

REVIEWS
NOTES AND DISCUSSIONS
etc.

CONTRIBUTIONS

TO

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PLAN AND OBJECT OF PUBLICATION.

During the last few years the study of palæontology in America has advanced with such vast strides, that the ordinary and established channels of publication have become entirely inadequate to the present needs. This fact must be obvious to every active palæontologist, who, after each season's work, is obliged to delay, perhaps indefinitely, the publication of the new material gathered. It is true, we have a number of learned societies that publish their proceedings, while several also publish a "Journal." But in most cases, when the use of their pages is not denied to non-members, they are not available to the palæontologist who desires to give a permanent value to his work, and is unwilling to encumber scientific literature with defective descriptions of his new species, and other discoveries. They are unavailable to the conscientious naturalist, mainly because of the inability or unwillingness of their publishers to furnish illustrations, without which it is practically impossible (at any rate in most cases) to identify the species with certainty, and, as the time has come when all descriptions of new species or genera, unaccompanied by suitable figures illustrating the characters upon which the species or genus is based, should be ignored, he is forced either to pay for the illustrations himself, or leave, the often valuable results of his labors and discoveries, to lie within the recesses of his own consciousness, a prey to forgetfulness, and the tarnishing influence of time. At all events, such has been the writer's experience, and to make himself independent, it is proposed to establish a series of private publications, to appear under the title of "Contributions to American Palæontology," and at such times when sufficient material has been arranged and studied to justify the outlay. Further, it is intended that each of the "Contributions" will be accompanied by from two to four lithographic plates, upon which all the new

species described will receive proper illustration. An edition of 1,000 copies is printed, and, to insure publication, 100 copies will be sent immediately to the working palaeontologists of this country and Europe. The remaining copies will be placed on sale, at but little above the cost of publication, with the principal booksellers making a specialty of works on natural history.

In the publication of this, the first number, the writer has been very generously aided, financially, by Mr. G. K. Greene, of New Albany, Ind., to whose collection also the types of all the species herein described belong. Such devotion to natural history, as his unwonted liberality proves him to possess, is rarely met with and highly creditable to him.

Descriptions of New Silurian and Devonian Fossils.

BY E. O. ULRICH.

BRYOZOA.

FENESTELLIDÆ, King, and ACANTHOCLADIIDÆ, Zittel.

More extended investigations of the large group of Palæozoic bryozoa comprised under the above families, have shown me that the classification adopted in the first part of my "American Palæozoic Bryozoa" (Jour. Cin. Soc. Nat. Hist., Vol. V., p. 150, 1882), is in some respects faulty, and yet more incomplete. Had I paid less attention to the arrangement given in Zittel's "Handbuch der Palæontologie," the result might have been more satisfactory. Since the publication of Part I., my studies have been carried on without interruption. A great quantity of material has been examined, most of it in an excellent state of preservation. I have sought especially to obtain examples of the typical species of all the genera related to *Fenestella* and *Acanthocladia*, and not without success. Thus, I am now enabled to treat these bryozoa with greater confidence than heretofore. However, as it is expected that my work on the bryozoa of the State of Illinois (Geol. Surv. of Ill., Vol. VIII.) will be ready for distribution in less than a year, the following synopsis of the classification I intend to adhere to in that work must suffice for the present. From the classification proposed by me in the Am. Pal. Bry., the following differs mainly in the removal of *Septopora*, Prout, and *Synocladia*, King, from the *Fenestellidæ* to the *Acanthocladidæ*. The propriety of this step seems so obvious to me, that I am confident it will become equally so to any one taking the trouble to make critical comparisons.

FENESTELLIDÆ. King.

Zoaria reticulate, poriferous on one side only, with the branches rigid, and united by regular non-poriferous dissepiments; or sinuous,

and united by anastomosis; rarely the branches remain free. Zooecia subtubular; apertures constricted, rounded, and usually provided with a peristome.

1. **FENESTELLA**, Lonsdale. Zoaria flabellate to infundibuliform, poriferous on the inside (always?) with branches nearly straight, and connected with each other at rhythmical intervals by non-poriferous dissepiments. Zooecia in two rows, separated by a more or less developed median keel.

2. **PTILOPORA**, McCoy. Zoaria pinnate, the median branch stronger than the oblique lateral branches. Otherwise like *Fenestella*.

3. **SEMICOSCINUM**, Prout. Zoaria funnel-shaped, poriferous on the outside. Dissepiments wide, very short, and, on the non-poriferous side, not readily distinguished from the branches. Here also the fenestrules are sub-rhomoidal or rounded. Zooecia as in *Fenestella*. Median keel strongly developed; without transverse bars.

Syn. *Carinopora*, Nicholson.

4. **UNITRYPA**, Hall. Zoaria and zooecia as in *Semicoscinum*, with the exception that the summits of the carinæ are connected transversely by continuous strong bars.*

5. **HEMITRYPA**, Phillips. Zooecia the same as in *Fenestella*. The median keel is thin, but high, slightly expanded at the summit, and provided with slender lateral processes on each side, which extend to the centre of the space between the carinæ, where they join an

*In his last report as State Geologist (1885), Hall publishes the conclusion of a paper "On the Mode of Growth and Relations of the Fenestellidae," which is continued from page 14 of his report for 1882. In the first part of the article he proves to his own satisfaction, that, with the exception of *Archimedes*, all the genera previously separated from *Fenestella* have been established upon insufficient grounds, and are, consequently, not entitled to recognition as distinct genera. Among the latter he places *Retepora*, but that genus was founded upon species differing so widely from *Fenestella*, that it is clear he did not examine into the characters of the original species. Had he done so, he would have learned that the two genera are very different, and that *Retepora* is, almost universally, regarded as a member of the *Cheilostomata*, with no paleozoic representation. Besides, *Retepora* has priority over *Fenestella*. However, during the preparation of the continuation of the paper, he seems to have changed his mind, and with the apology that they are convenient for reference and "an aid to the easy recognition and distinction of species," he gives short definitions of seventeen groups "which may be considered as of subgeneric importance." Six of these are described for the first time. It would be useless to enter into any controversy relating to the rank these divisions are entitled to, as I have no sympathy for sub-genera, and believe them an entirely superfluous encumbrance of nomenclature. Of the new divisions I accept *Unitrypa*, as above, because it seems to mark a natural and easily recognized genus. *Isotrypa*, and possibly, *Loculipora* as well, seems to differ only in the greater separation of the transverse bars which unite the carinæ. Such differences are scarcely of sufficient importance to justify the separation, and for the present, at least, I am not inclined to admit them. Not having met with any form having the characters ascribed to *Ptyloporina*, I will not presume to question the validity of the group, but I fail entirely to see the grounds upon which *Ptyloporella* is to be separated from *Ptilopora* of McCoy.

equally slender longitudinal bar that divides the space into two series of small angular openings, which may be alternate or opposite, and usually correspond in number to the zooecial apertures.

6. HELICOPORA, Claypole. Zoaria spiral, the inner edge thickened and non-poriferous, without, however, forming a solid central axis. Other characters as in *Fenestella*.

7. ARCHIMEDES, Leseur. Zoaria like those of *Helicopora*, but differing in having a solid central axis.

8. LYROPORA, Hall. Zoaria flabellate, the fenestrated portion spread between two strong, non-poriferous, diverging supports. Zooecia in from two to five rows. Median keel obsolete.

9. FENESTRALIA, Prout. Zoaria strong, with two rows of cells on each side of the median keel. In other respects like *Fenestella*.

10. POLYPORA, McCoy. Zoaria in most respects like *Fenestella*, but differing in having from two to six rows of cells, and in wanting the characteristic median keel. The latter is sometimes represented by a row of strong tubercles. Such species approach *Fenestralia*, Prout.

11. THAMNISCUS, King. Zoaria differing from those of *Polypona*, in wanting the dissepiments entirely, or in having them recur at very irregular and much longer intervals; beside, the branches bifurcate more freely.

12. ——— nov. gen. Zoaria in general much like *Polypona*, but the dissepiments are reduced to a minimum, and give the false impression that the branches inosculate as in *Phyllopora*.

13. PHYLLOPORA, King. Zoaria infundibuliform, consisting of anastomosing branches, which form a regular, round-meshed net work. Zooecia in two or more rows.

Syn. (?) PROTORETEPORA, DeKoninck.

14. SILURIAN FORMS; nov. gen. Like *Phyllopora*, but meshes irregular. Zooecia separated from each other by short, angular interstitial cells, the apertures of which are closed. Diaphragms often present.

15. GONIOCLADIA, Ethridge, Jr. Branches anastomosing, keeled on both sides. Zooecia in three or four rows on each side of the median keel of the poriferous side.

16. ——— nov. gen. Zoaria consisting of very slender, straight stems, which throw off a few lateral branches of equal dimensions. Cells in two rows. Median keel moderately developed. This genus should, perhaps, be placed with the *Acanthocladidiidae*.

(?) *Cryptopora*, Nicholson. This genus is unwillingly admitted as the characters ascribed to it are entirely anomalous. At present I am inclined to believe the author of the genus had before him some peculiarly preserved fragments of a species of *Semicoscinum*, or, possibly, *Unitrypa*.

ACANTHOCLADIIDÆ. Zittel (Emend Ulrich).

Zoaria poriferous on one side only, dendroid, pinnate, or forming fenestrated expansions, and consisting of strong, central stems, and numerous smaller lateral branches which proceed from their opposite margins. The lateral branches are free, or may unite (in the fenestrated genera) with those of the adjacent branches. Non-poriferous dissegments absent.

1. *PINNATOPORA*, Vine. Zoaria small, thin. Lateral branches short. Cells in two rows, one on each side of the moderately developed median keel, which is wanting on the lateral branches.

2. *SEPTOPORA*, Prout. Zoaria fenestrated, flabellate or leaf-like. Primary branches numerous, increasing by bifurcation or interpolation, and so arranged that the smaller lateral branches which proceed from their opposite margins unite with those of the adjacent branches. Reverse, or non-celluliferous side usually with fine striæ, and a variable number of scattered dimorphic pores. Celluliferous side, with two rows of zooecia arranged as in *Pinnatopora*.

3. *ACANTHOCLADIA*, King. Zoaria like those of *Pinnatopora*, but larger and with three or more rows of cells. Between these the surface is elevated into small longitudinal ridges or series of tubercles.

4. *SYNOCLADIA*, King. This genus differs from *Acanthocladia* in the same manner as *Septopora* does from *Pinnatopora*, in having the lateral branches of adjacent stems unite with each other, thereby forming of the whole a fenestrated frond.

Judging from the figures and description of the types of *Ithy-orachis*, McCoy, and *Penniretepora*, D'Orbigny, it seems probable that they also belong to this family, but till authentic specimens can be examined, their systematic position must remain doubtful.

FENESTELLA BIFURCA, n. sp. (Pl. I., fig. 2, 2a.)

(Ety. *bifurcus*, forked.)

Zoarium small, at first depressed infundibuliform, then decumbent and more or less undulated. Diameter of entire expansion not known to exceed 1.5 inches.

Poriferous side: Branches slender, bifurcating at intervals of 5 mm., more or less, .20 to .30 mm. in diameter, and from twelve to fifteen in the space of 5 mm. Dissepiments about one half the width of the branches, rarely carinate, usually rounded and slightly expanded at each end so as to leave sub-elliptical fenestrules; nine or ten in 5 mm. Length of fenestrules always a little greater than the width of the branches; width of same sometimes equalling that of the branches, but in the depressed portions of the undulated expansion, their transverse diameter is commonly reduced to only half their length. Zooecia in two ranges, one on each side of the moderately developed median ridge, the summit of which is rounded and often carries an inconspicuous series of small nodes. Zooecial apertures circular, when perfectly preserved with a faint peristome; about twenty-eight in the length of 5 mm. Diameter of aperture .07 mm. Just in front of the point of bifurcation of the branches, a cell of much greater dimensions than ordinary, is, apparently always, present, and, not infrequently, the angle between the diverging median ridges is occupied by two such cells. The diameter of their apertures is quite constant, being in most cases about .13 mm. Toward the margin of large examples, where the branches bifurcate less frequently than near the centre of the zoarium, similar cells may be detected occasionally on the side of a branch, taking the place of one of the ordinary cells.

On the non-poriferous side, the branches are rounded and rather unequal, the stronger ones being also more prominent. On most of the examples the surface is quite smooth, but on others irregularly distributed blunt spines may be detected. The fenestrules are larger than on the poriferous side, and generally more nearly quadrangular. Dissepiments faintly or not at all depressed below the level of the branches.

In most respects *F. bifurea* is quite an ordinary species of the genus and presents points of resemblance to a number of Silurian and Devonian species. It is distinguished, however, from all the species known to me, by the large cells occupying the angle of bifurcation of the branches. They enable the practiced observer to identify even worn fragments of the species. If these large cells and the peculiar dish-shaped appendages characterizing *F. pattelifera* n. sp., really represent ovicells, and I see no reason to doubt it, then these species furnish an important and very interesting addition to our knowledge of the *Fenestellidae*.

Formation and locality: Middle Devonian (Up. Helderberg?).
Falls of the Ohio.

FENESTELLA PATELLIFERA, n. sp. (Pl. I. fig. 1, 1 a.)

(Ety; *patella*, a small dish; *fero*, to bear.)

Zoarium of medium size, flabellate and somewhat undulating.
Width of entire expansion probably not exceeding two inches.

Poriferous side: Branches rigid, .20 to .25 mm. in diameter, fourteen or fifteen in the space of 5 mm.; bifurcations remote. Dissepiments short, rounded, about half the width of the branches, and more or less expanded at each end, leaving rather narrow, sometimes subquadrate, but more commonly elliptical fenestrules, the length of which is always greater than the width of the branches, being in most cases nearly twice as great. Width of fenestrules generally equaling about two-thirds that of the branches, often a little less, rarely more, while their length equals, apparently always, at least twice their width. Measuring longitudinally ten or eleven occur in the length of 5 mm. Sides of fenestrules often a little indented by the projecting apertures of the zooecia. Zooecia in two ranges, one on each side of a moderately developed median ridge, the summit of which, in the perfect state, is sharp and carries a series of small conical nodes, the bases of which are nearly in contact; usually there are three of these nodes to each fenestrule, one opposite the junction of the dissepiments with the branches, and two in the space between. Zooecial apertures small, circular, and surrounded by a faint peristome; about twenty-eight in the length of 5 mm.; diameter of apertures .07 mm. In a view at right angles with the plane of expansion the apertures appear to be of slightly elliptical form, with their longer diameter directed obliquely upward and outward. This appearance is most marked in perfectly preserved examples. Ovicells (?), consisting of a cell of larger size than the ordinary zooecia, occupying the bottom of a saucer or cup-shaped expansion, the inner margin of which is bounded by the median ridge of the branch, while the outer margin may project entirely across the fenestrule and combine with the next branch. But in most cases this margin is semi-circular in outline, and projects into the fenestrule so as to occupy only about half of it. These peculiar ovicells (?) or appendages are very unequally distributed, being apparently absent over considerable spaces on some examples. The figure on pl. I., fig. 1, representing a small portion of the poriferous side of a specimen having them more numerously developed than any other seen by me. Ordinarily, about half as many occur in the same space.

On the non-poriferous side the branches are rounded, subequal, and smooth. The fenestrules are wider than on the poriferous side, and, consequently, the branches narrower, while the dissepiments are thicker and often raised above the level of the branches, when they form irregular, transverse or oblique ridges. The fenestrules may be subquadrangular or nearly circular, but generally they are oval, with a width equal to about two-thirds of their length.

The distinguishing feature of this species is found in the peculiar cup-shaped appendages above described. Much more numerous, but very similar expansions are shown in a figure of a species given by Hall in his last report (1885). The species is noted as *Fenestella labiata* in the explanations accompanying the plate, and the name is followed by a very insufficient description. The geological horizon is not given. Comparing *F. patellifera* with the figure of *F. labiosa*, I find, beside the numerically greater development of the cup-shaped expansions, that the dissepiments in the latter are also much stronger.

Formation and locality: Middle Devonian (Up. Helderberg?). Falls of the Ohio.

FENESTELLA PULCHELLA, n. sp. (Pl. I., fig. 4, 4a).

(Ety., *pulchellus*, pretty.)

Zoarium flabellate and always more or less inclined to form a very shallow funnel. Inner side poriferous. Outer portion of expansion irregularly undulated. Diameter of entire zoarium not known to exceed 6 cm.

Poriferous side: Branches rather stout, strongly carinate, frequently bifurcated and somewhat flexuous, especially so near the point of attachment; width varying from .33 to .40 mm.; seven or eight occur in 5 mm. Dissepiments carinated, from one-half to nearly as wide as the branches, expanded at their ends, and varying greatly in length. On this account the fenestrules also vary in their width, being in some cases quite as great as that of the branches, while that of others of the same fragment may not exceed one-fourth of their width. Their length is more uniform, though by no means constant; in the space of 5 mm., the average number is about three or four. Zooecia, comparatively large, in two ranges, one on each side of the strong and sharp median keel. Apertures circular, about .14 mm. in diameter, with a distinct peristome; about twenty-two in 5 mm. Intervals between apertures of slightly less width than their diameter.

On the non-poriferous side the branches are rounded or a little

flattened, and ornamented by extremely fine granular striæ. The general appearance of this side varies greatly in different fragments. In some the width of the branches, and form and size of the fenestrules, is fairly constant, while in others they are very irregular, with some of the branches thicker and more prominent than others, and the fenestrules varying from broad oval to sub-linear. Dissepiments not depressed, generally about two-thirds as wide as the branches.

This species is remarkably variable in the form and size of the fenestrules, and to a less degree in the width of the branches. On the other hand, however, it is very constant in the size and arrangement of the cells, and the granulo-striate ornamentation of the back of the branches. These characters, as well as the large size of the fenestrules and branches, distinguish the species from all others of the genus known to me from the Devonian. I have before me three fragments of what may prove a variety, but more probably a distinct species, in which the cells are a little smaller, the branches more delicate and rigid, the dissepiments slenderer, and the fenestrules more regular and quadrangular. These fragments, therefore, seem to belong to a species more delicate in every respect than those now referred to *F. pulchella*.

Formation and locality: Middle Devonian (Up. Helderberg?). Falls of the Ohio.

FENESTELLA SCULPTILIS, n. sp. (Pl. I, fig. 3.)

(Ety., *sculptilis*, engraved).

Zoarium flabellate, strong, and somewhat undulated, with a diameter of about two inches.

Poriferous side: Branches stout, remotely bifurcated, sub-equal, eight or nine in the space of 5 mm., each having a width varying from .33 to .50 mm. Dissepiments strong, about two-thirds as wide as the branches. Fenestrules narrow, elliptical, about twice as long as wide, and, generally, about half as wide as the branches; seven or eight may be counted in the length of 5 mm. Along the centre of both the branches and dissepiments is an irregular channel or groove. The one on the branches passes from side to side in a more or less distinctly zigzag manner between two irregularly alternating rows of compressed nodes. The relative development of these nodes is very unequal, and in the narrower branches the two series are so closely approximated that they appear to form but a single row. At other times they may be wanting locally on one or even on both sides. In

all cases, however, the groove remains as a clearly defined feature, and because of its irregularly zigzag direction, gives the celluliferous surface a peculiar and very characteristic roughness. Zooecia in two ranges, their apertures circular, largest in the young stages, varying in diameter from .08 to .11 mm.; from twenty-three to twenty-five occur in each series in the length of 5 mm. Width of intervals between the cells sometimes equal to their diameter; usually it is not more than two-thirds as wide. Many of the specimens show an occasional cell that is appreciably larger than the average. These may represent ovicells.

On the non-poriferous side the branches are narrowly rounded, usually sub-equal, smooth, or with a few irregularly distributed nodes. Fenestrules oval, rarely subcircular, wider than on the poriferous side. Dissepiments of variable thickness, and usually smaller than the branches. Not infrequently they are prominent, and form short indistinct transverse or oblique ridges. Each zoarium seems to have been provided with a few of those peculiar thorn-like appendages, which are so characteristic of some of the Lower Carboniferous species (e. g. *F. banyana*, Prout). Some of them attained a length of at least 3 cm., and gradually tapered from a diameter of 1.5 mm. to a point.

This species is remarkable in having a median groove instead of a keel on the poriferous side of the branches. This character gives the zoarium such a distinctive aspect that comparisons with other species of the genus are rendered quite unnecessary. A somewhat similar channelling is usually present in an associated species of *Polypora*. The latter is very common, and may be the *P. shumardi* of Prout.

Formation and locality: Middle Devonian (Up. Helderberg?). Falls of the Ohio.

FENESTELLA BIGENERIS, n. sp. (Pl. II. fig. 1, 1a.)

(Ety., *bigeris*, of two kinds.)

Zoarium flabellate, robust, slightly undulating, as much as three inches in diameter.

Poriferous side: Branches equal, rigid, strong and high, but not stout, about .33 mm. in width; eleven or twelve occur in 5 mm. Median ridge thin, high, and very frail. In the perfect state it is slightly expanded at the top, and surmounted by small irregular transverse ridges or nodes, which project on each side and give the margin of the keel a distinctly crenulated or toothed character. These transversely extended nodes correspond in number to the cells, and have a length

about equal to the width of the branch. In the concave portions of the zoarium they may be brought into such close proximity that an irregular union takes place between those of the adjoining branches. This feature, however, is evidently accidental. Dissepiments as wide as the branches, eight in the length of 5 mm., and surmounted by a thin carina, giving the fenestrules a quadrangular form in the outer region (*i. e.*, the portion bounded by the crests of the branches and dissepiments). In passing downwards toward the non-poriferous side, they assume, gradually, an elliptical form, with a length about equal to twice their width, which is about .22 mm., or equal to two-thirds of that of the branches. Zooecia in two ranges, usually with three to each fenestrule, and from twenty-three to twenty-five in each row in 5 mm. Apertures circular, rather small, .08 mm. in diameter, and separated by intervals, the width of which equals one and a half times their diameter.

Non-poriferous side with the branches rounded, nearly equal throughout, and covered with numerous granules, when not worn. The dissepiments are often as wide as the branches, but usually a little narrower, and in many cases more prominent than the branches. The fenestrules, while in most cases of an elongate elliptical form, are frequently inclined to become quadrangular. Their greatest width is generally a little less than half their length.

This fine species resembles in some of its characters the *F. precursor*, Hall, from the Lower Helderberg group, but they are clearly distinct, since the dissepiments in that species are much thinner, and the carinæ of different construction. In Hall's species the crest is terminated above by a straight, obtusely angular ridge, and the lateral margins extended in slender processes, while in *F. bigeneris*, the carina is terminated by a series of transversely extended nodes. The summit of the carina is therefore quite different in the two species since in the one it is smooth, and in the other crenulated. The characters of *F. bigeneris* are so distinctive that specimens in a good state of preservation can not be confounded with any associated species. The propriety of referring species of this order to *Fenestella* might be questioned, as they clearly approach the genus *Hemitrypa*. I consider it very undesirable, however, that any but such species in which the lateral processes of the carinæ are united so as to leave regular series of openings, should be placed under *Hemitrypa*. This course admits of a better definition of the two genera, and to me seems preferable to any other.

Formation and locality: Middle Devonian (Up. Helderberg?). Falls of the Ohio.

SEMICOSCINIUM OBLIQUATUM, n. sp. (Pl. I., fig. 5, 5a).

(Ety., *obliquus*, oblique).

Zoarium infundibular, celluliferous on the outside, attached to foreign objects by a strong, expanded, ridged and irregularly poriferous or compact base. A short distance above the base the zoarium expands more or less rapidly, and the outer portions are often somewhat wavy. Diameter of entire specimen not known to exceed $2\frac{1}{2}$ inches. In the majority of specimens it is $1\frac{1}{2}$ inches or less.

Poriferous side: Branches stout, frequently a little sinuous, and connected by slightly depressed, short but wide dissepiments, of which six occur in the space of 5 mm. Width of branches varying from .33 to .50 mm.; ten or eleven in 5 mm. Width of dissepiments about .50 mm. Fenestrules of variable shape and size, usually rather small, and of an elliptical form. Carinæ high, strongest near the base, from which they gradually diminish in strength till at the outer margin of the zoarium they are reduced to a simple thin ridge. When fully developed the summit is abruptly expanded into a flat or concave band, about one-half as wide as the branch. Zooecia in two ranges, one on each side of the median keel; twenty-two to twenty-four in 5 mm. Apertures often oblique, sub-circular, about .08 mm. in diameter, with the outer margin prominent. Interspaces about equal to the aperture diameter. When worn, the zooecia are angular and thin-walled, the median plate thin and straight, or zigzag, according as the cells are opposite or alternate in their arrangement.

On the non-poriferous side the branches are narrow, depressed, and more or less zigzag in their direction, the dissepiments prominent, with a strong node at the upper margin, giving them an oblique and very characteristic appearance. The fenestrules are usually of an obscurely rhomboidal form, but may be sub-triangular or elliptical. Measuring diagonally, eight or nine occur in 5 mm. Beside the large nodes already mentioned, numerous smaller ones may be present.

Species of this genus are less readily recognized by the characters of the poriferous surface than by those of the opposite side. This is due, first, to the fact that the poriferous side is very nearly alike in all, and, second, because this side, in the ordinary state of preservation, is almost invariably obscured by the adhering matrix, which it is

quite impossible to remove from between the carinæ. Among the silicified and exquisitely preserved bryozoa from the Ohio falls I find no difficulty in separating at least six species, by the peculiarities of the inner or non-poriferous side alone. The differences are found in the form and size of the fenestrules, the thickness and characters of the branches and dissepiments, some being flat, and others simply convex, while in two of them the branches are thinner than the dissepiments, and, on account of the prominence of the anterior margin of the latter, the fenestrules penetrate the frond in an oblique manner. *S. obliquatum* resembles *S. rhomboideum*, Prout, the type of the genus, more nearly than any other known to me. Prout's species, however, is a much larger form, with stronger branches, and more uniformly rhomboidal fenestrules on the non-poriferous side. The branches on that side differ also in being faintly angular, and without nodes or spines. Another difference may be observed on the poriferous side, where the expanded summit of the carinæ is found to be sub-angular above and crenulated on each side.

Formation and locality: Not uncommon. Middle Devonian (Up. Helderberg?). Falls of the Ohio.

SEMICOSCINTIUM INFRAPOROSA, n. sp. (Pl. I., fig. 6, 6a, 6b.)

(Ety., *infra*, underneath; *porosa*, full of pores.)

Zoarium small, infundibuliform, celluliferous and ridged on the outer side, 3cm. or less in height, and not more than 3.5cm. in diameter; basal expansion comparatively small.

Poriferous side: Branches of moderate strength, often slightly flexuous, connected by rather short, wide and depressed dissepiments, of which six occur in 5 mm., while nine to eleven branches occupy the same space. Width of each branch varying from .30 to .50 mm. Fenestrules of variable size, circular or ovate. Carinæ strongest near the base, gradually diminishing in strength and height toward the upper margin of the zoarium. When fully developed, the summit is expanded, and faintly angular or rounded above, while each of the sides of the expanded portion presents a variable series of pits or cells with sub-circular apertures, the diameter of which is greater than that of the zooecia below them. Zooecia in two ranges, one on each side of the median keel; twenty to twenty-two in 5 mm. Apertures sub-circular, about .09 mm. in diameter, with a faintly elevated margin or peristome. Inter-spaces equal to nearly twice the aperture diameter.

On the non-poriferous side the fenestrules are very irregular in form and size, varying from elongate elliptical to sub-circular, and from .25 to .50 mm. in diameter. The branches and dissepiments are somewhat flattened, as wide as, or wider than the fenestrules, and, unless critically examined, not distinguishable from each other. Large pores of the same nature as those on the margin of the carinæ, with an average diameter of about .13 mm., are irregularly distributed over the surface of the branches and dissepiments. Their number varies considerably in different specimens, but, so far as observed, never exceeds the number shown in fig. 6, while in some specimens (locally, at least) they are scarcely half as numerous.

This species must be closely related to the *Fenestrapora biperforata*, Hall.* That species is illustrated by but one figure, representing a portion of the non-celluliferous side of the zoarium, magnified, but to what extent is not stated. The description was not intended, I suppose, to be specific, as no measurements are given. If the figure is correct, then *S. infraporosa* is a distinct species, since the pores on the non-celluliferous side are more numerous, and the branches and dissepiments much thinner than they are in my species. Until the nature of the irregularly distributed pores on the reverse of the branches is better understood, I am not inclined to recognize *Fenestrapora* as distinct from *Semicoscinium*. Pores apparently of the same nature occur in other members of the *Fenestellidae*, and also in *Sep-topora*, Prout.

Formation and locality: Middle Devonian (Up. Helderberg?). Falls of the Ohio.

UNITRYPA RETRORSA, n. sp. (Pl. I., fig. 7, 7a, 7b, 7c.)

(Ety., *retrorsus*, turned backwards.)

Zoarium large, strong, several inches in diameter; at first funnel-shaped, then decumbent and more or less undulating; poriferous on the outer side.

Poriferous or outer side of branches, when stripped of the transversely connected carinæ, (this is not often the case) somewhat sinuous, about .29 mm. in diameter; with two rows of comparatively large zooecia, the apertures of which are elevated, sub-circular, and separated from each other by interspaces of a width about equal to their diameter; eleven or twelve branches in 5 mm.; twenty-two to twenty-four cells in the same distance. Dissepiments short, wide, depressed.

*Generic illustration of Bryozoa. Pl. II. fig. 17. Report State Geologist. 1885.

Fenestrules elliptical, nearly twice as long as wide, and one-half to two-thirds as wide as the branches. Width of dissepiments and length of fenestrules generally about equal to the width of the branches. Six fenestrules in 5 mm. The outer layer, formed by the connected carinæ, is usually preserved. Its thickness is nearly equal to that of the celluliferous branches. A cross section (pl. I. fig. 7c) shows that just above the latter the carina is very thin. At a point about mid way between the top of the branch and the outer surface of the expansion, it begins to expand and unite with the adjacent carinæ by means of strong transverse bars. These bars have a width a little less or about equal to that of the elliptical interspaces left. They are vertically flattened, and at first are thin and directed obliquely forward, then, bending backward at nearly a right angle, they assume a direction opposite to that originally maintained by them (pl. I., fig. 7b.). The apertures of the interstices are, therefore, also directed obliquely backward. This peculiarity is regarded as one of the principal features of the species, and suggested the name. Summit of carina faintly angular and slightly elevated. Thirteen or fourteen of the transverse bars occur in 5 mm.

The characters of the non-poriferous side vary greatly with age and for other causes. In young examples the branches and dissepiments are much thinner than in fully matured specimens, while the latter are generally also more prominent, and form transverse or diagonal ridges. In the arrangement of the fenestrules is found a prolific source for variation. When they are alternate, as shown in fig 7b., pl. I., the branches and dissepiments are sub-angular, and form more or less distinctly defined hexagonal areas; but, when opposite, the branches are thinner and less prominent than the dissepiments, both are narrowly rounded or angular, while the fenestrules are quadrate. All intermediate gradations between these extremes may occur on the same fragment. The fenestrules are always longer than wide, and usually of less width than the branches.

This fine species differs from all other species of the genus in the retroflexion of the transverse bars and interspaces.

Formation and locality: Middle Devonian (Up. Helderberg?). Common at the Falls of the Ohio.

UNITRYPA CONFERTA, n. sp. (Pl. I., fig. 8, 8a.)

(Ety., *confertus*, close together.)

Zoarium strong, two inches or more in diameter, attached to foreign objects by a small, compact base, above which it assumes the shape of a rapidly diverging funnel, with the outer margins of the expansion slightly waved. Carinæ high, thin at their origin on the top of the branches, with the summit expanded, rounded, about .16 mm. wide, and prominently elevated above the level of the transverse connecting bars. The latter are only about half as thick as the longitudinal ridges, and separated by transversely elongated interspaces, the width of which is about equal to that of the bars; twenty-six or twenty-seven occur in the length of 5 mm. Measuring transversely across the frond, twelve branches and carinæ occupy the same space. The transverse bars are really thin plates, having a sort of imbricating arrangement, as they are not vertical, but directed obliquely backward. When stripped of this other layer, the celluliferous surface of the branches is exposed. Here the branches are about .28 mm. wide, somewhat rigid, with two rows of zoecia, twenty-three to twenty-five in each range in 5 mm. When preserved, the apertures are circular, .08 mm. in diameter, with a strongly elevated margin, and separated by interspaces of greater width than the apertures. Dissepiments very short and depressed, from one-half to nearly as wide as the branches. Fenestrules narrow, twice as long as wide, and usually about half the width of the branches; nine in 5 mm.

Non-poriferous side of the branches often slightly flexuous, smooth, rounded, and of less width than on the opposite side. Dissepiments variable, being in some cases stronger and more prominent than the branches, in others the height and width of the two are about equal, while in a few cases the branches are widest, and the dissepiments even a little depressed. The fenestrules are always somewhat longer than wide, but vary from sub-quadrata to sub-circular in form. The width is usually about equal to that of the branches.

Associated with the specimens now referred to this species, I find a number of others which belong to a closely allied species or variety. They differ from *U. conferta*, in having the summit of the carinæ much thinner, and less elevated above the level of the transverse bars. On the non-poriferous side the branches are thinner and the fenestrules larger. These specimens may belong to the *U. spatiosa*, Hall, the type of the genus, but till that species is fully described, I will not attempt to identify them with it. From *U. retrorsa* the present spe-

cies differs so obviously in the greater number of the transverse bars that detailed comparisons are rendered unnecessary.

Formation and locality: Middle Devonian (Up. Helderberg?). Not uncommon at the Falls of the Ohio.

POLYPORA TRANSVERSA, n. sp. (Pl. II., fig. 2, 2a.)

(*Ety., transversus, cross-wise.*)

Zoarium of moderate size, flabellate, and somewhat undulated.

Poriferous side: Branches strong, straight, and regular, varying in width from .35 mm. immediately after bifurcation, to .66 mm. just before division takes place, seven or eight in 5 mm. Dissepiments short, about as wide as the branches, and much depressed. Fenestrules very narrow, five in the length of 5 mm. On account of the depression of the dissepiments and the narrowness of the fenestrules, this side of the frond appears to be traversed longitudinally by narrow furrows. Zooecia in two ranges immediately after bifurcation; this number is soon increased to three, and before the branch divides, to four; twenty-two or twenty-three occur in 5 mm. The apertures are small, sub-circular, .07 mm. in diameter, and occupy the summits of papillose elevations, which are, in most cases, laterally confluent, and form transverse or oblique ridges, with narrow furrows between them.

On the non-poriferous side the branches are narrowly rounded and smooth, with the dissepiments somewhat thinner, slightly prominent, even, or faintly depressed. The fenestrules are elliptical, much wider than on the opposite side, and once and a half as long as wide.

This species resembles another new species from the Chester group more closely than any other known to me. Both are related to the *P. biarmica*, Keyserling, from the Carboniferous of Russia. *P. transversa* differs from those species in having the cell apertures arranged transversely upon ridges, and in being smaller. The narrow fenestrules and depressed dissepiments distinguish it from the associated species of the genus.

Formation and locality: Middle Devonian (Up. Helderberg?). Falls of the Ohio.

POLYPORA BLANDIDA, n. sp. (Pl. II., fig. 3, 3a.)

(*Ety., blandidus, pleasing.*)

Zoarium delicate, infundibuliform, poriferous on the inner side; with a small base near which the backs of the branches send down

thin supports or rootlets. Entire height, not exceeding 4 cm. so far as observed.

Poriferous side: The branches have a delicate aspect, bifurcate freely, and vary in width from .40 to .70 mm.; about five in 5 mm. Dissepiments sharply carinate, depressed, of variable length, about four-fifths as wide as the branches. Fenestrules large, generally about as wide as the branches, and two or three times longer than wide; five or six occur in 10 mm. Zooecia in three rows, but below the bifurcation the number is increased to four or five. Apertures small, .06 mm. in diameter, with strongly elevated margins, giving them a papillose appearance; often arranged in transverse or diagonally intersecting series. Measuring longitudinally, twenty occur in 5 mm. The interspaces are wide, and sometimes ornamented with vermicular striæ. A series of small inconspicuous and widely separated nodes is often present along the center of the branches.

On the non-poriferous side the branches are narrowly rounded, smooth, and slightly thinner than on the opposite side. Dissepiments as strong as the branches, and usually not prominent. Fenestrules wider than on the poriferous side, and therefore of more nearly oval form.

Species of this character approach *Thamniscus*, King. In fact, they differ from the typical species of that genus only, in possessing a much greater number of dissepiments. These structures are generally supposed to be entirely absent in *Thamniscus*, but that they are developed occasionally is shown by one of my specimens of *T. dubius*, Schlotheim (sp.), the type of the genus. A number of species presenting characters intermediate between. *Polypora blandida*, and *Thamniscus dubius*, occur in the Lower Carboniferous and Coal Measures, and it is not easy to say just where the dividing line should be drawn. In accordance with the amended definition of *Thamniscus* given on p. 5., I propose to extend the limits of the genus so that it will include, besides the type species, such forms as differ from the true species of *Polypora*, and agree with *T. dubius*, in having widely separated zooecial apertures occupying the summits of elevated papillæ, frequently bifurcated branches, and remote, irregular dissepiments. The facts here noted sufficiently explain the removal of *Thamniscus* from the *Acanthocladidiæ* to the *Fenestellidiæ*.

Specifically, *P. blandida* differs from the numerous Devonian species of the genus known to me, by the infundibulate form of the zoarium and the widely separated zooecial apertures.

Formation and locality: Middle Devonian (Up. Helderberg?). Falls of the Ohio.

FISTULIPORA NORMALIS, n. sp. (Pl. II., fig. 4, 4a, 4b.)

(Ety., *normalis*, according to rule.)

Zoarium incrusting, or partially free, consisting of an irregularly undulating, lamellate expansion, from one to four mm. thick, according to the number of super-imposed layers; under surface with a very thin, more or less wrinkled, epithical membrane. Zooecia tubular, with sub-circular or elliptical apertures, arranged in obscurely radiating series around the sub-stellate maculae, which are distributed over the surface at intervals of about 4 mm. Central portion of maculae smooth, concave, and of variable size. Apertures of zooecia in the immediate vicinity of the maculae, about .28 mm. in diameter; the diameter of the apertures gradually decreases in all directions from the maculae till it is no more than .20 mm., the ordinary size of those in the inter-macular spaces; here fifteen or sixteen cells occur in a row 5 mm. long. The anterior margin of the apertures is very thin and faintly elevated, while the posterior side (i. e., the side nearest to a macula) is thicker, more prominent, and of crescentic form, with one or both extremities projecting slightly into the aperture. In well-preserved examples the inter-apertural spaces are smooth, concave, and rather narrow, being generally only about half as wide as the cell apertures. When worn or otherwise injured, the vesicular interstitial tissue is exposed. The vesicles form a single series around the zooecia; in vertical sections they constitute a closely woven tissue. The zooecial tubes are provided with one or two diaphragms; sometimes they appear to be absent.

This species is in every respect a genuine *Fistulipora*, and for that reason is here described and figured. It may have been named by Hall, in his pamphlet on the Upper Helderberg bryozoa, where he names a large number of *Lichenalia* species, but as I have found it utterly impossible to identify any of the species from the brief and sometimes vague descriptions, I have deemed it best to name the species as above. From a recent paper on the genus *Fistulipora*, by Nicholson and Foord, it appears that now the only remaining excuse for the always uncertain genus *Lichenalia* has been removed, by finding that the type specimen of McCoy's *Fistulipora*, possesses a structure differing in no essential feature from the Upper Silurian *L. concentrica*. *Lichenalia*, therefore, must be dropped from the list, and *Fistulipora* used instead.

Formation and locality: Middle Devonian (Up. Helderberg?). Falls of the Ohio.

ERIDOPORA MINIMA, n. sp. (Pl. II., fig. 6, 6a.)

(Ety., *minimus*, the smallest.)

Zoarium encrusting, very thin, expanded, with slightly elevated stellate maculae, arranged in curved series, about 3 mm. distant from each other, measuring from centre to centre. Zooecia short, tubular, very oblique, or nearly prostrate, gradually becoming less so and smaller in all directions from the depressed and smooth central portion of the maculae. Apertures small, directed away from the maculae, usually of triangular form, but when perfect somewhat resembling the figure 3; posterior margin strongly elevated, slightly arched, acutely pointed above, and deeply notched in front; the arrangement is very regular in intersecting and radiating series; in the spaces between the maculae seventeen or eighteen occur in 5 mm. The interstitial spaces are concave, smooth, and wider than the zooecia; internally they are occupied by vesicular tissue. Zooacial tubes, so far as observed, without diaphragms.

This beautiful species agrees in every important feature with the typical species of *Eridopora*, proposed by me in the "American Palæozoic Bryozoa" (Jour. Cin. Soc. Nat. Hist., vol. v., p. 137). A number of species of the same order are known to me from the Devonian and Lower carboniferous deposits, and, although some of them approach *Fistulipora* in a more or less decided manner; the group, nevertheless, deserves generic recognition, because of the unquestionable affinity with the *Ceramoporidæ*. The difficulty of defining the limits of genera always increases with the discovery of new species. This is to be expected if the theory of evolution is founded upon facts. In my opinion it is no longer a theory, but a law, that is being demonstrated over and over again by the continual discovery of intermediate species and varieties, all tending to make the lines separating species, genera, and other divisions employed in nomenclature, fainter and fainter, till, in some groups, the naturalist is confronted with the extremely difficult task of classifying the links of an almost uninterrupted chain.

The minuteness of the cells and the acute termination of the strongly elevated posterior margin are peculiarities which distinguish *E. minima* from the associated *Fistuliporidæ*.

Formation and locality: Middle Devonian (Up. Helderberg?). Falls of the Ohio.

BUSCOPORA, n. gen.

Zoaria thin, lamellate, incrusting or free; under surface with a concentrically wrinkled epitheca. Zooecia tubular, short, with subcircular apertures, and a faintly elevated border or peristome; posterior margin more elevated than the anterior, with a strong tooth-like process, which projects nearly half across the aperture, is bidenticulate at its termination, and constitutes a ridge on the inner side of the zooecia. A variable number of smaller accessory cells, with elevated sub-circular apertures, is present; besides, a few large tumid cells (ovicells?), may also occur among the ordinary zooecia. Interstitial spaces vesiculose. Zooecial tubes with diaphragms.

Type. *B. dentata*, n. sp.

The genus differs from *Fistulipora*, McCoy, in the tooth-like process and accessory cells. The tooth or ridge is represented in all the *Fistuliporidae*, but in none of the genera, so far proposed, does it form a conspicuous external feature. In *Fistulipora* there is a small crescentic lip on the posterior margin of the apertures, the extremities of which project more or less into the visceral cavity. The appearance presented in transverse sections reminds one considerably of a circle, inside of which a short and more narrowly curved line is drawn, so that the enclosed line touches the circle on one side. In *Buscopora* it is quite different, since the central portion of the "lip," instead of the extremities, is drawn out into a tooth-like process.

I have seen only two species having the above characters. Both are from the Devonian at the Falls of the Ohio. *B. dentata* is regarded as the typical species. The other differs mainly in having wider interstitial spaces.

It gives me pleasure to name the genus in honor of Mr. George Busk, of England, to whom students of fossil bryozoa are indebted for several very valuable works.

BUSCOPORA DENTATA, n. sp. (Pl. II., fig. 5, 5a.)

(Ety., *dentatus*, toothed.)

Zoarium incrusting or free; consisting of one or more layers, which form small, irregular, lamellate expansions, from .5 mm. to 1.5 mm. thick; under surface with a very thin, concentrically wrinkled epitheca. Zooecia tubular, with apertures always a little wider than

long, more or less oblique, and, according to the width of the interstitial spaces, of sub-angular to sub-circular form. Posterior margin faintly elevated, with a strong tooth-like process, which projects nearly half across the aperture, and is split or bidenticulate at its termination. Interstitial spaces varying in width with age, being, comparatively, very thin in the younger stages, while the walls of adjacent zooecia appear to be in contact, and their apertures without the posterior elevated border or "lip." In the most fully matured example observed, Pl. II., fig. 5a, the lip is a well-marked feature, the zooecial apertures smaller and more nearly circular, and the interstitial spaces somewhat depressed and wider, though still narrow, the width in no case being greater than that of the cell apertures, and usually much less. At intervals of about 5 mm., the surface presents slightly elevated maculae, the centers of which are smooth, and substellate, but of variable size. The zooecia in the immediate vicinity of these centers are only a little larger than those in the intermediate spaces, where twelve or thirteen occur in 5 mm. The apertures are arranged in very regular, diagonally intersecting series; their direction is not materially disturbed by the maculae; their diameter varies from .24 to .33 mm. Insterspersed among the ordinary zooecia, a variable number of much smaller accessory cells are to be observed; their apertures are sub-circular, about .13 mm. in diameter, and without the tooth-like process; they are provided with an elevated thin border, and, usually, occupy a position just back of the posterior margin of the true zooecia. These cells are much more numerous in the matured condition of the zoarium than in the specimens with thin interstitial spaces, representing earlier stages of development. A small number of large cells, almost completely closed by a convex covering, also occur. From their large size and tumid appearance it seems probable that they represent ovicells. One of them is shown near the upper margin of fig. 5a.

Internally the interstitial spaces are occupied by closely-arranged vesicular tissue. The zooecial tubes are crossed by diaphragms, but their number in a given space was not determined.

Formation and locality: Middle Devonian (Up. Helderberg?). Rare at the Falls of the Ohio.

LICHENOTRYPA, n. gen.

(Ety., *Lichen*, a tree moss; *trypa*, a perforation.)

Zoaria thin, incrusting, with two distinct stages of development. In the first the colony resembles an ordinary species of *Fistulipora*,

with short, tubular zoocia, wide, concave interspaces, sub-circular apertures, the posterior margin more strongly elevated than the anterior. As growth proceeds the posterior portion of the peristomes of adjacent cells are united by thin, irregular walls, which traverse the interstitial spaces and gradually form an elevated and very irregular network, with still greater elevations at numerous points in the shape of strong spines. Many of the zoocia keep pace with the development of this elevated superficial layer, while others occupy the bottom of large cavities. Numerous sub-angular interstitial cells or vesicles are interspersed among the zoocia apertures.

Only known species, *Lichenotrypa cavernosa*, n. sp.

This genus is quite distinct from *Fistulipora*, McCoy, but as the only species known possesses a vesicular interstitial tissue, and presents other points of resemblance to that genus, I propose, provisionally, to arrange *Lichenotrypa* with the *Fistuliporidae*.

LICHENOTRYPA CAVERNOSA, n. sp. (Pl. II., fig. 7.)

(Ety., *cavernosus*, full of cavities.)

Zoarium forming very thin, irregular crusts upon foreign bodies; consisting in the immature stages, which may be observed near the margin of the colonies, of a layer resembling an ordinary species of *Fistulipora*, in having zoocia with sub-circular apertures, .13 mm. in diameter, surrounded by a strong but unequal peristome, with the interstitial spaces concave, and as wide or wider than a cell diameter; the apertures are arranged in sub-regular series, ten to twelve in 5 mm. Depressed maculae of variable size and distribution are also present. As growth proceeds, the posterior "lip" becomes more elevated, and those of adjacent cells are united by thin, irregular connecting walls, which traverse the interstitial spaces and gradually form an elevated and very irregular network, which at numerous points is further elevated into strong spines. The apertures of some of the zoocia occupy one side of the bottom of large depressions, while others have kept pace with the elevated network, and are on a level with numerous irregularly distributed, angular, and generally smaller cells, probably representing the interstitial vesicular tissue of the immature stage.

The superficial characters of this species are so very peculiar and distinctive, that it cannot be confounded with any other bryozoan known to me.

Formation and locality: Middle Devonian (Up. Helderberg?). Falls of the Ohio.

DISCOTRYPA DEVONICA, n. sp. (Pl. II., fig. 8, 8a.)

Zoarium consisting of large, thin, parasitic expansions, irregular in outline, 1 mm. or less in thickness, and as much as 7 cm. in diameter. The upper surface presents at intervals of five or six mm., measuring from centre to centre, very slightly elevated monticules, about 3 mm. in diameter, which are very conspicuous on account of the large size of the zooecial apertures occupying them. Zooecia short, tubular, with thin walls, and rhomboidal, hexagonal, or polygonal apertures, arranged in very regular intersecting series; in the inter-monticular spaces the apertures have a diameter of about .22 mm., with fifteen or sixteen in 5 mm.; near the monticules they increase in size, gradually, till at the summit of same they attain a diameter of .55 mm., or even more. Interstitial cells and spiniform tubuli wanting.

In vertical sections the tubes are short, thin-walled, nearly prostrate in the lower half, but almost vertical near the aperture; they are traversed by several horizontal diaphragms, about one tube diameter distant from each other.

The type species of *Discotrypa* is from the Cincinnati group, but as I have collected an unquestionably congeneric species from the Keokuk limestone, it is interesting to note the occurrence of the genus in the intervening Devonian deposits. *D. devonica* differs from both *D. elegans* and the Keokuk species, in its parasitic habit of growth, and greater size of the cells on the monticules. The conspicuousness of the groups of large cells serves to distinguish the species, at a glance, from the smaller expansions of an associated species of *Leptotrypa*, nearly allied or identical with the *Chonetes quadrangularis* of Nicholson.

Formation and locality: Middle Devonian (Up. Helderberg?). Falls of the Ohio.

BRACHIOPODA.

SCHIZOBOLUS, n. gen. (Pl. III., fig. 3, 3a, 3b, 3c, 3d.)

Shell oval, depressed convex, slightly inequivaled; valves inarticulate; structure calcareo-corneous. Cardinal margin somewhat thickened.

Ventral valve, with the apex at the terminous of a rather deep notch in the posterior margin; interior of valve with two pairs of adductores, separated by a faint median ridge or septum, which traverses the valve from the posterior margin, where it is bifurcated, to a point about two-thirds of the length of the valve from the anterior margin. The posterior adductores are very faint.

Dorsal valve with the posterior margin straightened, the apex sub-terminal, and but little elevated; interior of valve with a slender median septum, which separates two pairs of faintly impressed muscular scars; the posterior pair large, oval, and situated just in front of the cardinal margin; the anterior pair are less distinct, smaller, of triangular shape, narrowest in front, and situated near the anterior extremity of the mesial septum. Very faint impressions of lateral muscles were observed near the margin of both valves.

Surface with concentric striae, and, when exfoliated, also with extremely fine radiating lines.

Type *Discina truncata*, Hall. Pal., N. Y., Vol. IV., p. 23, pl. I., fig. 15a, 15b, and pl. II., fig. 36, 37.

The above description is based upon a large number of specimens, most of them showing the interior. The species is very common near the base of the Black slate at several localities in Madison Co., Ky., and there is little reason to doubt its identity with the *Discina truncata*, described by Hall from the Genesee slate of New York. Usually no markings of any kind can be determined, and it was only after a careful search that a few valves were obtained from which the form and position of the muscular scars could be ascertained. In the majority of specimens, however, the slender mesial septum is shown more or less distinctly.

The affinities of this genus appear to lie between the *Obolidæ* on the one side, and the *Discinidæ* on the other; the dorsal valve is not unlike that of *Discina*, while the whole shell resembles *Discinisca*, Dall. The notched cardinal margin of the ventral valve points more to *Trematis* and *Schizocrania*, while the muscular scars are not materially different from those supposed to be characteristic of the *Obolidæ*. On the whole, therefore, *Schizobolus* seems to be more nearly related to that family than to the *Discinidæ*.

RHYNCHONELLA GREENIANA, n. sp. (Pl. III., fig. 1, 1a, 1b, 1c, 1d.)

Shell large, ventricose on the dorsal side, flattened or slightly concave on the ventral, and deeply sinuate in the front; length and

breadth comparing respectively as five to six; convexity as great as the length, or less. Cardinal view sub-trigonal; in a lateral view the lower side forms nearly a right angle with the ventral side, while the dorsal side is gently curved and, generally, a little flattened above the middle.

Ventral valve gibbous at the umbo, slightly convex or flattened toward the sides, and becoming gradually depressed in the middle, and deeply sinuate at the front. Beak small, acute, closely incurved over the umbo of the opposite valve.

Dorsal valve ventricose, sloping somewhat abruptly to the margin of the ventral valve. Mesial region somewhat flattened, with the fold scarcely distinguishable in the younger examples; in older specimens the fold is more defined and may be traced to about the middle of the valve.

Surface marked by fine, concentric lines, and at intervals by faint wrinkles indicating successive stages of growth. The fold is marked by two, more or less distinct, narrow furrows, with a low, rounded, and rather broad plication between them, which becomes obsolete at a point near the middle of the valve. In the sinus there are two, slightly convex, narrow plications, which correspond with the furrows on the fold.

The specimens are casts of the interior, and show in the ventral valve, a narrow, ovate-triangular, muscular scar on each side of the rostral cavity. The upper half of the filling of the rostral cavity shows two narrow, faint impressions, and along the centre of the lower half, another, somewhat stronger than the others, which extends to the base of the muscular impressions. In the dorsal valve there is a rather short and not very well defined mesial septum. Muscular scars very faintly impressed; they appear to be somewhat smaller than those in the ventral valve.

This species is more nearly related to the *R. reniformis*, Sowerby, from the Carboniferous of England and Ireland, than to any American species known to me. However, a comparison shows several important differences. For instance, in comparing lateral views of the two species, it is seen that the umbo of the ventral valve of *R. reniformis* is much less tumid, and the beak smaller, the upper half of the dorsal valve much heavier and more ventricose, and the lower portion of the line of contact between the two valves much less deflected toward the ventral side. Other differences are to be observed in the depth and extent of the sinus, as well as in the plications of the surface.

This species is named in honor of the discoverer, Mr. G. K. Greene, New Albany, Indiana.

Formation and locality: Lower Carboniferous, Knobstone group; three miles west of New Albany, Indiana.

GYPIDIA UNGUIFORMIS, n. sp. (Pl. III., fig. 2, 2a, 2b.)

(Ety., *unguis*, a claw.)

Shell subovoid, gibbous, very inequivalue.

Ventral valve unguiform, convex, regularly arching from the beak to the front, with the beak extremely elevated, very slightly incurved, and much flattened. Fissure large, rather narrow, and bordered on each side by a narrow, illy-defined area. A small, shallow sinus extends from the beak to the front margin.

Dorsal valve broadly ovate, wider than high, moderately convex, regularly arching to the sides and front, with the beak strongly incurved and flattened. Mesial fold faintly elevated, but traceable from the beak to the front margin.

Surface with strong, somewhat unequal, angular plications, the greater number of which originate on the umbos, and remain simple throughout their length, while a few are bifurcated in the lower half of the shell. Those in the mesial sinus and on the fold are smaller than on the lateral slopes. The total number at the front margin is about twenty-four on each valve. The cardinal slopes of the ventral valve are convex and without radiating plications. Entire surface of both valves marked by numerous, somewhat irregular, concentric lines, which on the plicated portions are strongly zigzag and sublamellar, and with a number of strong, irregular undulations marking stages of growth. Many of the concentric lines cross the narrow cardinal area of the ventral valve and terminate at the sharply defined margin of the fissure.

Interior of ventral valve, with the converging dental lamellæ strong, and, uniting with each other a short distance below the centre of the valve, give origin to a strong mesial septum, which extends nearly to the front margin. The septum is very high and projects far into the cavity of the valve. In the dorsal valve the dental lamellæ are less strong, and, though converging, do not unite, but at the lower extremity are provided with long and very slender diverging crura. The lamellæ are supported and joined to the bottom of the valve by two, thin, nearly parallel septa, which terminate before they reach the centre of the valve.

This remarkable species is almost unquestionably congeneric with the *Gypidia conchidium*, of Dalman. Both differ from *Pentamerus*, proper, in having the beak of the ventral valve much more extended and but slightly arcuate, and the septa of the dorsal valve separate. *G. unguiformis* differs from *G. conchidium* in the more extended beak of the ventral valve, different plication of the fold and sinus, and somewhat in the form. I am not acquainted with any Pentameroid shell from American deposits that could be confounded or even compared with it.

Formation and locality: Niagara group, at Louisville, Kentucky.

GASTEROPODA.

PLATYCERAS QUINQUESINUATUM, n. sp. (Pl. III., fig. 4, 4a, 4b.)

(Ety., *quinque*, five; *sinuatus*, bent in.)

Shell obliquely sub-ovoid, arcuate from near the base. Apex minute, appressed, strongly incurved, making about one volution; body-whorl expanding rather rapidly at first and then very gradually to the aperture; dorsum narrowly rounded, spreading more on the right side than on the left, and a little flattened on the left side. Shell near the aperture with four rounded longitudinal plications. Aperture oblique, sub-rhomboidal or sub-pentagonal, with the peristome deeply sinuous, and strongly reflected on the posterior side under the umbilicus.

Surface nearly smooth, except near the aperture, where a small number of undulating striae of growth may be crowded together and form faint concentric wrinkles.

Among the numerous species of *Platyceras*, the *P. symmetricum*, Hall, from the Hamilton group, appears to be more closely related to the above species than any other. There are several marked differences, however, which readily distinguish the two species. In Hall's species the apex is less incurved, and the whole shell larger and much less oblique, being incurved nearly in the same plane; the plications are not so strong, and the posterior side of the peristome is not reflected, nor is the aperture margin so deeply sinuate. The most of these differences will apply when *P. quinque sinuata* is compared with the *P. thetis*, Hall, also from the Hamilton.

Formation and locality: Middle Devonian (Up. Helderberg?). Falls of the Ohio.

PLATYCERAS SERRATUM, n. sp. (Pl. III., fig. 5, 5a, 5b.)(Ety., *serratus*, like a saw.)

Shell obliquely sub-ovate, consisting of about two compressed volutions; apex minute. The outer whorl enlarges rapidly and becomes free near the aperture; it is very oblique and flattened, narrowly rounded below, with a slight shoulder near the suture line. Aperture obliquely elongate-elliptical, two and one-half times longer than wide, with the peristome serrated.

Surface with a few irregular concentric undulations, and without longitudinal plications, excepting near the aperture, where the perfect shell is provided with numerous short, sub-angular plications and furrows, giving the margin the serrated character already noticed. These plications were not observed on young specimens.

The distinguishing features of this species are found in the compressed volutions and serrated aperture margin.

Formation and locality: Lower Devonian. (Corniferous limestone). Falls of the Ohio.

PLATYCERAS (?) ARCTIOSTOMA, n. sp. (Pl. III., fig. 7, 7a, 7b.)(Ety., *arctus*, narrow; *stoma*, mouth.)

Shell semi-rhomboidal, obliquely enrolled, and consisting of about two volutions; apex minute, depressed; outer volution compressed laterally, rapidly increasing in height, but slowly in width, with the sides, which diverge at an angle of 45 degrees, flat at the aperture, and slightly convex near the nucleus whorl; the upper side is longitudinally concave, and narrowly rounded toward the depressed apex; the periphery is sub-angular, and the lower side rather flat and abruptly rounded into the large umbilicus. Aperture oblique, extremely elongate, with the sides sub-parallel.

Surface marked by fine, well defined, and somewhat undulating striæ of growth. These are crossed by faint revolving lines. Where the external layer of the shell is preserved the surface is polished.

Of this species I have seen only the specimen figured. It differs so much from the ordinary forms of *Platyceras* that I am not only quite certain it is new, but also believe it will ultimately have to be removed to some other group.

Formation and locality: Lower Devonian. (Corniferous limestone). Falls of the Ohio.

PLATYCERAS (ORTHONYCHIA) FLUCTUOSUM, n. sp. (Pl. III., fig. 6, 6a, 6b.)
 (Ety., *fluctuosus*, wavy.)

Shell obliquely conical, laterally compressed, gradually expanding; dorsum straight or arcuate; apex obtusely pointed, apparently not incurved. Surface of apical half of shell with irregular undulations or protuberances; lower half plicated longitudinally, the plications unequal, and crossed by irregular undulating lines of growth. Aperture narrowly ovate, with the margin sinuate, or rather, irregularly serrated.

This shell differs from all the species belonging to the genus or sub-genus *Orthonychia*, Hall, in the compressed form and irregular surface undulations. It may be compared with *P. (O.) perplexum*, Hall, from the Upper Helderberg group of New York.

Formation and locality: Middle Devonian. (Up. Helderberg?). Falls of the Ohio.

ANTHOZOA.

BUCANOPHYLLUM, n. gen.

(Ety., *Bukane*, a trumpet; *phyllon*, a leaf.)

Corallum trumpet shaped, simple, consisting of a long, slender, cylindrical stem, which is terminated above by an abruptly expanded, deep cup; inner side of calyx with fine radiating septal striae; outer side marked by successive lines of growth, and faint longitudinal striae. Internal structure of cup vesicular as in *Cystiphyllum*. Structure of stem not determined.

Only known species *B. gracile*, n. sp.

While the affinities of this genus are clearly with *Cystiphyllum*, the form and general aspect of the corallum is so distinctive, that a cursory examination would scarcely suggest the relation. A slight resemblance is presented to species of *Cladochonus*, McCoy, but I have satisfied myself that *Bucanophyllum* has no real alliance with the *Auloporidae*.

BUCANOPHYLLUM GRACILE, n. sp. (Pl. III., fig. 9, 9a, 9b, 9c.)
 (Ety., *gracilis*, slender.)

Corallum simple, trumpet-shaped, consisting of a long, slender, cylindrical stem, with the upper end abruptly dilated into a rather deep cup, from 6 to 10 mm. in diameter. The plane of the cup margin of young examples is nearly horizontal, while in older examples it becomes more or less oblique. Interior of cup with numerous fine

radiating septal striae, six or seven in 2 mm., which become obsolete near the bottom, and are strongest at the margin. Bottom of cup smooth, or with vesicular prominences. Exterior of cup marked with a number (varying with age) of irregular wrinkles of growth, and faint longitudinal lines. Stem smooth, about 2 mm. in diameter, with an observed length of 2.5 cm. As the stem is not entire on any of the examples seen, it may have been considerably longer.

Among the rugose corals from the Falls of the Ohio, I find a small *Zaphrentis* (probably the young of *Z. herzeri* or *Z. ungulu*), which might be confounded with imperfect specimens of *B. gracile*. A comparison of the cups will immediately separate them.

Formation and locality: Lower Devonian. Not rare at the Falls of the Ohio.

STROMBODES SEPARATUS, n. sp.

(Ety., *separatus*, separate.)

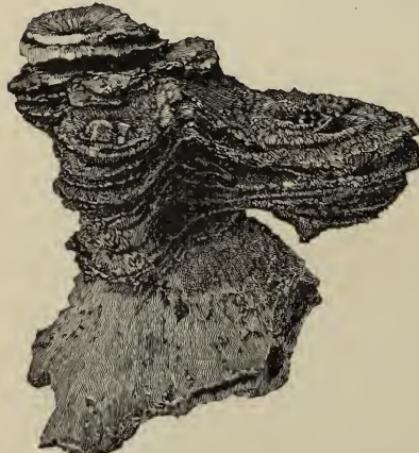


Fig. 1.—Lateral view of a specimen consisting of three individuals, two of them attached to a stromatoporoid.



Fig. 2.—Oblique view of another example, to show the calyces. The margin of the central depression is too sharp.

Corallum consisting of one or more individuals, which, at their origin, are separated from each other, but, by the lateral expansion and union of their cup-margins, become confluent and form irregular, but never discoid, masses. The base of each individual is obconical and covered by a very thin epithecal crust. Both the calyces and bases of the several polyparia, going to make up one of the confluent coralla, occur at different heights, and the corallum is never "compound" in the manner characteristic of *S. pentagonus* and other

species. Diameter of calyces varying from 1.5 cm. to 3.5 cm., with the margins sub-circular in simple examples, and irregularly angular in confluent coralla. Calyces shallow, slightly elevated toward the margins, and abruptly depressed at the centre. Sides of central cup with about forty septal ridges, which unite at the bottom and form a well-defined elevation. Beyond the central depression the calyx is marked by fine septal striæ; about twenty in 5 mm.

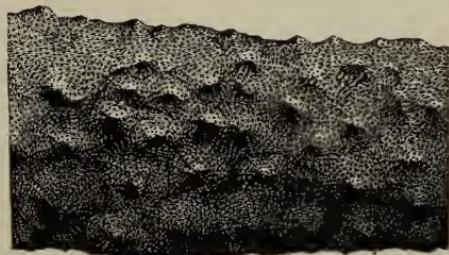
The distinctness of the polyparia is regarded as the principal specific character. In other respects the species is very much like the large variety of *S. pentagonus*.

Formation and locality: Niagara group, near Louisville, Ky.

HYDROIDA (?).

LABECHIA MONTIFERA, n. sp. (Pl. II., fig. 9, 9a.)

(Ety., *mons*, a mountain; *fero*, to bear.)



Portion of a large specimen of *Labechia montifera* which has grown over and completely enveloped a species of *Orthoceras*.

This species forms large crusts, rarely more than 5 mm. in thickness, upon foreign bodies. (Usually species of *Orthoceras*.) The surface is undulating and elevated at intervals of 6 mm., more or less, into large conical monticules, the slopes of which are marked by irregularly intermittent, radiating ridges; the intervening spaces between the monticules is covered quite uniformly by numerous unequal small granular eminences, of which about ten occur in 5 mm.; sections prove these to be the projecting ends of vertical pillars. In transverse sections (pl. II., fig. 9) the pillars are of an irregularly stellate form; their size is variable, but those occupying the monticules are always the largest. The intermediate spaces are crossed by a variable number of faint, curved lines, representing the cut edges of lenticular vesicles which occupy the space between the pillars. In vertical sec-

tions (pl. II., fig. 9a) the pillars are seen to be rather unequal, and separated from each other by a loosely-woven vesicular tissue. The vesicles vary much in size, but are disposed to arrange themselves in obscure layers.

It is possible that this species ought not to be considered as congeneric with *L. conferta*, E. and H. (the type of the genus) as the differences between them may be of greater importance than I now believe them to be. In transverse sections of *L. conferta*, the vertical pillars appear as simple, round columns, and look quite different from the irregularly stellate section presented by the pillars of *L. montifera*. Another, but less important difference is found in the different habits of growth. Thus *L. montifera* is an encrusting form, while *L. conferta* grows into free laminar expansions, covered on the lower side by a concentrically striated epitheca. Another species, forming masses as much as one foot in length, is not uncommon in the upper part of the Cincinnati group at Clarksville, O., and other localities. Specimens of *L. montifera* are rather rare in the same horizon. The specimen figured was collected at Madison, Indiana.

FORAMINIFERA.

MOELLERINA, n. gen.

Shell consisting of two sub-orbicular, thin-walled chambers, an outer one marked with strong spiral ridges, and an inner smooth one. At both ends of the outer chamber there is a round opening, surrounded by an elevated border, at which the spiral ridges terminate. The inner chamber is drawn out at each end into short tubular prolongations, which correspond with the openings in the outer chamber. Shell structure not determined with certainty.

Only species known: *M. greenei*, n. sp.

The affinities of this peculiar genus, though somewhat doubtful, seem to lie not very far from *Saccamina*, Sars. This conclusion is mainly based upon the resemblance existing between the inner chamber of *Moellerina*, and the single, spindle-shaped chambers of that genus. If they are really allied, then the shell of *M. greenei* ought to be imperforate. Although my material is bountiful, and much of it in an excellent state of preservation, I could not satisfy myself upon this point. The only fragment showing anything like perforations, is figured on pl. III., fig. 8d. In this a portion of the wall of the outer chamber is traversed by a number of indistinct transverse lines.

Should the shell prove to be perforated, then the genus may find nearer relatives among the *Lagenidae*.

The name is given in honor of Prof. Valerian v. Möller, who has done such excellent work on the Foraminifera of the Russian Coal Measures.

MOELLERINA GREENEI, n. sp. (Pl. III. fig. 8, 8a, 8b, 8c, 8d, 8e.)

Shell consisting of two sub-orbicular, thin-walled chambers, one enclosing the other. Outer chamber marked with eight or nine strong, angular, spiral ridges, which make a complete revolution and terminate at the opposite, or nearly opposite, ends of the chamber, where the rather large and expanding apertures are situated. Apertures surrounded by a more or less elevated thick border. Inner chamber smooth, orbicular, separated from the wall of the outer chamber by .10 mm. or less; the more or less nearly opposite ends are drawn out into short tubular prolongations of variable length, which traverse the space intervening between the two chambers, and unite with the wall of the outer chamber just below and around the aperture, so that the apertures observed at the ends of the outer chamber, are really the mouths of the tubular prolongations of the inner chamber. The appearances presented by the specimen figured on plate III. fig. 8e, seem to indicate that the outer chamber communicated with this tube by means of numerous small pores. Diameter of inner chamber .70 mm.; diameter of outer chamber 1.00 mm.

The above describes the typical form of the species. Beside these, I have before me a number of specimens on which the spiral ridges are almost obsolete. It is possible that these may prove distinct, but more probably, they represent the worn condition of *M. greenei*. This explanation is rendered plausible by the fact that the numerous fragments of other fossils, which occur in the same piece of stone, are all more or less changed by wearing.

The name is given in honor of Mr. G. K. Greene, of New Albany, Indiana.

Formation and locality: Middle Devonian, (Up. Helderberg?). Falls of the Ohio.

PLATE I.

Fig. 1. *FENESTELLA PATELLIFERA*, n. sp. View of poriferous side, enlarged 12 diameters.

1a. _____ Non-poriferous side, X 12.

2a. *FENESTELLA BIFURCA*, n. sp. Poriferous side, X 12.

2a. _____ Non-poriferous side, X 12.

3. *FENESTELLA SCULPTILIS*, n. sp. Poriferous side, X 12.

4. *FENESTELLA PULCHELLA*, n. sp. View of poriferous side, X 12.

4a. _____ Two views of the non-poriferous side, one smooth, and the other with granular striae, X 12.

5. *SEMICOSCINUM OBLIQUATUM*, n. sp. View of portion of the poriferous side, near the margin of the zoarium, X 12. On three of the branches the carinae are broken away.

5a. _____ View of non-poriferous side, X 12.

6. *SEMICOSCINUM INFRAPOROSA*, n. sp. View of a portion of the inner surface of the funnel shaped zoarium, X 12. Shows the dimorphic pores, and usual appearance of the branches.

6a. _____ Poriferous side. X 12. Shows pores on each side of expanded summits of carinae.

6b. _____ View of the broken edge of a frond of this species, showing height of carinae and branches, and the row of large pores on the sides of the expanded summit of carina. X 12.

7. *UNITRYPA RETRORA*, n. sp. View of the outer side of zoarium, showing summits of carinae, and connecting bars. X 12. Some of the interstices are closed by a secondary deposit.

7a. _____ View of inner or non-poriferous side, X 12. The branches are more sharply angular than usual.

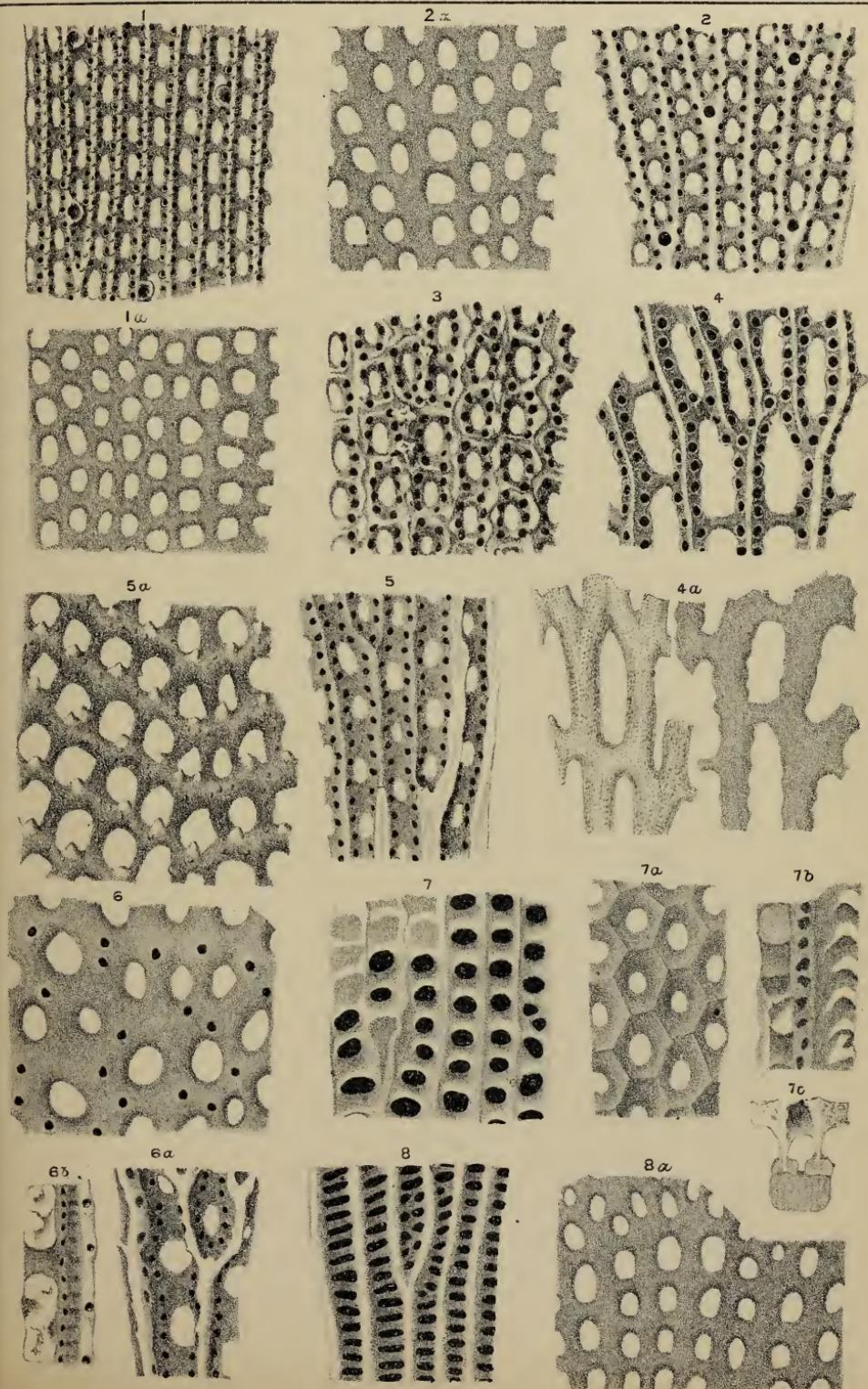
7b. _____ View of the broken edge of a frond, to show the relative height of branches, cells and carinae, and the retral bending of the connecting bars. X 12.

7c. _____ Transverse view of same. X 12.

8. *UNITRYPA CONFERTA*, n. sp. View of outer side of zoarium. X 12. Shows the prominent, rounded summits of the carinae, and comparatively numerous connecting bars.

8a. _____ View of non-poriferous side. X 12. Other specimens often have the dissepiiments more prominent.

(Devonian Bryozoa.)



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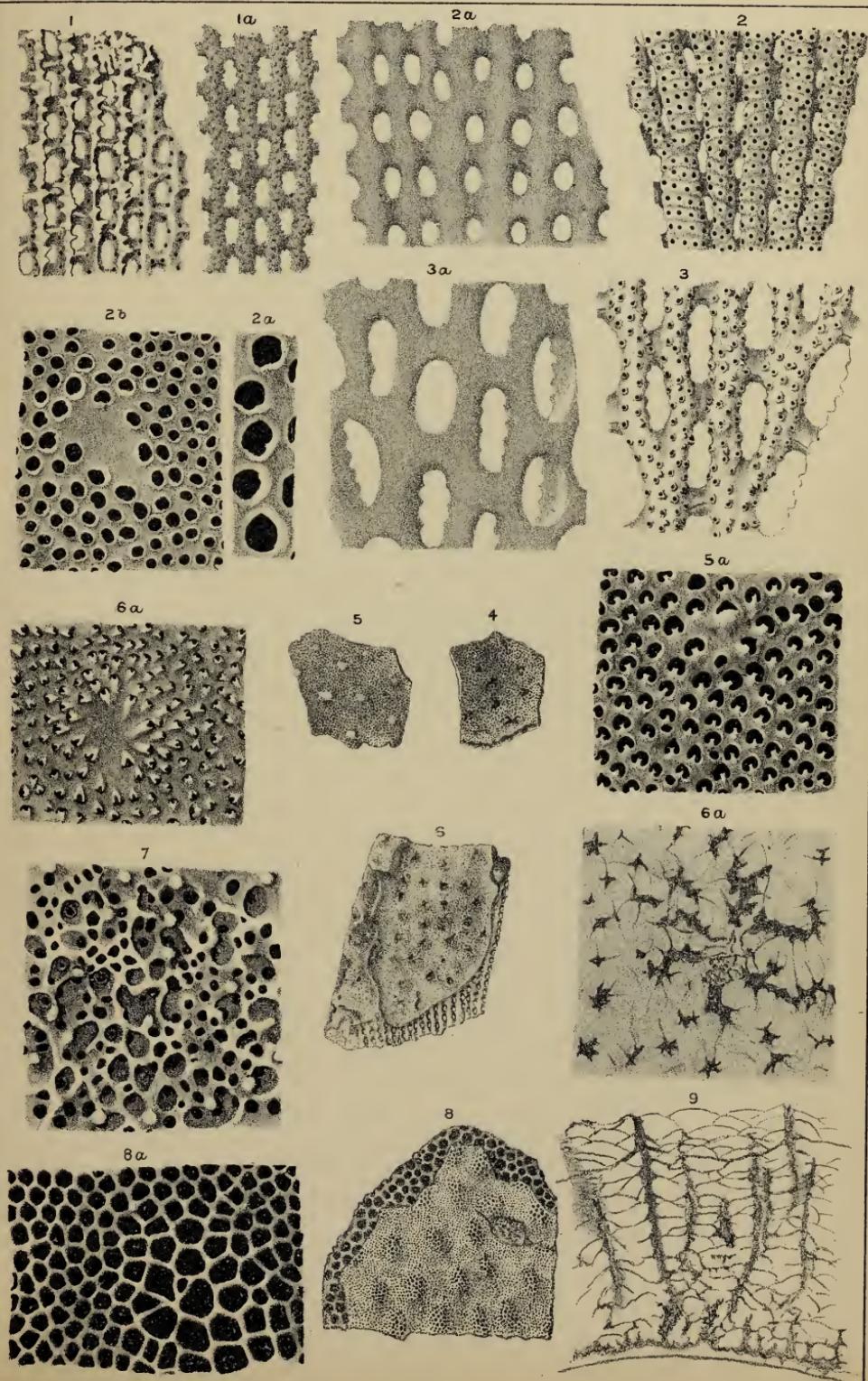
PLATE II.

Fig. 1. *FENESTELLA BIGENERIS*, n. sp. View of periferous side. X 9.

- 1a. ————— Non-poriferous side. X 9. The dissepiments are often more prominent, and slightly thicker.
2. *POLYPORA TRANSVERSA*, n. sp. Poriferous side of this species, magnified nine times.
- 2a. ————— Non-poriferous side. X 9.
3. *POLYPORA BLANDIDA*, n. sp. Poriferous side. X 9.
- 3a. ————— Non-poriferous side, X 9.
4. *FISTULIPORA NORMALIS*, n. sp. View of a fragment of this species, natural size.
- 4b.* ————— Portion of same, enlarged nine times.
- 4a.* ————— Several zoöecia, magnified 18 times.
5. *BUSCOPORA DENTATA*, n. sp. View of a fragment of this species, nat. size.
- 5a. ————— Celluliferous surface of same enlarged 9 times.
6. *ERIDOPORA MINIMA*, n. sp. Portion of a large expansion, which has grown upon a species of *Polypora*. Nat. size.
- 6a. ————— One of the maculae, and surrounding zoöecia. X 9.
7. *LICHENOTRYPA ASPERA*, n. sp. Portion of the surface of a specimen of this species. X 9.
8. *DISCOTRYPA DEVONICA*, n. sp. A small portion of the type specimen, nat. size. It is growing upon a species of *Favosites*.
- 8a. ————— Surface of same, enlarged 9 diameters.
9. *LABECHIA MONTIFERA*, n. sp. Vertical section of a specimen from Waynesville, Ohio, X 9.
- 9a. ————— Transverse section of same. X 9.

* These figures are erroneously marked 2b, and 2a, on the plate.

(Devonian Bryozoa.)

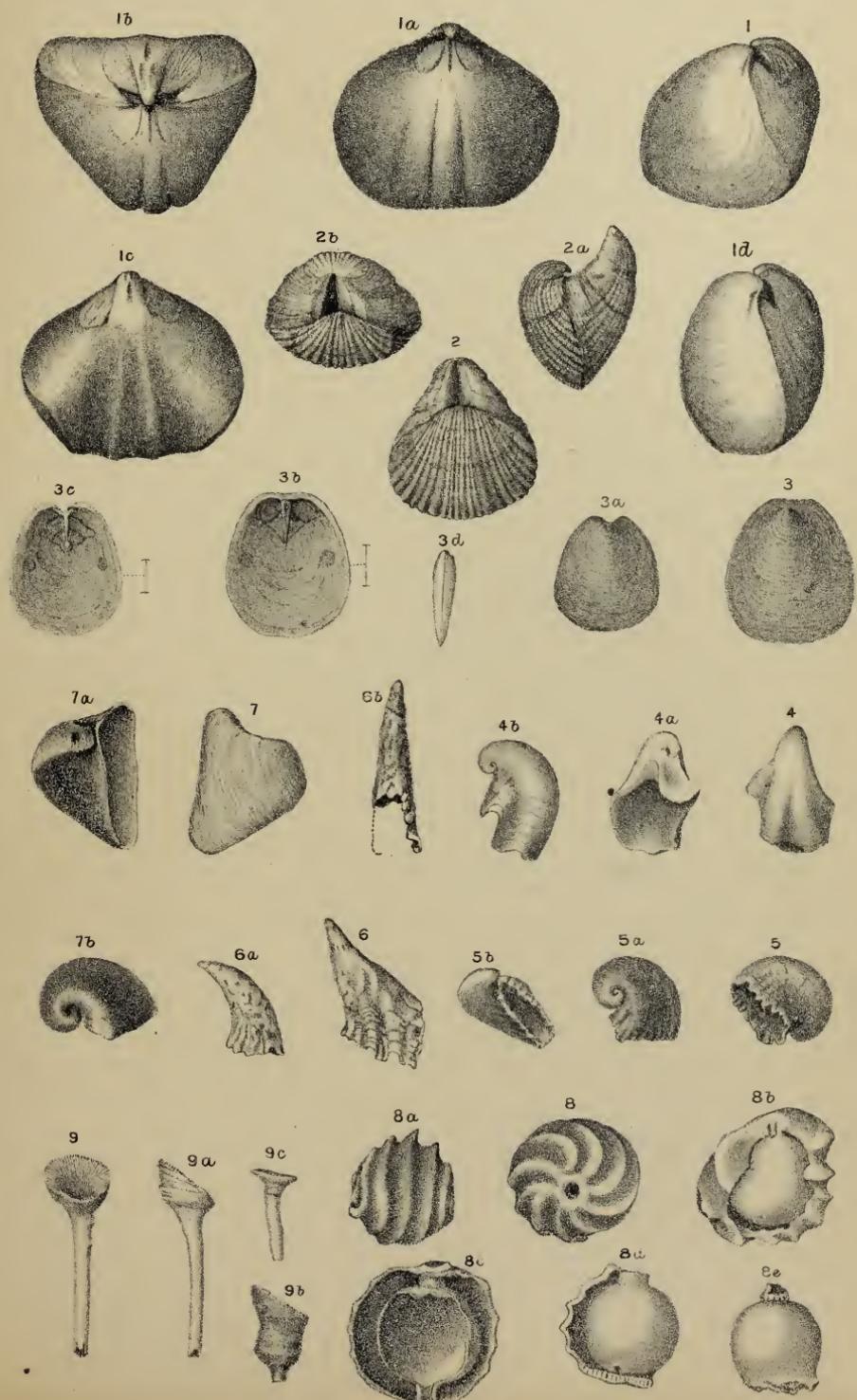


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PLATE III.

Fig. 1. *RHYNCHONELLA GREENIANA*, n. sp. Lateral view of a typical specimen.

- 1a. ————— Dorsal view of same.
1b. ————— Cardinal view of same.
1c. ————— Ventral valve of same.
1d. ————— Lateral view of another example, having the umbo of
the dorsal valve more tumid, and the fold less prominent.
2. *GYPIDIA UNGUIFORMIS*, n. sp. Dorsal view of type specimen. In this view the beak
of the ventral valve has been tilted forward so as to show the fissure to better
advantage.
2a. and 2b. Lateral and cardinal views of same.
3. *SCHIZOBOLUS TRUNCATA*, Hall sp. Dorsal valve of a specimen, larger and longer than
usual. X 3½.
3a. ————— Small ventral valve. X 3½.
3b. ————— Interior of dorsal valve. X 3½.
3c. ————— Interior of ventral valve. X 3½.
3d. ————— Profile view of both valves, X 3½.
4, 4a, and 4b. *PLATYCYRAS QUINQUE-SINUATUM*, n. sp. Three views of a perfect specimen.
5, 5a, and 5b. *PLATYCYRAS SERRATUM*, n. sp. Three views of a very perfect example.
6, and 6b. *PLATYCYRAS (ORTHONYCHIA) FLUCTUOSUM*, n. sp. Two views of the type speci-
men.
6a. ————— View of another specimen, which is smaller and more
curved.
7, 7a, 7b. *PLAYTYCYRAS (?) ARCTIOSTOMA*, n. sp. Three views of the only specimen seen.
8. *MELLERINA GREENEI*, n. sp. End view of a specimen. X 18.
8a. ————— Side view of a specimen, with the apertures opposite.
X 18.
8b. ————— A specimen, with a portion of the outer chamber
broken away. X 18.
8c. ————— Sectional view of the two chambers. X 20.
8d. ————— A specimen, with faint indications of pores in the wall
of the outer chamber. X 18.
8e. ————— The inner chamber. X 18. This specimen preserves re-
mains of what appear to have been a series of pores, through which the outer
chamber communicated with the tubular prolongation of the interior.
9, and 9a. *BUCANOPHYLLUM GRACILE*, n. sp. Two views of a specimen.
9b. ————— View of the largest specimen seen. The stem is broken
away.
9c. ————— A young example.



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