

DESCRIPTIONS OF NEW SPECIES OF INVERTEBRATE FOSSILS FROM
THE CARBONIFEROUS AND DEVONIAN ROCKS OF OHIO.

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The fossils described in this paper are some of the new forms collected during the progress of the Ohio Geological Survey, now being prosecuted under the direction of Prof. J. S. Newberry, the State Geologist. Illustrations of these and other characteristic fossils from the different formations are in course of preparation, and will be published along with full descriptions of the same in the reports of the Survey.

ECHINODERMATA.

DOLATOCRINUS ORNATUS, Meek.

Body, including the vault, depressed subglobose, the portion below the arm-bases being a little higher than the vault, with nearly vertical sides above, but rounding under below to the somewhat flattened under side; arm-bases protuberant, mainly in consequence of the rather deep furrows or sinuses of the vault over the interradial areas; vault composed of irregular pieces, each of which projects in the form of a little sharply prominent node or short spine, the largest of which are situated around the nearly central ventral tube, and on the elevations between it and the arm-bases. Base small, a little impressed within the shallow concavity of the under side, and marked by a distinctly indented column-facet, which occupies near three-fourths of its entire breadth, so that only a narrow ring, as it were, of the basal pieces can be seen when the column is attached. First radial pieces comparatively large, extending out nearly horizontally, or only a little arching upward, and with their inner ends curving slightly into the shallow central concavity; all wider than long, and hexagonal, with the upper (outer) side of each longer than any of the others. Second radial pieces about half as large as the

¹ I am under obligations to Prof. Henry for the use of books, rooms, and other facilities at the Smithsonian Institution, while preparing this paper.

first, wider than long, and quadrangular in outline.¹ Third radials about as large as the second, from the curved-up edges of which they rise vertically, wider than long, and pentagonal in form; bearing on each of their superior sloping sides a smaller secondary radial, each of which supports another smaller, more or less cuneiform piece, from which the arms arise; thus making two arms from each ray, unless the number is increased by bifurcations after they become free; arms unknown, but apparently composed, at their origin, of a double series of alternating pieces.

First interrarial pieces, somewhat larger than the first radials, about as wide above the middle as their length, eight or nine sided, with the lower part of each curving under to connect with the first radials, while they curve upward vertically from near or below the middle; each supporting on the upper side a much smaller hexagonal piece, which rises vertically, and usually bears on its short superior lateral edges two smaller pieces connecting with the secondary radials or first arm-pieces, while its short truncated upper side is not surmounted by any succeeding piece, but connects on its inner surface with the vault.

Sutures between all the plates channelled. Surface of body-plates ornamented with raised lines or very small radiating costæ, that cross the sutures parallel to each other at the sides of the plates, but soon become bent about and connected in various ways, so that very few of them extend directly to the middle of any of the plates, the arrangement being such as to produce a kind of vermicular stylè of ornamentation, especially over all the central part of the plates, like that often seen on the body-plates in *Amphoracrinus*. A small rather sharp ridge also extends up the middle of each radial series of plates, more or less interrupted at the sutures, and showing a slight tendency to form a pinched node on the middle of the first and second radials; while it is sometimes seen to bifurcate on the third radial, to send branches to the secondary radials, but these are generally so small as scarcely to be distinguished from the other little ridges ornamenting all of the body-pieces.

Ventral tube unknown, but, judging from the spiniferous cha-

¹ In one ray of the typical specimen the second radial is abnormally wanting, while the third is larger than usual.

racter of the vault-pieces around its base, probably also spiniferous.

Height of body to arm-bases, 0.47 inch; do. to top of vault, 0.60 inch; breadth, 0.95 inch.

This species differs so materially from *D. lacus* and *D. Marshi*, of Lyon, in its ornamentation and other characters, as to render a comparison unnecessary. The only other described species from the same horizon, known to me, *D. lamellosus* (= *Cacabocrinus lamellosus*, Hall, Fifteenth Report of Regents, p. 141), must also differ materially, as it is described as having the body "spreading horizontally to the top of the third radial plates." It also has four arms to each ray, instead of only two, as in our species, which likewise differs in the details of its ornamentation.

It is probably more nearly allied to some of the other species described by Prof. Hall from the Hamilton Group, under Troost's name *Cacabocrinus*, though it seems to differ from them all in details; while the limited vertical range of the species of Crinoidea, renders it extremely improbable that the same species would be found in both the Corniferous and Hamilton groups.

It may be proper to remark here that there is no difference between *Dolatocrinus*, Lyon, and *Cacabocrinus*, Troost. It is true, Mr. Lyon gives five as the number of basal pieces in his genus, but he also stated in a note that it may have only three basals, as he had not seen specimens showing the structure of the base very clearly. Troost's genus, as published from his manuscript, after the date of Mr. Lyon's publication of *Dolatocrinus*, agrees exactly with the characters assigned the latter, excepting in having only three instead of five basal pieces. The species here described, however, is certainly a typical *Dolatocrinus*, and yet shows only three basal pieces.

For the use of the fine specimen affording the above characters, the Survey is under obligations to the Rev. Mr. H. Hertzler, of Columbus, Ohio.

Locality and position. Columbus, Ohio. Corniferous division of the Devonian.

LAMELLIBRANCHIATA.**AVICULOPECTEN CRENISTRIATUS, Meek.**

Shell thin, attaining a moderately large size, plano-convex, with a truncato-suborbicular outline; height and breadth nearly equal; basal margin more or less regularly rounded; posterior margin rounding from the posterior ear into the base, sometimes a little straightened above; anterior side rounded so as to make a shorter curve than the other; hinge less than the breadth of the valves in length, but rather long.

Left valve moderately convex; beak rising a little above the hinge margin, nearly or quite central and not oblique; posterior ear small, with a marginal ridge, flat, without being separated from the swell of the umbo by a sulcus, rather acutely angular at the extremity, and distinctly shorter than the margin below, from which it is separated by a nearly rectangular notch; anterior ear larger, or sometimes nearly as long as the margin below, rather acutely angular at the extremity, convex and separated by a rounded impression from the umbo, defined by a rather deep subangular marginal sinus. Surface ornamented by numerous, very slender, radiating costæ or raised lines, separated by rather wide flat surfaces, in each of which a still smaller line is sometimes intercalated; crossing all of these are smaller regularly arranged, sharply elevated, concentric lines, that seem to form little projections at the points of crossing, so as to give a rough appearance to the surface; costæ becoming more closely crowded, but not smaller, on the ears.

Right valve flat or a little concave, and with beak obsolete; ears flat, and of nearly the same size and form as in the other valve, excepting that the anterior one is broader and defined by a more shallow and more rounded sinus than appears to exist in the left valve; surface cancellated by regular, rather closely arranged, radiating and concentric lines, the latter being very sharply elevated, and minutely and regularly waved, crenate, or somewhat vaulted; radiating costæ somewhat larger, and more distant on the ears.

Height, 2.50 inches; breadth, 2.78 inches; convexity about 0.40 inch.

The specimens of this species are not very well preserved, being
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mainly casts with some portions of the surface. It is remarkable in having only a comparatively shallow rounded sinus under the anterior ear of the flat right valve, where it is usually deep and angular in species of this genus; while in the left it is deeper and more angular, though none of the specimens are in a condition to show clearly its exact form. One cast shows a little of the cardinal plate, which is rather coarsely striated longitudinally. None of the specimens of the left valve have the surface well enough preserved to show whether the sharply elevated concentric lines or laminae are minutely waved as in the other valve, but they probably are so when the surface has not been worn or exfoliated.

I am not acquainted with any described species so nearly allied to this as to render a comparison necessary.

Locality and position. Sciotoville, Ohio. Upper part of the Waverley series of the lower Carboniferous.

AVICULOPECTEN (STREBLOPTERIA?) HERTZERI, Meek.

Shell usually under medium size, higher than wide, rather compressed, the right valve being nearly flat, and the left only moderately convex; subovate in general outline (exclusive of the small ears), with a slight backward obliquity caused by the greater prominence of the anterior margin; basal outline semicircular and curved regularly into the rather prominently rounded anterior side; posterior margin less prominent than the anterior, and forming a longer and more gentle curve from the posterior ear into the base. Hinge distinctly shorter than the antero-posterior diameter of the valves; posterior ear in both valves very small, flattened, very obtusely angular, much shorter than the margin below, but well defined from the umbo, and only separated from the margin below by a faint sinuosity; anterior ear of each valve distinctly larger than the posterior, though not as prominent as the anterior margin below, rather strongly compressed or flattened so as to be abruptly distinct from the umbo, and defined by a distinct sinus from the margin below, the sinus being deeper and more angular in the right valve; beaks compressed, scarcely projecting above the cardinal margin, and placed a little behind the middle of the hinge, as well as that of the valves. Surface of both valves elegantly ornamented by numerous, sometimes sharply elevated, nearly equal, very regularly

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arranged radiating and concentric lines, which are larger and more strongly defined in the anterior ear of the right valve, particularly the radiating markings, which there sometimes assume the character of small costæ, while the concentric markings sometimes project as little lamellæ slightly above the hinge-margin, so as to give it a dented appearance.

Height of one of the largest specimens seen, 1.32 inches; antero-posterior diameter, 1.20 inches; convexity, about 0.18 inch.

I know of no other shell in our rocks that is liable to be confounded with this, its general form and neatly cancellated markings being sufficient to distinguish it. Although I refer it provisionally to *Aviculopecten*, I really do not think it belongs properly to that genus, as restricted to the typical forms. At least it differs from all the characteristic forms of *Aviculopecten*, in having the anterior ear larger than the posterior, as well as in having its beaks placed a little behind the middle of the valves, thus giving the slight backward obliquity mentioned in the description. This latter character seems to approximate it to *Streblopteria* of McCoy, but as we know nothing of its hinge and interior, it is not possible to determine whether it belongs to that group.

The specific name is given in honor of the Rev. H. Hertzner of the Ohio Geological Survey, to whom I am indebted for the use of some fine specimens from his own private collection.

Locality and position. Newark, Ohio. Lower Coal-measures.

LUCINA (PARACYCLAS) OHIOENSIS, Meek.

Shell apparently not attaining a medium size, compressed, nearly circular; beaks small, central, depressed nearly to the dorsal line, and contiguous; anterior margin rather abruptly compressed above, just in front of the beaks; hinge-margin short and rounding into the posterior dorsal outline; surface ornamented with small, more or less regular concentric undulations (most strongly defined on the umbones), and very fine lines of growth; posterior dorsal slope of each valve marked by a strong oblique sulcus, extending from the back part of the beaks to the upper part of the posterior margin.

Length, 0.46 inch; height, 0.42 inch; convexity, 0.18 inch.

This species seems to be related to *L. lirata* (= *Posidonia lirata*, Conrad, Ann. Geol. Rept., N. Y., 1838, p. 116; and Thirteenth

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Report Regents on State Cab., N. H., pl. ii, fig. 12); but its peculiar posterior dorsal sulcus, which gives it so much the appearance of the recent *L. Jamaicensis*, is neither represented in Mr. Conrad's figure, nor mentioned in his description of *L. lirata*.

The identity of these Devonian shells with the existing genus *Lucina* may admit of some doubt, as their hinges and internal characters are not yet well known. The species under consideration, however, has even more exactly the *external* appearance of that genus than several foreign Devonian forms that are generally referred to it. Perhaps they may all be included under one distinct genus, for which the name *Paracyclas*, Hall, may have to be retained.

Locality and position. Dublin, Franklin Co., Ohio. Corniferous division of the Devonian.

'PTILODICTYA (STICTOPORA) GILBERTI, Meek.

Corallum growing in thin, or much compressed, branching (or perhaps sometimes foliaceous) expansions; branches varying from about half a line to three lines in breadth, with a thickness of near half a line; nonporiferous margins sharp, with striae well defined, and curving laterally and forward. Pores nearly circular, or slightly oval, and provided, in well-preserved specimens, with raised margins; ranged in about eight to ten longitudinal rows in a branch two and a half lines in breadth, those in adjacent rows regularly alternating so as to produce a quincuncial arrangement; five of them occupy a space of one line, measuring longitudinally, and about six measuring obliquely, the spaces between the pores in the longitudinal direction being usually a little greater than the diameter of the pores themselves; rows of pores separated by a slender, sharply raised longitudinal line. Axis forming about one-third of the thickness of the branches, and having the transverse striae sometimes very regular, well defined, and regularly arched.

I have not seen enough of any one specimen of this species to show whether or not its branches anastomose, but as they evidently frequently bifurcate, and send off lateral branchlets, it is probable that they do. It seems to be more nearly allied to *Stictopora fenestrata*, of Hall, from the Chazy limestone, in the

¹ This description was accidentally inserted in this place.

arrangement and nearly circular form of its pores, as well as in having a raised longitudinal line between each row of pores, than to any of the known Upper Silurian species. It is a much more robust species, however, with only about the same number of rows of pores, in a branch of twice the breadth of those of that species, while it shows no traces of the transverse bars mentioned in the description of *S. fenestrata*. Its flattened, nonporiferous, and striated margins are also much more strongly developed. Indeed, no traces of this character of the margins are represented in the published figures or mentioned in the description of that species.

Although I am not aware that any published notice of the occurrence of this genus in the Devonian rocks has hitherto appeared, I have little hesitation in referring this species to the group, since it seems to present all the characteristics assigned to the same. In one respect it differs from some of the species described under *Stictopora*. That is, in having the pores a little contracted, and nearly circular at the aperture. In this respect, however, it appears to agree with *S. fenestrata*, the first species described under that genus; and Prof. McCoy has shown that this character occurs in British species of *Ptilodictya*, of Lonsdale, of which it is now generally admitted that *Stictopora*, Hall, is only a synonym, or at most founded on types only subgenerically distinct.

From the same horizon as that from which the above-described species was obtained, but from a different locality (Whitehouse, Lucas Co.), there is in the collection a foliated specimen more than two inches in breadth, and 4.70 inches long, with broken margins all around. It is split in breaking the rock, so as to expose one side of the strongly wrinkled and striated axis. So far as I have been able to determine from some imperfect remaining portions of the poriferous part, its pores would seem to have the same form, size, and arrangement as the species here described. It may, therefore, possibly belong to the same species, though I am inclined to believe it will be found to be distinct. If so, it may be called *P. (Stictopora) lichenoides*.

Locality and position. Sylvania, Lucas Co., and Marblehead. Corniferous limestone. Mr. Gilbert.

CONOCARDIUM OHIOENSE, Meek.

Shell rather small, longitudinally subovate or subtrigonal, being widest and most convex anteriorly,¹ where the valves are rather distinctly ventricose; posterior side produced and abruptly contracted behind the gibbous anterior region, partly from lateral compression, and partly from the upward and backward slope of the posterior basal margin, which is slightly sinuous near the extremity, and distinctly gaping, the widest part of the hiatus being above; hinge-line straight, or sometimes slightly declining at the posterior extremity; cardinal margins of the valves ankylosed; anterior side short, though not properly truncated, abruptly contracted and a little impressed in front of the umbonal convexity, and apparently provided with a slender projection above (this part broken in the specimens); beaks projecting a little above the cardinal margin, placed in advance of the middle and incurved; umbonal slopes gibbous, broadly rounded, and, like the beaks, slightly inclined backward. Surface (as seen in specimens apparently a little exfoliated) ornamented by simple, somewhat flattened, radiating costæ, about five or six of which, on the gibbous part of each valve, are separated by flattened furrows nearly or quite as wide as the costæ themselves; while on the posterior contracted portion, the costæ are proportionally wider, and separated by merely sharply impressed hair-lines, excepting near the posterior cardinal margin, where these impressed linear furrows are represented by little *raised* lines; costæ on the anterior surface more obscure; fine regular lines, and a few stronger marks of growth, are also seen crossing the costæ parallel to the free margins.

Length of a specimen with the anterior attenuated appendage broken away, 0.64 inch; height, 0.43 inch; convexity, 0.37 inch.

This species belongs to the section of the genus that has the umbonal slopes rounded instead of angular, and the anterior side in front of these slopes not so distinctly truncated or flattened as to impart the peculiar Hemicardium-like appearance so often seen in the genus. These characters at once distinguish it from its associate, *C. trigonale*, Hall, sp.; which is also distin-

¹ I merely follow the most general adopted method of describing the gaping end as the posterior, without being entirely satisfied that this is the correct view.

guished by its remarkable alation extending forward from the angular umbonal slopes.

I have seen no specimens of our shell quite entire at the anterior end, but it is evident that there was a slender projection somewhat like that of *C. aliforme* of Sowerby, though it may not have been so long as in that species.

Locality and position. Columbus, Ohio. Corniferous division of the Devonian.

SOLENOMYA (JANEIA) VETUSTA, Meek.

Shell of medium size, transversely sub-oblong or narrow sub-elliptic, the length being a little less than twice and a half the height; valves rather convex; anterior or longer side regularly rounded; posterior extremity more narrowly rounded; basal margin nearly or quite straight along the central region, but rounding up at the extremities, the curve being more gradual behind; beaks depressed to a level with the dorsal margin, and placed somewhat behind the middle; dorsal margin a little convex and nearly horizontal in front of the beaks, but rounding regularly into the anterior outline, and behind the beaks, slightly depressed below the horizon of the latter, though without sloping much posteriorly. Surface apparently smooth; interior showing distinct radiating striæ below the middle of the valves, excepting near the extremities. Posterior muscular impression rather narrow, suboval, oblique, placed near the margin, and well defined by a slight oblique ridge along its antero-inferior margin; anterior do. larger and faintly marked.

Length, 1.22 inches; height, 0.50 inch; convexity, about 0.32 inch.

This is another type very unexpectedly found among the Corniferous specimens. So far as I am aware, no example of this group has ever before been obtained from any horizon below the mountain limestone. Whether we regard the Carboniferous and Permian forms usually referred to *Solenomya*, as really belonging to that genus, or as constituting a distinct group (for which Prof. King proposed the name *Janeia*), there can be no question whatever, that the shell here described belongs to the genus that includes these Carboniferous and Permian species. Specifically, it is perhaps more nearly related to *S. biarmica* of the European Permian rocks, than it is to *S. Puzosiana*, de Kon., or to *P. primæva*,

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Phillips, from the Carboniferous. Indeed it might even be referred to *S. biarmica*, with more propriety than a Kansas Coal-measure species that has been so referred by Prof. Geinitz. Compared with the figures of the original Russian example of *S. biarmica*, figured in the Palæont. of Russia and the Ural Mountains, pl. xix. fig. 4 *a* and 4 *b*, our shell is seen to be proportionally somewhat more depressed and longer, with the beaks a little less prominent, and farther removed from the shorter or posterior extremity. Its posterior dorsal slope, even in the internal cast, is also less oblique. In this latter character it is even less like the English and German Permian forms referred to *S. biarmica*.

I have elsewhere (Proceed. Acad. Nat. Sci., April, 1870, p. 44) expressed the opinion that these Palæozoic shells usually referred to *Solenomya*, may yet have to be separated from that genus, and ranged under Prof. King's name *Janeia*, notwithstanding the fact that he subsequently abandoned his genus, under the impression that it is not distinct from *Solenomya*. I still think it probable that this may have to be done.

Locality and position. Dublin, Franklin Co., Ohio. Corniferous group, of the Devonian.

CLINOPISTHA ANTIQUA, Meek.

Shell very thin, transversely suboval, gibbous, with flanks along the middle near the lower margin, somewhat flattened or slightly concave; more than half as high as long. Anterior or longer side regularly rounded in outline; posterior sloping above from the beaks to the narrowly rounded extremity, which is most prominent below the middle; basal margin straightened or broadly sinuous along the central region, and rather abruptly rounded up at the extremities; beaks depressed nearly or quite to the dorsal outline, and placed about half-way between the middle and posterior extremity; dorsal outline nearly horizontal and parallel to the base, in front of the beaks, but rounding regularly into the anterior margin. Surface merely showing moderately distinct lines of growth, with some obscure traces of radiating striae when a little worn near the base; these last-mentioned markings being more distinct on the internal cast.

Length, 0.82 inch; height, 0.51 inch; convexity, 0.39 inch.

I have been much surprised, to find among the collections from the Corniferous limestone, a shell agreeing so exactly as this in all 1871.]

its known characters, not evidently merely specific, with the type of the genus *Clinopistha*, which I had previously supposed to be confined to the Coal-measures. It has the same short gibbous form, thinness of substance, posterior position of the beaks and ligament, surface markings, and even the same obscure internal radiating striæ. Indeed, if it were not for its rather more narrowly rounded, and more protuberant, instead of slightly truncated, posterior or shorter end, somewhat less gibbous beaks, and faintly sinuous base and flanks, it would scarcely be possible to distinguish it from the Coal-measure form by any external character, excepting the white chalky texture of the shell merely due to its state of preservation. The valves are a little displaced in the only good specimen I have seen, but the beaks certainly give some evidence of being slightly unequal, that is, of the left one lapping slightly upon the other, as in the typical species from the Coal-measures.

Locality and position. Same as last.

SANGUINOLITES? SANDUSKYENSIS, Meek.

Shell approaching a longitudinal-oblong or trapezoidal outline, moderately convex, a little more than twice as wide as high, and slightly narrower anteriorly than behind; cardinal margin straight, equalling about three-fifths the entire length; basal margin nearly straight and subparallel to the hinge, or slightly ascending anteriorly along its entire length, and rounding up a little more gradually into the front than behind; posterior extremity compressed, obliquely truncated above, and rather narrowly rounded to the base below; anterior end very short, sloping from the beaks above, and rather narrowly rounded at the middle; beaks depressed nearly or quite to the hinge-line, compressed, and placed near the middle of the anterior third; posterior umbonal slopes not angular, or even prominently rounded. Surface only showing a few irregular furrows and slight undulations of growth, most distinct below the middle of the valves.

Length, 2.70 inches; height at the posterior end of the hinge, 1.20 inches; do. under the umbones, 1.04 inches; convexity, about 0.52 inch.

I know nothing of the hinge of this shell, and merely refer it to the genus *Sanguinolites* provisionally. Indeed, until palæontologists can agree in regard to which one of the several shells that

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were originally referred to that genus is to be regarded as the typical form of the same, and something can be known in regard to the hinge and internal characters of those shells, it seems to me almost impossible to determine what *Sanguinolites* is. I do not agree with those, however, who would make *Allorisma* of King a synonym of Prof. McCoy's genus, though some of the species included by him may belong to *Allorisma*.

Locality and position. Same as foregoing.

SANGUINOLITES? OBLIQUUS, Meek.

Shell so depressed and elongated as to be nearly three times as long as high, rather distinctly convex, particularly along the posterior umbonal slopes, which are more or less angular from the beaks nearly to the posterior basal extremity; pallial margin very nearly straight along most of its length; anterior end extremely short, and a little sinuous on the upper side just in front of the beaks, the sinuosity being caused by a very small deep lunule, at the lower end of which the margin is a little projecting and subangular in outline, and from this little projection curves obliquely backward into the base; cardinal margin extending back about three-fourths the length of the valves, and inflected so as to form a well-defined, lanceolate escutcheon along its entire length; posterior side narrowed with a long slope above from the end of the hinge to the extremity, which is a little gaping and very narrowly rounded or almost angular below; beaks strongly depressed, very oblique, compressed below the ridges, very nearly terminal, and with the immediate points incurved over the little lunule. Surface showing only lines and furrows of growth, with occasional small, obscure, concentric wrinkles, that are not regularly arranged.

Length, 2.13 inches; height, 0.77 inch; convexity, 0.70 inch.

This species seems to be nearly related to a form from the same rock at Medina, Ohio, specimens of which were loaned by Dr. Newberry to Prof. Hall, some time back, and returned with the name *Sanguinolites æolus* attached. A careful comparison, however, of good specimens of each, shows them to be clearly distinct; the form under consideration being much more convex along the umbonal slopes, which are also more angular. Its beaks likewise differ in being decidedly more nearly terminal, and the inflection of its cardinal margin wider. The specimens of *S. æolus* also 1871.]

show faint traces of two or three very obscure longitudinal ridges above the umbonal angle of each valve, and impressions in casts, of a slight ridge behind the anterior muscular impression, that are not seen in our shell.

From the little that is now known of the shell that will probably have to be regarded as the type of the genus *Sanguinolites*, it is impossible to determine whether or not such shells as this can be properly referred to that genus. They seem to agree, however, more nearly with the same than they do with the typical forms of *Allorisma*, to which they are also related.

Locality and position. Rushville, and Newark, Ohio. Upper part of the Waverley group, of the lower Carboniferous.

ALLORISMA (SEDGWICKIA?) PLEUROPISTHA, Meek.

Shell depressed and elongated, or more than twice as long as high, moderately convex centrally and anteriorly, and alate and produced behind; pallial margin long, nearly straight along the middle, rounded up anteriorly and ascending more gradually behind; posterior side very narrow, truncated and somewhat gaping at the extremity, which intersects the cardinal margin at an obtuse angle, and rounds abruptly into the base; anterior side wider (higher) than the other, and more or less abruptly rounded. Dorsal margin depressed below the horizon of the beaks behind the latter, where it is concave or nearly straight in outline, and inflected so as to form a short corselet near the beaks; while in front of them it slopes forward rather abruptly, and is provided with a well-defined oval lunule. Beaks moderately prominent, rather gibbous, and incurved without any obliquity or fissure; placed a little less than one-third the length of the valves from the anterior margin. Posterior umbonal slopes subangular, the ridge extending toward the posterior basal extremity, but becoming obsolete before reaching it; while above this ridge the posterior dorsal region is flattened or a little concave and smooth.

Surface ornated with more or less defined concentric wrinkles and lines of growth, which are crossed on the posterior portions by linear but distinct raised radiating costæ, separated by wider depressions. Of these costæ, the anterior ones descend almost vertically from the beaks to the base; while farther back they gradually become more oblique, and near the middle of the flanks

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more closely arranged, but above and behind this they become more widely separated again, and nearly as oblique as the obscure umbonal ridge, above which they are not defined.

Length, 2.28 inches; height, 1 inch; convexity, about 0.85 inch.

This shell strongly reminds one, by its general outline and physiognomy, of those Jurassic species for which Prof. Agassiz proposed the genus *Cercomya*. In that group, however, there is no lunule, and I am not aware that any of the species of the same are marked by radiating costæ as in the species under consideration. From all that is known of its characters, I am inclined to believe it more nearly allied to the curious Lyonsia-like Carboniferous shells, upon which Prof. McCoy originally proposed to found the genus *Sedgwickia*, but which he afterwards referred to the genus *Leptodomus*. Still, it differs from the group *Sedgwickia* also, in the possession of radiating costæ. These are not mere rows of granules, such as doubtless existed on nearly all the different types of this family (*Anatinidæ*), but decided costæ, such as we see in *Pholadomya*, and, what is rather singular, they do not exist on the anterior part of the valves, but extend only as far forward as the beaks, under which they end abruptly, the anterior one being as strongly defined as any of the others, while only the concentric striæ and wrinkles exist on the anterior third of the valves. In the possession of the radiating costæ mentioned, as well as in the shortness of its hinge and the inflection of its cardinal margin, and in its general physiognomy, it differs from the typical species of *Allorisma*, and hence it may be thought desirable to establish a subgenus for its reception, in which case I would propose for the group the name *Cercomyopsis*.

Along with the typical specimen of the foregoing species, another was found, with the same form and surface characters, excepting that the anterior end in front of the beaks is shorter, and more angular at the lower end of the lunule; while the anterior of its radiating costæ are directed much more obliquely backward, instead of descending vertically from the beaks to the base. This specimen has the posterior end broken away, but as the peculiarities mentioned seem not due to any distortion, I am much inclined to believe it belongs to another species, for which *Allorisma* (*Sedgwickia*?) *obliqua* would be a good name.

Locality and position. Rushville, Ohio. Waverley group of Lower Carboniferous. Prof. Andrews' collection.
1871.]

GRAMMYSIA? RHOMBOIDES, Meek.

Shell attaining a moderately large size, not very convex, the greatest convexity a little before and above the middle; valves without an oblique mesial ridge or fold; rhombic suboval in outline, with height equalling about three-fourths the length, closed or nearly so all around; basal margin most prominent just behind the middle, from near which it ascends with a nearly straight outline obliquely forward, and more abruptly with a convex outline behind; anterior side truncated obliquely forward from the beaks above, and very narrowly rounded near the middle; posterior side less narrowly rounded at the middle, with its upper edge probably sometimes obliquely truncated; cardinal margin equalling about one-third the length of the valves, and inflected so as to form a well-defined escutcheon that narrows backward from the beaks; lunule rather deep, well defined, lance-ovate in form, and as long as the truncated anterior dorsal slope; beaks moderately prominent, not very gibbous or very strongly incurved, and situated a little nearer the middle than the anterior margin; posterior umbonal slopes forming a very obscure rounded ridge, between which and the dorsal and posterior dorsal margins there is a rather narrow, slightly concave, or flattened space on each valve. Surface with only small marks or lines of growth, which are gathered into very small obscure wrinkles along the margins of the lunule.

Length, 2.90 inches; height, measuring vertically from the most prominent part of the beaks to the horizon of the tops of the beaks, 2.15 inches; do. to cardinal margin behind the beaks, 1.93 inches; convexity, 1.40 inches.

I only know this shell from casts, which show neither the nature of the hinge nor the muscular or pallial impressions. It presents no traces of the characteristic oblique mesial fold or ridge, seen in the typical forms of *Grammysia*, and might, when its cardinal margin and lunule are concealed in the matrix, be mistaken for a large *Schizodus*. Its well-defined lunule and escutcheon, however, and obsolete muscular impressions, show that it cannot be even nearly related to that group. As the casts show no indications of the characteristic internal cartilage process of *Edmondia*, and it does not seem to have the habit of *Cardiomorpha*, I know of no genus to which it appears to be more nearly related than to *Grammysia*, and have concluded to place it provisionally

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in that group until its relations can be more precisely determined from the study of better specimens.

Locality and position. Same as last.

GRAMMYSIA VENTRICOSA, Meek.

Shell attaining a moderate size, extremely ventricose, the convexity being greater than the height, with the greatest gibbosity a little in front of and above the middle; height equalling about half the length; posterior side comparatively long, a little gaping, and narrowly rounded in outline, at or a little above the middle; pallial margin usually a little sinuous near the middle or in front of it; anterior side very short, concave just under the beaks to the base of the lunule, where the margin is subangular or very abruptly rounded and most prominent, while below this it rounds obliquely backward into the base; cardinal margins scarcely more than equalling half the entire length of the valves, and inflected so as to form a kind of shallow escutcheon; beaks very gibbous, moderately elevated, oblique, strongly incurved, and placed almost over the anterior margin; lunule deep, ovate or obovate, and well defined; posterior umbonal slopes prominently rounded; flanks without any oblique ridge or sulcus. Surface marked on the anterior side of the valves near the lunule by small wrinkles, which pass into mere lines and linear furrows of growth farther back, while even the latter become nearly or quite obsolete over the more gibbous parts of the valve.

Length of largest specimen seen, 2.50 inches; height, 1.30 inches; convexity, 1.55 inches.

I know nothing of the hinge or muscular and pallial impressions of this shell, and refer it to *Grammysia* from its form and general appearance. It shows no traces of the oblique ridge and furrows seen on the typical species of that genus, but it is well known that this character is not constant in the group.

Locality and position. Same as foregoing.

GASTEROPODA.

PLATYCERAS MULTISPINOSUM, Meek.

Shell attaining a large size, comparatively thin, depressed subovate, and very oblique; apex free, stout, obliquely coiled so as

1871.]

to make about one turn, beyond which the body part expands very rapidly to the aperture, making less than half of another volution; aperture proportionally very large, and nearly circular; lip not sinuous or undulated, but sometimes slightly, and broadly retreating behind; surface without plications or costæ, but thickly covered by numerous slender, tubular spines, which leave small, depressed, smooth, undefined tubercles on the internal cast.

Length, measuring direct from the most prominent part of the spire to the anterior margin of the aperture, 3.33 inches; height, to the most elevated part of the dorsal surface, when the shell is placed with its aperture downward, 1.44 inches; length and breadth of aperture, each about 2.90 inches.

This fine species differs from *P. dumosum*, Conrad, not only in its much larger size, more oblique, depressed, and more rapidly expanding form, but in having more numerous spines. The largest specimens of that species are said to have more than one hundred spines, while that under consideration must have had more than two hundred. It likewise differs in not having its lip waved or undulated as in Mr. Conrad's species.

It is probably more nearly related to *P. echinatum*, Hall, from the Hamilton group. No figures of that species have yet been published, but judging from the description, our shell is not only very much larger (that species being described as from one inch to one and a quarter inch in length, with an aperture one inch in diameter), but wants the sinuous peristome mentioned in the description of *P. echinatum*. The term "strong nodes" would also not apply to the numerous small obscure elevations marking the positions of the spines on internal casts of our species.

None of our specimens show the entire length of the spines, but judging from the fact that their broken ends, at a distance of 0.42 inch from their bases, only measure 0.08 inch in diameter, they would seem to have been probably shorter and more slender, as well as much more numerous, than those of *P. dumosum*. Although these spines are as completely tubular as those of the genus *Productus*, their internal cavity does not seem to have communicated with the interior of the shell, with probably the exception of those near the lip; for if that had been the case, the smoothly rounded obscure tubercles seen on the internal cast would have shown the broken bases of the casts of the internal cavities of the spines.

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Locality and position. Columbus, Ohio. Corniferous group of Devonian series.

PLATYCERAS ATTENUATUM, Meek.

Shell attaining a moderate size, very slender and elongated. Body part more or less arched above, a little compressed behind,¹ subangular on the right side, rounded over the dorsal or anterior slope, and gradually tapering backward to the small free apex, which is composed of one to one and a half contiguous volutions, and twisted to the right of the longitudinal axis of the free body. Aperture irregularly oval or suborbicular, and comparatively small or little expanded; lip most produced on the right anterior side, and sometimes a little retreating behind, with one or two other faint, smaller undulations of its margin around the front. Surface of cast without longitudinal plications, folds, or undulations, but showing over the dorsal and anterior slope numerous small tubercles that evidently mark the positions of spines on the exterior. Surface markings of the shell itself unknown.

Length of the largest specimen, measuring direct from most prominent part at the curve of the spire to that of the anterior margin of the aperture, 2.10 inches; do. measuring from the apex over the dorsal curve to the same, about 3.70; greatest breadth of aperture, 1.35 inches.

This shell seems to differ from all of the described spiniferous species with which I am acquainted, in being more slender, more elongated, and in having the small apex twisted nearly at right angles to the axis of the body part. These characters appear to distinguish it readily from the typical *P. dumosum*, Conrad; while from the variety of that species that has been described under the name *rarispinum*, it differs in never having its body even "moderately ventricose," nor in any case in contact with the apical coils, as well as in having more numerous spines, if we can judge from the number of tubercles, of which about fifty may be counted on the specimen from which the foregoing description was made out.

In general form it resembles the more slender individuals of the non-spiniferous species *P. reflexum*, from the Oriskany sandstone,

¹ I describe such forms, for convenience, as if placed with the aperture downward and the apex directed backward toward the observer.

but its body part is much straighter, while it is never so large and ventricose as in some varieties of that species.

Locality and position. Columbus, Ohio. Corniferous group.

NATICOPSIS LEVIS, Meek.

Shell apparently attaining a medium size, subovate in general form, at maturity, but proportionally shorter in the young; spire moderately prominent; volutions four to four and a half, convex, increasing rather rapidly in size; last one large, or forming near nine-tenths of the entire bulk of the shell, rounded on the sides, and a little extended below; suture well defined; aperture ovate, being regularly rounded below, and more or less angular above; columella arcuate, and distinctly flattened, or a little concave below the non-perforate umbilical region, above which the inner lip is thickened. Surface only showing obscure lines of growth.

Length of the largest specimens seen, 0.60 inch; breadth, 0.48 inch; height of aperture, 0.38 inch; breadth of do., 0.27 inch.

So far as I am at present informed, this is the first Devonian species, beyond doubt known to belong to this genus, that has yet been described in this country; though it is certainly represented in rocks of that age in Europe.¹ Our species is even more closely allied to the typical Carboniferous forms of the genus, than it is to the European Devonian species, such as *Naticopsis subcostata* and *N. margaritifera* (= *Natica subcostata* and *N. margaritifera*, d'Archie and de Verneuil).

It is an interesting fact that the above-mentioned European Devonian species represent both of the subgenera found in our Coal-measures, the first belonging to the subgenus *Trachydomia*, and the other to the typical section of the genus.

Locality and position. Dublin, Franklin County, Ohio. Corniferous group of the Devonian.

NATICOPSIS (PLATYOSTOMA?) ÆQUISTRIATA, Meek.

Shell subglobose; spire much depressed; volutions four, in-

¹ It is probable that several of the so-called Naticas of the European Silurian rocks also belong to this genus, as may be the case with some of the American Silurian species referred to *Holopea*, and other genera, from the study of mere casts.

creasing rapidly in size, those of the spire convex, last one large and ventricose; suture well defined; aperture ovate; outer lip thin, extended forward and very oblique above, and broadly re-creating or sinuous below the middle; columella narrow arcuate, imperforate, and showing some appearance of being a little furrowed below, as if for the reception of the edge of an operculum; inner lip apparently not thickened above. Surface ornamented by fine, very regularly and closely arranged striae of growth, which pass very obliquely backward and downward on the upper and outer side of the body volution, and then curve gracefully forward again below, so as to conform to the broad sinuosity of the outer lip.

Height, 0.17 inch; breadth, 0.18 inch.

This little shell will be at once distinguished from the young of the last, of corresponding size, with which it agrees very nearly in form, by its beautiful, very regular, well-defined, and gracefully curved striae, as well as by its narrower columella, and thin inner lip. The latter characters lead me to doubt whether it is not more properly a *Platystoma*.

Locality and position. Same as last.

BELLEROPHON NEWBERRYI, Meek.

Shell scarcely attaining a medium size, subglobose in form; volutions rounded, all hidden by the last one, the umbilicus being closed on each side; last turn expanded at the aperture, which is rather large, transversely lunate or subreniform, being nearly twice as wide transversely as the antero-posterior diameter; lip moderately sinuous in front, and rounded in outline on each side, very thin excepting in the umbilical regions, between which it is thinly spread a little over that part of the return of the spire indenting the inner or posterior side of the aperture. Dorsal band rather narrow, not usually elevated above the surface of the rounded dorsum, and merely defined by a slight furrow along each side.¹ Surface ornamented by distinct, very regularly disposed little transverse costæ, or coarse raised lines, most strongly defined on the dorsal side, where they curve a little backward near the band, and more abruptly in crossing the latter; while they become finer, more curved, and directed backward in approaching the

¹ In one of the smaller specimens, the band is a little raised so as to form a slight ridge.

umbilical region on each side, and diminish to mere fine lines of growth on the expanded part of the body volution near the aperture. Traces of much finer longitudinal, or revolving lines are also seen on well-preserved specimens.

Greatest antero-posterior diameter of a moderate-sized specimen, 0.70 inch; transverse diameter of aperture, 0.72 inch.

In its surface markings, this species seems to agree with *B. patulus*, Hall, from which it differs materially in having its aperture very much less expanded, and not overlapping the volutions posteriorly; as well as in not having its axis umbilicate. It is much more nearly like *B. hiulcus*, Sowerby, as illustrated by de Koninck (Ann. Foss. Carb. Belg., pl. xxvii, fig. 4, a, b, c), but in addition to being much smaller, its aperture is less transverse, and not near so deeply sinuate posteriorly by the inner volutions; while its lip is very much less spread over the latter behind. It likewise differs in the possession of fine obscure revolving striae.

The specific name is given in honor of Prof. J. S. Newberry, the State geologist of Ohio.

Locality and position. Dublin, Franklin Co., Ohio. Corniferous group of the Devonian.

BELLEROPHON PROPINQUUS, Meek.

This species agrees so nearly with the last in form and size, that it may be sufficiently characterized by pointing out the few characters in which it differs. In the first place, its transverse lines are distinctly finer, more crowded, and less regularly arranged; while it has a small umbilical perforation not entirely closed by the thickened lip on each side, as we see in that species. Again, its dorsal band is always distinctly elevated, very narrow, and furrowed along the middle, so as to present a biangular appearance, while the transverse lines bend back more strongly in approaching this band than in *B. Newberryi*, and do not impart the crenated or subimbricated appearance in crossing the band, seen on this part of that species. It is likewise destitute of the very fine obscure revolving striae of *B. Newberryi*, and seems to have its aperture somewhat less expanded, though the specimens are scarcely in a condition to show the expansion of the aperture satisfactorily.

Locality and position. Same as last.

[June 6,

CYCLONEMA CRENULATA, Meek.

Shell turbate, subtrochiform, thin; spire depressed conical; volutions four, increasing rather rapidly in size, those of the spire convex but not rounded; last one large, convex on the upper slope to the periphery, which is rather narrowly rounded; suture well defined between the upper volutions, and somewhat canaliculate farther down; aperture ovate. Surface ornamented by sharply elevated revolving lines or small ridges, which are beautifully and minutely crenate by the crossing of the fine, very oblique lines of growth; of these revolving lines from sixteen to eighteen may be counted on the body volution, and six on the next above, while those farther up appear to be quite smooth.

Length, 0.34 inch; breadth, 0.32 inch.

This species seems to be related to *C. multilira*, Hall (Fifteenth Report of Regents, p. 48, pl. 5, fig. 17), but has a more depressed form, with the volutions of its spire merely convex instead of rounded, and its body volution narrowly instead of regularly rounded. It also has more revolving lines, which likewise show a delicate crenate character not represented in the figure nor mentioned in the description of *C. multilira*.

In general appearance our shell more nearly resembles Mr. Conrad's original figure of his *C. bilix* (Journ. Acad., N. S. VII, pl. xvi, fig. 10), but it is less oblique, with more convex volutions, and more numerous revolving lines.

Locality and position. Same as last.

ISONEMA HUMILIS, Meek.

Shell large and robust, depressed subturinate, about one-fourth to near one-third wider than high; spire much depressed: volutions four, increasing rather rapidly in size, the exposed part of those of the spire gently convex; last one large and regularly rounded, or sometimes very obtusely subangular around the middle of the outer side; suture well defined, without being properly channelled; aperture circular a little within, but more or less angular above at the immediate edge of the lip, where it is more oval in outline; outer lip thin, and, in mature specimens, slightly dilated; inner lip thickened, very distinctly flattened, and slightly spread over the imperforate umbilical region, as well as a little thickened near the top of the aperture. Surface ornamented 1871.]

with oblique, slightly arched lines of growth, which, on the first and second turns of the spire, are rather coarse, well defined, and present the characteristic regularity of size and arrangement, but soon become, on the succeeding turns, much finer and more crowded, as well as occasionally interrupted by irregular, stronger furrows and wrinkles of growth.

Height of a medium-sized specimen, 1.10 inches; breadth, 1.50 inches; height of aperture, measuring at the margin of the lip, to the top of the angle above, 0.95 inch; breadth, about 0.87 inch.

It is possible that this may be the full-grown adult form of *Isonema depressa*, M. & W., as its first and second volutions have much the form and surface markings of that shell. Still, as it shows only the same number of volutions in specimens of nine or ten times the volume of the typical specimen of that species, I am led to believe it distinct. Although young specimens are more inclined to be subangular around the middle of the outer turn than in the adult, which often has the body whorl regularly rounded, I think it is never at any stage of growth so angular as in the *I. depressa*.

In large examples, with the strong striæ of the first turns of the spire obscured by erosion, the specimens of this shell (which are usually preserved in such a condition as to present a perfectly white chalk appearance), when viewed from above, resemble very much the bleached shells of some of the large depressed forms of *Helicidæ*. The strongly flattened, smooth inner lip, however, gives a very different expression to the under side.

Until more is known in regard to the texture and ornamentation, and particularly in regard to the nature of the inner lip, in the shells on which the genus *Holopea* was originally founded, it is scarcely possible to determine exactly the relations of our shells to that group. My present impression, however, is that they constitute a distinct genus.

The species here described resembles some forms of *Platyschisma*, McCoy, but they show no traces whatever of the shallow sinus of the outer lip, and differ remarkably in the presence of the thickened, appressed, and distinctly flattened inner lip, while in the species here described, and in *I. depressa*, there is not even a slight umbilical perforation. This latter character, however, may not be constant in the group.

Locality and position. Same as foregoing.

[June 6,

ORTHONEMA NEWBERRYI, Meek.

Shell turreted, elongate-conical; volutions eight or nine in adult examples, compressed-convex, with a more outward slope than the general slant of the spire, the most convex part being near the lower side of each, a little above the suture; first one or two very small and depressed, and the next one or two more rapidly increasing in size than those below, thus giving a proportionally shorter and more conical appearance to young than adult specimens; suture well defined, in consequence of the prominence of the lower part of each turn just above. Surface ornamented by three very slender, raised revolving lines, one of which is placed a little below the suture, and the other two below the middle of the turns of the spire, and on the middle of the last volution; of these revolving lines the upper two are broken up into minute, regularly arranged, projecting points, while the other is usually continuous; lines of growth minute, sharply defined, and very regularly and closely arranged, passing vertically and very nearly or quite straight across the volutions. (Aperture unknown.)

Length, 0.63 inch; breadth, 0.22 inch.

The general appearance of this very neat little shell, with its three slender revolving lines, two passing around the middle of its body volution, and below the middle of those of the spire, at once recalls to the mind the genus *Murchisonia*. A moment's examination under a magnifier, however, shows that the sharply defined lines of growth pass straight across the volutions, without making the slightest flexure indicating a sinus in the lip, such as we see in *Murchisonia* and *Pleurotomaria*.

It is a more slender shell than the type of the genus, *O. Salteri*, M. and W., from the Coal-measures, and has a much deeper suture, and less angular body volution, with other differences in the details of its markings. Although nothing is known of the nature of its aperture and columella, it agrees so exactly in all its other generic characters with the genus *Orthonema*, that I have no hesitation in referring it to that genus. It is certainly not a *Murchisonia*, and differs radically in its ornamentation from *Loxonema*, and all of the other palæozoic types to which the more or less similar univalves of the older rocks are usually referred.

Locality and position. Otsego, Wood County, Ohio, from the Corniferous groups, just above the Glass Sand. Mr. Gilbert.

1871.]

TROCHITA ? ANTIQUA, Meek.

Shell strongly depressed, subtrochiform, about three times as wide as high; under side flattened and provided with a broad, shallow, excentric umbilical impression; volutions two and a half to three, a little convex, with a gentle outward slope above, and an angular periphery at the connection of the upper slope of the whorls and the base; suture rather obscure; aperture transversely rhombic; nearly three times as wide as high, with acutely angular outer and inner extremities; upper edge of lip very oblique, and extended far forward beyond that below, which seems to be nearly straight. Surface of upper side ornamented by rather distinct lines, or small ridges of growth, which cross the volutions very obliquely, with strong backward curves as they approach the periphery parallel to the margin of the lip.

Breadth, 2.12 inches; height, 0.66 inch.

The specimens of this shell yet found are very imperfect, but its form and general appearance are so peculiar that there can scarcely be any difficulty in identifying it. Although it has a broad umbilical impression, this impression does not appear to extend up into the very short spire as a true umbilicus. It may not be a true *Trochita*, but the specimens yet seen show no characters by which it can be separated from that group, which seems to be represented in the Carboniferous rocks.

Locality and position. Monclova, Lucas County, Ohio. Corniferous group of the Devonian.

TROCHONEMA TRICARINATA, Meek.

Shell turbinate, thin, a little wider than high; spire depressed. Volutions about five, strongly shouldered, or nearly rectangular above; the upper surface being flat, or a little concave, and extended out almost horizontally to the rectangular and carinate shoulder; below this the outer side is nearly vertically flattened to a second carina passing around near the middle of the body whorl, exactly coincident with the suture between that and the succeeding turn, so as not to be exposed on the spire; below this second carina the under side of the body volution is flattened, with a strong inward slope, to a third well-defined carina, passing around the middle of the under side, and forming the margin of the umbilicus. Aperture oval-subpentagonal, being a little higher

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than wide, and somewhat angular above, at the connection of its outer lip with the return of the spire, and at the termination of each of the three revolving carinæ, as well as very obscurely so a little below the middle of the inner side; inner lip thin below its connection with the carina passing around the umbilicus, at which point it is very slightly thickened, while above this it seems to be nearly or quite obsolete. Umbilicus rather wide, but shallow, or very rapidly contracting within. Suture well defined, without being in the slightest degree furrowed. Surface only showing very fine lines of growth, which, on the upper flattened space of the volutions, pass obliquely outward and backward, with a very slight curve from the suture to the upper angle or shoulder, below which they pass nearly straight down the outer flattened area to the second carina, which is as far as they can be traced in the specimen studied.

Height, 0.81 inch; breadth, 0.90 inch; height of aperture, 0.54 inch; breadth of do., 0.46 inch.

This rather neat shell seems to agree exactly in all of its generic characters with the type of Mr. Salter's genus *Trochonema* (*T. umbilicata*, Hall, sp.), excepting in not even showing any tendency to have its body volution become free at the aperture, nor apparently its peritreme continuous. The first of these characters, however, seems not to be always constant in the typical species of *Trochonema*; but the fact that it *does generally* occur in the same is worthy of note; while the apparent absence of a continuous peritreme in the shell here under consideration, would certainly seem to be one of more than specific importance. If so, I would suggest for it, at least as a subgeneric designation, the name *Trochonemopsis*.

Specifically this shell will be readily distinguished from *T. umbilicata*, which it most nearly resembles, not only by its more depressed form, closely contiguous body volution, obsolete inner lip above the middle of the aperture, and more shallow umbilicus, but also by not having its suture channelled and bordered below by a fourth carina around the upper margin of each volution, as in that species.

Locality and position. Marblehead, Ohio. Corniferous group.

NOTE.—In the same matrix with the above-described shell, I have been surprised to notice numerous minute bodies that I can scarcely doubt are

really the fruits of the fresh-water genus *Chara*. At any rate, they certainly seem to present all the external characters of the same. These little bodies are globose, about 0.05 of an inch in diameter, and each ornamented by nine strongly defined, and very regularly disposed, spiral ridges, which start on one side around a minute pit, and pass with perfect regularity spirally so as to converge to an exactly opposite point on the other side, making each about one spiral turn in passing from side to side. If really the seeds of this fresh-water genus of plants, they must have been carried into the sea by streams, and deposited where we now find them, along with numerous marine shells.

PTEROPODA.

CONULARIA MICRONEMA, Meek.

Shell elongate-pyramidal, with the sides equal and diverging from the apex at an angle of about 16 degrees; lateral surfaces nearly flat, and without any mesial furrow, but sometimes showing a very faint, slender mesial ridge, that becomes nearly or quite obsolete toward the smaller end; each of the four angles a little rounded, and provided with a shallow, moderately distinct longitudinal furrow. Surface with numerous, extremely small, closely crowded, transverse striæ, of very nearly the same size on all parts of the shell; striæ gently arching forward as they cross the sides, and scarcely interrupted at the little mesial longitudinal ridge; minutely crenate, and separated by extremely slender linear furrows, numbering fifteen in the space of one-tenth of an inch on all parts of the surface; crenulations of striæ twelve to fifteen in one-tenth inch.

Length of a specimen broken at both ends, with a diameter of 0.96 inch at the larger end, and 0.46 inch at the smaller, 2.30 inches.

This species is remarkable for the extreme fineness and closely crowded uniform character of the transverse striæ on all parts of the surface. I know of no other species, resembling it in other respects, with near such fine crowded striæ. At a little distance these lines are entirely invisible to the unassisted eye, and it requires the aid of a magnifier to see them distinctly. The furrows between these striæ are more impressed hair-lines, in which no crenulations are visible in the specimen.

Locality and position. Sciotoville, Ohio. Waverley, or lowest division of the Carboniferous.

[June 6,

CONULARIA ELEGANTULA, Meek.

Shell presenting the usual quadrangular pyramidal form, with the divergence of the sides from the rather pointed apex, forming an angle of about 18 degrees; each of the four lateral angles slightly rounded and distinctly furrowed; sides equal, nearly flat, and without any well defined longitudinal mesial furrow. Surface ornamented by numerous, very small, closely arranged, transverse lines that arch gently forward or toward the aperture, and sometimes become slightly interrupted and alternating along the middle of each side; while in other instances they are merely a little deflected and continuous across this slight impression or imaginary line. These lines attain their largest size, and are separated by spaces of their own breadth, at about 0.70 inch from the apex, and beyond this become gradually smaller and more crowded toward the aperture. Where largest and widest apart, they number about seven in one-tenth of an inch. They are all crenulated, there being fourteen of the crenulations in a length of one-tenth of an inch. Furrows between the transverse lines marked by very fine striæ, much smaller and more crowded than the crenulations on the striæ, and running in the direction of the longitudinal axis of the shell.

Length of specimen, apparently nearly entire, 1.70 inches; breadth, about 0.59 inches.

This species is related to *C. byblis* of White (Proc. Bost. Soc., N. H., Feb. 1862, p. 22), and *C. multicosata*, M. & W. (Proc. Acad. Sci., Phila., Dec. 1865, p. 252), from the Waverley group of Iowa and Ohio. It differs, however, in having its transverse lines smaller and more crowded, there being about 70 of them to the inch, at the point where they are largest and widest apart, and 100 in the same space near the larger end of the shell; while in both of the Waverley species mentioned, only forty-five to fifty occur in an inch. The crenulations of the transverse striæ are also smaller and more crowded in the species under consideration, there being usually fourteen of them in one-tenth of an inch, which would give 140 to the inch; while, according to Prof. Winchell's measurements, they are so much larger and more distant in *C. byblis*, that 60 to 75 of them would occupy the same space. The obtusely rounded and smooth apex mentioned in Dr. White's description, if natural, would be another very important distinction; 1871.]

but I suspect, from the appearance of some of the specimens of species of this genus figured by Prof. Barrande, that this is due to the removal of the apex by some accident, so as to expose one of the smooth septa within.¹

Compared with *C. Niagarensis*, Hall, the species under consideration evidently differs in being much more gradually tapering, and has the transverse lines much smaller and more crowded toward the larger end of the shell. In form it agrees more nearly with *C. simplex* of Barrande, which, however, has the furrows between the transverse lines smooth, and these lines not becoming smaller and more crowded toward the aperture from a point six to seven tenths of an inch from the apex.

Locality and position. Delaware, Ohio. Corniferous division of the Devonian.

CEPHALOPODA.

CYRTOCERAS OHIOENSE, Meek.

Shell long, slender, gently arched, and very gradually tapering, section nearly circular, the dorso-ventral diameter being slightly greater than the transverse. Septa distant from each other, on the outer or convex (ventral) side of the curve, slightly more than one-sixth, and on the inner side about one-seventh, the dorso-ventral diameter. Siphuncle situated near the outer side of the curve, but not exactly marginal. Surface ornamented by small, somewhat irregular annular ridges and striæ that curve a little backward in crossing the ventral side. Rather distinct, raised lines also mark the surface longitudinally, so as to form with the annular markings a somewhat cancellated appearance.

Length of a specimen incomplete at both ends, and septate throughout, excepting about one inch of the anterior end, 6.50 inches (measuring along the convex side of the curve). Dorso-ventral diameter at the posterior end, 1.33 inches; transverse

¹ Since seeing these figures of Prof. Barrande's, I am led to think it probable that *C. byblis*, White, and *C. multicostata*, M. & W., may belong to one species, the apparent obtusely rounded smooth apex of *C. byblis* being the principal character that led us to suppose the *C. multicostata* to be quite distinct. A comparison of specimens, however, might show other distinctions.

diameter at the same place, 1.27 inches. The increase in size is such that the same measurements at a point three inches farther forward, are respectively 1.56 and 1.50 inches, while from this point to the broken anterior end, which includes only about one inch of the body chamber, the shell diminishes a little in both diameters, but apparently more in the transverse than the dorso-ventral, though this may be in part due to accidental lateral pressure.

This species seems to be related to *Cryptoceras eugenium*, Hall (Regents' 15th Report, p. 70, pl. 9, figs. 1, 2, and 3), but evidently not only attained a larger size, but differs in having its dorso-ventral diameter a little greater than the transverse, instead of the reverse. It also differs in being marked with distinct longitudinal raised lines, as well as in tapering somewhat, from the central region forward, and in having its septa more closely arranged. In form it agrees more or less nearly with several of the Bohemian species figured by Dr. Barrande, but it differs from all of them in its surface markings; while from his *C. pugio*, which has somewhat similar sculpturing, it differs in being a little more curved, and without transverse undulations.

The entire shell could scarcely have been less than 12 to 14 inches in length, and probably curved so as to form about one-fourth of a circle.

Locality and position. Dublin, Franklin Co., Ohio. Corniferous group of the Devonian series.

GYROCERAS (TROCHOCERAS ?) OHIOENSE, Meek.

Shell attaining a large size, oval-subdiscoid; composed of three or four rather rapidly enlarging whorls, the inner ones of which are closely contiguous, while the last one seems to become a little free at the aperture; umbilicus large and of moderate depth. Volutions rounded—subquadrangular, with the transverse diameter somewhat greater than the dorso-ventral; rather broadly flattened on the periphery, and compressed convex on the sides, which round off gradually into the umbilicus, and more abruptly to the periphery, excepting in young shells, which have the sides of the volutions more flattened, and rounding as abruptly into the umbilicus as to the flattened outer side. Septa moderately distant, or separated by spaces which measure, on the middle of each side, about one-third the dorso-ventral diameter of the volu-
1871.]

tion at the same point; curving gracefully backward as they cross the sides, and forward as they pass from the sides to the flattened periphery, in crossing which they again make another, but stronger, backward curve. Body chamber large, or occupying more than half the outer volution. Surface (of cast) ornamented by small transverse ridges, of which about thirty may be counted to a side of each volution, the outer half only of which they occupy, without passing over or upon the periphery; while on the inner volutions they are sometimes so short as to assume the aspect of transversely elongated nodes. Siphuncle, aperture, and finer surface markings unknown.

Greatest diameter across the disc of a specimen with a part of the outer volution broken away, about nine inches; dorso-ventral diameter of outer volution at the point where it is broken off, 3.63 inches; thickness, or transverse diameter, of same at same point, about 3.90 inches.

Owing to the fact that the only two specimens of this species I have seen are both in such a condition as to show clearly only one side (the upper side of it is a *Trochoceras*), I am in some little doubt whether it is a *Gyroceras* or a *Trochoceras*. From the depth of the concavity of this side, however, I can scarcely question that the volutions are really coiled in the same plane, as in *Gyroceras* and *Nautilus*. The contiguous character of its volutions (excepting apparently the last one, near the aperture) is, however, rather against its being a *Gyroceras*, though the inner turns are sometimes in contact in species apparently belonging to that genus. If the last turn really does become free, as seems to be the case, this character would be equally against the probability of its being a *Nautilus*; but as the specimens are not in a condition to quite remove all doubts on this point, it is barely possible that this shell may be found to belong to some of the sections of that group, though I can scarcely think so.

I know of no described species of *Gyroceras* so nearly allied to this specifically, as to require a close comparison.

Locality and position. Delaware, Ohio, and in Marion County of the same State. Corniferous limestone of the Upper Helderberg Series (Devonian).

GYROCERAS (NAUTILUS?) INELEGANS, Meek.

Shell attaining a large size, subdiscoidal. Volutions about two and a half to three, increasing rapidly in size, having a somewhat greater dorso-ventral than transverse diameter, being moderately compressed on each side, narrowly rounded over the periphery, and rounding regularly into the umbilicus, which is of moderate depth and distinctly narrower than the dorso-ventral diameter of the outer whorl. First turn apparently slightly embraced by the second, which seems to become free toward the aperture. Septa rather distant, deeply concave on their anterior faces, and all crossing the sides and periphery with very slight backward curves; separated from each other on the periphery by spaces equalling about half the dorso-ventral diameter at the point of measurement. Body chamber large, or forming half the outer volutions; aperture not expanded; lip sinuous on the outer side. Surface of cast showing, on the inner volutions, some traces of rather distant transverse ridges, which become nearly or quite obsolete on the outer turn. Siphuncle and finer surface markings unknown.

Greatest diameter across the disc of a specimen a little compressed by accidental pressure, nine inches; dorso-ventral diameter of last turn near the aperture, 4.10 inches; transverse diameter of same, 3.50 inches.

This is another form in regard to the generic characters of which I am in doubt. Its more rapidly expanding volutions, more rounded periphery, proportionally narrow umbilicus, and closely contiguous, or even slightly embraced inner turns, give it a much more nautiloid look than the last, and I should scarcely hesitate to refer it to the genus *Nautilus*, if it were not for the fact that the outer volution seems to be a little detached at the aperture. Still, this may possibly be due to compression.

Locality and position. Corniferous group, Marion County, Ohio.

CRUSTACEA.**PROETUS PLANIMARGINATUS, Meek.**

Pygidium depressed, semi-elliptic, the length and breadth being nearly as five to seven; anterior margin gently arcuate or convex in outline; posterior somewhat narrowly rounded; lateral margins diverging forward, with slightly convex outlines, to the anterior

lateral angles, which are not truncated. Mesial lobe rather depressed, but rounded and well defined, narrow, or only about two-thirds as wide at its anterior end as the lateral lobes, tapering gradually, with straight sides, to its posterior extremity, which terminates at a distance of about half the breadth of the anterior end, within the margin; provided with about twelve or thirteen nearly straight segments, most of which are well defined. Lateral lobes gently convex, sloping gradually from near the middle to the lateral and posterior margins, which are horizontally flattened, but not thickened; segments eight or nine, not extending upon the flattened margins, and each divided its entire length, by so broad a furrow (flat within) that only a very narrow anterior and posterior margin is left projecting, and merely separated from that of the contiguous segment by a faint linear depression, thus presenting the appearance of narrow ribs or segments longitudinally marked by faint linear furrows, and separated from each other by broad flattened depressions. Surface apparently nearly smooth. (Other characters unknown.)

Length of pygidium, 0.64 inch; breadth, 0.94 inch; height of lateral lobes, 0.13 inch; do. to top of mesial lobe at its anterior end, 0.23 inch.

The pygidium of this species seems to present much the same proportions as the corresponding part of *P. Haldemani*, Hall, from the Hamilton group; but it has a proportionally narrower mesial lobe, and a smaller number of segments in the lateral lobes. It also differs in having a distinctly flattened instead of thickened border. If I have correctly understood the nature of the segments of its lateral lobes, they are also very different from those of *P. Haldemani*, being provided with wide flattened longitudinal furrows. These furrows are so wide and strongly defined that I have been in some doubt whether they ought not rather to be regarded as the divisions between the segments (which, in that case, would be represented by the comparatively narrow intervening furrows) than as the furrows of the segments themselves. On tracing them inward, however, to the mesial lobe, they are found to be abruptly narrowed and curved slightly forward as they approach the latter, so as to seem to correspond to the furrows on the segments, rather than to depressions *between* them.

None of the specimens show much of the surface, but, as far as it can be seen, it seems to be smooth, and to coincide exactly

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with the smallest elevations and depressions of the internal cast, from which the foregoing description was drawn up.

Locality and position. Upper part of the Corniferous group, Sylvania, Lucas County, Ohio. Devonian. Mr. Gilbert's collection.

DALMANITES OHIOENSIS, Meek.

Pygidium large, depressed, semi-elliptic or semi-oval in general outline, nearly straight or gently convex in outline on the anterior margin, with the lateral angles a little rounded; posterior extremity somewhat raised and truncated, with the lateral angles of the truncated margin produced into two rather short, distinctly converging spines. Mesial lobe narrow, or only equalling half the breadth of each lateral lobe at the anterior ends, depressed and gradually tapering to the posterior end, which terminates very near the truncated posterior margin; rather distinctly separated by the furrow on each side from the lateral lobes; segments about eighteen, passing straight across, and separated by well-defined furrows, that are narrower than the segments themselves, which are not furrowed. Lateral lobes most convex along somewhat within the middle, where they are nearly or quite as high as the mesial lobe, toward which they slope slightly on the inner side, while beyond the middle they slope off gradually to the lateral margins, which are very narrow, not thickened above, and curve outward nearly horizontally; segments about fifteen, widening slightly outward, and separated by deep, well-defined furrows extending very nearly to the lateral margins; the larger ones showing faint traces of a slender longitudinal furrow along the middle, while all, excepting a few of the smallest posterior ones, are produced beyond the lateral margins in the form of slender, sharp rounded spines, that curve a little backward and upward. Surface nearly or quite smooth. Thorax and cephalic shield unknown.

Length of pygidium, 1.70 inch; breadth, 2.70 inches; height or convexity; 0.25 inch; breadth of posterior truncation, 0.45 inch; length of longest spines projecting from lateral margin, 0.38 inch.

This Trilobite seems to be closely allied to *D. myrmecophorus* (= *Asaphus myrmecophorus*), Green, to which I was at one time inclined to refer it. A careful comparison, however, with the 1871.]

description of that species given by Green and Hall, seems to show that our fossil cannot be properly considered identical. In the first place, it differs in having the mesial lobe only just half as wide as each of the lateral (measuring both at their anterior ends), instead of only about one-third as wide (see dimensions *D. myrmecophorus*, given in the Fifteenth Report, Regents Univ. N. Y., on State Cab. N. H., p. 18). Again, it shows no traces whatever of nodes or spines (excepting the marginal spines) on any of the segments, either of the mesial or lateral lobes; while in Green's species the segments of the lateral lobes are described, in the Regents' Report above cited, and also by Green, as being marked by one or two rows of nodes, and those of the mesial lobe are described in the Regents' Report as being marked each by three spines. Our species also shows a faintly impressed mesial line along each segment of the lateral lobes, not mentioned either by Hall or Green in describing *D. myrmecophorus*.

Green gives the number of segments in the middle lobe of the pygidium as fourteen, and in each lateral lobe as thirteen; while in apparently a larger specimen (three inches in length), Prof. Hall counted twenty-four segments in the axis, and twenty in each lateral lobe; from which we may infer that the number of segments varied somewhat with the size of the specimen in that species.

Although nothing is known of the cephalic shield of this species, or, I believe, of that described by Green, I have little or no hesitation in expressing the opinion that at least the form here under consideration possessed the peculiar perforated or digitated extension of its anterior margin seen in *D. selinurus*, and hence that it belongs to Mr. Conrad's subgenus *Odontocephalus*.

Another specimen in the collection from the same locality and position as that from which the foregoing description was made out, consisting of a rude cast of the pygidium, shows the same proportional breadth of the mesial and lateral lobes, and apparently about the same number of segments, but differs in being proportionally longer, its length being to its breadth as about 8 to 11, instead of about 8 to 13. It also differs in having the spines on each side of the truncated posterior extremity distinctly larger than in the form above described, and directed straight backward as in *D. selinurus*, instead of converging, as in the last. The spines along its lateral margins, however, are, on the contrary,

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proportionally decidedly smaller. This, I suspect, belongs to a distinct species; but, as the specimen is too much eroded to show its surface character clearly, I have preferred to refer it doubtfully, for the present, to the same.

Locality and position. Marblehead, Ohio. Corniferous group of the Devonian. 4