

Prof. Asa Gray  
with the kind regards of  
J. Stern Hunt.

# GEOLOGICAL SURVEY

OF

## CANADA.

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### REPORT OF PROGRESS

FOR THE YEARS 1853-54-55-56.

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# GEOLOGICAL SURVEY OF CANADA.

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MONTREAL, *March*, 1857.

SIR,

I have the honor to request that you will do me the favor to present to His Excellency the Governor General, the accompanying Reports, showing the progress made in the Geological Survey of the Province, in the years 1853, 1854, 1855 and 1856.

The Reports are accompanied by Maps, in eleven lithographed sheets, shewing the explorations of the Muskoka, the Petewahweh, the Bonne-Chère, the South-West Branch of the Madawaska, and the sources of the Ottonabee; and by three Maps in manuscript, one of them a large one, illustrating Lake Nipissing and several rivers of the surrounding country.

All the Maps are required for the proper understanding of the Reports.

I am, Sir,

Your most obedient servant,

W. E. LOGAN,

*Provincial Geologist.*

To the Hon. T. Lee Terrill,

Provincial Secretary,

&c., &c., &c.

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This volume contains a map illustrating the distribution of the Laurentian limestones, as described in the Report of Sir W. E. Logan ; a reduced map of Mr. Murray's explorations ; and a map of Anticosti, explaining Mr. Richardson's Report. It is also accompanied by an atlas, containing twenty sheets by Mr. Murray and two sheets by Sir W. E. Logan, embracing the results of their surveys of the region between Lake Huron and the Ottawa River.

## NEW SPECIES OF FOSSILS FROM THE SILURIAN ROCKS OF CANADA.

The following descriptions of some of the new species of fossils in the museum of the Survey include several *Cystideæ* published in the Canadian Journal at Toronto, in 1854. It is thought advisable to include them in this Report with the other new forms since discovered, in order to furnish a complete synopsis of all the species of this type of the echinodermata in the collection. I beg that these descriptions may be considered as merely provisional, and that I may soon have an opportunity of republishing them with good figures.

*Sub-kingdom*, RADIATA ; *Class*, ECHINODERMATA ;  
*Order*, CRINOIDEA.

*Genus* GLYPTOCRINUS.—Hall.

*Generic Characters*.—Cup pyriform, or sub-globular; pelvis of five hexagonal or pentagonal plates, alternating above which are five primary rays, each supporting upon its third plate two secondary rays, partly included in the general test of the body ; four of the spaces between the primary rays hold six interradianal plates; the fifth space six or more interradianals ; above these and between the secondary radials a number of smaller plates ; free rays articulated in two series and pinnulated ; column round or sub-pentagonal, composed of thin joints with numerous larger and thicker ones at variable distances.

The plates of the species of this genus are flat, thin and either smooth or ornamented with radiating ridges, striæ or raised margins; the large joints of the columns are often nodulose. In the Black River and Trenton limestones in Canada, the remains of several species are exceedingly abundant, but usually reduced to mere fragments of the plates and column. At the city of Ottawa where these rocks are exposed on a large scale, three of the species hereinafter described, *G. priscus*, *G. ramulosus* and *G. marginatus*, appear to be more common than at any other locality yet examined. The heads are



frequently found there in a fragmentary state, but good specimens are rare. *G. priscus* is the only head collected in the Black River limestone, but it also occurs in the Trenton. I have met with *G. lacunosus* near the top of the Trenton limestone only. *G. ornatus* is found about the middle of the deposit, rather common, and in fewer numbers upwards to the Utica slate. There is a sixth species which also occurs at Ottawa, but is only known by its very characteristic sub-pentagonal column.

#### GLYPTOCRINUS PRISCUS.

*Description.*—The cup of this species is pretty regularly oval, covered with smooth plates and surmounted by ten long undivided fingers or free rays, which are densely fringed with two rows of pinnulæ. A strong rounded carina or ridge, runs up each of the primary rays, and dividing into two upon the centre of the third plate, sends a branch up each of the secondary rays to the base of the fingers; the carinæ are also divided upon each of the pelvic plates, and coalesce into one on the centres of the first primary radial plates; in the large interradial space a sixth ridge ascends to the top of the cup; dividing the space into two parts about equal, it bifurcates below on the centre of the large interradial, one branch proceeding to the centre of each of the two contiguous first primary radial plates. The pelvic plates are of a moderate size, but the basal plates of the primary rays are large, broad and in contact with each other by their upright lateral margins. The joints of the free rays are very thin and closely set. The rays are also rather broadly rounded on the back. As to the column, the only perfect head in the collection has but a single joint attached to its base, but the columns found associated with it and also those which have been observed in the Trenton limestone at Ottawa, along with the fragments of the heads of individuals of this species, are round with the large joints rather thick and rather nodulose. I think this species grew to a very large size; but the evidence is not sufficient to connect positively the small specimen examined with the large ten-fingered fragments found in the Trenton limestone.

*Locality and Formation.*—One small perfect head collected at the upper mouth of the cave at the fourth chute of the Bonnehère, in the County of Renfrew, in the Black River limestone. Fragments of the heads and columns apparently referable to this species are common in the Trenton limestone at Ottawa.

#### GLYPTOCRINUS RAMULOSUS.

*Description.*—The cup of this species very much resembles that of *G. priscus*. It is covered with smooth plates, and the primary and secondary rays are strongly keeled, but the base is broader, the pelvic plates smaller in proportion to the size of the body, and there are twenty free arms springing from the margin instead of ten, as in *G. priscus*. The arms also are several times bifurcated at various distances from the top of the cup, while those of the former species remain single to their extremities; the pinnulæ are in two rows, and from one-fourth to three-fourths of an inch in length; the ossicula of the arms are very thin, and interlock with each other so deeply that each joint seems to extend completely across, giving the appearance of but a single series of joints where in fact there are two. Near the base of the arms there are about two joints in one line, but higher up there are from four to eight in the same length. The arms are regularly rounded on the back, and comparatively slender, being scarcely more than one line in diameter at the base of the largest specimens. In the specimens examined four of the plates of each of the secondary rays are included in the general test of the body. The column is round, and at the base of the cup the large projecting joints are thin, sharp-edged and crowded close together; they gradually become farther apart as the distance from the base of the cup increases, until at length they are from one to three lines removed from each other. Between these large joints the column is composed of very thin plates with crenulated margins, the projecting teeth of one plate fitting into the corresponding notches of those in contact with it above and below. The edges of the large joints are nodulose, and the column is much larger at the base of the cup than at its lower extremity. One specimen tapers from one-fourth of an inch to one-eighth in a length of fifteen inches.

The form of the alimentary canal appears to vary in different parts of the same column, being usually more or less star-shaped, but sometimes circular. The separate large joints are generally seen in the shape of flattened rings, with the outside margin thick and rounded, but thinned down to a sharp edge around the perforation of the centre.

The columns of this species very much resemble those of *Schizocrinus nodosus* (Hall), Pal. of New York, vol. 1, pl. 10, and were always so-called in Canada, until a number of specimens were found with the heads attached. The figures and description of that species however, given by Professor Hall show that it had four plates in the primary rays, and must be therefore not only specifically but generically distinct from *G. ramulosus*. I think that a large proportion of those great columns so common in the Trenton limestone on the Ottawa should be referred to this species and to *G. priscus*. Specimens four or five feet in length are sometimes seen in the quarries, and some of the crushed heads, including the arms, are seven inches in length.

A highly interesting specimen in the cabinet of Dr. Van Cortlandt of the city of Ottawa, consists of the inside of a cup two inches and a-half in length and one inch and seven-eighths in diameter, at the base of the free arms. It had been completely embedded in the stone, but by some means the body has been completely extracted, leaving all the plates lining the cavity in their natural position. The impression of a fragment of the column one inch and a-half in length from the base of the cup downwards still remains. Each of the plates has a small tubercle in its centre on the inside. The characters of the column are precisely those of many of the large ones usually seen without the heads attached. If therefore any of these large columns belong to this species, then in their advanced age they must have lost their nodulose character, because they are smooth instead of nodose, as is the case with the smaller specimens in the collection of the Survey which have the heads attached. It appears to me that in all the species of *Glyptocrinus* the columns were ornamented until past the middle age, and that afterwards they became plain.

## GLYPTOCRINUS MARGINATUS.

*Description.*—The plates of this fine species are all margined by a strong elevated border, the effect of which is to give to the surface a beautifully reticulated appearance. The only specimen in the collection is crushed, but then the size of the plates near the bottom shows that it had a broad rounded base, and that its general form was sub-globular. The large interradial space contains ten plates below the level of the base of the secondary rays; the rays are all carinated, and there is also an upright row of small plates in the centre of the large interradial space which exhibits a faint keel. There are four or five of the secondary radial plates included in the cup. A piece of the column two inches and a-half in length remains attached, and shows that the large joints at the base of the cup of this species were much thicker, and consequently not so sharp edged as those occupying a similar position in the other species.

The length of this cup from the base to the free arms is one inch and a-half, and the breadth about the same. The column is four lines in diameter, and in the length of two inches and a-half there are twenty-one large joints with the same number of others a little smaller, each situated half-way between two of the largest. The arms are not preserved in the specimen.

This species also grew to a large size and was closely related to both *G. priscus* and *G. ramulosus*.

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

## GLYPTOCRINUS ORNATUS.

*Description.*—In the specimens of this species that have been collected the cup is broad-oval, the base well rounded but narrower than the upper extremity, the rays (as in the other species) are keeled, and there are ten long slender undivided free arms as in *G. priscus*. Each of the plates is ornamented with five or six sharp ridges which radiate from the centre, thus covering the body with numerous stars with triangular

interspaces. The column is round, and the large joints are thin, sharp edged and distant from each other half-a-line at and near the base of the cup in a specimen of the ordinary size.

Length of the cup in several specimens a little more than half an inch; diameter at the base of the free rays about the same; diameter of column at the base of the cup about one line.

The surface ornament of this species is very like that of *G. decadactylus* (Hall) of the *Hudson River group*: but there is a very decided difference in the form of the columns of the two. Those figured by Professor Hall have the large joints very thick and rounded, while in *G. ornatus* they are exceedingly thin and sharp edged; some of our specimens are very like the figure of *G. basalis* (McCoy), given on page 180 of Sir Roderick Murchison's new work *Siluria*. In Sedgwick and McCoy's *British Palaeozoic Rocks*, page 57 however, that species is described by Professor McCoy as having the pelvic plate immediately below the large interradial space, hexagonal, and supporting upon its upper truncated margin the large interradial. In our species all the pelvic plates are very small and pentagonal; to both the English and New York species ours is evidently closely allied.

*Locality and Formation*.—Upper half of the Trenton limestone, City of Ottawa.

#### GLYPTOCRINUS LACUNOSUS.

*Description*.—This species is characterized by its very large pelvic plates, one of which, that beneath the large interradial space, is hexagonal, and supports upon its upper truncated edge the first interradial. The surface of the body is completely covered with small rugose pits and wrinkles; the rays become free at the second or third secondary radial plate, they divide immediately after becoming free, at least once, perhaps again above, but the specimens do not shew them perfectly above the first subdivision. The body is sub-globular, about three-quarters of an inch in length, and the same in breadth.

The column is round, and when once carefully examined is easily distinguished from that of any other species occurring

in the Trenton limestone. The large joints are proportionally very broad and projecting, while the constrictions between them are wide and deep. At the distance of from six to ten inches from the base of the cup, the large joints disappear altogether, and the column becomes smooth like that of the genus *Thysanocrinus* (*Rhodocrinus*); in one specimen at the distance of three inches from the base of the cup, the large joints are nearly one line in thickness at their edges, and are two lines distant from each other; they are also two and a-half lines in diameter; the constricted portion of the column between them is scarcely one line.

*Locality and Formation.*—Upper part of the Trenton limestone, City of Ottawa.

*Genus* THYSANOCRINUS (Hall), RHODOCRINUS (Miller).

*Generic Characters.*—Cup, oval or conical, and of the same structure as *Glyptocrinus*, except that there is a series of five plates (sub-radial) alternating above the pelvic plates, the arms are of medium length, slender, articulated in two series, and fringed with two rows of pinnulæ. The column is also the same as that of *Glyptocrinus* near the base of the cup, but a few inches below becomes smooth and without the large joints; it was attached to the bottom by a branched root-like base.

THYSANOCRINUS (RHODOCRINUS) PYRIFORMIS.

*Description.*—Cup conical or pyriform, the adult specimens about two inches in length and one inch and a-half in their greatest diameter, which is near the base of the free rays. The pelvic plates are pentagonal, with an obscurely rounded ridge across their base; sub-radials hexagonal, each supporting upon its truncated upper margin a large interradiat. The first primary radial on each side of the large interradiat space is hexagonal, the other three are pentagonal; the second plates in the rays are hexagonal, and the third heptagonal; each of the latter supporting upon its upper sloping edges the bases of two secondary rays, which become free at the third or fourth plate,

thus furnishing ten arms, which divide at not quite one-fourth of an inch from their base, and again at half-an-inch; the full grown arms are again subdivided, some of them once, others twice. The arms are comparatively short, not exceeding two inches in length in a specimen whose cup measures one inch and a-half in length. The ossicula which constitute the double series of joints of the free rays or arms, are obtusely cuneiform, the two rows interlocking with each other so slightly that the points of the joints extend but a short distance across the centre of the back of the arm; there are two ossicula to one line in length in that portion of the arm at the base which is situated next the cup, and below the first sub-division; the arm here is scarcely one line in thickness. All the plates are smooth or slightly granulated on their surface; in some of the specimens there is a trace of an obscurely elevated margin round the plates, and there is also a broadly rounded keel, not very prominent, upon each of the primary and secondary rays.

The column is round, slender, annulated, with thin but round edged projecting joints, for several inches below the bottom of the cup; it then becomes smooth and continues of an uniform size to the base of attachment, which consists of a number of root-like branches. The annulated portion of the column is usually found a little curved, but the smooth cylindrical portion is always straight, and in this part there are about ten joints to two lines of the length; near the cup there are three or four annulations to two lines. The diameter of the column is from one and a-half to two lines and a-half, and the length varies greatly; one specimen, a very perfect impression of the head, column and root, all in their natural connection, measured but seventeen inches in length; a fragment of the smooth portion of a column still lying in the rock measures thirty-seven inches and a-half. At Ottawa, in the upper part of the Trenton limestone, there are fragments of smooth round columns, four or five lines in diameter, which appear to be a large variety of this species.

*Locality and Formation.*—Trenton limestone, City of Ottawa, plentiful; in the upper part of the same formation, around the base of the mountain at Montreal, where the columns are rather common.

THYSANOCRINUS (RHODOCRINUS) MICROBASALIS.

*Description.*—The specimens for which the above specific name is proposed are about five-eighths of an inch in height, and the same or a little more in breadth at the top. They are cup-shaped, and uniformly expanding from the narrow pelvis upwards. The pelvic plates are so small that they can only be well seen when the column is removed. The rays are keeled, and all the plates of the body exhibit obscure radiating ridges somewhat similar to those of *Glyptocrinus ornatus*, but not so prominent. The column is round, annulated in its upper and smooth in its lower part. I have not seen either the root or the arms.

This species is closely allied to *T. pyriformis*, but differs in its much smaller size, in the comparative minuteness of the pelvic plates, and also in the character of the surface. *T. pyriformis* is a large smooth species, but this one has a surface ornamented with stars, only well seen however on good specimens.

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

Genus DENDROCRINUS (Hall).

*Generic characters.*—In this genus there are five pentagonal pelvic plates, and alternating above these a series of five sub-radials, one of which has its superior angle truncated, and supports a large interradial. There are five rays alternating above the sub-radials; the ray on the left-hand side of the large interradial has two of its plates entering into the composition of the cup; this ray is free, from the third joint inclusive, of the other four rays, only the first joint is included in the cup. A large and long proboscis rises from the interradial plate.

This genus is exactly the same in the composition of the test as *Cyathocrinus* with the exception of the peculiarity that one of the rays has two of its joints contained in the walls of the cup. In the original description given by Professor Hall, (Pal. N. Y., vol. 2, p. 193,) four series of plates are mentioned,



including five "scarcely visible" plates beneath those which I regard as constituting the true pelvis; they cannot be seen in any of the specimens in the collection of the Survey, although at least four of the species are unquestionable congeneric with *D. longidactylus* (Hall).

I have seen Professor Hall's specimens, and he agrees with me that the generic description may be so modified as to receive many species with the same structure in other respects, but which do not exhibit the small plates at the base. It will be seen by referring to fig. 7, c, plate 42, vol. 2. Pal. of New York, that the column of *D. longidactylus* consists of alternately large and small (or thin) joints, and that the latter sometimes consist of five divisions. Professor Hall is now of opinion that the small pieces at first regarded as constituting the true pelvis are not of generic importance, and that they may be considered either as one of the quinquepartate thin plates of the column, or as a basal series so little developed as not to be of more than specific value.

It will be recollected by those who have studied the Crinoidea, that a similar question relating to the base of *Poteriocrinus* still remains unsettled; Professor Philips and the Messrs. Austin having published that genus with three minute plates situated under the three basal plates.

#### DENDROCRINUS GREGARIUS.

*Description.*—Cup, acutely conical, from three to eight lines in length, and from two to six lines broad at the greatest diameter, which is at the margin, whence to the small pointed base it tapers uniformly with nearly straight sides; pelvic plates, narrow, nearly one-third the height of the cup; sub-radials, rather more than one-third broader than high; large interradial, not quite so large as the plate on which it stands, broader above than below; proboscis, for several lines above the interradial, nearly as wide as the cup, and composed of numerous small plates, which appear to be regularly arranged in upright rows; the arms bifurcate once immediately after becoming free, and many times again above; they are very

long and obtusely angular on the back. Below the first bifurcation there are about four joints, and they occupy a length of two lines in a specimen where the cup is six lines high and the arms two inches and one-fourth long. Their thickness in this part is about half the width of the first primary radial plates from which they spring, and they appear to hold a very deep groove on their inside, as the thickness is greater in that direction than it is in the other; the column is round, slender and flexible, slightly enlarging near and up to the base of the cup, and composed of alternately thick and thin joints, about six of each in a line of the length; the plates are without ornament.

This species so much resembles *D. longidactylus* (Hall) of the Niagara group that it can scarcely be separated. The principal differences consist in its smaller dimensions, and in the absence of the vertical ridges along the proboscis. On comparing with the illustrations given in the Palæontology of New York, it will be seen that the second plates of the rays on each side of the proboscis are in fig. 1 *a*, plate 43, broader than those upon which they rest. In our specimens the second plate of the left-hand ray is equal to the first; in the right-hand ray it is a great deal less, agreeing in this respect with fig. 7 *a*, plate 42. The species are closely related, and yet I am satisfied they are different.

*Locality and Formation.*—City of Ottawa, in the central part of the Trenton limestone.

#### DENDROCRINUS ACUTIDACTYLUS.

*Description.*—Cup, small, conical, somewhat pentagonal; arms, very slender, several times sub-divided and excessively sharp on the back; column, round, composed of small nearly globular joints; length of cup in the specimen examined, two lines, breadth at base of free rays the same; length of free rays, one inch and one-eighth; thickness upon the back below the first sub-division, about one-fifth of a line. At three-fourths of an inch below the base of the cup there are five joints of the column to one line in length. The two arms visible in the

specimens bifurcate at the fourth free joint, and three times again at varying distances above. Only one side of the specimen can be seen, yet the characters of the cup and arms are so similar to those of the last species that there can be little doubt of its generic affinities, while the globular joints of the column and the thin sharp backed arms are characters sufficient to separate them specifically.

*Locality and Formation.*—Upper part of the Trenton limestone, near the Toll-gate, St. Lawrence Street, Montreal.

#### DENDROCRINUS PROBOSCIDIATUS.

*Description.*—Cup, small, conical sub-pentagonal; proboscis, enormously large in proportion to the size of the cup; column, pentagonal with raised edges along the five angles, and with concave faces between, composed of very thin joints, twenty-four in the length of two lines; the arms are thin and sharp on the back. In a specimen, the crushed cup of which is three lines in length, there is a proboscis attached, sixteen lines in length; the portion seen is of a very remarkable structure; it is composed of four vertical rows of small plates, with a strong central keel running up each row, from either side of which projects, nearly at right angles, a pair of short ridges to the outer side of each plate, giving to the surface the appearance of several small rope ladders side by side, as in the rigging of a ship. This peculiar style of ornament is well shewn in the figures of *D. longiductylus*, (Hall) Pal. N. Y., vol. 2, fig 7 a, plate 42, but the pattern is somewhat different; in that species the transverse ridges diverge from each other at an angle of about 45 degrees, but in this the divergence is only about 20°, producing to the eye a very different effect.

*Locality and Formation.*—Upper part of the Trenton limestone, near the Toll-gate, St. Lawrence Street, Montreal.

#### DENDROCRINUS SIMILIS.

*Description.*—Cup, small, conical and sub-pentagonal; arms, long, three or four times sub-divided, rather broadly rounded

on the back, and comparatively stouter than those of any of the above described species. Of the two arms preserved in the specimen examined, one remains single for a distance of two lines and a-half, and then divides; there are five joints in the undivided part; the other arm shews but two joints in the part below the first bifurcation. The column for seven lines below the pelvis is pentagonal, with round edges and slightly concave faces; it is composed of alternately thick and thin joints, nine of each in the space of two lines, diameter of column nearly one line; length of arms sixteen lines, and the diameter at the undivided part nearly a line on the back.

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

The three last species appear at first sight to be identical, but the moment a magnifying glass is brought to bear upon them, their differences become quite as apparent as those of the large species. In *D. acutidactylus* the arms are exceedingly thin and sharp on the back above the first division like the edge of a knife, and the column is circular and composed of round edged joints, which at the distance of one-half or three-fourths of an inch become nearly globular. In *D. proboscidiatus* the column at the base of the cup is pentagonal with the angles so strongly projecting, and the faces so concave that a single joint has the form of a five-rayed star; the arms, judging from the fragments seen, were very similar to those in *D. acutidactylus*.

In *D. similis* the column is only different from that of *D. proboscidiatus* by the unequal thickness of the joints, and in being more regularly pentagonal; its faces are only slightly concave, its arms also are five times thicker.

#### DENDROCRINUS CONJUGANS.

*Description.*—In this species the column about one inch below the pelvis, is round, smooth, and from half to two-thirds of a line in diameter; proceeding upwards it rapidly enlarges to two or three lines, at the base of the cup, which is small, and not much broader at the margin where the arms become free, than it is at the bottom; the pelvic plates are low and broad.

the sub-radials twice as high, and the arm-bearing plates rather more than two thirds the length of these latter; the arms are half the breadth of the plates on which they stand, and broadly rounded on the back; they all divide at the height of about three lines, and again at the same distance above; there are three or four joints in each of the undivided portions. The ray on the left-hand side of the base of the proboscis, which in the generic description is said to have two of its plates included in the cup, in this species has the second plate free, with the exception that it is united on one side to the plates of the proboscis; it is however nearly as broad as the first radial plate upon which it stands, and one-third wider than the first free joint of the arm which rests upon it. This character connects *Dendrocrinus* with *Cyathocrinus*, in which the second joint of the ray in question is entirely free. The column as before mentioned is circular, broad at the base of the cup, and rapidly diminishing in size for a short distance below; it is in this part smooth, but farther down enlarges again, and is composed of thick round-edged compressed spheroidal joints very similar to those of *Heterocrinus simplex*. In one perfect specimen the height of the cup is three lines, the diameter at base two lines and a-half, and at the margin three lines and a-half; length of the arms to first division three lines and a-half, to second division six lines, width of arm to second free joint one line, and of the proboscis the same. In another individual this organ is wider than the arm; in a third specimen the arms divide at the fifth joint, but in every other respect it is the same as this species, although slightly more slender.

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

#### DENDROCRINUS ANGULATUS.

*Description.*—In this beautiful little crinoid the plates are ornamented with radiating ridges similar to those of *Glyptocrinus decadalactylus*. The cup is small, conical and pentagonal; from the centre of each of the rather large sub-radial plates, there proceed six strongly elevated ridges; one to the base of

each of the arms, one to each of the pelvic plates, and one to each of the adjoining sub-radials. The arms are very slender, sharp on the back, and at least twice divided; the three joints of the column which remain attached to the specimen are pentagonal. Length of cup three lines, breadth at the margin four lines, diameter of column nearly one line.

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

#### DENDROCRINUS HUMILIS.

*Description.*—Cup small, conical; arms, nearly as broad as the first primary radials, divided at the fourth or fifth joints, and again above; the pelvic plates are small, their height about equal to their width, the sub-radials three times larger than the pelvic plates; the first primary radials are low and broad; column, unknown; height of cup, two and a-half lines, breadth at the margin, the same.

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

#### DENDROCRINUS LATIBRACHIATUS.

*Description.*—This species is most closely related to *D. humilis*, the only difference being in the greater breadth and length of the arms, which at the base are quite as wide as the first primary radials, and become a little broader above, whereas in the other species they become narrower from the base upwards. The bottom of the cup is more rounded than in *D. humilis*, and as the columns of both are unknown and as they occur in different formations, they cannot be easily identified at present; the arms are three times divided; length of cup, three lines and a half; of the arms, ten lines.

*Locality and Formation.*—Hudson River group, Charleton Point, Anticosti.

#### DENDROCRINUS RUSTICUS.

*Description.*—The base of the cup in this species is broad, like that of *D. conjugans*; the pelvic plates about as high as

they are wide, the sub-radials one-third higher than the pelvic plates; the arm-plates a little shorter than the sub-radials, and broader than high; the interrarial is about the size of one of the pelvic plates, and bears three or four small plates upon its summit; the column is round at its junction with the pelvic plates, and composed of thin plates, but one line and a-half below it becomes pentagonal, with raised rounded edges and concave faces; at the distance of two inches below the pelvis there are about three joints of equal thickness to one line in breadth; the arms appear to have been short; breadth of cup, two lines and a-half in one specimen and three lines in another; height of latter to the top of the interrarial, four lines and a-half; the whole surface is smooth. The specimens examined are imperfect, but to each there are about three inches of the column attached.

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

### *Genus* HETEROCRINUS, (Hall.)

*Generic Characters.*—The species of this genus are small, and including the arms long and nearly cylindrical crinoids. The pelvis is composed of five small plates, alternating above which are five elongated rays, composed of a variable number of joints. They divide immediately on becoming free, and are pinnulated, but as they are nearly always found closed up, specimens in which the pinnulæ can be seen are rare. Hence the genus was originally defined as being without these.

The new species here described have also an interrarial plate between two of the rays.

### HETEROCRINUS SIMPLEX, (Hall.)

*Description.*—Sub-cylindrical or elongated fusiform, length including the rays from one to two inches, diameter at half the length from three to four lines. The base of the pelvis in the large specimens is about one line and a-half in diameter, and the body gradually enlarges to about three lines at that point

where the rays divide. The diameter above is always greater, the extent depending upon the amount of expansion of the rays in the particular specimen examined. The pelvic plates are scarcely a line in height, the length of the undivided portions of the rays in the large individuals is about three lines. The ray on the right side of the interrarial plates consists of three joints, the first equal in length to the other two, and with one of its angles truncated where it is in contact with the interrarial. The ray on the left side of the interrarial has four joints, the second being the longest, and having one of its angles truncated to support the interrarials.

The other three appear to consist each of four equal joints. The upper joint of each ray is pentagonal, and supports two secondary rays, which continue single to their extremities. The interrarial is oblong, higher than wide, five-sided, two of the sides meeting to form an obtusely pointed lower extremity, which rests wedge-like between the truncated angles of the first joint of the ray upon the left, and the second joint of the ray on the right; its upper side is horizontal and supports another plate which is probably the base of a proboscis. The secondary rays, ten in number, consist each of a series of oblong quadrangular joints usually one line in length and two-thirds of a line in breadth.

There is a row of long pinnulæ upon each of the inner margins of each ray, they rise upwards nearly parallel with the rays instead of projecting at nearly right angles as in other species. The column is round and smooth at the base of the pelvis, below which it tapers and becomes very slender at the distance of one or two inches, then slightly larger and composed of compressed globular joints, the rounded edges of which to the eye present a bead-like appearance. The longest column seen with the head attached was fifteen inches, and as it was broken off below, it had been probably several inches longer. The diameter is usually somewhat less than a line, and there are about seven joints of equal size to two lines in length. The smooth slender upper portion of the column near the base of the cup is generally half a-line or a little more in diameter, expanding to twice or three times this size at the pelvis.



*Locality and Formation.*—Trenton limestone, Ottawa and Montreal.

I had drawn up the description of our Canadian specimens as above, under the impression that they were of a species different from that of the Hudson River Group. But having since seen Professor Hall's collection, I now believe that ours are identical. The original specimen figured in the Palæontology of New York is imperfect, and consequently it was described without noticing the interrarial, and also as having a pentagonal column. The species is abundant in the Trenton limestone in Canada, and therefore it is thought advisable to publish the above description, which contains a more full account of its characters. Should, however, it hereafter be found that ours is different from the Hudson River species, I beg that it may be called *H. Canadensis*, the name I had given to it previous to examining Professor Hall's specimens.

#### HETEROCRINUS TENUIS.

*Description.*—Much smaller than *H. simplex*; arms long, very slender, and several times divided; column very obscurely pentagonal, composed of sub-globular joints; proboscis extending nearly to the apices of the arms; length, including the arms, from ten to sixteen lines; without the arms, one and a-half to two and a-half lines; diameter at base of arms, about two lines; of column, at base of pelvis, half-a-line.

It is not certain that this species should be referred to the genus *Heterocrinus*. The plates of all the specimens in the collection are so closely united that their number and arrangement cannot be satisfactorily made out. The weight of the evidence is in favor of the genus under which I have placed it. The species, when several times attentively examined, is easily distinguished from *H. simplex*. In that species the column, for a short distance below the cup, is smooth and slender, and it enlarges suddenly from a few lines below, until it forms rather a broad base for the pelvis to stand upon. But in *H. tenuis* the column continues moniliform to the base of the cup and without enlarging, but on the contrary is rather

less in diameter at the point of contact than it is below. In one specimen there are forty-two joints in the first nine lines from the pelvis, and some irregularities in the size can be seen. They are thinner near the cup, and gradually become thicker, so that at two inches from the pelvis there are only sixteen in half-an-inch. The arms, although much more slender than those of *H. simplex*, usually lie folded together, or but slightly separated.

*Locality and Formation.*—Trenton limestone, Ottawa and Montreal.

### *Genus* HYBOCRINUS, (new genus.)

*Generic Characters.*—Cup pyriform, or sub-globular, more protuberant upon one side than on the other; pelvic plates five, pentagonal, alternating above which are five large plates, four bearing free arms, and the fifth supporting upon its upper sloping sides two plates, one of which is an interrarial, the other an arm-plate supporting the fifth free ray. The columns of the two species known are round and short. The generic name is from the Greek *hubos*, hump-backed.

### HYBOCRINUS CONICUS.

*Description.*—In this species the cup is conical, with slightly ventricose sides; the base narrow, and the arms long and undivided; plates smooth; height of cup thirteen lines from the base of the pelvis on the large side to the upper margin of the interrarial; height of the opposite side nine lines; length of the arms three inches; the pelvic plates occupy more than one-half the height on the large side, and about one-half on the others; the arms are one line and a-half in width, and broadly rounded on the back; composed of a single series of joints, each one line in length; on their insides the ambulacral grooves are margined by rows of small plates resembling those upon the arms of some of the Cystidea (*Pleurocystites*), about five of those plates to one joint of the arm. The column is round and smooth, consisting of very thin joints, ten to one line.

The mode of attachment to the bottom was by a broad button-shaped base. Length of column in the largest specimen seen, one and three-quarter inches.

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

#### HYBOCRINUS TUMIDUS.

*Description.*—Smaller than *H. conicus*, sub-globular, the plates tumid in their centres; column, slender and round, composed of thin joints, and tapering towards the base; surface of the plates, obscurely granular; length of cup, six lines; breadth at margin, about eight lines; arms, one line broad upon the back, composed of joints one line in length. Although about twenty heads of this species have been collected, none of them are quite perfect, but they all are smaller and of a different form from *H. conicus*.

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

#### Genus CARABOCRINUS (new genus).

*Generic Characters.*—Cup, globular; pelvic plates, five, four of them pentagonal, and the fifth hexagonal; sub-radials, five, four large, hexagonal, and one small and pentagonal. The series of sub-radials is divided on one side by a large inter-radial, which is supported upon the hexagonal pelvic plate. The arm-plates or first primary radials are also five, and of these, three alternate regularly above four of the sub-radials; the fourth rests partly upon one of the sub-radials and partly upon the large interradial of the second series; the fifth is supported in part by the heptagonal sub-radial, and partly by a plate which stands upon the small pentagonal sub-radial; the fourth and fifth arm-plates are separated by a second inter-radial, supported by that which stands upon the hexagonal pelvic plates.

Upon the summit five calycinal ambulacral grooves radiate from the centre (where there appears to be an aperture) to the bases of the arms; the mouth is situated in the margin over the interradial plates; there is a small aperture, surrounded by an elevated border half-way between the mouth and the centre.

This genus is distinguished from *Cyathocrinus* and *Poteriocrinus* by the depth to which its interrarial plates descend. In the genera cited they are always situated above the sub-radials, but in *Carabocrinus* one of them stands upon one of the pelvic plates. I refer all the specimens to one species. The generic name is from the Greek *karabos*, a crab.

#### CARABOCRINUS RADIATUS.

*Description.*—Cup, globose, rather broader at the margin than it is high; base, broadly rounded, covered with strong rounded ridges which radiate from the centres of the plates; arms, short, three times divided; column, round and slender, composed of alternately projecting thin joints. From the centre of each sub-radial plate two principal ridges ascend diagonally to the bases of the two arms on both sides; two others radiate to the centres of the two sub-radials on either side, and thus a series of triangles is formed round the upper half of the cup. In a similar manner ridges extend from the centres of the sub-radials to the centres of the pelvic plates, thus constituting another set of triangles in the lower half. Within each triangle, both in the upper and lower halves, are contained two or three smaller triangles, one within the other. In consequence of this arrangement, the ridges appear to radiate in groups of three or four.

Each arm-plate supports in its centre a small but stout pentagonal second radial plate, from the upper sloping edges of which spring two short round arms, which divide again at the second joint; these branches are again divided once or twice above. Height of the largest specimen, one inch; diameter at half the height, fourteen lines. Specimens are in the collection of all sizes, from three lines to twelve in diameter.

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

#### Genus CLEIOCRINUS, (new genus.)

*Generic Characters.*—Cup, large, conical or pyriform; pelvic plates, five; rays, five, alternating with the pelvic plates; the

third plate of each ray is pentagonal and bears two secondary rays, which are several times divided above. Between two of the rays a single vertical series of interrarial plates extends from the pelvis to the margin of the cup. The interradians and rays are all firmly anchylosed together by their lateral margins up to the height of the fifth or sixth sub-division. The column is pentagonal in the species known.

This genus has the structure of a *Pentacrinus*, with numerously divided arms all soldered together in the walls of the cup.

#### CLEIOCRINUS REGIUS.

*Description.*—Cup, elongate, conical, gradually expanding from the base until near the top, where it is slightly contracted. The margin supports about forty long, very slender, tentaculated free rays. At first sight there appear to be ten small pelvic plates, but upon examination five of these are found to be the first plates of the five rays which rest immediately upon the upper joint of the column; the other five are the true pelvic plates; four of them are pentagonal, and the fifth, which supports the column of interradians, is nearly square; height of each pelvic plate, one line; breadth, the same; the small radial plates which rest on the column between the pelvic plates are a little broader than these latter, but not so high; the column is pentagonal, and the pelvic plates are placed upon the angles of the upper joints, while the bases of the rays are situated upon the straight edges; there are about two joints of the column to one line, and they are alternately thicker and thinner; the column near the lower extremity becomes round and suddenly expands into a broad base of attachment.

The surface of the cup is nearly smooth, only varied by obscure vertical rounded ridges along the centres of the rays and of their sub-divisions.

Length of cup, one inch and three-fourths; breadth near the margin, about one inch; diameter of column, from two to four lines. Nearly all the large pentagonal columns in the Trenton limestone at the City of Ottawa belong to this species.

*Locality.*—Trenton limestone, Ottawa.

*Genus* LECANOCRINUS.

*Generic Characters.*—In this genus there are three pelvic plates, one of them pentagonal and the other two hexagonal; in the second series there are five sub-radial plates, two of which are supported by the two hexagonal pelvic plates, while the other three alternate with these latter. Alternating above the sub-radials are five primary rays of three joints each, and above these, ten secondary rays; some of the species have several small interrarial plates in one or more of the divisions between the primary rays.

## LECANOCRINUS ELEGANS.

*Description.*—Cup, small, conical, three lines in height from the base of the pelvis to the upper margin of the first primary radial plate, at which level the breadth is also about three lines; the breadth of the pelvis is one line and a-half, and the top of the column scarcely less; the first primary radials are a little broader than high, and rendered slightly heptagonal by the truncation of their upper lateral angles; the second primary radials are narrower and quadrangular, or obscurely hexagonal; the third are pentagonal; the length of each is about a line and a-half; the third in each of the three rays exposed in the only specimen seen, supports two secondary rays of five joints each, and then divides into two tertiary rays; these latter are again divided; the rays above the fourth division are articulated in two series; between the primary rays are several small interradians. The column is circular, with round-edged joints, from four to six in one line; length of ray from the base of first primary radial to the extremities, one inch and one-fourth.

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

## LECANOCRINUS LÆVIS.

*Description.*—This species is shorter than the preceding, and has only four joints instead of five in the secondary rays; the upper part of the column is round and smooth. In other respects there is much resemblance between the two, but still I think them distinct.

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

*Genus POROCRINUS, (new genus.)*

*Generic Characters.*—Cup composed of three series of plates, with one or more small interradians on one side, and with a number of poriferous areas similar to the pectinated rhombs of the Cystidea.

In this genus there are five pelvic plates, five sub-radials, and five first primary radials alternating with each other. as in *Poteriocrinus*, *Cyathocrinus*, and other allied genera. The principal new character upon which the genus is founded consists in the presence of poriferous areas.

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

## POROCRINUS CONICUS.

*Description.*—Cup, one line and a-half in diameter at the base, and gradually enlarging, with slightly ventricose sides, to the width of five lines at the margin ; height, seven lines ; pelvic plates narrow, nearly two lines high ; sub-radials, three lines in height ; first primary radials, about two lines and a-half in height and breadth ; all the plates smooth ; column, circular, smooth, and suddenly enlarged near and up to the base of the cup, composed of very thin joints ; free rays, long, slender and single to their extremities ; they are about half-a-line in thickness, and appear to be composed of a single series of joints. Only about one inch in length of the column next the base has been seen.

In this species there exists a number of poriferous areas resembling the pectinated rhombs of the Cystidea in their structure, and probably adapted to the performance of the same functions. Their forms and position are however somewhat different from those of any known cystidean. In fossils of the latter order these organs consist of two parts, one situated upon each of two contiguous plates, but in this crinoid, each is so placed that it occupies the angles of three plates. Their form is that of an equilateral spherical triangle, and their size about one line in diameter. There are five situated at the apices of the five pelvic plates, five at the lower angles of the arm-plates, five at the apices of the sub-radials

and five between the arm-plates on the margin of the cup. There are also two or three small ones at the angles of the interradians, in all twenty-two or twenty-three. The pores consist of fine elongated parallel slits, which appear to penetrate through the plates; they are not at right angles to the margin of the plates as in the *Cystideæ*, but oblique.

The central pore of each division divides the angle into two equal portions, and all the other pores upon the plate are parallel to this central one; consequently in each area they have three directions at which they are at right angles to the sides of the triangular space in which they are situated, but oblique with respect to the margins of the plates.

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

valvular apparatus; in the summit a small oral orifice from which radiate several calycinal ambulacral grooves which are continued upon the arms; more than three pectinated rhombs; column short and tapering to a point at its lower extremity.

This genus is so closely allied to *Echino-encrinites* that I have had much doubt as to the propriety of retaining it. The principal differences are, that while the European genus has an oval or sub-globular body, and only three pectinated rhombs, *Glyptocystites* has an elongated cylindrical body covered with rhombs, some of them of a large size. The genus was proposed and published by me in the *Canadian Journal* in 1854, as *G. multiporus*, the only species then known, which, on account of the arms extending down the sides to the base, the great number of the rhombs, and the somewhat irregular arrangement of the plates, appeared to be well separated from *Echino-encrinites*.



## GLYPTOCYSTITES MULTIPORUS.

(*G. multipora*,—*Canadian Journal*, vol. 2, p. 215.)

*Description*.—One inch in length, five lines in diameter, cylindrical, obscurely five-sided, round at the apex, abruptly truncated at the base; ovarian aperture large, oval; without valves; arms five, four of them extending down the sides to the base, the fifth two or three lines in length; thirteen pectinated rhombs; column short, tapering to a point, composed of alternately wide and narrow joints, the former projecting and striated upon their external edges.

In this species the basal and second series of plates are pretty regular, but the third series contains two plates which are very small in proportion to the others, an irregularity compensated by a corresponding enlargement of two of the plates of the fourth series. The whole of the upper half of the test, in consequence of this disproportion in the size of these plates presents very little of order in its structure, and cannot be very well described without the aid of figures.

The distribution of the pectinated rhombs is as follows:—

If we regard the side containing the ovarian aperture as the posterior aspect of the fossil, then the side opposite would be anterior, and the spaces between, the right and left sides.

On the posterior side there are two rhombs, a small one situated just below the ovarian aperture towards the side, and a large one above, which extends from the ovarian aperture nearly to the apex.

On the left side there are two: a small one near the apex, and a large one below but nearly altogether in the upper half of the fossil.

On the anterior side there are four, two at the base, one half of each being on the basal plate of this side, and the other half on the contiguous plate of the second series; a third very small rhomb is situated between the two small plates of the third series, and a fourth very large one divided between the two large plates of the fourth series.

On the right side there are five, a large one next the ovarian aperture, and at its upper angle another which extends across

the side sloping a little downwards, with a third which rises nearly perpendicularly from the anterior angle of the second one; below these there is a half-rhomb, and above the large one first mentioned in this division a very small rhomb only seen in perfect specimens.

In the centre of the apex there is a small aperture, from which a narrow calycinal ambulacral groove extends in each direction towards the anterior and posterior sides for about one line, and then branches into the four arms which continue down to the base; it also sends down a short branch two or three lines into the right side, thus forming the fifth or short arm. These grooves in the perfect specimens are bordered on the apex and for a short distance down the sides, by minute marginal plates which interlock and close the grooves entirely. In the original description given in the *Canadian Journal*, I described these as constituting a valvular apparatus closing the mouth, but I now think them to be simply the marginal plates of the ambulacral grooves of the arms. On the left side there is situated a minute pore in the centre of a small protuberance near the apex.

The long arms were provided with small slender pinnulæ, six or seven on each side.

*Locality and Formation.*—This species has been found in the Trenton limestone at Ottawa, Montreal and Beauport.

#### GLYPTOCYSTITES LOGANI.

*Description.*—Length of large specimens one inch and a-fourth; diameter eight lines; cylindrical, obscurely five-sided, abruptly truncated at the summit; base slightly rounded; each plate ornamented with from three to seven exceedingly elevated, somewhat thin, sharp ridges, which radiate from the centre to the sides; spaces between the ridges smooth or very minutely striated; calycinal ambulacral grooves, extending only to the angles of the truncated apex, bordered by marginal plates and furnished near their extremities each with several small free arms or stout pinnulæ articulated in two series; there are about twelve or fifteen conspicuous pectinated rhombs.

The ovarian aperture has not yet been observed; the column is short, strongly annulated and tapering to a point at its lower extremities. It is both pentagonal and circular, and presents a very remarkable character in the fact that the angles of the pentagonal joints form five spiral lines round the column throughout its length. The large joints which constitute the annulations of the column are the circular ones, and those between, the pentagonal.

The detached plates of this magnificent species can be readily distinguished from those of any other crinoid or cystidean of the Trenton limestone by the peculiar star-like appearance produced by the very elevated sharp, and thin radiating ridges with which their surfaces are ornamented. Although a number of the bodies, many of them with the column attached, have been collected, yet none of them show clearly that side in which the ovarian aperture is situated. The plates are more regularly alternating than in *G. multiporus*. This species cannot be identified with the *Echino-encrinites anatinaformis*, figured by Professor Hall on plate 29, vol. 1, Pal. of New York. By referring to that work it will be seen that all the plates of that species are strongly striated with radiating ridges, (see the two figures 4 d and also 4 f,) while in our species they are quite smooth, or only marked with very minute lines; and these, when they can be seen, are in a direction at right angles to that of the striæ upon the New York specimens. Professor Hall's figures do not exhibit any pectinated rhombs, and further, by figure 4 c., it is shown that the base of *E. anatinaformis* is composed of two pentagonal and two quadrangular plates; ours has three pentagonal and one hexagonal basal plate.

*Locality and Formation.*—Trenton limestone, Island of Montreal; plates in an excellent state of preservation are very abundant in the upper part of the formation. I beg to dedicate this species to the discoverer.

#### GLYPTOCYSTITES FORBESI.

*Description.*—The body of this species, judging from the fragments in the collection, is about two inches in length and

three-fourths of an inch in diameter. The character of its surface is such that detached plates may be distinguished at a glance from those of either of the two preceding species, being larger, thicker and more profusely ornamented. When perfect, these plates are somewhat convex, and covered with radiating ridges which are crossed at right angles by coarse striæ. There is usually one strong ridge extending from each side of the plate to the centre, and several shorter ones parallel with these. Those of the latter class which are nearest the larger ridges are the longest, and the others decrease in length in proportion as they are distant from it. From each angle of the plates there is a small sharp ridge extending to the centre. The transverse striæ run parallel with the margins of the plates. The large ridges are sharp edged but broad at their bases. There are usually seven or eight of the transverse striæ to one line; some of the largest plates are eight lines in length, and nearly as much in breadth, showing that the perfect specimens were about two inches long.

One specimen consisting of the column and a part of the basal and second series of plates, shows the remains of the pectinated rhombs at the base of the anterior side, characteristic of this genus. The portions of the rhombs shown by the detached plates indicate that the pores were much shorter in proportion to the size of the plates than in *G. multiporus* and *G. Logani*. The column is antulated, about two inches long, and tapering to a point. This cystidean being from the Chazy limestone, is the most ancient species known on this continent. I beg to dedicate it to the late accomplished naturalist, Professor Edward Forbes.

*Locality and Formation.*—Chazy limestone, Caughnawaga.

#### Genus PLEUROCYSTITES.

(*Canadian Journal*, vol. 2, page 250.)

*Generic Characters.*—Body oval, flat, one side covered with large polygonal plates, the other almost entirely occupied by an enormous opening covered only by an integument of numerous small plates; arms free, two in number, articulated in

two series; one small aperture near the apex, above the large opening, and another at the base near the column.

The following is the arrangement of the plates as described in the Canadian Journal above cited :—" On the upper joint of the column rest four pelvic plates; two of these are pentagonal and spread away from each other in the form of the capital letter Y, and in the angle thus formed is placed the large central hexagonal plate of the second series; the two other pelvic plates are situated one on each side, and partly under the former; they do not unite on the other side and form the cup-shaped pelvis of the ordinary cystideæ, but spread out wing-like from the sides of the column. Each sends out a slender projection at the bottom, which clasps around or rests upon the upper joints. Outside of these again are two other small plates, one upon each wing, making in all six in the basal series." In the second range there are three large plates, one in the centre, hexagonal, with an heptagonal plate on each side. "The third series contains four large plates, elongated vertically; one of these on the right hand of the centre, pentagonal, the other on the left, hexagonal. They are narrowed above to correspond with the decreasing dimensions of the body, which here begins to contract. The other two plates of this row are either heptagonal or slightly octagonal, and at their upper extremities they fold round the body and unite on the other side by narrow projections, which arch over the great oval opening. Above these there are ten smaller plates, which close the summit and form a solid support for the arms.

The column is short and tapers to a point at the lower extremity. There are three pectinated rhombs; one of these is at the base, situated one-half on one of the pelvic plates, and the other half on the large central hexagonal plate of the second series; the other two are situated one on the left pair of plates of the third series, and the other on the right.

The following appear to me to be distinct, but when more becomes known of this extraordinary genus it may be necessary to unite them all into one variable species.

## PLEUROCYSTITES SQUAMOSUS.

*Description.*—In this species the large plates are smooth, and the great opening on the anterior side protected by an integument composed of a vast number of small mostly hexagonal plates, each less than the fiftieth part of an inch in size; the rhombs are small and somewhat elliptical, the larger axes of the two above being transverse to the length of the fossil; column annulated, the edges of the projecting rings striated vertically; in a specimen with a body thirteen lines in length, the left upper rhomb has a major axis of three lines, and a vertical axis of two lines in length. The rhomb on the right is two lines long and one and a-half broad; the basal rhomb about the same size; they are all slightly elevated above the general surface and flat. The pores extend completely across from one side to the other.

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

## PLEUROCYSTITES FILITEXTUS.

(*Canadian Journal*, vol. 2, page 252, 1854.)

*Description.*—Plates with strong ridges radiating from the centre to the angles, with smaller ones from the centre to the edges; all these are crossed by other striæ parallel to the margin of the plates, which are also in some specimens slightly granular, with small irregular tubercles. The rhombs are large, with straight sides and sharp angles; the greater diagonals extend up and down the fossil instead of across the body, as in the last species. The integument consists of about forty or fifty irregularly polygonal plates. Length of the left superior rhomb in a specimen fourteen lines long, five lines; of the right rhomb three lines.

This species is distinguished from the former by the great size of the rhombs, the striation of the surface, and also by the large plates of the tegumentary covering of the great opening in the ventral aspect.

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

## PLEUROCYSTITES ROBUSTUS.

(*Canadian Journal*, vol. 2, page 252, 1854.)

*Description.*—In this species the rhombs are obscurely elliptical, or rather in the shape of a spherical triangle, one side crossing the suture above, and one of the angles being upon it below; they are surrounded by an elevated border and have a concave surface, instead of being plane as in the two above described species. The plates are ornamented with fine rounded striæ at right angles to the margins, and crossed by a few obscure concentric ridges. The only specimen collected consists of the upper part of the body.

Length of the upper left rhomb, three lines and a-half; breadth in the vertical direction, three lines; the right rhomb is somewhat smaller.

*Locality and Formation.*—Trenton limestone, Ottawa.

## PLEUROCYSTITES ELEGANS.

*Description.*—This species much resembles *P. filitextus*, but may be readily distinguished by the rhombs being shorter, and by the much stronger striation over its whole surface.

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

## PLEUROCYSTITES EXORNATUS.

*Description.*—Rhombs, sub-triangular, much elevated above the surface, surrounded by a sharp border; surface profusely ornamented with strong radiating ridges; column beautifully striated longitudinally; the plates of the ventral integument are about the size of those *P. filitextus*; the shape of the rhombs of this species is like that of *P. robustus*, except that the pores form a flat instead of a concave surface.

*Locality and Formation.*—Lower part of the Trenton limestone, Montreal.

## PLEUROCYSTITES ANTICOSTENSIS.

*Description*.—Rhombs very long and narrow; column with the annulations so coarsely striated that they appear to be nodulose. Only a fragment, consisting of a portion of the column and the lower part of the body of this species, has been collected; in a specimen which measures seven lines from the base of the body to the upper angle of the large hexagonal plate, the length of the right superior rhomb is five lines, and its breadth one line.

*Locality and Formation*.—Charleton Point, Anticosti, in the Hudson River Group.

## Genus COMAROCYSTITES.

(*Canadian Journal*, vol. 2, page 227.)

*Generic characters*.—Ovate, the smaller extremity being the base; pelvis small, of three plates, above which are from eight to eleven irregular rows of plates, mostly hexagonal; ovarian aperture near the summit, closed by a valvular apparatus; arms free, and composed of a single series of joints bearing pinnulæ; column round.

## COMAROCYSTITES PUNCTATUS.

(*Canadian Journal*, vol. 2, page 270.)

*Description*.—Plates depressed or concave in the centre and covered with small oblong punctuations; ovarian aperture near the summit, closed by five triangular plates; arms four, each composed of a single series of joints bearing pinnulæ; column round, of thin plates. Length of large specimen one inch and a-half, of arms about two inches.

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

## Genus AMYGDALOCYSTITES.

(*Canadian Journal*, vol. 2, page 270.)

*Generic characters*.—Body ovate or sub-globular; pelvis of three plates, above which are eight or more irregular rows of



plates completing the cup ; ovarian aperture near the summit, closed by a valvular apparatus ; arms composed of a double row of joints crossing the summit and articulated to the surface ; each joint bears a pinnula ; column round.

*Comarocystites* differs from this genus by the presence of free arms like those of a crinoid.

#### AMYGDALOCYSTITES FLOREALIS.

(*Canadian Journal*, vol. 2, page 271.)

*Description*.—Each of the plates of this species has a low rounded tubercle situated in the centre, from which ridges radiate to the angles ; these ridges are scarcely elevated above the surface where they leave the border of the tubercle in the centre, but increase in width and height as they depart from it ; they are sharp edged and attain their greatest height at the angles of the plates. The arm crosses the summit and extends nearly to the base upon one side, and only two or three lines from the apex on the other ; the ovarian aperture is situated close to the arm on one side of the summit ; the column is round. The body is ovate, rounded at the apex, and tapering below to the base ; length of body one inch. This species forms a link between *Sphaeronites* and *Pseudocrinites* ; it has the test composed of a great number of plates like the former genus, and the arms and pinnulæ of the latter.

#### AMYGDALOCYSTITES RADIATUS.

(*Canadian Journal*, vol. 2, page 271.)

*Description*.—Plates somewhat convex and ornamented with strong ridges which radiate from the centres to the angles ; column round ; the body is ovate ; ovarian aperture and arms unknown.

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

#### AMYGDALOCYSTITES TENUISTRIATUS.

(*Canadian Journal*, vol. 2, page 271.)

*Description*.—Body elongate, ovate ; plates smooth in the centre ; a low rounded ridge proceeds from the smooth space in

the centre to each of the angles, where it meets the similar ridges, which radiate from the centre of the adjoining plates; between these ridges fine striæ cross the sutures at right angles; the pelvis consists of three broad pentagonal plates; the ovarian aperture is nearly on the top of the summit; length of body  $1\frac{1}{2}$  inch.

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

### *Order ASTERIADÆ.*

The species of Star-fishes in the collection appear to be referable to the genera proposed by Mr. Salter at the meeting of the British Association, in August last; I have seen no other description of these genera than that given in Silliman's Journal of November, 1856, which is as follows:—

PALÆASTER.—Without disc, avenues deep.

PALÆASTERINA.—Pentagonal, disc moderate.

PALÆOCOMA.—No disc, avenues very shallow.

It is probable that our species, when opportunity can be had for a direct comparison with British specimens, will be found congeneric. The following is the arrangement I propose for the present:—

#### PALÆASTERINA STELLATA.

*Description.*—Pentagonal; disc extending half the length of the rays; ambulacral grooves narrow and deep, bordered on each side by a row of small nearly square plates which extends to the ends of the rays; a second row outside of these extends nearly to the end; the remaining space in the angles between the rays outside of the two rows of marginal plates, is filled with numerous smaller plates. Length of rays measured along the ambulacral grooves, three lines; number of marginal plates on each side of groove, sixteen; the rays terminate in a round point and rapidly enlarge, so that at one-half their length their breadth is one and a-half lines; the angles between the rays are broadly rounded.

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

## PALÆASTERINA RIGIDUS.

*Description*.—This species has much the aspect of an *Astropecten*; the diameter is scarcely two inches, the width of the disc being half-an inch, and of the rays at their base about three lines; the grooves are deep and margined by two rows of quadrate somewhat convex plates, the outer row forming a continuous curved margin in the angles between the rays.

In the disc there is a V shaped assemblage of smaller plates between the two marginal rows; there are seven plates to two lines in length of the ambulacral row, and five in the same distance of the outer row at the base of the ray; towards the extremities they become smaller; there are five rays.

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

## PALÆASTERINA RUGOSUS.

*Description*.—Two inches in diameter, rays five, acute at their apices and rapidly enlarging to a breadth of four lines at the disc, which is eight lines in width. The specimen shews the upper side of the fossil only; some of the plates are absent from the centre of the disc, but those which remain are very prominent in their centres and roughly ornamented by four or five deep crenulations or furrows from near the centre to the edges, producing a star-like appearance resembling a half-worn plate of *Glyptocrinus decadactylus*; their diameter is from one to two lines.

The rays are composed (at least the backs and sides of them) of four rows of plates which are so very prominent that they appear to be almost globular, and even pointed in their centres, the central rows are the smallest; the first four plates of the outer row occupy three lines in length, and of the inner rows nearly as much. Towards the point of the arm all diminish rapidly in size.

Beneath the outer rows two others can be seen which are probably the outer marginal plates of the under side, corresponding to those of *P. rigidus*.

*Locality and Formation*.—Hudson River Group. Charleton Point, Anticosti. Collected by J. Richardson.

## PALÆASTER PULCHELLUS.

*Description.*—Diameter two inches and one-fourth; rays sub-cylindrical, two and a-half lines in width at the base, with a length of one inch; disc three and a-half lines in diameter; grooves narrow, bordered throughout by narrow oblong plates, nine in the length of two lines; the length of these plates in a direction transverse to the rays is about one line; near the disc there appears to be but one row of marginal plates.

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

## PALÆOCOMA SPINOSA.

*Description.*—About seven lines in diameter; rays five, linear-lanceolate; one line in width at base, flexible, covered with numerous small spines; no disc.

*Locality and Formation.*—Trenton limestone. Falls of Montmorency.

## PALÆOCOMA CYLINDRICA.

*Description.*—One inch and a-half in diameter; rays five, covered with spines, sub-cylindrical, regularly rounded on the upper side, flattened on the lower, about one line in width at base, and regularly tapering to an acute point.

This species and the preceding appear to be somewhat common; most of the specimens have their rays variously curved, shewing that they were extremely flexible.

*Locality and Formation.*—Trenton limestone. Ottawa.

## Genus CYCLASTER.

*Generic characters.*—Body sessile, circular, discoid, covered with numerous irregularly polygonal plates; mouth large, sub-pentagonal; five ambulacral areas, each composed of two series of oblong plates, and having two rows of large pores which penetrate to the interior.

This genus was discovered about thirty years ago, by Dr. Bigsby, in the Trenton limestone, at the Chaudière Falls, in the vicinity of the present City of Ottawa; the specimen then procured was described and figured without a name, by Mr.

G. B. Sowerby, in the second volume of Zoological Journal, in 1847. Another species was discovered by Mr. Gibbs, of the Geological Survey of England, near Ysptty Evan, in North Wales, in a mass of schistose rocks, in a quarry associated with the Bala limestone; in 1848, Professor E. Forbes described this latter species in the Memoirs of the Geological Survey of Great Britain, in his magnificent paper on the Cystidea. He placed it in Vanuxem's genus, *Agelacrinites*, with specific name of *Buchianus*.

In 1853, while collecting fossils at Ottawa, I found several specimens of Dr. Bigsby's species, and ascertained that the rays supposed to be grooves for the reception of arms are in fact true ambulacra. This fact I communicated to the Canadian Institute, in 1854, in a paper on the cystideæ, published in the June number of the Journal of the Society of that year. It is scarcely necessary to add that it is not a cystidean, and that in all probability neither *Agelacrinites* of Vanuxem, nor *Hemicystites* of Hall, should be placed in that order. They are low forms of *Asteriadae*.

#### CYCLASTER BIGSBYI.

*Description.*—The body of this species is circular, about one inch and a-half across, and half an inch in height in the centre; It is covered with numerous small plates of various sizes, and except in the ambulacral areas, disposed without order; the mouth, situated in the centre of the upper side, is about two lines in diameter, and apparently five-sided; the other aperture between the rays consist of a space covered with plates much smaller than the average size; these form a small elevation, which is imperfect in all the specimens I have seen, but enough remains to render it almost certain that there was an aperture of some kind in this place.

The ambulacral areas are five in number, radiating from the mouth, precisely like those of a common star-fish, and composed of two series of oblong plates which alternate with each other in the centre of the furrow; there are about ten of these plates to five lines in length, on each side of the ambulacrum.

The pores pass between the plates, one being situated between each two. The ambulacra are three lines wide at the mouth, and about an inch and a-half in length in full grown specimens. As they recede from the centre they curve round towards the right in some specimens, and towards the left in others.

The mouth appears to be composed of ten plates; five of these are at the ends of the ambulacra, and the other five placed in the angles between the ambulacra. In some of the specimens the plates are all smooth, in others covered with small tubercles.

The general aspect of this remarkable fossil is well expressed by Mr. Sowerby, who compares it to a star-fish lying upon an Echinus; it is not quite certain that the animal was permanently attached to the bottom. All that I have collected were seated upon the rock with the mouth upwards, and apparently somewhat flattened by pressure. It is probable that when perfect they were more globular than they are at present; one specimen is detached and shews that the plates covered the whole of the under surface, except a small space in the centre which appears to be without plates; perhaps this was the point of attachment; I see no evidence of a column. As this species has not yet received a name, I beg to propose that of its discoverer, Dr. Bigsby, one of the most able of the first explorers of the geology of this country.

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

#### AGELACRINITES DICKSONI.

*Description.*—Of this species we have only a fragment, consisting of one perfect ray and two of the interradiial spaces; but as I have seen other specimens, I am able to state that the diameter is from three-fourths of an inch to one inch; the rays, are five in number, and constructed upon a plan very different from those of *Cyclaster Bigsbyi*, being bordered by two rows of marginal plates, which rise from the surface and arch over the areas; the upper ends of the plates on one side meet those of the opposite side, in a line over the centre, thus forming for each ray a sort of covered way; the spaces between

the rays are paved with numerous flat sub-imbricating plates. The specimen does not shew the central or any other aperture, it is quite flat, and appears to have been firmly attached. The width of the ray is nearly two lines at its origin, and it tapers gradually to a point at the distance of five lines.

Like those of *C. Bigsbyi*, the rays of this species are curved; there are five marginal plates in two lines, and their height is nearly one line; I beg to dedicate this remarkable species to Andrew Dickson, Esq., of Kingston, C. W., one of the best workers in the field of Canadian geology,

*Sub-kingdom, MOLLUSCA ; Order, BRACHIOPODA.*

*Genus* PENTAMERUS (Sowerby).

PENTAMERUS REVERSUS.

*Description.*—Orbicular, transversely elliptical; dorsal valve the larger, exceedingly convex, with an elevated, broadly-rounded, very tumid umbo; beak small, incurved within that of the ventral valve; broad, slightly elevated mesial fold occupied by four or five rounded or obtusely angular ridges, which disappear at about two-thirds of the length from the base to the top of the umbo; four or five similar short ridges on each side. Ventral valve, shorter, and only one-half or one-third the depth of the dorsal valve; a broad, shallow, mesial depression extends two-thirds the length, and is continued below under the base or front, so as to produce a deep oblong sinus in the margin of the dorsal valve; three or four obscure folds in the mesial sinus, and four or five short ones on each side, the number being variable on both valves. The small acute beak is without an umbo, and is not at all incurved, but rather slopes outward, exhibiting what appears to be a small cardinal area on each side.

Width of full-grown specimen, thirteen lines; height, eleven lines; depth, nine lines. The umbo of the dorsal valve is nearly a line higher than the beak of the ventral. The young specimens are much flatter than the full grown ones, the valves nearly equal, and the surface nearly smooth.

This species is somewhat like *P. Sieberi* (v. Buch), but is distinguished easily by the reversal of the valves, the dorsal being the larger.

*Locality and Formation.*—Middle Silurian. Junction Cliff, Anticosti.

*Collector.*—J. Richardson.

#### PENTAMERUS BARRANDI.

*Description.*—Elongate, oval, narrowed above, rounded below; dorsal valve, the shorter, depressed convex, most projecting at one-sixth the length from the beak, which is strongly incurved under that of the ventral valve; a barely perceptible mesial sinus; in the lower one-third, some very obscure flattened radiating ridges; ventral valve very convex, with a high and very conspicuous umbo, beak incurved down to the umbo of the dorsal valve; a slight mesial fold which continues all the way to the beak, and is bordered on each side in its passage over the umbo by an obscure shallow furrow; about sixteen scarcely visible broad rounded radiating ridges. Length one inch and three-quarters, width one inch and a-quarter, depth one inch; the width is variable.

*Locality and Formation.*—Middle Silurian. Becscie River Bay in vast abundance.

*Collector.*—J. Richardson.

#### Genus ORTHIS, (Dalman.)

##### ORTHIS GIBBOSA.

*Description.*—About the size and shape of *Orthis testudinaria*, but with both valves convex; greatest width at the centre or a little in front of the centre of the length; above which the sides are somewhat straight and converging to the extremities of the hinge line, the latter about one-sixth shorter than the greatest width; the front margin very broadly rounded; almost straight or even slightly sinuated in some specimens, for one-third of the width in the centre; front angles well rounded; the ventral valve is depressed, pyramidal, most elevated at



about one line from the beak, which is small, pointed, and but slightly incurved; a broad, shallow, mesial depression occupies the front of this valve, but disappears usually at one-half the distance to the beak; cardinal area triangular at the base, nearly at right angles to the plane of the margin, but curved over above, owing to the backward projection of the beak. Dorsal valve exceedingly convex in most specimens; greatest elevation about the centre, often a barely perceptible broad mesial elevation towards the front; cardinal area small, lying in the plane of the margin; beak very small and scarcely projecting from the upper edge of the area; the whole surface is covered with fine striæ which are about twice sub-divided; the cast of the interior of the ventral valve shews that the muscular impressions were bordered by strong lamellæ extending downward, slightly converging at three lines from the beak; in a specimen eight lines wide they were separated by a median ridge with a broad base and sharp edge; width of large specimen eight lines; length six lines and a-half.

*Locality and Formation.*—Black River limestone. La Petite Chaudière Rapids, Ottawa River.

*Collector.*—E. B.

#### ORTHIS LAURENTINA.

*Description.*—Semi-elliptical, broader than long, in the proportion of about seven to five; hinge line straight, slightly exceeding the width of the shell; the dorsal valve nearly flat, very slightly convex, the most elevated point being at the minute beak, a perceptible depression along the centre; cardinal area low, triangular, inclining forward at an angle of  $100^{\circ}$  or a little more; foramen partly closed above. Ventral valve convex, most elevated at one-third from the beak, which is small, pointed and slightly incurved; cardinal area large, triangular, somewhat concave, owing to the incurvation of the beak; foramen narrow, extending to the beak, but closed by a convex semi-cylindrical deltidium, except a small triangular space at the hinge line; the surface covered with about twenty-three thick, sub-angular, prominent, radiating ridges which gradually

enlarge from the beak to the base, separated by the same number of sulci equal to the ridges in breadth and depth. Some of the specimens are obscurely sub-quadrangular. Breadth of large specimen seven lines; length five lines; resembles *Orthis tricenaria*, but is smaller and has not the open foramen of that species.

*Locality and Formation*.—Middle Silurian. Junction Cliff, Anticosti.

*Collector*.—J. Richardson.

### Order GASTEROPODA.

#### Genus MURCHISONIA, (d'Arch. & de Vern.)

##### MURCHISONIA GIGANTEA.

*Description*.—Very elongate, acutely conical; whorls about ten, ventricose, and with indications on the east of an obtuse angulation or spiral band. Apical angle  $20^{\circ}$ ; length nine inches; breadth of last whorl, which however is proportionally broader than the others, two inches and a-half. Some of the fragments shew the obtuse rounded angulation in the centre of the whorl very distinctly, and also a very shallow concave spiral band above and another below. These latter appearances are however barely perceptible, and may not exist in perfect specimens.

*Locality and Formation*.—Middle Silurian. Prinista Bay, Anticosti.

*Collector*.—J. Richardson.

##### MURCHISONIA TERETIFORMIS.

*Description*.—Elongate, conical; whorls about ten, ventricose, regularly convex, apical angle  $27^{\circ}$ , length six inches.

This species differs from the *M. gigantea* in being more obtusely conical, and in the absence of the angulation on the whorls.

*Locality and Formation*.—Lower Silurian. Charleton Point, Anticosti.

*Collector*.—J. Richardson.

## MURCHISONIA RUGOSA.

*Description.*—Very elongate, subulate ; apical angle  $15^{\circ}$ , whorls ten or twelve, regularly convex ; surface marked with coarse striæ which cross the whorls with a broad rounded undulation backwards, most pronounced in the upper two-thirds of the whorls ; length seven inches. This species tapers more gradually than either of the preceding. There are some traces of numerous rounded ridges ascending the whorls spirally, and also of an angulation beneath the suture. Of the surface markings only a few are preserved on a single specimen, upon two of the whorls near the aperture.

*Locality and Formation.*—Lower Silurian. English Head, Anticosti.

*Collector.*—J. Richardson.

## MURCHISONIA MULTIVOLVIS.

*Description.*—Elongate, acutely conical, apical angle  $17^{\circ}$ , whorls twelve to fifteen, ventricose in their lower one-third only, above which they taper with a flat or slightly concave surface to the suture, close to which there is an angulation. The striæ, after leaving the suture above, turn back at an angle of  $45^{\circ}$ , and cross the flat upper two-thirds of the whorls in a straight line, or with a very slight sigmoid curvature until they at length sweep with a short rounded curve over the lower projecting part of the whorl, when they turn forward to the suture below. Length, three inches ; breadth of last whorl eleven lines.

*Locality and Formation.*—Lower Silurian. South-west of West-end light-house, Anticosti.

*Collector.*—J. Richardson.

## MURCHISONIA MODESTA.

*Description.*—Conical, apical angle about  $50^{\circ}$  ; whorls, five, with a rounded angular carina on the cast of the interior, situated a little above the centre, a second inconspicuous keel

close to the suture, between which and the outer central carina, the whorl is slightly concave; below the centre of the whorl there is at first a barely perceptible concave band, one line and a-half wide. Length from eight lines to one inch, two lines; breadth of last whorl in one specimen, one inch; length, nine lines.

*M. bicincta* (Hall), has an apical angle of  $57^{\circ}$ , and the upper carina distant from the suture. The proportions of this fossil, and the above description are very near those of *M. cancellatula* (McCoy, British Palæozoic fossils, page 244); but there the upper carina is more prominent than in this species, and the whorls more convex on the outside and below. There are other specimens with the whorls more angular, from the same locality (English Head), associated with these, which for the present I have referred to *M. cancellatula*.

There are others from Pauquette's rapids closely resembling these; but the perfect shell shows a slightly prominent carina about half-way between the suture and the outer margin, which is visible on the cast, while in this species in the same place there is a perceptible concavity.

*Locality and Formation.*—Lower Silurian. English Head, Anticosti.

*Collector.*—J. Richardson.

#### MURCHISONIA VARIANS.

*Description.*—Obtusely conical; apical angle about  $58^{\circ}$ ; volutions five; a broad band on the outer margin of the body-whorl with three obtuse carinæ; the upper one strongest, the central somewhat less, and the lower the least; a fourth carina at the suture, between which and the upper marginal one the whorl is concave; the upper whorls show but one rounded keel in the centre, the lower two of the body-whorl having disappeared or become obsolete. Length six lines, of which the body-whorl occupies one-half nearly. Breadth at base, five lines and a-half.

*Locality and Formation.*—Lower Silurian. English Head, Anticosti.

*Collector.*—J. Richardson.

## MURCHISONIA TURRICULA.

*Description*.—Small, conical; apical angle about  $42^{\circ}$ ; whorls three or four, a very thick and projecting carina about the centre of the whorls; below, a broad flat keel, rounded on its lower side by a much smaller sharp carina; another on the upper part of the whorl, close to the suture, of a square step-like form, strongly marked with rather coarse striæ which curve sharply backward and then descend the vertical side with a curve forward; umbilicus apparently small; length five and a-half lines; breadth at aperture five lines. This species is remarkable for the prominence of the central carina, and the nearly rectangular strongly striated band at the suture. The specimens examined are imperfect.

*Locality and Formation*.—Middle Silurian. The Jumpers, Anticosti.

*Collector*.—J. Richardson.

## MURCHISONIA PAPILLOSA.

*Description*.—Obliquely conical; apical angle about  $75^{\circ}$ ; whorls four; a broad concave vertical band truncating the outside, upon the upper angle of which is the narrow spiral band proceeding from the slit in the aperture. Lower side of the body-whorl, ventricose; upper side scarcely concave, until near the suture, which is followed by a spiral sub-muricated band of short radiating ridges; whole surface covered with small tuberculous points, about the tenth of a line in diameter; these are arranged in rows which seem to mark out the direction of the striæ; in ascending from the place of the umbilicus, their course is nearly vertical until they reach the lower carina; in crossing the broad spiral band they curve very slightly forward, in the narrow band backward, and thence on the upper surface of the whorl, forward to the suture; both of the spiral bands are bordered by sharp keels, of which there are three, one on the upper side of the narrow band, one on the lower edge of the broad band, and one which separates the two. There is no umbilicus, it being concealed by the folding ones

of the inner lip. Length of most perfect specimens, nine lines; width of base seven lines and a-half; of the larger band at the aperture, one line and a-half; of the small band, one-third of a line; depth of respiratory slit, one line and a-half; closely related to *P. Baltica*, Murch, and *de Vern.* Geol. Russia, Plate 23.

*Locality and Formation.*—Middle Silurian, one mile east of Junction Cliff, Anticosti.

*Collector.*—J. Richardson.

#### PLEUROTOMARIA SUPRACINGULATA.

*Description.*—Obtusely conical or lenticular; apical angle,  $105^{\circ}$ ; height about two-thirds the width; whorls four, angulated and keeled on their upper outer margin, their sides vertical, their upper surfaces gently convex from the distinct suture half-way to the margin, and then scarcely concave to the spiral band; lower side of the body-whorl convex; the spiral band narrow, and lying wholly on the upper side of the whorl, where it forms a border along the margin following all the whorls to the apex; umbilicus large; width one inch and a-quarter; height ten lines; width of umbilicus at centre of body-whorl three lines and a-half; width of band on last whorl about half-a line.

The most striking character is the position of the band upon the upper surface of the whorls. In *P. rotuloides* (Hall), it is about the same size, but forms a narrow vertical truncation of the edge of the whorl, while in this species it lies in the plane of the upper surface. The cast somewhat resembles *P. lenticularis*, Hall, but differs in having an obtusely rounded margin, and in the whorls being distinctly truncated one above the other. The specimen examined retains a large portion of the shell, and yet the striæ are not sufficiently distinct to be noticed.

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

*Collector.*—A. Murray.

## PLEURATOMARIA THALIA.

*Description*.—Small, obtusely conical, oblique; apical angle  $74^{\circ}$ ; whorls three; body-whorl with a sharp keel close to the suture, another half-way to the outer upper margin, where there is a third which is perceptibly stronger than the others; below this is the marginal band, bordered on its under side by a fourth sharp keel; three others equally sharp and prominent follow between the fourth and the umbilicus, and it is probable that as the shell became larger, still others were developed below; of these seven keels, the first, sixth and seventh are concealed within the spire after the first turn from the aperture; the second and fifth are lost in the next whorl; the striæ are fine but well exhibited, their course is nearly directly across the whorl, but with slight curvature backwards, commencing from the suture, and most extended on the outer margin; length four lines, breadth about four, width of marginal band half-a line, of the first band rather more than half a line; those on the under side of the whorl are a little nearer together than those above. All the bands are concave, and the different keels are prominent; the umbilicus appears to be small.

The surface markings of this little shell are very similar to those of *Euomphalus funatus*, as figured and described by authors. In the only specimen examined the aperture is imperfect, and the umbilicus filled with limestone. The surface is well preserved on two of the whorls, and in none of the spiral bands do the striæ make the sharp backward curve which marks the band proceeding from the slit in the lip of *Murchisonia* or *Pleurotomaria*. On the contrary they are so uniformly direct in all the furrows that no particular one can be singled out by the character of its striæ as the respiratory band.

*Locality and Formation*.—Middle Silurian, one mile east of Junction Cliff, Anticosti.

*Collector*.—J. Richardson.

## PLEUROTOMARIA CIRCE.

*Description*.—Obtusely conical; apical angle  $72^{\circ}$ ; whorls four; upper surface slightly convex near the suture, and con-

cave towards the margin, which in the cast presents a prominent somewhat sharply rounded angle; lower side slightly convex; a barely perceptible concavity just below the angle inclining inward; lower or exterior side of body-whorl very ventricose; umbilicus small; height one inch; width of base at the aperture ten lines; the body-whorl which is large, occupies one-half the length. The specimen is a cast, and does not show the surface markings.

*Locality and Formation.*—Lower Silurian. English Head, Anticosti.

*Collector.*—J. Richardson.

*Genus* CYCLONEMA, (Hall.)

CYCLONEMA PERCINGULATA.

Compare *C. sulcata*, (Hall) Pal. N. Y., Vol. 2, page 348.

*Description.*—Obtusely conical; apical angle about  $83^{\circ}$ .; whorls three, ventricose, most acutely rounded and projecting at about one-third their height; surface with numerous conspicuous ridges, following the whorls spirally from the aperture to the apex, seven in three lines on the lower part of the body-whorl, more distant above; separated by shallow concave spaces in which are sometimes seen intermediate smaller parallel ridges; usually but one of the smaller half-way between each two of the larger; the latter when examined with a magnifier, shew a rather sharp edge imbricating towards the apex like the crest of a wave; whorls crossed by broad obscure rounded undulations or ridges from one to two lines apart, which incline backwards from the suture, at an angle of about  $45^{\circ}$  with the longitudinal axis of the shell; whole surface also cancellated with fine barely visible striæ, one set of which is in the direction of the large spiral striæ, and the other transverse, following the curves of the undulations. Height, one inch; breadth, ten lines; perhaps identical with *C. sulcata* above mentioned, but appears to be larger and proportionally more depressed.

*Locality and Formation.*—Upper Silurian, South-west Point, Anticosti. Niagara and Clinton Groups.

*Collector.*—J. Richardson.



There is a variety with the apical angle a little more obtuse, having all above the body-whorl trochiform, and the spire acutely pointed. In the specimens upon which the species is founded the whorls are all ventricose, somewhat depressed on the upper side, and the suture distinct, but in the variety they are flattened above, and the suture not so deeply distinguished in the plane sloping sides. In any other respect however there is no difference between the specimens sufficient to separate the species.

#### CYCLONEMA VARIANS.

*Description*.—Ovate, sub-spherical; whorls three, oblique, rapidly enlarging from the apex; body-whorl very large, the two above small and somewhat depressed, all of them ventricose; somewhat obscurely exhibiting a broadly rounded angle along the centre; often regularly rounded; suture canaliculated; apical angle about  $100^{\circ}$ ; surface reticulated by very fine flexuous transverse and longitudinal striæ, the latter being usually the more distinct, the former sometimes absent or obsolete. On many specimens the body-whorl near the aperture is crossed by rough imbricating lines of growth which are often undulated backwards about the centre, like those of a *Murchisonia* or *Pleurotomaria*; umbilicus small; height of a large specimen thirteen lines, breadth twelve lines. The forms above indicated might be regarded as constituting two species; a large number, however, of very good specimens of all sizes, which were procured from the same mass of rock in Anticosti, show that the differences gradually fade in a series, so that no line of demarcation can be drawn. Although from the character of the striation in some instances, a slit or notch in the margin of the lip might be expected, yet none appears in specimens which are certainly perfect. The species is much larger and more ventricose on the body-whorl than *C. cancellata* (Hall), more depressed than *C. ventricosa*, and more elevated than *Platystoma Niagarensis*.

*Locality and Formation*.—Middle Silurian, South-west Point, ticosti.

*Collector*.—J. Richardson.

## SUBULITES RICHARDSONI.

*Description*.—Elongate cylindrical, fusiform, acutely pointed; length five inches; diameter at the posterior part of aperture one inch and a-quarter; whorls five, flat; suture obsolete; aperture very long and narrow.

This species has much the aspect of *Subulites elongata*, (Emmons) but is proportionally one-half thicker, and is upon the whole a larger species. Perhaps these fossils should be added to the genus *Macrocheilus* (Philips).

*Locality and Formation*.—Lower Silurian, Charleton Point. I beg to dedicate this species to Mr. James Richardson, of the Geological Survey of Canada, a most indefatigable and successful explorer and collector.

Class CEPHALAPODA, (Cuvier.)

Order TETRABRANCHIATA, (Owen.)

Genus NAUTILUS, (Gualtieri.)

NAUTILUS HERCULES.

*Description*.—Sub-orbicular, whorls about two, umbilicus wide, shewing the spire; section of shell transversely elliptical or sub-triangular; diameters as four to six; dorsal aspect broad and but very moderately convex, sides rounded, most prominent on the outer edge, thence descending with a convex slope into the umbilicus; septa simple, two to one inch of the dorsal circumference near the external chamber, more approximate near the apex; siphuncle?

This fine large species may be readily recognised by the great breadth and comparative flatness or gentle convexity of the dorsal side. The specimen examined is six inches and a-half in diameter, measured from the mouth across to the opposite side. The width of the aperture is four inches and four lines; the depth of the chamber of habitation is five inches on the outside, and about two and a-half on the inside next to the penultimate whorl of the spire; the shell tapers at the rate of about one line and a-half to the inch.

In the only specimen collected the cavities of the umbilicus and also that of the aperture, are still partially filled with the matrix, and all the characters cannot therefore be ascertained.

*Locality and Formation.*—Lower Silurian, Charleton Point, Anticosti.

*Collector.*—J. Richardson.

*Genus* GYROCERAS, (Meyer.)

GYROCERAS (LITUITES) MAGNIFICUM.

*Description.*—Shell extremely elongated; discoidal spire about eight inches in diameter, the produced free extremity at least twenty inches in length in the full-grown individuals; whorls about three, scarcely contiguous, more nearly so in some specimens than in others; section of the tube semi-elliptical towards the aperture, and semi-circular near the apex; dorsal aspect or outside of the shell nearly flat, while the inside is convex; septa distant about five lines, measured on the centre of the dorsal aspect, in crossing which they make a deep undulation towards the apex; siphuncle situated a little to the right and below the centre of the tube, one line in diameter in its passage through the septum, dilated in the chambers so as to constitute elongate oval expansions two lines and a-half in diameter.

The specimens of this extraordinary fossil are in a bad state of preservation, and it cannot thus be shewn that they possess all the generic characters of *Gyroceras*. The genus as defined by Barrande, Koninck and others, consists of shells spirally inrolled in the same plane at their smaller extremities, the whorls not being in contact, while the large open end of the tube, after leaving the spire, is produced to a greater or less distance and more or less curved. The section, according to Koninck is either oval or angular; M. Barrande has ascertained that the mouth is "neither round nor elliptical, as in other allied forms, but half closed by a bending back of the shell on itself." (Quarterly Journal of the Geological Society, vol. 10, Translations and Notices, page 23.) The mouth has not been seen in

the species above described, and the whorls, although separate, are so much approximated to each other, that should it hereafter be discovered that the mouth has not the form peculiar to *Gyroceras*, it may be necessary to classify the species as a *Lituities*.

In one specimen the breadth of the flat dorsal side is two inches and four lines, in another the length of the free portion of the shell is twenty-one inches, and it is yet imperfect; the diameter of the spire of a third specimen is six inches, and of a fourth eight inches; the produced portion is not straight but gently curved in the same direction and plane as the spire.

*Locality and Formation*.—Lower Silurian, near the Southwest end Lighthouse, Anticosti.

*Collector*.—J. Richardson.

#### GYROCERAS (LITUITES) VAGRANS.

*Description*.—Shell elongated, tapering at the rate of nearly two lines to the inch; laterally compressed, section elliptical, dorso-ventral diameter greater than the lateral, apparently in the proportion of twelve to eight; about seven inches of the apical extremity of the shell spirally inrolled so as to form two whorls not in contact, the interior one of which is one inch in diameter, and the exterior three inches; septa convex, distant one line and a-half at a dorso-ventral diameter of one inch.

The specimen exhibits an artificial polished section passing through the central plane of the whorls, shewing clearly the construction of the tube to the apex, where it has a diameter of only one line; some of the septa and almost one-half of the transverse section, but neither the siphuncle, the character of the surface, nor the length of the produced oral extremity is indicated; several specimens still lying imbedded in the rock which are known to me, are in my opinion of this species, and if so, then the free portion was gently curved, and in some individuals at least six inches in length, thus giving thirteen inches as the total length. It is scarcely necessary to observe that from the above materials the generic rank of the fragment cannot be determined with the certainty desirable; the tube is

too much curved to come within the definition of *Cyrtoceras*, the whorls too widely separated for *Nautilus* or *Lituities*, and yet, without a view of the aperture we cannot say positively that it is a *Gyroceras*.

*Formation*.—Black River limestone.

*Localities*.—La Petite Chaudière Rapids, Ottawa River, and in the out-crop of the Black River limestone, near Mile End, St. Lawrence Street, Montreal.

### GYROCERAS (LITUITES) AMERICANUM.

*Description*.—Tube long, slender, gradually tapering; section semi-elliptical; dorsal aspect nearly flat; side and ventral aspect convex, and ornamented with prominent annulations, which, in leaving the lateral angles, are at first deflected towards the aperture at a sharp angle, and then curved towards the apex, crossing the ventral side nearly at right angles to the length, or with but a slight undulation towards the apex. These annulations are upon the average five lines and a-half distant, from the summit of one ridge to that of the next, the intervening spaces being regularly convex; the surface is further marked by coarse striæ following the curves of the lateral and dorsal annulations; on the flat dorsal surface, where these latter do not appear, the striæ curve in the direction of the smaller extremity of the fossil. The dorso-ventral and lateral diameters appear to be about equal in the fragments examined, which are however somewhat distorted; the siphuncle is small and slightly eccentric, being nearest the dorsal aspect; the septa are convex and distant four lines.

The length of the longest fragment measured along the outside curve is twelve inches, its greatest diameter one inch and a-half and the least one inch, thus tapering at the rate of about half-a-line to the inch; at least one-third of the outer whorl remains, and shews by its curvature that the diameter of the discoidal spire was four inches and a-half nearly.

This species is closely allied to *Lituities giganteus*, Sowerby, but differs in its more round dorsal aspect, and in the annulations being extended quite across.

*Locality and Formation.*—Upper Silurian, Port Daniel, Gaspè.

*Collector.*—Sir W. E. Logan.

*Genus ASCOCERAS, (Barrande.)*

ASCOCERAS CANADENSE.

*Description.*—The only specimen yet collected of this species consists of the lower half, in a very perfect state of preservation, but totally denuded of the external shell; it shews that from the centre or below that level, where the septum of the last chamber crosses the body, the form was ventricose or broad oval, widest at about one-third the distance from the upper septum to the base, and thence decreasing with an elliptical outline to the rounded bottom; the transverse section across the broadest part is sub-elliptical, the back being much flatter than the ventral side; a side view shews the outline of the ventral aspect much more prominent and regularly ventricose than the dorsal; measured from the base to the line of the upper septum, the length of the lower part of the fossil is two inches and two lines; the width at three-fourths of an inch below the upper septum is one inch and eleven lines; the depth or diameter through, from the most prominent point of the ventral to the dorsal side, is one inch eight lines. There are only three air chambers in this species, the edges of the septa between which cross the back at about one-third of an inch from the base, girding a little more than one-third of the circumference of the fossil at that place; they then turn a short rounded angle and ascend the sides, and turning again cross the ventral aspect at the following levels: the upper septum two inches and two lines from the base, the second two lines below the upper, and the third six lines below the second. In crossing the ventral side the course is at right angles to the longitudinal axis of the fossil, and the upper two occupy more than one-half the circumference, the lower less than one half.

Where they cross the back, the edges of the three septa are much approximated, scarcely one-fifth of a line distant from each other; but after turning the angles near the base on either side they diverge from each other in ascending, so that the upper angle made by the first is three lines outside that made by the second, which latter is again six lines outside of that made by the third; in ascending they at first curve backwards, and in the upper part of their course, as they approach the upper angles they are arched gently forward. The siphuncle is small and situated one line from the centre of the base towards the dorsal side.

*Locality and Formation.*—Lower Silurian, English Head, Anticosti.

*Collector.*—J. Richardson.

#### GOMPHOCERAS SUBGRACILE.

*Description.*—Moderately ventricose, greatest thickness at about mid-length; section elliptical, diameters about as 17 to 15, dorsal outline much curved from the aperture to the apex, ventral side moderately arched, nearly straight; septa convex, two lines and one-third distant length about; three inches, diameters in the middle seventeen and fifteen lines; depth of chamber of habitation, which is much contracted at the aperture, one inch and two lines.

The general form of this species is very like that of *Oncoceras constrictum*, (Hall) but the oral extremity is more rounded, and although the shell of the specimen examined has completely disappeared yet there is sufficient evidence that the aperture was lobed like that of a *Gomphoceras* or *Phragmoceras*; in *Oncoceras* it is oval.

*Locality and Formation.*—Upper Silurian, Port Daniel, Gaspe.

*Collector.*—Sir W. E. Logan.

#### GOMPHOCERAS OBESUM.

*Description.*—Section elliptical; dorso-ventral greater than the lateral diameter in the proportion of five to four; general

form compressed, ventricose, turbinate; septa convex, about three lines distant; length about four inches; depth of chamber of habitation one inch; greatest diameter (at the second and third chamber) two inches and a-half; lateral diameter at the same place two inches; above this level the size diminishes to the diameters of one inch and one inch and a-half, which appear to be the dimensions of the aperture. Below, tapering ventricosely to a rounded point; neither the siphuncle nor the character of the surface markings of the shell is indicated by the specimen.

The specimen is imperfect at both ends, and it appears also to be slightly compressed laterally. Sufficient does not appear to decide positively upon its generic place, but it appears to me to be more allied to *Gomphoceras* than to *Phragmoceras*. Viewed laterally, it has a short, stout, somewhat heart-shaped form, while looking at the dorsal or ventral aspect, the outline is long, oval, and most pointed below.

*Locality and Formation.*—Lower Silurian, three miles east from Charleton Point, Anticosti.

*Collector.*—J. Richardson.

### *Genus* CYRTOCERAS, (Goldfuss.)

#### CYRTOCERAS SUBTURBINATUM.

*Description.*—Short and stout, four or five inches in length; about two inches in width at the mouth; tapering at the rate of about one line to the inch from the aperture to the centre of the length, thence rapidly diminishing to the apex; section elliptical; one specimen broken through at the middle of the length is one inch nine and a-half lines in the greatest diameter, and one inch six lines in the smaller. The specimens are but slightly curved, and the greatest diameter is transverse to the direction of the curvature; siphuncle near the margin, in the centre of the dorsal aspect; small in its passage through the septa, but dilated to the diameter of four lines in the upper chambers, apparently less in the lower; septa but moderately arched, seven or eight to the inch.



This species is allied to *C. macrostomum* (Hall), but is not so much curved, and has an elliptical section, the major axis of the ellipse being at a right angle to the plane of the curvature; *C. macrostomum* is circular in the section, or if elliptical, as appears by one of Professor Hall's figures, the greater diameter corresponds to the shorter in our species.

The specimens are imperfect at both extremities, and denuded of the shell; neither the form of the apex, nor that of the aperture, nor the character of the surface, has been seen.

*Locality and Formation.*—Lower Silurian. Mingan Island, near Tower Rock, South-east side of Large Island of Bayfield's Chart.

*Collector.*—J. Richardson.

#### CYRTOCERAS SIMPLEX.

*Description.*—Slightly compressed laterally; section oval; dorso-ventral diameter greater than the lateral in the proportion of eleven to nine nearly; dorsal aspect obtusely rounded angular; ventral more obtusely convex than the dorsal. Septa ten to the inch, measured on the sides, where they are broadly but slightly undulated towards the apex; more acutely undulated on the dorsal aspect towards the aperture; curvature more than half-a-whorl; depth of chamber of habitation about equal to the greatest diameter of the aperture; siphuncle small, dorsal, dilated between the septa.

The cast of the interior shows a shallow concave constriction four lines in width, encircling the fossil close to the aperture; the rate of tapering is about one line to the inch for one-half of the length, but becomes greater towards the apex.

The dorsal curvature for two inches of the larger extremity lies nearly in a segment of the circumference of a circle, of which the radius is one inch eleven lines, thence the curve becomes more rapid, until at the length of four and a-half inches, the distance between the extremities of the ventral side of a specimen (imperfect at the small end) is one inch eight lines. The diameters at the aperture of this specimen are

eleven lines and a-half, and nine lines; at the small imperfect end, six lines and five lines respectively. The plane of the aperture is at right angles to the central axis of the fossil. This species is not so much compressed laterally as *C. falx*, neither is it so rapidly tapering, nor so much curved.

*Locality and Formation.*—Black River limestone. Lot N. concession A. Nepean.

*Collector.*—J. Richardson.

#### CYRTOCERAS FALX.

*Description.*—Laterally compressed, section an ellipse somewhat acuminate at either end; diameters as seven to ten; sides broadly convex; dorsal and ventral aspects more acutely rounded than the sides; septa much arched in the direction from the ventral to the dorsal aspects; in crossing the latter they are strongly undulated towards the aperture; siphuncle small, dorsal; general curvature very slight near the oral extremity, but amounting to more than two-thirds of a whorl in the last two inches in length of the small end. The specimens examined do not shew the distance of the septa. The surface of the shell appears to have been striated transversely. A specimen which measures three inches in length along the outside curve tapers from ten lines to three in the dorso-ventral diameter, and from seven and one-third to two and one-third lines in the lateral diameters.

Fragments of this species cannot be well distinguished from those of *C. simplex*, unless by attention to the form of the section, which in this species is about equally narrowed at either end, while in *C. simplex* it is more rounded on the ventral than on the dorsal aspect.

*Locality and Formation.*—Black River and base of Trenton. Pauquette's Rapids, River Ottawa.

*Collector.*—Sir W. E. Logan.

#### CYRTOCERAS REGULARE.

*Description.*—Section circular, curvature half-a-whorl; the oral one inch and a-half of the length, lying in the circumfer-

ence of a circle, of which the radius is one inch three lines in the specimens examined; thence curving more rapidly to the apex, which is approximated to within half-an-inch of the aperture in specimens with an outside length of three inches; depth of external chamber equal to the diameter of the aperture; tube regularly tapering at the rate of one line and a-half to the inch; siphuncle small, dorsal, dilated between the septa, which are very slightly concave and one line distant from each other where seen near the large extremity; the surface appears to be smooth.

The largest specimens seen are three inches in length and seven lines in diameter at the aperture; depth of chamber of habitation eight lines on the dorsal margin and six and a-half on the ventral; the plane of the aperture is oblique to the axis of the shell, the ventral margin being most approximated to the apex.

The proportions of this species are almost identical with those of *Cyrtolites filiosum*, (Hall, Pal. N. Y., vol. 1, page 190. plate 41, fig. 38,) except as to the length. The specimens from Pauquette's Rapids appear to be full grown, and yet the largest is only about three inches long, while the specimen of *Cyrtolites filiosum* figured by Professor Hall is fully four inches. At present I think these two species distinct, ours being smaller, and having a smooth surface.

*Locality and Formation.*—Black River and base of Trenton. Pauquette's Rapids.

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

#### CYRTOCERAS SINUATUM.

*Description.*—Compressed laterally, section elliptical, diameters as eleven to nine, tapering at the rate of about two lines and a-half to the inch; surface annulated with apparently sharp ridges one-third of a line wide at base, and separated by shallow regularly concave spaces one line in width, which in crossing the dorsal aspect make a strong undulation or sinus towards the apex; curvature, amounting to half-a-whorl or more, lying in the circumference of a circle, with a radius of

one and a-half inches for two inches from the aperture, thence more rapid.

The specimen examined has a dorso-ventral diameter of one inch at the aperture, and a lateral diameter of nine lines and three-quarters; the length of the dorsal margin is three inches, and in that distance it tapers to the diameter of from six to five lines. Neither the septa nor the siphuncle is visible. In some respects this species resembles *Cyrtoceras annulatum*, (Hall, Pal. N. Y., vol. 1, page 194, plate 41, fig. 485,) but in that species the section is circular, and the rate of tapering is not so great as in this, while the specimens figured on the plate cited are more sharply curved.

*Locality and Formation.*—Black River limestone. La Petite Chaudière.

*Collector.*—E. Billings.

### Genus ORTHOCERAS.

#### ORTHOCERAS ANTICOSTENSE.

*Description.*—Elongated, large, section sub-oval, dorsal side broad, flattened or but moderately convex; siphuncle large, marginal, lying along the central axis of the dorsal aspect, much dilated between the septa; the rate of tapering varies in different parts of the same individual, being more rapid near the aperture than it is near the smaller extremity. From a diameter of three inches and one-eighth, measured across in the broadest direction, one specimen contracts to two inches and a-quarter in a length of six, or at the rate of about one line and a-half to the inch; further towards the apex the rate becomes gradually less. The septa are convex, about five lines distant from each other, and in crossing the dorsal side make a strong undulation in the direction of the apex.

In one fragment deprived of the shell, the character of the surface appears to have been impressed upon the cast of the interior, and if this supposition be correct, then the exterior of the shell was ornamented by sharp longitudinal raised lines, about two in one line, with finer ones between.

This fine species is most closely allied to *O. tenuifilum* (Hall) of the Black River limestone, but differs in being much flatter upon the dorsal side, and in not so rapidly expanding near the aperture; the undulations of the septa also are more pronounced, the striation of the surface apparently stronger, and the whole proportions more slender. It appears to have grown to the length of two feet and a half.

*Locality and Formation.*—Lower Silurian. Charleton Point, Anticosti.

*Collector.*—J. Richardson.

#### ORTHOCERAS FORMOSUM.

*Description.*—Section circular, tapering at the rate of one line and a-half to the inch; siphuncle one-third the diameter from the margin, small in its passage through the septa, and dilated in the chambers; septa much arched from the ventral to the dorsal margin, but moderately so in the direction of the lateral diameter; their edges strongly undulated towards the apex on the sides, and in an opposite direction on the dorsal and ventral margins; this curvature is also greater on the ventral than on the dorsal margin, the septa being a little oblique, or more approximated to the aperture on that side; proportional depth of the chambers varying from one-fifth to one-seventh of the diameter in the same individual; surface striated longitudinally by fine sharp parallel raised lines, about six or eight in one line.

In one specimen two inches and a-half in length, one inch in diameter at the large, and nine lines at the small end, the distance of the septa from each other averages two lines and a-half, there being twelve in a length of two inches and a-half. In another specimen one inch and a-half in diameter, the average, is the same; and in a third with a diameter two inches, the distance is four lines. The centre of the siphuncle in this latter specimen is five lines distant from the ventral margin, where the diameter is sixteen lines.

The dilatations of the siphuncle constitute small compressed nummuloid beads three lines in diameter.

*Locality and Formation.*—Lower Silurian. English Head, Anticosti.

*Collector.*—J. Richardson.

#### ORTHOCERAS XIPHIAS.

*Description.*—Very much compressed, two-edged; lateral diameter greater than the dorso-ventral, in the proportion of fourteen to six; ventral aspect slightly convex, nearly flat; dorsal broadly rounded, but somewhat angular along the central line; sides represented by two obtuse edges; siphon small, marginal, lying along the central axis of the ventral aspect; septa much arched, and distant a little more than two lines from each other, where the lateral diameter is one inch and a quarter; the edges or lateral margins taper or incline towards each other at the rate of about two lines to the inch. the dorsal and ventral sides at one-half that rate; the septa, in a fragment one inch five lines in width, are so arched that they form an arc of a circle, of which the radius is nine lines nearly.

The specimens are imperfect and do not exhibit the character of the surface. In general form this species resembles a large *Theca*. A fragment one inch five lines in width at the larger extremity, one inch and two lines at the smaller, is one inch and a-half in length, and when perfect was apparently about nine inches long. The chamber of habitation in this specimen appears to have been one inch in depth.

*Locality and Formation.*—Lower Silurian. Cliffs east of English Head, Anticosti.

*Collector.*—J. Richardson. Trenton limestone, City of Ottawa, A. Murray.

*Note.*—This species has not the double curvature of the septa of *Gonioceras*.

#### ORTHOCERAS BALTEATUM.

*Description.*—Section circular, tapering at the rate of about one line to the inch; siphuncle small near the centre; septa moderately convex and a little oblique, their margin nearest

the aperture on the ventral side; surface longitudinally striated with extremely minute lines, about twelve in one line; girth with strong annulations, with acutely rounded edges, two lines distant at a diameter of seven lines, one line distant at a diameter of four lines and a-half; the intervening annular sulci are regularly concave from the edge of one annulation to another, and slightly undulated towards the aperture on the dorsal side.

*Formation*.—Lower Silurian.

*Locality*.—English Head, Anticosti.

*Collector*.—J. Richardson.

#### ORTHOCERAS MINGANENSE.

*Description*.—Cylindrical, tapering at the rate of less than half-a-line to the inch; siphuncle small, one-third the diameter from the margin, slightly expanded between the septa into slender fusiform beads; septa moderately arched, a little more than one line distant from each other at a diameter of nine lines; surface with strong rounded annulations, with concave annular sulci between, nearly direct, but slightly undulated, ten in one inch at a diameter of nine lines.

Differs from *O. balteatum* in its more approximate annulations, and more gradually tapering form.

*Locality and Formation*.—Lower Silurian.—Mingan Islands, near Tower Rock, South-east side of Large Island, of Bayfield's Chart.

#### ORTHOCERAS PERANNULATUM.

*Description*.—Section circular, very widely and strongly annulated, tapering at the rate of a little more than half-a-line to the inch. Siphuncle moderately large, central; septa regularly but not much arched, distant three lines from each other at a diameter of eight lines, annulations very prominent, sharp, a little oblique, and four lines distant at a diameter of one inch; the intervening sulci are regularly concave from the edge of one annulation to another.

*Locality and Formation.*—Lower Silurian. West-end, Anticosti.

*Collector.*—J. Richardson.

#### ORTHOCERAS PROPRINQUUM.

*Description.*—Large, section circular, tapering at the rate of one line to the inch; septa very convex, slightly undulated at their edges, and distant two and a-half lines on an average at a diameter of three inches. The above are all the characters that can be gleaned from the very imperfect specimen examined, which, however, clearly indicates an orthoceratite of great size and length, with the septa very closely approximate in proportion to the diameter. The fragment is seven inches long, and tapers from three and a-half inches to two inches eleven lines, and exhibits the edges of thirty-five septa.

*Locality and Formation.*—Lower Silurian. Charleton Point, Anticosti.

*Collector.*—J. Richardson.

#### ORTHOCERAS LYELLI.

*Description.*—Cylindrical, smooth, section circular, tapering at the rate of one-third of a line to the inch; at a diameter of eight lines there are twelve moderately convex septa to the inch, and the centre of the siphuncle is two and one-third lines from the margin. The species is remarkable for its cylindrical, straight, and very slightly tapering form.

*Locality and Formation.*—Lower Silurian. Cliff East of Salmon River, Anticosti.

*Collector.*—J. Richardson.

#### ORTHOCERAS SEDGWICKI.

*Description.*—Section circular, tapering at the rate of nearly two lines to the inch from a diameter of three inches. Siphuncle large, marginal, dilated between the septa; septa convex, slightly undulating towards the apex on the ventral side, dis-



tant from each other four and a-half lines, and two and a-half at two inches; surface striated longitudinally. In a specimen seven inches long, three inches in diameter at the large end, and one inch ten lines at the smaller extremity, the siphuncle is one inch in diameter where seen at the small end. The striation of the surface is but very obscurely indicated in the specimen. This fine large species is allied to *O. tenuifilium* of the Black River limestone, and also to *O. Anticostense*, from both of which however it differs in its circular section and straight sides.

*Locality and Formation.*—Lower Silurian, West End, Anticosti.

*Collector.*—J. Richardson.

#### ORTHOCERAS CANADENSE.

*Huronian vertebralis*, (Stokes).

*Description.*—Extremely elongated, very gradually tapering; septa distant; siphuncle large, dilated only in the upper part of each chamber, where it forms a strong projecting annulation abruptly rounded on the upper side, and gradually sloping to the lower; depth of chambers near the aperture about one inch and a-half, becoming gradually less in the direction of the apex, somewhat variable; diameter of the non-dilated portion of the siphuncle about equal to the distance of the septa, often a little greater, sometimes a little less.

In consequence of the peculiar mode of dilatation of the siphuncle (the only part of this remarkable fossil which is well known,) it resembles a long, slowly-tapering, many-jointed column, each joint having a truncated sub-pyriform shape, its smaller extremity fitting into the centre of the large expanded upper termination of the next succeeding segment. The inferior half or two-thirds of the length of each joint is either cylindrical, or but very gradually expanding upwards with an inward and outward curve, until it finally has swollen out to form the lower sloping sides of the annulation above. A specimen from the north-west side of the Island of Anticosti, (where it is associated with fossils of Upper Silurian age, many

of them identical with species peculiar to the Niagara and Clinton groups,) consisting of six segments, corresponding to six chambers of the animal to which it belonged, is four inches and seven lines in length, giving nine lines and one-sixth as the average distance between the septa; the diameter of the uppermost annulation is one inch and four lines, and of the lowermost one inch and two lines; the rate of tapering therefore of this *Orthoceras*, as indicated by that of the siphuncle was about half-a-line to the inch, and consequently the perfect individual was in all probability six feet in length.

The specimen is fractured longitudinally, so as to exhibit a good section through four of the segments; it shews a small slightly eccentric tube one and a-half lines in diameter, with its centre filled with dark-coloured matter, apparently the same in composition as the rock in which the fossil had been imbedded, a small portion of which still adheres to one end of the specimen. With the exception of the contents of this tube, the whole siphuncle is composed or filled with a whitish calcareous spar, with however, several small druses lined with semi-transparent crystals; into these cavities small quantities of the dark-colored rock have also penetrated. At the upper end of each segment, just where the joint above appears to be inserted, a thin plate penetrates from the outer shell into the now filled-up cavity of the siphuncle, curving downwards; these appear to me to be the edges of the septa, and if so, then as in every other species of *Orthoceras*, with a dilated siphuncle, the passage from one chamber to another was smaller than the main body of the tube (in this instance about four lines less in diameter than the cylindrical portion, and from eight to ten less than that of the fully developed annulations.)

It can be clearly seen in this specimen that upon each of the inner edges of the septa there is a reniform mass, of a color a shade deeper than that of the general filling of the tube; it is placed with its constricted side against the inward projecting edges of the septum, and seems to curl around it above and below. The same arrangement of the different materials in the interior of these fossils is well figured in the Transactions of the Geological Society, vol. 5, plate 60, Figs.

2, 6, 3, in illustration of Mr. Stokes' paper on the *Orthocerata*; although at the time of the date of that memoir the meaning of these curving shades of color was not understood. Since, however, the publication of M. Barrande's investigations upon the subject, \* they have become perfectly intelligible, and enable us to decide from the internal structure alone of this fossil, that it is really, the siphuncle of an *Orthoceras*, only differing from an ordinary form by the circumstance of its being dilated in the upper part of each chamber, so as to produce a series of top-shaped joints, instead of the row of spherical or nummuloid joints usually to be seen in the figures of different species of *Ormoceras* described in various works. This mode of dilatation in the siphuncle of an *Orthoceras*, so far from being of generic importance, is not always of specific value, because there are specimens in the collection of the Survey which exhibit both turbinate and nummuloid joints in the same individual. While upon this subject, I beg to give the following compilation of the history of the genus *Huronina*.

This genus was first described in a paper entitled "Notes on the Geology and Geography of Lake Huron," read before the Geological Society, in 1823, by Dr. Bigsby, who had then recently returned from his travels in North America. His memoir is full of interesting information, and the palæontological portion of it may be considered as the first essay of any importance upon the fossils of Canada. It was prepared, I believe by the late C. Stokes, Esq., who thus correctly describes the species in question, but under the impression that the specimens examined by him were corals.

"The corals of the species represented in plate 28, fig. 2, have in their general appearance a considerable resemblance to vertebræ; they are columns tapering from the top, composed of similarly formed joints, which diminish downwards both in length and breadth, though not in regular graduation. The length of each joint in this species is about one inch, and the breadth exceeds the length; the transverse section is circular. The lower or middle part of each joint is cylindrical, or slightly conical; the upper part swells out and is inflected

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\* See a paper by M. Barrande in the Bulletin of the Geological Society of France, dated 23rd April, 1855, and entitled "*Remplissage organique du siphon dans certaines cephalopodes paléozoïques.*"

inwards at the top, so as to meet entirely the base of the joint next above it. The dilated part is in different species in very variable proportion to the rest of the joint; the lower part of one joint is inserted to some little depth into the upper part of the next beneath it, so as to attach the joints firmly to one another. The external surface is covered over with a thin smooth coat, but this is rarely preserved, and then only in small portions; the surface is usually without this coat, and is then longitudinally striated.

"When the joint is most dilated a thin horizontal septum, formed by the abrupt inflexion inwards, and coalescence of the upper and lower parts of the outer coat, passes transversely across the joint, as is seen in two of the joints in fig. 2." (Transactions of the Geological Society, N. S., vol. 1, page 202, Plate 28, fig. 2.)

The thin horizontal septum mentioned in the above extract as occurring where the joint is most dilated, is well shewn in all the joints of our specimen, and is without doubt the remains of the ordinary septum of an *Orthoceras*. It does not extend through the siphuncle, but only penetrates inward about two lines, curving downwards as previously stated.

He proceeds to describe five species under the names of *Huronia Bigsbyi*, *H. vertebralis*, *H. turbinata*, *H. obliqua*, and *H. spheroidalis*. The greatest length of any column he had seen was twenty-seven inches. The first and second of these appear to me to be of one species, *H. vertebralis*, or *Orthoceras Canadense*, as it is now proposed to call it.

As I understand him the specimens were from the quartzose limestone at Collier's Harbour, from the west end of the Great Manitoulin, and also from Drummond Island.

Afterwards, in a paper entitled "On some species of *Orthocerata*," read June 6th, 1837, and published in the third volume of the Transactions, Mr. Stokes announces his conviction that the *Huronæ* previously described were the siphuncles of *Orthoceratites*. He had in the interim examined numerous specimens of other species of undoubted *Orthoceratites*, and found among them so many points of resemblance to *Huronia* that he could no longer doubt their relationship, although he thought proper to retain the generic name. The idea therefore of their being at least related to this family of the Cephalopoda is not new, but was long since seriously entertained by the first geologist who studied them attentively.

In the excellent little "Manual of the Mollusca," by S. P. Woodward, published in Weale's scientific series in 1851, part 1, page 89, there are two figures of *Huronia* with the following remarks :

"Numerous examples of this curious fossil were collected by Dr. Bigsby (in 1822) and by the officers of the regiments formerly on Drummond Island. Specimens have also been brought home by the officers of many of the Arctic expeditions. But with the exception of one formerly in the possession of Lieut. Gibson (68) and another in the cabinet of Mr. Stokes, the siphuncle only is preserved, and not a trace remains of septa or shell wall. Some of those seen by Dr. Bigsby in the limestone cliffs were six feet long."

Mr. Woodward's figure *a* consists of four joints of the siphon, with the corresponding septa, and he states in a note that it was made from a specimen presented to the British Museum by Dr. Bigsby. "The septa were added," he says, "from Dr. Bigsby's drawing; they were only indicated in the specimen by colorless lines on the brown limestone." His figure *b* represents two joints, beneath each of which are curved lines indicating the existence in that specimen of the reniform patches of color seen in our specimen, and which are simply transverse sections of the solid rings of animal secretion formed around the inside of the siphuncle upon the edges of the septa, and called by M. Barrande "anneaux obstruteurs."

If then, in view of the above facts and opinions which I have thought proper to give at some length, because they tend to support the disposition here made of these remarkable fossils, the *Huroniæ* are really the remains of chambered cephalopods belonging to the family of the *Orthocerata*, another question arises; are they generically distinct from *Orthoceras* proper?

And upon this part of the subject it may be observed, that the *Orthoceratites* were at first described as being all provided with a cylindrical non-inflated siphuncle either central or sub-central, and that since the discovery of the Lake Huron fossils those with siphons swollen between the septa have been usually referred to the genus *Ormoceras*, a name suggested by the bead-like form of this organ.

Some of the species have also been thought to be sufficiently distinct to constitute other generic groups and hence the names *Actinoceras*, *Conotubularia*, *Orthoceratites cochleati*, &c. But at present there appears to be a disposition among many palæontologists to allow these subdivisions to drop out of use, and to refer nearly all the species to the old genus *Orthoceras*. Thus M. Barrande, after examining nearly 300 species of palæozoic cephalopoda, has announced his intention to keep together, under the name *Orthoceras*, all the straight forms, whatever position the siphuncle may take, "*and no matter whether it be cylindrical or swollen between the septa.*"\*

The specimens in the collections of the Geological Survey of Canada show a regular transitional series, from those with siphons scarcely at all inflated, to those with annulations an inch and a-half in diameter. The segments are also either fusiform, globular, oblate, spheroidal, nummuloid, turbinate, or more swollen at one side of the chamber than at the other. Some of these forms are also apparent in two other genera. Thus in *Gyroceras magnificum* the siphon between the septa is dilated into a series of fusiform beads; in *Cyrtoceras regulare* the expansions are globular but scarcely two-thirds of a line in diameter; in *Cyrtoceras subturbinatum* globular, four lines in diameter, and exhibiting radiating lamellæ; while in one fragment of a species of *Cyrtoceras*, not described, it is expanded in the upper part of the chamber, and tapering below exhibits a form very like *Huronia*.

These specimens shew that it is absolutely impossible to draw a line between those species which should be referred to *Ormoceras* (provided that genus be retained) and those which belong clearly to *Orthoceras* proper. It is equally difficult to separate *Huronia* from *Ormoceras*. In the best-known species of this latter genus *O. tenuifilum*, Hall, good specimens show that the siphuncle is constructed on precisely the same plan as *Huronia*, with this difference only, that the inflation occurs in

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\* See a paper in the Quarterly Journal of the Geological Society of London, Vol. 10, page 6 of the "Translations and Notices," entitled "*On the Silurian Crustacea, Pteropoda, and Cephalopoda of Bohemia.*" By M. J. Barrande.

the lower part of the chamber. One beautiful example from the township of Fitzroy is completely silicified. It was originally imbedded in limestone, and thus by treatment with hydrochloric acid it became possible to remove completely the calcareous matter, leaving eight segments of the siphuncle perfect, and the corresponding chambers entirely empty. The length occupied by the eight chambers is three inches and one-eighth, the lateral diameter at the small end is one inch, at the large end one inch ten lines; the distance between the septa is pretty uniformly five lines, agreeing in this respect with fig. 2, plate 17, Pal. N. Y., Vol. 1, which Professor Hall refers to the variety *O. distans*. The septa appear to spring from the edges of the annulations of the siphon, but in one instance there is some evidence of an origin in the constriction below. The greatest expansion of the swollen portion of the siphuncle is just within the concavity of the septum, as expressed by Professor Hall, and on its upper side it first slopes with a rounded outline, and then ends suddenly with a perpendicular contraction to the small cylindrical portion, which is continued about one and a-half lines, and then gradually expands to form the next inflation above. Were all traces of septa and shell removed, this siphuncle would at once be called a *Huronia*. In another more slender specimen, also silicified, and prepared by the same process, the septa are only about three lines distant, and yet the *Huronia* form of the siphuncle is very perfectly exhibited, and moreover the septa seem to originate from the lower part of the constricted portion, immediately in contact with the base of the projecting shoulder-like upper margin of the next expansion below; they seem to be funnel-shaped and to contain the siphuncle, only branching away from it from the circumference of the annulations on the lower side. If this be the true interpretation of the appearances presented by these specimens, then the points of the insertion of the edges of the septa into the siphuncle, or rather of their attachment to it in these species, are the same as in *Huronia*.

In the next species to be described, *O. persiphonatum*, the siphuncle is on one side a perfect *Huronia* in appearance.

It consists of a regular series of joints, each broad at the top and diminishing downwards, the smaller end of each joint inserted into the larger extremity of the one next below. There are no traces of septa except just at the upper end of the joint, and there only so much as is seen in *Huronian vertebralis*, that is to say, "the thin horizontal septa" first observed by Mr. Stokes. Judging from this side we could only classify the specimen as an additional species of *Huronian*, but on examining the other side we find two of the septa remaining, and the perfect cast of the interior of the external shell, for the length of one of the chambers. It also shows that the septa were excessively thin, and although expanding from the edges of the annulation, as in *O. tenuifilum*, they originate from the base of the expansion next below; the three specimens have also the central slender tube of *Huronian*. The same organ may be seen more or less distinctly in almost every section of the siphuncle of *O. tenuifilum*.

It appears to me therefore that these several species only differ from each other specifically in the form and position of the inflated portions of their siphuncles, and that all the species of *Huronian* should be referred to the genus *Ormoceras*, provided that genus be retained; but if it be suppressed, that they should then be classified in the old genus *Orthoceras*. In removing this species to its new place it would be desirable to retain for it one of the original specific names, and I would call it *Orthoceras vertebralis*, were it not that there are already several species of that name. There is also one *O. Bigsbyi*. As it was first discovered in Canada, and as it has always been associated with the geology of Canada, I beg therefore to propose for it the name of *O. Canadense* -

*Locality and Formation*.—Middle Silurian, South-west Point of the Island of Anticosti.

*Collector*.—J. Richardson.

It occurs also in the same geological position on the Great Manitoulin and Drummond Islands, Lake Huron.



## ORTHOCERAS PERSIPHONATUM.

*Description*.—Elongate, large; siphon of great size, marginal; strongly annulated in the upper-half or two-thirds of each chamber, and cylindrical or but gradually expanded in the lower third; septa very thin and convex, distant six and a-half lines on an average when the siphuncle has a diameter of one inch and a-half.

The annulations of the siphuncle are in the two specimens examined, a little oblique, the ventral margin being nearest the aperture; a fragment of a siphuncle six inches and a-half in length tapers from one inch and a-half to one inch and a-quarter, or at the rate of about half-a line to the inch.

This species differs from *O. Canadense* only in its more approximate septa, and appears to have been like that, an extremely long, tapering form, with very thin, fragile, exterior shell and septa.

*Locality and Formation*.—Middle Silurian. Cormorant Point, Anticosti.

*Collector*.—J. Richardson.

## ORTHOCERAS CORNUM.

*Description*.—Section circular, tapering at the rate of one and a-half lines to the inch, from a diameter of two inches and four lines; siphuncle small, eccentric, one-fourth of the diameter from the margin; septa convex, from four to six lines distant. The only specimen seen is slightly bent, and has the siphuncle approximated to the side of curvature.

The specimen is ten inches in length and two inches in diameter at the largest end. A portion of the chamber of habitation remains, and some of the septa at its base are much less distant than elsewhere. Thus the first and second are distant two-thirds of a line, and the next five about one line and a-half each, the sixth and seventh two lines and a-half, and then they become at first six lines distant, and towards the apex only four lines.

The specimen resembles *O. subarcuatum* (Hall), but no traces of the annulations occurring on that species have been observed in this.

*Locality and Formation.*—Lower Silurian, apparently at the base of the Trenton limestone. Tower Cliff, S. E. point of Large Island, Bayfield's Chart, Mingan Island.

*Collector.*—J. Richardson.

#### ORTHOCERAS BUCKLANDII.

*Description.*—Section circular, tapering at the rate of one line to the inch; siphuncle small, eccentric, dilated between the septa into globular, bead-like expansions, two lines in diameter; septa moderately convex, two lines distant at a diameter of one inch and two lines; where the fossil is fourteen lines in diameter the siphuncle is four lines from the margin.

A specimen with a diameter of twenty-two lines, has the centre of the siphuncle distant from the margin about seven lines.

*Locality and Formation.*—Upper Silurian. Beach west of South-west Point, Anticosti.

*Collector.*—J. Richardson.

#### ORTHOCERAS MAGNI-SULCATUM.

*Description.*—Tapering at the rate of two lines to the inch; septa convex, exceedingly oblique, distant one line upon an average, at a diameter of one inch four lines; surface sulcated longitudinally by about fourteen shallow concave furrows, which, at the diameter mentioned, have a width of four lines each.

The specimen is a fragment one inch and a-half in length, exhibiting only the above characters. The great width of the longitudinal furrows is a most marked character, and will be sufficient to render very small fragments of this fossil instantly recognizable.

*Locality and Formation.*—Lower Silurian, Charleton Point.

*Collector.*—J. Richardson, Anticosti.

## ORTHOCERAS ALLUMETTENSE.

*Description.*—Section nearly circular, tapering at the rate of one line and a-half to the inch; siphuncle eccentric, dilated between the septa to the width of four lines and a-half; septa very convex, from two to two lines and a-half distant; surface apparently smooth.

The inner margins of the dilatations of the siphuncle are near at the centre of the fossil, and are oblique; the outer margins are most approximate to the aperture. When separated, the siphon resembles *O. persiphonatum* in consisting of a series of flattened discs with rounded edges, but it is not more than one-fifth the diameter of that species. It is also less than the same organ in *O. tenuifilum*; in a specimen of this last named species, at a diameter of one inch, even the constricted portion of the siphon is nine lines, while in *O. Allumettense* the annulations have only a breadth of from four to five lines.

This species is rather common in a fragmentary condition. It occurs at Pauquette's Rapids, at the lower end of the Allumettes Island, and also in the townships of Fitzroy, Hull and Huntley, associated with Bird's-eye, Black River and Trenton limestone fossils.

The specific name is derived from the *Ile des Allumettes*, as it is in the limestone at the lower end of this island that specimens of this species have been obtained in the greatest perfection.

*Formation.*—Lower Silurian, Bird's-eye, Black River, and Trenton. Localities as above.

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

## ORTHOCERAS OTTAWAENSE.

*Description.*—Section circular, tapering at the rate of about one line to the inch, from a diameter of seven lines; siphuncle small, nearly central, slightly dilated; septa at the diameter of seven lines, six in thirteen lines, about ten to the inch at a diameter of four lines; they are rather convex and a little oblique, their dorsal margin most approximate to the aperture.

The siphon appears to be more eccentric towards the apex than it is near the aperture. At a diameter of two lines and a-half, its centre is one line and a-half from the centre of the fossil, but at the diameter of seven lines it is very nearly central.

This species somewhat resembles *O. recticameratum* (Hall), but differs in its regularly convex and distant septa. In the figure of that species, Pal. N. Y., vol. 1, plate 2, figure 4, at a diameter of seven lines there are nine septa to the inch, and they are described by Professor Hall, as not curved, but passing obliquely in a line from the inside of the shell to the siphuncle, or *vice versa*. In one specimen at the same diameter there are scarcely six chambers to the inch, and the septa have a well rounded convexity of more than one line in height.

The specimen from which the above description has been drawn was collected at La Petite Chaudière Rapids, on the River Ottawa, where it occurs associated with numerous species of fossils of the Black River and Trenton limestones; but in the vicinity of the Union Bridge, two miles further down the river, numerous fragments occur in the central part of the Trenton, which have the same proportions, and appear to me to be the same species. In this latter locality they are replaced and often filled by crystalline dolomite weathering of a light red color. The specimens are usually from four to five inches in length, rarely more than six inches, and almost always consist of the smaller extremity of the fossil.

#### ORTHOCERAS MURRAYI.

*Description.*—Section sub-elliptical or obscurely triangular, tapering at the rate of one line and a-third to the inch, from a lateral diameter of thirteen lines; ventral aspect the broader; flattened or but slightly convex; dorsal side most convex along the centre, giving to the section a sub-triangular shape; lateral diameter greater than the dorso-ventral in the proportion of about eleven to thirteen; siphuncle cylindrical, one-sixth of the greatest diameter of the fossil, situated near the

ventral margin. The septa on the ventral side make a strong curve towards the apex; they are distant from one-seventh to one-tenth of an inch. In a specimen three and a-half inches in length and thirteen lines wide at the largest end, in the first inch of the smaller extremity there are not quite seven septa; in the next inch the same number, in the third nine, and in the half-inch five. Another specimen shews ten septa to one inch, at a diameter of thirteen and a-half lines, and in a third there are nine at a diameter of one inch; they are moderately convex. An artificial section through five of the chambers shews that the siphuncle is cylindrical, and that the septa, at the point of their contact with, it are bent suddenly towards the apex; the surface, which is not well shewn, appears smooth. The species is named after Alexander Murray, Esq., Assistant Provincial Geologist, who discovered it.

*Localities and Formation.*—Trenton limestones, north and east sides of St. Joseph's Island, Lake Huron.

*Collector.*—A. Murray.

#### ORTHOCERAS HASTATUM.

*Description.*—Shaped like a *Theca*, two-edged; ventral side broad and almost flat, slightly convex; dorsal aspect most convex along the centre, thence sloping to the sides, which are perpendicular to the ventral aspect, and nearly flat in the larger portion of the shell. The section is thus a low, broad-based triangle, with the angle at each end of the base truncated, and with the apical angle rounded. At a lateral diameter of eleven lines the height or dorso-ventral diameter is six lines; the rate of tapering is about four lines to the inch, measuring the inclination of the sides; the ventral and dorsal aspects approach each other at the rate of two lines and a-third to the inch; siphuncle small, close to the centre of the ventral margin; the septa are curved in a circle of which the radius is about half-an-inch, their distance from each other has not been satisfactorily ascertained; near the apex the sides consist of two rounded edges, but in the direction of the aperture

these become more and more broadly truncated, until at a diameter of eleven lines they have a perpendicular width of about two lines. The surface is coarsely striated transversely, and at the dorsal ridge, the striæ appear to make a bend towards the aperture.

*Locality and Formation.*—Black River, and Trenton limestone, Pauquette's Rapids, Ottawa City.

*Collectors.*—Sir W. E. Logan and E. Billings.

This species tapers more rapidly than *O. xiphias*, and judging from the size of one fragment must have attained a length of six inches.

#### ORTHOCERAS ROTULATUM.

*Description.*—Septa very convex, four lines distant at a diameter of one inch eleven lines; siphuncle large, dilated between the septa, constituting an obliquely nummuloid cylinder fourteen lines in diameter, where the diameter of the perfect fossil was two inches, and situated within three lines of the ventral margin. The annulations have an obliquity of about  $20^{\circ}$  to the longitudinal axis, and they are evenly convex from one septum to another.

A silicified specimen from which all the calcareous matter has been removed by the application of hydrochloric acid, shows the rings of obstruction to be contiguous, the line of contact between each two being near the centre of the dilatation on the dorsal side of the siphuncle, and a little in advance of the centre on the ventral side, where also they have the greatest thickness. The fragment appears to be the oral extremity of the siphuncle, and four of the rings at the entrance are still incomplete on the dorsal aspect, the last-formed having made the least progress at the time of the death of the animal. The acid has also removed from the interior all the limestone, leaving the inside of the rings exposed. They are transversely wrinkled or deeply striated in the general direction of the length. The diameter of the internal tubular cavity of the siphuncle is in this specimen six lines at the extremity, but it contracts to about two lines after penetrating three inches

(the length of the fragment), and it then contains a second small tube one line in diameter. Another specimen, two inches and a-quarter in length, is fourteen lines in diameter, and there is a portion of the external shell still attached to it, the convexity of which when extended into a complete circle, shows the diameter of the perfect animal to have been at this place two inches nearly. It also exhibits the strong transverse plications on the interior of the rings of obstruction, and shows that these were thickest on the ventral side. The lines of contact of the rings in this specimen are visible on the outer margins of the annulations of the siphuncle, as in the last, but appear to be nearly central all around; the small internal tube cannot be detected. This species differs from *O. persiphonatum* in the much more approximate septa, and in the uniform dilatation of the siphuncle, which in that is only expanded in the upper part of the chamber, while in this the margins of the segments are regularly rounded from one septum to another.

*Locality and Formation.*—Upper Silurian, Niagara Group, Head of Lake Tamiscamangue,

*Collector.*—Sir W. E. Logan.

#### ORTHOCERAS PYTHON.

*Description.*—Large, elongated, gradually tapering; septa very convex, distant one inch or a little more at the oral extremity, thence becoming more approximate, until at the apex they are scarcely half-an-inch apart; the siphuncle is large and dilated between the septa into a series of sub-globular or oval expansions, decreasing in size from the aperture towards the apex; these are slightly more inflated in the upper than in the lower half. At the apex in one specimen, the most perfect seen, where the septa are five lines distant, the diameter of the last bead of the siphuncle is four lines, and of the twenty-seventh from the apex eleven lines, the length being one inch; the passage through the septa is small. The separated siphuncle of this species is a fossil of a very remarkable appearance, resembling a row of small eggs placed end to end, the size gradually diminishing from the diameter of one inch

to that of three or four lines. It is one of these species which will probably not often be found with the septa and external shell preserved, as these portions of the structure appear to have been of a thin and perishable nature, while the siphuncle with the exception of a small central channel, was completely solidified by the calcareous secretion of the animal during life, and thus will perhaps be more frequently discovered well preserved.

The finest specimen known is a siphon eighteen inches in length, consisting of twenty-seven joints, corresponding to twenty-seven chambers, collected by Mr. P. A. McArthur in the Trenton limestone at the City of Ottawa. In this specimen there are no traces of septa or external shell. This, and several other fragments from the same locality, are now in the collection of the Geological Survey.

Another specimen of six segments, with a portion of the shell and traces of septa, was found by myself at the Côte des Neiges, Montreal, last summer. An artificial section shews the internal channel or tube, and also that the amount of secretion was greatest on one side, probably the ventral side.

Since the above was written, Professor Dawson, Principal of McGill College, Montreal, has given me the opportunity of examining another specimen in his collection; it consists of a fragment exhibiting on one side eleven of the expansions of the siphuncle, with traces of the septa upon the other. The specimen, although crushed, proves the siphuncle to be considerably excentric, and that the rate of tapering is almost one line to the inch. The eleven joints occupy a length of six and one-fourth inches, and they appear to belong to the terminal half of an individual of medium size. The memorandum accompanying the fossil when sent to McGill College, states that it was "Found in limestone rock, near the surface in the 14th concession of the Indian Lands, Kenyon. The surrounding country has abundance of limestone with the remains of fish or reptiles, thickly interspersed with granite boulders; the land has a great deal of sea-shell in it."



## ORTHOCERAS DECRESCENS.

*Description.*—Shell annulated, with sub-acutely rounded and slightly undulating ridges, which are two lines distant at a diameter of fourteen lines, somewhat more approximate towards the apex; intervening spaces regularly concave and half-a-line in depth. Section circular, tapering at the rate of two lines to the inch; siphuncle small, excentric, about one-sixth of the diameter from the centre; septa concave, slightly oblique, their ventral margins nearest the aperture, distant two lines at a diameter of eleven lines.

Differs from all other described annulated species of the Silurian limestone of America in its more rapid rate of tapering.

*Locality and Formation.*—Black River limestone. La Petite Chaudière Rapids, Ottawa River. East side St. Joseph's Island. A. W. Smith's farm, Côte de la Visitation, Island of Montreal.

*Collectors.*—E. Billings and J. Richardson.

## ORTHOCERAS VULGATUM.

*Description.*—Section circular or very slightly oval, tapering at the rate of one line and a-half to the inch; siphuncle nearly central, small; septa concave, distant from each other from two to two and a-half lines. A fragment two inches and a-half in length, fourteen lines in diameter at the large end, and ten and a-half at the smaller, has twelve chambers. A second specimen fourteen lines in diameter, has five chambers in a length of ten lines and a-half. A third, at a diameter of nine lines, has four chambers in a length of eight lines.

*Locality and Formation.*—Trenton limestone, Ottawa.

*Collector.*—E. Billings.

## ORTHOCERAS HURONENSE.

*Description.*—About six inches long; section circular; tapering at the rate of two lines to the inch; septa moderately convex, two lines distant at a diameter of eight lines, one line

distant at a diameter of four lines ; siphuncle small, central ; depth of chamber of habitation one inch and a-half, slightly contracted towards the aperture, and shewing upon the cast an internal thickened ring half-an-inch wide. The surface appears to have been sulcated with shallow longitudinal furrows, one line in width, which have left their impression on the cast ; this appearance, however, may be deceptive. Resembles *O. Ottawaense*, but has a more decidedly central siphuncle, while the septa are not so convex.

*Locality and Formation.*—Trenton limestone, east side of St. Joseph's Island.

*Collector.*—A. Murray, Esq.

*Sub-Kingdom*, ARTICULATA ; *Class*, CRUSTACEA ;

*Order*, ENTOMOSTRACA.

*Genus* BRONTEUS, (Goldfuss.)

BRONTEUS LUNATUS.

*Description.*—Oblong-ovate, or broadly-ovate, including the spines ; length two inches, width of thorax about one inch ; width across the head behind the eyes one inch and a-half. Head a perfect crescent, the posterior angles being produced backwards in broad flat spines, which terminate with sharp points almost as far back as the angles of the pygidium. Glabella between the eyes, about two-thirds the width of the axis of the thorax ; front of the glabella one and a-half times the width of the axis of the thorax ; the sides regularly curved, the neck-furrow moderately deep, rounded at the bottom and extending quite across. Immediately above the neck-furrow the glabella is suddenly but not much elevated, and continues at nearly the same level along the centre, until within one-fifth of its length of the front, and then descends with a somewhat sudden rounded slope to the margin. The transverse furrows of the glabella are represented on each side by three barely perceptible indentations, the first two a little in advance of a line drawn across the front part of the eyes,

the second nearly on this line, and the third about as far behind as the first are before the line. The eyes are two lines in length, more than semi-circular, and one line at their base from the posterior margin; they are separated from the glabella by a rather wide deep furrow, which is angular at the bottom. The distance from the eyes to the outer margin of the head is about equal to the width of the glabella in its most narrow part. The thorax is well trilobed, the axis elevated, depressed-cylindrical, one-fourth wider than the glabella between the eyes, a little broader in the middle than at the ends, and in perfect specimens somewhat narrower than the side lobes.

This however is owing to the greater convexity of the axis, for in specimens pressed quite flat the axis is as wide as the pleuræ are long.

All the annulations are smooth, slightly rounded, and terminate in sharp falcate points turned backwards.

The axis of the pygidium is semi-oval or sub-triangular, partly terminated at rather more than one-fourth the length from the thorax, and below that point continued in a low rounded ridge, which becomes gradually broader and less prominent until it reaches the margin. There are six shallow lateral furrows on each side; the first runs nearly parallel with the upper edge of the pygidium, and at a distance therefrom of a little more than the width of the articulations of the thorax, until it has proceeded half-way to the margin; it then runs backward and soon becomes obsolete. The second originates nearly in the same point with the first, but curves backward more directly. The other four are nearly straight, and at equal distances from each other, but all disappear on their approach to the margin.

In a specimen one inch eleven and a-half lines in length, the head occupies six and a-half lines, the thorax six lines, and the pygidium eleven lines; width of glabella between the eyes three and a-half lines, of front of glabella seven lines; centre of axis of thorax four and a-half lines; of the spines in the line of the posterior margin of head four lines, and of the pygidium at its upper margin fifteen lines. The specimen is

pressed nearly flat, consequently some of the transverse measurements are exaggerated.

The most striking character presented by this species is the remarkable crescent-shape of its head. The form to which appears to be most nearly allied in this respect is *B. Partschi*, (Barrande, *Système Silurian du centre de la Bohême*, vol. 1, plate 46, fig. 19.) In that species the spines extend backwards to the points of the third pleuræ, in ours to the points of the ninth.

*Locality and Formation.*—Not uncommon in the central part of the Trenton limestone, at the City of Ottawa.

*Collector.*—E. Billings.

### Genus TRIARTHURUS, (Greene.)

#### TRIARTHURUS SPINOSUS.

*Description.*—This interesting little trilobite is principally distinguished from *T. Beckii* by its spines. One of these springs from the centre of the neck-segment and extends backwards to the third or fourth segment of the body; a second proceeds from the centre of the eighth segment of the axis of the thorax, and projects back beyond the apex of the pygidium. Two others from the posterior angles of the head extend as far as the points of the seventh or eighth pair of pleuræ.

The spines are all slender, apparently cylindrical, and about one-fifth of a line in diameter.

The species is destitute of the short spines of *T. Beckii*, and in none of the specimens have I been able to detect more than thirteen segments in the thorax, and four or five in the pygidium, which is remarkably like that of a small specimen of *Calymene Blumenbachii*. In a well preserved specimen of *T. Beckii*, in the museum, there are distinctly fifteen segments in the thorax and five in the axis of the pygidium, so that if these two species be congeneric, the number of articulations in the genus must be a variable character.

*Locality and Formation.*—Very abundant in the Utica slate in the township of Gloucester, County of Carleton.

*Collector.*—E. Billings.

*Genus ACIDASPIS, (Murchison.)***ACIDASPIS HORANI.**

*Description.*—Broadly oval, sub-quadrilateral; length one and a half inch; width at the centre of the thorax eleven lines; surface nearly smooth, slightly granular; glabella including the side lobes oval, narrowed in front, the side lobes separated from each other by deep furrows sloping forward and outward, and from the body of the glabella by a shallow rounded groove; the central lobe on each side the largest. There are ten segments in the thorax; axis cylindrical, one-third wider at the head than at the pygidium; pleuræ with an elevated rounded ridge along their centres, on each side of which there is a shallow concave furrow. They are geniculated at a distance from the sides of the axis about equal to the width of the axis in the centre of the thorax; all the pleuræ that can be seen are terminated with long cylindrical sharp spines.

The pygidium is the segment of a circle of which the proportional length of the chord to the height is as seven and a-half to two and a-half; it is margined by a narrow sub-angular or rounded border half-a-line in width. The axis is conical, convex, terminated at the border behind; it exhibits three annulations, the first two conspicuous, rounded, and the last obscure; the first annulation is continued backwards on the lateral lobes of the pygidium and beyond the margin in the two principal spines. There are four secondary spines on each side of the principal, and six between them; they are all cylindrical and sharp pointed.

The following are the dimensions of the specimen discovered:

Length without the terminal spines,.....	nearly 16 lines.
Width at centre of thorax, .....	11 "
Length of glabella, .....	5 "
Length of thorax, .....	8 "
Length of pygidium, .....	nearly 3 "
Width of pygidium, .....	8 "
Length of principal spines,.....	3 "
Length of secondary spines,.....	2½ "

Of the head only the central portion is preserved. The neck-segment is mutilated, and it cannot therefore be determined whether or not there were any spines attached to the posterior part of the glabella. Detached specimens of the glabella would so much resemble the same part of certain forms of *Calymene Blumenbachii*, that they would be mistaken for that species unless critically examined.

I beg to dedicate this species to the Rev. E. J. Horan, Director of the Laval Normal School, at Quebec, who discovered and kindly communicated the specimen for description.

*Locality and Formation.*—Trenton limestone, Rivière à la Friponne, near Cape Tourment.

#### CLASS UNCERTAIN.

#### *Genus* PASCEOLUS.

The above generic name is proposed for certain ovate or sub-globular bodies resembling the *Ischadites Kœnigi* of the Silurian system, but differing therefrom in the form of the plate-like markings of the casts of the interior, which in this genus are pentagonal or hexagonal instead of quadrangular. A specimen from Anticosti shews that the animal was inclosed in a thin leather-like sack, and attached to the bottom by a short tubular continuation of this external covering. Its affinities appear to be with those of the *Tunicata*.

#### PASCEOLUS HALLI.

*Description.*—Body ovate or balloon shaped, being regularly rounded above and produced below into a short neck-like pedicle, which constitutes the organ of attachment; outer integument thin, its external surface covered with small irregular rounded wrinkles about ten in one line, distinctly visible to the naked eye; its interior reticulated with ridges corresponding to the divisions between the plate-like markings of the cast of the inside. The cast of the interior is completely covered with hexagonal or pentagonal divisions, presenting the

appearances of *Sphaeronites* or *Favosites*; these spaces are each about a quarter of a line in diameter at the base of the fossil, but increase in size above, until at the summit they are one line in diameter. The spaces are convex in their centres, and the interior of the integument is fitted with concave depressions to correspond.

One specimen was procured with the integument preserved; it extends below the base, and encloses the short pedicle as well as the body above. On one side of the cast there is a small elevation about half-way between the top and bottom, which appears to mark the position of an aperture in the side of the animal. I beg to dedicate this species to Professor Hall. Length of specimens one inch and a-half, greatest diameter about the middle, thirteen lines.

*Locality and Formation.*—White Cliff, Gamache Bay, Middle Silurian.

*Collector.*—J. Richardson.

#### PASCEOLUS GLOBOSUS.

*Description.*—Sub-globular from one to two inches in diameter; surface markings principally hexagonal, and about two lines in diameter.

*Locality and Formation.*—Trenton limestone, City of Ottawa, where it is found in certain quarries in great numbers, usually flattened or pressed into a hemispherical shape.

*Collector.*—E. Billings.

#### PLANTÆ.

##### *Genus* BEATRICEA.

The above generic name is proposed for certain tree-like fossils collected in the Lower and Middle Silurian rocks of Anticosti. They consist of nearly straight stems from one to fourteen inches in diameter, perforated throughout by a cylindrical and nearly central tube, which is transversely septate. Outside of the tube, they are composed of numerous concen-

tric layers resembling those of an exogenous tree. No traces of roots or branches have been distinctly observed. There appear to be two species, distinguishable only by the characters of the surface.

#### BEATRICEA NODULOSA.

*Description.*—The surface of this species is covered with oblong, oval, or sub-triangular projections from one to three lines in height, each terminating in a rounded blunt point which is nearer to one end of the prominence than to the other. Some of the projections are six or seven lines in length at the base, and half as wide. Generally they are smaller, and often with a nearly circular base; the distance between them is from one to three lines. They exhibit in some specimens a tendency to an arrangement in rows following the length of the stem. In some instances these rows wind around the stem in spirals. In addition to these characters, the whole surface is fretted with minute points, and these when partially worn show a perforation in their centres.

In a specimen three inches in diameter, the diameter of the central tube is three-quarters of an inch; the transverse septa are thin, very concave, and at distances from each other varying from one line to one inch.

*Locality and Formation.*—Anticosti, at Wreck Point, Salmon River and Battery Cliff. Lower Silurian.

*Collector.*—J. Richardson.

#### BEATRICEA UNDULATA.

*Description.*—The surface of this species is sulcated longitudinally by short irregular wave-like furrows from two lines to one inch across, according to the size of the specimen. In other respects it appears very like *B. nodulosa*. The largest specimen is ten feet five inches in length, about eight inches in diameter at the large end, and six inches and a-half at the smaller extremity. Another short fragment is fourteen inches in diameter.



All the specimens of both species are replaced by carbonate of lime, but show more or less perfectly the septate character of the central tube and the concentric arrangement of the layers of the stem. They are generally broken up into short pieces.

*Locality and Formation.*—Cape James, Table Head, two miles east of Gamache Bay, and numerous other localities in the Middle Silurian.

*Collector.*—J. Richardson.

I have the honour to be,

Sir,

Your most obedient servant,

E. BILLINGS.