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Source: *Proceedings of the Academy of Natural Sciences of Philadelphia*, 1862, Vol. 14 (1862), pp. 405-430

Published by: Academy of Natural Sciences

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Descriptions of Fossils from the Marshall and Huron Groups of Michigan.*

BY ALEXANDER WINCHELL.

CENTRONELLA, Billings.

CENTRONELLA JULIA, n. sp.—Shell small, nearly circular, ranging from slightly elongate to transverse, and squarely rounded; both valves with regular lens-like convexity, sometimes with a gentle ridge running the length of the ventral valve, and a slight sinuation near the margin of the dorsal. Ventral valve with a moderate beak, circularly foraminated, turned up at a right angle, covering the beak of its fellow. Area entirely wanting. Shell obsoletely striate concentrically, and having a minutely punctate structure. Apophysary system as follows: A delicate ribbon-like loop originates from the stout blunt crura of each side of the socket valve, having its flat sides at first vertical; the two branches of the loop proceed at first in lines parallel or a little convergent, and then gradually diverge, widening as they proceed, and assuming an inclined position, until, approaching the front of the valve by a regular curvature, the lower edge has become anterior, giving the band an angle of 30° with the plane of the shell; approaching the median line the band rapidly widens, and the front margin is drawn forward in a long acumination, while the inner margin is regularly concave, except that near the median line it turns abruptly forward so as to meet that line at an acute angle. The loop thus forms an urceolate figure on its inner margin, and on the outer a somewhat oval one truncated behind and attenuately acuminate before. In the median line where the two branches meet, both are suddenly deflected downwards, forming a double vertical plate, not quite reaching the ventral valve, the upper edge of which, when viewed from the side, is flatly roof-shaped, while the lower edge describes two convexities, the greater, anterior, leaving a notch between them. The surfaces of the loop and median plate are covered with minute obliquely conical pustules, in some places seeming to become spinulous. The casts exhibit on the ventral side a delicate impressed line extending from the beak to the middle, and on the right and left of this a fainter one; on the dorsal side a median impression with two fainter ones on the right, and two on the left—the median terminating rostrally upon a small pyramidal process (filling the beak of this valve) separated by a short slit (made by the socket ridge) from a smaller isolated process on each side.

Length, breadth and thickness of an average specimen: .31 (100), .29 (94) and .15 (48).†

Locality.—Grindstone quarries, Pt. aux Barques, in a conglomeritic ferruginous sandstone overlying the gritstones of the Marshall Group. Abundant.

SPIRIFERA, Sowerby.

SPIRIFERA SUBATTENUATA, Hall.—Iowa Rep., p. 504, pl. 10, fig. 3. Comp. Owen Rep. on Iowa, Wis., &c., pl. iii. fig. 9.

Our specimens agree with the figures and descriptions of Hall.

Locality.—Light-house Pt. aux Barques, with *Spirifera Huronensis*.

* For a description of the rocks of these groups see the author's Report on the Geology of the Lower Peninsula of Michigan, 1860; also Silliman's Journal for May, 1862.

Descriptions of 26 species of Cephalopoda from these two groups were published in the number of Silliman's Journal just referred to; and descriptions of most of the Gastropoda and Lamellibranchiata of the present paper were sent for publication on the 1st of April last, since which time further discoveries and investigations have extended my notice of the palæontology of these interesting groups to its present limits, and I have for this reason obtained permission of the editors of Silliman's Journal to offer the whole for publication together, to the Phil. Acad. of Nat. Sciences.

† The measurements in this paper are given in inches. The numbers in parenthesis are the *relative* measurements—that which is generally greatest being assumed 100.

SPIRIFERA MEDIALIS (?) Hall.—Rep. IVth Dist. N. Y., p. 208, fig. 8; 10th Rep. N. Y. Reg., p. 164.

Locality.—Light-house, Pt. aux Barques, with *S. Huronensis*.

SPIRIFERA HURONENSIS, n. sp.—Shell of medium size, transversely semi-elliptic, with acuminate hinge-extremities; entire hinge-length nearly three times the length of the shell; anterior and antero-lateral borders regularly curved. Ventral valve ventricose, especially towards the beak, which is erect over a high, triangular area, triangularly foraminated to the apex; sinus beginning near the beak, not well defined, round at its margins and bottom; entire surface covered with about forty rounded ribs, of which the lateral half on each side terminate upon the cardinal border, while about four, of the same size as their neighbors, occupy the sinus. Dental plates standing at an angle of 58° . Dorsal valve equally tumid with the ventral; beak incurved over a narrow area; mesial fold indistinct, with three or four ribs; oclucosor and pedicle scars lanceolate, deep. Surface of shell with one or two squamous incremental lines.

Length of shell, .49 (100); length of hingeline 1.3 (265); convexity of ventral valve .25 (50).

Locality.—Light-house Pt. aux Barques, in a hard, gray, pyritous, coarse, often conglomeritic bed of sandstone two feet thick, intercalated in the argillaceous slates of the Huron group.

SPIRIFERA PHAROVCINA, n. sp.—Shell large and ventricose. Ventral valve with a gentle sinuation which extends to the beak; dental plates moderately long, forming an angle of 80° ; area very elevated, with a narrow triangular fissure reaching to the apex, which scarcely overhangs the area; surface faintly marked each side of the sinus by rather remote radiating ribs, which, near the margin, are somewhat distinct. Some impressions of areas supposed to belong to this species, are 2.1 long, and .95 high, with a fissure .44 wide at base; deltoidal impression grooved in the direction of the fissure; surface of area flat, slightly incurved at apex and marked by very distinct transverse striae. Dorsal valve with a low rounded fold, marked (in the cast) by a single small median groove; beak prominent, incurved over a small area.

Locality.—Light-house, Pt. aux Barques, with *Rhynchonella Huronensis*, *Spirifera Huronensis*, &c.

This well marked species is known only by imperfect casts.

SPIRIFERA (?) *INSOLITA*, n. sp.—Shell large, smooth. Ventral valve with a broad, concave sinus reaching to the beak, and forming at its lateral margins angles with the shell surface; area short and imperfectly bounded, though the beak is rather high; dental plates very long, reaching the middle of the shell or beyond, and forming with each other an angle of 25° , which is the same as the rostral angle of the mesial sinus.

Locality.—Light-house, Pt. aux Barques.

This species has the short hinge line of *Brachythyrus*, and the smooth surface of *Martinia*—characters which, with the very long and approximate dental plates render it unique among *Spiriferæ*.

RETZIA, King.

RETZIA POLYPLEURA, n. sp.—Shell of medium size or rather large, cuneate-oval, tumid. Ventral valve with a prolonged, isolated, nearly erect, perforate beak, which projects one-fourth the valve length beyond the dorsal valve, a swollen umbo, and depressed central and anterior region. Dorsal valve rotund, with a subcuneate rostral margin; beak obtuse, closely appressed against the ventral valve; umbo ventricose; entire valve with a regular cardiacum-like convexity; median ridge extending one-third the length of the valve, with a lanceolate oclucosor impression on each side of it. Surface marked by about forty small rounded radiating ribs. Spires not seen.

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Length, breadth and thickness of a rather small specimen: .70 (100), .58 (83), and .34 (50). Length of dorsal valve .52 (74.) Length and breadth of another dorsal valve .69 and .66

Locality.—Light-house, Pt. aux Barques with *Rhynchonella Haronensis*, &c.

This species resembles *R. serpentina*, de Kon. (Anim. Foss., 291, pl. xix. 8), but the ventral valve is most ventricose in the umbonal instead of the middle region, and has a nearly erect instead of a straight beak. It differs from *R. vera*, Hall (Iowa Rep. 704, pl. xxvii. 3), in the absence of wings, and in its more erect beak.

MERISTA, Suess.

MERISTA HOUGHTONI, n. sp.—Shell of medium size, subrotund and subtumid. Ventral valve a little produced at the straight, obtuse foraminated beak; somewhat truncate in its contour, along the cardinal slopes, and very slightly elongate in front across the width of the sinus; regularly convex in all directions from the middle, except along the shallow sinus, which takes its origin near the middle of the valve. Impressions of the divaricator muscles longitudinally striate. Dorsal valve circular; beak scarcely projecting beyond the hinge; ocluser impressions small, spatulate, separated by a rostral septum reaching one-fourth the length of the valve; mesial fold represented by an undulation at the anterior margin. Surface of cast smooth.

Length, breadth and thickness .70 (100), .68 (97) and .36 (51).

Locality.—Light-house, Pt. aux Barques, with *Rhynchonella Haronensis*, &c.

RYNCHONELLA, Fischer de Waldheim.

RYNCHONELLA SAGERIANA, n. sp.—Shell of medium size, somewhat quadrantal in outline, rather tumid. Ventral valve not seen. Dorsal valve in the older specimens with a prominent and inflected beak, and about 16 obtuse plications, some of the central ones showing a groove on the summit toward the margin, as if preparatory to bifurcation. Mesial fold consisting of two or three plications just perceptibly raised above the others in the vicinity of the anterior margin.

Length, .56 (100); breadth .60 (107); convexity of dorsal valve .23 (41).

Locality.—Marshall, in the Marshall sandstone.

RYNCHONELLA WHITEI, n. sp.—Shell small, sub-circular. Dorsal valve sub-tumid, with the greatest elevation at one-third the distance from beak to anterior margin; cardinal slopes slightly convex, terminating in subulate spaces which descend from the umbo; lateral and anterior margins circularly rounded. Surface marked by about 17 rounded, moderately elevated ribs. Mesial elevation entirely wanting, or barely perceptible, and embracing about two of the plications. Median septum present, little developed.

Length of dorsal valve .38 (100); breadth .45 (119); convexity .10 (26).

Locality.—Marshall.

RYNCHONELLA HUBBARDI, n. sp.—Shell small, subquadrantal in outline; cardinal slopes straight, forming a right angle or more; lateral extremities about midway of the shell; anterior border gently curved; the two valves equally convex; ventral valve most tumid near the beak, the dorsal in the middle. Surface marked by 21 small rounded radiating plications. Mesial sinus represented by a broad shallow flattening of the mid-frontal slope of the ventral valve, occupying the two middle-fourths of its width, and corresponding to 8 or 9 plications. No fold perceptible in the dorsal valve, but a shallow depression extends from the beak about one-third the length of the shell, corresponding to the extent of the median partition beneath it. Dental plates of the ventral valve well developed, diverging at an angle of about 30°. Shell thin, fibrous.

Length of a ventral valve .26 (100); breadth .31 (119); convexity, .08 (31). 1862.]

Localities.—Marshall and the grindstone quarries at Pt. aux Barques, belonging to the Marshall group.

The dorsal valve greatly resembles that of *R. circularis*.

RHYNCHONELLA MARSHALLENSIS, n. sp.—Shell of medium size; dorsal valve very ventricose, with the middle region somewhat flattened, and all the margins abruptly deflected—the anterior at nearly right angles; beak prominent, obtuse, incurved; cardinal slopes short, making with each other an angle of about 100°. Surface of valve marked by about 27 medium-sized rounded, radiating plications, two or three of which are implanted on each lateral extremity, some of the plications reaching the beak. A shallow mesial fold rises in about the middle of the valve and embraces seven plications. The mesial septum extends about one-eighth the length of the valve.

Length of the dorsal valve .58 (100); breadth .62 (107); convexity, .30 (52).

Locality.—Marshall.

RHYNCHONELLA CAMERIFERA, n. sp.—Shell of moderate size, tumid; beak of ventral valve projecting and slightly upturned; cardinal slopes straight, at right angles; sides of the shell rounded; front margin similarly rounded or somewhat straight, not unfrequently produced on one side of the mesial sinus. Dorsal valve nearly circular, a little more convex than the ventral, most convex anterior to the middle, and rather abruptly bent down in front. Ventral valve with a shallow sinus, which extends back about one-fourth the length of the valve, corresponding to the fold in the dorsal valve; most convex between the beak and the middle; dental plates parallel, well developed; teeth at right angles, elongate, growing stouter anteriorly, with handsomely crenulated margins; mesial partition of the dorsal valve, extending nearly one half its length, thickening near the beak, to give space for the excavation of a small chamber within the septum. Shell with 20 or 21 (a variety? with 16) sharp plications, of which three or four are comprised in the mesial sinus; these are crossed by a few squamulose concentric wrinkles; shell structure fibrous.

Length of an average specimen .38 (100); breadth .34 (90); thickness, .19 (50).

Locality.—Pt. aux Barques, in a conglomeritic ferruginous sandstone overlying the gritstones of the Marshall group—myriads of casts sometimes forming, with *Centronella Julia*, the whole mass of the rock.

The small chamber in the mesial septum of the dorsal valve is an interesting and unique character. On a similar cameration of the septum of the ventral valve of some *Cyrtina* the genus *Cyrtina* has been founded; and Professor King established his *Camarophoria* on the formation of an arch in the ventral valve by the approximation of the dental plates.

This species has the external appearance of the young of *R. incubescens*, but, amongst thousands, none attain proportions very different from those given above.

RHYNCHONELLA BARQUENSIS, n. sp.—Shell small, transversely oval, thin. Ventral valve with a moderately prominent beak and slightly curved cardinal slopes; greatest tumidity near the beak, from which the surface descends in a nearly right plane to the anterior margin, and with little convexity to the right and left margins. Dorsal valve flattish, most inflated in the middle. Mesial fold and sinus small, traceable one fifth or sixth the length of the shell, embracing two or three sharp plications, of which the entire surface of each valve receives about 12 or 13. Dental plates of ventral valve parallel; mesial septum of dorsal valve camerated as in *R. camerifera*.

Length .30 (100); breadth .32 (107); thickness .13 (43).

Locality.—Grindstone quarries, Pt. aux Barques, with *R. camerifera*.

RHYNCHONELLA SUBCIRCULARIS, n. sp.—Shell small, cuneate-rotund, subtumid.
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Ventral valve unknown. Dorsal valve with a blunt depressed beak, equalling the hinge, a moderately elevated umbo from which the surface slopes with gentle convexity to the lateral and anterior margins, and abruptly, with slight excavation, towards the superior portion of the rounded hinge-margins. Surface marked by about 32 fine rounded plications, which reach from the margin half way to the beak. Mesial fold wanting. Mesial septum extending one-fifth the length of the shell.

Length of dorsal valve .25 (100); breadth .25 (100); convexity .08 (34).

Locality.—Grindstone quarries, Pt. aux Barques, with *R. camerifera*.

This species is a close analogue of *R. radialis*, Phillips, sp. (Geol. Yorks. 223, pl. xii. 40, 41) from the carboniferous limestone of Bollard.

RHYNCHONELLA HURONENSIS, n. sp.—Shell of medium size, tumid, transversely oval, or nearly circular, with rounded lateral, and cuneate rostral margins. Ventral valve with a straight beak, flattened in the central region, and rather abruptly inflected around the margin, toward the plane of the valve; mesial sinus beginning with the last third of the shell-length, and consisting of a sudden depression in the antero-marginal slope. Dental lamellæ well developed, very slightly divergent. Dorsal valve with an inconspicuous beak and a mesial fold abruptly elevated and confined to the anterior third of the valve. Median septum reaching two-fifths the length of the valve. Ocluser muscular impressions, semi-elliptic, lying close to the median septum. Shell-structure fibrous. Surface marked with 23 small rounded ribs, of which five occupy the mesial sinus.

Length of the ventral valve .48 (100); breadth .58 (121); convexity .10 (21).

Locality.—Light-house, Pt. aux Barques, in a hard pyritous sandstone intercalated in the argillaceous slates of the Huron group.

Var. *precipua* differs from the typical forms in being more flattened on the ventral side, with mesial sinus consisting of an abrupt deflection of nearly the whole anterior margin of the valve, forming a right angle with the plane of the valve; surface with 18 rounded radiating ribs, of which 6 fall in the sinus; dental plates diverging at an angle of 40°.

ORTHIS, Dalman.

ORTHIS VANUXEMI, Hall (10th Ann. Rep. N. Y. Reg., p. 135).—Shell nearly circular, sub-tumid; hinge-line very short. Dorsal valve a segment of a sphere; beak not surpassing the hinge, slightly incurved; a thick median plate or ridge reaching nearly to the centre of the valve, bisecting the right angle formed by the well developed socket ridges. Ventral valve flat, or slightly concave anteriorly, with a projecting beak; median ridge feeble, extending scarcely to the mid-valve; a barely perceptible trace of the semi-circular divaricator impressions sweeping from the beak to the anterior extremity of the median ridge, in the middle of which space are the two small semi-elliptic ocluser scars; dental plates short and thick; teeth well developed, lying in the hinge-line. One of the casts differs in having one of the ocluser scars half heart-shaped and the dental plates more slender. Surface not fully known; marked by numerous radiating striæ which increase by implantation and bifurcation, and produce a crenulated anterior margin. Shell structure finely punctate.

Length .81 (100); breadth .81 (100); thickness .25 (31).

Locality.—Light-house, Pt. aux Barques, with *Rhynchonella Huronensis*, &c.

This shell is a little more convex in the dorsal and flatter in the ventral than the figures given by Prof. Hall, but none of its characters differ materially from his description. Compared with *O. Michelinii*, Lev., as described by de Koninck, it is a little more convex dorsally, and presents circular instead of digitate [from the vascular system?] divaricator impressions upon the ventral 1862.]

valve. *O. Vanuxemi* is described from the shales and shaly sandstones of the Hamilton group of New York and Iowa, the lithographic limestones of Missouri, and from the soft sandstones in Eastern Ohio, regarded as Chemung by Prof. Hall.

ORTHIS CRENISTRIA? Phillips. (Pal. Foss. Corn. &c., p. 66, pl. 27, fig. 113).—Hinge line equalling greatest width of shell; ventral valve semi-elliptic with shallow constrictions beneath the cardinal extremities; flat, with an umbonal elevation beginning about the middle and rising to a beak which overlooks a large triangular area inclined at an angle of 45° with the shell-plane; dental plates strong, each equalling one-fourth the hinge length, forming with each other an angle of about 60° . Ocluser scars reaching nearly the middle of the shell, closely contiguous, leaving together a ligulate anteriorly acute depression upon the cast. Surface covered by fine radiating striae, interrupted by distinct or obscure concentric wrinkles. In one specimen supposed to belong here, the surface is covered by a set of sharply-cut, twice-dichotomizing striae—the second set reaching half way, and the third one-third the distance to the beak. Dorsal valve hemispherically convex with sharp striae and concentric wrinkles, like the ventral.

Length of shell 1.27 (100); length of hinge line 1.37 (107); length of dental plates .32 (25).

Locality.—Light-house, Pt. aux Barques.

I can make no distinction between this species and that described by Phillips, from South Devon. The beak, however, seems to be perfectly symmetrical, and in this it differs from *Streptorhynchus robusta*, Hall, sp., from the coal measures of Iowa, as well as from the Punjab examples of Davidson (Quar. Jour. Geol. Soc. Lond., xviii. p. 30), who identifies the Devon, Iowa and Punjab forms. The Michigan forms differ from all the others in the rugose exterior, giving it sometimes the aspect of *Strophomena rugosa*; but as they at the same time differ among themselves, I am not disposed to hesitate in the identification.

ORTHIS IOWENSIS? Hall. (Io. Rep., 488, pl. 2, fig. 4).—Some casts in my possession resemble those of the above species. Ventral valve nearly circular, regularly convex, with deep pit in the beak between the dental plates, which in the cast produces a conical projection. Middle region of cast with three faint rounded ridges radiating from the beak to the anterior margin.

Locality.—Light-house, Pt. aux Barques.

CHONETES, Fischer.

CHONETES PULCHELLA, n. sp.—Shell small, nearly semi-circular; hinge almost equalling the greatest width, rectangular at the extremities, furnished with two or three stout hollow spines on each side of the beak, one projecting from the hinge extremity, and diverging at an angle of about 22° with the hinge line—the second half way to the beak and diverging at an angle of 45° , each of these spines having a length equal to half the hinge line. Ventral valve, exclusive of the flattened hinge angles, spherically convex; internal median ridge extending to the middle of the valve. Surface with about 54 feeble, rounded ribs, often nearly obsolete on the hinge angles; these are crossed by numerous microscopic, concentric striae; the grooves beneath the ribs are acute and bear a few spinous projections near the shell margin. Dorsal valve nearly flat, generally a little concave near the margin, marked like its fellow with radiating striae, and often a few concentric folds. Area very narrow, equally excavated in the two valves. Some specimens exhibit a shorter hinge line, and a flatter ventral valve, elevated only in the umbonal region, with a beak projecting slightly beyond the hinge.

Length .30 (100); breadth .38 (126); convexity of ventral valve .07 (23).

Localities.—Hillsdale county at Moscow, N. W. $\frac{1}{4}$, N. W. $\frac{1}{4}$, Sec. 4, Jefferson,

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and S. W. $\frac{1}{4}$, S. W. $\frac{1}{4}$, Sec. 26, Allen. These localities are all in the lower part of the Marshall sandstone.

The variety of this species somewhat resembles *C. Michiganensis*, Stevens. (Sill. Jour. [2] xxv. p. 263), but the spines and ribs are much less numerous, not to speak of the alleged direction of the spines in Dr. Stevens' species.

CRONETES SETIGERA? Hall. (Geol. Rep. 4th Dist. N. Y., p. 180; 10th Rep. N. Y. Regents, p. 150).—Shell small, semicircular, flattened; hinge line slightly less than greatest width; ventral valve regularly convex, except upon the flattened hinge angles; median ridge feeble; hinge with two (perhaps three) strong diverging spines each side of the beak; dentigerous plate with four tooth-like elevations each side of the beak, slightly elongated in a direction at right angles with the cardinal spines. Surface marked by about 80 minute diverging striae, obsolete except near the border, and sometimes one or two distinct concentric wrinkles. Dorsal valve slightly concave, striated nearly to the beak.

Length .25 (100); breadth .36 (145) convexity of ventral valve .04 (16).

Locality.—Union, Branch county, in argillaceous shales of the Huron group.

This species differs from the New York specimens of *C. setigera* in the inclination of its spines, and the much greater number of radiating striae.

PRODUCTA, Sowerby.

PRODUCTA CONCENTRICA, Hall. (Iowa Geol. Rep., p. 517, pl. vii. fig. 3; 10th Rep. N. Y. Reg. p. 180).—All my specimens of this species from the southern part of the State exhibit, like the Iowa ones, only the inside of the concave valve. On the other hand, fragments of a species supposed to be the same, from the grindstone quarries at Pt. aux Barques, present only the exterior of the convex valve, a circumstance which may throw suspicion on the identification of the two sets of forms.

MYALINA, de Koninck.

MYALINA MICHIGANENSIS, n. sp.—Shell of medium size, oblique, equivalve, inflated, posteriorly winged, with a straight hinge line. Beaks compressed, acute, incurved, and slightly directed forward, but little elevated above the hinge line; posterior margin very slightly concave below the extremity of the hinge; thence describing a semi-circle or more to the middle of the anterior margin, where a deep incurvation exists, bounded by a small pouch-like expansion which projects a little anterior to the beaks. Anterior umbonal slope somewhat vertical to the shell-plane; the posterior gradual, towards the margin becoming nearly parallel with the same plane. Hinge furnished in the left valve with two small, curved diverging teeth just anterior to the beaks; behind the beaks a narrow ligamental area extends the whole length of the hinge; this area is marked by three longitudinal slightly diverging furrows—the outer parallel with the hinge line and co-extensive with it, the middle reaching the inner border of the ligamental area at two-thirds the distance from the beak to the hinge extremity, the third meeting the same border still nearer the beak. Surface marked by irregular, fine incremental lines, some of which are more deeply impressed.

Greatest dimension of shell from beak to ventral margin along the umbonal slope 1.25 (100); angle included between this line and hinge line 50° ; diameter of shell from umbo to umbo .78 (62); length of hinge .67 (53); angle formed by hinge line and posterior margin 112° — 120° ; projection of shell anterior to the beaks, .19 (15).

Localities.—Marshall (abundant), Moscow: This interesting species resembles *M. virgula*, de Kon. (An. Foss. 127, pl. vi. 3). It is, however, less oblique, less indented on the posterior border, and more prominent in front of the umbo.

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MYALINA IMERICARIA, n. sp.—Shell rather small, very oblique, inflated. Beak (of left valve) compressed, acute, incurved, scarcely rising above the hinge; posterior margin straight, making a very obtuse angle with the hinge line; ventral margin regularly curved; anterior, with a rather deep sinus a little above the middle, and a slight projection in front of the umbo. Hinge line straight, equal to the greatest antero-posterior dimension of the shell. Umbo abruptly convex on both sides, but posteriorly blending with the flattened expansion below the hinge. Surface strongly marked by imbricating lamellæ.

Length along the umbonal slope about 1·04 (100); this line forms with the hinge line an angle of 29°; length of hinge line ·70 (67); angle formed with posterior border 53°; projection of anterior margin beyond the beak ·07 (67).

Locality.—Moscow, Hillsdale county, in the Marshall sandstone.

This species differs from its analogue *M. lamellosa*, de Kon. (An. Foss. 126, pl. iii. 6) by its sharper posterior angulation, and deep anterior sinus in the margin.

MYALINA AVICULOIDES.—Shell small, oblique, with subcentral beaks scarcely rising above the straight hinge line. Right valve unknown; left produced anteriorly just beneath the hinge; anterior margins parallel, forming an angle of about 70° with the hinge line; midumbonal slope forming the same angle, having its anterior declivity convex, its posterior at first convex, then slightly excavated, giving an extended appearance to the posterior margin, but without any perceptible isolation of a posterior wing; ventral margin regularly curved. Surface marked by faint incremental lines.

Length along umbonal slope ·34 (100); length of hinge line ·31 (91); greatest antero-posterior dimension ·32 (94).

Locality.—Marshall.

MYALINA PTERINEÆFORMIS, n. sp.—Shell small, equivalve, obliquely elongate, with an alate posterior expansion, which is suddenly thickened above to form the basis of the straight elongated hinge line. Beaks subterminal, obtuse, incurved, elevated a little above the hinge; midumbonal slope making an angle of about 35° with the dorsal margin; from the upper portion the declivity is steep to the hinge on the posterior side, while on the anterior side the shell swells out into a sort of pouch, projecting beyond the beak; posterior margin of shell showing a sinuation just below the hinge, from which a regular curve sweeps around to the anterior side. Shell thin, with fine incremental lines.

Length of shell along dorsal margin ·44 (100); length from beak along midumbonal slope ·38 (86); distance from beak to anterior extremity, ·10 (22); to posterior ·34 (78); diameter of shell through umbo ·12 (24).

Locality.—Pt. aux Barques, from a friable and ferruginous sandstone overlying the grindstones.

PTERINEA, Goldfuss.

PTERINEA CARDINATA, n. sp.—Shell small, hinge line extremely elongate, posteriorly terminating in an angle of 40°, separated by a slight sinuation from the body of the shell; ventral margin transversely semi-elliptic; anterior wing short, saccate; anterior margin forming with dorsal line an angle of about 45°. Beak flattened, not elevated above the hinge; umbonal slope terminating at the middle of the ventral border, opposite which is the greatest width of the shell; descent from the umbonal slope to the antero-ventral border very abrupt. Surface of cast showing numerous faint concentric grooves which are most conspicuous in the postumbonal region.

Length of hinge ·65 (100); greatest width of shell ·21 (32); convexity of right valve ·06 (9); length of anterior wing ·06 (9).

Locality.—Grindstone quarry, Pt. aux Barques, with *Rhynchonella camerifera*, &c.

[Sept.

This species differs from *P. elongata*, Goldf. (Petref. Germ. ii. 135, Taf. cxix. 5), in having a much smaller body, and less distinct from the alate extremities.

MYTILUS, Linnæus.

MYTILUS WHITFIELDIANUS, n. sp.—Shell small, ventricose, transversely elongate, very oblique, with terminal beaks. Hinge line two-thirds the length of the shell, forming a rounded, very obtuse angle with the somewhat circular posterior border; ventral border slightly arcuate, more rapidly curved beneath the beaks. Greatest width opposite the posterior extremity of the hinge-line. Umbonal ridge elevated, crowded over towards the hinge line, and rendered somewhat angular, more sharply so towards the beak. Surface of shell and cast marked by numerous concentric lamellose lines. One of the best preserved specimens shows distinctly a multitude of minute diverging striæ running in all parts of the surface at right angles with the lines of growth.

Length from beak to posterior extremity .59 (100); greatest height .29 (50); length from beak to extremity of hinge line .44 (75); convexity of right valve .12 (20).

Localities.—Holland, Ottawa county and Marshall.

CARDINIA, Agassiz.

CARDINIA COMPLANATA, n. sp.—Shell of moderate size, ovoid, compressed, with sub-central beaks. Ventral border gradually curved to the abruptly turned extremities, from which the outline is nearly straight along the cardinal slopes to the obtuse incurved beaks; line joining extremities equidistant from beaks and ventral margins. Right valve flattened, producing an angular fold along the postero-dorsal declivity near the hinge line. Exterior sculptured by about 20 broad regular furrows parallel with the ventral border. Other characters unknown.

Length 1.2 (100); height .64 (53); length of anterior cardinal slope to extremity of shell .64 (53); of posterior .87 (72); convexity of right valve (perhaps mechanically compressed) .13 (11).

Locality.—Union, in Branch county, in blue argillaceous shales of the Huron group.

CARDINIA ÆQUIMARGINALIS, n. sp.—Shell of medium size, tumid, beaks central, anterior and posterior hinge-slopes at right angles with each other, straight, very nearly equal and symmetrical; extremities rounded, situated about midway between beaks and ventral margin, which is regularly arcuate between the extremities; posterior extremity a little more acute than the anterior. Shell tumid, regularly convex, slightly truncate along the antero-cardinal slope. Beak (of cast) marked only by obscure incremental lines and nearly obsolete concentric furrows. Hinge structure unknown.

Length of shell .91 (100); height .86 (94); thickness .50 (55.)

Locality.—Marshall.

Cardinia robusta, J. de C. Sowerby is a close representative of this species, but is not so high, and is more produced and angulated posteriorly.

CARDINIA CONCENTRICA, n. sp.—Shell of medium size, ventricose, transversely elliptic, with subequal extremities and marked ventral enrolment. Beaks appressed, incurved, rising little above the hinge, distant one-fourth the shell-length from the anterior end; umbo and middle of the shell flattened antero-posteriorly; antumbonal ridge inflected towards the hinge, forming above a lunuliform area; dorsal and ventral borders sub-parallel in the adult shell; posterior end obtusely, or at length truncately rounded; anterior end paraboloid. Hinge line straight and rather extended posteriorly. A broad shallow inconspicuous sinus extends from the posterior ventral margin towards the beak. External surface marked, towards the beak, with remote, equidistant, raised, concentric striæ and intervening flat belts; towards the margin

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the striæ gradually become sharp ridges, and the intervening belts deep furrows—these characters being especially strong at the anterior end; whole surface marked by faint incremental lines. Greatest convexity of shell considerably below the middle.

Length 1.30 (100); height .55 (42); convexity of left valve .24 (18; whole number of furrows on exterior 14.

Localities.—Hillsdale county at Jonesville, and S. E. $\frac{1}{4}$ S. W. $\frac{1}{4}$, Sec. 33, Adams.

Differs from *C. complanata* in its greater relative transverse dimension and its vertical enrolment. It may yet prove to be a *Grammysia*.

EDMONDIA, de Koninck.

EDMONDIA BINUMBONATA, n. sp.—Shell of moderate size, rotund-quadrate, very tumid. Hinge line short, posterior to the beaks; posterior margin forming with it a very obtuse angle; anterior slope straight, forming a rounded right angle with the slightly curved ventral border which is nearly parallel with the hinge line, and joins the posterior slope by a regular curve. Beaks depressed and incurved; greatest thickness through the middle of the shell; principal umbonal slope running to the posterior extremity of the ventral border; a subsidiary one running to the anterior extremity; between these the surface is subcylindrical; anterior to them it descends abruptly to the anterior margin, while behind them it sinks at first rather abruptly, and near the posterior border presents a little flattening. Surface (of east) marked by eight or ten concentric furrows. Anterior lunule excavated.

Distance measured along the principal umbonal slope .85 (100); length from anterior to posterior extremity .85 (100); anterior slope .59 (69); convexity of right valve .24 (28); angle between anterior cardinal slope and principal umbonal line 70° .

Locality.—Marshall.

Closely related to *E. scalaris*, McCoy (Brit. Pal. Foss. 502, pl. 3 H, fig. 6), from the carboniferous limestone of Lowick, but the anterior extremity is produced into a rounded angle instead of being truncated.

ORTHONOTA, (Conrad), McCoy.

ORTHONOTA RECTIDORSALIS, n. sp.—Shell of moderate size, tumid, elongate transversely with subterminal beaks and gaping extremities. Hinge margin straight, reaching nearly to the posterior extremity of the shell, somewhat elevated; ventral margin straight, and parallel with the dorsal; posterior extremity truncately rounded, making with the dorsal margin an anterior angle of 105° ; anterior end slightly gaping two-thirds the width of the shell, rounded abruptly above, gradually below; beak scarcely elevated above the dorsal line, flattened, incurved, with a conspicuous lunule in front; umbonal swelling running to the lower posterior angle. Hinge apparently edentulous and simple; pallial and muscular impressions undiscernible; a deep groove runs from beneath the beak to the anterior extremity, which interrupts the concentric lines shown on the interior of the shell. The cast shows five or six very faint lines diverging from the beak along the superumbonal slope.

Length 1.48 (100); height .44 (30); convexity of right valve .10 (7); length of anterior end .25 (17).

Locality.—Moscow, Hillsdale county.

This shell agrees tolerably well with *Orthonota*, as modified by McCoy. The gaping extremities and general outline perhaps indicate affinities with *Solen*.

SANGUINOLITES, McCoy.

SANGUINOLITES UNIONIFORMIS, n. sp.—Shell small, compressed, transversely ellipsoidal, with subterminal beaks. Hinge line straight, a little shorter than the shell at both extremities; hinge consisting only of a long, sharp, laminar lateral tooth behind the beak. Anal margin obliquely subtruncate, as

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also the supero-buccal region; ventral border very slightly curved. Beaks subterminal, flat, not projecting beyond the dorsal line. Anterior muscular impression circular, deep, behind which is a clavicular process extending from beneath the beaks, at right angles with the dorsal line, half way across the valve. Cast nearly smooth, but marked by a few concentric undulations. Shell very thin, marked simply with fine incremental lines.

Length .84 (100); height .39 (46); convexity of one valve .11 (13); projection of anterior extremity beyond the beak .12 (14).

Locality.—Sec. 29 Moscow, Hillsdale county.

SANGUINOLITES MARSHALLENSIS, n. sp.—Shell of medium size, transverse, equivalve, ellipsoidal in outline, with subterminal beaks. Hinge line apparently edentulous, straight, flattened and elevated posteriorly, terminating one fourth the length of the shell from the posterior extremity, at which point is the greatest height of the shell. Posterior extremity a semi-ellipse; anterior subtruncate above, regularly rounded below; a sinus in the ventral border one-third the shell-length from the anterior end, from which a diminishing furrow extends to the flattish, straight, incurved beak. Greatest thickness of shell on the middle line a little nearest to the anterior end. Surface marked by about three remote, deep, concentric grooves, and numerous fine lines of growth.

Length 1.2 (100); greatest height .63 (52); thickness .36 (30); projection of anterior end beyond the beak .09 (7).

Locality.—Marshall.

This species seems to be destitute of the elongated posterior escutcheon characteristic of McCoy's *Sanguinolites*, but agrees perfectly with Professor King's modified ideas of *Allorisma*, (Perm. Foss. pp. 162 and 196). Some hesitancy is shown, however, among palæontologists about the adoption of the latter name, which McCoy regards as a synonym of *Sanguinolites*.

SANGUINOLITES BOREALIS, n. sp.—Shell rather small, ventricose, transversely elliptic; beak somewhat projecting and incurved, less than one fifth the shell-length from the anterior extremity, with a lunuliform excavation in front of it; dorsal margin straight; ventral margin slightly arcuate; posterior extremity regularly rounded; anterior sharply bent in front of the lunule, from which it slopes with a truncate backward curve to the ventral border; umbonal slope extending diagonally to the infero-posterior margin, somewhat angulated behind the beak, and inflected toward the cardinal region. Surface of shell of northern specimens unknown; cast showing several distinct concentric grooves. Shell of southern specimens thin, marked both with concentric and minute radiating striae. Greatest height of shell along the perpendicular from the beak; greatest convexity in the middle of the same line.

Length 1.10 (100); breadth .44 (40); thickness of right valve .15 (44).

Locality.—Grindstone quarries, Pt. aux Barques above the gritstones, and Moscow, Hillsdale county.

Distinguished from *S. unioniformis* and *S. Marshallensis* by its terminal beaks, greater relative gibbosity, greater length and its posterior attenuation.

LEPTODOMUS, McCoy.

LEPTODOMUS CLAVATUS, n. sp.—Shell small, tumid, transversely quadrangular, obliquely carinate, concentrically sulcate, with subterminal beaks. Length nearly three times the breadth; ends abruptly rounded, and slightly deflected upwards, creating a discernible concavity along the extended hinge line. Beak (of left valve) broad, flattened, incurved, with anterior and posterior lunettes. Anterior extremity truncate along the anterior umbonal slope; posterior extremity squarely truncated; postumbonal slope diagonally precipitous to the cardinal expansion, which begins behind the beak and widens to the posterior extremity.

Length .62 (100); height .24 (39); convexity of left valve .10 (16).

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Locality.—Union, Branch county, in blue argillaceous shales of the Huron group.

This fossil may be a *Grammysia*, but it is destitute of the oblique furrows considered characteristic of that genus.

It bears a remote resemblance to *Sanguinolites* (*Leptodomus*) *costellatus*, McCoy.

CARDIOMORPHA, de Koninck.

CARDIOMORPHA MODIOLARIS, n. sp.—Shell rather small, vertically ovate, inflated, equivalve, with very short hinge line, and very symmetrical extremities. Hinge line blending by a regular curvature with the posterior margin; both margins approximately parallel, gradually curved, and connected by the more rapidly curved respiratory border. Beaks scarcely projecting beyond the hinge, obtusely pointed and straight; valve inflated and convex to the pallial border, slightly flattened on the anterior umbonal slope. Surface smooth, with a few coarse concentric folds marking the later growth.

Length from the extremity of the beak over the umbonal slope 1.05 (100); shortest distance from this line to extremity of anterior margin .34 (32); to posterior margin .40 (38).

Localities.—Section 27, Columbia, Jackson county; Moscow, Hillsdale county, and Marshall and Battle Creek, Calhoun county.

The hinge characters of this species not being known, its generic identity may be questioned. The beak and hinge line do not present the characters of the typical *Cardiomorpha*, but the shell presents strong analogies with *C. livida*, de Kon., (*Anim. Foss.* 106, pl. iii., 4), from which it differs only in being more equilateral and in having its beaks more separated.

CARDIOMORPHA JULIA, n. sp.—Shell small, luciniform; beaks moderately produced, small, appressed turned forward, somewhat anterior to the middle of the shell; posterior hinge slope nearly straight, making a very obtuse angle with the posterior margin, which is also nearly straight, and connects by an abrupt curve with the ventral border. Anterior hinge slope making an angle of about 118° with the posterior, uniting by an abrupt curve with the regularly convex ventral border. The hinge has not been fully examined, but a couple of fine sharp laminae are seen proceeding from beneath the beak, along the posterior hinge plate. External surface marked by sharply cut concentric striae, at regular intervals, which increase gradually in width with the growth of the shell.

Length from anterior to posterior angulation .85 (100); height from beak to ventral margin .64 (75); radius of curvature of ventral side .48 (56); bringing the centre of curvature on the postumbonal slope .17 from the beak; convexity of right valve .12 (14); number of concentric striae on the measured specimens about 45.

Localities.—Battle Creek, Marshall, Moscow. This seems to be a close representative of *C. Puzosiana*, de Kon. (*Anim. Foss.* 104, pl. ii., 8), and only differs in more angulated extremities and more regular striation; though an occasional specimen has more rounded extremities. This species recalls also the forms figured by Prof. Hall, under the names *Lucina* ? *retusa* and *Unquolina* [*Lucina* ?] *suborbicularis*, (*Geol. Rep.* 4th Dist., N. Y., pp. 243, 245), from the Portage group. While the Michigan fossil is more transverse than the specimens figured by Prof. Hall, it may yet prove identical.

CARDIOMORPHA CAPULOIDES, n. sp.—Shell very small, with a very prominent umbo; body and margin of each valve trumpet shaped, giving it the appearance of a capuloid shell. Beak slightly anterior, turned forward, and in the cast obtuse, with a terminal callosity, as if by the absorption of the shell-substance separating the extremity of an enrolled beak from the body of the mollusc. Body of shell more extended posteriorly; antumbonal slope rather rapid; margin nearly circular or a little ovate. Hinge and external surface unknown; cast smooth, with a few concentric wrinkles of growth.

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Length from extremity of beak over umbo to ventral margin .35 ; antero-posterior dimension .29 ; elevation of umbo above plane of valve .20.

Locality.—Grindstone quarries, Pt. aux Barques, with *Rhynchonella camerifera*, &c.

None of my specimens of this singular shell are perfect, even as casts ; and I should be induced to refer them to *Platyceras*, Conrad, were it not that five would thus be sinistral and six dextral, while at the same time the very campanulate aperture seems to suggest rather *Cardiomorpha* or *Isocardia*.

CARDIOPSIS, Meek and Worthen.

CARDIOPSIS CRENISTRIATA, n. sp.—Shell of medium size, gibbous ; hinge line straight, rather short, joining the posterior margin by a regular curve which proceeds to the ventral side where a more abrupt curvature separates the posterior from the anterior border. Beak prominent, incurved, projecting a little above the hinge line. Surface marked by a set of irregular concentric wrinkles, and a set of fine, regular raised concentric striæ, the whole decussated by conspicuous, radiating, unequal, wrinkled ribs, which are fine and somewhat regular on the beak, becoming irregularly crenulated in the middle of the valve, and irregularly flexuous near the pallial border.

Greatest length from the beak to the ventral margin over the umbonal slope .96 (100) ; angle between this and the hinge margin 55° ; convexity of left valve .33 (34).

Locality.—Section 27, Columbia, Jackson county.

This fossil differs from *Cardiomorpha radiata*, de Kon., (An. Foss. 109, pl. ii., 6), in being less inflated all around the pallial region, and in being more produced posteriorly, as well as in the characters of the striation. It probably agrees in generic characters. Its closest analogue is *Cardiopsis radiata*, Meek and Worthen, (Proc. Acad. Nat. Sci., Phil., Oct., 1860, and June, 1861), = *Megambonia Lyoni*, Hall, (13th Rep. Reg. N. Y., p. 110), from which it seems to differ only in its striation.

CARDIOPSIS JEJUNA, n. sp.—Shell small, somewhat orbicular, nearly equilateral, with a prominent sharp beak slightly turned forward. Hinge line obtusely angulated beneath the beak, extending on each side to a subulate expansion of the (right) valve, between which points the curvature of the pallial margin describes about three-fifths of a circle. Beak projecting above the hinge ; umbo excavated on the anterior side ; umbonal ridge tumid on the posterior side. Characters of hinge and external surface unknown ; surface of cast with a few concentric furrows.

Length .38 (100) ; height .41 (108) ; distance from posterior extremity to line drawn over umbonal slope .23 (61) ; from anterior extremity to same line .20 (53) ; convexity of right valve .12 (32).

Locality.—Railroad cut, three miles north of Napoleon, Jackson county.

CARDIOPSIS MEGAMBONATA, n. sp.—Shell very small, ovate, with an elevated, little incurved, nearly central beak, gibbous umbo and regularly rounded margins, of which the ventral is most abruptly so. Slopes from the umbo convex in all directions to the very margin. Anterior and posterior cardinal margins similar and equal. Surface of casts striately ribbed, most distinctly so toward the ventral border, and in some cases marked by rather strong concentric wrinkles toward the pallial margin.

Height from beak to ventral margin .25 (100) ; length from anterior to posterior margin .23 (92) ; convexity of left (?) valve .11 (44).

Locality.—Grindstone quarries, Pt. aux Barques, with *Rhynchonella camerifera*, &c.

NUCULA, Lamarck.

NUCULA HUBBARDI, n. sp.—Shell rather large, ovate-triangular, ventricose ; beaks three-fifths the shell-length behind the anterior (longer) extremity, 1862.]

prominent, acute, incurved and turned backward; cardinal lines nearly straight, beyond the dental series curving rapidly to the extremities, of which the anterior is broadly rounded; ventral side with a slight general convexity, varied by a broad shallow sinuation in front of the middle, which extends one-third the distance up to the beaks. Pallial line entire; posterior adductor forming a round deep scar. Cardinal angle between the beaks varying from 115° to 125° ; teeth numerous, in a series not perceptibly interrupted between the beaks, those on the anterior slope posteriorly angulated, those on the posterior slope rather larger; the remoter often transverse to the hinge plate; those nearer the beak angulated forwards; between the beaks the hinge plate is somewhat widened, and the teeth are slender, long and crowded in a scarcely interrupted series. Shell massive, thickened around the smooth ventral margin; external surface marked by numerous unequal lines of growth; casts nearly smooth.

Length of an average specimen 1.45 (100); height .80 (55); convexity of one valve .26 (18); length of posterior end .59 (41); anterior end .96 (66); height of beaks above line connecting extremities .46 (32); number of teeth in posterior series from 12 to 16; in anterior from 30 to 40.

Localities.—Marshall, Battle Creek, Moscow, and at nearly every other exposure of the Marshall Sandstone in the southern part of the State. The most abundant fossil in the group, generally occurring in beds ten or twelve inches in thickness.

This species has about the proportions of *Cucullella tenuiarata*, Sandb. (Verstein, 276, Taf. xxix. 4), but specimens of the latter from Kirschweiler, in the cabinet of Dr. Rominger, are more symmetrically furrowed, and possess fewer teeth.

This is, perhaps, the species described by Dr. Stevens as *Leda nuculaformis* (Sill. Jour. [2], xxv. 262), but it is not *Leda*, and the number of teeth is much too great for his description.

Named in honor of Bela Hubbard, Esq., of Detroit, who published in 1840 the first notice on record of the interesting sandstones under consideration, and designated the generic relations of several of the more abundant fossils.

Var. prolata. A form which I am inclined to regard as only a variety of the preceding, is very ventricose, and more elongated anteriorly, with a greater number of teeth.

Length 1.46 (100); height .69 (47); convexity of one valve .28 (19); length of posterior end .38 (26); of anterior end 1.06 (72).

Localities.—Moscow and Battle Creek.

NUCULA IOWENSIS. White and Whitfield (Proc. Bos. Soc. Nat. Hist., Feb. 1862, p. 298).—Shell small, triangularly ovate, ventricose, with prominent incurved, subterminal beaks. Cardinal plate forming an angle of 95° , but the dorsal outline of the shell, from the prominence of the beaks, forms an angle of 80° . Anterior and posterior slopes truncated; anterior extremity rounded, ventral border semi-elliptic. Long end with about 11 teeth; short end with 6 very inconspicuous ones. Pallial impression entire, connecting the deep adductor scars; anterior scar nearly terminal, lenticular, with a small oval scar above; posterior scar oval, scarcely above the extremity. Shell thickened near the margin.

Length .47 (100); height .40 (85); convexity .26 (55); distance from beak to line joining extremities .27 (57).

Localities.—Battle Creek and Sec. 7, Wyoming, Kent county.

These specimens possess a somewhat greater number of teeth than the Iowa ones, according to the author's description. In general form they recall *Cucullaea antiqua*, Sow., from the old red sandstone of Felindre (Murch. Sil. Syst., pl. iii. fig. 120).

NUCULA SECTORALIS, n. sp.—Shell rather small, ventricose, sectoriform, with nearly central beaks. Anterior cardinal slope straight; posterior, nearly so,

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making with the former an angle of 88° to 91° ; ventral border sub-circular. Beaks prominent, acute, direct, incurved. Anterior hinge plate with about 17 teeth; posterior with about 13, much smaller. Adductor scars subterminal, profound, roundly oval. Surface of casts perfectly smooth.

Length .86 (100); height .74 (86); thickness .44 (51); distance from beak to line joining extremities .40 (46); length of anterior end .51 (59); of posterior end .35 (41).

Locality.—Battle Creek and Grindstone Quarries, Pt. aux Barques.

NUCULA STELLA, n. sp.—Shell very small, elliptic-ovate, with subcentral beaks. Anterior cardinal slope arched, posterior nearly straight; extremities rather sharply rounded; ventral side semi-elliptic. Anterior hinge plate with 17 minute, acute teeth; posterior with 5, angulated in both cases towards the beak. Beaks a little attenuated near the extremity, curved inwards and backwards. Pallial line entire, connecting the muscular scars, which are oval, and situated considerably above the middle line of the shell. Shell thin, with delicate concentric striæ.

Length .33 (100); height .24 (73); thickness .14 (42); length of anterior end .20 (61); of posterior end .13 (39); distance from beak to line adjoining extremities .14 (42).

Localities.—At every outcrop of the formation in the southern part of the State. Also at the Grindstone Quarries, Pt. aux Barques.

This beautiful little shell has affinities with *N. ventricosa*, Hall, (Iowa Rep. 716, pl. 29, fig. 4), from the coal measures of Iowa. It is easily mistaken for the young of *N. Hubbardi*, but is proved distinct by its more rounded sides and fewer teeth, as well as by its occurrence in a region of the State where the larger species is as yet unknown.

LEDA, Schumacher.

LEDA BELLISTRIATA, Stevens (Sill. Jour. [2], vol. xxv., p. 261).—Shell small, twice as long as high, somewhat ventricose, with sub-central beaks, which are rather prominent, incurved and pointed forward. Anterior cardinal slope slightly convex, posterior concave, with a well defined, long, deep and narrow escutcheon; anterior extremity broadly rounded; posterior attenuate, with a blunt termination. Angle of the cardinal line between the beaks 130° . Surface marked by regular sharply-impressed concentric striæ, of which 45 may be counted between the ventral margin and a point one-tenth of an inch below the beak, where they become undistinguishable. Striæ not visibly extending across the escutcheon.

Length .61 (100); height .34 (56); thickness .18 (29); length of posterior end .38 (62); of anterior end .23 (38); height of beaks above line connecting extremities .17 (28).

Locality.—Moscow, Hillsdale county.

I see no means of separating our species from the one described by Stevens from the coal measures of Ohio. Prof. Hall's specimens from Iowa, however, which he has referred to the same species, differ from ours in a broad escutcheon, and the continuation of the striæ across it, characters which are stated *not* to exist in the original specimen.

A rostral extremity of a *Leda*, from Battle Creek, marked and proportioned as above, is .64 long and .59 high, and by the principles of proportion must have belonged to an individual nearly $1\frac{1}{2}$ inches long.

CARDIUM, Bruguière.

CARDIUM NAPOLEONENSE, n. sp.—Shell small, truncately triangular, oblique. Beaks elevated above the hinge, prominent, sharp, direct; hinge-line anterior to beak, short and straight, forming a rounded anterior angle with the ventral border, which sweeps by a regular course to the posterior border, which is elongate, truncate at right angles with the hinge-line, and furnished with a 1862.]

large arched opening beneath the umbo. This truncation makes but a small angle with the midumbonal slope, the arch beneath which is partly closed by the curtain-like deflection of the posterior part of the shell. External surface marked by fine radiating ribs, and a few concentric rugæ in front of the beak and along the anterior terminal expansion.

Height of shell from beak along midumbonal slope to remotest point of ventral border .59 (100); distance from anterior cardinal angle across the shell at right angles with posterior truncation .42 (71); convexity of right valve .15 (25).

Localities.—Marshall, Battle Creek, and R. R. Cut, 3 miles North of Napoleon, Jackson county.

CONOCARDIUM, Bronn.

CONOCARDIUM? BOVIPEDALE, n. sp.—Shell small, very ventricose, truncated along the umbonal slope, or a little posterior thereto, by a plane nearly vertical to the plane of the valves, but a little inclined posteriorly, thus producing a slightly acute plane angle with the external surface. Beak prominent, somewhat enrolled and turned forward; hinge-line anterior, short, convex, joining, by a rounded, obtuse angle, the gently rounded anterior angle, which curves more rapidly in approaching the ventral margin and the truncation. Posterior, truncated side nearly flat, but a little concave, with an arched, mactra-shaped opening under the umbo. Convex surface of shell, with 26 radiating ribs, slightly flattened along their summits, and very fine, sharp, undulating, concentric striæ, most distinct between the anterior angle and the umbo; the truncated surface with obsolete arched striæ. Right valve unknown.

Length along truncating line .30 (100); distance from anterior extremity to truncating plane, at right angles with latter .20 (67); convexity of left valve .12 (40).

Locality.—Marshall.

This species belongs to the group of *C. Napoleonense*, but may be easily distinguished by its coarser ribs, greater ventricosity, less flattened marginal regions and nearly mesial truncation.

POSIDONOMYA, Brown.

POSIDONOMYA ROMINGERI, n. sp.—Shell of medium size; general outline about two-thirds of an ellipse, the longer axis of which is nearly at right angles with the anterior cardinal slope of the shell, and forms an angle of 75° with the straight hinge-line, and one of 33° with the midumbonal slope; greatest width of shell a little nearer the (regularly curved) ventral border; region behind the beak a little excavated, making the posterior cardinal region appear slightly flattened and produced; beaks elevated above the hinge-line, approximated and slightly turned forward. Surface (of cast) distinctly marked by continuous equidistant and direct concentric striæ. Hinge unknown.

Greatest length of shell (over midumbonal slope) .97 (100); longer axis of the elliptic outline .90 (92); greatest width of shell (at right angles with last measure) .70 (72); thickness of right valve .20 (21); number of striæ in one-tenth of an inch, in the middle of the shell 3½.

Locality.—Marshall.

Closely imitates in outline *P. vetusta*, Sow. sp. (Phill. Geol. Yorks. 211, pl. vi. 3), but the beak is less projecting, and the concentric furrows are more numerous and smaller.

POSIDONOMYA WHITEANA, n. sp.—Shell of moderate size, oblique, with an extended, straight, hinge-line, a subulate expansion before, and a rather flattened and extended posterior margin. Beaks little elevated above the hinge, incurved, and slightly turned forward. Umbonal ridge much swollen, situated anterior to the middle of the shell, and making an angle of 66° with the

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straight hinge-line. Surface of cast nearly smooth; pallial line distinct, entire. Surface of shell showing only five irregular lines of growth, without undulations.

Length over umbonal slope .64 (100); diameter at right angles with this dimension .50 (77); convexity of left valve .15 (23).

Locality.—Marshall.

Named in honor of C. A. White, M. D., of Burlington, Iowa.

POSIDONOMYA MESAMBONATA, n. sp.—Shell small, tumid equimarginal. Beaks prominent, slightly incurved; umbonal slope passing scarcely anterior to the middle of the valve, and nearly at right angles with the short, straight hinge-line; posterior margin slightly curved, scarcely alate, obtusely angulated at its junction with the dorsal side; anterior margin similar to posterior, and connected with it by the semi-circular ventral margin. Entire surface convex, without undulations, and marked only by fine striæ of growth.

Length from beak to opposite ventral margin over umbo .50 (100); width at right angles with this line across the middle (and widest part) of the valve .41 (82); convexity of right valve .12 (24).

Localities.—Marshall and Moscow.

Almost an exact copy in outline of *P. vetusta*, Sow. (de Kon. Anim. Foss., pl. vi. fig. 1, a and b, not c.) It wants, however, the undulations of that species, and is smaller.

SANGUINOLARIA, McCoy.

SANGUINOLARIA SIMILIS, n. sp.—Shell rather large, transversely elliptic, rather appressed. Beaks a little anterior to the middle of the shell, flat, obtuse, and little elevated. Hinge-line about one-third the length of the shell, slightly angulated under the beaks; buccal and anal slopes somewhat straight; anterior and posterior margins abruptly rounded; ventral margin regularly curved, except a slight bend in the middle. Longest dimension equidistant between beaks and venter. Pallial impression entire?; anterior muscular scar roundish-oval; posterior obliquely pyriform. A pair of strong internal ridges diverge from beneath the beaks (as in *Tellina*), the anterior passing along the posterior side of the buccal scar, and the posterior along the front margin of the posterior scar, terminating opposite the lower borders of the respective scars. A sharp but shallow groove runs along the anterior of the posterior ridge. Hinge not fully known; a strong triangular cardinal tooth passes a little obliquely forward across the hinge-plate, behind which is a deep pit, while a shallow one bounds the tooth anteriorly; an elongated triangular lateral tooth extends in front of the beak, and apparently another behind the beak. Shell thick; external surface marked by irregular, fine incremental striæ, and a few broad shallow furrows.

Length 2.0 (100); height 1.11 (55); convexity of one valve .23 (11); length of posterior lateral tooth .42 (21); from beak to anterior extremity .95 (47); to posterior extremity 1.25 (62).

Locality.—Marshall, where it is rather abundant.

SANGUINOLARIA SEPTENTRIONALIS, n. sp.—Shell of moderate size, equivalve, quadrately elliptic, subtumid, with sub-central beaks. Hinge line occupying three-fourths the length of the shell, nearly straight. Posterior extremity roundly truncate by a plane inclining towards the beaks; anterior end similarly truncated by a plane parallel with the last; ventral border slightly arcuated, bounded behind by a rounded acute angle, and before by a rounded obtuse angle. Hinge (as shown by casts) consisting of a prominent triangular cardinal tooth, and a lateral one each side—the posterior very slender. Pallial line entire (?); anterior muscular scar small, nearly circular. Clavicular ridges indistinct. Surface of casts showing a few obscure incremental furrows.

Length 1.15 (100); height .73 (63); convexity of left valve .15 (13).

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Locality.—Gaines, Kent county, from large angular fragments of a purplish-red, friable sandstone, strewn along the region of outcrop of the Marshall sandstone throughout the western part of the State.

SANGUINOLARIA SECTORALIS, n. sp.—Shell rather large, subtumid, triangular, with beaks but little in advance of the middle. Anterior and posterior cardinal slopes but slightly curved, the latter the longest; anterior end a broad curve; posterior more produced and more abruptly curved between the extremities. Beak prominent, somewhat depressed, incurved. Greatest thickness of shell in the middle. Muscular pits situated above the middle, oval, profound, connected by the entire pallial impression.

Length 1.18 (100); height .92 (78); thickness .54 (45); length of anterior end .43 (36); of posterior end .75 (63). Length, height and thickness of largest specimen seen are 1.75 (100), 1.30 (74) and .70 (40); length of anterior end .80 (45); of posterior end .94 (53).

Locality.—Marshall.

SOLENS, LINNÆUS.

SOLENS SCALPRIFORMIS, n. sp.—Shell of moderate size, having the hinge line straight, and the ventral regularly curved, and so situated that its chord forms posteriorly, an angle of about 5° with the dorsal margin; extremities abruptly rounded—the anterior one regularly, the posterior truncately. Valves with a slight constriction beneath the subterminal beaks, which corresponds to a strong ridge within, fading away at about half the distance from the dorsal to the ventral margin. Valves but moderately inflated, flatter behind, and a little drawn together anteriorly. Exterior surface marked by incremental lines nearly concentric with the pallial border.

Length of shell 2.05 (100); projection of anterior extremity beyond the beaks .11 (5); greatest width of shell (one-third its length from forward end) .56 (27); width at two-thirds the shell-length from forward end .48 (23), whence it narrows rapidly.

Localities.—Marshall and Moscow, abundantly. Also, near Napoleon.

A well marked variation in form has been observed in many specimens, having a straight ventral border and more uniform width.

SOLENS QUADRANGULARIS, n. sp.—Shell of medium size, quadrangular; hinge margin straight, somewhat shorter than the ventral margin, which is also straight through the greater part of its length, but is abruptly rounded upwards anteriorly, and a little more gradually rounded posteriorly. Beaks terminal; anterior extremity of shell transversely truncate, posterior obliquely so. Valves rather tumid anteriorly, becoming less so posteriorly; not at all contracted toward the gaping extremities. A constriction appears close to the anterior extremity, which corresponds to a ridge within, narrow and sharp near the beak, but becoming broad and depressed towards the opposite margin. Surface marked by distinct lines of growth running parallel with the ventral and posterior margins.

Greatest length 2.0 (100); width .66 (33); posterior truncation forming with hinge-line an angle of about 64° .

Locality.—Marshall.

SOLENS PRISCUS, n. sp.—Shell of medium size, slightly arcuate by an inflection of the two extremities toward the ventral side; dorsal and ventral margins nearly parallel; valves but little inflated, giving an oval-lanceolate transverse section; anterior extremity widely gaping, projecting a little beyond the beak, regularly rounded to the ventral side below, and above truncated obliquely backwards to the vicinity of the hinge; posterior extremity obliquely truncate, with the lower angle abruptly rounded. The cast shows the impression of a broad ridge passing from the hinge toward the ventral margin, and is further marked by distinct incremental lines parallel with the pallial border except on the anterior truncation, by which they are intercepted.

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Length about 2.75 (100); width .78 (28); thickness .25 (9); projection of anterior extremity beyond beaks .28 (11); posterior angle formed with hinge line by anterior truncation 140° ; anterior angle formed by posterior truncation 128° .

Locality.—Union, Branch county, in blue argillaceous shales of the Huron group—the “Kidney Iron formation” of Houghton.

But few specimens of this interesting species have been seen, and the best of these is defective at the posterior extremity; and I have determined the total length only from a restoration founded on the incremental lines.

The three foregoing species of *Solen* nearly double the number previously known from the Palæozoic rocks. Messrs. Sandberger have described *S. costatus* from the *Aviculaschiefer* of the *Spiriferensandstein* group in Nassau, which is supposed by them to occupy the horizon of the Marcellus Shale and Hamilton group. *S. pelagicus*, Goldf., and *S. Lustheidi*, d’Arch. and Vern., come also from the Devonian, but they are both doubtful species. The first is referred by d’Orbigny to *Cypricardia*; the latter, judging from specimens in Dr. Rominger’s collection from the Eifel, has the valves scarcely gaping anteriorly, and presents much the appearance of a *Solemya*, (see especially *Solemya primæva*, Phil. McCoy, Brit. Pal. Foss. pl. 3F., fig. 3). Lastly, de Koninck has noticed a very imperfect solitary specimen, *S. siliquoides*, from the subcarboniferous limestone of Visé, in Belgium.

PUGIUNCULUS, Barrande.

PUGIUNCULUS (?) ACULEATUS, Hall, (13th Rep. N. Y. Reg., p. 107).—Shell small, elongate, tapering, with an obtusely triangular section. Slant height slightly curved on all the sides and angles; sides also more convex in the transverse direction. The two equal sides making with each other an angle of 102° , and with the broader side angles of 39° . Specimen a cast without any external markings.

Length .43 (100); breadth of sides at aperture .19 (44), .12 (28), .12 (28).

Locality.—S. E. $\frac{1}{2}$ S. W. $\frac{1}{4}$ Sec. 23., Adams, Hillsdale county.

This form lacks the evidence of striation attributed to *Pugiunculus*, Barrande (*Theca* of English authors) and presents still less agreement with any other known genus. The original specimens were described from Rockford, Indiana.

PLEUROTOMARIA, DeFrance.

PSEUROTOMARIA VADOSA, Hall, 10th Rep. N. Y. Reg., p. 108).—Shell globosely conical, with a width equal to its height; whorls about three, rounded on the exterior, somewhat flattened where they come in contact, marked along the middle by a moderately raised carina, on each side of which is a feeble but distinct revolving line, and beyond this another still feebler, and sometimes a third; body whorl occupying about three-fourths of the altitude of the shell, regularly curved on the base, and limited by a neatly rounded umbilicus open to the apex of the shell. Aperture subcircular, but slightly modified by the body whorl; apex quite obtuse; angle of sides 65° ; sutural angle about 90° on the last whorl. Cast shows the revolving lines on the last whorl, but not on the preceding ones.

Height of shell .44 (100); width .48 (109); height of body whorl .36 (82); diameter of umbilicus (in a cast) .08.

Locality.—In a loose fragment from the western part of the State, consisting of an agglomerated, silicious, sintery and somewhat ferruginous mass of fossils, physically resembling some states of the Marshall sandstone. Described here in consequence of its supposed identity with a fossil from beds which appear to be the equivalent of the Marshall sandstone, at Rockford, Ind.

PLEUROTOMARIA WHITEI, n. sp.—Shell with a trochoid spire, straight columellar lip, and prominent carinate whorls. Number of whorls three and a half, rapidly enlarging, raised in the middle of the dorsum in a prominent 1862.]

carina; the sides of which rise vertically from the whorl and form a feebly bilinear crest—a character best seen in specimens with the shell partly worn away; from the base of the carina the surfaces slope with but little curvature, at an angle of 115° to 120° with each other, and form a well marked sutural angle of about the same value with the contiguous whorl. Apex rather obtuse; angle of sides 67° . Aperture roundly quadrangular, produced on the columellar side. Umbilicus remote.

Height of shell .64 (100); width of last whorl .59 (92); height of last whorl .53 (83); width of aperture at right angles with columella .29 (45); greatest width—at an angle of 45° with the columella—.42 (66).

Locality.—With *P. vadosa*.

Somewhat resembles *P. subconica* from the Trenton limestone, but the whorls are not so closely crowded—being thus more rounded, and forming a much deeper suture.

Named in honor of Mr. A. D. White, an efficient assistant in the geological survey of the State during 1859 and 1860.

PLEUROTOMARIA HUMILIS, n. sp.—Shell depressed, conical. Band prominent, revolving close to the linear suture in the upper whorls, central on the body whorl; surface of shell above and below the band but slightly convex on the body whorl, flat on the spire, and making a peripheral angle of 61° . Inclination of sides 109° . Umbilicus small, and apparently perforate.

Approximate measurements of an imperfect specimen: height .52 (100); with .67 (129); height of last whorl .46 (88); width of umbilicus .09.

Locality.—With *P. vadosa*.

Has the general form of *P. crenato-striata*, Sandb., (Verstein. Taf. xxii. 2), but the band is narrower and more prominent. It closely resembles *P. helicinoides*, McCoy, (Synop. Carb. Foss. Irel., pl. 7, f. 6), but is less depressed and formed of fewer whorls.

PLEUROTOMARIA STELLA, n. sp.—Shell minute, trochiform, composed of four and a half whorls closely appressed, and forming an apical angle of about 90° . Suture linear, inconspicuous—the flat sides of the whorls all lying in the same plane. Body whorl regularly rounded, marked by a raised bilinear band situated a little above the peripheral line, and on the whorls of the spire nearly concealed. The body whorl is ornamented by a line of minute tubercles running close to the suture, and occupying a feeble revolving ridge. No indications can be seen of transverse striæ connected with the tubercles. Aperture subcircular, with the columellar lip reflected over the umbilicus. Some sharp irregular incremental lines rise from the umbilical depression, and extend across the body of the shell.

Height .16 (100); width .20 (125); height of body whorl .14 (88); height of aperture .09 (56); width of band at aperture .02 (12); number of tubercles in one-tenth of an inch, 12.

Locality.—N. W. $\frac{1}{4}$, N. W. $\frac{1}{4}$, Sec. 4, Jefferson, Hillsdale county.

PLEUROTOMARIA EXIGUA, n. sp.—Shell very small, depressed-turbinate, consisting of three and a half rapidly enlarging convex whorls but slightly appressed and forming a deep suture, with an apical angle of about 87° . Base of shell convex, descending into a broad, deep umbilicus, from which rises a set of sharp transverse striæ crossing the whorl at right angles, but slightly bent backwards on reaching the band, which is broad and situated a little above the peripheral zone, and marked by incremental lines; above the band similar striæ describe an anteaely convex curve to the suture. Aperture circular.

Height of shell .17 (100); diameter .18 (106); height of last whorl .14 (82); width of band .02 (12); number of transverse striæ in one-tenth of an inch counted near the aperture above the band is 24.

Locality.—N. W. $\frac{1}{4}$, N. W. $\frac{1}{4}$, Sec. 4, Jefferson, Hillsdale county.

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PLEUROTOMARIA HURONENSIS, n. sp.—Shell rather large, depressed-turbinate, consisting of about four very rapidly enlarging whorls. Body whorl flattened from above, moderately convex above; the base a twisted plane bounded on one side by the slope into a large open umbilicus, on the other, by the sharp prominent carina which marks the periphery of the whorl. Surface of the whorl marked by eleven raised plications and intervening broad sulci, of which, counting from the umbilicus, the sixth rests upon the carina, and the eleventh is close to the suture. These are crossed by striæ of growth rising from the umbilicus, stretching far forward upon the base, curving backwards just before reaching the carina, and apparently curving forward again after passing it.

Height of shell 1·00 (100); diameter of base 2·00 (200); transverse diameter of aperture ·92 (92).

Locality.—Light-house, Pt. aux Barques, in intercalated sandstones of the Huron group.

This species recalls *Euomphalus carinatus*, Sow., (Murch. Sil. Syst., 616, pl. vi. fig. 10).

DENTALIUM, Linnæus.

DENTALIUM ? BARQUENSE, n. sp.—Shell small, very gradually tapering, slightly compressed. Surface of cast smooth. Surface of shell unknown—apparently striate or grooved transversely; shell-structure prismatic, the axes of the prisms being normal to the surface of the shell. The shortness of these prisms gives the structure the appearance of miniature mosaic. Diameter of fragment ·06.

Locality.—Pt. aux Barques, in a stratum overlying the gritstones.

BELLEROPHON, Montfort.

BELLEROPHON RUGOSIUSCULUS, n. sp.—Shell of moderate size, globoid, very rapidly enlarging; umbilicus rather broad and deep, but not perforate—only one whorl being exposed to view. Transverse section somewhat rhomboidal, with rounded angles, becoming more rounded with age. Keel in the young shell rather prominent, but obtuse, becoming more depressed with age, until finally the dorsal surface is regularly rounded, and the sides have developed some obliquely longitudinal folds winding into the umbilicus. Aperture transversely expanded, subreniform. The entire surface, except the peripheral belt, is marked by direct, longitudinal raised striæ, separated only by a narrow groove; these are crossed by a set of transverse striæ, which, on the umbilical slope are somewhat irregularly waved and more pronounced than on the dorsum; on passing the lateral angle they divide irregularly and result in a set of finer striæ, which are abruptly reflected in approaching the keel, and in the older portion of the shell, gradually disappear before reaching it, while in the young shell they meet upon the keel in an acute angle of about 58°. Cast nearly destitute of ornaments.

Diameter of large specimen ·77 (100); height of last whorl to the middle of the umbilicus ·52 (68); height of aperture ·36 (47); width of aperture ·54 (70); number of longitudinal striæ in one-tenth of an inch 8; number of transverse striæ in one-tenth of an inch, counted on the umbilical slope 6, counted on the keel 12 to 15.

Localities.—Marshall and Secs. 19 and 26, Liberty, Jackson county.

The general appearance of this shell is that of *B. decussatus*, Flem., but a careful examination of all the figures and descriptions in my possession, has convinced me that it is a distinct though representative species. Want of space, however, forbids offering the comparisons.

Var. *taniatus*. This well-marked variety (perhaps distinct species) is the form which approaches nearest to Sandberger's *B. decussatus*. It differs from the usual forms of the present species in having a less depressed dorsum and a smaller transverse diameter; a more prominent keel which is bounded by a slight elevation along each margin, and in its finer striæ, especially on the 1862.]

umbilical slope. In a specimen which is .6 (100) across the outer whorl, the height of the aperture is .32 (53), its width .38 (63). The number of longitudinal striæ in one-tenth of an inch is about 14, and the number of transverse striæ 18.

Locality.—Moscow, Hillsdale county.

BELLEROPHON GALERICULATUS, n. sp.—Shell small, globose, involute, ecarinate, exumbilicate, longitudinally striate, and deeply notched. Dorsum broadly and regularly rounded, without any evidences of a band, except in approaching the aperture of adult shells, where a rather broad band with ventrally concave incremental lines can be faintly traced. Aperture crescentic, not suddenly expanded, strongly auriculate, with the ears hanging detached from the inner whorl. Notch infundibuliform, deep and broad, obtuse, its sides reaching to the tips of the aurications. Umbilicus closed, scarcely indented. Dorsal and dorso-lateral surface marked by about 28 longitudinal, sharply raised striæ, separated by much wider flutings, and not perceptibly modified by the dorsal band until within half a whorl of the aperture of the adult shell, when the two middle striæ become slightly raised and enlarged, and the entire set simultaneously die away. Between these striæ and the umbilical point similar striæ diverge spirally and irregular until intercepted by the former set, or by each other. Cast smooth, perforately umbilicate.

Average diameter of adult .47 (100); height of last whorl at the aperture .26 (55); height of aperture .18 (38); showing the inner whorl impressed into the outer .08 (17); width of aperture .35 (74); depth of notch .22 (47); width of peripheral belt at notch .06 (13); separating distance between tip of aurications and inner whorl .10 (21); number of striæ in one-tenth of an inch 10, and this is the same in young and old specimens. Diameter of largest specimen seen .53.

Localities.—Marshall, Battle Creek, and nearly all other Southern outcrops of the Marshall Sandstone.

This shell bears a close resemblance to *B. Urei*, of authors, but seems to differ in essential points, as follows:—From *B. Urei*, de Kon. (An. Foss. 356, xxx. 4) in being only half the size, having the dorsal belt elevated instead of compressed, in its very deep notch, less proportional width and distinct aurications; from McCoy's *B. Urei* (Brit. Pal. Foss., 554) in having the striæ much narrower than the intervening grooves and not at all modified by the dorsal band, and in having the width of the aperture less than the diameter of the shell. Prof. Phillips' figures differ in the absence of aurications, and in the lateral striæ. To Fleming's original description I have not access.

BELLEROPHON CYRTOLITES, Hall (13th Rep. N. Y. Reg., p. 107).—Shell sub-cuneiform, laterally somewhat appressed; whorls very rapidly enlarging, but slightly embracing; transverse section subcordate, broadest near the umbilicus; dorsum strongly but obtusely carinated; dorso-lateral slope nearly flat, sometimes slightly concave near the peripheral belt; sides regularly rounded, as well as the umbilical slope; umbilicus moderate, exposing only the last volution; notch deep, pointed, moderately broad. Entire surface of shell ornamented with fine, sharply raised transverse striæ, which curve backwards upon the side, and meet upon the dorsum in an angle of about 60°. The umbilical region and the sides are equally marked by fine longitudinal striæ, which disappear in the vicinity of the keel.

The largest specimen seen measures across the outer whorl .41 (100); height of aperture .23 (56); transverse diameter of aperture .19 (46), with about 13 longitudinal and 13 transverse striæ in one-tenth of an inch, counted on the dorso-lateral slope near the aperture. Another specimen with shell better preserved has 10 transverse striæ in the same distance.

Locality.—Moscow, Hillsdale county.

The side view and section of this species are not unlike those of *B. com-*
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pressus, Sandb. (Verstein, Taf. xxii. 6.) = *B. striatus*, Sow. My specimens have the transverse section and external markings of the latter, but they are less capuliform (See Murch. Sil. Syst., 604, iii. 12e).

BELLEROPHON NAUTILOIDES, n. sp.—Shell involute, scarcely umbilicate, longitudinally striate and deeply notched. Dorsum regularly rounded, sometimes slightly raised along the peripheral band; sides less convex than the dorsum, bending into a small shallow umbilicus, not disclosing previous whorls. Aperture crescentic, width about equal to its height, strongly auriculate. Notch deep, but obtuse, broad, infundibuliform, with its margins reaching to the tips of the auriculations. Exterior surface longitudinally striate, with fine sharp raised lines marking the sides as well as the dorsum. Cast smooth, perforately umbilicate, exposing two whorls.

Diameter of large specimen .50 (100); height of whorl at aperture .31 (62); depth of impression of inner whorl into outer .09 (18); height of aperture .22 (44); width of aperture .27 (54); separating distance between tip of auriculation and inner whorl .10 (20); depth of notch .17 (34).

Locality.—Moscow, Battle Creek, Marshall, and near Grandville, Kent county.

BELLEROPHON MICHIGANENSIS, n. sp.—Shell globose, carinate, involute, scarcely umbilicate, longitudinally and transversely striate. Dorsum obtusely angulated by the peripheral band, which is slightly raised, and more distinctly relieved by a furrow which runs along each margin. Dorso-lateral surfaces regularly convex, bending (in the cast) abruptly into a small perforate umbilicus. Aperture suddenly and widely expanded, broadly auriculate, and with a broad, rather shallow notch. Exterior of shell not seen; casts generally nearly smooth or faintly marked by longitudinal striæ, sometimes distinctly marked by two sets of striæ, the longitudinal consisting of 8 to 12 prominent raised lines on each side of the band, with one or two small intervening striæ, which gradually attain the size of the larger, these being crossed by finer, less regular transverse striæ, broadly curved anteriorly on the sides and suddenly bent backwards on the dorsum.

Diameter of last whorl (of cast) .23 (100); height of aperture .14 (61); diameter of aperture .35 (152); diameter of whorl .08 (35) back from the aperture .25 (109); diameter of next inner whorl where it touches the lip .17 (74); width of band close to aperture .07 (30); depth of notch .04 (17).

Localities.—Battle Creek, and the vicinity of Grandville, Kent county.

The characteristic of this species when compared with *B. galericulatus* is its great width in relation to its height, its much greater expansion of aperture, and its transverse striæ. The existence of a carina distinguishes it from *B. lineolatus*, Hall, from Rockford (13th Ann. Rep. Reg., N. Y., 107).

BELLEROPHON BARQUENSIS, n. sp.—Shell small, globose, involute, rapidly enlarging, dorsally depressed; umbilicus small, but deep; dorsum broadly convex, with a distinct raised band; sides sharply rounded into the umbilicus; aperture crescentic, expanded, with a deep broad constriction behind it; notch deep and narrow. Surface marked by fine, regular, longitudinal lines, which cover the band as well as the other parts.

Diameter .48 (100); transverse diameter of aperture .54 (112); height of aperture to middle of umbilicus .27 (56).

Locality.—Pt. aux Barques, above the gritstones.

Most nearly resembles *B. Michiganensis*, but the apertural construction and single set of striæ render it easily distinguishable.

BELLEROPHON LINEOLATUS, Hall (13th Rep. N. Y. Reg., p. 107).—An imperfect specimen agreeing fully with Hall's description.

Locality.—Holland, Ottawa county.

GONIATITES, de Haan.

GONIATITES ROMINGERI, n. sp.—Shell of moderate size, globoid, exumbilicate. 1862.]

Dorsum broad, regularly rounded; sides gently rounded with only a slight depression near the umbilical center. Septa approximate, thickened at the line of junction with the shell, producing furrows along the septum-lines of the cast. Lobes and saddles strongly pronounced. Dorsal lobe clavate linguiform, with a long cuspidate acumination reaching as far back as the preceding dorsal saddle; dorsal saddle linguiform, obtuse, unsymmetrical, indented on the dorsal side by the broadest part of the dorsal lobe, passing the point of the following lateral lobe; first lateral lobe profound, rather narrow, extending as far back as the dorsal, sublinguiform, acute; lateral saddle deep, very broad, somewhat regularly arched to the umbilical point, extending nearly as far forward as the dorsal saddle. Exterior unknown; surface of cast smooth.

Diameter of cast of last whorl .84 (100); axial diameter .38 (46); greatest transverse diameter of tube .42 (50); distance from axial diameter to dorsum .47 (56); length of dorsal lobe .21 (25); of dorsal saddle .19 (22); of lateral lobe .20 (24).

Locality.—Marshall.

This well-marked species resembles *G. rotatorius*, de Kon. and *G. Izion*, Hall, in the plan of its septa; but, besides its smaller size, its transverse diameter is proportionally much greater, being to the whorl diameter as 1 : 2 instead of 1 : 3; and the diameter through the points of the lateral lobes is as 1 : 2½, while in *G. rotatorius* it is as 1 : 4. The sides of the new species are also more convex.

Named in honor of its discoverer, Dr. C. Rominger, of Ann Arbor.

GONIATITES WHITEL, n. sp.—Shell very small, with surfaces regularly convex, a small deep umbilicus and sinuous apertural constrictions. Dorsum rather abruptly rounded, the curvature gradually diminishing on the sides, which are a little appressed; umbilical boundary rather sharply defined. Apertural constrictions separated about 80° from each other, forming a broad, shallow, ventral sinus across the dorsum, and a broader and shallower one on each side. Surface of shell faintly marked by lines parallel with the apertural constrictions, and in some cases by indications of fine crowded revolving striae. Lobes and saddles strongly pronounced. Dorsal lobe truncately infundibuliform, minutely bi-denticulate, with the minute circular siphon issuing from between the denticulations; first lateral lobe acute, infundibuliform, separated from the dorsal by a deep parabolic saddle; second lateral lobe, which is separated from the first by a broadly parabolic saddle, is broadly infundibuliform, with its right angled apex resting on the brink of the umbilical pit.

Diameter .35 (100); thickness or transverse diameter .21 (60).

Locality.—Union, Branch county, in blue argillaceous shales of the Huron group.

Named in honor of A. D. White, Esq., its discover.

NAUTILUS, LINNÆUS. *TREMATODISCUS*, Meek & Worthen.

NAUTILUS (TREMATODISCUS) STRIGATUS, n. sp.—Shell of medium size; dorsum flattened, broad, equal to the greatest transverse diameter, bounded by a prominent angle on each side; lateral surface making a right angle with the dorsal, curving rapidly into the deep broad umbilicus; dorso-ventral diameter of shell equal to one-half the transverse. Surface marked by deep cut longitudinal flutings, of which about nine occupy the latero-umbilical region, and six, less remote, occupy the space on each side from the dorso-lateral angle half way to the middle line of the dorsum, thus leaving a middle belt along the dorsum equal to one-half its width, destitute of longitudinal grooves. The dorsal grooves nearer the midline become successively fainter, but the last one is well marked. In the bottom of each of these furrows are about three very fine longitudinal striae. These two sets are crossed by fine, sharp, rather regular raised striae, which curve gently backwards on the sides, while on the dorsal surface they are deflected, at first gradually, then very

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rapidly backward, forming along the middle belt a very deep, broad sinus. Septa regularly concave. Young shell less angular in transverse section.

Diameter of whorl (wholly septate) 2.4 (100); width of dorsum .92 (39); dorso-ventral dimension .53 (22); number of transverse striæ in one-tenth of an inch, counted on the dorso-lateral angle, about nine.

Locality.—Marshall.

The young shell of this species may be distinguished from the young of *N. striatulus*, from the same group, by the presence of the transverse striæ.

NAUTILUS (TREMATODISCUS) ALTIDORSALIS, n. sp.—Shell rather large; section quadrilateral, presenting an acute angle on the dorsum, a very obtuse one on the ventrum, and an angle of about 80° on each side, about two-thirds the distance from the dorsum to the ventrum; sides of section but slightly curved; middle line of dorsum not seen. Septa with shallow concavity, somewhat irregular—a shallow sinus occupying the lateral carina, and another the dorsal, with a slight forward swell on the dorso-lateral slope, and another in the umbilical cavity—a very unusual arrangement of the sinuses, since the forward sinuations are thus brought upon those points nearest the central line of the shell. Surface marked by about 8 broad longitudinal grooves on the umbilical slope, and a large number on the dorso-lateral. Each of these grooves contains about 18 very fine, wavy, raised striæ. Both sets are crossed by fine, somewhat irregular, transverse striæ, nearly direct, though slightly sinuated ventrally on the umbilical slope.

Diameter of (completed) whorl wholly septate 2.1 (100); dorso-ventral diameter of shell .67 (32); transverse diameter .78 (37); angle between plane of whorl and dorso-lateral slope 48°; between plane of whorl and umbilical slope 55°; longitudinal grooves in one-tenth of an inch 1½; longitudinal striæ in same distance 30; transverse striæ in same distance, counted on lateral carina, 8.

Locality.—Marshall.

This species, at first view, resembles *N. strigatus*, but is very distinct. Even small fragments may be distinguished by the numerous very fine striæ in the grooves.

ORTHO CERAS, Breynius.

ORTHO CERAS MULTICINCTUM, n. sp.—Shell small, very gradually tapering; section circular; siphon central (?); surface marked by numerous small, acute, transverse annuli, with intervening sharp grooves; septa with shallow convexity. Number of annuli in one-tenth of an inch 7.

Localities.—Marshall and Holland.

A close analogue of *O. cinctum*, de Kon. (An. Foss. 512, xliii. 6, xlv. 5, xlvii. 3), if it is not identical with it. The only perceptible distinction consists in its smaller size and more acute annuli and grooves. *O. cinctum* is said to occur in the Silurian, Devonian and Carboniferous systems. A species with such tenacity of life may have had a great geographical range.

ORTHO CERAS GRACILIUS, n. sp.—Shell with an apical angle of 3½°, a circular section and central siphon. Cast smooth; interseptal space .04 where the diameter is .9.

Locality.—Union, Branch county, in argillaceous shales of the Huron group.

CYTHERE, Müller.

CYTHERE CRASSIMARGINATA, n. sp.—Carapace minute, ventricose, regularly oval, microscopically wrinkled-scrubulate; hinge-line impressed, and hinge-margin a little hollowed; valves margined by a smooth bead, which projects slightly beyond the general surface, behind which is a small groove; cast smooth, but margined by a raised band terminating near the hinge anteriorly and posteriorly.

Length .08; breadth .05.

1862.]

Localities.—In the Marshall Sandstone, at Battle Creek, Liberty (Jackson county), Moscow, near Napoleon and at the Gritstone Quarries, at Pt. aux Barques, with *Rhynchonella camerifera*.

Besides the species already enumerated from the Marshall group there yet remain a few too imperfect for adequate description, or belonging to classes not yet investigated. Among these are *Lepidodendron* and *Neuropteris*?; a coralline structure, encrusting, foliaceous or branching, with minute, short, crowded polygonal cells .0088 of an inch in diameter, without visible lamellæ, but with some indications of transverse floors; some undetermined Lamellibranchs; two sorts of Chiton-like scales; two or three Nautili, of which one is nodulous; and sundry remains of spines, teeth and bones of fishes.

University of Michigan, July 1, 1862.

Synopsis of the CARANGOIDS of the Eastern Coast of North America.

BY THEODORE GILL.

In the preparation of the "Catalogue of the Fishes of the Eastern Coast of North America," I trusted almost wholly to previous naturalists for that portion relating to the species of Scombroids and the allied groups. Drs. Dekay, Holbrook and Girard having each introduced supposed new forms, it was to be presumed that they had studied the species in their various stages. My attention having been since attracted especially to the Carangoids, it has been discovered that the nomenclature of several was quite erroneous and that some genera and species had been founded on young individuals of previously named forms. The preoperculum in early youth, as far as known, is armed with three stout spines at the angle and smaller ones above and below, the spinous dorsal is always developed at that period, and teeth are also present. At a later period the spines of the preoperculum are absorbed in the margin, while in some types the first dorsal becomes atrophied and is, in several, represented by free and simple projecting spines, and at a still later period the teeth are likewise lost. A single species of one such type (*Trachynotus*) has served at different stages of growth as a representative of three different genera, characterized by the condition of the spinous dorsal and the dentition.

The following table will enable the student to distinguish the several groups. Although the genus *Pomatomus* Lac. (*Temnodon* Cuv.), is here retained in the family, I am not certain that it truly belongs to it.

The object of the present article is to correct the nomenclature of several species, as well as to draw attention to the imperfection of our information regarding several others, especially the species of the subfamily of *Centronotinae*. No one will deny that it is for the interest of science that the nomenclature of the genera and species of animals shall be settled as soon as possible, and it is hoped that the present communication will contribute to that desirable end as far as the American species of Carangoids are concerned. Much, however, yet remains to be done. Although I have seen all the species enumerated, with one exception,* specimens, from the eastern coast, of several are not represented in the collection of the Smithsonian Institution. Those desired species are the following:—*Decapterus punctatus*, *Carangus fallax*, *Blepharichthys crinitus*, *Trachynotus glaucus*, *Naucratus ductor*, *Zonichthys fasciatus* (young), and *H. boscii*. It is hoped that such deficiencies may be soon remedied.

* *Halatractus boscii*.

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