl. xv, fig. 1.

Holopella piligera, G. and F. Sandberger. 1853. Verstein. Rheinisch. Schichtensyst. Nassau, p. 228, pl. xxvi, figs. 9, 9a-c.

Loxonema deornatum, De Koninck. 1881. Ann. Mus. Royal, N. H. Belg., vol. VI, p. 47, pl. iv, figs 24 and 25.

Holopella piligera, Holzapfel. 1882. Palæontographica, vol. XXVIII, p. 249.

“ Whidborne. 1889. Geol. Mag., dec. 3, vol. VI, p. 30.

Loxonema priscum, Whidborne. 1891. Mon. Devon. Fauna S. of England, vol. I, p. 181. pl. xvii, figs. 17-19.

A few specimens of a small *Loxonema*, which agree very well with the descriptions and figures of this species, were collected by J. W. Spencer in 1874 on the west shore of Dawson Bay (“from slabs apparently derived from the adjacent cliffs”); by J. B. Tyrrell and the writer in 1888 from rocks in or nearly in place at Monroe and Pentamerus Points, December, 1892.

Lake Manitoba ; and by Messrs. Tyrrell and Dowling in 1889, on or in Dawson Bay, at Whiteaves Point, at the mouth of Steep Rock River, and at the south end of Rowan Island.

Some of the specimens from these localities are extremely like the two Lummaton examples of *L. priscum* figured by the Rev. G. F. Whidborne (*op. cit.*), but the former are apparently a little the larger. The approximate dimensions of a large and nearly perfect specimen from Pentamerus Point are : height or length, twenty-eight mm. ; greatest breadth, nine mm. : height of outer volution as measured in the median line of the dorsal surface, about nine mm. In some of the specimens from Lakes Manitoba and Winnipegosis the outer volution is more ventricose than that of the original of the figure on Plate xlv, and not so narrow at the base. The surface markings are not satisfactorily shown in any of them, but so far as can be ascertained, the shell is practically smooth to the naked eye, though a few obscure and minute lines of growth, parallel to the outer lip and close to it, can be seen with a lens on one specimen. In another, there is a single faint transverse constriction at a short distance from the aperture.

B. Slightly aberrant and reticulate species, whose surface is marked with spiral revolving raised lines or small ridges, as well as the usual sigmoidal costulæ or crowded growth lines.

(S.) LOXONEMA CINGULATUM. (N. Sp.)

Plate 44, fig. 3.

Shell rather large, narrowly elongated and many whorled : spire between three and four times as long as the outer volution. Volutions nine or ten, the apical ones being imperfectly preserved in the few specimens collected, compressed convex and increasing very slowly in size, those of the spire a little broader than high : outer volution moderately convex, as high as broad, narrowly rounded and somewhat produced at the base : axis imperforate : suture distinctly defined : aperture subovate, higher than wide and abruptly pointed above.

Surface marked with small and very narrow but prominent spiral ridges, which are regularly arranged and nearly equidistant, also by slightly flexuous and somewhat sigmoidal lines of growth. In the largest specimen collected, whose surface markings are not very well preserved, there appear to have been about seven spiral ridges on the dorsal surface of the last volution but two, nine on that of the last but one, and probably not less than ten and perhaps as many as eleven or twelve on that of the outer volution.

The figure on Plate xlv is taken from a wax impression of the dorsal surface of the last four volutions of an apparently adult specimen, with the earlier volutions restored from a gutta percha impression of another specimen in which these happen to be well preserved.

The maximum breadth of the outer volution of the largest specimen collected is twenty four millimetres, and the entire height or length of an adult specimen is estimated to have been about eighty five mm.

Lake Manitoba, at Point Richard, and Monroe Point, J. B. Tyrrell and J. F. Whiteaves, 1888: one specimen at each of these localities. Dawson Bay, Lake Winnepegosis, at Whiteaves Point (four specimens), on a small island about half way between that point and Salt Point (one specimen), and at the south end of Rowan Island (one specimen); J. B. Tyrrell and D. B. Dowling, 1889. All the specimens are mere natural moulds of the exterior of the shell, in dolomite, but in some the corresponding cast of the interior of the shell also is preserved.

The prominent spiral ridges of this shell, which resemble those of some of the recent and tropical *Melania*s from the Pacific or eastern hemisphere, will at once enable it to be distinguished from any other species of *Loxonema*.

LOXONEMA GRACILLIMUM. (N. Sp.)

Plate 45, fig. 10.

Shell very small, narrowly elongated, slender, turriculated and many whorled. Volutions about nine, increasing very slowly in size, the earlier ones of the spire moderately convex, the later ones ventricose in the middle and below (or anteriorly), but narrowly and concavely constricted next to the suture above, a little broader than high: outer volution apparently considerably higher but not very much broader than the one which immediately precedes it, though the basal portion and the characters of the aperture are unknown: suture distinctly defined.

Surface (of the lower volutions) marked with spiral revolving ridges, which are crossed by numerous and very minute sigmoidal costulæ, or simple and entire thread-like raised lines. In the only specimen collected, which is imperfect at the base, nine spiral or revolving ridges can be counted on the last volution, and six on the last but one. These ridges, most of which are large enough to be seen with the naked eye, are unequal in size, four of those on the most prominent and lower part of the two latest volutions being larger and more elevated than the others, and all of them are narrow and minutely tuberculated at the many points where the sigmoidal costulæ pass over them. The sigmoidal costulæ, which cross the

volutions transversely and are parallel to the outer lip, have a slightly concave curvature above, or posteriorly, and an equally slight but convex curvature below. They are closely and very regularly disposed and so small as to be invisible without the aid of a lens.

Height or length of the only specimen collected, which, as already stated, is slightly imperfect anteriorly, nine millimetres and a half: maximum breadth of the outer volution of the same, about three mm.

Devils Point, Lake Winnipegosis, J. B. Tyrrell, 1889: a single but unusually well preserved mould of the exterior of the shell, in dolomite. The figure on Plate xlv is taken from a gutta percha impression of this mould, upon which the foregoing description also is based.

This species and the one previously described, although encircled by distinct spiral ridges, are also marked with the sigmoidal costulæ or growth lines parallel to the outer lip, which are so characteristic of *Loxonema*.

A fifth species of *Loxonema* is indicated by a single and nearly perfect cast of the interior of the shell, collected by Mr. Tyrrell, in 1889, at Roderick Point, Birch Island, Lake Winnipegosis. The outline and proportions of this specimen are quite unlike those of either of the four species already described or identified, but as its surface markings are entirely unknown, its specific relations cannot be ascertained.

(S.) *MACROCHILINA SUBCOSTATA*, Schlotheim. (Sp.)

Plate 44, figs. 4 and 5.

Buccinities subcostatus, Schlotheim. 1820. Petrefactenkunde, p. 130, pl. xii, fig. 3.

Buccinum imbricatum, Sowerby (pars). 1827. Min. Conch., vol. VI, p. 127, pl. dlxvi, fig. 2, right-hand figure only.

Macrocheilus arcuatus, Phillips. 1841. Pal. Foss. Cornw., Dev., and W. Somers, p. 139, pl. lx, fig. 194.

Macrocheilus elongatus, Phillips. Ibid., p. 104, pl. xxxix, fig. 195.

Macrocheilus Schlotheimi, d'Archiac and de Verneuil. 1842. Trans. Geol. Soc. Lond., ser. 2, vol. VI, pt. 2, p. 354, pl. xxxii, fig. 2.

Loxonema Phillipsi, F. A. Roemer. 1843. Verst. Harz., p. 30, pl. viii, fig. 9.

Loxonema apressum, F. A. Roemer. Ibid., p. 30, pl. viii, fig. 10.

Buccinum arcuatum, Goldfuss (pars). 1844. Petref. Germ., vol. III, p. 28, pl. clxxii, fig 15b only.

Macrocheilus subcostatus, Tschernyschew. 1887. Mem. Com. Geol. Russ., vol. III, No. 3, p. 171, pl. v, figs. 6a, b.

Macrochilina subcostata, Whidborne. 1891. Mem. Dev. Faun. S. England, vol. I, p. 159, pl. xvi, figs. 1-6.

Dawson Bay, Lake Winnipegosis, on a small island south-west of Whiteaves Point (one specimen), and on another about three miles north of Salt

Point (two specimens), also at two exposures, one about two miles west of Salt Point (two specimens), and the other at the mouth of the Red Deer River (where it appears to be abundant) ; J. B. Tyrrell, 1889.

Most of the specimens from these localities are either imperfect casts of the interior of the shell, with well preserved portions of the tests attached, or sharply defined moulds of the exterior, in dolomite. Only two or three testiferous specimens were obtained and these are very imperfect. The surface markings are very variable, not only in different specimens, but sometimes also in different parts of the same shell. Thus, on the outer volution of one of the specimens from the small island north of Salt Point, (fig. 5) the markings consist of slightly sigmoidal, acute ridges, from two to three millimetres apart, with fine striæ between them and parallel to them. On the other hand, in the original of fig. 4, which is drawn from a wax impression of a natural mould of a specimen from the mouth of the Red Deer River, the crowded subsigmoidal growth lines or minute costulæ are very nearly equal in size and not more than from one-half to a whole millimetre apart. In another specimen from the mouth of the Red Deer River the sigmoidal costulæ on the last whorl but one are nearly a millimetre apart, with finer striæ between them, but they suddenly become nearly equal in size and much closer together on the outer volution. The entire height of one of the largest specimens from Dawson Bay would probably have been about sixty millimetres.

It is still doubtful whether the distinction between *M. subcostata* and *M. arcuata* can be sustained. The characters which Mr. Whidborne, the most recent writer on the subject, (op. cit., pp. 159-63) seems to rely upon for separating English or German examples of the two forms are, the proportionately narrower and shorter body whorl of *M. arcuata*, its "flat, angulated shoulder," and finer and more irregular surface markings. Yet Mr. Whidborne includes in the synonymy of *M. arcuata*, the specimen figured under the name *Macrocheilus arcuatus* by Ferdinand Roemer, on Plate xxxii. (fig. 6) of the "Lethæa palæozoica," in which no such shoulder is apparent, and the Chudleigh specimens of *M. arcuata*, which he himself figures, are all equally shoulderless. Fischer's figure of *Macrochilus arcuatus*,* which is not referred to by Mr. Whidborne, is almost a facsimile of F. Roemer's, and the present writer has failed to understand how the specimens of *M. arcuatus* figured by F. Roemer, Fischer, or Frech,† can be distinguished from the specimen of *M. subcostata* figured by d'Archiac and de Verneuil under the name *M. Schlotheimii*. Still, if these two names are to be retained, the Dawson Bay specimens undoubt-

* Man. de Conchyliologie, &c., 1885, p. 698.

† Ueb. das Devon der Ostalpen, pt. 2, (Zeitschr. der Deutsch. geolog. Gesellsch., 1891) p. 679, pl. xlv, fig. 5.

edly agree better with the descriptions and figures of the shoulderless *M. subcostata* than with those of the strongly shouldered *M. arcuata*.

(S.) *MACROCHILINA PULCHELLA*. (N. Sp.)

Plate 44, figs. 6 and 6a.

Shell small, the most perfect specimen collected being less than one-third the size of adult specimens of *M. arcuata* from Dawson Bay, imperforate, but pointed above and one-third higher or longer than broad: spire almost conical, acutely pointed and a little shorter than the outer volution, as measured in the median line of the dorsal surface. Volutions five or six, those of the spire obliquely compressed, the outer one moderately convex, slightly inflated, but very faintly constricted above, about as broad or a little broader than high and narrowing abruptly into the evenly rounded base: suture impressed, linear and minutely crenulated by the transverse costulæ: aperture subovate, higher than wide and occupying more than one-half of the entire height, pointed above and rounded below: outer lip thin and simple.

Surface marked with closely and regularly arranged, flexuous raised lines, or nearly equidistant, extremely thin and acute, minute costulæ, which cross the volutions transversely but somewhat obliquely.

Dimensions of the specimen figured: height or length, eighteen millimetres and a half; maximum breadth, twelve mm.

South-west shore of Dawson Bay, about two miles west of Salt Point, J. B. Tyrrell, 1889: one nearly perfect specimen with the test preserved. Three casts of the interior of shells which are probably referable to this species, but which do not show a trace of the characteristic surface ornamentation, had previously been collected by Mr. Tyrrell and the writer, in 1888, at Pentamerus Point, Lake Manitoba. The largest of these casts is nearly an inch in length.

This delicately sculptured shell appears to differ from *M. arcuata* chiefly in its diminutive size. It has somewhat the same general contour as the *Polyphemopsis Louisvillæ* of Hall and Whitfield,* from the Upper Helderberg limestone at the Falls of the Ohio, but that species is represented as narrow and somewhat pointed at the base, and its surface is stated to be smooth.

The following description should have followed that of *Pleurotomaria infranodosa*, on page 313.

*Twenty-third Reg. Rep. N.Y. St. Cab. Nat. Hist., 1869, pl. xii, figs. 1 and 2; and twenty-fourth do., 1870, p. 193.

(S.) PLEUROTOMARIA SPENCERI. (N. Sp.)

Plates 41, figs. 4, 4a-b, 43, fig. 13, and 46, fig. 1.

Shell depressed subturbinate, more than twice as broad as high, ovately orbicular as seen from above, spire low and short: base concavely depressed in the centre, but apparently not umbilicated in such a way as to expose any portion of the inner whorls. Volutions four, expanding rather gradually in a lateral direction, those of the spire depressed convex, the outer one occupying three-fifths of the entire diameter, somewhat flattened, both above and below, and depressed next to the suture above: periphery narrowly rounded: suture distinct. Aperture oblique, transversely elliptical, with the peristome interrupted on the columellar side, the interruption being caused by the encroachment of the narrow peripheral portion of the preceding volution: lip with a notch or slit obscurely indicated on the apical side of the periphery, but otherwise thin and simple, its inner margin shallowly concave.

Surface marked with numerous, closely and rather regularly disposed minute spiral ridges, which are crossed by still more minute lines of growth, parallel to the outer lip. These incremental striæ are too small to be seen without the aid of a lens, and are not shewn on any of the figures on Plates xli or xliii. They are, however, represented somewhat diagrammatically in fig. 1 on Plate xlvi. Slit band not clearly observed, though its presence is inferred, partly from the obscure notch or slit on the outer lip at the periphery and partly from the backward curvature of the lines of growth, both above and below.

Maximum breadth of the largest specimen collected, twenty-five millimetres: approximate height of the same, as measured in the median line of the dorsal surface, about ten mm.

Western shore of Dawson Bay, Lake Winnipegosis, "from slabs apparently derived from the neighbouring cliffs," J. W. Spencer, 1874: one specimen, the original of the figures on Plate xli. A few smaller and less perfect specimens, six in all, were collected by Messrs. Tyrrell and Dowling in 1889, in place, at exposures on two small islands in the southern part of Dawson Bay, and on the western shore of that bay, at the mouth of the Red Deer River and on the first small point north of the mouth of the Red Deer River. Small specimens, whose maximum diameter is about eight or nine millimetres, which are probably the young of this species, were collected by Mr. Tyrrell and the writer, in 1888, at Pentamerus Point, Lake Manitoba, and by Messrs. Tyrrell and Dowling in 1889, on three small islands in the southern portion of Dawson Bay. One of these specimens (from Pentamerus Point), is represented, twice the natural size, on Plate xliii, fig. 13. At this stage of growth the

aperture of the shell is not far from circular in outline, and in one specimen the suture appears to have been somewhat channelled. Adult specimens have much the same shape as the recent *Stomatella imbricata* of Lamarck, but some which are not quite full grown have more the aspect of a *Sigaretus*.

This shell is very similar, both in shape and sculpture, to the *Pleurotomaria Sigaretus* of G. and F. Sandberger, but as the slit band and even the lines of growth of that species have never been seen, its generic position is quite uncertain. When that portion of this paper was published in which the species of *Pleurotomaria* are enumerated or described, (pp. 312-314) the writer was under the impression that the shell now under consideration should be referred to *Cyclonema* or *Polytropis*. Professor E. Koken (of Königsberg, Prussia), who has since examined the original of figs. 4, 4a and b, on Plate xli, is, however, of opinion that it is a true *Pleurotomaria*, and a careful re-examination of the minute growth lines of all the specimens has led the writer to form a similar conclusion. Professor Koken, in a letter to the writer, says that the whorls of *P. Sigaretus* are more rounded and more inflated than those of the present species, and the spire proportionately higher.

The writer has much pleasure in naming this shell in honour of its discoverer, Dr. J. W. Spencer, now State Geologist of Georgia.

PTEROPODA.

(S.) *HYOLITHES ALATUS*. (N. Sp.)

Plate 46, figs. 2, 3 and 4.

Shell large, attaining to a length of a little more than four inches, nearly straight, except when abnormally distorted, which it often is, narrowly elongated and increasing very slowly in thickness: sides broadly alate at their base, the "dorsal" margin being produced on each side into a broad thin laminar expansion. "Dorsal" side much flatter than the "ventral," slightly convex along the median line and broadly but shallowly concave on each side: ventral side strongly convex but angulated and obtusely subcarinate along the median line: outline of transverse section triangular, with the latero-basal angles produced on each side into a narrow projecting spur, the base of the triangle, with its two spurs, being more than twice as broad as the triangle is high, and each of its sides faintly convex. Shape of the aperture not clearly ascertainable, though on the dorsal side there is a broad and rather deep sinus, which is nearly flat at the bottom, in the middle of the lip, and a projecting lobe, which is broadly rounded on its inner margin and narrowly rounded or sub-angular externally, on each side, as represented by fig. 3.

The only surface markings that are preserved in any of the specimens are a few lines of growth on the dorsal side parallel to the outer lip. Operculum unknown.

Onion Point and Little Sandy Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: Lake Winnipegosis, on the east shore at Point Brabant, and on the south-west shore of Dawson Bay, at two small points, one about half a mile and the other three miles north of the mouth of Bell River, D. B. Dowling, 1888: one or two specimens from each of these localities. A few specimens, also, were collected by Messrs. Tyrrell and Dowling, in 1889, at Lake Winnipegosis, on Snake and South Manitou islands, at Devils Point, in Cameron Bay, and at ten different exposures on the islands and shores of Dawson Bay; also, on the Red Deer River, half a mile above the Lower Salt Spring. The species appears to be rare in and below the *Stringocephalus* zone, and to be most abundant in the beds above that zone.

In the foregoing description the flattened side of the shell is regarded as the dorsal, and the strongly convex and angulated portion as the ventral, in accordance with the terminology used by Sowerby, Morris and Salter and by Walcott in his later publications.

Most of the specimens collected are either separate casts of the interior of the shell, or casts with the corresponding mould of the exterior, from which the intervening test has decayed. The outline of the transverse section of the shell, as represented by fig. 4, is well shown in many specimens. The test is rarely preserved, but indications of it are shown in three or four specimens, particularly in the original of fig. 3, which consists of the anterior moiety of a specimen, in which the central portion and one of the broad lateral wings of the dorsal surface are well exhibited, with the lines of growth and shape of the lip on that side.

Mr. Walcott says* that the *H. princeps*, Billings, "is the largest species of *Hyolithes* known," but some of the specimens of *H. alatus* collected by Messrs. Tyrrell and Dowling are considerably larger than any of Billings's types of *H. princeps* in the Museum of this Survey.

The present species is only referred to *Hyolithes* provisionally, as it seems to differ from that genus in its broad latero-basal alation, and more particularly in the deep central sinus of the lip on the dorsal side. It is most probable that a new genus will have to be constituted for its reception, but the specimens so far collected are too imperfect to admit of an accurate or sufficiently explicit generic description.

*Bulletin U. S. Geological Survey, Washington, No. 30, 1886, p. 135.

CEPHALOPODA.

ORTHOCERAS HINDII.

Actinoceras Hindii, Whiteaves. 1891. Trans. Royal Soc. Canada, vol. VIII, Sect. 4, p. 101, pl. vi, figs. 4a and 5.

Snake Island, Lake Winnipegosis, Prof. H. Youle Hind, 1858: one specimen. The species has since been collected by Messrs. Tyrrell and Dowling in 1889 at the following localities in, on or near Lake Winnipegosis. On Charlie and Snake Islands, at the southern extremity of the lake; on a small island off Weston Point; on South Manitou Island; at Point Brabant; on the south-west side of Cameron Bay; in Dawson Bay, on the second small point east of the mouth of Bell River; and on the Red Deer River, a mile above the Lower Salt Spring. A few specimens of a shell which appears to be an unusually slender variety of *O. Hindii*, were obtained by Mr. Tyrrell and the writer, in 1888, at Onion Point, Lake Manitoba.

Although slightly enlarged between the septa, the siphuncle of this shell is not nummuloidal as in *Actinoceras*, nor even distinctly moniliform as in *Sactoceras*. The characters of the species, therefore, seem to accord better with those of *Orthoceras* as described by most palæontologists (though perhaps not as restricted by Hyatt) than with those of *Actinoceras* or *Sactoceras*.

(S.) ORTHOCERAS (THORACOCERAS) TYRRELLII.

Orthoceras (Thoracoceras) Tyrrellii, Whiteaves. 1891. Trans. Royal Soc. Canada, vol. VIII, Sect. 4, p. 100, pl. vii, figs. 1, 1a, 2, 3 and 4.

Pentamerus Point, Lake Manitoba, J. B. Tyrrell and the present writer, 1888: one specimen. Dawson Bay, Lake Winnipegosis, on the east shore, at Whiteaves Point (abundant), also on the west shore, near the mouth of Steep Rock River (two specimens), and at the mouth of the Red Deer River (a few characteristic fragments); J. B. Tyrrell, 1889.

GOMPHOCERAS MANITOBENSE.

Gomphoceras Manitobense, Whiteaves. 1891. Trans. Royal Soc. Canada, vol. VIII, Sect. 4, p. 102, pl. vii, figs. 7 and 7a.

Lake Winnipegosis, at Snake Island and on a point a little to the south of Snake Island, on South Manitou Island, and on the south-west shore of Cameron Bay, also in or on Dawson Bay, at a small point three miles north of the mouth of Bell River, at Point Wilkins, and at the mouth of the

Red Deer River, J. B. Tyrrell and D. B. Dowling, 1889 : a few specimens, some of them mere fragments, from each of these localities.

It is possible, as elsewhere stated (op. cit.) that this species may be a *Poterioceras* rather than a *Gomphoceras*.

(S.) CYRTOCERAS OCCIDENTALE.

Cyrtoceras occidentale, Whiteaves. 1891. Trans. Royal Soc. Canada, vol. VIII, Sect. 4, p. 103, pl. vii, figs. 5, 5a, and 6.

Lake Winnipegosis, at Snake Island (one specimen), and around Dawson Bay, at Whiteaves Point (four specimens), at the mouth of Steep Rock River (pieces of the siphuncle only), and at the mouth of the Red Deer River (the largest specimen figured in the Trans. Royal Soc. Canada); J. B. Tyrrell and D. B. Dowling, 1889.

(S.) HOMALOCERAS PLANATUM.

Homaloceras planatum, Whiteaves. 1891. Trans. Royal Soc. Canada, vol. VIII, Sect. 4, p. 105, pl. viii, figs. 7 and 2a-b.

Dawson Bay, Lake Winnipegosis, at Whiteaves Point, J. B. Tyrrell, 1889 : one imperfect but characteristic specimen and three fragments.

In the elaboration of the generic and specific characters of this species and the next, the writer was materially assisted by Mr. L. M. Lambe.

(S.) TETRAGONOCERAS GRACILE.

Tetragonoceras gracile, Whiteaves. 1891. Trans. Royal Soc. Canada, vol. VIII, Sect. 4, p. 105, pl. viii, figs. 2, 2a-b.

Western shore of Dawson Bay, Lake Winnipegosis, at an exposure about two miles west of Salt Point and four miles north-east of the mouth of Steep Rock River, J. B. Tyrrell, 1889 : "one specimen imbedded in a piece of rock which has been so broken as to show nearly the whole of the characters of the interior of the septate portion of the shell, as well as the general shape of the latter."

(S.) GYROCERAS CANADENSE.

Gyroceras Canadense, Whiteaves. 1891. Trans. Royal Soc. Canada, vol. VIII, Sect. 4, p. 106, pl. ix, figs. 1a-c, and 2.

Dawson Bay, Lake Winnipegosis, on a small island about half-way between Whiteaves and Salt Points, D. B. Dowling, 1888 : one imperfect specimen. Dawson Bay, at Whiteaves Point (five specimens), and at a point three miles north of the mouth of Bell River (one specimen); J. B. Tyrrell, 1889.

(S.) GYROCERAS FILICINCTUM.

Gyroceras filicinctum, Whiteaves. 1891. Trans. Royal Soc. Canada, vol. VIII, Sect. 4, p. 107, pl. ix, fig. 3.

Pentamerus Point, Lake Manitoba, J. B. Tyrrell and J. F. Whiteaves, 1888: one fragment. Dawson Bay, Lake Winnipegosis, at the mouth of the Red Deer River (three specimens), and the first small point north of the mouth of that river (one specimen); J. B. Tyrrell and D. B. Dowling, 1889.

GYROCERAS SUBMAMILLATUM.

Gyroceras submamillatum, Whiteaves. 1891. Trans. Royal Soc. Canada, vol. VIII, Sect. 4, p. 107, pl. x, figs. 1 and 1a.

Snake Island, Lake Winnipegosis, Professor H. Y. Hind, 1858: the specimen referred to by E. Billings on page 187 of Hind's Report of the Assiniboine and Saskatchewan Exploring Expedition as "a species of *Nautilus* or *Gyroceras*." Steep Rock Point, Lake Manitoba, J. B. Tyrrell, 1888: one imperfect specimen. Lake Winnipegosis, at the north end of Snake Island (a large fragment), on South Manitou Island (two specimens), and on a small island off Weston Point (one specimen); also at Swan Lake, Manitoba, near the mouth of the Swan River (one specimen): J. B. Tyrrell, 1889.

CRUSTACEA.

OSTRACODA.

. ISOCHILINA DAWSONI, Jones.

Isophilina Dawsoni, Jones. 1891. Contr. to Canad. Micro-Palæont., vol. I, pt. 3, p. 93, woodcuts 7a, b, c.

South-east side of Dawson Bay, Lake Winnipegosis, on a small island north of Whiteaves Point, J. B. Tyrrell, 1889: a few casts of the interior of separate valves.

ELPE TYRRELLII, Jones.

Elpe Tyrrellii, Jones. 1891. Contr. to Canad. Micro-Palæont., vol. I, pt. 3, p. 93, woodcuts 2a, b, c, (a misprint for 8a, b, c).*

Same locality, collector and date as for the preceding species: one cast of the interior of both valves.

*By an unfortunate mistake the figures are numbered 2a, 2b, 2c, but the explanations immediately below them are correctly stated to be those of figs. 8a, b, c.

LEPERDITIA (?) EXIGUA, Jones.

Leperditia (?) exigua, Jones. 1891. Contr. to Canad. Micro-Palæont., vol. I., pt. 3, p. 94, pl. xii., fig. 10.

East side of Lake Winnipegosis, on a small island east of the south end of Birch Island, about four miles north-east of Wade Point, thirty miles south of Long Point, J. B. Tyrrell, 1889 : a single left valve.

TRILOBITA.

(S.) BRONTEUS MANITOBENSIS. (N. Sp.)

Plate 46, figs. 5, 6 and 7-

This singular species is based upon very imperfect specimens of the head of five different individuals, but as it is not quite certain that they all belong to the same species, it is thought best to describe each specimen separately.

Specimen No. 1 (fig. 5), consists of the median portion of the head of an unusually small individual, of which little more is preserved than the glabella, with its long posterior median spine, and the postero-lateral spine on each of the fixed cheeks. This specimen was collected by Mr. Tyrrell, in 1889, on a small island north of Whiteaves Point, Dawson Bay, Lake Winnipegosis, and may be characterized as follows. Glabella moderately convex, inversely subconical in outline, broadest anteriorly and narrowing gradually backward, shallowly sinuated at its margin on each side by the second or median pair of lateral glabellar depressions, then slightly expanded posteriorly and ultimately faintly constricted and narrowing rather abruptly into a nearly straight and very slender, median and posterior, tubular spine, which is fully twice as long as the non-spinose portion of the head, if not more, and directed backward. Although three pairs of glabellar furrows are obscurely indicated in specimens Nos. 3, 4 and 5, by as many short lateral depressions or pits, only the anterior and median pair can be detected in this specimen and the next. On each side of the glabella, but just outside of it and commencing much farther forward than the median posterior spine, there is a rather shorter, stouter and more curved postero-lateral spine, which is nearly parallel with the median spine, and, like it, directed backward. The surface, which is rather worn, is marked indistinctly with minute scattered tubercles, which are too small to be seen without the aid of a lens.

This is the only specimen in which the long and slender postero-median and postero-lateral spines are preserved.

Specimen No. 2, which not figured, was collected by Mr. Tyrrell or the present writer, in 1888, at Monroe Point, Lake Manitoba. It is a portion of a glabella of a rather larger individual than the last, with a very short piece of the postero-median spine preserved. It is very imperfect anteriorly and shows only two pairs of the lateral glabellar depressions. The tuberculation of the surface, however, is much more clearly shown in it than in specimen No. 1.

Specimens Nos. 3 and 4. These are two examples, one of which is figured (fig. 6), of the central portion of the head of still larger individuals than Nos. 1 and 2, collected by Mr. Tyrrell and the present writer, in 1888, at Pentamerus Point, Lake Manitoba. Both are nearly perfect anteriorly, but imperfect posteriorly. They show that the front margin of the head is nearly straight, or but slightly convex in the centre, and that it is bordered by a narrow raised rim, which is succeeded by a transverse linear depression or faint groove. On the glabella of both there are three pairs of short lateral depressions or pits. The postero-median spine of each is broken off and scarcely a vestige remains in either of the two postero-lateral spines. The tuberculation of the surface is well preserved in both, and in one of these specimens there is a low conical tubercle, much larger than any of the others, nearly in the centre of the glabella.

Specimen No. 5 (fig. 7). This is a fragment of the anterior portion of the head of an individual of much larger size even than Nos. 3 and 4, collected by Mr. Dowling, 1889, on the west side of Dawson Bay, at the south end of Rowan Island. The anterior and median lateral depressions of the glabella are well shown on the right side of this specimen, and the posterior lateral depression on the left. The surface of these depressions is nearly smooth and the more or less scattered tubercles upon the remainder of the test are very irregular in their distribution. When examined with a lens, the anterior portion of the glabella shows traces of raised lines running parallel to the front margin of the head.

The position of the eye is not indicated in any of these specimens, and not a vestige of the free cheeks is preserved. Still, the few fragmentary examples so far obtained seem to indicate a hitherto undescribed species of *Bronteus*, in which the postero-median spine of the glabella and the pair of postero-lateral spines on the fixed cheeks, are far longer and more slender than the corresponding spines on the head of the *B. rhinoceros* of Barrande.* Apart from the circumstance that they both bear three spines on the posterior portion of the head and, possibly another in the centre of the glabella, there is indeed very little resemblance between this species and *B. rhinoceros*, the shape and surface ornamentation of the glabella and the modifications of the glabellar furrows in these two forms

*Sil. Syst. du Centre de la Bohême, vol. I, Suppl., 1872, p. 131, pl. ix, figs. 12-19.

being quite different. The surface markings of the head of the present species are more like those of the *B. granulatus* of Goldfuss, as described and figured by European and English writers.

(S.) LICHAS (TERATASPIS). N. Sp.

Plate 46, fig. 8.

Portions of the marginal spines of the pygidium of a trilobite apparently congeneric with the *Terataspis grandis* of Hall, were collected by Mr. Dowling, in 1889, on the west side of Dawson Bay, Lake Winnipegosis, at the south end of Rowan Island. These specimens, which are figured, probably represent an undescribed species of *Terataspis*, which cannot yet be properly characterized for want of sufficient material. The species indicated, however, was clearly of much smaller size than *T. grandis*, and the spinules on the spines of the pygidium of the former are feeble and ramose, not stout and simple like those on the tail spines of *T. grandis*.

(S.) CYPHASPIS BELLULA. (N. Sp.)

Plate 46, figs. 9 and 9a.

Head strongly convex and distinctly three-lobed, much broader than long, rounded in front, nearly straight at the sides, but slightly constricted posteriorly: genal angles produced backward into a pair of slender and nearly parallel or but slightly divergent spines, which are nearly as long as the unarmed portion of the cephalic shield, as measured along the median line. Border prominent but rather narrow, although thickened by doublure, the test being very thin: marginal sulcus rather broad but shallow. Facial suture intersecting the occipital sulcus just inside the genal angle, passing obliquely and rather abruptly inward and forward to the eye-lobe, thence rather more gradually outward and forward to the anterior margin. Glabella occupying about one-third of the length of the cephalic shield, as measured in the median line, convex, prominent, egg-shaped, longer than broad, broadest anteriorly and surrounded by a groove, the basal portion of which is formed by the occipital sulcus: latero-basal lobes small, moderately prominent, egg-shaped, a little longer than broad and broadest behind. Eye-lobes more prominent than the latero-basal lobes, their visual surface not preserved. Cheeks strongly convex round each eye-lobe and sloping abruptly downward to the lateral margin. Thorax and pygidium unknown.

Surface ornamented with numerous and rather closely disposed but distinct, minute rounded tubercles, which are obsolete upon the anterior

marginal and occipital sulci, as well as upon the genal spines. The occipital ring also is smooth, with the exception of a single circular tubercle in the centre. Most of the projecting part of the outer border is broken off in the few specimens collected, and even when otherwise uninjured its surface markings are very badly preserved, though they seem to have consisted of a single row of tubercles.

Dimensions of the most perfect specimen collected: maximum breadth of head, 8.25 mm.; length of the same, as measured in the median line, 6.25 mm.; length of glabella of the same, 4.25 mm.

Lake Winnipegosis, on three small islands in the southern portion of Dawson Bay, J. B. Tyrrell, 1889: four specimens from one of these islands and one from each of the others. The specimens consist of nearly perfect and fairly well preserved detached heads, with the free cheeks in place, but the summits of the eye-lobes of each specimen are broken off, as are also the slender genal spines, with one exception, and the surface ornamentation of the anterior border is very obscurely indicated.

This little trilobite seems to have much the same kind of surface markings as the *C. ornata* of Hall* (from the Hamilton formation of the State of New York) though the anterior border of the former may prove to be spinose, when better preserved specimens shall have been collected. The glabella and fixed cheeks of *C. ornata*, however, are represented as being very much less convex than those of the present species.

(S.) PROETUS MUNDULUS. (N. Sp.)

Plate 46, figs. 10 and 11.

General form narrowly subelliptical, the length, as measured along the median line, being about twice the maximum breadth: surface depressed convex, but distinctly trilobate, with a prominent axis.

Head nearly semicircular in outline, much broader than long, rounded in front and broadest at the base: characters of the genal angles, and those of the genal spines, if there were any, unknown. Frontal area rather broad and flattened, margined externally by a very narrow but rather prominent upturned rim. Facial suture normal, intersecting the anterior margin almost in a line with the most prominent lateral portion of each eye. Glabella (fig. 11) moderately convex, distinctly defined and bounded on all sides by a narrow groove, a little longer than broad and broadest posteriorly, ovately subtriangular in outline, but with the anterior angle more broadly rounded than the postero-basal angles, and the sides very faintly constricted at

*Palæont. St. N. York, vol. VII, 1888, p. 145, plates xxi, fig. 1, and xxiv, fig. 21.

the second pair of glabellar furrows, and nearly opposite the anterior termination of each eye. Glabellar furrows in three pairs, each lateral and oblique: the first pair straight and very short, the second curved and longer than the first, the third longer than the second and curving obliquely into the occipital furrow on each side, thus separating a pair of lateral lobes at the base of the glabella. Occipital lobes represented by a pair of small, distant tubercles in the occipital furrow, one placed close to and immediately behind the postero-basal angle of each of the latero-basal lobes of the glabella: occipital furrow narrow: occipital ring rather broad and flat. Cheeks moderately prominent around the eye-lobe, sloping rather abruptly downward and outward: eyes prominent, appressed close to the sides of the glabella, and placed much nearer to the occipital furrow than to the anterior or lateral margins of the cephalic shield.

Thoracic segments, apparently nine in number, those of the axis prominent and strongly convex, the pleuræ not quite so convex.

Pygidium rather more narrowly rounded at its outer margin than the cephalic shield, its border narrow and flat: axis composed of from about eleven to thirteen segments: pleuræ about nine.

Glabella and fixed cheeks minutely tuberculated, the flat frontal area smooth. Surface markings of thorax and pygidium unknown, as the test is not preserved upon either, in any of the specimens collected. Under a lens, however, well preserved casts of the pygidium show that its axis and pleuræ are also minutely tuberculated, and that there is a comparatively large pair of tubercles on each annulation of the axis, one on each side of its outer boundary.

Approximate length of the most perfect specimen collected, as measured in the median line, twenty-one millimetres; greatest breadth of the thorax of the same, ten millimetres.

"Western Shore of Dawson Bay," Lake Winnipegosis, "from slabs apparently derived from the neighbouring cliffs," J. W. Spencer, 1874: one cast of the head, minus the free cheeks, and casts of two pygidia. Several additional specimens of this trilobite were collected by Mr. Dowling in 1888, and by Mr. Tyrrell in 1889, in the *Stringocephalus* zone at three small islands in the southern portion of Dawson Bay, and at an exposure on the south-western shore of that bay, about two miles west of Salt Point. These specimens consist of a few detached heads, with the free cheeks in place, some with most of the test preserved; numerous sharply defined casts of the pygidium; one cast of the dorsal surface of the united head (minus the free cheeks), thorax and pygidium; an united head and thorax, and a cast of the thorax and pygidium.

At the time that the introduction to this paper was written, the writer was under the impression that the three specimens of the trilobite now under consideration, collected by Dr. Spencer, represented "a variety of *Proetus Haldemani*," as stated on page 257 (lines 17 and 18 from the top). A subsequent study of the whole of the specimens collected, however, has led to the conclusion that they indicate a previously undescribed and probably distinct species of *Proetus*, which is more nearly related to the *P. Rowi*, Green (Sp.), *P. Prouti*, Shumard, and *P. curvimarginatus*, Hall, as described and figured in the seventh volume of the Palæontology of the State of New York, than to *P. Haldemani*. The characters by which these three most nearly related species of *Proetus* can most readily be distinguished from *P. mundulus*, are as follows. The anterior margin of the cephalic shield of *P. Rowi* is not narrowly upturned, its eyes are apparently larger proportionately than those of *P. mundulus*, and there are only from nine to ten annulations in the axis of the pygidium of *P. Rowi*, and from six to seven pleuræ. *P. Prouti* has an upturned border to the anterior margin of the head, but it is said to have four pairs of lateral furrows on the glabella, eight to ten annulations on the pygidium and six to eight pleuræ. *P. curvimarginatus* is described as having four pairs of lateral glabellar furrows, large occipital lobes, and a pygidium with thirteen to fourteen annulations on the axis and twelve pleuræ.

Two fragmentary specimens of a small trilobite which may be referable to *P. mundulus*, were collected by Mr. Tyrrell in 1889, at Devils Point, Lake Winnipegosis, from beds whose stratigraphical position is immediately below the Stringocephalus zone. These specimens are mere casts of the under surface of the right free cheek of two individuals.

A few specimens, which are also probably referable to *P. mundulus*, were collected by Mr. Tyrrell, in 1889, from beds whose stratigraphical position is above the Stringocephalus zone, on the south-western shores of Pelican and Cameron bays, Lake Winnipegosis; in Dawson Bay, at the first small point north of the mouth of Bell River; and on the Red Deer River, at the Upper Salt Spring. Most of the specimens from these localities are separate pygidia, with the test preserved. Some of these pygidia are much larger and more narrowly rounded posteriorly than those of the typical form of *P. mundulus* from the Stringocephalus zone, and, in the largest of these large pygidia there appear to be about thirteen or fourteen annulations on the axis and perhaps as many as eleven pleuræ. The surface of these testiferous pygidia, also, when examined with a lens, is seen to be faintly and very minutely tuberculated. One of the specimens from Cameron Bay is a detached left free cheek with the test preserved, but its lower surface only is exposed, the upper being buried in the matrix. In this specimen only the rather broad basal portion of the genal spine is preserved.

FISHES.

HOLOCEPHALI.

CHIMÆROIDEI.

PTYCTODUS CALCEOLUS, Newberry and Worthen.

Rinodus calceolus, Newberry and Worthen. 1866. Pal. Illinois, vol. II, p. 106, pl. x, figs. 10, 10 a-c.

Ptyctodus calceolus, Newberry. 1875. Rep. Geol. Surv. Ohio, vol. II, pt. 2, (Palæont.) p. 59, pl. lix, fig. 13.

Lake Winnipegosis, on a small island at the southern extremity of the lake (one tooth), on the western shore of Dawson Bay, at Point Wilkins (three separate teeth), and at the head of a small bay about three miles south of that point (one tooth); J. B. Tyrrell, 1889. Two small teeth, which are possibly referable to this species, were obtained by Mr. Tyrrell, in 1889, at an exposure on the Red Déer River, about a mile above the Lower Salt Spring.

Separate teeth of *P. calceolus* are not uncommon in the Hamilton Formation of Western Ontario, on the banks of the Sable River, at Bartlett's Mills, near Arkona, and elsewhere.

RHYNCHODUS. (Sp. Undt.)

An imperfect tooth, apparently from the lower jaw, of a species of *Rhynchodus*, was collected by Professor H. Youle Hind, in 1858, at the north end of Manitoba Island. The specimen is still preserved in the museum of the Survey.

DIPNOI.

ARTHRODIRA.

DINICHTHYS CANADENSIS. (N. Sp.)

Plate 46, fig. 12.

"Premaxillary" tooth or dental plate (the only part of the fish yet collected) of small size for the genus, its upper portion laterally expanded and subrhombic in outline, its lower portion abruptly contracted on one side and produced into a large, narrow, conical and pointed process which projects downward and constitutes a lateral cone of the crown. Upper and expanded portion of the tooth convex externally and concave internally: the angle formed by its upper and

outer sides much more acute than those formed by the upper and inner and outer and lower, that formed by the upper and inner side being not only obtuse but rounded off. Lower and conical portion of the tooth prominent, angulated and obtusely subcarinate along the median line above (the obtuse keel extending backward to, or rather rising abruptly in and commencing at the centre of the upper and expanded portion), and flattened below, the outline of its transverse section being distinctly triangular.

Surface nearly smooth, though a slightly roughened subtriangular area, devoid of enamel, and probably representing the "root" of the tooth, is bounded by the upper and outer sides of the expanded portion and by a line which might be drawn from the outer lateral margin a little above the angle formed by the lower and outer sides, to the rounded off angle at the junction of the upper and inner sides, and passing just above the abrupt commencement of the blunt keel which ultimately runs down the median line of the cone of the crown.

Snake Island, Lake Winnipegosis, D. B. Dowling, 1889: the specimen figured.

This detached tooth or dental plate is apparently homologous with one of the large dental plates, which Dr. Newberry provisionally termed the "premaxillaries," in the centre of the upper jaw of *Dinichthys*. It is doubtful, however, whether it represents the so-called "premaxillary" of the right side, or that of the left. In the preceding description, it has been regarded as the "premaxillary" of the right side, because, in the corresponding dental plate of *D. Terrelli* and *D. Hertzeri*, as represented diagrammatically by Dr. Newberry*, it is the outer side of the upper portion that is laterally expanded. If the specimen from Snake Island should prove to be the "premaxillary" of the left side, the terms inner and outer, in the preceding description of its characters, will of course have to be reversed. In either event, it is not at all likely to be confounded with the "premaxillary" of any of the described species of *Dinichthys*.

ASPIDICHTHYS (?) NOTABILIS. (N. Sp.)

Plate 47, figs. 1 and 1a.

The foregoing name is suggested provisionally for a specimen, which, as suggested to the writer by Professor Cope, is probably the median plate of the ventral shield of a large fish belonging to the family *Coccosteidae*. When entire, this plate must have been eight inches or more in length and at least seven inches in its maximum breadth. The specimen, which

*Rep. Geol. Surv. Ohio, vol. II, pt. 2, Palæont., (1875), pp. 7 and 8.

was collected by Mr. Tyrrell, in 1889, at South Manitou Island, Lake Winnipegosis, is very well preserved, although imperfect and somewhat crushed or distorted. It is nearly flat but slightly convex above, and shallowly concave below. As viewed from above, it consists of a central tuberculated area, with a broad and slightly bevelled outer margin devoid of tubercles. The central tuberculated area, whose outer limits are by no means sharply defined, is longer than broad, symmetrical, and somewhat five sided, though the side which presumably represents the anterior end of the plate and which therefore it will be convenient to call the antero-median side, is shorter and narrower than any of the others, and concavely and rather deeply emarginate, apparently to allow of the overlap of the narrowly rounded posterior end of an antero-median plate. The two antero-lateral sides are at first nearly straight and parallel to the longitudinal axis of the plate, but they are very slightly expanded about the midlength and concavely contracted posteriorly. The two postero-lateral sides are nearly straight and converge gradually and obliquely until they meet at an acute angle in the centre posteriorly. The outer and non-tuberculate margin is nearly two inches in breadth at its broadest part.

The surface markings of the central area consist of numerous small, smooth and rounded tubercles, which are unequal in size and irregular in their distribution, though the largest average two millimetres in diameter at the base, and from two to five millimetres in their distance apart at the summits. The greater part of the bevelled outer margin is smooth to the naked eye, but around its outer limits there are indications of short and irregular radiating grooves and ridges.

The actual length of the central tuberculated portion of the specimen, as measured in the median line, is 167 millimetres: the approximate breadth of the same, at the lateral angles, is about 113 mm. The maximum thickness of the test is six mm.

The genus *Aspidichthys*, Newberry, was based upon a single dorso-median plate, of gigantic dimensions, which is stated * to be "similar in form to that of *Pterichthys*, but many times larger" and to be "covered with large hemispherical, smooth, enamelled tubercles." "The most striking feature in this plate," Dr. Newberry says, † "is its external ornamentation. This consists of knobs or bosses of smooth, shining enamel, of the size and form of split peas. In its general aspect this tuberculation resembles that of *Pterichthys* or *Cocosteus*, but differs strikingly in this, that the tubercles are perfectly smooth and polished, and show nothing of the

* Rep. Geol. Surv. Ohio, vol. I, pt. 2, Paleont., (1873), p. 322.

† Ibid., p. 323.

stellate ornamentation which is to be seen on the plates of nearly all the great mailed fishes of the old world." This character, Dr. Newberry thinks, is of generic value.

The ventral armature of *Aspidichthys clavatus*, Newberry, the typical and heretofore only known species of the genus, is entirely unknown, and the imperfect median ventral plate collected by Mr. Tyrrell is referred to *Aspidichthys* provisionally, only on account of the similarity of its surface ornamentation to that of the dorso-median plate of *A. clavatus*. The impression that the specimen from South Manitou Island makes upon the mind of the writer is that of the median ventral plate of a large fish more nearly allied to *Coccosteus* than to *Pterichthys* or *Bothriolepis*, but which differs from that of *Coccosteus* in the circumstance that it is partially overlapped, not only by the two postero-lateral and two antero-lateral plates, but also by the narrowly rounded end of an antero-median plate. The median ventral plate of *A. notabilis* was evidently of much smaller size than that of *A. clavatus* could have been, besides being much more minutely tuberculated, and it is quite likely that the discovery of more perfect specimens of these two forms may show differences between them that are of generic rather than of specific value.

TELEOSTOMI.

CROSSOPTERYGII.

ONYCHODUS. (Sp. Undt.)

An imperfect scale of a fish, which is probably referable to this genus, was collected by Mr. Tyrrell or the present writer, in 1888, on the north shore of Manitoba Island, in Lake Manitoba. The scale is not quite three-quarters of an inch in its maximum diameter, cycloidal and not far from circular in outline. Its under surface, the surface which happens to be exposed, is marked by fine concentric wrinkles and by very minute radiating raised lines, which are too small to be seen without the aid of a lens. The substance of the scale is so thin as to be transparent, and with a lens minute tubercles, apparently for the most part disposed in radiating lines, can be detected over most of its upper surface.

All the remains of fishes that have so far been collected from the Devonian rocks of this region, are from the beds immediately above the *Stringocephalus* zone, at the supposed base of the Upper Devonian.

The stratigraphical relations of the subdivisions of the Devonian system in this region are described in detail in Mr. Tyrrell's "Report on North-western Manitoba, with portions of the adjacent districts of Assiniboia and Saskatchewan," published as Part E of vol. V, New Series, of the Annual Reports of this Survey. In a preceding paper, published in the Transactions of the Royal Society of Canada for 1891,* Mr. Tyrrell states that "near the north-eastern angle of Lake Manitoba the typical Niagara dolomites are overlain by a few feet of thick-bedded stromatoporoid magnesian limestone holding *Pycnostylus Guelphensis*," which probably represents the Guelph formation. "Over these Silurian limestones there is, in the lacustral region, a gap in the known section," and the lowest Devonian rocks exposed are a few feet of soft red shales, which are apparently unfossiliferous. Above these shales, "a hundred feet or more of harsh porous dolomites, containing *Pentamerus comis*, &c.," are "overlain by a similar thickness of tough white dolomites containing *Stringocephalus Burtini*." Above these dolomites are fifty to seventy feet of calcareous shales marked by many brine springs along their line of outcrop ; "to these succeed a "highly fossiliferous limestone containing great beds of *Atrypa reticularis*, and this is "overlain by light grey compact brittle limestones which represent the local top of the Devonian." "As far as could be seen," the whole of these rocks "are practically conformable and almost undisturbed throughout."

It has already been stated (on page 258) that all the fossils that are enumerated or described in the present paper, are probably from the Middle and Upper Devonian. The Middle Devonian appears to be represented in this region by the *Stringocephalus* zone and the hundred feet or more of fossiliferous dolomite immediately beneath it, and the Upper Devonian by all the beds above the *Stringocephalus* zone and beneath the Cretaceous.

The discovery of dolomites in which *Stringocephalus Burtini* is one of the most characteristic fossils, at many localities on the shores or islands of Lakes Manitoba and Winnipegosis, is of considerable interest to the geologist. In Manitoba the *Stringocephalus* zone appears to occupy much the same stratigraphical position as the *Stringocephalus* limestone of Germany and England, and it is noticeable that among the fossils of the *Stringocephalus* zone of Manitoba there are several which can be identified with well-known European species. Among these are *Sphaerospongia tessellata* ; *Favosites Gothlandica* ; *Pachypora cervicornis* ;

*Vol. IX, Sect. 4, pp. 91, 92.

Productella productoides, var. *membranacea*; *Strophodonta interstitialis*; *Atrypa reticularis*, and its var. *aspera*; *Rhynchonella pugnis*; *Paracyclas antiqua*; the *Murchisonia* referred to on p. 315 as *M. Archiacana*, but which, as stated in a postscript a little farther on, is probably a variety of the *M. turbinata* of Schlotheim; *Euomphalus annulatus*; *Loxonema priscum*; and *Macrochilina subcostata*; besides the *Stringocephalus Burtini* itself.

In the preceding pages a (S.) is prefixed only to those species which are characteristic of beds in which *Stringocephalus* has actually been found. It has been omitted in some few instances, such as in the case of *Cyrtina Hamiltonensis*, for example, where the species seems to be rare in the *Stringocephalus* zone, but abundant in the beds below or above that zone; and it is of course not prefixed to species from beds whose lithological characters and stratigraphical position are believed to be identical with those of the *Stringocephalus* zone, although no specimens of *Stringocephalus* have as yet been found in them.

The "Cuboides zone" appears to be represented in this region by those beds on the Red Deer River and elsewhere, in which *Cyathophyllum vermiculare*, var. *præcursor*; *Cyathophyllum dianthus*; *Chonetes Logani*, var. *Aurora*; *Productella subaculeata*; *Orthis striatula*; *Strophodonta arcuata*; and *Cyrtina Hamiltonensis* are the prevalent fossils, although *Rhynchonella cuboides* itself has not yet been found in them.

POSTSCRIPT.

MURCHISONIA TURBINATA, Schlotheim. Var.

Murchisonia angulata, var. A. d'Archiac and de Verneuil. 1842. Trans. Geol. Soc. Lond., Ser. 2, vol. VI., p. 356, pl. xxxii, fig. 7.

Murchisonia Archiacana, Whiteaves. 1892. This vol., p. 315, pls. xli, fig 7, and xlv, fig. 3. Not *M. Archiacana*, de Koninck.

Murchisonia turbinata, Schlotheim, var. Whidborne. 1892. Mon. Dev. Fauna S. England, vol. I, p. 307, pl. xxx, figs. 5-10.

Since pages 315 and 316 of this paper were printed, Professor Koken has reminded the writer that the name *Murchisonia Archiacana* is pre-occupied by de Koninck, but in the concluding part of the first volume of his Monograph on the fossils of the Devonian Rocks of the South of England, just received, Mr. Whidborne regards both forms of the *M. angulata* of d'Archiac and de Verneuil, as mere varieties of *M. turbinata*, Schlotheim.

ERRATA

- Page 257. Lines 15 and 16 from the top, for "the 'Euomphalus' is a small species of *Straparollus* here described and figured as *S. filicinctus*;" read "the *Euomphalus* is *E. annulatus*, Phillips."
- Page 257. Lines 17 and 18 from the top, for "the *Phillipsia* a variety of *Proetus Haldemani*"; read "the *Phillipsia*, an apparently new species of *Proetus*, which is described in this paper under the name *P. mundulus*."
- Page 291. Line 5 from the top, for "1890" read "1891."
- Page 295. Line 8 from the bottom, erase the words "(Separate copies)," and on the line above, for "1890" read "1891."
- Page 300. Lines 13 and 14 from the bottom, for "in the Upper Devonian," read "at the base of the Middle Devonian."
- Page 302. Line 20 from the top, for "1890" read "1891," and on the line below erase the words "(Separate copies)."
- Page 311. Line 3 from the top, for "1890" read "1891," and on the line below erase the words "(Separate copies)."
- Page 312. Line 9 from the bottom, erase the words "(Separate copies)," and in the line above, for "1890" read "1891."
- Page 315. Line 13 from the top, for "*Murchisonia Archiacana* (Nom. Nov.)" read "*Murchisonia turbinata*, Schlotheim. Var."

PLATE XXXIII.

Unless otherwise stated, the figures in this and the following plates are of natural size.

SPHÆROSPONGIA TESSELLATA (page 259).

- Figure 1. Side view of a specimen in which none of the spicular head plates are preserved, but which is otherwise nearly perfect, shewing the general arrangement of the spicules, minus the head plates, and the meeting at the apex of the prolonged distal rays of the summit spicules. Twice the natural size.
- Figure 1a. Portion of the same, enlarged three times, to shew the mode of interlocking of the spicules.
- Figure 2. Some of the spicular head plates of another specimen, enlarged four times.
- Figure 3. Restoration of the species as it occurs in this region, the details supplied from a number of specimens, which, however, do not shew whether there was or was not an opening at the apex, or whether there were or were not any head plates to the apical spicules.
- Figure 4. Side view of a nearly cylindrical specimen.
- Figure 5. Specimen with the basal plates preserved. Three times natural size.
- Figure 5a. Diagram shewing the shape and arrangement of the basal plates.
- Figure 6. Outline of an arcuate and club-shaped specimen.
- Figure 7. Outline of part of a slender specimen which is curved in two directions.
- Figure 8. Outline of basal portion of a broadly conical specimen.
- Figure 9. Outline of an imperfect subconical specimen.
- Figure 10. Outline of a subpyriform specimen.

The originals of all the figures on this plate, are from the shores or islands of Dawson Bay, Lake Winnipegosis.

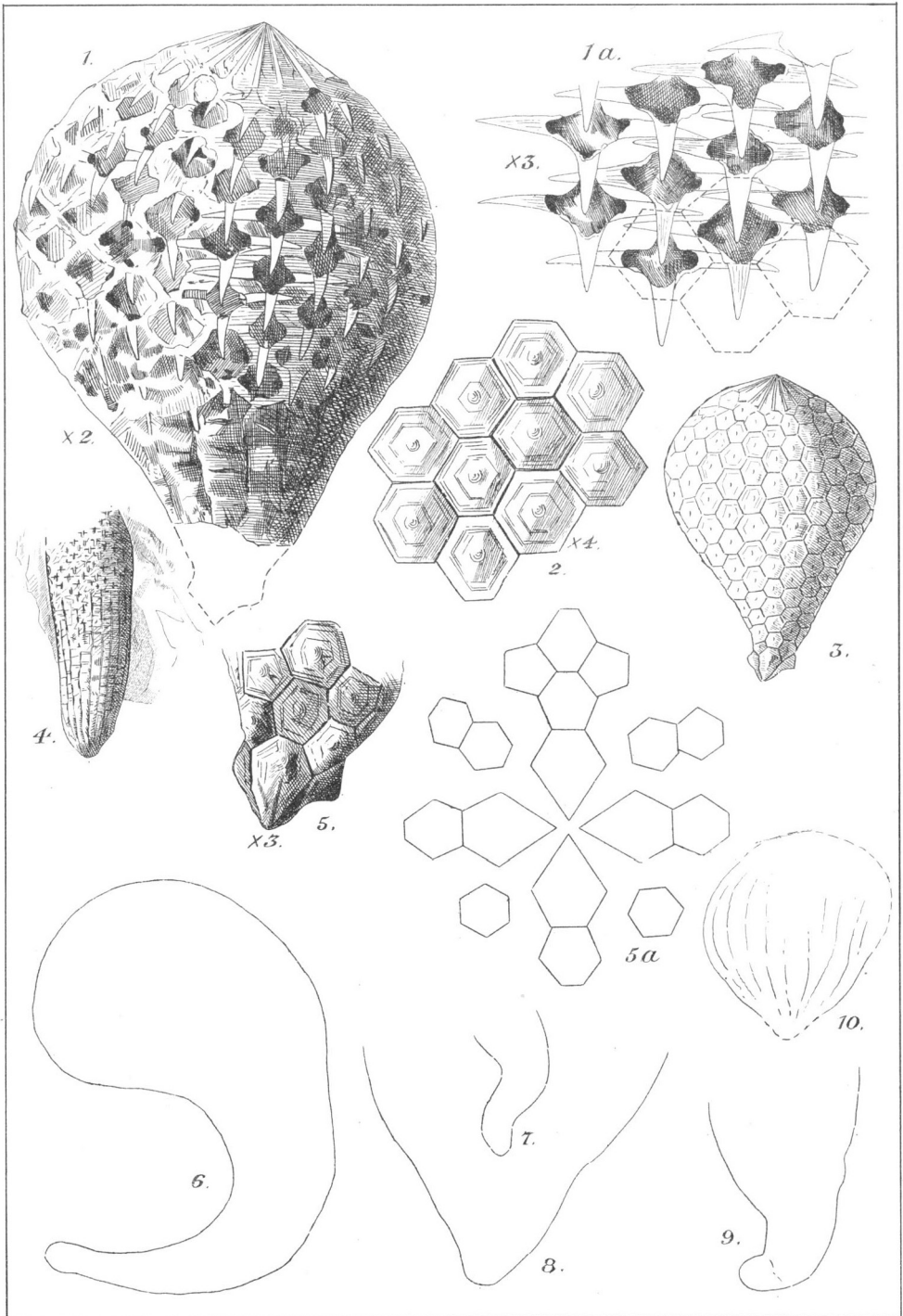


PLATE XXXIV.

CYATHOPHYLLUM PETRAIOIDES (page 265).

- Figure 1. Side view of a specimen from the Red Deer River, at the Lower Salt Spring.
- Figure 1a. Longitudinal section of the same, to shew the internal structure.
- Figure 2. The other half of the same specimen, shewing the base of attachment.

COLUMNARIA (CYATHOPHYLLOIDES) DISJUNCTA (page 269).

- Figure 3. Natural longitudinal section of a portion of a large colony of this species, from the western shore of Dawson Bay, at the mouth of the Steep Rock River.
- Figure 3a. One of the corallites of the same, twice the natural size, to shew the structure of the interior more clearly.
- Figure 3b. Transverse section of another portion of the same colony, to shew the outlines of the corallites, their relative arrangement and the number and proportionate length of the septa.

CYATHOPHYLLUM PROFUNDUM, Var. (page 268).

- Figure 4. Longitudinal section of one of the corallites of a large colony from Snake Island, Lake Winnipegosis, to shew its internal structure and the shape of the calyx.
- Figure 4a. Transverse section of four adjacent corallites of the same, shewing the thin walls, and the number and length of the septa.

CYATHOPHYLLUM WASKASENSE (page 264).

- Figure 5. Side view of a simple specimen from the Red Deer River.
- Figure 5a. Longitudinal section of the same, to show the internal structure.
- Figure 6. A proliferous specimen, from the same locality, shewing lateral gemmation.
- Figure 7. A proliferous specimen, also from the Red Deer River, showing calycinal gemmation.

CYATHOPHYLLUM ATHABASCENSE, Var. (page 269).

- Figure 8. Side view of the specimen from Cameron Bay, Lake Winnipegosis.
- Figure 8a. Longitudinal section of the same.

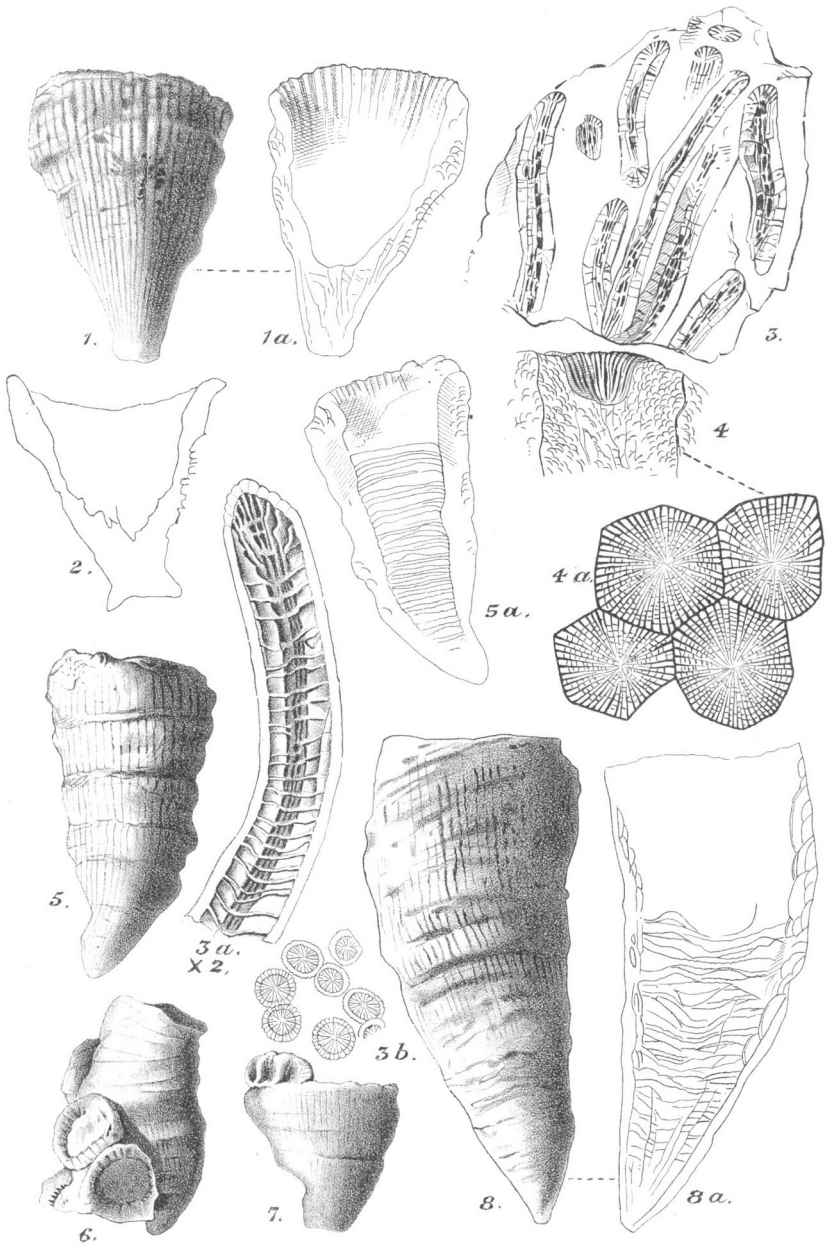


PLATE XXXV.

CYATHOPHYLLUM VERMICULARE, var. PRÆCURSOR (page 263).

- Figure 1. Side view of an unusually broad and short specimen, from a small island at the south end of Lake Winnipegosis.
- Figure 1*a*. Longitudinal section of the same.
- Figure 1*b*. Transverse section of the same, at a short distance below the base of the calyx.

AMPLEXUS, or DIPHYPHYLLUM. Sp. (page 270).

- Figure 2. Natural longitudinal section of one of the corallites of a specimen from the western shore of Dawson Bay, at the first small point north of the Red Deer River.
- Figure 2*a*. Transverse section of a similar specimen from the same locality.

ACTINOCYSTIS VARIABILIS (page 271).

- Figure 3. Longitudinal section of an imperfect specimen of this species, from the south end of Rowan Island, Dawson Bay, Lake Winnipegosis.
- Figure 3*a*. Transverse section of the same, a little below the base of the calyx.

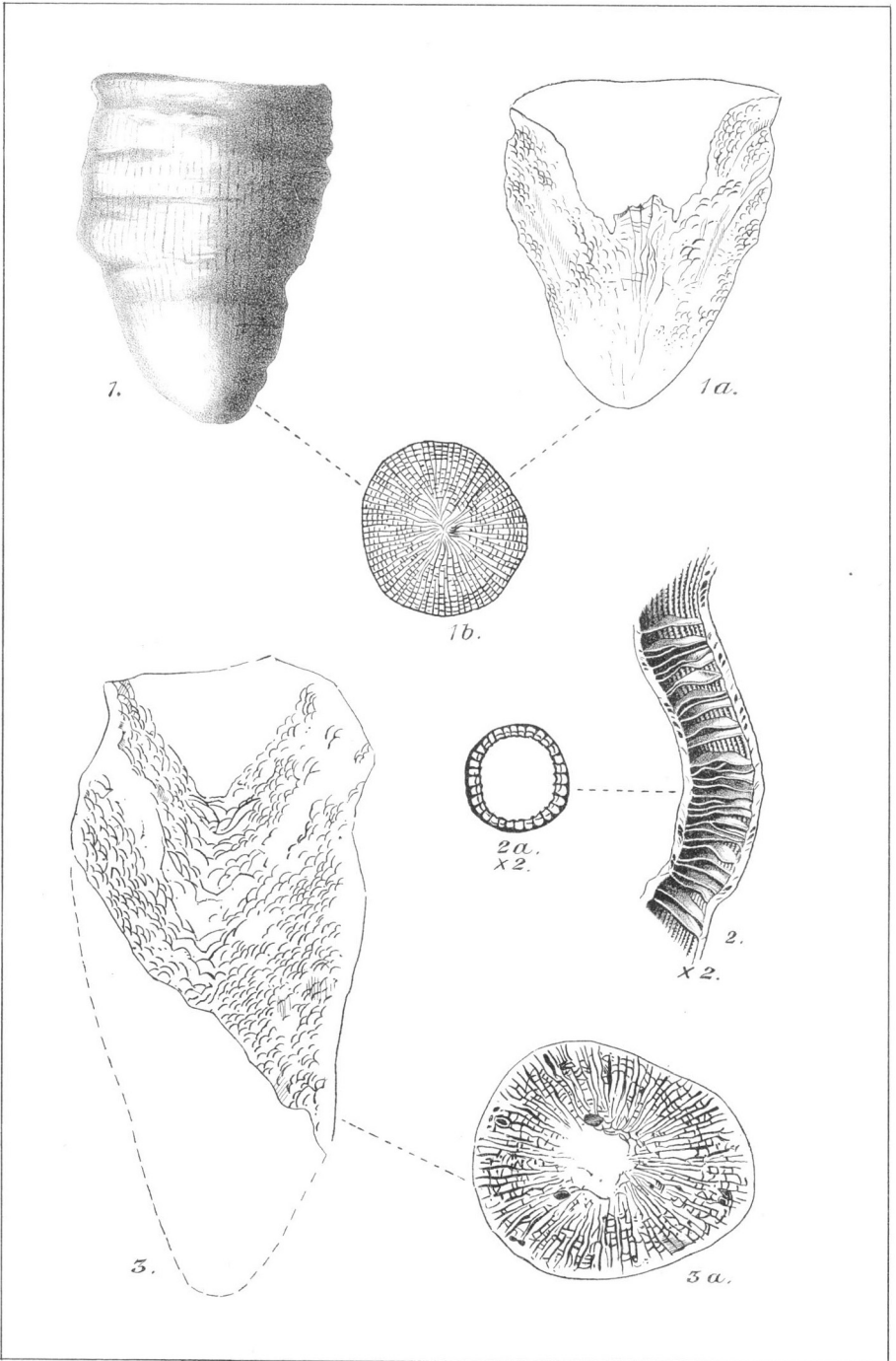


PLATE XXXVI.

PINACOTRYPA MARGINATA (page 278).

Figure 1. A perfect zoarium of this species, from a small island in Dawson Bay, as viewed from above, and shewing five maculæ.

Figure 1a. Portion of the same, three times the natural size, shewing one of the maculæ, &c.

Figure 1b. Another specimen from the same locality, four times the natural size, shewing the at first recumbent but ultimately erect zoecia, the broad and longitudinally striated basal lamina, &c.

CYSTODICTYA HAMILTONENSIS (page 279).

Figure 2. Outline of a portion of the zoarium of this species, from a small island in Dawson Bay.

Figure 2a. The same specimen, enlarged three times, and shewing the details of its structure.

Figure 2b. Portion of the same, enlarged eight times.

FINESTELLA VERA (page 279).

Figure 3. Side view of the outer or non-celluliferous surface of the zoarium of a specimen of this species, from a small island in Dawson Bay.

Figure 3a. Portion of the same, enlarged five times, with the right side partly scraped down to show the zoecia.

FENESTELLA, like *F. DISPANDA* (page 279).

Figure 4. Outline of a specimen of this species, from the south-eastern shore of Dawson Bay, at Whiteaves Point.

POLYPORA (*POROSA* ? var.) *MANITOBENSIS* (page 280).

Figure 5. Portion of a zoarium of this species, from Monroe Point, Lake Manitoba, four times the natural size, shewing the non-celluliferous side, but with the lower part scraped down to show the zoecia.

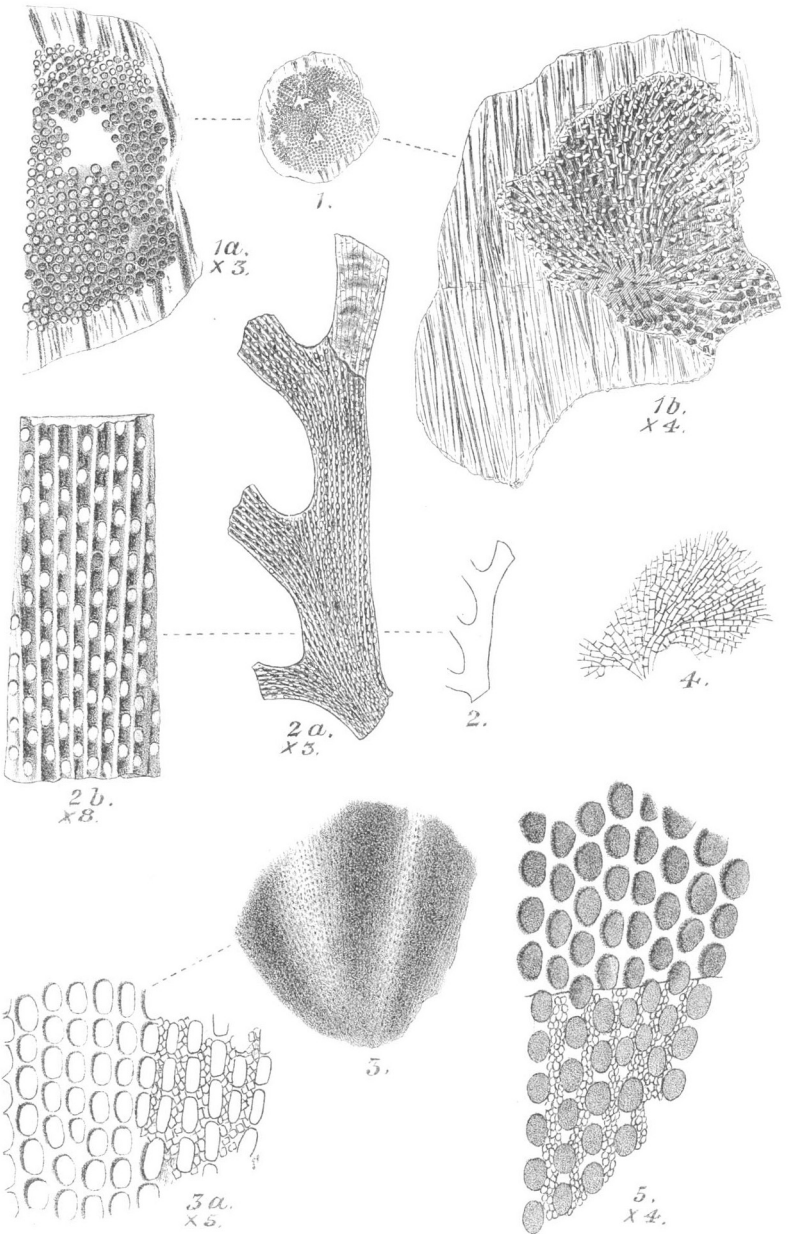


PLATE XXXVII.

CHONETES MANITOBENSIS (page 281).

- Figure 1. Specimen from the north side of Manitoba Island shewing the exterior of the ventral valve and the spines on its cardinal border. Twice the natural size.
- Figure 1a. Portion of the same enlarged four times, to shew the surface markings more clearly.
- Figure 2. Another specimen from Manitoba Island, shewing the whole of the dorsal valve, and the hinge area, but not the cardinal spines, of the ventral valve. Twice the natural size.

ORTHIS (SCHIZOPHORIA) MANITOBENSIS (page 283).

- Figure 3. Specimen from a small island in Dawson Bay, shewing the exterior of the "dorsal" or most convex and brachial valve only.*
- Figure 3a. Portion of the same, twice the natural size.
- Figure 4. Specimen from the same locality, shewing the front margin and relative convexity of both valves.
- Figure 5. Cast of the interior of the "dorsal" or brachial valve of a shell which is probably referable to this species, from Devils Point, Lake Winnipegosis.
- Figure 5a. Umbonal region of the same, enlarged three times, to shew the impressions made by the very short median septum in the beak and by the two divergent brachial processes.

STROPHODONTA INTERSTRIALIS (page 286).

- Figure 6. Specimen from a small island on the east side of Dawson Bay, shewing the exterior of the ventral valve.

SPIRIFERA (MARTINIA) RICHARDSONII (page 287).

- Figure 7. Specimen from the south-west shore of Dawson Bay, which is probably referable to this species, shewing the interior of the shell, the spiral coils and hinge dentition.

ATRYPA RETICULARIS (page 289).

- Figure 8. Specimen from Pentamerus Point, Lake Manitoba, in which most of the broad marginal fringe or foliated expansion of the ventral valve is preserved.

TEREBRATULA SULLIVANTI (page 291).

- Figure 9. Dorsal view of a specimen from Whiteaves Point, Dawson Bay, with a short mesial sinus in each valve and the anterior border emarginated.
- Figure 9a. Ventral view of the same.
- Figure 10. Dorsal view of another specimen from a small island in Dawson Bay, north of Salt Point, in which there is no sinus in either valve, nor any emargination of the anterior border.

*Ehler, in Fischer's *Manuel de Conchyliologie*, p. 1287, calls the corresponding valve of *Orthis (Schizophoria) striatula*, the "ventral."

Geological Survey Department, Canada

CONTR. TO CAN. PAL., VOL. I.

PLATE XXXVII.

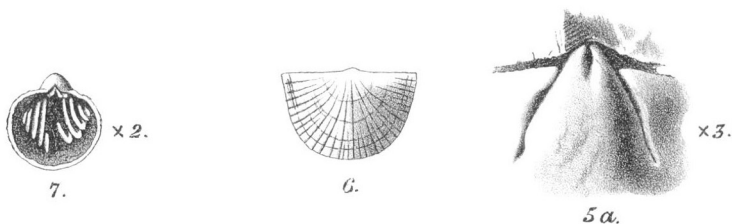
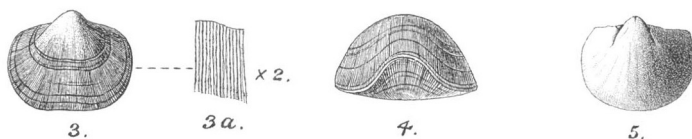
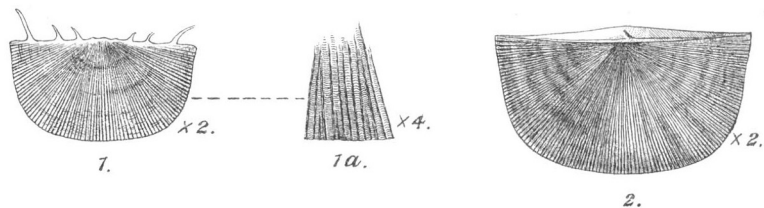


PLATE XXXVIII.

PTERINA LOBATA (page 292).

- Figure 1. Side view of the largest specimen collected, from a small island in Dawson Bay, shewing the whole of the right valve and part of the left.
- Figure 2. Side view of an imperfect left valve, from Dawson Bay, at Whiteaves Point.
- Figure 3. Side view of an immature specimen of the left valve, from the western shore of Dawson Bay, at the mouth of Steep Rock River.
- Figure 4. Imperfect left valve of a very young shell, from Whiteaves Point, which may be referable to this species.

MYTILARCA INFLATA (page 293).

- Figure 5. Side view of the largest specimen collected, from the western shore of Dawson Bay, at the mouth of Steep Rock River, shewing the right valve.
- Figure 6. Side view of a small specimen, from a small island north of Whiteaves Point, in Dawson Bay, showing the left valve.
- Figure 6a. Ventral aspect of the same.

MYALINA TRIGONALIS (page 294).

- Figure 7. Side view of the only specimen collected, from Dawson Bay, at the first small point north of the mouth of the Red Deer River.
- Figure 7a. Ventral view of the same.
- Figure 7b. Dorsal view of the same.

MODIOMORPHA COMPRESSA (page 296).

- Figure 8. Side view of a cast of the interior of both valves, from the south-eastern shore of Dawson Bay, at Whiteaves Point, shewing the general shape of the left valve, the anterior muscular impression, and a very small portion of the test posteriorly.
- Figure 9. Side view of a similar cast of another specimen, from the western shore of Dawson Bay, at the mouth of Steep Rock River.

MODIOMORPHA TUMIDA (page 296).

- Figure 10. Side view of the largest specimen collected, which is a cast of the interior of the slightly separated valves, shewing the general shape of the right valve, from the south-west side of Lake Winnipegosis, at a small island off Weston Point.
- Figure 10a. Outline of the same, as seen from above.

MODIOMORPHA PARVULA (page 297).

- Figure 11. Cast of the interior of the widely spread out valves of a specimen from the western shore of Dawson Bay, at the first small point north of the mouth of the Red Deer River.

SPATHELLA SUBELLIPTICA (page 298).

- Figure 12. Side view of a cast of the interior of both valves, from the western shore of Dawson Bay, at the second small point north of the mouth of the Red Deer River, shewing the general form of the left valve, and indications of its surface workings.

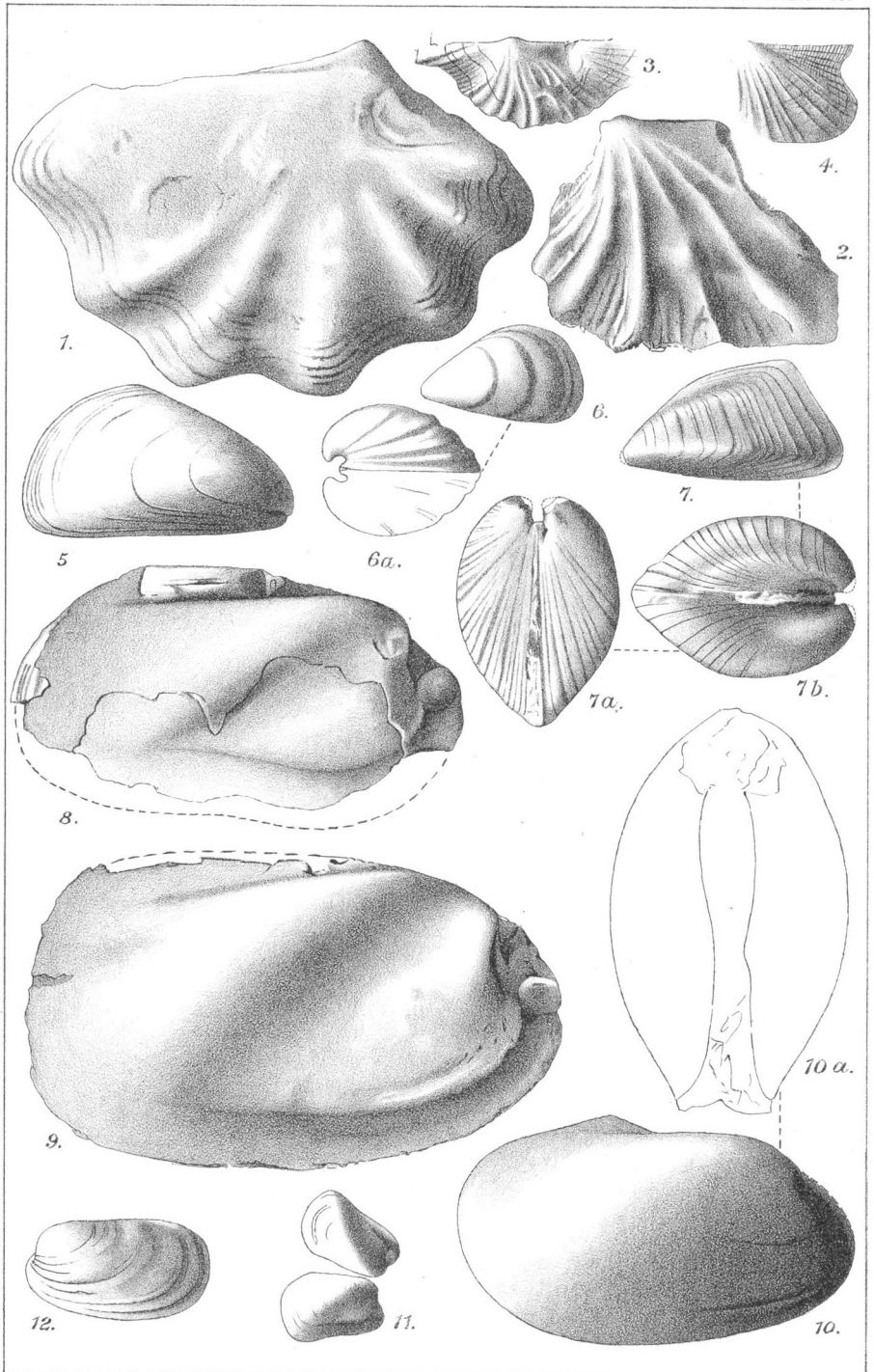


PLATE XXXIX.

GONIOPHORA PERANGULATA (page 299).

Figure 1. Side view of the most perfect specimen collected, a nearly perfect cast of the interior of both valves, from a small island off Whiteaves Point, Dawson Bay, shewing the right valve.

Figure 1a. Front view of a specimen from the western shore of Dawson Bay, near the mouth of Steep Rock River, in outline, to shew the amount of convexity of the two valves.

MACRODON PYGMÆUS (page 299).

Figure 2. Cast of the interior of a left valve, from the western shore of Dawson Bay, at the mouth of Steep Rock River.

Figure 3. Cast of the interior of the right valve of a specimen from Devils Point, Lake Winnipegosis.

NUCULITES. Sp. (page 302).

Figure 4. The "imperfect cast of the interior of a single valve" from the north side of Manitoba Island, referred to in the text, twice the natural size.

PARACYCLAS. Sp. Undt. (page 306).

Figure 5. Side view of the wax impression of a natural mould of the exterior of the closed valves from the first small point north of the mouth of the Red Deer River, in Dawson Bay, referred to in the text, shewing the right valve.

Figure 5a. Dorsal view of the same, in outline, to shew the proportionate convexity of the two valves.

PARACYCLAS ANTIQUA (page 304).

Figure 6. Side view of a wax impression of a natural mould of the exterior of the shell from the south-west shore of Dawson Bay, near the mouth of Steep Rock River, shewing the right valve.

PARACYCLAS ELLIPTICA, var. OCCIDENTALIS (page 305).

Figure 7. Specimen, which is believed to be quite free from distortion or compression, from the southern shore of Dawson Bay, at a small point about a mile east of Bell River.

Figure 8. Original drawing of the type of *Lucina occidentalis*, Billings, from Snake Island, Lake Winnipegosis.

Figure 9. Side view of a specimen from the Red Deer River, which has been obliquely distorted.

Figure 10. Side view of another specimen from the Red Deer River, in which the abnormal compression, in the direction of the height, has reached its maximum.

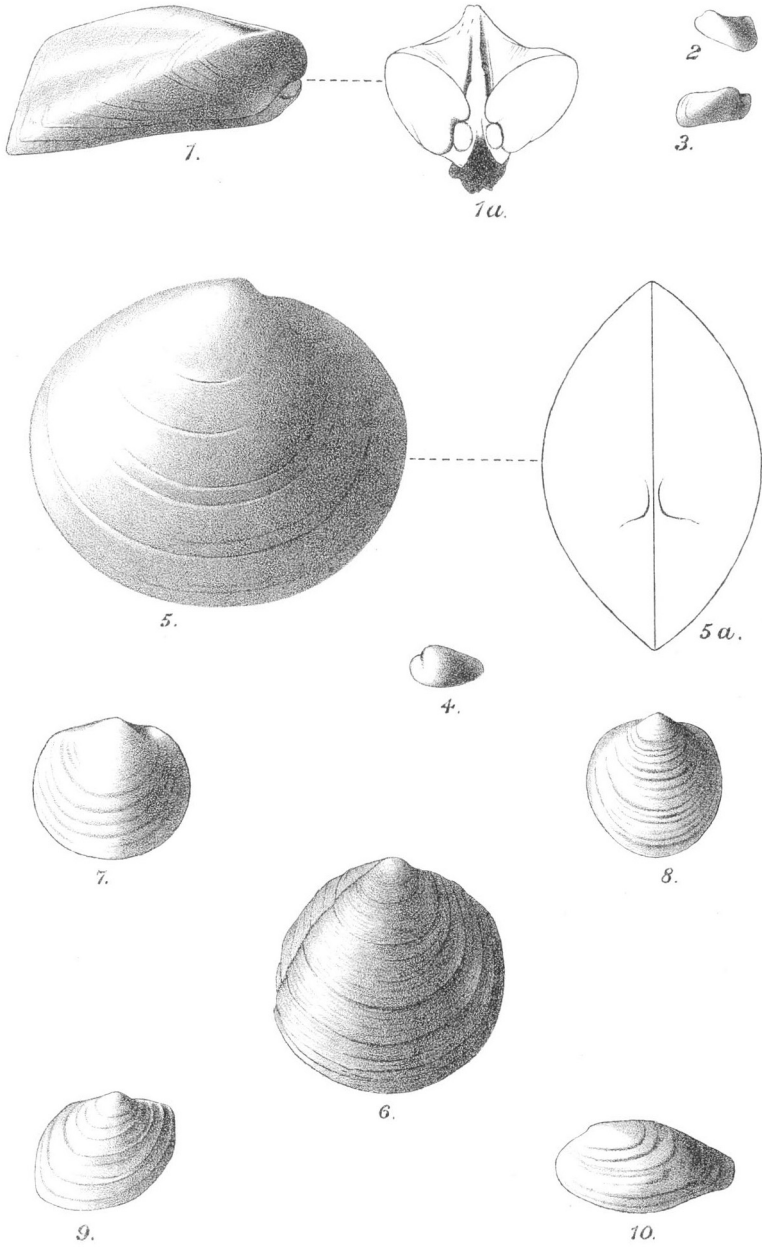


PLATE XL

CARDIOPSIS TENUICOSTATA (page 307).

- Figure 1. Side view of a large but imperfect left valve of this species, from Dawson Bay, two miles west of Salt Point.
- Figure 2. Similar view of a smaller left valve from Dawson Bay, at the mouth of the Red Deer River.

CYPRICARDINIA PLANULATA? Var. (page 309).

- Figure 3. Gutta percha impression from a natural mould of the exterior of a left valve collected at Devils Point, Lake Winnipegosis.

CYPRICARDELLA BELLISTRIATA (page 308).

- Figure 4. A comparatively large but imperfect cast of the interior of the closed valves of a specimen from Point Wilkins, Dawson Bay: lateral view, shewing the right valve.
- Figure 5. Side view of a smaller and more perfect but in other respects similar specimen from the same locality, shewing the contour of the left valve.

ANODONTOPSIS AFFINIS (page 303).

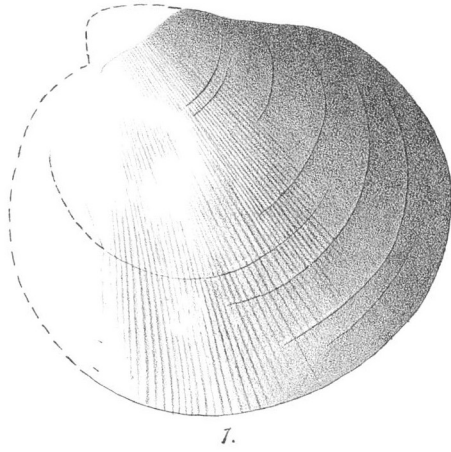
- Figure 6. Side view of a cast of the interior of a left valve, from Devils Point, Lake Winnipegosis.

GLOSSITES MANITOBENSIS (page 310).

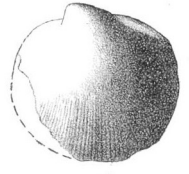
- Figure 7. Side view of the only specimen collected, from Pentamerus Point, Lake Manitoba, shewing the left valve.

CYPRICARDELLA PRODUCTA (page 309).

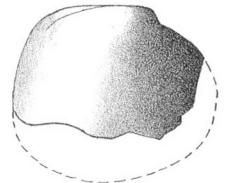
- Figure 8. The wax impression of a natural mould of the exterior of a left valve from Dawson Bay, at the mouth of Steep Rock River, referred to in the text. Side view.



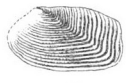
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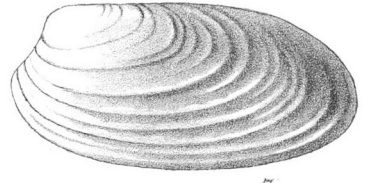
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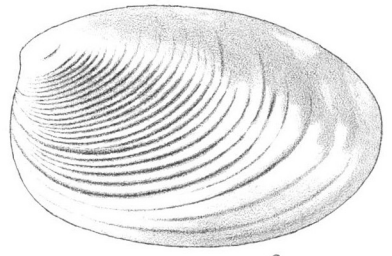
7.



5.



6.



8.

PLATE XLI.

NUCULA (?) *MANITOBENSIS* (page 301).

- Figure 1. Side view of the larger of the two right valves collected, from a small island off Whiteaves Point, in Dawson Bay twice the natural size.

PLEUROTOMARIA INFRANODOSA (page 313).

- Figure 2. Dorsal view of a small specimen with a considerable portion of the test preserved, from Pentamerus Point, Lake Manitoba.

Figure 2*a*. Basal view of the same.

- Figure 3. Dorsal view of a cast of the interior of the shell of a large specimen of this species, from Dawson Bay, Lake Winnipegosis, about two miles west of Salt Point.

PLEUROTOMARIA SPENCERI (page 341).

- Figure 4. The type specimen, from the western shore of Dawson Bay, as seen from above.

Figure 4*a*. Dorsal view of the same.

Figure 4*b*. Basal view of the same.

RAPHISTOMA TYRRELLII (page 314).

- Figure 5. Small specimen, with the whole of the test preserved, from Dawson Bay, about two miles west of Salt Point, as seen from above.

Figure 5*a*. Dorsal view of the same.

- Figure 6. A cast of the interior of the shell of a large specimen from Dawson Bay, at a small point half a mile north of the mouth of Steep Rock River, as seen above.

Figure 6. Basal view of the same.

Figure 6*b*. Dorsal view of the same, in outline only.

MURCHISONIA TURBINATA, Var.* (page 358).

- Figure 7. View of a gutta percha impression of a natural mould of the exterior of a shell of this species, in dolomite, from Dawson Bay, north of Steep Rock River.

MURCHISONIA DOWLINGII (page 316).

- Figure 8. View of a gutta percha impression of a sharply defined natural mould of the exterior of a shell of this species from Dawson Bay, four miles west of Salt Point.

*Referred to in the text (page 315) as "*Murchisonia Archiacana*, Nov. Nom." but this name is preoccupied.

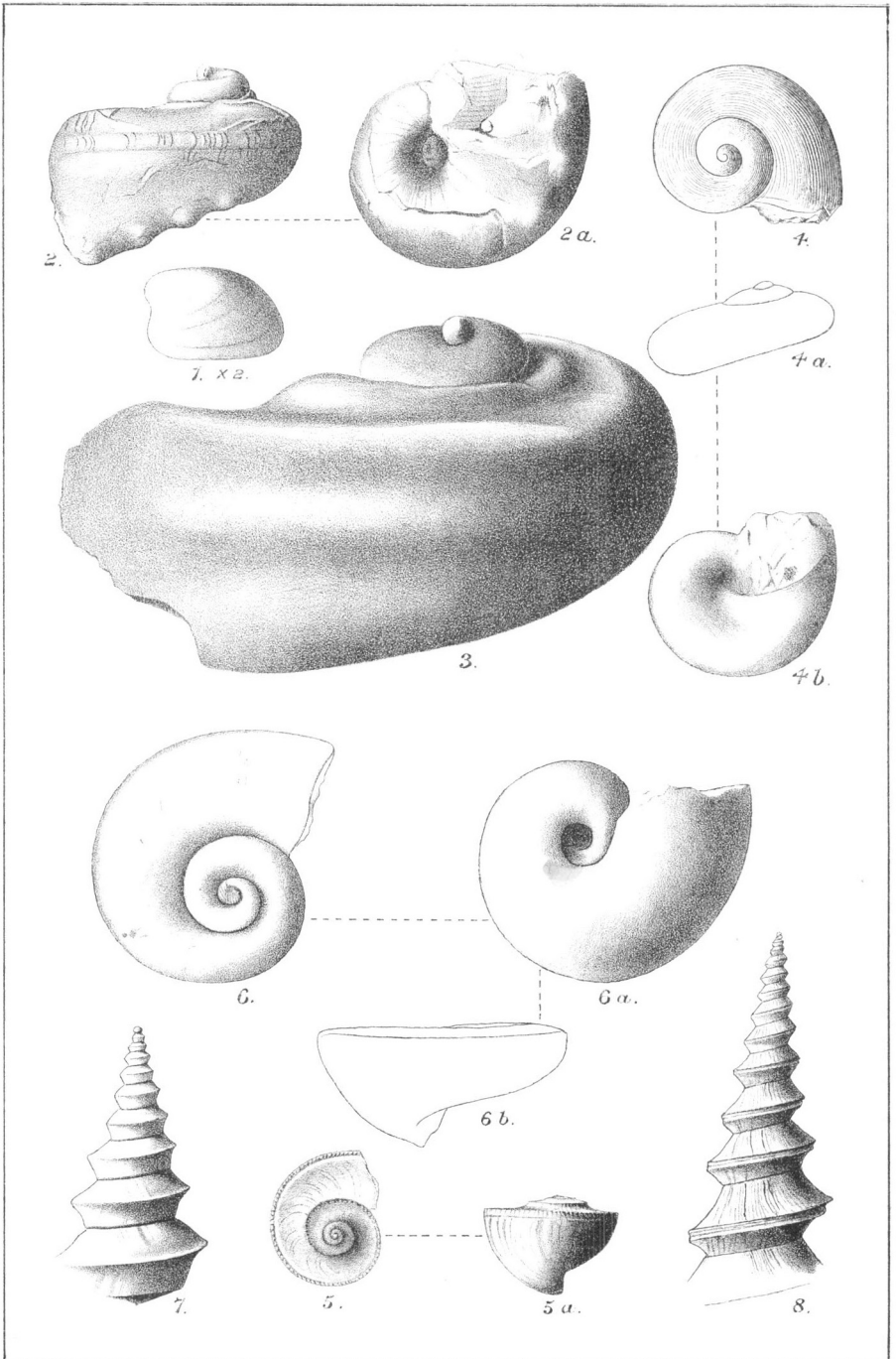


PLATE XLII.

PLEUROTOMARIA. Sp. Undt. (page 313).

Figure 1. Dorsal view of the specimen from Pentamerus Point, Lake Manitoba, referred to in the text.

BELLEROPHON PELOPS, var. (page 317).

Figure 2. Side view of an immature specimen, from the Red Deer River, a mile and a half above the Lower Salt Spring.

Figure 2a. Dorsal view of the same.

Figure 3. Outline of transverse section of a specimen from the first small point east of the mouth of Bell River, in Dawson Bay, to shew the number of volutions.

PORCELLIA MANITOBIENSIS (page 318).

Figure 4. Side view of the most perfect specimen collected, from Pentamerus Point, Lake Manitoba.

Figure 4a. Dorsal view of the same.

EUNEMA SPECIOSUM (page 320).

Figure 5. Dorsal view of a gutta percha impression of a natural mould of the exterior of a shell of this species from one of the small islands in Dawson Bay. Natural size. By a typographical error, which escaped detection when the table of Errata on page 359 was prepared, it is stated in the text that "the largest example" of this shell, "when perfect, must have been fully ten inches in length." For "ten" read "two."

EUNEMA BREVISPIRA (page 320).

Figure 6. Dorsal view of a gutta percha impression of a natural mould, in dolomite, of the exterior of a shell of this species from Weston Point, Lake Winnipegosis.

Figure 7. Ventral aspect of a gutta percha impression of a similar mould of a specimen from Net Point, Lake Winnipegosis, shewing the shape of the aperture, &c.

EUNEMA SUBSPINOSUM (page 321).

Figure 8. Dorsal view of a gutta percha impression of a natural mould of the exterior of a shell of this species from Dawson Bay, at the first small point north of the mouth of the Red Deer River. Twice the natural size.

EUNEMA CLATHRATULUM (page 322).

Figure 9. Dorsal view of a gutta percha impression of a sharply defined mould of the exterior of an immature shell of this species from the western shore of Dawson Bay, at the mouth of the Red Deer River, six times the natural size.

ASTRALITES FIMBRIATUS (page 324).

Figure 10. Dorsal view of a gutta percha impression of a natural mould of the upper surface of a shell of this species from the southern shore of Dawson Bay, four miles west of Salt Point.

Figure 10a. Basal view of the only testiferous specimen collected, from the western shore of Dawson Bay, at the mouth of the Red Deer River.

Figure 11. Dorsal view, in outline, of a cast of the interior of the shell from the western shore of Dawson Bay, at the mouth of Steep Rock River.

Figure 11a. Basal view of the same, to shew the spiral groove which represents a corresponding fold upon the internal axis of the shell.

STRAPAROLLINA OBTUSA (page 328).

Figure 12. Dorsal view of a nearly perfect cast of the shell of a specimen of this species, from Pentamerus Point, Lake Manitoba.

Figure 12a. Basal view of the same.

Figure 13. Dorsal view of a gutta percha impression of a natural mould of the exterior of a shell of this species from the south end of Rowan Island, in Dawson Bay, to shew the surface ornamentation. Twice the natural size.

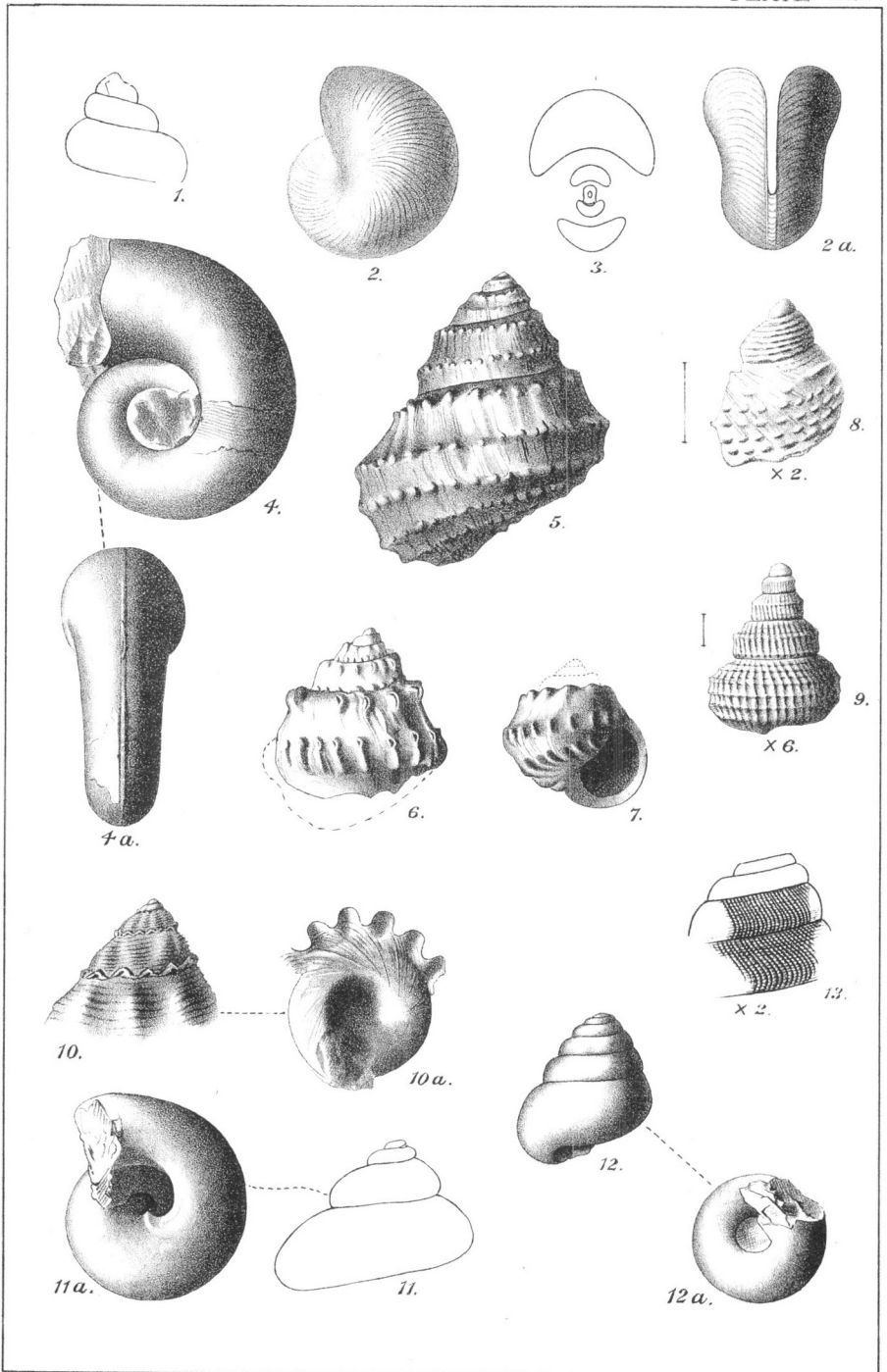


PLATE XLIII.

EUOMPHALUS (STRAPAROLLUS) ANNULATUS (page 324).

- Figure 1. View of the upper surface of a specimen from Pentamerus Point, Lake Manitoba.
Figure 1a. A portion of the same enlarged.
Figure 2. Outline of transverse section of a specimen from a small island north north-west of Beardy Island, in Dawson Bay.

EUOMPHALUS (PHANEROTINUS). Sp. Undt. (page 325).

- Figure 3. View of the exposed portion of the specimen from a small island off Weston Point, Lake Winnipegosis, referred to in the text.
Figure 3a. Outline of transverse section of the same.

EUOMPHALUS (CIRCULARIS? var.) SUBTRIGONALIS (page 326).

- Figure 4. Front view of a cast of the interior of a shell of this species from Snake Island, Lake Winnipegosis.

OMPHALOCIRRUS MANITOBENSIS (page 327).

- Figure 5. Diagrammatic representation of the upper side of the shell of this species, drawn from wax impressions of a number of natural moulds, in dolomite.
Figure 6. View of the lower surface of a specimen from Whiteaves Point, Dawson Bay, drawn from a wax impression of a mould of the exterior of the shell, in dolomite.
Figure 6a. View of the peripheral portion of the same.
Figure 7. Front view of a "loose" specimen from a small point three miles north of the mouth of Bell River, Dawson Bay, in outline only, drawn from a wax impression of a natural mould of the exterior of the shell.

PALÆACMÆA (?) CINGULATA (page 311).

- Figure 8. Dorsal aspect of the most perfect specimen collected, from the western shore of Dawson Bay, at the mouth of the Red Deer River.
Figure 8a. Lateral view of the same.

PLATYCERAS (ORTHONYCHIA) PARVULUM (page 331).

- Figure 9. Side view of a specimen from one of the small islands in Dawson Bay.
Figure 10. Side view of a specimen from another small island in Dawson Bay.
Figure 11. Similar view of another specimen from the same locality as the last.

PLATYOSTOMA TUMIDUM (page 331).

- Figure 12. Dorsal view of the most perfect specimen collected, from Pentamerus Point, Lake Manitoba.

PLEUROTOMARIA SPENCERI (page 341).

- Figure 13. Dorsal aspect of a small shell, supposed to be the young of this species, from Pentamerus Point, Lake Manitoba. Twice the natural size.

NATICOPSIS INORNATA (page 333).

- Figure 14. Dorsal view of the type of this species, from a small island in Dawson Bay, north north-west of Beardy Island.

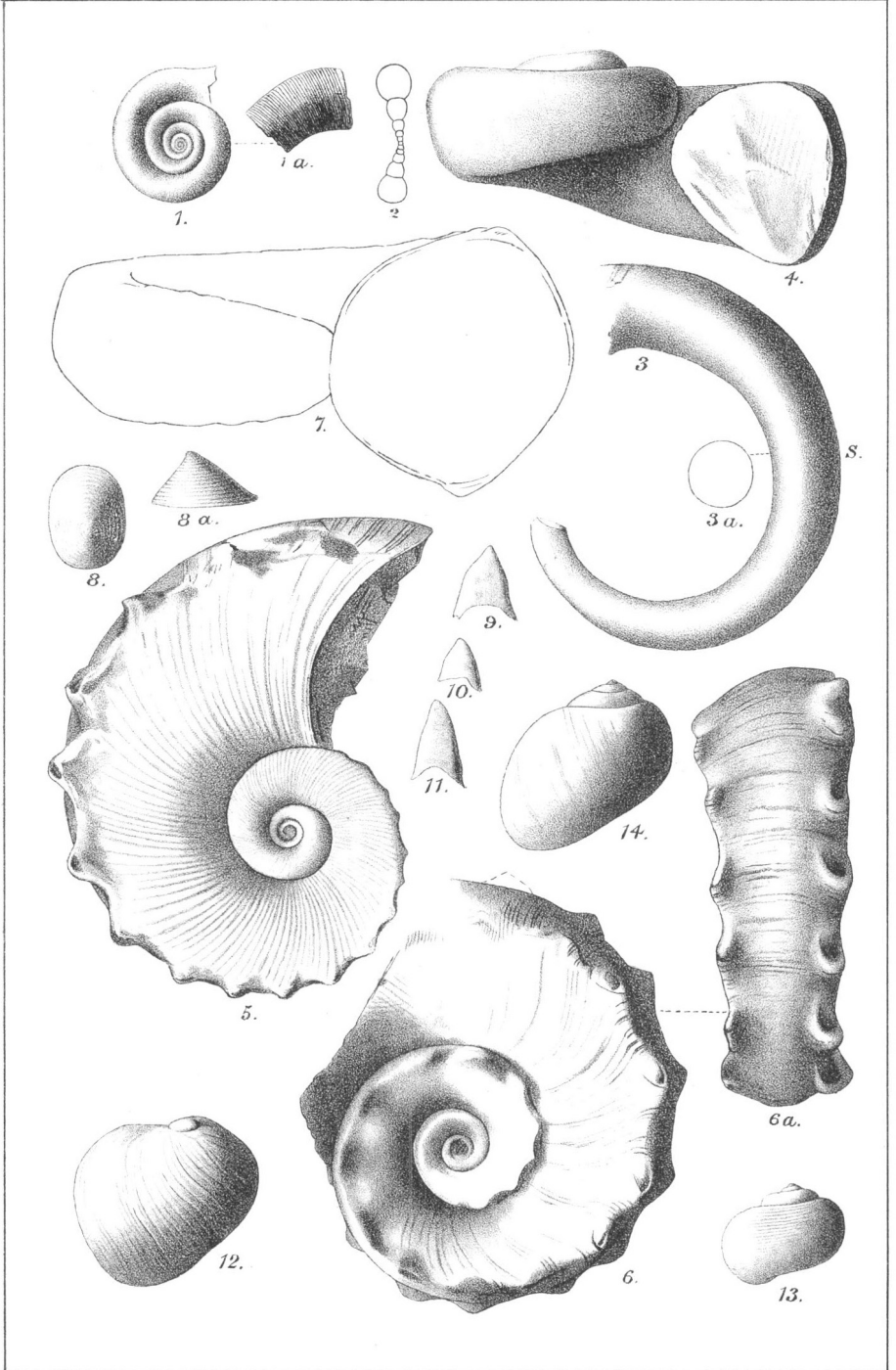


PLATE XLIV

PSEUDOPHORUS TECTIFORMIS (page 330).

Figure 1. Dorsal view of the type specimen, from Dawson Bay, two miles west of Salt Point.

Figure 1a. Basal view of the same.

LOXONEMA PRISCUM (page 335).

Figure 2. Dorsal view of one of the most perfect specimens collected, from Pentamerus Point, Lake Manitoba.

LOXONEMA CINGULATUM (page 336).

Figure 3. Diagrammatic representation of a shell of this species, based upon wax impressions of natural moulds of the exterior of two specimens, one shewing the whole of the spire, and the other the three latest volutions.

MACROCHILINA SUBCOSTATA (page 338).

Figure 4. Dorsal view of a specimen from Dawson Bay, at the mouth of the Red Deer River, in which the costulae of the surface are unusually minute and nearly equal in size.

Figure 5. Dorsal view of a fragment from a small island in Dawson Bay, north of Salt Point, showing the typical sculpture of this species.

MACROCHILINA PULCHELLA (page 340).

Figure 6. Dorsal view of the most perfect specimen of this species yet collected, from the south-west shore of Dawson Bay, about two miles west of Salt Point. Twice the natural size.

Figure 6a. View of the ventral side of the same, to show the shape of the aperture. Twice the natural size.

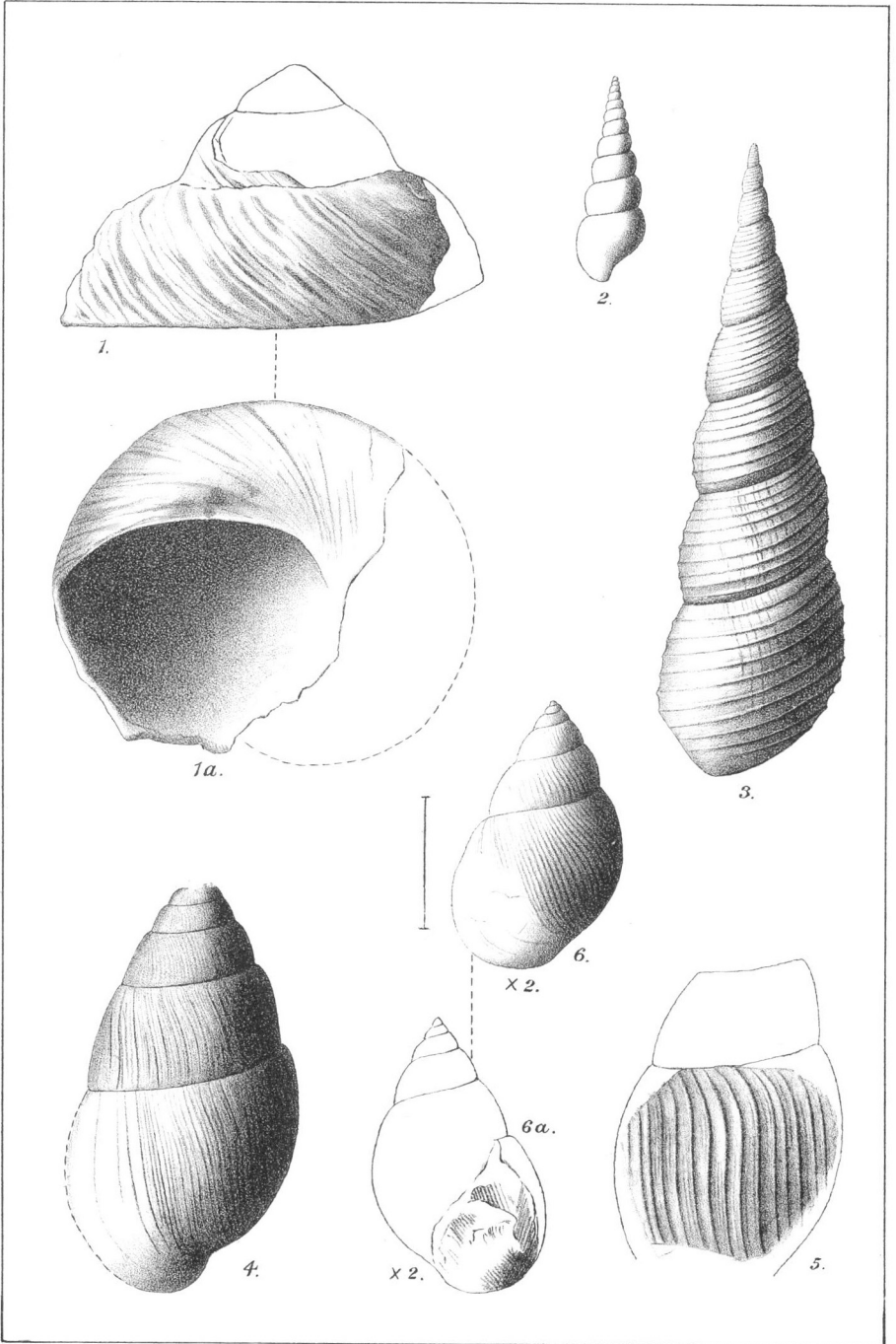


PLATE XLV.

DENTALIUM. Sp. (page 311).

Figure 1. Side view of a specimen from Pentamerus Point, Lake Manitoba.

Figure 2. Similar view of a portion of a large specimen from Dawson Bay, Lake Winnipegosis.

MURCHISONIA TURBINATA, Var. (page 358).

Figure 3. Ventral view of the specimen referred to on page 315, under the name *M. Archiacana*, "in which the body whorl and two of the preceding volutions are preserved." Drawn from a wax impression of a natural mould of the exterior of the shell collected at an island in the southern portion of Dawson Bay.

BELLEROPHON PELOPS (page 317).

Figure 4. Dorsal view of a cast of the interior of the shell of a nearly adult example of this species, from Dawson Bay, at Whiteaves Point.

EUNEMA SUBSPINOSUM (page 321).

Figure 5. View of a gutta percha impression of a natural mould of the exterior of a shell of a specimen of this species from Dawson Bay, at a small exposure near Salt Point.

ASTRALITES FIMBRIATUS (pp. 323 and 324).

Figure 6. The wax impression of the natural mould referred to on page 323, showing the "regularly lobate or sinuate lateral expansion" at the periphery, as seen from above.

NATICOPSIS MANITOGENSIS (page 332).

Figure 7. Dorsal aspect of the most perfect specimen collected, from Pentamerus Point, Lake Manitoba. Twice the natural size.

LOXONEMA ALTIVOLVIS (page 335).

Figure 8. Dorsal view of a specimen from an exposure on Dawson Bay, half a mile north of the mouth of Bell River, which "has a considerable portion of the test preserved, on three contiguous volutions."

Figure 9. Ventral view of a cast of the interior of a shell of this species, from the south-west side of Cameron Bay, Lake Winnipegosis.

LOXONEMA GRACILLIMUM (page 337).

Figure 10. The gutta percha impression of a mould of the exterior of a shell of this species from Devils Point, Lake Winnipegosis, referred to on page 338. Four times the natural size.

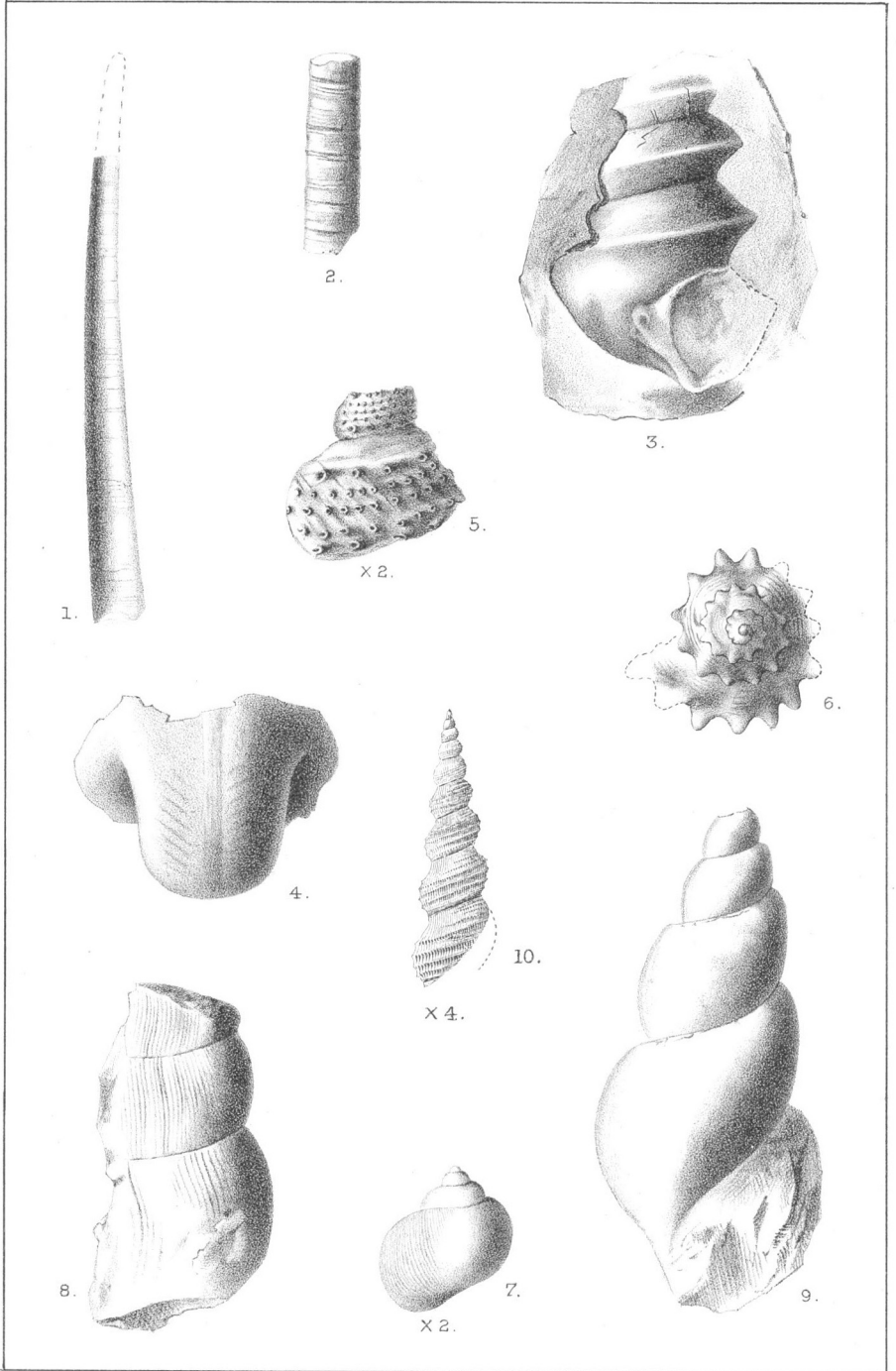


PLATE XLVI.

PLEUROTOMARIA SPENCERI (page 341).

- Figure 1. Upper surface of an immature specimen from an exposure at the mouth of the Red Deer River, in Dawson Bay, shewing the incremental striæ (somewhat diagrammatically) curving obliquely backward to the slit band. Drawn from a gutta percha impression of a mould of the exterior of the shell.

HYOLITHES ALATUS (page 342).

- Figure 2. Side view of a cast of the interior of the shell, from South Manitow Island, Lake Winnipegosis.
- Figure 3. Anterior moiety of another specimen from the same locality, "in which the central portion and one of the broad lateral wings of the dorsal surface are well exhibited, with the lines of growth and shape of the lip on that side."
- Figure 4. Outline of transverse section of the shell of another specimen, from the western shore of Dawson Bay, north of Steep Rock River.

BRONTEUS MANITOBIENSIS (page 347).

- Figure 5. The specimen from a small island north of Whiteaves Point, Dawson Bay, referred to in the text as "Specimen No. 1."
- Figure 6. The specimen from Pentamerus Point, Lake Manitoba, referred to in the text as "Specimen No. 3."
- Figure 7. The specimen from Rowan Island, in Dawson Bay, referred to in the text as "Specimen No. 5."

LICHAS (TERATASPIS). N. Sp. (page 349).

- Figure 8. Portion of the marginal spines of the pygidium from Rowan Island, Dawson Bay, referred to in the text. Drawn from a gutta percha impression of a natural mould, in dolomite, of the exterior of these spines.

CYPHASPIS BELLULA (page 349).

- Figure 9. A cephalic shield of this species, from one of the small islands in Dawson Bay, as seen from above.
- Figure 9a. Side view of the same, in outline, to shew the proportionate convexity.

PROETUS MUNDULUS (page 350).

- Figure 10. Restoration of this species, in outline, as far as warranted by actual specimens. The characters of the genal angles of the cephalic shield, and those of the genal spines, if there were any, are unknown.
- Figure 11. Glabella of a specimen, from a small island north of Whiteaves Point, Dawson Bay, twice the natural size, to shew the surface markings and glabellar furrows, as well as the occipital furrow and ring.

DINICHTHYS CANADENSIS (page 353).

- Figure 12. View of the exterior of the only specimen collected, from Snake Island, Lake Winnipegosis, of the "premaxillary" tooth or dental plate of this species.

