

lateralis, tumidula; striis regularibus distantibus; epidermide flavescente induta; valvis solidiusculis, intus albis, umbonibus prominentibus, erosis, cardine crasso, tridentato.

Long. 11; lat. 10; diam. 6 mill.

Hab.?—(Collect. Prime.)

14. *Corbicula violacea Prime*. C. testa ovato-transversa, subaequilaterali, obliqua, extremitatibus aequaliter obtusa, transversim irregulariter striata; epidermide squalide virescente vestita; umbonibus magnis, obliquis, erosis, intus profunde violacea; cardine angusto tridentato.

Long. 15; lat. 13; diam. 8 mill.

Hab.?—(Collect. Jay et Prime.)

15. *Corbicula Agrensia Prime*.

Cyrena Agrensia Kurr., in litt.

C. testa ovato-transversa, aequilaterali, laevigata, depressiuscula, extremitatibus rotundata; epidermide viridi-olivacea induta; sulcis regularibus, distantibus; intus pallide violacea; umbonibus tumidis, erosis; cardine angusto, dentibus cardinalibus crassis, lateralibus aequalibus, tenuiter serrulatis.

Long. 9; lat. 8; diam. 5 mill.

Hab.—Agra, India. (Collect. Prime.)

16. *Corbicula inaequilateralis Prime*. C. testa ovato-transversa, depressiuscula, tenui, inaequilaterali; extremitatibus rotundata; umbonibus prominentibus, approximatis, antice obliquatis, violaceo subradiatis; sulcis regularibus, intus pallide violacea; epidermide pallide virescente induta; cardine angusto; dentibus cardinalibus crassis, lateralibus inaequalibus.

Long. 16; lat. 12; diam. 8 mill.

Hab.—Africa. (Collect. Prime.)

17. *Sphaerium Vermontana Prime*. S. testa ovato-trigona, tumida, inaequilaterali, striis regularibus, epidermide viridi-flavescente vestita; umbonibus tumidis; cardine arcuato; dentibus lateralibus crassis.

Long. 11; lat. 10; diam. 7 mill.

Hab.—Vermont, N. America. (Collect. Prime.)

This species, though somewhat allied to *Sph. striatinum Lam.*, is much more inequilateral.

Descriptions of new Palæozoic Fossils from Illinois and Iowa.

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ECHINODERMATA.

CRINOIDEA.

Genus PLATYCRINUS, Miller, 1821.

PLATYCRINUS OWENI.—Body rather large, cup-shaped, or sub-hemispherical below the summit of the first radials, rounded on the under side, height about two-thirds the breadth. Base saucer-shaped, or nearly four times as wide as high, pentagonal in outline, the sides being nearly straight or slightly concave, sutures anchylosed; columnar facet large, its breadth equalling about half that of the base, concave, margined by a slightly raised somewhat undulated rim, and perforated by a large central opening. First radial plates large, sub-quadrangular in general outline, but having the superior lateral angles truncated for the reception of the anal and interradial pieces, widening a little from the base upwards; facet for the reception of the second radial pieces

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prominent, near one-third as wide as the plate, and extending down between one-third and one-half its length. Second radial pieces small, extending out nearly horizontally from the first; round below, and presenting a pentagonal outline, as seen from the under side, supporting on their superior (outer) sloping sides, the two first divisions of the arms. First anal piece rather large for a species of this genus, apparently pentagonal, and extending down between the first radials, nearly as deep as the articulating facets supporting the second radial pieces. (Other parts unknown.)

The sutures separating the first radial plates from each other, and from the base, are rather distinctly canaliculated, in consequence of the beveling of the edges of the plates. The surface is finely granulose, and ornamented by small obscurely subnodose costæ, of which there are two on the base passing around near the margin. Three similar costæ ornament the first radial plates, being arranged parallel to the basal and lateral margins, but becoming nearly or quite obsolete above the middle.

Named in honor of Prof. Richard Owen, of the Geological Survey of Indiana.

Locality and position. Burlington, Iowa. Burlington Limestone. Collection of Mr. Charles Wachsmuth.

PLATYCRINUS SCOBINA.—Body rather small, cup-shaped or subtrubinate below the summit of the first radial pieces. Base basin-shaped, about twice as wide as high, and rather more than equalling one-third the height of the body to the top of the first radials; pentahedral in outline, with slightly concave sides, columnar facet less than one-third the breadth of the base. First radial plates slightly broader than high, widening a little upwards from the base, presenting a subangular outline, the superior lateral angles being truncated for the reception of the anal and interrarial pieces; facet for the reception of the second radial piece not protuberant, concave, rather less than one-third the breadth of the upper side of the first radial plates, and extending down about one-fifth their length. Second radial pieces small, triangular, and supporting on their superior sloping sides the first divisions of the arms. After dividing on the second radial pieces, the arms divide again on the second piece above, beyond which they are long, slender, and apparently simple. After the second bifurcation, they are each at first composed of a single series of wedge-shaped pieces, but gradually pass into a double alternating series of pieces, each of which is about as long as wide.

The surface of the basal and first radial plates is ornamented with numerous small, rather sharply elevated, irregularly arranged nodes, or coarse granules, so as to present a rasp-like appearance. The sutures are closely ankylosed in the base, and well defined between the first radial plates.

In its surface markings this species is much like *P. Wortheni* of Hall, but it differs in having a distinctly protuberant, instead of a flat or concave base, and in having but four arms to each ray, instead of eight or nine.

Locality and position. Burlington, Iowa. Burlington Limestone. Mr. Charles Wachsmuth's collection.

PLATYCRINUS (PLEUROCRINUS) ASPER.—Body small, rather deeply basin-shaped below the arms. Base much depressed, largely and deeply excavated below, with a narrow prominent marginal rim, which is notched at the sutures, and somewhat undulated. First radial plates broader than high, widening moderately upwards and presenting a subquadrangular outline, but really hexagonal, in consequence of the truncation of the superior lateral angles for the reception of the interrarial and anal plates; sinus in the summit of each, for the reception of the second radials, deep, semi-circular, and equalling about half the breadth of the upper side; surface of each ornamented by a very prominent, sharply elevated carina, which passes across near the lower side, and is waved or often broken up into isolated prominences. Second radial pieces triangular, wider than long, and

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nearly entirely received within the sinus, in the upper margin of the first radial pieces. First aual and first interrarial plates of apparently about the same size, the former connecting with a range of small plates above, which form the under margin of the lateral anal opening.

The arms, after the first division on the second radial plates, divide again on the second piece, above which the two inner branches bifurcate again on the second piece, thus making six arms in each ray seen in the specimen under description. Above the last division the arms are slender, very gradually tapering, and each composed of a double series of small alternating pieces, (excepting near the points of bifurcation,) and support on their inner side rather closely set ranges of tentacles. The column is a little compressed, and composed of rather thin pieces, with prominent crenulated margins near the base.

Locality and position. Burlington, Iowa. Burlington Limestone. Collection of Charles Wachsmuth.

Genus FORBESIOCRINUS, Koninck and Le Hon.

FORBESIOCRINUS MONROENSIS.—Body below the free arms apparently short-turbinate, or subglobose, composed of nearly smooth, rather thick plates, connected by linear sutures. Base small, and nearly hidden by the column. Subradial plates of moderate size, four of them pentagonal, and one on the anal side apparently hexagonal, with unequal sides. First radials about twice as wide as high, hexagonal in form, and nearly twice as large as the subradials. Second, third and fourth radials, in two of the rays, (and the fifth and sixth in another,) all nearly of the same length, hexagonal in form and about twice as wide as long. Last primary radial pieces of nearly the same size as the others, and supporting on their superior sloping sides the secondary radials.

Of the numerous interradians, the first is about the size of the subradial pieces, hexagonal in form, and supports two smaller pieces in the second range. Above these four or five occur in the next range, in one interrarial space, which is as far up as they can be counted in the specimen examined, though it is evident from the breadth of the interrarial spaces, that they must increase at the same rate for several ranges above. (Anal plates unknown.)

The column is rounded and comparatively thick at its junction with the base, from which it tapers gradually towards the lower extremity. Near the base it is composed of extremely thin, equal segments, connected by minutely crenulated sutures. Farther down it gradually passes into a series of alternately thicker and thinner pieces.

After the first division of the rays on the last primary radial pieces, the arms divide several times, and appear to give off lateral branches, but our specimen is not in a condition to enable us to determine how many pieces intervene between the points of division, nor do they show whether or not there are any interaxillary pieces.

The specimen before us presents the peculiar and anomalous appearance of having a small false arm arising directly from the summit of the upper truncated side of the largest subradial piece. It seems even to be inserted into a sinus in the upper side of the subradial, yet we can scarcely believe it is anything but one of the smaller divisions of the arms, accidentally broken off and placed in that position.

As near as we can determine from a description alone, this species appears to be somewhat closely related to *F. exculptus*, (*Onychocrinus exculptus*, Lyon and Cassiday, Am. Jour. Sci. vol. 29, N. S. page 78,) but differs in having less produced basal pieces, while the upper angles of the subradials are obtuse instead of "quite sharp." It also seems to have two or three more primary radial pieces in one ray than occur in any of those of the species described by Lyon and Cassiday. Again its surface appears to be smooth instead of granu-

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lose, and we have not been able to see any indications of the small patelloid pieces between the radial and arm pieces as in *F. exsculptus*.

Locality and position. River Bluff, near the south line of Monroe County, Illinois. Keokuk Limestone of the Lower Carboniferous series.

FORBESIOCRINUS AGASSIZI, var. *GIGANTEUS*.—This large Crinoid differs from the typical specimen of *F. Agassizi* (Hall), in having four instead of three plates in each secondary ray; (in three of the rays seen) while there are some differences in the number and arrangement of the anal and interradial plates. It also differs in having its column almost exactly cylindrical for a distance of at least four inches below the base, while that of *F. Agassizi*, is described as "rapidly tapering below the summit." We suspect it may prove to be a distinct species from that described by Prof. Hall, but as it agrees with his description and diagram in most of its characters, excepting the points of difference we have mentioned, we merely call attention to it as a variety of that species, until we can have an opportunity to compare better examples of it with authentic specimens or figures of Prof. Hall's species. Should it prove to be distinct, it can take the name *giganteus*, which would be very appropriate, since it is the largest species of that genus known, the length of its body to the commencement of its free arms being near 3.30 inches, and its breadth apparently about the same. Its arms are proportionally short, and bifurcate frequently.

Locality and position. Burlington, Iowa. Burlington Limestone.

Genus ACTINOCRINUS, Miller, 1821.

ACTINOCRINUS DODECADACTYLUS.—Body rather small, subglobose; summit and calyx below the arms of nearly the same size; breadth a little greater than the height; composed of slightly convex, smooth or subgranulose plates, which are connected by moderately distinct sutures. Base small, much depressed or subdiscoidal, obtusely hexagonal in outline, with three other obtuse retreating angles at the sutures. First radial plates wider than long, three of them regularly hexagonal, and two heptagonal. Second radial pieces much smaller than the first, about twice as wide as long, and all quadrangular. Third radials a little larger than the second, all regularly hexagonal, the two lateral margins being very short, and the two superior sides each about equalling the base. In the two posterior rays, the third radial pieces each support on one of their superior sloping sides a large brachial piece, and on the other a secondary radial of near the same size, which, in its turn, supports two brachial pieces, making three arms to each of these rays; while in all the others, two brachial pieces rest directly upon the third radial, thus making only twelve arms in the whole series. The first anal plate is about as wide as the first radials, but a little longer, being longer than wide, instead of the reverse. It is regularly heptagonal, and supports on each superior lateral sloping side, a smaller heptagonal piece; while an elongated, coffin-shaped piece rests upon its short superior truncated side, between the two latter, and extends up, flanked on either side by the first brachials, to its connection with the summit. Each of the interradial spaces is filled by a single ovate, octagonal piece, about as large as the second and third radial pieces taken together.

The vault is composed of rather large, somewhat regularly arranged plates which are very nearly flat, the smaller ones all being on the anal side; the proboscis is small, and located nearer the anal than the dorsal side.

Height to base of proboscis, 0.50 inch; breadth, 0.58 inch; breadth of base, 0.23 inch.

Locality and position. Burlington, Iowa. Burlington Limestone.

ACTINOCRINUS PYRIFORMIS, var. *RUDIS*.—*Actinocrinus pyriformis*, Shumard, 1855, Geol. Report of Missouri, p. 192, pl. A, fig. 6, a, b.

Body exclusive of the proboscis pyriform, being very narrow and apparently 1861.]

cylindrical from the base to the top of the third radial plates, above which the secondary radial and brachial pieces curve abruptly outwards to the base of the arms, so as to form with the ventricose summit a much expanded visceral cavity, entirely above the basal and primary radial plates. Base unknown; first radials unknown, excepting from some remaining portions of their upper ends, which show that they are comparatively large. Second radials very small, a little wider than long, (those seen) irregularly pentagonal in form, one of the sides being much shorter than the others. Third radials as long as the first, and nearly one-third wider, (the only two visible in our specimen,) hexagonal in form, and each supporting on its superior sloping sides two secondary radials of about its own size. Each of these is surmounted by a somewhat larger second secondary radial, which in its turn supports two first brachial pieces, each of which is succeeded by a second, from which the free arms are given off. The two series of secondary radials, and the four series of brachial pieces in each ray, connect laterally, so as to leave no room for interaxillary and interbrachial pieces. Interradial plates two or three, the first being about the same size as the second radials, and hexagonal or heptagonal in form. Above this there are one or two small pieces, of variable size and form, over which the secondary radials, and the lateral series of brachial pieces of the rays on each side, connect all the way up to the free arms, in such a manner as to leave no spaces for interradians above those just described. (Anal plates unknown.)

Dome hemispherical, composed of pentagonal, hexagonal, and heptagonal plates of nearly uniform size, each of which is provided with a spine-like tubercle. Proboscis central or nearly so. Arm openings twenty. Surface smooth or obscurely granulose; small rather pointed tubercles are also seen on the second and third radial plates, first interradians, and first secondary radials.

It is possible this Crinoid may be specifically distinct from *A. pyriformis*, of Shumard, but it agrees with it in so many respects that we do not feel fully warranted in regarding it as specifically distinct. Its most important differences are the sub-spiniferous character of its plates, and the possession of only two or three interradian plates, instead of six in each interradian space. It also differs in having a more ventricose dome, while the inferior half of its body is more abruptly contracted below the arms.

Locality and position. Salt Lick Point, Monroe County, Illinois. Where it occurs in beds of the same age as the Chouteau Limestone of Prof. Swallow.

ACTINOCRINUS (AMPHORACRINUS?) CONCAVUS.—Body small, subglobose, broader than high, a little oblique; summit nearly flat; under side rounded and distinctly concave, sides rising vertically or nearly so. Surface smooth or subgranulose. Base small, concave, and entirely included within the concavity of the under side. First radial plates comparatively large, convex, and curving under, so as to form a part of the concavity below; two of them heptagonal, and three hexagonal. Second radial pieces (wanting in two of the rays of the specimen before us,) wider than long, and quadrangular in form in the others.

Third radial pieces smaller than the second, (in three of the rays,) pentagonal in form, and each supporting upon its superior sloping sides the first brachial pieces, which form a part of the walls of the body. First interradian pieces, comparatively large, or about one-half the size of the first radial plates, nine-sided, the superior sloping sides of each supporting one side of two of the brachial pieces, while two very small pieces rest upon the middle of the summit, and connect with the vault above, and with the brachial pieces on each side. First anal piece a little larger than the first radials, heptagonal in form, and supporting in the next range three pieces, the two lateral of which are larger than the other, and connect above on their sloping sides, with brachial pieces, while the middle piece between these is irregularly hexagonal,

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and supports three very small pieces in the next range, which connect with the anal opening, and the vault pieces above, and with the brachials on each side. The vault is made up of a few comparatively large pieces, the central one of which is a little more convex than the others. The anal opening is very small, lateral, or about on the same horizon as the arm openings, and surrounded by only five plates, which are not protuberant. There are twelve small arm openings arranged around the margin of the summit, three to each of the posterior rays, and two to each of the others. The arms would appear, from the small size of the openings, and the very small articulating surfaces for the reception of the first free arm pieces, to be very slender and fragile. (Column unknown.)

Height of body, 0.31 inch., breadth from the anal to the anterior side, 0.42 inch.; breadth of base, 0.17 inch.

This is a very remarkable species, differing from any other *Actinocrinus* known to us, in the concavity of the under side, and the incurved character of its first anal, and first radial pieces. Its under side presents much the appearance of *Zecrinus*, though in the number and arrangement of the parts composing the whole body it will be seen to possess all the essential characters of the great genus *Actinocrinus* as it is now understood. We place it provisionally in the sub-genus *Amphoracrinus*, on account of the lateral position of the anal opening, but we suspect it should be made the type of a distinct sub-genus. It differs from *Agaricocrinus*, in having comparatively much larger first radial pieces, as well as in the general form of its body, and its much smaller arms, which are also located around the summit, instead of around the lower part of the body.

We are under obligations to Mr. Charles Wachsmuth, of Burlington, Iowa, for the use of the only specimen we have seen.

Locality and position. Burlington, Iowa. Burlington Limestone, of the Lower Carboniferous series.

ACTINOCRINUS (PRADOCRINUS ?) AMPLUS.—Body large, unshaped, composed of thin, smooth, or finely granulose plates. Base comparatively small, somewhat spreading; columnar facet large, or between one-half and two-thirds as wide as the base, having a small marginal rim. Column strong, round, and composed of thin segments near the body, where it has a very minute round central cavity. First radial plates rather large, a little longer than wide, and all apparently hexagonal, there being no distinct angle at the middle of those alternating with the basal pieces. Second radial plates about two-thirds as large as the first, nearly or quite as wide as long, and all hexagonal. Third radials a little smaller than the second, hexagonal and heptagonal in form, and supporting on their superior sloping sides the two first brachial pieces, which are comparatively large, and each succeeded by three or four much smaller short brachials, before the arms pass into double alternating ranges of small pieces. The first anal plate is as large as the first radials, pentagonal in form, and supports two subhexagonal pieces in the next range, above which there are some twelve or thirteen other smaller pieces of various forms. The first interradial plates are a little larger than the second radials, irregular hexagonal, and each surmounted by two rather small pieces in the second range, and three in the next, over which there are six or seven still smaller pieces, making eleven or twelve in each interradial space.

After the division of the rays on the third primary pieces, the brachials above the first pair curve nearly horizontally outwards, but are included so as to form a part of the walls of the body. Beyond the fourth or fifth brachial, the arms consist of a double row of small alternating pieces, of which there are eight or ten ranges, to a point where the first bifurcation of the free arms takes place.

Beyond this division, the arms continue to be strong, rounded, and each composed of a double series of short alternating pieces, though the specimen
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under examination is not in a condition to show whether or not there were any other bifurcations. They all extend out nearly horizontally at first, and gradually curve upwards. Resting upon the inner sloping sides of each pair of first brachial pieces, there is a rather large interaxillary piece, with three or four much smaller pieces above.

The vault is moderately convex, and composed of innumerable minute pieces, and is provided with a central, or sub-central proboscis. It appears to have continued out over the anus as far as to the third or fourth ranges of small alternating arm pieces.

This species evidently belongs to the same group as that on which M. de Vernuil proposed to establish the genus *Pradocrinus*, which Prof. Koninck thinks does not differ from *Ctenocrinus* of Bronn.

Locality and position. Burlington, Iowa. Burlington Limestone. Collection of Mr. Charles Wachsmuth.

ACTINOCRINUS SILLIMANI.—Body of moderate size, distinctly stelliform, or pentalobate, as seen from below or above, in consequence of the deeply sinuous character of the interradian and anal spaces; rapidly spreading from the base to the third radials, which, with the secondary and tertiary radials, and brachial pieces, extend out horizontally. Summit nearly flat and provided with a rather small sub-central proboscis. Basal pieces short, thickened and projecting down over the summit of the column, so as to form a distinctly trilobate rim, deeply indented at the sutures; columnar facet concave, and rather less than one-third the breadth of the base. First radial plates about as large as the anal pieces, very thick and prominent; wider than high, three of them heptagonal, (the angle at the middle of the under side being very obtuse,) and two hexagonal. Second radial pieces smaller than the first, thick and prominent, wider than high, and hexagonal in form. Third radials about the size of the second, wider than long, heptagonal or hexagonal, and supporting on each superior sloping side a secondary radial. Each of the latter supports on its outer side a series of brachial pieces, and on its inner side tertiary radials, on the second of which another bifurcation takes place, making six arms to each ray, or thirty in the entire series. The two secondary, and the four tertiary radials, as well as two or three of the brachial pieces on each side of them, are covered in above by vault pieces. The first anal plate is hexagonal, and nearly as large as the first radial pieces. In the next range above, it supports two smaller hexagonal pieces, which in their turn support three pieces in the next range, the middle one of which is larger and longer than the others. On each side of this larger middle piece, there are two other smaller pieces resting upon the two lateral pieces of the third range, and connecting with the vault above, and with the brachial pieces on each side. The first anal plate is regularly hexagonal, and supports two smaller pieces in the second range, over which there are three or four still smaller pieces connecting with the vault above.

A marked feature of this species is the prominence, and very profound sculpturing of its plates. Its first radial and first anal pieces rise into elevated transverse nodes, which occupy nearly their entire surface, and project beyond the base, so as to present a distinct six-lobed outline, as seen from below. From the under side of each of these prominences, one or two short ribs connect with the base, while similar ribs connect them with each other on each side. A single, rather prominent rib also passes from each to a smaller node on each second radial piece above.

The two second anal pieces, and all the first interradians are provided in the middle with a rounded, rather small, very prominent subspiniferous node. The third radial pieces have a central prominence, connecting by short carinæ with the node on the second radial below, as well as with each of the secondary radials above. On the latter pieces, these carinæ bifurcate, and extend along the tertiary radial and lateral brachial pieces, leaving deep depressions

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between. The upper anal and interradial plates are convex, but do not generally rise into distinct nodes.

Named in honor of the venerable Prof. B. Silliman, Sr., of New Haven, Connecticut, who perhaps did more to create an interest in scientific studies and pursuits, at an early period in the history of this country, than any other person now living.

Locality and position. Clear Creek, Warren County, Illinois. Burlington Limestone.

Genus AGARICOCRINUS, Troost.

AGARICOCRINUS GRACILIS.—Body small, truncato-subglobose exclusive of the arms; under side concave, the concavity extending out to the middle of the second radial, first interradial, and second range of anal pieces, all of which are geniculated, or abruptly bent upwards, and swollen, so as to form a circle of hemispherical nodes around the margins of the concave under side.

Anal and interradial pieces rising vertically from the margins of the concavity below. Dome rather depressed, and provided with a short, strong, sub-central spine. Anal opening small, not protuberant, and placed about on a level with the arm openings, which are located slightly above the middle of the entire body, including the dome.

Base small, concave, nearly or quite hidden by the column. First radial plates flat, included within the concavity of the under side, about as wide as long, and apparently all hexagonal. Second radials slightly larger than the first, and quadrangular in form. Third radial pieces shorter and wider than the second, and each provided with an obtuse mesial ridge, which connects with the prominence of the second radials below; sub-heptagonal in outline, the superior angle being rather salient, and the slopes on each side supporting the first brachial pieces. First interradial pieces larger than the first or second radial plates, wider above the geniculation than below; irregularly octagonal in form, and supporting two smaller elongated pieces in the next range above. First anal plate small, and included within the concavity of the under side; supporting in the next range three larger pieces, the middle one of which is smaller than the other two. Above these five smaller pieces are seen in the next range, which is as far as they can be counted in the specimen examined. After the first division on the third radial pieces, the arms are each at first composed of a single nodose brachial piece, but almost immediately pass into a double series of short alternating pieces, which support a closely set range of tentacles on each side within. As they do not bifurcate again, there are but two arms to each ray, or ten in the entire series. Near the base the column is rather slender, round, and composed of alternately thicker and thinner plates, with a very small round central perforation. The surface is finely and regularly granulose where well preserved, but generally appears to be smooth.

Locality and position. Burlington, Iowa. Burlington Limestone. Collection of Mr. Charles Wachsmuth.

PLATYCRINUS MULTI-BRACHIATUS.—Body below the summit of the first radial pieces depressed, basin-shaped. Base discoid, pentagonal in outline, moderately concave below, and not prominent enough to be seen in a side view; columnar facet about one-third as wide as the base. First radial plates large, broader than high, and widening rather rapidly upwards from the base; facet for the reception of the second radial pieces prominent, extending down apparently below the middle of the plate. Second radial pieces small, triangular, wider than long, and extending obliquely outwards and upwards from the first radials.

After dividing on the second radials, the arms bifurcate again on the second piece, and the two inner divisions, which are larger than the others, bifurcate again on the second piece, above which two of the sub-divisions in some of the
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rays again divide once more, making seven rays to some of the arms and eight to others. The arms are rounded, very gradually tapering, and each composed of a double series of alternating pieces, supporting tentacles within. The sutures separating the first radials, as well as those between them and the base, are rather distinctly grooved, as well as those between the succeeding pieces, up to the last bifurcation of the free arms.

The surface of the first radial plates is rather concave, and between the projecting margin of the sinus above, and the marginal grooves; the concave space being sometimes marked by very faint traces of small radiating corrugations. Very small longitudinal obscure striæ or wrinkles, can also be seen by the aid of a magnifier on the outer side of the arms, above the last divisions.

This species is allied to *P. corrugatus* of Owen and Shumard, but differs in the style of its surface markings, being in fact nearly entirely smooth. It also differs in having a distinct marginal groove along the sides and base of its first radial plates. Its body is also proportionally higher to the summit of the first radials.

Locality and position. Burlington, Iowa. Burlington Limestone. Collection of Mr. Charles Wachsmuth.

Genus CYATHOCRINUS, Miller. 1821.

CYATHOCRINUS WACHSMUTHI.—Body depressed, obconical, or subturbinate. Base of moderate size, low, and distinctly pentagonal, the angles formed by the extremities of the plates a little incurved. Columnar facet covering about one-third to one-fourth of each basal piece. Column obscurely pentagonal near the base, the angles being rounded; central perforation comparatively large and pentagonal. Subradial plates five or six times as large as the basal pieces, about as long as wide, three of them hexagonal, and two on the anal side heptagonal, all indented or incurved at the sides and at the upper angles. First radials larger than the subradials, unequal in size, and wider than long; all heptagonal, in consequence of the truncation of the superior lateral angles apparently for the reception of small terradials, each having the angles below distinctly indented, and upper side truncated, and moderately concave for the reception of the succeeding plates. Second radials very short or nearly linear, and about two-thirds as wide as the first. Third radials generally a little narrower, and longer than the second, and apparently triangular in form. Sub-anal piece comparatively large, quadrangular, and indented at the angles; first true anal plate larger than the sub-anal piece, heptagonal in form, resting upon a very short upper truncated side of one of the subradials, and connecting on each side with the first radials; its right inferior sloping side also resting against the sub-anal piece. The arms after dividing on the third radials, are strong and rounded on the outer side; one of the divisions in each of the rays, excepting anterior one, bifurcates again on the fourth piece. All the divisions and subdivisions are rounded, gradually tapering, and composed each of a single series of pieces as long as, or a little longer than wide, and giving off at intervals of two or three pieces alternately on opposite sides, rather strong jointed lateral divisions, which extend obliquely outwards and bifurcate several times. The surface seems to be merely irregularly granulose. On examining it closely, however, traces of very small radiating slightly raised lines are seen on the subradial and radial plates, as well as extending up the principal divisions of the arms.

We take pleasure in dedicating this species to Mr. Charles Wachsmuth, of Burlington, Iowa, to whom we are indebted for the use of the specimen described.

Locality and position. Burlington, Iowa. Burlington Limestone of the Lower Carboniferous series.

Genus BURSACRINUS, N. G.

(*βυρσα* a purse; *κρινος* a lily, in allusion to the purse-like form of the typical species, as seen with its arms folded together.)

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Generic formula.

Basal plates, 5 ?

Subradial plates, 5 ; four hexagonal and one pentagonal.

Radial plates, 2×5 .

Anal plate, 1.

Interradial plates, none.

Arms, 10, bifurcating.

The crinoid upon which we propose to found this genus, has much the appearance of an *Ichthyocrinus*, with which genus it seems to agree, excepting in having true subradial plates, and but two, instead of three primary radial plates in each ray ; also in the possession of a distinct anal plate.

Notwithstanding its general similarity to *Ichthyocrinus*, its structure is more nearly like that of *Cyathocrinus*, from which it differs mainly in having only two, instead of three primary radial pieces in each ray, and much broader and flatter arms, which connect laterally as in *Ichthyocrinus*, so as to leave no interradian spaces.

BURSACRINUS WACHSMUTHI.—Body below the summit of the first radial plates rather broad turbinate, or rapidly expanding from below. Base unknown. Subradial plates of moderate size, a little wider than long, and all hexagonal, excepting one on the anal side, which is larger than the others, and heptagonal in form ; the angles at the middle of the under side of each being less salient than that above. First radial plates about one-third larger than the subradials, near twice as wide as high, and all pentagonal, the upper side being transversely truncated. Second radial pieces of the same size and form as the first, but inverted so as to bring the truncated side below ; supporting on their superior sloping sides the first divisions of the arms, which are broad, flat, and connected laterally with each other all around. Anal piece rather small, longer than wide, heptagonal, the angle at the middle of the summit being more salient than the others ; supported upon the short truncated upper side of one of the subradials, and connecting on each side with the first and second radial plates, and the first of the broad secondary radial or arm pieces above.

After the first division on the second radials, the arms bifurcate again on the sixth or eighth piece, above which one is seen to bifurcate again on the twelfth piece, which is as far as they can be traced in the only specimen seen, though they seem to be long and probably bifurcate once or oftener above.

Between the divisions on the second radial pieces, and the next bifurcation above, they are very wide, flat, and composed of short, slightly wedge-formed pieces, which are squarely truncated on each side. The next divisions above these are a little more than half as wide, and composed of a single series of pieces bearing near the same proportions of length and breadth as those below. The surface is finely granulose, though there are no traces of nodes, costæ, or other prominences on any of the plates. The sutures are merely linear, and not impressed.

We take pleasure in dedicating this interesting species, (the type of a new genus,) to Mr. Charles Wachsmuth, of Burlington, Iowa, who discovered the only specimen we have seen.

Position and locality. Burlington Limestone. Burlington, Iowa.

Genus POTERIOCRINUS, Miller, 1821.

POTERIOCRINUS ? ENORMIS.—Body small, irregularly cup-shaped ; sides somewhat convex, expanding from the base ; breadth greater than the height. Base small, spreading from the column, above which the plates are seen presenting small pentagonal faces. Subradial plates comparatively large, unequal, hexagonal in form, excepting one on the anal side, which is much larger than the others, and sub-heptagonal in outline. First radial plates

larger than the smaller subradials, longer than wide, and irregularly sub-hexagonal or heptagonal; facet for the reception of the second radials small, not protuberant outwards, shallow and about one-third as wide as the plates. Arms above the first radial pieces very slender, cylindrical, and composed of a single series of segments from twice to three or four times as long as wide. In some of the rays the first division takes place on the second, in others on the third, and in the anterior ray on the fourth piece above the first radials, after which they bifurcate irregularly once, twice, or oftener, on the second, third or fourth piece. The first anal plate is rather large, and rests upon the upper truncated side of the largest subradial plate, so as to project considerably above the first radials. Its left side curves inwards, and its right connects with another plate of nearly its own size resting upon a sloping side of the first radial on the right. Above these are seen several other plates, which form together a kind of slender lateral trunk, or proboscis, rising like an arm on a range with the true arms. Some little distance above, it curves in with its upper extremity between the arms, leaving at its base, on the left, a cavity or opening, passing apparently into the body between it and the first arm on that side.

The surface is finely granulose, and the sutures indistinct. The column is small, round, and composed of nearly equal, rather short joints, near the base.

A very marked feature of this species, is its peculiarity of having apparently a slender proboscis much like an arm, rising from the anal side, with an opening between its left side and one of the arms. This is so anomalous a character, that if we were sure it is not due to some accident, we would have regarded the species as the type of a new genus.

Locality and position. Burlington, Iowa. Burlington Limestone. Collection of Mr. Chs. Wachsmuth.

POTERIOCRINUS SUB-IMPRESSUS.—Body obconical. Base forming a shallow cup about twice as wide as high, expanding moderately from the summit of the column; composed of plates which are about as high as wide, and pentagonal in form, the angle at the middle of the upper side of each being a little indented. First radials somewhat smaller than the subradials, wider than long, pentagonal, or some of them hexagonal, and truncated above for the reception of the second radials. First anal or sub-anal plate, a little larger than the basal pieces, pentagonal, and resting between the upper sloping sides of two of the subradial pieces; second anal piece of the same size as the first, hexagonal in form, and resting upon the upper truncated side of one of the subradials, while its left side connects with one of the first radials, and its right with one side of the first anal piece, and with a third hexagonal piece resting upon it. (Succeeding parts unknown.)

The column is comparatively strong at its connection with the base, near which it is composed of rather thin segments, connected by crenulated sutures; its central perforation is of moderate size and pentagonal.

The surface seems to be granulose, and the subradial pieces show a very slight tendency to develop short costæ near the sutures on each side, and below, as well as sometimes at their connection with the first radials above.

The round indentations at the angles of the subradial and first radial plates, present a rather marked character in this species.

Locality and position. Burlington, Iowa. Burlington Limestone. Mr. Charles Wachsmuth's collection.

POTERIOCRINUS TENUBRACHIATUS.—Body small, calyculate, or turbinate below the summit of the first radial plates. Base small, forming a low pentagonal saucer-shaped cup, composed of small plates, showing a pentagonal outline above the column. Subradial plates rather large, about as wide as long, three hexagonal, and two on the anal side heptagonal, and a little longer than the

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others. First radial plates somewhat larger than the subradials, wider than long and pentagonal in form; facet for the reception of the second radials moderately prominent, a little concave, and from one-half to two-thirds the breadth of the plate. Anal plates three, the first (or subanal piece) hexagonal, and resting between the upper sloping sides of two of the subradial pieces, while another on the left rests against this, and upon the superior truncated side of one of the subradials. A third piece is supported on the upper truncated side of the subanal piece, and projects more than half its length above the first radial on its right. The succeeding primary radial pieces after the first, are distinctly smaller, and a little wider than long. In all excepting the anterior ray, where the bifurcation takes place on the fifth plate, the first division of the arms takes place on the fourth primary radial. Above this the arms, which are very long, slender and rounded, divide again on the fourth piece, after which the divisions bifurcate three or four times, and become very attenuate. Each division is composed of a single series of pieces, usually about twice as long as wide.

The proboscis connects directly with the anal plates already described, and is made up of hexagonal plates, along the sutures of which, distinct vertical ranges of rather large and distinct pores are seen. The entire surface is finely granulose. The sutures are linear and not grooved or impressed. This species is similar to *P. calyculatus* of Hall, but may be at once distinguished by its sutures not being excavated, and by its much more slender arms, which are composed of elongate, instead of short wedge-formed pieces.

Locality and position. Burlington, Iowa. Burlington Limestone. Collection of Mr. Charles Wachsmuth.

POTERIOCRINUS CARINATUS.—Body small, basin-shaped or rather rapidly spreading below the arms. Base very small, having the form of a pentagonal star, the angles of which project but slightly beyond the column. Subradial pieces small, about as wide as long, four of them hexagonal, (the form of the one on the anal side is not distinctly visible in the specimen examined;) all rather prominent, and provided with a vertical carina near the upper angle. First radial pieces about twice as large as the subradials, as wide again as high, and pentagonal in form, the upper side being truncated, and longer than either of the others. Second radials slightly larger than the first, wider than high, quadrangular, and a little constricted around the middle.

Third radials about the size of the first, pentagonal in form, and like the second slightly constricted, the upper angles being rather salient. The anal plates are not all preserved in the specimen before us, though we can see that the first or subanal piece is of moderate size, pentagonal in form, and extends so far down between two of the subradials, as to connect (apparently) by a very short side, with the produced extremity of one of the basal pieces. Its right superior sloping side supports one edge of a first radial above, and it evidently supported another piece on its superior truncated edge, while it connects on the left with another resting on the upper truncated side of one of the subradials.

After the first division of the third radials some of the arms bifurcate again on the fifth, sixth or seventh piece, while others seem to be simple. They are all composed of pieces which are a little constricted around the middle, as long as wide, and alternately longer and shorter on opposite sides, the upper extremity of the longer side of each being a little projecting for the reception of the tentacles, so as to give a zigzag appearance to the arms. The tentacles are large, and composed of rather long joints. Owing to the length of the arm pieces, and the fact that only every alternate piece on the same side supports a tentacle, they are very widely separated and alternately arranged.

The surface seems to be granulose, and each ray is provided with a distinct linear carina, commencing on the middle of each first radial piece and extend-

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ing up along each division of the arms to their extremities. The sutures between the primary radials seem to be a little gaping, as in *Scaphiocrinus*, to which the species appears to bear some relations in other respects. The anal side of the specimen being imperfect, we are left in some doubts in regard to the generic characters of this species. In some respects it seems to agree more nearly with *Cyathocrinus* than *Poteriocrinus*, though it evidently possessed more anal pieces than occur in the latter genus. The carinated character of its arms and primary radial pieces is a peculiarity that will readily distinguish it from any other species with which we are acquainted.

Locality and position. Burlington, Iowa. Burlington Limestone. Mr. Charles Wachsmuth's collection.

Subgenus SCAPHIOCRINUS, Hall, 1858.

POTERIOCRINUS (SCAPHIOCRINUS?) CARBONARIUS.—Body small, depressed or basin-shaped below the summit of the subradial plates, rounded and concave below, composed of thick, convex, smooth plates, which are connected by distinctly impressed sutures. Base small, concave, and pentagonal in outline. Subradial plates a little longer than wide, directed obliquely outwards from the base, and curving upwards at the extremities; all pentagonal, excepting one on the anal side, which is a little truncated at the upper extremity for the reception of one of the anal pieces; upper angle of each rather salient. First radials nearly twice as large as the subradial pieces, wider than long, pentagonal, or subheptagonal, the upper side being truncated, and concave on its outer slope. Second radial pieces nearly twice as long as wide, pentagonal in outline, rounded on the outer side, and distinctly constricted around the middle; supporting the first division of the arms on their superior sloping sides.

We are in some doubt in regard to the generic relations of this species, not having seen the arrangement of its anal pieces. It agrees with Prof. Hall's subgenus *Scaphiocrinus* in the elongated and constricted form of its second radial pieces, as well as in having the sutures between these pieces and the first radial plates widely gaping. It differs, however, from the typical forms of that group in having a concave base. It also seems to differ from *Scaphiocrinus*, as well as the typical forms of *Poteriocrinus* in apparently having between the second radials small interrarial pieces, yet we are not sure the pieces seen occupying the interrarial spaces may not be fragments of the arms that have accidentally been placed in this position. We suspect, however, it may belong to an undescribed genus, but prefer to place it in the genus *Poteriocrinus*, until we can see better specimens.

Locality and position. Near Springfield, Ill. Coal Measures.

POTERIOCRINUS (SCAPHIOCRINUS) SOLIDUS.—Body small but strong, calyculate or inversely bell-shaped below the top of the first radial plates; sides expanding rather gradually, with a slightly convex outline to near the middle of the first radial plates, above which they curve a little outwards. Base depressed, spreading from the summit of the column; pentagonal in outline, each piece showing a rather short pentagonal face above the column. Subradials about as wide as long, three hexagonal and two heptagonal. First radial plates nearly twice as large as the subradials, wider than long, and pentagonal in form, the upper side being transversely truncated and a little concave; second radial plate narrower than the first, longer than wide, pentagonal in form, (excepting in the anterior ray, which is simple,) and distinctly constricted around the middle.

First anal (or subanal) plate pentagonal, and resting between the upper sloping sides of two of the subradial plates; connecting on the left with another, which rests upon the superior truncated side of a subradial. The upper truncated extremity of the first anal or subanal plate supports a third

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piece, which extends nearly half its length above the first radial on its right. The arms above the first division on the second radial plates are strong, angular on the outer side, and (excepting in the anterior ray) bifurcate again on the sixth or eighth plate, beyond which they are simple, as far as they can be traced in the specimen under description. They are each composed of a single series of pieces, which are as long as wide, or somewhat longer, a little wedge-shaped, and alternately prominent or subnodose on opposite sides, so as to give the arms a somewhat zigzag appearance. The surface is finely granulose; and while the sutures are scarcely visible between the body plates, those between the first and second radials are distinctly gaping.

Locality and position. Burlington, Iowa. Burlington Limestone. Mr. Charles Wachsmuth's collection.

POTERICRINUS (SCAPHICRINUS) WACHSMUTHI.—Body small, inversely bell-shaped below the summit of the first radial plates, wider than high. Base small, scarcely visible in a side view, and extending a little beyond the summit of the column, which is round and composed of rather thin segments near the body. Subradial plates as wide as high, convex, four hexagonal and one heptagonal. First radial plates from one-third to one-half larger than the subradials, wider than long, truncated above and pentagonal in form, the upper side being longer than the others. Second radial pieces somewhat larger than the first, distinctly constricted around the middle, about as long as wide, and pentagonal in outline, the upper superior angle being rather acute. First anal plate larger than the subradials, hexagonal in form, resting upon the truncated upper side of one of the subradial pieces, and projecting nearly half its length above the first radial plates on each side of it. The arms, after the division on the second radial pieces, appear to be simple, very long, and gradually tapering. They are each composed of a single series of joints, all of which are longer than wide, somewhat constricted around the middle, and alternately longer and shorter on opposite sides, the upper extremity of the longer side of each projecting out for the reception of the tentacles, so as to give the arms a zigzag appearance. The tentacles are strong and composed of joints which are two or three times as long as wide, and distinctly grooved on the inner side.

The surface is granulose, and the sutures well defined; while at each corner of the subradial plates there is a deep round pit or depression. This species seems to be related to *S. spino-brachiatus* of Hall, but differs in the form of its body, and in having longer arm pieces, which are also without spines. It has remarkably long arms, and a neat symmetrical bell-shaped body below the first radials.

Locality and position. Burlington, Iowa. Burlington Limestone. Collection of Mr. Charles Wachsmuth.

BLASTOIDEA.

Genus PENTREMITES, Say, 1820.

PENTREMITES CORNUTUS.—Body under medium size, subglobose, broader than high, the widest part being at the middle; upper and lower extremities truncated. Base deeply concave, and entirely within the concavity of the under side. Radial pieces long, or extending from the base of the body to near the summit; narrow, somewhat contracted above and below, and divided by the pseudo-ambulacral areas nearly four-fifths their entire length; all very thick and rising into prominent carinae on each side of the pseudo-ambulacral fields. Interradial pieces of moderate size, and each projecting out in the form of a very prominent, compressed horn-like process. Pseudo-ambulacral areas very narrow, or lance-linear, and deeply implanted between the very prominent, carinated forks of the radial plates. (Summit unknown.)

Height 0.45 inch, breadth 0.54 inch; greatest breadth of radial pieces, 0.20 inch; breadth of pseudo-ambulacral areas, 0.04 inch.

This species will be readily distinguished from all the others yet known by 1861.]

its prominent horn-like interradial pieces, and its strongly carinated radial plates. These carinae are so prominent and regular, as to give the body the appearance of being divided into ten sharply angular ridges, or lobes, extending from near the summit to the base, the intervening depressions at the sutures, and those containing the pseudo-ambulacral fields being about equal.

Locality and position. Dry Fork, Brown Co., Ills. St. Louis Limestone.

PENTREMITES MELO, var. *PROJECTUS*.—This Pentremite agrees with *P. melo* of Owen and Shumard, excepting that its base is proportionally a little larger, and instead of being concave, projects so as to be distinctly visible in a side view. Its pseudo-ambulacral areas are also not continued down quite so near the base of the radial pieces as in *P. melo*. It may be a distinct species, but the difference seems to be scarcely of specific importance.

Both of these forms differ from the typical species of the genus *Pentremites*, in having each pair of ovarian openings distinctly separated, instead of closely united with merely a thin septum between. In this character, as well as in form, and the prolongation of the pseudo-ambulacral areas, they agree with the genus *Nucleocrinus* of Conrad, (= *Eleacrinus*, Rømer,) from which they differ in having the anal and oral openings distinct as in the true *Pentremites*. They constitute a sub-genus of *Pentremites*, occupying a position between the typical forms of that genus and *Nucleocrinus*.

Locality and position. Burlington, Iowa. Burlington Limestone. Collection of Mr. Charles Wachsmuth.

ASTERIDEA.

Genus *PETRASTER*, Billings, 1858.

PETRASTER WILBERANUS.—This beautiful star-fish resembles rather closely *Petraster rigidus* of Billings, (Decade III. Org. Rem. Canada, plate ix. fig. 3^a,) but is smaller, and has more slender rays, with more angular spaces between. It also differs in having but two ranges of plates on each side of the ambulacral grooves, on the under side, instead of three. These pieces are about of the same size in each row, and sometimes appear to alternate; they are all rather prominent, and those of the outer range project a little laterally in the form of small nodes. Towards the outer extremities of the rays, however, the lateral ranges are contracted behind the others, so as to be scarcely visible from below. About 23 of these pieces may be counted on each side of the ambulacral furrow in each ray. The ambulacral furrows are very narrow, and indeed seem to be closed towards the extremities of the rays, by the gradual approximation of the inner rows of pieces on each side, which alternate and appear to fit together.

Our specimen only shows the under side, but along the outer margins of two of the rays, there is some appearance either of the overlapping of some of the dorsal parts by pressure, or of a slightly developed disk. This part does not seem to have any distinct range of marginal plates, but appears to be made up of small pieces, covered with granules, or bases of small spines.

We take pleasure in dedicating this interesting species to Prof. C. D. Wilber, of the Illinois State Normal School, to whom we are indebted for the use of the only specimen we have seen.

Greatest diameter about 1 inch; smaller diameter 0.33 inch.

Locality and position. Oswego, Kendall Co., Ill., in rocks of the age of the Trenton or Hudson River Group of the N. Y. series.

MOLLUSCA.

BRACHIOPODA.

Genus *PRODUCTUS*, Sowerby, 1812.

PRODUCTUS MAGNUS.—Shell large, semi-oval, or sub-hemispherical in outline;

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ventral valve gibbous, with a moderately shallow sinus, which usually becomes obsolete on the posterior part of the shell, before reaching the beak. Cardinal line scarcely as long as the entire width of the shell. Auriculate expansions moderately developed, and ornamented with a row of short spines, extending from the beak to the lateral angles, while there are indications of similar spines, scattered at irregular intervals upon the lateral borders and front of the shell. Dorsal valve concave, flat on the central and posterior portions of the shell, with a slightly rounded elevation, which corresponds to the sinus in the ventral valve. Surface of both valves ornamented with rather coarse rounded striæ, which increase by intercalation and bifurcation, and are about as wide as, or a little wider than, the spaces between them. These striæ are more tortuous and irregular upon the dorsal than on the ventral valve. Beak short, depressed, and extending but little beyond the cardinal border.

Length of an average sized specimen 3·75 inches, width 4·25 inches, height 1·50 inch.

This is the largest *Productus* known to us in the rocks of this country, and may be distinguished from the large varieties of *P. semireticulatus*, which it most nearly resembles, by its shorter and less elevated beak, as well as by the arrangement of the spines upon its surface, and by well marked internal differences which can only be explained by the aid of figures. It has heretofore been referred to the European *P. giganteus* (Martin,) but Mr. Thos. Davidson, to whom we sent specimens, has decided that it is not identical with that species.

Locality and position. Monroe County, Ill., and St. Genevieve County, Mo., in the Keokuk Limestone.

SPIRIFERA GLABRA, var. *CONTRACTA*.—Shell rather under medium size, quadrato-subcircular in outline, becoming moderately gibbous with age; length and breadth nearly equal, sides rounded; hinge short or scarcely equalling half the breadth of the valves near the middle. Dorsal valve much more compressed than the other, most convex along the middle from near the beak to the front, and sloping towards the sides; hinge margin truncated; beak very small, scarcely projecting beyond the hinge line, slightly incurved; area narrow. Dorsal valve gibbous, provided with a narrow, shallow sinus, commencing near the middle, and widening to the front, which is a little produced to fill a shallow sub-semicircular sinus in the anterior margin of the opposite valve; beak prominent, incurved, and rather pointed at the extremity; area very much contracted, triangular, more or less arched, and very obscurely defined; foramen rather large, or occupying near three-fourths of the small area, having nearly the form of an equilateral triangle, and apparently open to the beak. Surface nearly smooth, or only having obscure marks of growth, and sometimes showing, by the aid of a lens, faint traces of fine radiating striæ.

Length of largest specimen, 0·86 inch; breadth 0·90 inch; convexity 0·58 inch; length of hinge 0·45 inch.

This shell agrees so nearly with some varieties of *Spirifera glabra*, Martin, (sp.), that we have not been able to fully satisfy ourselves that it is specifically distinct, though we strongly suspect that it will prove to be so. In form it is almost exactly like Mr. Davidson's fig. 33, pl. 1*, in his Monograph of the Carboniferous Brachiopoda of Scotland, representing a rather small specimen of Martin's species. It differs, however, from this, and all the varieties of *S. glabra* we have seen figured, in having a much smaller, and more obscurely defined ventral area. Indeed the sides of the beak of its ventral valve round in so regularly to the foramen, that it is often difficult to see where the margin of the area is. As this character is persistent in the five specimens of different ages that we have seen, we should not hesitate to con-
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sider our shell distinct from *S. glabra*, were that species not known to be so extremely variable.

Locality and position. Chester and Pope Counties, Illinois. Chester Limestone of the Lower Carboniferous series.

LAMELLIBRANCHIATA.

Genus CARDIOPSIS, M. & W.

(*Cardium* and $\sigma\mu$, from its resemblance to *Cardium*.)

Shell equivalve, somewhat inequilateral, very slightly oblique, ovate or cordiform, entirely closed; beaks rather elevated, distinctly incurved, and directed towards the anterior side; surface marked by radiating striæ or costæ; cardinal margin short, and rounding into the posterior border; hinge provided with one or two distinct anterior teeth in each valve, near the beaks. (Ligament and muscular impressions unknown.)

In first describing the species we regard as the type of this genus, we placed it provisionally in the genus *Cardiomorpha* of De Koninck, stating at the same time that we suspected it to be generically distinct.* Prof. Hall has since described the same species from the same locality, in the Thirteenth Annual Report of the Regents of the University of New York, under the name of *Megambonia Lyoni*, and mentions the presence of two strong anterior teeth in the hinge of one valve. On clearing away the matrix from the hinge of one of our specimens, we have been able to see impressions of these teeth, the presence of which establishes, we think, the correctness of our suggestion, that it does not properly belong to the genus *Cardiomorpha*.

It is not improbable some of the species ranged by Prof. Koninck in his genus, (when all their characters can be made out,) may be found congeneric with our shell; though it is manifest those he considered the typical species are not, since he distinctly states that the hinge is without teeth, and provided with a smooth lamina from the beaks to the posterior extremity, as some of his figures show. In addition to this, all the species described by him, (with one single exception, which is a transverse shell, and apparently a wide departure from his typical species, as well as from ours,) are merely marked by concentric striæ, and show no traces of the regular radiating costæ seen on our shell.

Prof. Hall has described another species of this group, from near the same horizon, under the name of *Cardiomorpha ovata*, (non *C. ovata* DeOrbigny,) in the Iowa Report, vol. i. part ii. p. 522. The radiated surface and general appearance of these species give them somewhat the aspect of some species of *Ambonychia* of Hall. They differ, however, from that group, in having no posterior hinge teeth, and in being destitute of a hinge area, as well as in having a shorter, and less straightened hinge. They have scarcely any relations to Prof. Hall's genus *Megambonia*, which is founded on his *Pterinea? cardiformis*, of the Corniferous Limestone, and belonging apparently to a different family.

Genus LEDA, Schumacher, 1817.

LEDA CURTA.—Shell small, ovate, rather gibbous in the central and umbonal regions; anterior side abruptly rounded, the most prominent point being at the middle; base semi-ovate, more prominent in the antero-ventral region than behind; posterior side abruptly contracted, so as to become subangular at the extremity, beaks elevated, incurved, and nearly central; dorsal outline declining rather rapidly from the beaks, the anterior slope being convex, and the posterior slightly concave, posterior umbonal slopes prominently

* *Cardiomorpha radiata*, M. & W., Proceed. Acad. Nat. Sci., Phila. Oct. 1860.

rounded, or subangular from the beaks to the narrow anal extremity. Surface ornamented by very regular, closely arranged concentric striae, about ten of which may be counted in 0·05 of an inch. (Hinge and interior unknown.)

Locality and position. Waterloo, Monroe Co., Ill. St. Louis Limestone.

GASTEROPODA.

Genus DENTALIUM, Lin. 1740.

DENTALIUM VENUSTUM.—Shell very slender, and slightly tapering, nearly straight, rather thin; section circular, surface smooth.

Length, 0·80 inch; diameter of larger end, 0·09 inch; do. at smaller end, 0·03 inch.

It is probable where the surface of this shell is well preserved, very fine striae of growth could be seen by the aid of a lens, but in all of those we have examined, no traces of surface markings of any kind are visible. It seems to be allied to *D. antiquum*, of Goldfuss, (a Devonian species,) but is proportionally thinner, and has a smooth surface. From *D. priscum* of Munster, it differs in being much more slender and more gradually tapering. We have before us a few fragments of apparently the same species, but of larger size, from Spergen Hill, Ind., where they are associated with the small fossils described by Prof. Hall from that locality. Prof. H. has described in the Iowa Report, (p. 666,) a larger, more robust, and more curved species, from Warsaw, Ill., under the name of *D. primum*, and gives the Warsaw Limestone as its geological horizon. This, however, is an error, the specimen described by Prof. Hall, belongs to one of us, (A. H. W.), and is from the Keokuk Limestone, near Warsaw, Illinois.

Locality and position. Waterloo, Monroe County, Ill. St. Louis Limestone.

Genus STRAPAROLLUS, Montfort, 1810.

STRAPAROLLUS SIMILIS.—Shell very small, sub-discoidal; spire much depressed, volutions four and a half to five, increasing rather gradually in size, horizontally flattened above from the suture to a moderately distinct revolving angle near the middle of the upper side, thence a little compressed on the upper outer slope, and rather narrowly rounder over the periphery; under side of last turn rounded, excepting in the middle, where there is an obtuse, but well defined revolving angle. Umbilicus (measuring across from its marginal angle on the middle of the body whorl,) once and a half the breadth of the last turn at the aperture, deep, and showing the inner side of all the whorls of the spire; suture well defined. Aperture subcircular, or a little modified by the succeeding turn, and the flattening on the upper side of the whorls; lip not oblique. Surface marked by rather obscure lines of growth.

Height (of a medium sized specimen) 0·18 inch; breadth, 0·31 inch; diameter of aperture, 0·08 inch.

This delicate little shell seems to be almost an exact miniature of our *S. planodorsatus*, excepting that its spire is a little more elevated, its periphery slightly less regularly rounded, and its umbilicus proportionally smaller. It appears to stand as it were intermediate between that species and our *S. umbilicatus*, being more elevated than the first and less than the last. It is certainly not the young of either of these forms, however, since the largest of our specimens never attain more than one-tenth the size of those shells, and yet have the same number of whorls.

We have before us specimens of a very closely allied form from Spergen Hill, Indiana, which agree exactly in size and form, excepting that the angles
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of the whorls are less distinct, and the flattening of the upper side of the whorls is not quite so broad. These, we think, probably belong to the species under consideration, as they differ from any of those described by Prof. Hall from that locality, resembling them in other respects, in having a smaller umbilicus, more rapidly enlarging whorls, and a more elevated spire.

Locality and position. Waterloo, Monroe Co., Ills. St. Louis Limestone.

STRAPAROLLUS SIMILIS, var. *PLANUS*.—This form differs from the last in having its spire completely flattened so as to be upon a level with the last turn, and in having a slightly larger umbilicus; while the angle on the under side of the body whorl is a little farther out from the umbilical side. The flattened space on the upper side of its whorls also differs in sloping inwards instead of being horizontal; and its suture seems to be more distinct. Notwithstanding these differences, these forms agree so very nearly in size and other respects, that we do not feel quite warranted in regarding them as distinct species. Should it be thought necessary, however, to separate them specifically, the form under consideration can take as a specific name that by which we have designated it as a variety.

It is an interesting fact that these two forms taken together, present an exact miniature representation of the two varieties of *S. pentangulatus* (Sowerby's sp.) The fact, however, that the shells under consideration present all the appearance of mature growth, and never attain more than one-twentieth the size of *S. pentangulatus*, while they have only two or three whorls less, is, we think, sufficient reason for regarding them as distinct.

Locality and position. Same as last.

Genus ORTHONEMA, M. & W.

(*Ety m.*— $\sigma\theta\epsilon\sigma$, straight; $\nu\eta\mu\alpha$, thread.)

Shell elongate, many whorled; volutions ornamented with revolving carinæ, crossed by nearly straight lines of growth; body whorl not produced below; aperture angular above, slightly effuse below; peristome incomplete; lip simple, nearly straight; axis imperforate.

The shell upon which we propose to found this genus, has much the appearance of a *Murchisonia*, but differs in being entirely destitute of a spiral band, or a sinus in the lip as in that genus and *Pleurotomaria*, the lines of growth being distinctly seen crossing the carinæ, and the spaces between, without making the slightest curve. In first indicating the typical species of this genus, (*Eunema Salteri*, Proceed. Acad. Nat. Sci. Phila. Oct. 1860,) we referred it, with a query, to Mr. Salter's genus *Eunema*; later comparisons, however, have satisfied us that it cannot properly be placed in that group, since it does not possess the peculiar sigmoid lip characterizing the forms described by Mr. Salter. It also differs in having its whorls closely contiguous at all stages of growth; while its inner lip is less developed, and its columella is not provided with a ridge or angle as in the typical species of *Eunema*.

From the genus *Turritella*, some species of which our shell resembles in form and general appearance, it differs in its slightly effuse and less rounded aperture, disconnected peristome, and straight outer lip. It is probably more nearly allied to *Loxonema*, than to any of the groups we have mentioned, but presents the well marked difference of being provided with distinct revolving carinæ, and a straight, instead of a sigmoid outer lip. It will probably include several species of *Turritella*-like shells from the Coal Measures.

Genus LOXONEMA, Phillips, 1841.

LOXONEMA MULTICOSTATA.—Shell small, conical; spire moderately elevated; volutions about seven and a half, somewhat convex, increasing gradually in

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size; last one forming about one-third the entire length, rounded, not much produced below; suture well defined; aperture oval subrhombic, slightly effuse on the inner side below; outer lip thin, and nearly straight; inner lip a little reflexed. Surface ornamented by small, regular, straight, vertical folds or costæ, about equalling the spaces between, and numbering near thirty on the body whorl. Costæ obsolete on the under side of the last turn; no lines of growth visible under a lens.

Length, 0·36 inch; breadth, 0·15 inch; apical angle nearly regular, divergence about 28°.

Locality and position. Hodges Creek, Macoupin Co., Ill. Coal Measures.

CEPHALOPODA.

Genus ORTHOCERAS, Breynius, 1732.

ORTHOCERAS ANNULO-COSTATUM.—Shell attaining a medium size, and having the form of an elongated, moderately compressed cone, the sides of which converge towards the apex at an angle of about 14°. Section elliptical, the greater transverse diameter being to the smaller, as 100 to 80. Surface ornamented with slightly oblique, annular costæ, which are less than the depressions between, and rather sharply elevated on the smaller half of the shell, but become gradually obsolete towards the aperture, where they are no more widely separated than near the smaller end. Traces of fine transverse striæ are also seen on well preserved specimens, both between and upon the costæ. (Septa and siphuncle unknown.)

The largest specimen we have seen is about five inches in length, (both extremities being incomplete,) and 1·83 inches in its greater diameter at the larger end, while the greater diameter at the smaller end is near 0·70 inch.

This species bears some resemblance to *O. dactylio-phorum* of De Koninck, (An. Fos. Ter. Carb. Belg. p. 518, Pl. XVII. fig. 1 A, and XVIII. fig. 7, a, b,) but differ in being more tapering and somewhat compressed instead of round.

Locality and position. Chester, Ill. Chester Limestone.

Genus NAUTILUS, Breynius, 1732.

Subgenus TREMATODISCUS, M. & W.

(τρήμα and δισκος,) in allusion to the perforated umbilicus, and the discoid form of the shell in the typical species.

We propose to range under the above subgeneric name, a peculiar group of *Nautili*, which differ so materially from the living typical species of *Nautilus*, that few Conchologists would place them even in the same genus, if they were found inhabiting our present seas. These shells are characterized by a discoid form and a wide shallow umbilicus, usually, if not always, perforated in the middle. Their whorls are slender, very slightly embracing or merely in contact, and provided with revolving angles and grooves, while the surface is frequently ornamented with revolving striæ. The siphuncle is central, or located between the middle and the dorsal side, though never quite marginal.

In first publishing descriptions of some of the forms included in this subgenus, we proposed to retain for it Prof. King's abandoned name, *Discus*. As this name had, however, been previously used by Fitzinger (in 1833) for a group of *Helicidæ*, and by Prof. Haldeman (in 1840) for a group of *Limnæidæ*, it becomes necessary to introduce a new name for the group under consideration.

Although in some respects analogous to *Discites* of McCoy, these shells differ 1861.]

from the typical forms of that group, in having a perforated umbilicus; while their whorls are less compressed laterally, more slender, and provided with several distinct revolving angles and grooves. They also differ in being often ornamented with well defined longitudinal lines.

This group appears to be mainly, if not exclusively, confined to the Carboniferous system, and will include in addition to our *N. digonus* and *N. trisulcatus*, the following foreign species: *Nautilus stigalis*, *N. Edwardsianus*, and *N. Omalianus* of Koninck, together with *N. sulcatus*, *N. pinguis* and *N. cariniformis* of Sowerby.

We believe all such fossil shells will some time be separated entirely from the genus *Nautilus*.

NOTE.—Our recent investigations enable us to make the following corrections in regard to a few of the fossils described in our papers of September and October, 1860:

1. *Cyathocrinus scitulus* (Sept. 1860). In comparing this species with those described by Prof. Hall, in the supplement to the Iowa Report, we overlooked its probable identity with his *C. sculptilus*. The fact that he had described the first anal plate of *C. sculptilus* as being "nearly as large as the subradials [and] heptagonal" in form, led us to regard our crinoid as a distinct species, and it was not until our description was in print, that a more careful examination of his diagram on page 60, satisfied us that he had inadvertently described one of the subradial plates as the first anal piece. When this correction is made in his description, it agrees so nearly with our crinoid, that we have scarcely a doubt in regard to its identity with his species; and as his name was first published, it will have to take precedence.

2. *Platystoma nana*, (Oct. 1860). Better specimens show this to be a true *Naticopsis*.

3. *Eulina peracuta*, (Oct. 1860), should be ranged under *Polyphemopsis*, of Portlock, probably a section of the genus *Lozonema*.

4. *Orthoceras expansum*, (Oct. 1860), belongs to the genus or subgenus *Actinoceras*.

5. *Cyrtoceras curtum*, (Oct. 1860), should be ranged under the subgenus *Aploceras*.

Descriptions of New Fossil Mollusca, from the Cretaceous Formation at Haddonfield, New Jersey.

BY ISAAC LEA.

In December, 1858, I published, in connection with Prof. Leidy and W. Parker Foulke, Esq., in the Proceedings of the Academy, some account of the *Green Sand Formation* at Haddonfield, New Jersey. I then gave reasons for believing that this interesting and extensive deposit—which my late learned friend, Professor Vanuxem, was the first to place on its true horizon, in relation to the well known Cretaceous deposits of Europe—might be the analogue of the "*Etage Cenomanien*" of D'Orbigny. The object being, then, simply to make out some of its relations, its extent so far as known, and its true position in relation to our *Cretaceous Formation*, I gave only a list of genera of the *Mollusca*, found by Mr. Foulke and myself. I now give a complete list of all the species we then discovered, and I add descriptions of the few species which had not heretofore been observed. It will at once be recognized by those who have studied the Cretaceous masses of the United States, that there is a very strong similarity, if not identity, of this deposit at Haddonfield, with that of the "*Ripley Group*" in Mississippi, from which Mr. Conrad and Mr. Gabb have

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