Paleontology

of

Late Cambrian and Early Ordovician Formations in Missouri

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CHAPTER VI.

SYSTEMATIC PALEONTOLOGY.

E. O. Ulrich, Aug. F. Foerste and J. Bridge.

During the past 30 years, Doctor E. O. Ulrich has devoted much time to the study of the fossils from the late Cambrian and early Ordovician (Ozarkian and Canadian) formations, and has recognized several hundred species, the great majority of which are undescribed. The task of describing and figuring these forms is an enormous one, and while much has been accomplished, a great deal more remains to be done. At the present time, Ulrich and Foerste have nearly completed a monograph on the Cephalopods of the proposed Ozarkian and Canadian systems. Preliminary descriptions of many of the gastropods have been prepared by the writer, under Ulrich's direction, while Ulrich himself has made numerous preliminary studies of the trilobites and other groups.

Since the publication of these papers cannot be expected for some time, it has been deemed advisable to describe and figure a few of the most common forms found in each formation from the Potosi to the Roubidoux inclusive.

DESCRIPTION OF SPECIES.

GASTROPODA

E. O. Ulrich and Josiah Bridge

Gastropods are by far the most obvious and abundant fossils found in the rocks of the Eminence region, and many of them have proved to be excellent index fossils. The descriptions and figures on the following pages have been abstracted from a report upon the Gastropods of Ulrich's proposed Ozarkian and Canadian systems, now in the course of preparation. They show a few of the great host of forms, mostly undescribed, which have been collected from these formations.

Patellacea,* Ulrich and Schofield

Hypseloconus, Berkey

1898—Hypseloconus, Berkey, Amer. Geol., Vol. XXI, pp. 282-3.

Genotype: *Hypseloconus* (*Metoptoma*), *recurvus* (Whitfield).

Original Description—"Shell conical, high; apex smooth and more or less recurved toward or even beyond the broader margin of the oval aperture; aperture entire and

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*The assignment of genera to families is provisional.

more or less acuminate anteriorly; surface smooth or striated; muscle scars in six pairs forming a circle parallel to the aperture and about one-third of the distance from the base to the apex."—Berkey, 1898.

Stratigraphic and Geographic Distribution—*Hypseloconus* was originally described by Berkey from the Franconia sandstone (Upper Cambrian) of Wisconsin, and it has subsequently been found at a similar horizon in the Davis formation of Missouri. While not widely distributed within the formations named, it is abundant where found. Berkey describes five species and one variety from the Franconia of Wisconsin and Minnesota, to which should be added Whitfield's *H. recurvus*, making a total of 7 forms from the Cambrian of that locality. Most of these forms, and in addition, a few others not yet described, occur in the Davis of Missouri.

The genus is represented by a single species in the Potosi, another in the Eminence, and by two forms in the Van Buren, one of which or a closely allied form, continues into the Gasconade. It has not been found above this latter horizon.

Hypseloconus ozarkensis, Ulrich and Bridge, new species.

Plate XX, figures 23, 24, 25, 26.

Description—Shell conical, height commonly slightly greater than length. Apex pointed, slightly anterior to the center and only very slightly recurved; aperture ovoid and narrowest anteriorly, sides sloping uniformly, no longitudinal keels or furrows developed. On most specimens there is a distinct impressed band from 1 to 3 mm. in width according to the size of shell, completely encircling it, at about ⅓ of the height from the apex to the margin. The dimensions of the cotypes are length 29 and 18.5 mm., width 18 and 13 mm., height 20.5 and 16.5 mm.

Occurrence—Cotypes, U. S. N. M. No. 83533-a-b-c, from chert of the Van Buren formation, at locality 102-c, one mile east of Eminence, Shannon County, Mo.

Remarks—This species strongly resembles *H. stabilis*, Berkey, but is narrower and more compressed anteriorly.

Hypseloconus compressus, Ulrich and Bridge, new species.

Plate XX, figures 20, 21, 22.

Description—Shell conical, compressed anteriorly, expanding posteriorly. Apex pointed, directed posteriorly, anterior profile convex, posterior profile concave, the sides sloping uniformly, flaring outward as they approach the posterior margin. Aperture ovoid, almost pointed anteriorly. Impression of muscle band distinct, about ¼ height of shell above margin. Surface marked with fine concentric lines. Dimensions of the holotype are length 15.5 mm., width 14.5 mm., height 14 mm.

Occurrence—Holotype, U. S. N. M. No. 83532 from chert of the Van Buren formation at locality 102-e, 1 mile southeast of Eminence, Shannon County, Mo., on the old Van Buren road.

Remarks—This form resembles a diminutive *H. recurvus* (Whitf.), but in that species, the apex is always anterior to the center of the shell, and the proportionate height of the shell is somewhat greater. A form indistinguishable from *H. compressus* except for its larger size and slightly more strongly compressed anterior portion, occurs in the Gasconade of Missouri at a few localities.

"Pleurotomariidae", d'Orbigny

Dirhachopea, Ulrich and Bridge, new genus.

Description—Shell small to medium in size; consisting of five or more slowly expanding volutions; spire low in the more typical forms, moderately high in others. Whorl quadrangular or rounded quadrangular in cross-section; suture strongly de-

pressed, the final whorl becoming detached in some forms. Peripheral keel double, enclosing a distinct band; aperture with a deep peripheral notch, the apex of which corresponds with the end of the band. Surface markings consist of fine concentric striae, and occasionally broad undulations, both of which are parallel to the outline of the aperture.—Genotype *D. normalis*, new species.

This genus is to be distinguished from *Rhachopea* by the presence of the peripheral band with its two keels; by its more slowly expanding whorls and by its greater number of whorls. The tendency of the last whorl to separate from the spire is well marked in many species of *Dirhachopea*, and so far has not been observed in any species of *Rhachopea*.

Stratigraphic and Geographic Distribution—This genus appears to be confined to the Potosi, Eminence and Proctor dolomites, and so far has not been found outside the Ozark region. It is highly characteristic of cherts derived from the Eminence dolomite, no less than 8 species occurring here. It is also well represented in cherts derived from the Proctor dolomite, but has not been reported from younger strata. A single specimen referable to this genus has been obtained from chert derived from the Potosi dolomite and doubtless more would be found, if this chert were better adapted to the preservation of fossils.

Dirhachopea normalis, Ulrich and Bridge, new species.

Plate XVIII, figures 14, 15, 16.

Description—Shell of medium size, consisting of five whorls. Spire low, apical angle 160-165°. Whorl gradually expanding; subquadrangular in cross-section, the diameter of the final whorl about twice the diameter of the preceding one; the last half of the final whorl often not in contact with the remainder of the spire and variously deflected. In most instances it rises slightly so that the upper portion of the aperture is as high or higher than the spire. Peripheral band narrow, about .5 mm. high; median. Apertural notch deep, the edges diverging at an angle of 30°. Umbilical keel sharp, median; dorsal and ventral keels prominent, rounded, slightly nearer the umbilical keel. Umbilicus about ⅔ the diameter of the shell at the point where the final whorl diverges; deep, exposing all the whorls.

Surface ornamented by fine concentric lines of growth which parallel the aperture, bending slightly backward from the umbilical keel, the curvature increasing gradually until they reach the peripheral band at an angle of about 30°.

The dimensions of a well preserved specimen, the holotype are: Greatest diameter 23 mm., diameter at point where last whorl becomes free 17.5 mm., diameter of umbilicus at same point 11.5 mm., height 6.6 mm., length of aperture 11 mm., height of aperture 6.8 mm.

Occurrence—Holotype, U. S. N. M. No. 83518 from chert of Eminence dolomite, locality 438-r, on hill ½ mile west of Eminence, Shannon County, Mo.

Remarks—This species is characteristic of the Eminence and is widely distributed. It is one of the largest species of the genus and is readily recognized by its partially detached and slightly elevated body whorl.

Dirhachopea intermedia, Ulrich and Bridge, new species.

Plate XVIII, figures 17, 18, 19.

Description—Shell of medium size, consisting of five whorls. Spire low, apical angle, 155°. Whorl gradually expanding, the final whorl three times the width of the one preceding it, well rounded; subquadrangular, final whorl not separated from remainder of spire; suture strongly depressed. Peripheral band median, about .5 mm. wide in mature forms. Apertural notch deep. Umbilicus open, exposing all of the whorls; deep, diameter about half that of the shell. Surface markings as in *D. normalis*. The

dimensions of an average specimen, one of the cotypes, are: Greatest diameter 13.8 mm., height 7.8 mm., diameter of umbilicus 8 mm.

Occurrence—Cotypes, U. S. N. M. No. 83519-a-b, from chert of Eminence dolomite, locality 399-c, 6 or 7 miles south of St. Clair, Franklin County, Mo.

Paratypes, U. S. N. M. No. 83520, locality 452-q-1, near the Munsell school house, 4 miles south of Eminence, Shannon County, Mo., on State highway 19 (temporary).

Remarks—This species appears to be intermediate in form between *D. normalis* and *D. nitida*. It differs from the former in its relatively higher spire and more rounded whorls, and in the fact that the body whorl is not separated from the spire.

Dirhachopea subrotunda, Ulrich and Bridge, new species.

Plate XVIII, figures 21, 22.

Description—Shell below medium size, consisting of five volutions, spire flat or very slightly elevated above or depressed below the outer whorls. Whorl gradually expanding, the diameter of the final whorl about twice that of the preceding one; earlier whorls rounded, final whorl sub-angular. Peripheral band distinct, about .5 mm. wide in a specimen 11 mm. in diameter. Suture depressed, final whorl so far as observed in contact with the remainder of the spire, but dropping slightly below the plane of the other coils. Umbilicus, wide, shallow, exposing all the whorls. Surface markings as in other members of the genus. The dimensions of the cotypes are: Diameter 11 and 9 mm., height 3.5 and 3 mm.

Occurrence—Cotypes, U. S. N. M. No. 83522-a-b, from chert from the Eminence dolomite, locality 100-i, 5 miles southwest of Eminence, Shannon County, Mo.

Common and widely distributed.

Remarks—This is one of the smaller species of the genus and may be readily distinguished from other forms by its flat spire and rounded whorls. *D. intermedia* which also has rounded whorls is larger and has an elevated spire, while *D. appressa* which approaches *D. subrotunda* in size has a low spire and a sharply compressed whorl.

Dirhachopea appressa, Ulrich and Bridge, new species.

Plate XVIII, figures 8, 9, 10.

Description—Shell small, consisting of about four and one-half volutions, spire slightly depressed, umbilicus, open, broad, more than half as wide as the shell. Whorl rather rapidly expanding, the final whorl being 3.5 to 4 times the width of the preceding one at the aperture, although this ratio does not hold throughout. Strongly compressed dorso-ventrally. Sharply keeled on the periphery. Aperture with a deep notch. Peripheral band median, about .5 mm. wide on adult shells. Dorsal and ventral keels well defined, rounded, about 2/3 the width of the whorl from the peripheral edge. Suture depressed. Umbilicus open, about half the diameter of the shell. Surface markings consist of fine growth lines.

Average specimens have a diameter of 9 or 10 mm. and a height of 3 mm. but these dimensions are sometimes exceeded.

Occurrence—Cotypes, U. S. N. M. No. 83514, chert from Eminence dolomite, locality 373-l, (M. S. M. 98.15) hill on north side of Jacks Fork, 1½ mile northwest of Eminence, Shannon County, Mo.

Paratype, U. S. N. M. No. 83515, locality, 188-y, near Elvins, St. Francois County, Mo.

Paratype, U. S. N. M. No. 83516, from same formation, locality 452-q-1, on Current River just below the mouth of Sinkin Creek, Shannon County, Mo.

Remarks—This is one of the smaller species of *Dirhachopea*, and is quite distinct. It is close to *D. subrotunda* in size, and is similar to it in its depressed spire, but differs in its sharply-angled whorl and flat shoulders.

Varieties of this species differing in the more sharply angulated and less rapidly expanding whorls are found in the Proctor dolomite in Camden County, Missouri.

Dirhachopea corrugata, Ulrich and Bridge, new species.

Plate XVIII, figure 20.

Description—Shell of medium size, composed of five volutions. Spire low, apical angle 155-160°. Whorl slowly expanding, the final whorl less than twice the diameter of the preceding one, compressed laterally, height greater than width, subquadrangular in cross-section; suture strongly depressed. Dorsal and ventral keels submedian, prominent, especially on the final whorl; rounded. Umbilicus broad, its width about three-fourths the diameter of the shell. Peripheral band prominent, about 1 mm. wide. Surface markings consist of fine concentric growth lines, and broad gentle undulations which parallel the outline of the aperture. These undulations are spaced about a millimeter apart and are most conspicuous on the body whorl.

Dimensions of the holotype are: Diameter 18 mm., height 5 mm.

Occurrence—Holotype, U. S. N. M. No. 83521 from residual chert from the Eminence dolomite at locality 373-l (M. S. M. 98.15) on hill north of Jacks Fork, 1½ mile northwest of Eminence, Shannon County, Mo. Rather common at this locality, rare elsewhere.

Remarks—This is one of the rarer forms of the genus. It is close to *D. intermedia* in size, but may be distinguished by its surface markings, lower spire, narrower whorl and wider umbilicus. It is larger than *D. subrotunda* and *D. appressa* and differs from them in its narrower whorls, higher spire, and surface ornamentations.

Dirhachopea abrupta, Ulrich and Bridge, new species.

Plate XVIII, figures 11, 12, 13.

Description—Similar in size and general appearance to *D. normalis*, but differing in the position of the ventral keel, which is so placed that the umbilical wall is practically vertical. This gives the mould of the umbilical area a step-like appearance instead of the rather smooth conical mould which characterizes *D. normalis*.

Occurrence—Holotype, U. S. N. M. No. 83517, from chert of Eminence dolomite at locality 100-c, 1 mile south of the Casey Mine, near Eminence, Shannon County, Mo.

Dirhachopea dubia, Ulrich and Bridge, new species.

Plate XVIII, figures 5, 6.

Description—This species is founded upon a single badly corroded and encrusted specimen, which is of interest because it is one of the few fossils which have been obtained from the Potosi dolomite. The specimen is about the size of an average example of *D. normalis* and consists of a closely coiled portion with a low spire, and a detached, descending body whorl. The number of coils is not clearly visible. The final half volution is quadrangular in cross-section and bears faint traces of a band along the peripheral angle. The specimen is evidently a *Dirhachopea* and is very close to *D. normalis*, but differs from it in that the detached portion of the whorl is turned downward.

Occurrence—The holotype and only known specimen, U. S. N. M. No. 83513, was collected by Mr. Stuart St. Clair in chert of the Potosi dolomite 1/3 of a mile west of Piedmont, Wayne County, Mo.

Rhachopea, Ulrich and Bridge, new genus.

Description—Shell consisting of about four volutions, the spire low, only slightly to moderately raised above the top of the final whorl. Apical angle varying in the different species, from 80° in *R. elevata* to about 160°-165° in *R. washburnensis* and 185° in *R. depressa*. Whorl gradually expanding, increasing from two to four times its diameter

in a single volution, subquadrangular in cross-section, the peripheral keel most prominent, slightly below the median plane of the whorl, sharply angled; the angle averaging about 110°. There is a distinct angled keel on the umbilical side of the whorl where it makes contact with the preceding whorl, the slope above this keel being concave or sigmoid while the remaining slopes are convex. The dorsal and ventral carinae are obscure and broadly rounded and are situated slightly on the umbilical side of the center of the whorl, making the umbilical slopes somewhat steeper than the peripheral slopes. Suture depressed.

Umbilicus about 1/3 the diameter of the shell; open, exposing all of the whorls.

Aperture with a deep notch on the outer side of the whorl which marks the terminus of the peripheral keel. Surface markings consist of fine growth lines, parallel to the aperture. These lines are gently convex anteriorly and swing backward from the umbilical keel, crossing the dorsal and ventral keels without any sharp change of direction but making an angle of about 75° where they cross the peripheral keel, this angle corresponding to the apertural notch.

Genotype—*R. typica*, n. sp.

Stratigraphic and Geographic Distribution—According to present knowledge, the genus is confined to the formations included in Ulrich's proposed Ozarkian system, and is most abundant in the higher formations of the series. It is represented in the Eminence and Proctor dolomites of the Ozark region, but becomes extremely abundant in the Van Buren, and continues up into the Gasconade. It is also known from the southern portion of the Appalachian Valley, where it occurs sparingly in the Copper Ridge dolomite, and more abundantly in the Chepultepec dolomite.

Schizopea washburnensis, Ulrich, figured by Butts in the Geology of Alabama, Pl. 14, figs. 23-24, is now referred to *Rhachopea*.

Rhachopea typica, Ulrich and Bridge, new species.

Plate XX, figures 1, 2, 3, 4, 5.

Description—Shell of medium size, consisting of four whorls, spire low, scarcely elevated above the top of the final whorl. Apical angle about 150°. Suture strongly depressed. Whorl gradually expanding, the final whorl from 2½ to 3 times the width of the preceding; peripheral keel on adult specimens which preserve the exterior, is a smooth rounded band from 1-1.5 mm. wide, slightly raised. On internal moulds, it appears as a single sharp line.

Aperture subquadrangular, with a deep peripheral notch, the edges of which make an angle of 70°. Surface marked by finely spaced concentric growth lines which follow the general outline of the aperture and become obsolete as they cross the peripheral keel.

A large specimen, one of the cotypes, U. S. N. M. No. 83525-b, has the following dimensions: Diameter, 39 mm., height, 22 mm. (allowing for apex which is missing), diameter of aperture 20.7 mm., height of aperture 19.4 mm., width of umbilicus at base 24 mm., depth of umbilicus 18 mm. An average specimen, another cotype, U. S. N. M. No. 83525-a, has a diameter of 28.4 mm., and a height of 16.5 mm.

Occurrence—Cotypes, U. S. N. M. No. 83525-a-b, from chert from the Van Buren formation at locality 102-e, about one mile southeast of Eminence, Shannon County, Mo., on the old Van Buren road. (Center NW ¼, SE ¼, sec. 35, T. 29 N., R. 4 W.)

In addition to the two specimens here mentioned, there are 8 more cotypes, all from the same locality.

Paratype, U. S. N. M. No. 83526, from the same horizon at locality 261-o, 3 miles southeast of Eminence at top of hill on Highway 19, SE ¼, NE ¼, sec. 1, T. 28 N., R. 4 W.

Abundant at many other localities, both in the Eminence and Potosi regions.

Remarks—This species is one of the most abundant and characteristic fossils of the Van Buren formation and is widely distributed throughout southeastern Missouri, occurring in almost every locality where Van Buren fossils have been found.

Rhachopea transitans, Ulrich and Bridge, new species.

Plate XX, figures 6, 7.

Description—Shell of medium size, consisting of four whorls, spire low, but distinctly higher than *R. typica*. Apical angle 120°-125°. Whorl gradually expanding, the final whorl twice the diameter of the preceding one, subquadrangular in cross-section, peripheral keel sharp, about 1/3 the height of the whorl above the base, making the upper portion or the whorl somewhat steeper, and the bottom somewhat flatter than in *R. typica*. Umbilical keel sharp; dorsal and ventral keels rounded but sharper, and much closer to the suture than in *R. typica*. Suture depressed, narrow. Surface markings as in *R. typica*. Apertural notch shallow, the edges meeting at an angle of 85°.

The slope from the dorsal keel to the peripheral keel is distinctly flattened near the top of the whorl and in many forms is even slightly concave, giving this section of the whorl a somewhat sigmoid profile, which is one of the most striking characteristics of the species.

The dimensions of the holotype are: Diameter 28.2 mm., height 19 mm., diameter of the umbilicus 15 mm., width of aperture 17 mm., approximate height of aperture 14.5 mm.

Occurrence—Holotype, U. S. N. M. No. 83527 from lower portion of chert from the Van Buren formation at locality 438-r, near hilltop about ½ mile west of Eminence, Shannon County, Mo. (center SW ¼, sec. 27, T. 29 N., R. 4 W.).

Remarks—This species is apparently intermediate between *R. typica* and *R. elevata*. From the former it differs, in its higher spire, its narrower and less depressed suture and the position of the peripheral keel. It differs from *R. elevata* in its larger size, lower spire, and more deeply impressed suture.

Rhachopea elevata, Ulrich and Bridge, new species.

Plate XVIII, figures 23, 24.

Description—Shell below medium size, consisting of four whorls; spire moderately high, apical angle 80°. Whorls gradually expanding, the diameter of the final whorl twice that of the preceding one, subquadrangular in cross-section. Peripheral keel sharp, similar in position to that of *R. transitans*, suture only slightly depressed, narrow. Whorl subpentagonal in cross-section, umbilicus narrow.

The dimensions of an incomplete specimen, a cotype are: Maximum diameter 19 mm., height (allowing for top whorl which is missing) 17 mm., diameter of body whorl near aperture 9.4 mm., height of aperture 8.6 mm.

Occurrence—Cotypes, U. S. N. M. No. 83523-a-b-c, from the *Plethopeltis* zone of the Eminence dolomite, locality 102-h, 4 miles west of Eminence, Shannon County, Mo.

Widely distributed in the upper part of the Eminence dolomite throughout the Ozark region.

Remarks—This species is common in the *Plethopeltis* zone of the Eminence, and is apparently the only species of this genus which occurs in this formation. It may be readily distinguished from congeneric forms by its much greater height and narrower apical angle. A cross-section of the whorl of this species shows the dorsal keel to be rounded and nearly median in position. The outline of the whorl is gently concave from dorsal to the umbilical keel and gently convex from the dorsal to the peripheral keel. The diameters of the whorl are approximately equal.

Rhachopea grandis, Ulrich and Bridge, new species.

Plate XXI, figures 15, 16.

Description—Shell large, spire low, apical angle 140°-145°. Whorls, four, gradually expanding, the final whorl three times the diameter of the preceding one; subquadrate, the umbilical and peripheral keels sharp; the dorsal and ventral keels, median, obsolete.

The dimensions of a medium sized specimen, one of the cotypes, are: Greatest diameter 58.5 mm., height (allowing for first whorl which is missing) 35 mm., diameter of umbilicus 30 mm., diameter of aperture 35 mm., height of aperture 28 mm. A somewhat larger specimen, a paratype, gives the following measurements: Greatest diameter (allowing for a broken portion of whorl) 73 mm., height (allowing for first whorl) 42 mm., diameter of umbilicus 40 mm.

Occurrence—Cotypes, U. S. N. M. No. 83545-a-b, from the upper portion of the Gasconade dolomite at locality, 238 on Huzzah Creek, Crawford County, Mo., about one mile west of the mouth of Dry Creek, and 10 miles east of Steelville on the Potosi road (now State Highway No. 8).

Paratype, U. S. N. M. No. 83546, also from the upper portion of the Gasconade, from some locality in Missouri, exact place unknown.

Widely distributed throughout the upper portion of the Gasconade dolomite in Missouri. Also found in the cherts from the Chepultepec dolomite of eastern Tennessee.

Remarks—R. grandis closely resembles *R. typica* in its general form and proportions, but is much larger, and occurs at a higher horizon. *R. washburnensis*, from the Copper Ridge dolomite of Alabama is of about the same size, but differs from *R. grandis* in the lower position of the peripheral keel, and in its more depressed spire. *R. depressa* commonly attains the size of *R. grandis* and is associated with it, but is readily distinguished by its more rapidly expanding whorls and depressed spire.

Sinuopea, Ulrich

1911—*Sinuopea* Ulrich, Revision of the Paleozoic Systems, Bull. Geol. Soc. Amer., Vol. 22, p. 630. (Defines the genus and refers *Holopea sweeti* Whitf. to it.)

Description—Shell consisting of about four whorls, spire moderately high, height and diameter subequal. Whorls moderately inflated, round in cross-section, except sutural slope; no peripheral keels. Aperture with U-shaped rounded notch, the apex of which lies along the periphery of the whorl. Suture distinct, but not strongly depressed. Surface marked by fine concentric growth lines parallel to the aperture similar to the markings on *Rhachopea*. Umbilicus small, open, exposing all the whorls. Genotype, *Sinuopea vera*, n. sp.

Stratigraphic and Geographic Distribution—Sinuopea is one of the most common and one of the most widely distributed genera of early Paleozoic gastropods. It appears to be limited to the Cambrian and the proposed Ozarkian system of Ulrich. The oldest species *S. sweeti* (Whitf.) occurs in the so-called Potsdam of Wisconsin, at Osceola Mills, in strata which are now included in the Norwalk sandstone, (Upper Cambrian). This genus is also represented in the Oneota of that state.

In the Ozark region the genus doubtfully recorded from the Eminence dolomite, is represented by several species in the Proctor and attains its maximum development in the Van Buren and Gasconade formations. It has not been reported from any younger horizon in this state.

In the Arbuckle region several species, some of them identical with Missouri forms, have been found in Ulrich's proposed Chapman Ranch formation, a subdivision of the Arbuckle limestone of Oklahoma, which is considered to be the partial equivalent of the Van Buren.

The genus is also well developed in the Copper Ridge and Chepultepec dolomites of the southern Appalachian region, and may possibly be represented in the overlying Nittany dolomite.

Holopea obesa, Whitfield from the Oneota of Wisconsin, belongs in this genus and has also been found in the Gasconade of Missouri. Whitfield's figures do not show the notch, but he states that his figure is "somewhat restored" and it is possible that his specimens did not show the surface markings.

Besides the forms mentioned above and those described on the following pages, there are a large number of undescribed species.

Remarks—The general shape of these shells is much like *Holopea*, to which genus many species of *Sinuopea* were formerly referred, but they differ in the possession of an apertural notch. *Taeniospira* differs from *Sinuopea* in having a much deeper apertural notch, which terminates in a distinct band, bounded by well defined peripheral keels.

Sinuopea vera, Ulrich and Bridge, new species.

Plate XX, figures 12, 13.

Description—Shell of medium size, height and diameter subequal, apical angle 95°-100°. Whorls five, moderately expanding, inflated, the final whorl twice the diameter of the preceding one, suture distinct but not depressed. Whorls evenly rounded on the outer slopes, without keels; sutural slope slightly concave. Aperture round, with a rounded peripheral notch, the edges of which make an angle of 75°. Surface markings consist of low, broad, growth lines, which parallel the outline of the aperture. Umbilicus open, exposing all the whorls, about half the diameter of the shell, rapidly diminishing to about ½ of this width, the umbilical slope grading into the basal slope without any marked break.

Dimensions of the holotype are: Height 23 mm., diameter 23 mm., diameter of umbilicus 13 mm., diameter of final whorl near aperture 9.5 mm.

Occurrence—Holotype, U. S. N. M. No. 83529, from chert of the Van Buren formation 102-e, about 1 mile southeast of Eminence, Shannon County, Mo., where it is common and associated with *R. typica*, *R. transitans*, and many other forms.

Remarks—This species is an extremely abundant and well characterized form, and for that reason is selected as the type of the genus. It is the form which Ulrich has for several years referred to in unpublished manuscripts and personal communications as *S. typicalis*. In 1926, Butts figured a specimen from the Copper Ridge dolomite of Alabama as *S. typicalis*, and thereby established the species. Unfortunately, Butts' specimens were not the *S. typicalis* of Ulrich's mss., so that it becomes necessary to propose the present name, *S. vera* for the form which Ulrich had previously called *S. typicalis*.

Sinuopea cingulata, Ulrich and Bridge, new species.

Plate XX, figures 8, 9, 10, 11.

Description—Shell about the size and general proportions of *S. vera* but differing from it in the possession of an impressed median peripheral band from 1 to 1.5 mm., wide, which at first sight resembles the band of *Taeniospira*. In that genus, however, the band shows as a ridge upon internal moulds, and the surface markings change direction abruptly at the bordering keels, while in *S. cingulata* the band appears as a shallow groove, and is crossed by the surface markings without appreciable change of direction. The whorl is somewhat flattened along the periphery, particularly in large specimens and this gives it a sub-squarish appearance. Apertural notch rounded at the apex, the sides making an angle of approximately 55°.

The dimensions of an average specimen, one of the cotypes, are: Height 23 mm., diameter 21.5 mm., diameter of umbilicus 9.5 mm., height of last whorl 12.5 mm., diameter of last whorl 12.5 mm., apical angle 90-95°. Specimens are known which are at least 1/3 larger than this.

Occurrence—Cotypes, U. S. N. M. No. 83528-a-b, from cherts of the Van Buren formation at locality 102-e, about 1 mile southeast of Eminence, Shannon County, Mo., associated with *S. vera*, *R. typica* and *R. transitans*.

A variety, distinguished by its lower spire, occurs with the typical form at several localities.

Remarks—This species is fairly abundant, and is widely distributed in Missouri. It may be readily recognized by the impressed peripheral band, which in most cases is quite distinct. Sometimes the band becomes obsolete, and in such cases the species is best distinguished from *S. vera*, by the sub-squarish whorl of *S. cingulata*.

Sinuopea umbilicata, Ulrich and Bridge, new species.

Plate XX, figures 14, 15, 16, 17.

Description—Shell of medium size, occasionally larger. Spire low, apical angle 105°. Whorls five, moderately expanding, the final whorl twice the diameter of the preceding one; compressed dorso-ventrally, smoothly rounded, slightly embracing; a faint peripheral keel about 1/3 the height of the whorl above the base. Suture moderately depressed. Shoulder distinct, rounded, close to suture. Umbilicus open, exposing all the whorls, less than ½ the diameter of the shell. Aperture not preserved on any of the specimens at hand. Surface apparently smooth. The cotypes both of which are incomplete are: 24 and 26.5 mm., in height, and the restored diameter of the first specimen would be approximately 30 mm.

Occurrence—Cotypes, U. S. N. M. No. 83530-a-b, from cherts of the Van Buren formation at locality 102-e, about 1 mile southeast of Eminence, Shannon County, Mo. Rather common in Missouri.

Also from Ulrich's proposed Chapman Ranch formation, a subdivision of the Arbuckle limestone, locality 459-z at Chapman's Ranch north of Springer, Oklahoma, on the road to Davis.

Remarks—This species is fairly common in the Van Buren formation and may be distinguished by its large size, low spire and its rounded and flattened whorls.

Sinuopea basiplanata, Ulrich and Bridge, new species.

Plate XX, figures 18, 19.

Description—Shell of medium size of the same general type as *S. vera*, but differing from it in its flattened base, and subangular whorl. The dimensions of the holotype which is incomplete, showing only the last three whorls, are: Diameter 24.7 mm., height 24.5 mm., apical angle 75°. Whorls rather slowly expanding the ratio of the final whorl to the one preceding it being as 5:3. Suture distinct, not depressed, shoulder rounded, close to suture, the surface of the whorl sloping abruptly to a faintly defined, obtuse, submedian peripheral notch, the edges of which meet at an angle of about 80-85°. Surface marked with rather broad, low concentric growth lines, paralleling the aperture.

Occurrence—Holotype, U. S. N. M. No. 83531, from chert from the Van Buren formation at locality 102-e, about 1 mile southeast of Eminence, Shannon County, Mo.

A large variety, intermediate between this form and *S. subangulata*, occurs in Ulrich's proposed Chapman Ranch formation at locality 459-z, Chapman's Ranch, Okla.

Sinuopea regalis, Ulrich.

Plate XXI, figure 3.

1926—*Sinuopea regalis*, Ulrich. Butts, Geol. of Ala., Special Report No. 14, Pl. 15, Fig. 12.

Description—Shell large. Whorls five evenly rounded moderately expanding. Final whorl not quite twice the diameter of the preceding one; apical angle 95-100°. Peripheral keel submedian, faint. Aperture with a shallow rounded peripheral notch, the edges of which make an angle of about 75°. Umbilicus about one-half of the diameter of the shell, rapidly contracting to about 1/3 of this figure. Surface markings as in *S. vera*.

Dimensions of the larger cotype are: Diameter 50 mm., height 61 mm., diameter of aperture 27 mm., height of aperture 30 mm., diameter of umbilicus 28 mm.

Occurrence—Cotypes, U. S. N. M. No. 71436, from chert of the Gasconade dolomite, locality 238, on Huzzah Creek, about 1 mile west of the mouth of Dry Creek and 10

miles east of Steelville, Crawford County, Mo., on the Potosi road (now State Highway 8) associated with *Rhachopea grandis*, *Clarkoceras subcrassum*, *Cameroceras huzzahense*, etc. Rather common.

Remarks—*S. regalis* is the largest species of the genus. The specimen figured by Butts and re-figured here, was said to have come from the Chepultepec dolomite of Alabama, but this is an error, for it is from the highly fossiliferous Gasconade locality on Huzzah Creek, Crawford County, Mo. The Chepultepec forms agree very well in shape and general proportions, but fail to attain the size of the Missouri forms.

Taeniospira, Ulrich and Bridge, new genus.

Description—Shells composed of four to five whorls coiled in a moderately high spire; height and diameter subequal. Whorls moderately inflated, round in cross-section (except on the sutural slope which is concave) with a pair of faint, but distinct, median or submedian peripheral keels bounding a narrow peripheral band. Aperture with shallow ≻-shaped notch, the apex of which is truncated and terminates in the peripheral band. Umbilicus open, exposing all of the whorls, narrow, but without any callous.

Surface ornamented with growth lines parallel to the aperture. These are nearly vertical on the inside of the whorl, but after crossing the top and bottom of it they sweep backward in a curve convex anteriorly to the peripheral keels. In crossing the band the growth lines are shallowly concave anteriorly.

Genotype—*T. eminencensis*, n. sp.

Stratigraphic and Geographic Distribution—The genus is most abundantly developed in the Eminence dolomite of the Ozark region, but is sparingly represented in the overlying Van Buren.

Taeniospira eminencensis, Ulrich and Bridge, new species.

Plate XVIII, figures 25, 26, 27.

Description—Shell large, composed of 5 (?) volutions, spire moderately high; apical angle 80-95°. Whorl inflated, moderately expanding, the diameter of the final whorl being about twice that of the preceding one. Peripheral keels, submedian, distinct, 2-2.5 mm. apart on adult shells. Suture distinct, moderately depressed, sutural slope raising steeply to the shoulder which is moderately well defined, rounded, the surface sloping steeply to the periphery. Peripheral angle about 105°. Base sloping almost as steeply to the obtusely angled, rounded, ventral keel. Umbilicus narrow, about half the diameter of the shell, steep sided, deep, exposing all the whorls.

Aperture with a slightly flaring lip, which is particularly well shown on internal moulds and with a deep almost slit-like notch which terminates in the peripheral band, the edges making an angle of about 30°. Surface marked by concentric growth lines, which parallel the outline of the aperture.

The dimensions of a typical large, but incomplete specimen are: Greatest diameter 37 mm., height 33 mm. (to which should be added about 5 mm. for the missing spire), width of the aperture from the inner lip to the apex of the notch, 26.5 mm., height of aperture 24 mm., diameter of umbilicus 18 mm.

Occurrence—Holotype, U. S. N. M. No. 83524 from the *Plethopeltis* zone of the Eminence dolomite, locality 373-1 (M. S. M. 98.15), on the high hill north of Jacks Fork, 1½ miles west of Eminence, Shannon County, Mo., 40 feet below the Gunter sandstone. The species is abundant at this locality. It is fairly common in the upper portion of the Eminence at many localities.

Remarks—This is the largest, most abundant and best characterized species of the genus. It closely resembles *T. st. clairi*, from the Van Buren formation, but differs in the position of the band, the width of the shoulder and in its larger size.

Gasconadia, Ulrich and Bridge, new genus.

Small, turreted shells, whorls six to eight closely coiled, angular or rounded. Aperture with an expanded lip. The outer margin of this lip is interrupted by a deep > -shaped notch, the apex of which lies on the peripheral keel or on the broadest portion of the whorl. Umbilicus very small, but extending the length of the spire.

Specimens which preserve the body whorl show a deep indentation on the lower side just to the left of the lip. This cavity has rounded edges and was interpreted by Sardeson as having been made by some predatory organism, which, in some unexplained manner bent the shell without crushing it.

The indentation occupies a definite position upon the whorl in all specimens which preserve it, and is visible not only upon internal moulds but also upon specimens in which the shell is silicified. It appears to represent an infolding of the shell wall to form a toothlike projection on the floor of the whorl, the exact purpose of which is not known. Whatever its function may have been, it is highly characteristic of this group of shells, and is a feature which at once sets them off from other Pleurotomaroids.

Genotype—*Gasconadia* (*Murchisonia*) *putilla* (Sardeson).

Stratigraphic and Geographic Distribution—Gasconadia appears to be confined to the Gasconade and its equivalents. The genotype was originally described from the Oneota dolomite of Wisconsin and Minnesota and appears to be widely distributed in these two states. It also occurs in the Oneota of Iowa. In Missouri it is one of the most characteristic forms found in the Gasconade. It is also fairly common in the Chepultepec dolomite of the southern Appalachian region and has been found in strata of equivalent age in Pennsylvania. Several well-defined species may be recognized.

Gasconadia putilla (Sardeson)

Plate XXI, figures 11, 12, 13.

1892—*Murchisonia* sp. Calvin, S., Amer. Geologist, Vol. 10, p. 147.
1892—*Murchisonia* sp. Calvin, S., Bull. Lab. Nat. Hist., State Univ. Iowa, 2, p. 192.
1896—*Murchisonia putilla* Sardeson, F. W., Bull. Minn. Acad. Nat. Sci., Vol. IV, No. 1, p. 98, Pl. V, figs 5, 6.

Description—Shell small, spire moderately high, apical angle 45° to 50°, whorls 6, strongly angular. There is a strong peripheral keel—slightly below the mid height of the whorl, from which the outer slopes diverge at an angle of about 115°. There are also strong dorsal and ventral carinae, which are in contact along the suture. Aperture with a broad, reflexed, trumpet-shaped lip, the outer margin of which is drawn back into a deep > -shaped notch. Just to left of the lip of the aperture is a narrow depression which indicates the presence of a ridge-like tooth on the inside of the upper end of the body whorl. Umbilicus small, open.

The dimensions of a small, nearly perfect specimen which lacks the two uppermost whorls are: Total height 13.5 mm., height of spire 6.5 mm., height of aperture (including the reflexed lip) 8 mm., width of aperture 7 mm., depth of apertural notch 3.5 mm. Specimens commonly attain a somewhat larger size.

Occurrence—Sardeson's specimens came from the Oneota dolomite near Dresbach and at Stillwater, Minnesota, and from Blanchardville, Wisconsin. He also reports it from the so-called Jordan sandstone near Rapidan, Minnesota, but according to Ulrich, the terms Jordan and St. Lawrence were applied by earlier authors to several different formations, among them the New Richmond and the Oneota. As no gastropods of this type have been reported from the true Jordan at other localities it seems probable that the specimen from Rapidan came from the top of the Oneota or the base of the New Richmond sandstone. Calvin's specimens came from Clayton and Allamakee Counties, Iowa. The Missouri specimen here figured is from the upper part of the Gasconade formation, at locality 238-d at Meramec Springs, Phelps County, Mo. It has also been

found in the Gasconade formation at many other localities, at several localities in Wisconsin, Minnesota and Iowa, and from the Chepuletpec dolomite in southeastern Tennessee.

Plesiotypes, U. S. N. M. No. 83593, loc. 238-d, Meramec Springs, Mo.

Ophileta, Vanuxem.

1842—*Ophileta*, Vanuxem, L., Natural History of New York, Pt. III, Geology of the 3d Dist., pp. 35, 36.

1847—*Ophileta*, Hall, James, Natural History of New York, Pt. VI, Paleontology, Vol. I, pp. 11, 12, Pl. III, Figures 4, 5, 6.

Description—Shell composed of from five to eight rather slowly expanding volutions coiled into a broad, low cone—more rarely planispiral. Whorls sub-rhomboidal in cross-section, with a strong, rounded peripheral keel. The keel is bordered above by a well-defined groove, giving the peripheral slope a distinct sigmoid profile which is one of the most characteristic features of the genus. Under surface of the whorls evenly rounded; umbilicus open, exposing all of the whorls. Suture distinct, narrow, not strongly depressed.

Genotype—*Ophileta levata* Vanuxem.

Stratigraphic and Geographic Distribution—Ophileta is an extremely abundant form in the early Ordovician (middle and upper Ozarkian and Canadian of Ulrich) faunas of North America. In the Mississippi Valley the earliest forms are found in the Van Buren of Missouri and the genus reaches its greatest development in the succeeding Gasconade dolomite. Many of the forms found here are conspecific with those found in equivalent formations, both in the Upper Mississippi Valley and in the Appalachian region. It is also common in the younger formations of Beekmantown age. In general these younger forms have somewhat broader whorls than the older ones, and as a result, the width of the umbilicus is proportionately narrower, a fact which is of some value in making a rough separation of horizons.

Remarks—The true nature of this important genus has long been misunderstood. Many species which should have been referred to it have been described under other genera such as *Pleurotomaria, Raphistoma, Straparollus* and *Euomphalus* while, on the other hand, most of the published forms which have been referred to *Ophileta* belong to an entirely different genus, *Lecanospira.*

O. levata and *O. complanata*, the first species described, came from the Tribes Hill limestone of the Beekmantown group of New York. The original brief description and figures of *Ophileta* are very poor, and might apply to almost any discoidal shell. Fortunately however, the types figured by Hall have been preserved, and since they came from the same localities as Vanuxem's forms, and since nothing else occurs in these strata with which they might easily be confused, it is safe to assume that they are identical with the forms described by Vanuxem.

In 1859 Salter described and figured a new species, *Ophileta compacta*, from supposedly equivalent strata at Beauharnois, near Montreal. He evidently had not seen specimens of Vanuxem's species, and his reference of this new form to *Ophileta* must have been based entirely upon the figures and descriptions of Vanuxem, Hall and Emmons. His generic diagnosis, accompanied by excellent figures, was based entirely upon his own specimens, and, as a result nearly all of the subsequent references to *Ophileta* have been based upon Salter's description and figures rather than upon those of Vanuxem and Hall. The two forms are quite distinct, and many years ago, Ulrich, after studying Hall's types and additional collections from the type localities along the Mohawk River, restricted the term *Ophileta* to its original meaning and proposed the name *Lecanospira* for forms of the type described by Salter.

Although these distinctions were not published, species belonging to each genus were figured by Butts in 1926.*

*Butts, Chas., Geol. of Alabama. Ala. Geol. Surv. Special Rept. No. 14, 1926, p. 94, Pl. 16. (The spelling Ophiletta is a typographical error.)

At the present time the following appear to be valid species of *Ophileta:*

O. lavata Vanuxem, Tribes Hill limestone of New York.

O. complanata Vanuxem, Tribes Hill limestone of New York.

O. minnesotense (Owen), Oneota dolomite of Wisconsin.

O. oweni (Sardeson) Oneota dolomite of Wisconsin.

O. solida Ulrich, Longview and Newala limestone of Alabama.

O. grandis Ulrich, Oneota dolomite of Wisconsin.

O. canadensis (Billings) "Calciferous" of Canada.

O. pepinensis (Meek) from the Oneota dolomite of Wisconsin may be a distinct species, or may be a synonym of *O. minnesotense. Raphistoma acuta* Hall and Whitfield from the Garden City limestone of Utah may eventually prove to be a member of this genus. The same may also be true of *R. praevium* Whitfield, from the Beekmantown at Fort Cassin, Vermont. In addition to the foregoing there are a great number of undescribed forms.

Ophileta grandis, Ulrich.

Plate XXI, figures 6, 7.

1926—*Ophiletta grandis* Ulrich, in Butts, Geol. of Alabama, Ala., Geol. Survey, Special Rept. No. 14, p. 94, Pl. 16, Fig. 14, (figured but not described).

Description—Shell large—the incomplete holotype having a diameter of 55 mm. Whorls 7, slowly expanding, the diameter of the final whorl near the aperture being about 1½ times that of the preceding one. Peripheral keel strong above the median line of the whorl. Shoulder of whorl low, rounded, the profile from suture to periphery being distinctly sigmoid. Under surface of whorls evenly rounded. Spire low, the apical angle being approximately 115°. Umbilicus open—shallow. Aperture, rounded trapezoidal, with a deep ≻-shaped notch, the apex of which lies on the peripheral keel. Surface marked by concentric growth lines which curve strongly backward from the suture, making an angle of about 110° with the radius of the shell, and which meet in a sharp angle along the peripheral keel. Some of the better preserved shells show indications of faint revolving striae as well, but these are not often preserved.

Occurrence—Holotype, U. S. N. M. No. 71446 from the Oneota dolomite, locality 351-c, 1½ miles southeast of Wilson, Wis.

Paratype, U. S. N. M. No. 65095 from cherts of the Gasconade dolomite, locality 238-a, near Boyler's Mill, Miller County, Mo.

Also recorded from the same formation at numerous other localities in Missouri and from the Chepultepec dolomite of eastern Tennessee.

Ophileta supraplana, Ulrich and Bridge, n. sp.

Plate XXI, figures 9, 10.

Description—Shell consisting of 7 whorls, spire flat, apical angle 180°, whorls very slowly expanding, the diameter of the final whorl being about 1¼ times that of the preceding one. Cross-section of the whorl rounded subtriangular. (See Plate XXI, figure 10.) Aperture with a deep ≻-shaped notch, the angle of which lies along the peripheral keel, the plane of this aperture approximately tangent to the whorl. The suture is distinct and slightly depressed, the dorsal keel is rounded and prominent, while the peripheral keel is sharp and angular and is directed upward and outward. The undersurface of the whorl is rounded with a well defined, rounded angulation on the umbilical side of the center. Umbilicus broad, about three-fourths the diameter of the shell, open, exposing all the whorls. Surface marked with fine growth lines which are parallel to the aperture. The dimensions of the cotypes are: Diameter 32.5 and 25 mm., width of body whorl near the aperture, 6 mm. and ? mm., diameter of umbilicus ? and 18.5 mm. Another specimen, a paratype, is 24.5 mm. in diameter; the

body whorl is 4.5 mm. wide and 4 mm. high near the aperture and the umbilicus is approximately 18 mm. in diameter.

Occurrence—Cotypes, U. S. N. M. No. 83557 from cherts of the Gasconade dolomite at locality 238-g near top of hill north of Highway 8, one mile east of Berryman, Washington County, Mo.

Paratype, U. S. N. M. No. 83542 from the same horizon, exact locality unknown, probably somewhere in Missouri.

Also from the Gasconade formation at the following localities: 261-l and 401-t, Shannon County, Mo., and 238-a Morgan County, Mo.

Also from chert of the Chepultepec dolomite at locality 255-t, Jasper, Tenn.

Remarks—This is a well characterized species which may be easily identified by its flat spire and narrow whorls. The form figured by Butts as *Ophileta cf. supraplana* has an elevated spire and is more properly referred to another species.

O. alturensis of Sardeson from the upper part of the Oneota dolomite resembles *O. supraplana* in its flat spire. We have had no opportunity of examining the types of this species, but the collections from the Oneota in the National Museum contain a number of specimens which appear to belong to this species. The cross-section of the whorl of this form is entirely different from that of *O. supraplana*, and other forms of *Ophileta*. It strongly resembles a *Lecanospira* and has been referred to that genus.

Euomphalidae, de Koninck

Ozarkina, Ulrich and Bridge, new genus.

Description—Thin, discoidal, planispiral shells composed of from 8 to 10 narrow, slowly expanding, slightly overlapping volutions, all of which are visible from both sides. Spire flat or slightly depressed, umbilicus open, shallow. Cross-sections of the shell are plano-concave, or subequally biconcave.

Whorls reniform in cross-section, always slightly higher than wide, dorsal and ventral sides smoothly rounded, the latter commonly the sharper. Peripheral surface evenly rounded with no trace of a peripheral keel. Surface smooth, or with faint concentric growth lines. Aperture not well shown on any specimens at hand, but believed to be entire or else with a shallow dorsal notch.

Genotype—*O. typica*, new species.

Remarks—*Ozarkina* is abundant in the lower part of the Gasconade dolomite of Missouri (as here restricted) where it is represented by at least four species. It is not known to occur in any older or younger strata in the Missouri section, but is known from beds which are the equivalent of the Gasconade, in other parts of North America.

The genus is easily recognized by its planispiral habit, its plano-concave or biconcave cross-section and its many, narrow, slowly expanding whorls. It differs from *Ophileta* with which it is sometimes associated, in the shape of the cross-section of the whorls, and in its flat or depressed spire. The flat dorsal side of some of the species might be mistaken for a small *Lecanospira*, but in that genus, the flat side is nearly always the umbilical side, so that the direction of coiling is opposite to that of *Ozarkina*. The cross-sections of the whorls of the two genera are strikingly different, those of *Lecanospira* being triangular or trapezoidal, while those of *Ozarkina* are reniform. The specific distinctions are based upon size, shape of the cross-section of the whorl, and upon the relative concavity of the dorsal and ventral sides.

These are the forms which Ulrich has grouped under the name *Ozarkispira* in correspondence and manuscripts for many years, but since the latter name was preoccupied by Walcott,* for a totally different genus of gastropods the name *Ozarkina* is here proposed in its stead.

Ozarkina typica, Ulrich and Bridge, new species.

Plate XXI, figure 8.

Description—Shell below medium size, most specimens averaging from 10 to 12 mm. in diameter. Dorsal side plane or very slightly depressed, umbilical side moderately concave. Whorls eight or nine, very narrow, very slowly expanding, slightly embracing, with a smooth rounded dorsal keel and a slightly sharper ventral keel. Surface smooth or with very faint, concentric growth lines.

Dimensions of the holotype are: Diameter 14.5 mm., height of the body whorl (and also of the shell) 3 mm., diameter of body whorl 2.5 mm., depth of umbilicus 2 mm. (est.).

Occurrence—Holotype, U. S. N. M. No. 83541 from the Gasconade dolomite at locality 104-j, one-half a mile northwest of the pegmatite dike near Decaturville, Camden County, Mo. Found at many localities throughout the Ozark region.

Remarks—This is probably the most abundant species of *Ozarkina* in the collections. It is a small flat form, which differs from *O. complanata* in its smaller size and narrower and fewer whorls. It differs from *O. valida* and *O. elevata* in its narrower whorls, smaller average size and shallower umbilicus.

Ozarkina complanata, Ulrich and Bridge, new species.

Plate XXI, figures 4, 5.

Description—Shell large for the genus, the incomplete holotype measuring 28 mm. in diameter. Spire flat. Whorls 10, higher than broad, the diameters of the final whorl being 5.5 and 3 mm. Whorls sharply angulated where in contact with preceding whorl, slightly angled on the ventral surface, otherwise evenly rounded. Surface markings not preserved. Aperture unknown. Umbilicus broad and shallow, that of the holotype being about 3 mm. deep.

Occurrence—Holotype, U. S. N. M. No. 83540 from the Gasconade dolomite at locality 101-t, near the head of Mill Creek (T. 28 N., R. 3 W.), Shannon County, Mo.

Also from the same formation at locality 435-k in the same county. An imperfect specimen clearly belonging to this species was collected by Mr. Stuart St. Clair, of the Missouri Bureau of Geology and Mines, in the NW. ¼, sec. 22, T. 37 N., R. 7 E., Ste. Genevieve County, Mo.

Remarks—This species is distinguished by its large size, strongly rounded whorls and flat cross-section. It is not a common form, but appears to be rather widely distributed throughout the Gasconade of Missouri.

Euomphalopsis, Ulrich and Bridge, new genus.

Planispiral shells consisting of about four moderately expending volutions. Spire depressed, never rising above the top of the final whorl. Whorls round in cross-section, without keels, only slightly impressed where in contact, the body whorl often slightly separated from the spire. Aperture round, with a broad, shallow ⊃-shaped notch, similar to those possessed by *Rhachopea* and *Sinuopea* but situated on the top of the whorl. Surface marked with fine concentric growth lines which parallel the outline of the aperture.

Genotype—Euomphalopsis involuta, n. sp.

Stratigraphic and Geographic Distribution—The genus is abundant in the Gasconade and appears to be restricted to a definite horizon which is rather low in the formation. The two species which are here described are the dominant forms in this zone, but associated with them are occasional specimens of *Hyolithes*, *Gasconadia*, small patelloid gastropods, and fragments of small slender cephalopods.

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*Walcott, C. D., Smith. Miscell. Coll., Vol. 75, No. 1, 1924, p. 37, fig. 6.

This horizon outcrops in the bottom of the valley at Meramec Spring, where it is more than 100 feet below the contact with the Roubidoux formation. It also outcrops near the top of the hill east of the mouth of Procter Creek in Morgan County. At this locality, it is about 100 feet above the top of the Gunter sandstone, or about 40 to 50 feet above the base of the Gasconade as now restricted. It has also been found at several localities in both the Potosi and Eminence regions.

The genus is also found in the Oneota dolomite in the Upper Mississippi Valley and in the Chepultepec dolomite of the southern Appalachian region.

Euomphalopsis involuta, Ulrich and Bridge, new species.

Plate XXI, figures 17, 19, 20.

Description—The general characters of this form have been given in the discussion of the genus. Average specimens have a diameter of 12 to 15 mm., and a height of five to six mm. The whorls are round, in some cases slightly compressed laterally, and the body whorl is often slightly detached in the last quarter turn. The final whorl is about twice the diameter of the one preceding it. The position of the spire in this form is somewhat variable. In most of the specimens studied, it is slightly depressed below the top of the body whorl, but in others it lies in this plane. In a few specimens it is so strongly depressed that the umbilicus is almost flat.

The figured specimen, one of the cotypes, has a diameter of 15 mm. at the point where the final whorl begins to detach itself from the spire. The whorl at this point has a diameter of 6 mm.

Occurrence—Cotypes, U. S. N. M. No. 83547, a-b are from the Gasconade dolomite at locality 238-d, Meramec Spring, Phelps County, Mo. It is abundant here and also at locality 346-j=M. S. M. 56.1, on the top of the hill east of the mouth of Procter Creek, Morgan County, Mo. Widely distributed and locally abundant.

Also from the Oneota dolomite, Clayton County, Iowa, and from the Chepultepec dolomite at Jasper, Tenn.

Remarks—*Straparollus intralobatus*, Sardeson, from the Oneota at Altura, Minnesota, is very similar in size and general proportions and may be a member of this genus. His description is very brief and his figure is inadequate, and we have not had the opportunity of comparing his specimens with ours. He notes that the growth lines "run a little backwards near the dorsal side" and this might indicate that his specimen was a *Euomphalopsis*. He also emphasizes the fact that the whorl is compressed dorsoventrally and in this respect his species appears to differ from ours. The species also resembles *Straparollus pristiniformus* described by Calvin from the Oneota of Iowa. Calvin's descriptions were unaccompanied by figures, but at the request of friends he prepared a photograph of most of his specimens and distributed copies of it to those who were interested. Recently his types have been made available for study through the courtesy of the Department of Geology of the University of Iowa. They contain four specimens marked *Straparollus pristiniformus*, three of which are figured in his photograph. Two of these carry a distinct keel on the dorsal surface and belong to the genus *Helicotoma*. The other figured form is not so well preserved but probably also belongs here. The unfigured specimen, Catalogue No. 7002, University of Iowa, appears to be a specimen of *Euomphalopsis involuta*.

Euomphalopsis robusta, Ulrich and Bridge, new species.

Plate XXI, figure 18.

Larger than the preceding, and with more rapidly expanding whorls, the ratio of the diameter of the final whorl to the one preceding it being 3:1. The holotype is 22 mm. in diameter, and the final whorl is 9 mm. in diameter near the aperture.

Occurrence—Holotype, U. S. N. M. No. 83548 from cherts of the Gasconade dolomite, locality 238-d, Meramec Spring, Mo. Associated with *E. involuta*. *E. robusta* is a much rarer form, but has been found at several widely separated localities in Missouri and also in the Chepultepec dolomite in eastern Tennessee.

Lecanospira, Ulrich.

1859—*Ophileta*, Salter, Canadian Organic Remains, Decade I, p. 10, Pl. 3.
1859—*Ophileta*, Salter, Quart. Jour. Geol. Soc., London, Vol. 15, pp. 378-9, Pl. XIII, fig. 12.
1861—*Ophileta*, Hitchcock, Geology of Vermont, Vol. 1, p. 271.
1862—*Ophileta*, Chapman, A popular exposition of the minerals and geology of Canada. Canadian Journal, n. s. 7, p. 121, fig. 121.
1863—*Ophileta*, Chapman, A popular exposition of the minerals and geology of Canada. Canadian Journal, n. s. 8, p. 190, fig. 158.
1864—*Ophileta*, Chapman, A popular exposition of the minerals and geology of Canada, p. 124, fig. 121, and p. 162, fig. 158.
1865—*Ophileta*, Billings, Paleozoic Fossils, I, pp. 245-6, fig. 232.
1889—*Ophileta*, Lesley, Dictionary of Fossils, Penn. Geol. Survey, Rept. P-4, Vol. 2, p. 499.
1889—*Ophileta*, Whitfield, Bull. American Mus. Nat. Hist., No. 2, p. 48, Pl. 7, figs. 18 to 25.
1889—*Ophileta*, Miller, North American Geol. and Pal., p. 413.
1889—*Ophileta*, Koken, Ueber die Entwicklung der Gastropoden vom Cambrium bis Trias. Neus Jharb. Geol. Min. Pal. 6, Beilage Band, pp. 305 to 484.
1897—*Ophileta*, Ulrich and Schofield, Palentology of Minnesota, Geol. Surv. Minn., Final Rept., Vol. III, Pt. 2, p. 1025.
1898—*Ophileta*, Koken, Ueber untersilurischen Gastropoden, Neues Jharb. Min. Geol., Pal. I, p. 23.
1909—*Ophileta*, Grabau and Shimer, North American Index Fossils, Vol. 1, p. 656, fig. 904 (not 905).
1909—*Ophileta*, Bassler, Va. Geol. Survey, Bull. II-A, p. 50, Pl. III, figs. 1 and 2.
1915—*Ophileta*, Bassler, Bibliographic Index of North American Ordovician and Silurian Fossils, Bull. U. S. Nat. Mus. 92, Pt. II, pp. 878-80.
1919—*Ophileta*, Bassler, Md. Geol. Survey, Cambrian and Ordovician, p. 304, Pl. XXXIII, figs 1 to 3; Pl. XXXIV, fig. 2.
1926—*Lecanospira*, Ulrich, in Butts' Geology of Alabama, Ala. Geol. Survey, Special Rept. 14, p. 93, Pl. 16, figs 1 to 10.

This genus has long been confused with *Ophileta*, Vanuxem, and much of its early history has been given in the discussion of that form. Nearly all of the previously published references to *Ophileta* are based upon Salter's description of the genus and refer wholly or in part to *Lecanospira*. Salter considered *Ophileta* as a sub-genus of *Scalites*. His original description is as follows: "Subgenus *Ophileta*, Vanuxem. Discoidal; spire sunk above; umbilicus below perfectly open, exposing all the whorls on one plane; whorls numerous, truncate and binagular exteriorly; mouth trigonal. Forms with deeply concave spires."

It is to be especially noted that the features stressed by Salter are the depressed concave spire, and the flat open umbilicus. Neither of these characters is possessed by either of Vanuxem's species, and the reference of forms characterized by these features to *Ophileta* is obviously wrong. This inconsistency was recognized many years ago by the senior author, and the name *Lecanospira* was proposed by him for forms of the type described by Salter. It has appeared in faunal lists in a few publications and Butts figured two species under this name and accompanied these with a brief statement of the difference between the two genera.

Description—Shell planispiral, spire depressed below the top of the final whorl, umbilical side flat or slightly concave. Whorls five to eight, moderately expanding, triangular to subquadrangular in cross-section. On the dorsal side of each whorl there is a strong, raised and rounded keel, the position of which, together with the resulting cross-section of the whorl, is an important specific character. Outer wall of each whorl vertical or steeply inclined, depending upon the position of the dorsal keel; the area on the inner face of each whorl where it is in contact with the preceding one commonly bounded by a pair of small keels.

Aperture, triangular to subquadrangular with a deep > -shaped notch, the apex of which lies on the dorsal keel.

Surface marked with strong growth lines which originate near the ventral margin, curve forward along the outer wall for about one-third of its height, and then are directed sharply backward to the dorsal keel. After crossing this they again bend forward to the suture line. They are commonly faint where they cross the keel, and are faint or entirely wanting upon the umbilical surface.

Genotype—Lecanospira (Ophileta) compacta (Salter).

The synonomy given above is admittedly incomplete, but contains the most important references to the genus. As might be expected, some of them refer to both genera, but in nearly all of them, the author's conception of the genus was based primarily upon Salter's description and figures.

At the present time the following described or figured forms seem to be valid species of *Lecanospira:*

Lecanospira compacta (Salter) Beekmantown group of New York and Canada, Nittany dolomite and Longview limestone of the Appalachian Valley. Roubidoux formation of Missouri.

Synonym—*Ophileta complanata* of Whitfield, Miller, Lesley, Grabau and Shimer, and Bassler.

Note—The rame *Ophileta complanata* has doubtless been applied to almost every species of *Lecanospira* occurring in these horizons. In most cases it is impossible to tell what particular species the author had under consideration without a study of the original specimens.

Lecanospira nerine (Billings) Quebec group, Div. F., St. John, Newfoundland.

Lecanospira conferta, Ulrich, same distribution as *L. compacta*

Synonyms—See note under *L. compacta.*

Lecanospira alturensis (Sardeson) Oneota dolomite of Minnesota, Wisconsin, and Iowa; Gasconade dolomite of Missouri.

Synonym—*Ophileta alturensis.*

Besides these species and the forms described in this report there are a considerable number of undescribed species.

Stratigraphic and Geologic Distribution—Species of *Lecanospira* of the general type of *L. compacta*, are widely distributed in the early Ordovician (middle Canadian of Ulrich) formations. They are the most important index fossils of the Roubidoux formation of Missouri; of the Longview and Nittany formations of the Appalachian region, and of the lower portion of the Beekmantown of the Champlain Valley. The same species are also found in eastern Canada and Newfoundland and in the northern portion of Scotland. Closely allied forms are found in strata of approximately the same age in the western part of North America.

For a long time this was the lowest horizon in which this genus was known to occur, but it has recently been found in the Oneota and Gasconade formations. The species however are quite distinct. The genus is also found in the younger Lower Ordovician formations, but again the species are readily distinguishable, and they are seldom as abundant as they are in the Roubidoux and its equivalents.

Lecanospira compacta (Salter).

Plate XXII, figure 1.

1859—*Ophileta compacta*, Salter, Can. Org. Remains, Dec. 1, Geol. Surv. Canada, May, 1859, pp. 10, 16 to 18, Plate 3.
1859—*Ophileta compacta*, Billings, Can. Nat. Geol., Vol. 4, No. 5, Art. XXVII, Oct., 1859, p. 356, mentions species from Salter's type locality, no description or figures.
1863—*Ophileta compacta*, Billings, E., Geol. Surv. of Canada, 1863, p. 102, fig. 9a-b, p. 115, fig. 23, a-b.
1865—*Ophileta compacta*, Billings, E., Geol. Surv. Can., Pal. Foss., Vol. 1, 1865, p. 246.
1889—*Ophileta compacta*, Lesley, J. P., Dict. of Foss.; Penn. Geol. Surv., Rept. P-4, p. 499, fig. 23.
1889—*Ophileta compacta*, Miller, S. A., N. A. Geol. & Pal., p. 413 (regarded as synonym of O. complanata).
1894—*Ophileta compacta*, Keyes, C. R., Geol. Surv. of Mo., Vol. 5, Paleontology, p. 162.
1926—*Lecanospira (Ophileta) compacta*, Butts, Chas., Geol. of Ala. Geol. Surv., Ala., Special Rep. No. 14, Pl. 16, figs. 2 and (?) 7 (not 1, 6, 8 or 9).

The foregoing are known to refer definitely to Salter's species. In addition there are many other references which probably apply to it among others.

Original Description—"O. magna, sesquiuncalis, anfractibus 5-6 utraque perangulatus, supra profunde excavatus, infra planissiums: ore trapezoidale fere trigono, faciei interna angustissima externa biangulata,—verticali." Salter, 1859.

Description—Shell large, composed of five or six volutions; spire deeply depressed, the last two volutions rising steeply above the inner ones. Whorls rapidly expanding for this genus, the diameter of the final whorl, being slightly more than twice that of the preceding one. Final whorl often slightly detached. Keel prominent, elevated, situated about one-third the width of the whorl from the outer margin. Outer wall of whorl gently convex, almost vertical, inner wall concave. Base of shell flat. Because of the peculiar cross-section of the whorl they appear to be narrower on the base than on the upper side.

Surface marked with parallel lines of growth which arise from the outer margin, curve slightly forward and then backward, passing over the keel at a distance behind the point of origin which is nearly equal to height of the whorl at that point, and then curve forward intersecting the suture line about opposite the point of origin. Base smooth in most specimens or with obscure growth lines. Aperture trapezoidal, the inner side very short.

Diameter of an average specimen 50 mm., thickness at center of spire 3 mm., height of outer whorl 15 mm., concavity of dorsal surface 12 mm. Width of outer whorl near lip 9 mm., distance of primary keel from outer margin 3 mm.

Occurrence—Plesiotypes, U. S. N. M. No. 14692 and No. 83549 from the "Calciferous" at locality 434-u, along the St. Lawrence River, three miles east of Beauharnois, Quebec. Plesiotype, U. S. N. M. No. 71437 from the Longview limestone 10 miles southwest of Montevallo, Ala. Chas. Butts, collector. Plesiotype, U. S. N. M. No. 83550, from the Roubidoux formation, locality 101-l, 0.25 miles west of New Offenburg, Ste. Genevieve County, Mo. Plesiotype, M. S. M., Dept. of Geology No. 3074-1, from the Roubidoux formation, locality M. S. M. 90.10, Reynolds County, Mo. J. Bridge, collector.

Also from many other localities in Missouri and in the Appalachian Valley.

Remarks—One of the largest species of the genus. The diagnostic characters are the size, the extreme concavity of the spire, the rapid expansion of the whorls, especially the final one as compared with other species, and the almost triangular cross-section of the whorls, due to their slight attachment to each other. The other specimens figured by Butts as *L. compacta*, belong to other species, some of which are as yet undescribed.

Lecanospira sigmoidea, Ulrich and Bridge, new species.

Plate XXII, figure 2.

1926—*Lecanospira (Ophiletta) compacta*, Butts, Geol. of Ala., Ala. Geol. Survey, Special Rept. 14, Pl. 16, fig. 9.

Shell large, composed of six to seven moderately expanding volutions; spire moderately depressed. The ratio of the width of the final whorl to the one preceding it is about 5:3. Keel, prominent, elevated, situated about two-thirds the width of the whorl from the outer margin. Outer wall of whorl convex outward near base, becoming slightly concave near keel, forming in cross-section a gentle sigmoidal curve, the convex portion of which is larger and more prominent than the concave portion. Inner wall steep and gently concave. Base of shell smooth, flat on outer whorls, becoming gently concave on the inner ones. Surface markings as in *O. compacta*. Aperture rounded trapezoidal.

Occurrence—Cotypes, U. S. N. M. No. 83551 from cherts of the Nittany dolomite, locality 256-n, Washburn, Tenn.

Plesiotype, U. S. N. M. No. 83552, from the "Calciferous," locality 434-u, three miles east of Beauharnois, Quebec.

Plesiotype, M. S. M., Dept. of Geology No. 3074-2 from cherts of the Roubidoux formation, locality M. S. M. 90.10, Reynolds County, Mo. J. Bridge, collector. This form has been observed at several other localities in the Ozark region.

Remarks—This is also a large form having about the same diameter as *L. compacta*, but the whorls are narrower, there being about one more in this form than in a specimen of *L. compacta* of the same size. The position of the primary keel and the steeply concave inner slope of the whorl also serve to distinguish it.

Lecanospira salteri, Ulrich and Bridge, new species.

Plate XXI, figure 3.

Description—Shell of medium size, composed of about six moderately expanding volutions. The diameter of the final volution is about twice that of the preceding one. The whorls increase rapidly in height, and overlap to such an extent that the dorsal keel on the inner whorls is only slightly elevated above the suture. Dorsal keel median, outer wall of whorl steep, slightly convex, basal angle rounded. Inner wall concave. External moulds of the spire are rounded conical in form, with only a very slight offset at the junction of the whorls, except between the body whorl and one preceding it. Average specimens are about 35 mm. in diameter. In a form of this size the dorsal concavity is 8 to 10 mm. deep.

Occurrence—Cotypes, U. S. N. M. No. 83553 from cherts of the Nittany dolomite, locality 256-d, one mile southwest of Jefferson City, Tenn. Also from the Roubidoux formation, locality M. S. M. 90.10, Reynolds County, Mo. M. S. M. Dept. of Geol. No. 3074-3. It also occurs at Beauharnois, Quebec.

Remarks—This species is often associated with *L. sigmoidea*, from which it differs in the position of the dorsal keel, the outer profile of the whorls and the much more deeply depressed spire.

Lecanospira biconcava, Ulrich and Bridge, new species.

Plate XXII, figure 4.

Description—Shell of medium size, composed of six to seven rather slowly expanding volutions, which are in contact for about one-half of their height. The ratio of the diameter of the final whorl to the one preceding it is about as 5:3. Dorsal keel median, outer slope uniformly convex, inner slope concave to the suture, which is strongly depressed. Lower margins of the whorl smoothly rounded. Umbilicus slightly concave, its depth about one-third to one-fourth the depth of the spire.

Occurrence—Holotype, U. S. N. M. No. 83554, from the Roubidoux formation, about three miles north of New Offenburg, Ste. Genevieve County, Mo. Stuart St. Clair, collector.

Paratype, U. S. N. M. No. 83555, from the same horizon, locality 346-t, on Highway 60 between Birch Tree and Winona, Mo. It is also recorded from several other localities both in Missouri and in the Appalachian region.

The specimens here figured, M. S. M. Dept. of Geology No. 3074-4, are tentatively referred to this species.

Remarks—This species somewhat resembles *L. conferta*, but is distinguished by its concave base and by its proportionately broader whorls, there being about one more whorl in a specimen of *L. conferta* of the same diameter.

Family Undetermined.

Scaevogyra, Whitfield.

Scaevogyra cf. swezeyi Whitfield.

Plate XVIII, figures 3, 4.

The form figured here is the most common fossil of the Potosi dolomite. Its sinistral spire and inflated whorls show it to be an undoubted *Scaevogyra*, and it most nearly approaches *S. swezeyi* Whitfield in size and general proportions. The spire in the Missouri specimens is somewhat higher than is common in the Wisconsin forms, but this feature is rather variable. Some of the forms from the type locality at Baraboo, Wis., show spires as high as those of specimens here figured. These may eventually be separated as a distinct species but until further studies can be made on this interesting group it seems best to refer it tentatively to Whitfield's species.

Occurrence—The figured specimens, U. S. N. M. No. 83512 and M. S. M. Dept. of Geol. No. 7250, were collected by Mr. F. L. Sevier from residual cherts of the Potosi dolomite in the NE. ¼ NE. ¼ sec. 6, T. 35 N., R. 1 E., near Palmer, Washington County, Mo. (M. S. M. loc. 74.51). Other localities from which this species has been obtained are given in the table on page 74.

CEPHALOPODA

E. O. Ulrich and A. F. Foerste

The following descriptions have been abstracted from a monograph on the cephalopods of the proposed Ozarkian and Canadian systems by Ulrich and Foerste. The greater portion of this monograph is completed and it is hoped that it will soon be ready for publication.—J.B.

Shelbyoceras, Ulrich and Foerste, new genus.

Plate XVIII, figures 1, 2.

The name *Shelbyoceras* is about to be proposed by Ulrich and Foerste for a group of very primitive cephalopods, found in formations assigned by them to the proposed lower and middle Ozarkian series. These are small, laterally compressed cyrtocones, strongly curved on the ventral side, angulate dorsally with the body chamber much larger and longer than the phragmacone.

Butts figured three forms, now referred to this genus under the names of "Leviso-ceras" and "Quebecoceras."*

*Butts, Chas., Geol. of Ala., Ala. Geol. Survey, Special Rept. 14, 1926, Pl. 14, figs. 1, 2, 3, 6, 7, 8, 9.

Butts' specimens came from chert which was provisionally mapped as Copper Ridge, but which is apparently much older. A similar form has been found in the Eminence dolomite, and is the only cephalopod known from that formation.

The two specimens here figured were collected several years ago, but their true nature was not suspected until they were examined by Dr. Ulrich, who, on the basis of a preliminary examination, referred them to this genus. Detailed descriptions of these forms will be published in the forthcoming monograph by Ulrich and Foerste.

It is interesting to note that the Potosi specimens are associated with *Scaevogyra cf. swezeyi*, and that the same species or a form closely resembling it occurs with the Alabama species.—J. B.

Burenoceras, Ulrich and Foerste, new genus.

Conch small, relatively very short, rapidly expanding, more or less strongly curved, moderately compressed laterally, the phragmacone usually somewhat shorter and much smaller than the living chamber, which, as a rule, continues to expand on all sides to the aperture, flaring especially on the ventral side. Camerae shallow, septa flat to only very moderately concave, the septal sutures nearly straight and direct or very slightly oblique, the usual dorsal saddles inconspicuous. Siphuncle near or in contact with the ventral wall, its diameter relatively large in the older (Van Buren) species but always much smaller in their descendants; lower part of siphuncle with one or more flat, transverse diaphragms that correspond to the endocones of other Holochoanites.

Genotype—*Burenoceras pumilum*, n. sp.

Stratigraphic and Geographic Distribution—Rather widely distributed in the Van Buren and Gasconade formations of Missouri. Also from the Oneota dolomite of the Upper Mississippi Valley and the Chepultepec dolomite of the Southern Appalachians. About 16 species are known.

Burenoceras pumilum, Ulrich and Foerste, new species.

Plate XX, figures 32, 33.

The cross-section of the conch of this species is oval rather than triangularly oval. This is due to the absence of distinct flattening of the dorsoventral sides and to the absence of any tendency toward angulation at the maximum lateral diameter of the conch. On the contrary, the lateral sides of the cross-section increase gently in convexity from the dorsal toward the ventral side without any intermediate angulation. In a specimen with a dorsoventral diameter of 10 mm. and a lateral one of 7 mm. at the base of the living chamber this maximum lateral diameter is located 4 mm. from the ventral wall of the conch. The diameter of the siphuncle here is 3.2 mm. On the dorsal side the height of the living chamber is 7.5 mm., on its lateral surface 8.5 mm., and at the middle of the ventral side only 5 mm. The rate of enlargement of the living chamber and its curvature are similar to that of *B. angulare* n. sp. (not described here) but the curvature of the lower part of the conch, as indicated by the siphuncle, is sharper.

Faint wrinkles of growth slope diagonally downward from the ventral toward the dorsal side of the conch across the lower part of the living chamber, but the slope decreases toward the upper part of the chamber, where the wrinkles are more nearly horizontal.

Occurrence—Van Buren formation; the holotype, U. S. N. M. No. 83537, was found north of Potosi, Washington County, Mo., in sec. 13, T. 36 N., R. 3 E. Two other specimens were collected on Highway 21, between 4.5 and 5 miles south of Potosi. Five precisely similar specimens were found at the same horizon in Shannon County, 1 mile east of Eminence, and two others 8 miles southeast of Eminence. At each of these places the species occur in association with other highly characteristic fossils of the Van Buren formation.

Burenoceras expandum, Ulrich and Foerste, new species.

Plate XX, figures 30, 31.

The holotype and perhaps only known specimen of this small species consists of a silicified cast of the interior of the living chamber, 8.5 millimeters in height, elliptical in cross-section, with a dorsoventral diameter of 9.8 millimeters and a lateral diameter of 7.6 millimeters at its base. From this it enlarges dorsoventrally to 12 millimeters at mid-height and to 17 millimeters at the aperture. The aperture flares ventrally and ventrolaterally like the mouth of a trumpet, the most extended part projecting fully 4 millimeters beyond the ventral outline at mid-length of the chamber. Dorsally, however, the upper part of the vertical outline of the chamber curves slightly inward. The diameter of the siphuncle at the base of the chamber is 3 millimeters. The surface of the shell is ornamented by wrinkles of growth which are strongly oblique, curving downward dorsally at an increasing rate along the lower part of the living chamber but becoming more nearly horizontal at the top of the chamber, indicating that the hyponomic sinus was conspicuous at earlier stages of growth of the conch but became shallow under gerontic conditions.

Another much smaller cast of the living chamber of a supposedly younger shell of this species was found with the holotype. Aside from the matter of size it differs from the latter only in the expected lesser flare of the ventral side of the aperture.

Occurrence—Van Buren formation, 1 mile east of Eminence, Shannon County, Missouri.

Holotype—U. S. N. M. No. 83536.

Remarks—Though most probably a close ally of the associated but less rare *Burenoceras pumilum* the present species, particularly in its mature condition, is readily distinguished by the strikingly abrupt and greater flare of the ventral side of the apertural part of the living chamber. They differ also in their respective cross-sections, the curvature of the dorsal and ventral sides of the outline being nearly alike in *B. expandum* whereas in *B. pumilum* the dorsal side of the section is distinctly narrower than the ventral. Both of these species are also very similar in general expression to such other Van Buren species as *B. compressum* and to such Gasconade species as *B. ungulatum* and *B. curvatum*, but in every case comparison of reasonably complete and undistorted living chambers discloses constant features by which they may be distinguished from each other.

Dakeoceras, Ulrich and Foerste, new genus.

Conchs endogastric, moderately breviconic, more or less compressed laterally, curved but mainly in its lower half, usually intermediate in curvature between *Levisoceras* and *Eremoceras*, the rate of enlargement varying from moderate to rapid. Phragmacone usually considerably longer than the living chamber. Camerae shallow, numerous, the sutures, beginning at the ventral outline, curved downward on the lateral surfaces, the upturn in the dorsal third or half more gentle and failing to rise as high as on the ventral side. Siphuncle usually large, situated close to or in contact with the ventral wall, its circumference often flattened on the ventral side, with flat diaphragms stretched across the truncated lower ends of short endocones in its lower half or two-thirds.

Genotype—*Dakeoceras retrorsum*, n. sp.

Stratigraphic and Geographic Distribution—A number of species and varieties are referred to this genus. The great majority of these forms are found in the Van Buren formation of Missouri, but two species are known from the Oneota dolomite of the Upper Mississippi Valley.

Remarks—In general aspect the group of species here assigned to *Dakeoceras* reminds of *Levisoceras* on the one hand and of *Eremoceras* and *Ectenoceras* on the other. Most of them being older than the typical forms of those genera it seems quite possible that they represent the stock from which both of the mentioned generic groups were

derived. In *Levisoceras* the conch is relatively shorter and more strongly curved; in *Eremoceras* the conch is more erect and longer, particularly in the part made by the phragmacone. However, the most striking feature in which *Dakeoceras* differs from both those groups and which is best displayed by the contour of the base of the living chamber is the decided downward slant of the camerae and septa so that the sutures lie lower on the dorsal side of the conch than on the ventral side. In *Eremoceras* the course of the sutures is nearly direct across the lateral surfaces of the conch or slants slightly upward in dorsad direction whereas in *Levisoceras* the dorsal upward slant is always a pronounced feature.

Dakeoceras normale, Ulrich and Foerste, new species.
Plate XX, figure 29.

Species based on five specimens, one fairly complete, the others consisting mainly of living chambers with varying lengths of the matrix-filled siphuncle. The holotype is 27 millimeters long, laterally compressed, and curved lengthwise. The radius of curvature of its convex dorsal outline is about 30 millimeters along the phragmacone, increasing to 40 millimeters along the living chamber. The latter is about 10 millimeters long. The lateral diameter of the conch enlarges from 4.5 millimeters at its base to 9.8 millimeters at the base of the living chamber and to 12 millimeters at the top of this chamber. The dorsoventral diameter at the base of the specimen is estimated at 6.2 millimeters, increasing to about 12 millimeters at the base of the living chamber. The cross-section of the conch is ovate, but the dorsal part of its outline is much more sharply rounded than the ventral. The dorsum, in fact, particularly beneath the living chamber, is obtusely angular. Thirteen camerae, counting downward on the dorsum from the point at which the dorsoventral diameter is 10 millimeters, occur in a distance of 10 millimeters. The sutures of the septa curve downward laterally for an amount equaling 1½ to 2 camerae, producing broad lateral lobes and narrower dorsal and ventral saddles. Beginning at the ventral outline the downward curve of the sutures extends two-thirds across the lateral side before the shorter upturned part of their course begins. The siphuncle is large, strongly depressed on the ventral side, the transverse diameter about 4.5 millimeters, the dorsoventral 2.5 millimeters, where the corresponding diameters of the conch are 9.5 millimeters and 11 millimeters.

The specimen figured here, a paratype, from the same place as the preceding, consists mainly of a living chamber that seems to be nearly complete on the dorsal side where its wall retains a height of about 10 millimeters. Beneath this are two camerae and a 6-millimeter length of the siphuncle. The specimen agrees in all essential respects with the others except that the siphuncle is not so strongly compressed in dorsoventral direction, its diameters at the base of the living chamber being 2.2 millimeters and 3.5 millimeters. It is notable chiefly for two reasons, the first being that the surface of the living chamber is faintly wrinkled in transverse direction. The wrinkles slope slightly downward in a dorsad direction near the base of the chamber but become directly transverse at its midheight and finally rise slightly in dorsad direction at the top of the chamber. The second and more important reason is that the lower end of the siphuncle is flatly truncated at probably the last of the diaphragms. The outline of the diaphragm is rounder than is the section of the siphuncle nearer its top and thus indicates that on at least its ventral side the lower part of the siphuncle exposes the wall of an endocone.

Occurrence—Holotype, U. S. N. M. No. 83534 and paratypes, U. S. N. M. No. 83556, from cherts of the Van Buren formation at locality 102-e about 1 mile southeast of Eminence. Also from other localities both in the Eminence and Potosi regions.

Dakeoceras subcurvatum, Ulrich and Foerste, new species.
Plate XX, figures 27, 28.

Holotype 39 millimeters long, embedded in chert so as to expose only its dorsal half to two-thirds, consisting of a living chamber apparently complete and 18 millimeters in length and a part of the phragmacone, with 22 camerae, 23 millimeters in

length, when measured along the dorsal outline of the specimen. The outline of the exposed dorsal part is moderately curved in a lengthwise direction, the radius of the curve varying from 30 millimeters along the phragmacone to 40 millimeters along the living chamber. The concealed ventral outline is assumed to be moderately concave. The lateral diameter enlarges from 5 millimeters at a point 5 millimeters above the smaller end of the specimen to 12 millimeters at the base of the living chamber and about 16 millimeters at the top of the chamber. At the point where the lateral diameter is 9 millimeters the dorsoventral diameter of the conch is approximately 11 millimeters, and at the top of the living chamber, where the lateral diameter is 15 millimeters, the dorsoventral one is estimated at 19 or 20 millimeters. Accordingly the cross-section is ovate, but the dorsal side of the outline is more narrowly curved than the ventral. About 14 camerae occur on the dorsum in a length equal to the estimated dorsoventral diameter of 15 millimeters at the top of the phragmacone. On the remaining basal part of the specimen the camerae average about 1 millimeter each. The sutures of the septa curve downward laterally for a distance of at least two camerae, producing broad lateral lobes and narrower dorsal and probably still narrower ventral saddles. Projecting the curve of the septa from their visible parts to the ventral wall, the sutures should attain somewhat higher levels on the ventral side than on the dorsum, in which respect, then, the species would conform with normal *Dakeoceras*. The siphuncle is very poorly indicated in two artificially made cross-fractures. It lies close to the ventral wall and seems to have a diameter of about 3 millimeters where the transverse diameter of the phragmacone is 11 millimeters. The aperture of the living chamber appears to be directly transverse to the curving vertical axis of the conch. Numerous but rather faintly impressed lines of growth seem to be more clearly indicated on the dorsum than on the lateral surfaces.

A smaller specimen found in the same formation about 4.5 miles south of Potosi, Washington County, Mo., seems to agree in every essential respect with the holotype.

Occurrence—Holotype, U. S. N. M. No. 83535 from the Van Buren formation, locality 102-e, 1 mile southeast of Eminence, NW. ¼, SE ¼, sec. 35, T. 29 N., R. 4 W. Also from the same formation at other localities in both the Eminence and Potosi regions.

Cameroceras, Conrad.

Cameroceras huzzahense, Ulrich and Foerste, new species.

Plate XXI, figure 14.

One of the larger specimens is 145 millimeters long, enlarging from a dorsoventral diameter of 13 millimeters a short distance above the base of the specimen to 27 millimeters at the base of the living chamber, 90 millimeters farther up. The figured specimen represents an individual of approximately the same dimensions, but lacking more of the apical portion. The length of this chamber is 38 millimeters. The number of camerae in a length equal to the diameter of the conch at the top of the series counted, equals 6.5 camerae where the diameter of the conch is 13 millimeters, 9 camerae where this diameter is 20 millimeters, and 13.5 camerae where the diameter is 27 millimeters. The sutures of the septa are directly transverse even where crossing the siphuncle. The specimen is a cast of the interior of the conch, and in this cast the camerae fail to cross the median part of the ventral side of the siphuncle along a vertical area which is 4 millimeters in width at the top of the phragmacone. Here the lateral diameter of the siphuncle, judging from numerous other specimens, is estimated at 11.5 millimeters.

This species is abundant along Huzzah Creek in Crawford County, Mo., and shows numerous variations in dimensions. The rate of enlargement of the conch varies from an apical angle of 4 to one of 8 degrees. The ventral side of the conch frequently is more or less flattened. The living chambers usually are from 24 to 30 millimeters in diameter at their bases, their length varying from slightly greater than their diameter to fully

1.5 times the length of the latter. In some specimens the number of camerae in a length equal to the diameter of the conch equals 16 to 20 at the top of the phragmacone. While in most specimens the sutures of the septa are directly transverse to the length of the conch along the entire circumference of the latter there are a few in which these sutures curve slightly upward or downward in crossing the siphuncle. The ratio of the diameter of the siphuncle to that of the conch varies from 0.43 to 0.52 in most specimens.

In one specimen including a phragmacone 26 millimeters in length, with a lateral diameter of 18 millimeters at its base, the siphuncle projects above it for a length of 21 millimeters, and an endocone extends beneath it for a length of 16 millimeters. The ventral side of this endocone is flattened along its median part, but laterally and dorsally it is very obliquely annulated in directions parallel to adjacent parts of the septa.

Occurrence—Cotypes, U. S. N. M. No. 83544, from the Gasconade dolomite, locality 238 on Highway 8, 1 mile west of the junction of Huzzah and Dry Creeks, and 10 miles east of Steelville, Crawford County, Mo. Rather common in the upper portion of the formation, particularly in the central part of the Ozarks.

TRILOBITA

E. O. Ulrich

A great many species of trilobites, most of them new and many of them belonging to undescribed genera, have been collected from the various formations outcropping in the Eminence region. These are being made the subject of a monographic study by Doctor Ulrich, and the following descriptions of some of the species, which have proved to be most useful in the identification of the various formations, have been abstracted from his notes and manuscripts.—J. B.

Order Hypoparia

Entomaspidae, Ulrich, new family

This family is proposed for a small group of trilobites which resemble the Harpidae in most characters but in which the genal spine is borne entirely upon the epistomal plate as in the Trinucleidae.

Entomaspis, Ulrich, new genus.

The genotype of the new genus, for which I propose the name *Entomaspis radiata*, n. sp., is represented by numerous dorsal shields of the cephalon, a few cranidia, three ventral (epistomal) plates, a hypostoma, and a dozen or more pygidia. The cephalon, as far back as the occipital ring, reminds of *Harpes*, especially in such parts as the glabella, the eyes, convex cheeks, the peculiar depressed, semilunate areas which, though separated from them by a shallow groove, suggest lateral extensions of the posterior glabellar lobes, the structure of the ventral plate in front of the genal angles, and the course of the posterior half of the facial suture. The flat or gently concave rim, however, is not so sharply separated from the cheeks, nor is it pitted, as in *Harpes*, being covered with rugose or simple radiating lines instead. A more important difference is the fact that the dorsal shield does not take an equal part with the ventral plate in making the genal extensions, these being also narrower and more spinelike than in *Harpes* and wholly borne by the ventral plate as in the Trinucleidae. All these cephalic characters of *E. radiatus* are found also in the heads of the other species referred to the genus. So far then as the cephalon is concerned *Entomaspis* occupies an intermediate position between the Harpidae and the Trinucleidae.

In the chert derived from the Eminence dolomite of Missouri I have found five similar but distinguishable kinds of pygidia that can belong only to heads of this generic type. Though evidently representing closely related species the peculiarities by which these pygidia are distinguished from each other are readily notable. The assignment of three of the five to particular kinds of the heads is as usual largely a matter of opinion and subject to correction if entire specimens retaining both the terminal shields in place are ever discovered. So long as we are reasonably confident of the generic relations of the associated parts, especially when two or more kinds of each are found in the same bed and place, little harm will have been done when subsequent discoveries prove that the tail of one had been erroneously assigned to the head of a second or third species. In the present instance two of the Missouri species of *Entomaspis* are founded primarily on cephalia and three others mainly or solely on pygidia that are recognizably different from those provisionally assigned to the first two species.

Regarding these pygidia the accompanying illustrations show that they are more like those of *Cryptolithus* and Ampyxidae, both in structural characters and relative size, than those of *Harpes* in which the pygidium is very small as compared to the cephalon. The heads and tails of *Entomaspis* being much less unequal in size than in *Harpes* and the difference in size between the two shields relatively intermediate as compared with Trinucleidae on the one hand and Raphiophoridae on the other, I am inclined to believe that the number of thoracic segments was much smaller than in *Harpes* and probably less than eight or ten.

Entomaspis radiatus, Ulrich, new species.

Plate XIX, figures 14, 15, 16.

Description—Head small, 5 to 7 millimeters wide, semiovate, the greatest width somewhat less than twice the length, the posterior edge straight in the middle half, the outer fourths strongly recurved and passing across the dorsal sides of the basal parts of long genal spines which are inseparably attached to the ventral plate. Glabella small, moderately convex, suboblong, tapering slightly forward, with two, rarely three, rather obscure pairs of short glabellar furrows, surrounded on the sides and front by a wide, minutely granostriated convex area sloping outwardly to the level of a more gently convex border that is edged with an elevated smooth rim. Inside of the rim the border is crossed by somewhat unequal, often alternating fine rugose striae, most of them continuations of the radial lines on the convex inner area. Space between front of glabella and the edge of cephalon about equally divided between brim and border. Middle of anterior slope of brim with a low prolongation into the depressed band of the border. Eyes small, sharply elevated and irregularly lobate, about two-thirds the width of the glabella from the dorsal furrows, connected with the latter by clearly elevated oblique eye lines. The anterior half of the facial suture is generally completely obliterated in the fusion of the cheeks, but a thin ridge that I regard as representing their fused edges behind each eye is commonly clearly notable. It runs with gently sigmoid curvature from the eye to a point opposite the inner half of the wide base of the genal spine (Pl. XIX, fig 14). Post-lateral lobelike depressed areas barely discernible and mainly confined to the dorsal furrows. Occipital ring well defined, wide and carrying a small nuchal spine in the middle, narrow at the dorsal furrows. Extremities of thickened posterior edge of fixed cheeks strongly recurved to inner side of base of genal spine.

Pygidium about 4 millimeters wide, semi-elliptical, short, nearly three times as wide as long, with prominent conical axis carrying six narrow rings. Each of the latter carries a pair of rather widely separated nodes between which the grooves between the segments are shallower than on the flanks of the axis. Pleural lobes flat, divided by five oblique grooved ribs, the anterior half of each with a small tubercle midway out from the axis. Outer margin of pygidium with 13 larger and more prominent regularly spaced knobs, each at the outer terminus of the groove between the segments.

Horizon and localities—Though never very common and, on account of its small size, easily overlooked, dorsal shields of the head and pygidia of this species have been observed at a number of places in Missouri where the partly rotted and therefore rather soft chert debris of the upper half of the Eminence dolomite is at the surface. Some of the most favorable localities for collecting fossils of this zone occur in a belt passing 3 miles to the east and 4.5 miles south of Potosi, Mo. Here it lies at the top of the Eminence and directly under the Van Buren formation. Other good and in part even better exposures of this zone occur in the vicinity of Eminence, the most accessible being the road cut 3 miles south of the town. Another good collection was taken from the brow of a large hill 1 mile north of Eminence. In the latter region the *Entomaspis* zone is succeeded by the *Plethopeltis* zone, which also contains a prolific but strikingly different fauna that has not been found in the region about Potosi.

Entomaspis trigonalis, Ulrich, new species.

Plate XIX, figures 12, 13, 17.

This species is founded mainly on a pygidium. Its appearance in general is much the same as the pygidium referred to *Entomaspis radiatus* but differs in its relatively great length, more triangular outline, and proportionally smaller though equally numerous marginal knobs. The pleural segments also are more deeply grooved and comprise an extra short posterior pair. Its length is 1.8 millimeters, width 3.6 millimeters.

A head found associated with this pygidium also differs slightly from the head of *Entomaspis radiatus*. Its outline is more sharply curved in front, making it just appreciably triangular, the border slightly narrower, the rim somewhat thicker, and the radial markings on the depressed inner band of the border strong and more regular. On the strongly convex cheeks and brim, however, the radial striae are barely notable and, at that, apparently only near the base of the steep convex slopes.

Horizon and locality—The two type specimens were found near the top of the Eminence dolomite, 1 mile east of Berryman, Mo.

Order Opisthoparia

Triarthridae, new family

Provisionally proposed for a group comprising *Triarthrus*, *Parabolinella*, *Peltura*, *Protopeltura*, *Acerocare*, and *Cyclognathus* and more doubtfully *Triarthropsis*, n. gen., *Stenochilina*, n. gen., and two other allied but as yet undescribed genera. At present this group of genera is generally referred to the Olenidae, but that family, as usually recognized, seems to comprise a very heterogeneous assemblage of forms. Doubtless when these divergent contents are subjected to the closer study and more comprehensive and detailed comparisons they require and deserve, the family Olenidae will be split into several. Anticipating this move for a more natural classification of the Olenidae I shall provisionally use the term Triarthridae for the group of genera listed above.

Triarthropsis, Ulrich, new genus.

Triarthropsis nitida, Ulrich, new species.

Plate XIX, figures 3, 4.

This genus and species were proposed by me about 15 years ago in an as yet unpublished paper read before the Paleontological Society of America for a small form occurring in the Eminence dolomite of Missouri. In general appearance the cranidium of this form is much like that of *Triarthrus* but differs in the possession of narrow brim separating the glabella from the rim. This brim is lacking in all of the Ordovician species referred to *Triarthrus*.

The glabella has subparallel sides and is evenly rounded anteriorly, and the circumglabellar furrow is strongly defined. There are three pairs of glabellar furrows, all of which are directed posteriorly and some of which unite across the glabella. Occipital ring well defined, shorter than the width of the glabella, narrow at the ends, thicker in the middle and set off from the glabella by a strongly impressed, curved occipital furrow. No occipital spine. Palpebral lobes well defined, narrow, slightly bowed outward indicating a long narrow eye, the center of which is opposite the next to last glabellar lobe. Posterior limbs triangular, the extremities somewhat recurved posteriorly. Surface smooth.

Horizon and locality—The species is fairly common in the Eminence dolomite of Missouri but is likely to be overlooked because of its small size. The holotype, U. S. N. M. No. 83491, is from locality 102-h, 4 miles west of Eminence. A paratype, U. S. N. M. No. 83492, is from locality 100-i, 5 miles northwest of Eminence.

Remarks—This genus is also very closely allied to *Bienvillia* Clark, as that genus is now understood. Good specimens of *Triarthropsis* are to be distinguished by the slightly more posterior position of the eyes, the shorter and more recurved posterior limbs, and in the complete absence of the narrow upturned rim that is barely noticeable in specimens of *Bienvillia* from Levis, but which is more strongly developed in some of the specimens from the Eureka district, Nevada.

Stenochilina, Ulrich, new genus.

Stenochilina spinifera, Ulrich, new species.

Plate XIX, figures 1, 2.

Cranidium moderately convex, consisting mainly of the glabella, the free cheeks being narrow and continued as a very narrow band around the front of the glabella. The latter has parallel sides, is regularly rounded in front, about 3.2 millimeters wide and 4 millimeters long to the occipital furrow, moderately convex, with two pairs of widely separated oblique slit-like furrows, the posterior pair suggesting confluence across the middle and branching so as to draw a faint longitudinal boundary between the inner sides of the posterior lobes and the remaining squarish median third. Occipital ring very narrow at the ends, wider in the middle and posteriorly extended into a long slender spine. Palpebral lobes sharply defined, depressed, moderately bowed, indicating an eye of rather large size located opposite the second glabellar lobe. Posterior limbs triangular, the posterior edge made by a thin elevated straight rim not recurved at the extremities. Surface of glabella, free cheeks, and anterior band thickly covered with minute tubercles.

Horizon and locality—A rather rare fossil in the *Entomaspis* or *Calvinella ozarkensis* zone of the Eminence dolomite, 1 mile east of Eminence, Mo.

Holotype—U. S. N. M. No. 83490.

The above description includes the generic characters of the new genus *Stenochilina* of which the species is the genotype. It reminds of some of the associated species of *Triarthropsis* but is distinguished by its wider glabellar lobes and but two instead of three pairs of furrows, larger eyes, pustulated surface, long occipital spine, and straighter posterior edges of limbs. So far as known to me, this particular combination of characters does not occur in any previously established genus. Two or three other somewhat similar species are found with the genotypes of both *Triarthropsis* and *Stenochilina* in the Eminence of Missouri. These have not been studied sufficiently to determine their relations to either of the mentioned genera, but as they have smooth surfaces and three pairs of nearly transverse glabellar furrows the probabilities seem at present to favor *Triarthropsis* rather than *Stenochilina* as their final resting place.

Solenopleuridae, Angelin

Hystricurus, Raymond.

A large proportion of the trilobites occurring in the Gasconade dolomite belong in this genus. There are a great many different forms, and the separation into species is not easy. One of the largest and most characteristic of these is described below, but descriptions of other species must await more detailed studies.—J. B.

Hystricurus missouriensis, Ulrich, new species.

Plate XXI, Figures 1, 2.

Description—Glabella high, rounded, semi-elliptical. Circumglabellar and occipital furrows strong, deeply impressed, the latter almost straight. No glabellar furrows. Occipital ring strong, rounded, with no trace of an occipital spine. Facial suture cutting the anterior margin almost directly in front of the eyes and continuing backward in a straight line until past the eye, when it turns abruptly outward to cut posterior margin just inside the genal angle. Posterior marginal furrow strong.

Brim sloping abruptly downward to the marginal furrow and then sharply turned upward into a strong, rounded rim, which, when viewed from the front, is strongly arched. The surface of all the convex portions of the cephalon is strongly pustulose, the pustules being of two sizes. The larger ones are commonly surrounded by a circle of five or six smaller ones, which are spaced about twice their diameter apart.

Free cheeks and thoracic segments unknown. There are two or three types of pygidia associated with these heads, but the exact relationships have not been determined.

Dimensions of the holotype are: Length of cranidium, 11.5 millimeters; length of glabella 9 millimeters; width of cranidium at rim 9 millimeters; width at eyes, 12 millimeters; width at the posterior margin 15 millimeters; width of glabella, 7 millimeters; height of cranidium, 5 millimeters.

Occurrence—Holotype U. S. N. M. No. 83538 from cherts of the Gasconade dolomite at locality 101-v, 1.25 miles north of Decaturville, Mo.

Also from the same formation at numerous other localities in the Ozark region.

A similar if not identical form is found in the Manitou limestone of Colorado.

Remarks—This species strongly suggests *Hystricurus conicus* (Billings) but differs in the shape of the glabella and in the proportionately wider brim. In *H. conicus* there is not more than one row of pustules between the anterior end of the glabella and the marginal furrow, while in this form there are two or three rows. It also reminds of *H. tuberculatus* (Walcott) from the Eureka district, but that species has a short occipital spine, and the sides of the glabella are more nearly parallel. It somewhat resembles *H. ravni* Poulsen, but in that species the glabella is proportionately narrower and the anterior edge of the cephalon is more strongly rounded.

Dikelocephalidae, Miller

Calvinella, Walcott.

Calvinella ozarkensis, Walcott.

Plate XIX, figures 8, 9, (?) 11.

1914.—*Calvinella ozarkensis* Walcott, Smithsonian Misc. Coll., vol. 57, No. 13, p. 389, pl. 70, figs. 1, 1a, 2, 2a, 3, 4, 4a, (?) 5, 5a (not fig. 6).

This is the largest as well as one of the most distinctive trilobites found in the Eminence dolomite. No complete or even approximately complete specimen is known, but cranidia, free cheeks, and large pygidia, all more or less fragmentary, are relatively abundant at many localities. The large nearly complete cranidium, the holotype, is here refigured actual size, and in this connection it should be noted that Walcott's figure

was enlarged 1.5 times and not twice as stated in the description of his plate. The free cheeks are large, broad, and moderately convex; the lateral and posterior margins thickened into a broad rim which is oval in cross-section. The genal angle is terminated by a long stout spine. The surface of the free cheek inside of the rim is covered by fine raised irregularly branching and anastomosing lines which roughly parallel the outer margin. At the junction of these lines there is often a small raised tubercle. A complete cephalon of a specimen about the size of the holotype would be about 35 millimeters long and 80 to 90 millimeters broad.

The pygidia figured by Walcott belonged to much smaller individuals. A large but incomplete specimen shows that its length and width must have been approximately 35 and 70 millimeters. A great many of the specimens referred to this species are much smaller, but their proportions are identical.

Horizon and localities—The holotype, U. S. N. M. No. 58674, is from chert of Eminence dolomite, locality 102-h, about 4 miles west of Eminence, Mo.

Paratypes, U. S. N. M. Nos. 58675 and (?) 58677, from the same formation at locality 100-b, near the Slater Mine, 1.5 miles east of Eminence.

Paratype, U. S. N. M. No. 60055, from the same formation at locality 102-f, about 1.5 miles east of Eminence.

Paratype, U. S. N. M. No. 60056, from the same formation, locality 102-j, 1.5 miles southwest of Eminence, Mo.

It is also abundant at locality 373-l,=M. S. M. 98.15, about 1.5 miles northwest of Eminence, and at locality 452-u=M. S. M. locality 98.4, about 3 miles south of Eminence on Highway 19.

Calvinella minor, Ulrich, new species.

Plate XIX, figure 10.

1914.—*Calvinella ozarkensis*, Walcott, Smithsonian Misc. Coll., vol. 57, No. 13, pl. 70, fig. 6, (?) 5, 5a.

Smaller than average examples of *Calvinella ozarkensis* and distinguished from it by its relatively longer, narrower, and anteriorly more prominently convex glabella. In *C. ozarkensis* the ratio of the length of the glabella to the width is 3:2, while in *C. minor* it is 2:1. That it is not a young form of *C. ozarkensis* is indicated by the fact that small cranidia with exactly the proportions of that species are commonly associated with it. The small cranidium figured by Walcott and refigured here clearly belongs to this species. The pygidium shown on Plate XIX, Figure 11, has a somewhat higher, narrower, and more sharply defined axis than is found in most specimens and may belong to this species.

The incomplete cranidium here figured is 5 millimeters long, but specimens two or three times this size are fairly common.

Horizon and localities—The cotypes, U. S. N. M. No. 83494, a. b. (not figured) are from the Eminence dolomite, locality 452-u=M. S. M. 98.4, 3 miles south of Eminence, on Highway 19.

Paratype, U. S. N. M. No. 58676, from residual cherts of the Eminence dolomite at locality 188-y, on hilltop near Flat River, Mo. The species appears to be more abundant in the lower part of the formation.

Euptychaspis, Ulrich, new genus.

This genus is founded on a small new species from the Eminence dolomite in Missouri that seems an unquestionable derivative from the typical genus of the subfamily. However, in the meantime its generic characters were so strongly modified that it can no longer be assigned to *Ptychaspis* proper. It differs in the following respects: First, the cranidium is wider, the excess being added to the fixed cheeks, which are as wide as the glabella and smooth. Next, in the widening of the cranidium and the lateral

extension of the ends of the convexly bowed and abruptly deflected anterior border, the small eyes, though located in front of the midlength of the facial sutures, are further back, being opposite the middle lobe of the glabella. Third, the occipital ring carries a strong spine extending backward about as far as the length of the glabella. The glabella is prominent and crossed by two deep furrows as in the genotype (*P. striata* Whitfield) and other typical species of *Ptychaspis;* and the deflected brim, which might be called a thick vertically faced edge, also is marked with coarse striations as in those species. Eye lines, extending obliquely backward from the front of the glabella, are usually notable, especially in moulds of the exterior.

Genotype—*Euptychaspis typicalis*, n. sp.

So far as known the genotype is confined to the Eminence dolomite of Missouri. As the same bed contains species of *Calvinella*, whose closest relatives occur in the Conococheague limestone of Pennsylvania and New Jersey, and species of *Acheilus*, *Acheilops*, *Leicoryphe*, *Stenopilus*, and *Plethometopus* that when not identical are at least exceedingly close to species found in northern Vermont and in the boulders at Levis, Quebec, it seems reasonably probable that *Euptychaspis typicalis* was developed in the Arctic or Pacific realm and invaded the Mississippi Valley from the north. This belief finds additional support in the fact that a species of that genus occurs in the Lodi shale member of the Upper Cambrian St. Lawrence formation (Trempealeau of Ulrich) in Wisconsin. *Ptychaspis* itself doubtless originated earlier in the northern Pacific realm from whence it invaded the continental basins of North America at least as far as central Wisconsin. Except the doubtful *P.? affinis* Raymond typical *Ptychaspis* apparently failed entirely to reach the Appalachian troughs on the east side of the continent.

Euptychaspis typicalis, Ulrich, new species.

Plate XIX, figures 5, 6, 7.

The specific characters are sufficiently indicated in the foregoing discussion of the genus, and unmentioned details are shown in accompanying figures. It remains here only to add that the average dimension of the cranidium in 14 specimens is about 3.1 millimeters for the length, excluding the occipital spine, and 4.5 millimeters for the greatest width, which is nearly the same at the eyes and at the posterior edge.

Horizon and localities—Cranidia of this species have been found in the partly rotted cherts of the upper half of the Eminence dolomite at most localities in the vicinity of Eminence, Mo., where any considerable effort was made to collect the fauna of this formation. More than half the number collected were found on the weathered edge of a bluff 1 mile north of the town.

Cotypes—U. S. N. M. No. 83493, a-b.

Corynexochidae, Angelin

Acheilops, Ulrich, new genus.

The cranidium in the five or six species to be referred to this genus may be compared in general features with those of *Corynexochus*, *Dolichometopus*, *Zacanthoides*, and the new genus *Glossopleura* about to be proposed by Poulsen, all of which are Cambrian genera and so far not positively recognized above the Middle Cambrian. However, in none of these Cambrian genera are the fixed cheeks wholly wanting in front of the eyes as in the proposed genus *Acheilops*. In the latter the front of the cranidium is rounded and made by the anterior side of the glabella, in the older types the front edge is always straighter with more or less of a border or at least short and commonly well developed anterior limbs. Compared then with these genera the outstanding peculiarity of *Acheilops* is the fact that the facial suture in front of the eyes lies in the dorsal furrow; consequently the cranidium lacks both anterior limbs and rim. As usual in typical Cornexochidae, to which family *Acheilops* seems properly referable, the eyes are large,

situated far back and, especially at their anterior extremities, close to the dorsal furrow. Glabellar furrows may be fairly well indicated, two, three, or four pairs, or quite obsolete; and the well-defined occipital ring may or may not have a nuchal spine. Palpebral lobes simple, apparently always without furrow.

Genotype—*Acheilops dilatus*, n. sp., Plate XIX, Figures 20, 21, 22. Eminence dolomite, Shannon and Washington Counties, Mo.

Stratigraphic and geographic range—Eight closely allied species of this genus have been distinguished. Six of these occur in the Eminence dolomite in Missouri, one of the six in the Madison sandstone in Wisconsin, another, together with a seventh species, in the Milton dolomite of Vermont. The Milton species were described by Raymond as *Acheilus macrops* and *A. spicatus*. All the others are new. The unexpected discovery of an evidently congeneric cranidium in the St. Lawrence formation (Trempeleau of Ulrich) in Monroe County, Wis., shows that the type was already in existence in late Upper Cambrian time. The St. Lawrence (Trempeleau of Ulrich) species is most like *A. dilatus* but differs from it and all the younger species of *Acheilops* in the greater longitudinal convexity of the anterior half of the glabella.

Although Raymond referred his two species to *Acheilus* it seems to me quite improbable that they are closely allied to the genotype of that genus. As determined by *Acheilus marcoui* Raymond, a common fossil in the boulders of the *Hungaia* zone at Levis, Quebec, and a very similar species or variety from the Eminence of Missouri the glabella in *Acheilus* expands in anterior direction very slightly, or not at all, the eyes are of moderate size, situated farther forward, and their anterior extremities do not quite reach the dorsal furrows. Moreover, the suture does not lie in the dorsal furrow and thus bound the anterior half of the glabella but leaves a narrow band-like fixed cheek. But the most striking difference lies in the posterior limbs. These are uncommonly long and narrow in *Acheilops* and are directed much more strongly backward than in *Acheilus*.

Acheilops dilatus, Ulrich, new species.

Plate XIX, figures 20, 21, 22.

The figures show an outline drawing and photographs of the genotype found in the Eminence dolomite of Missouri.

Description—Glabella expanding rather rapidly, the anterior end evenly rounded. Occipital furrow strong. Two pairs of glabellar furrows, the posterior pair directed slightly backward, the anterior ones essentially parallel to the occipital furrow. Palpebral lobes broad, eyes large—half as long as the cranidium. Posterior lobe of the fixed cheeks consisting of a long narrow spine directed slightly backwards. Posterior marginal furrow strong, occupying about half of lobe. No occipital spine.

The dimensions of the holotype are: Length of cranidium, 5.5 millimeters; width of cranidium at posterior end, 9 millimeters; width across the palpebral lobes, 6 millimeters; width of glabella at posterior end, 3.25 millimeters; greatest width of glabella, 4.25 millimeters; width of posterior lobe near glabella, 1 millimeter; length of posterior lobe, 2.8 millimeters; height of cranidium, 1.5 millimeters.

Horizon and localities—Common in the Eminence dolomite, particularly in the lower or main faunal zone. The holotype, U. S. N. M. No. 83499, is from locality 102-j, 1.5 miles southwest of Eminence, but the species is widely distributed, occurring in almost every area in which the Eminence dolomite outcrops.

Family Undetermined

Plethopeltis, Raymond, emend Ulrich.

1913.—*Plethopeltis* Raymond, Victoria Mem. Mus. Bull. 1, p. 64. Describes the genus, makes *Agraulos saratogensis* Walcott the genotype, and refers *Bathyurus armatus* Billings to it.

1915—*Plethopeltis* Field, Ottawa Naturalist, June-July, pp. 37-44. Discusses the two forms of *P. saratogensis* found at the type locality and compares with other species.

1924—*Plethopeltis* Raymond, Boston Soc. Nat. Hist. Proc., vol. 37, pp. 412-419.

In the last paper cited above Raymond states that he had originally intended to restrict this genus to forms similar to *Bathyurus armatus* Billings. However, he selected *Agraulos saratogensis* Walcott as the genotype. The two forms differ in many important particulars, and it is thought advisable to restrict *Plethopeltis* to those forms which are closely related to *Plethopeltis saratogensis*.

Thus restricted the genus may be characterized as follows: Cranidium strongly convex. Glabella oblong, sometimes slightly tapering anteriorly, circum-glabellar furrow strongly developed, entire. Two pairs of glabellar furrows, may or may not be present. Occipital furrow strong, occipital ring well developed, widest at the center, tapering toward the ends, the transverse dimension less than the width of the glabella. No occipital spine.

Palpebral lobes small, bowed upward, situated slightly in front of the middle of the cranidium. Brim rather sharply deflected in most species with no trace of an upturned rim. Posterior limbs short, triangular, slightly recurved. Posterior marginal furrow well defined, broad. Free cheeks smoothly rounded, with short genal spine. Pygidium small, convex, with no border, usually wider than long, axis with about five segments which are well defined, lateral slopes showing four or five pleurae.

Plethopeltis buehleri, Ulrich, new species.

Plate XIX, figures 18, 19, 25, 26.

Cranidium of moderate size, length and width subequal, the length from the brim to the base of the occipital ring being slightly less than the distance between the tips of the posterior limbs. Glabella well defined, strongly convex, widest at the rear, tapering very gradually anteriorly. In average specimens this narrowing amounts to about 1.25 millimeters in a length of 10 millimeters. Occipital furrow and ring well defined. Brim abruptly deflected, making an angle of 125°-130° with the top of the glabella. Palpebral lobes small, somewhat elevated, situated just anterior to the middle of the cranidium and about two-thirds of the distance from the base to the front of the glabella. Posterior limbs short, their tips slightly reflexed, posterior marginal furrow well defined.

The cotypes consist of two cranidia which show the following measurements: Length, 17.5 and 17 millimeters; length of glabella, 11.25 and 11 millimeters; width across posterior limbs 19.5 and 19 millimeters; width at palpebral lobes, 16 and 15 millimeters; width at anterior margin 13 and 12.5 millimeters; width of glabella at base, 10.25 and 10 millimeters; width at front, 8.5 and 8.25 millimeters; height of cranidium 7 and 7 millimeters. An imperfect cranidium, a paratype, is about 20 per cent larger.

Horizon and localities—The species is abundant in the upper portion of the Eminence dolomite. The cotypes, U. S. N. M. No. 83502, a-b, are from locality 100-b near the old Slater Mine about 1.5 miles east of Eminence, and the species has been found at almost every locality where the upper beds of the formation are preserved. It is so abundant and widespread and so characteristic that it is customary to refer to this part of the formation as the *Plethopeltis* zone. The specific name is given in honor of Dr. H. A. Buehler, State Geologist of Missouri.

Plethopeltis platymarginatus, Ulrich, new species.

Plate XIX, figures 23, 24.

Similar to *Plethopeltis buehleri* but with a broader, flatter, and less rapidly tapering glabella. The brim is wider in front, and is not as abruptly deflected, making an angle of 145°-150° with the top of the glabella.

Horizon and localities—The holotype and paratype, U. S. N. M. Nos. 83500 and 83501, came from the Eminence dolomite at locality 102-h, about 4 miles west of Eminence, Mo. It occurs with *Plethopeltis buehleri* at almost every locality where the *Plethopeltis* zone has been found.

Plethometopus, Ulrich, new genus.

Cranidium strongly convex, in general form and proportions similar to *Plethopeltis*. The circum-glabellar furrow is much less clearly defined in *Plethometopus* and in most species is faint or entirely wanting opposite and in front of the eyes, so that the anterior end of the glabella merges into the brim without definite boundary. In some species, e. g. *Plethometopus convexus* (Whitfield), only the posterior third of this furrow is indicated, while in other forms, as for example *Plethometopus armatus* (Billings), the entire glabella is faintly outlined. No glabellar furrows. Occipital furrow more or less distinct in all species. Occipital ring broadly triangular, its posterior extremity sometimes produced into a blunt, thick spine. Palpebral lobes small, bowed outward, slightly elevated, situated just anterior to the middle of the cranidium. Fixed cheeks moderately wide; posterior limbs short, triangular, the extremities often slightly reflexed. The posterior marginal furrows are always distinctly impressed, and this serves to distinguish the smoother forms of *Plethometopus* from *Stenopilus*.

Free cheeks similar to those of *Plethopeltis*. A small, almost complete specimen of an undescribed species from the Eminence dolomite shows that the thorax consists of 10 segments. The pygidium of this specimen is very small, and the axis is not completely outlined. There is no trace of segmentation on either the axis or the lateral slopes of the pygidium, with the exception of a single furrow near the anterior margin. In this respect it differs from the pygidium of *Plethopeltis*, which is distinctly segmented.

Genotype—*Plethometopus* (*Bathyurus*) *armatus* (Billings).

The genus as here proposed includes *Plethometopus armatus* (Billings), *P.* (*Illaenurus*) *convexus* (Whitfield), and five species described by Raymond and referred to *Plethopeltis*, namely, *P. arenicola*, *P. convergens*, *P. laevis*, *P. angusta*, and *P. latus*. It also includes *Plethometopus modestus*, n. sp., from the Eminence of Missouri and a number of other new and as yet undescribed forms from the same formation.

In its general aspect the cranidium in this genus appears to be intermediate between *Plethopeltis* and *Stenopilus*. The glabella and occipital ring as a rule are less clearly defined than in the former and more so than in the latter; and the cranidium differs from both in the possession of the occipital spine. It is by no means certain, however, that this is its true systematic position.

Plethometopus convexus (Whitfield).

Plate XIX, figures 29, 30, 31.

1877—*Illaenurus convexus* Whitfield, Wisconsin Geol. Survey Ann. Rept., p. 66.
1882—*Illaenurus convexus* Whitfield, Geology of Wisconsin, vol. 4, p. 203, Pl. 4, figs. 3, 4 (not fig. 5).

There is little to add to the original description except to note that *Plethometopus convexus* is quite rare at the type locality, Eikey's quarry near Baraboo, Wis., and that the smooth globose cranidia which are so abundant there belong to *Stenopilus*. It was long ago suspected that Whitfield actually had the two forms under consideration, and this has recently been confirmed by a study of the types, which have been made available through the courtesy of the Department of Geology of the University of California. In the lot marked *Illaenurus convexus* there are ten cranidia, nine of which belong to *Stenopilus*. The remaining specimen is the one figured and is entirely different from the others and is a true *Plethometopus*.

The species is fairly common in the lower portion of the Eminence dolomite. The larger specimen, Figure 29, is almost exactly the same size as the holotype.

None of the specimens available at present preserves the occipital spine, and this portion of the cranidium is also missing upon the holotype and was restored in Whitfield's illustration. This restoration was based upon the associated *Stenopilus* cranidia and shows the gently convex posterior margin characteristic of that genus. A study of the material at hand, however, shows that the species possessed a thick blunt spine as indicated in Figures 30-31.

Horizon and localities—Holotype, California Univ. Mus. No. 1216, from the Mendota limestone at Eikey's quarry, Baraboo, Wis. Plesiotypes, U. S. N. M. No. 83504 and 83505, from the Eminence dolomite at locality 103-t, 3 miles south of Fredericktown, Mo., and 238-n, 0.5 mile west of the St. Francois River on the Piedmont-Marble Hill road (Highway 34).

Plethometopus modestus, Ulrich, new species.

Plate XVIII, figure 7; Plate XIX, figures 34, 35, 36, 37.

Average specimens are smaller than *Plethometopus convexus*. The cranidium is flatter, the convexity being less than that of the preceding form. It also differs in its strongly impressed occipital furrow, slender spine, and narrower posterior limbs.

Horizon and localities—Cotypes, U. S. N. M. No. 83506 a, b, from the Eminence dolomite at locality 103-t, 3 miles southeast of Fredericktown, Mo., on the road to Marquand.

Paratype, U. S. N. M. No. 83507, from the north bank of Current River at the old Chicopee Ferry, about 1 mile east of Van Buren, Mo.

Paratype, U. S. N. M. No. 83508, from locality 100-i, 5 miles northwest of Eminence, Mo. It is rather common in the main faunal zone of the Eminence at many localities.

A single specimen presumably belonging to this species was found in a finely crystalline, light dolomite, thought to belong to the Potosi dolomite, at M. S. M. locality 74.28, near Palmer, Washington County, Mo. M. S. M. Dept. of Geol. No. 7251.

Stenopilus, Raymond.

Stenopilus latus, Ulrich, new species.

Plate XIX, figures 32, 33, (?) 27, 28.

Cranidium large, broad, smooth, strongly convex, the greatest convexity being in the posterior third. No trace of any furrows. On the posterior margin at the junction of the glabella and the fixed cheek there is a small deep pit, which appears to be a generic character. It is particularly noticeable upon internal moulds. Occipital portion of the glabella convex posteriorly. Eyes probably small, situated about midway between the posterior and anterior margins and well out toward the sides. Posterior portion of the fixed cheeks small, directed downward, the extremities rounded. Free cheeks, thoracic segments and pygidium unknown.

This is one of the largest species of the genus. The dimensions of the holotype are: Length, 22 millimeters; width, 23 millimeters; height, 9 millimeters. Average specimens are from one-half to two-thirds this size.

Horizon and localities—Common in the Eminence dolomite throughout the Ozark region. Holotype, U. S. N. M. No. 83509, from locality 102-g, 2.5 miles northwest of Van Buren, Mo., on south bank of Current River. Paratypes, U. S. N. M. No. 83510, from locality 438-r on the south slope of the hill about 0.5 mile west of Eminence.

Figures 27-28 are of a much smaller specimen, which is slightly more convex and somewhat narrower anteriorly than the type. It may be a young form of *Stenopilus latus*, or it may represent a distinct species. The specimen figured came from the Eminence at locality 100-b, near the Slater Mine 1.5 miles east of Eminence, and has been noted at many other localities.

Plesiotype, U. S. N. M. No. 83511.

List of Fossil Localities.

The localities listed below are those from which fossils were collected by the writer and his assistants during the course of this investigation. The majority of those listed in Chapter VI are the ones from which Ulrich has collected at various times during the last 25 years. Where it is definitely known that one of his localities is the same as one of the Missouri ones, the fact is indicated in the text.

REYNOLDS COUNTY.

Mo. 90.1—On line between secs. 3 and 4, T. 29 N., R. 1 W., south side of Logan creek on section line, at creek level. Large boulder. Horizon-Eminence.

Mo. 90.2—Center SE. ¼ sec. 1, T. 30 N., R. 1 W., just south of upper Dry Valley School, on the old Ellington-Centerville road, west side road Eminence outcrops, fossils from float boulders. Horizon-Eminence.

Mo. 90.10—SW. cor. sec. 5, T. 29 N., R. 1 W., on divide between Pumpkin Hollow and Carr creek, west side of divide, elev. 960-970. Horizon-Roubidoux-*Lecanospira* zone.

Mo. 90.11—In the NE. ¼ SW. ¼ sec. 35, T. 29 N., R. 1 W., on the north side of Little Paint Rock creek, about 20 feet above road. Horizon-Eminence.

Mo. 90.12 a. b.—NE. cor. quad. in the NE. ¼ sec. 1, T. 29 N., R. 1 W., east side of Coleman Hollow on northwest slope of hill. Horizon-12.a-Eminence-12.b. Van Buren.

Mo. 90.16—Near center, SW. ¼ NW. ¼ sec. 1, T. 28 N., R. 1 W., in low saddle between main ridge and large spur running north, elev. 880 feet. Horizon-Osage Group.

SHANNON COUNTY.

Mo. 98.1—Near center sec. 31, T. 29 N., R. 4 W. on road, at elev. 910. Ledge of chert in place and float boulders. Horizon-Base of Roubidoux.

Mo. 98.2—On line between secs. 35 and 36, T. 28, N., R. 5 W., in Dry Camp Hollow. Float boulders. Horizon-Roubidoux.

Mo. 98.3—In the NE. ¼ sec. 4, T. 29, N., R. 4 W., about the center of Lot 7, on hillside west side of Grassy creek. Elev. 860-930. Horizon-Upper Gasconade.

Mo. 98.4—About the center of the east side of the NE. ¼ sec. 12, T. 28, N., R. 4 W. on State highway No. 19 road cut, west side of road on turn at top of low hill. Elev. 670 feet. Horizon-Eminence.

Mo. 98.5—About the center of the SE. ¼ sec. 30, T. 27, N., R. 3 W. on the Eminence-Winona road State highway No. 19 (temporary) along road ditch on steep grade known as Saddler Hill. Horizon-5. Gasconade,-5. a Roubidoux.

Mo. 98.6—In the NW. ¼ SE. ¼ sec. 25, T. 27 N., R. 5 W., on Bluff above Alley Spring. Elev. 850-900 feet. Horizon-Gasconade.

Mo. 98.7—On spur a little south of center SW. ¼ sec. 25, T. 29 N., R. 5 W., near edge of cliff. Elev. 850 feet and up. Horizons-Roubidoux-Gasconade.

Mo. 98.8—SW. cor. NW. ¼ sec. 33, T. 29 N., R. 4 W., on nose of hill. Elev. 915. Horizon-Basal Roubidoux.

Mo. 98.9—In the NW. ¼ SE. ¼ sec. 5, T. 27 N., R. 3 W., about 40 feet above valley floor, northwest of creek forks on point of hill. Horizon-Roubidoux.

Mo. 98.10—in the NW. ¼ sec. 1, T. 29 N., R. 5 W., in Lot 8 on the Eminence-Ink road, on steep hill going down to Reinharts ranch. Horizon-Roubidoux-Gasconade.

Mo. 98.11—NE. cor. sec. 27, T. 28 N., R. 4 W., on point of hill north of road. Elev. about 1000 feet. Horizon-Gasconade.

Mo. 98.12—SE. ¼ NW. ¼ sec. 5, T. 28 N., R. 3 W., on new road crossing the divide between Hay Hollow and Little Shawnee creeks, top of first bench. Elev. about 880. Horizon-Eminence.

Mo. 98.13—NE. ¼ sec. 25 T. 28 N., R. 5 W., at point where Birch Tree road turns onto section line. Northwesterly up the hill from this point. Horizons-Roubidoux-*Syntrophina* zone-Gasconade-Cryptozoon ledge at road.

Mo. 98.14—SE. ¼ NE. ¼ sec. 33, T. 29 N., R. 1 W., on west side of Big Paint Rock Creek, on bluff opposite house and above spring. There are some well marked pinnacles about 100 feet above the road, and these fossils were collected in place at the south end of these pinnacles, and about 40 feet below the Gunter ss. Horizon-Eminence.

Mo. 98.15—Near center of east half of south line of sec. 22, T. 29 N., R. 4 W., on hillside north of road and north of old field. Ledges of chert, in place or very nearly so. Elev. 840 feet, 30 feet below Gunter ss. Horizon-Eminence.

Mo. 98.16—SE. ¼ SW. ¼ sec. 26, T. 29 N. R. 4 W., on nose of hill south and a little east of picnic ground at Eminence. About two-thirds of the way up the hill. Horizon-Eminence.

Mo. 98.17—SW. ¼ sec. 4, T. 28 N., R. 3 W., on hillside west of house. Elev. 820 feet. Horizon-Eminence.

Mo. 98.18—NW. ¼ SW. ¼ sec. 26, T. 29 N. R. 4 W., just northwest of the town of Eminence on the south side of the most northerly spur of the hill. Horizon-Eminence.

Mo. 98.19—On top of long ridge in SW. ¼ sec. 26, T. 28 N., R. 4 W. Horizon-Burlington.

Mo. 98.20—In the NE. ¼ NW. ¼ sec. 29, T. 28 N., R. 3 W., on tip of spur facing NW. Elev. 1000 feet. Horizon-Burlington.

Mo. 98.21—Near the line separating the E. ½ of secs. 12 and 13, T. 29, N., R. 4 W., on hill northeast of the Munsell school below the Gunter sandstone near hilltop. Horizon-Eminence.

Mo. 98.22—NW. ¼ NW. ¼ sec. 18, T. 29 N., R. 3 W., on west side of the 970-foot saddle north of the 1020-foot knob. Horizon-Fminence.

Mo. 98.23—On spur in NW. cor. SW. ¼ SW. ¼ sec. 35 T. 29 N., R. 4 W., about a mile south of Eminence and just east of the Eminence-Birch Tree road at the point where it makes a sharp turn west. Horizon-Van Buren.

Mo. 98.24—In the NE. ¼ SE. ¼ sec. 7, T. 27 N., R. 3 W., along the road to Flip, south side of shallow valley. Elev. 1000 feet. Horizon-Roubidoux-*Lecanospira* zone.

Mo. 98.25—In the SW. ¼ SE. ¼ sec. 22, T. 29 N., R. 4 W., on the bluff of the old meander scarp. Elev. 850 feet, float boulders. Horizon-Van Buren.

Mo. 98.26—SW. ¼ SW. ¼ sec. 9, T. 28 N., R. 3 W., in Hay Hollow on hillside across road and northeast of house, up hill behind barn. Horizon-Gasconade.

Mo. 98.27—On the top of the 1000-foot knob, at the common corner of secs. 35 and 36, T. 29 N., and secs. 1 and 2, T. 28 N., R. 4 W., about 1 mile due SE. of Eminence. Horizon-Eminence.

Mo. 98.28—Just off of the north edge of the quadrangle, on the north bank of Current River, probably near the line between the SE. ¼ sec. 21, and the SW. ¼ sec. 22, T. 30 N., R. 4 W., on ridge top. Elev. about 980 feet and above the Cryptozoon bed. Horizon-Gasconade.

Mo. 98.29—East side of hill above house, center SW. ¼ sec. 4, T. 28 N., R. 3 W., at about 900 feet. Horizon- Van Buren.

Mo. 98.30—NW. ¼ NW. ¼ sec. 10, T. 28 N., R. 3 W. Horizon-Eminence.

Mo. 98.31—Just south of road fork in center of SW. ¼ sec. 32, T. 29 N., R. 3 W. Horizon-Eminence.

Mo. 98.32—On NE. point of hill NE. ¼ sec. 34, T. 29 N., R. 3 W. Horizon-undetermined.

Mo. 98.33—In the SW. ¼ SW. ¼ sec. 32, T. 29 N., 2 W., in saddle. Elev. about 870 feet. Horizon-Eminence.

Mo. 98.34—In the NW. ¼, SW. ¼ sec. 23, T. 28 N., R. 3 W., on ridge behind Horner school. Elev. 900 feet. Horizon-Gasconade.

Mo. 98.35—In the center of the N. ½ sec. 17, T. 27 N., R. 4 W., about ½ mile northeast of Bartlett in orchard belonging to J. L. Webb. Chert float scattered over several acres. Horizons-Keokuk-Burlington.

Mo. 98.36—SE. ¼ SE. ¼ sec. 20, T. 28 N., R. 3 W., two small knobs of residual chert, one about the center of the 10 acres, the other to the southeast, both on divide. Horizon-Osage Group.

Mo. 98.37—NE. ¼ SE. ¼ sec. 1, T. 28 N., R. 4 W., on extreme east tip of small east-west spur. There is a conical mound on the tip of this spur about 30 feet high which is not shown on the contour map. Residual cherts. Horizon-Osage group.

Mo. 98.38—Center, SE. ¼ SE. ¼ sec. 21, T. 29 N., R. 3 W., on ridge top, along secondary road. Elevation, 980 feet a single boulder of chert. Horizon-Osage Group-Burlington.

Mo. 98.39—On the north line of the SW. ¼ sec. 16, T. 28 N., R. 3 W., near the sink. Horizon-Basal Roubidoux-*Syntrophina* zone.

Mo. 98.40—NW. ¼ NE. ¼ sec. 34, T. 29 N., R. 3 W., on spur south side of valley. Elev. about 800 feet. Horizon-Van Buren.

Mo. 98.41—NW. ¼ NE. ¼ sec. 21, T. 29 N., R. 4 W., on hillside northwest of Storey's school.

Mo. 98.42—In creek on section line between NE. ¼ sec. 34 and NW. ¼ sec. 25, T. 29 N., R. 3 W. Elev. about 920 feet. Horizons: Eminence, *Plethopeltis* zone, 98.42.a; Van Buren, 98.42 b; Gasconade, *Gasconadia* zone, 98.42 c.

Mo. 98.43—NE. ¼ SE. ¼ sec. 13, T. 28 N., R. 3 W., on west side of small tributary of Rocky Creek. Chert ledges in place. Elev. 820. Horizon-Van Buren.

CARTER COUNTY.

Mo. 99.1—In the NW. ¼ sec. 26, T. 27 N., R. 2 W., on top of hill overlooking Midco. Horizon-Basal Roubidoux.

Mo. 99.2—On the first hill west of Current River on U. S. Highway No. 60. Horizon-Basal Gasconade.

Mo. 99.3—Top of second prominent divide west of Current River, on U. S. Highway No. 60, 1½ to 2 miles west of Van Buren. Loc. approximate. Horizon-Gasconade.

PLATE XVIII

PLATE XVIII

Shelbyoceras sp.

1-2. Views of two fragmentary specimens tentatively referred to this genus. Residual cherts of the Potosi dolomite, M. S. M., locality 74.51, near Palmer, Mo. F. L. Sevier, collector.

Scaevogyra cf. swezeyi Whitfield

3. Lateral view of an average specimen. U. S. N. M. No. 83512.
4. Dorsal view of another specimen. M. S. M. Dept. of Geology, No. 7250. Both from residual cherts of the Potosi dolomite. M. S. M., locality 74.51, near Palmer, Mo. F. L. Sevier, collector.

Dirhachopea dubia Ulrich and Bridge, n. sp.

5-6. Lateral and dorsal views of the holotype. Residual chert of the Potosi dolomite. One-third of a mile west of Piedmont, Mo. Stuart St. Clair, collector. U. S. N. M. No. 83513.

Plethometopus modestus Ulrich, n. sp.

7. Dorsal view of a cranidium found in limestone, believed to be of Potosi age. M. S. M., locality 74.28, near Palmer, Mo. C. L. Dake, collector. M. S. M. Dept. of Geology No. 7251.

Dirhachopea appressa Ulrich and Bridge, n. sp.

8. Dorsal view of one of the cotypes. Eminence dolomite, locality 373-l, 1.5 miles northwest of Eminence, Mo. U. S. N. M. No. 83514-a.
9. Lateral view of another specimen. Eminence dolomite, locality 188-y, Flat River, Mo. Paratype. U. S. N. M. No. 83515.
10. Ventral view of another specimen. Eminence dolomite, locality 438-v-1, Bluff on Current River, just below mouth of Sinkin Creek, Shannon, County, Missouri. Paratype, U. S. N. M. No. 83516.

Dirhachopea abrupta Ulrich and Bridge, n. sp.

11-12-13. Dorsal, lateral, and ventral views of the holotype. Eminence dolomite, locality 100-c. 1 mile south of the Casey Mine, near Eminence, Mo. U. S. N. M. No. 83517.

Dirhachopea normalis Ulrich and Bridge, n. sp.

14-15-16. Dorsal, lateral, and ventral views of the holotype. Eminence dolomite, locality 438-r, about .5 mile west of Eminence, Mo. U. S. N. M. No. 83518.

Dirhachopea intermedia Ulrich and Bridge, n. sp.

17-18. Dorsal and lateral views of one of the cotypes. Eminence dolomite, locality 399-c, 2.5 miles above mouth of Little Indian Creek, Franklin County, Missouri. U. S. N. M. No. 83519-a.
19. Ventral view of another specimen. Eminence dolomite, locality 452-q-1. on hillside just north of the Munsell School, four miles south of Eminence, Mo. Paratype U. S. N. M. No. 83520.

Dirhachopea corrugata Ulrich and Bridge, n. sp.

20. Dorsal view of the holotype. U. S. N. M. No. 83521. Eminence dolomite, locality 373-l = M. S. M. 98.15, 1.5 miles northwest of Eminence, Mo.

Dirhachopea subrotunda Ulrich and Bridge, n. sp.

21. Dorsal and lateral views of the cotypes x 2. U. S. N. M. No. 83522-a.
22. Oblique view of a wax squeeze, made from the external mould of the specimen shown on the left in Fig. 21, x 3. U. S. N. M. No. 83522-b. Eminence dolomite, locality 100-i, 5 miles northwest of Eminence.

Rhachopea elevata Ulrich and Bridge, n. sp.

23. Dorsal view of an incomplete specimen. Cotype. U. S. N. M. No. 83523-b.
24. Lateral view of another specimen. Cotype. U. S. N. M. No. 83523-a. Both from the Eminence dolomite, locality 102-h, 4 miles west of Eminence, Mo.

Taeniospira eminencensis Ulrich and Bridge, n. sp.

25-26-27. Dorsal, lateral, and ventral views of the holotype. U. S. N. M. No. 83524. Eminence dolomite, locality 373-l = M. S. M. 98.15, 1.5 miles northwest of Eminence, Mo.

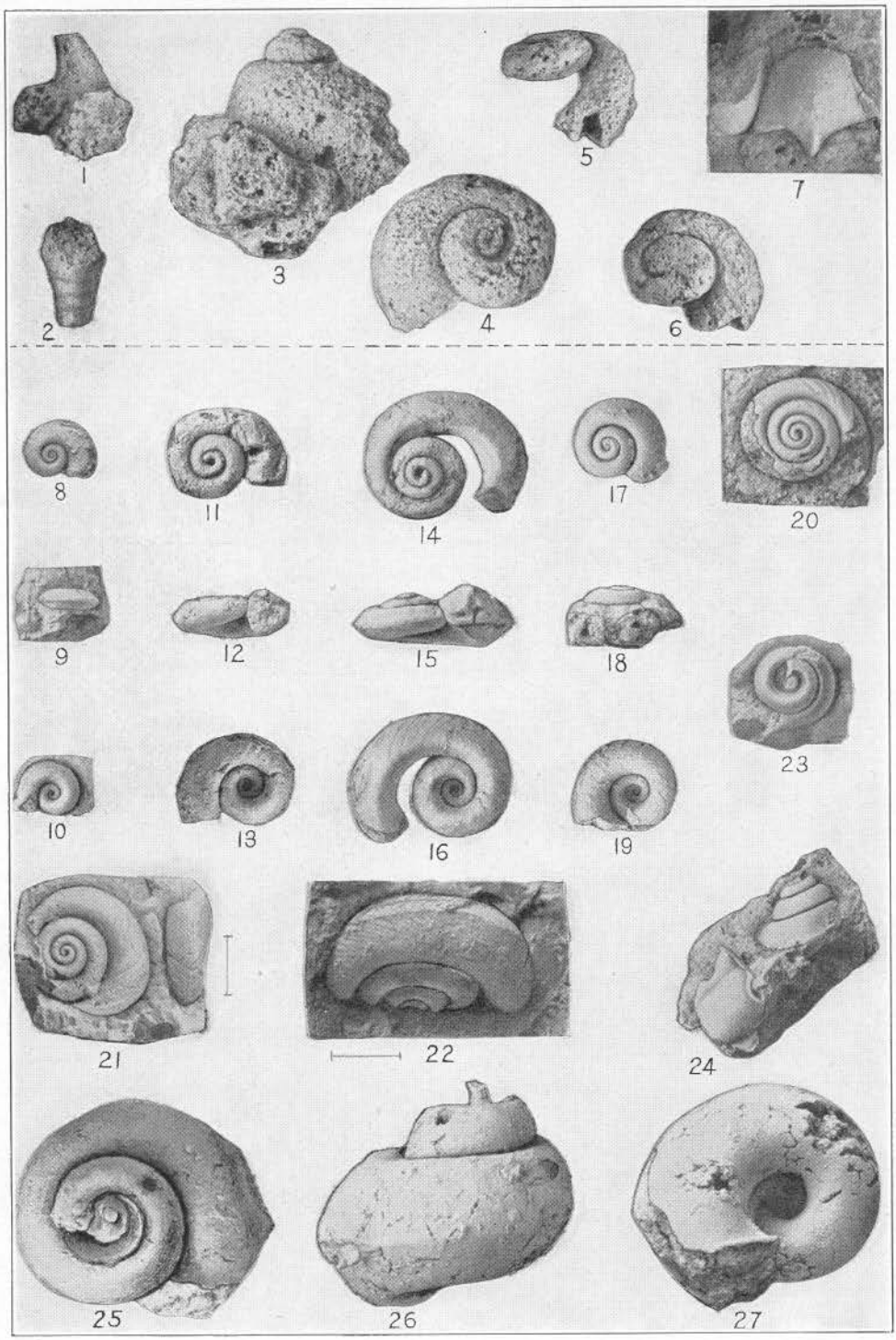
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PLATE XIX

PLATE XIX

Stenochilina spinifera Ulrich, n. sp.

1. Outline drawing of the cranidium x 3.
2. Dorsal view of a cranidium x 2. Eminence dolomite, locality 100-b, near the old Slater Mine, 1.5 miles east of Eminence, Mo. Holotype, U. S. N. M. No. 83490.

Triarthropsis nitida Ulrich, n. sp.

3. Dorsal view of a cranidium x 2. Eminence dolomite, locality 102-h, 4 miles west of Eminence, Mo. Holotype, U. S. N. M. No. 83491.
4. Outline drawing of the cranidium x 3.

Euptychaspis typicalis Ulrich, n. sp.

5-6. Outline drawings showing dorsal and lateral aspects of the cranidium x 5.
7. Dorsal view of an incomplete cranidium x 4. Eminence dolomite, locality 100-i, 5 miles northwest of Eminence, Mo. Cotype, U. S. N. M. No. 83493-a.

Calvinella ozarkensis Walcott

8-9. Lateral and dorsal views of an incomplete cranidium x 1. Eminence dolomite, locality 102-h, 4 miles west of Eminence, Mo. Holotype, U. S. N. M. No. 58674.
11. A small pygidium x 2 figured and referred to this species by Walcott. May belong to *C. minor*. Eminence dolomite, locality 100-b at old Slater Mine, 1.5 miles east of Eminence, Mo. Paratype. U. S. N. M. No. 58677.

Calvinella minor Ulrich, n. sp.

10. Dorsal view of cranidium of an average specimen x 2. Eminence dolomite, locality 188-y, near Flat River, Mo. Paratype, U. S. N. M. 58676.

Entomaspis trigonalis Ulrich, n. sp.

12. Outline drawing of a cranidium referred to this species x 3.
13. Cranidium, natural size, from which Fig. 12 was drawn. Paratype, U. S. N. M. No. 83496.
17. Pygidium x 4. Holotype, U. S. N. M. No. 83495. Both specimens from the Eminence dolomite, locality 238-h on State Highway 8, 1 mile east of Berryman, Mo.

Entomaspis radiatus Ulrich, n. sp.

14. Outline drawing of cranidium x 5 showing the generic characters.
16. Cranidium upon which Fig. 14 is based x 5. Eminence dolomite, locality 453-l, 3 miles east of Potosi, Mo. Cotype, U. S. N. M. No. 83497
15. Outline drawing of a pygidium referred to this species x 5. Drawn from a specimen from the Eminence dolomite, locality 455-v, 4.5 miles south of Potosi, Mo., on the old Caledonia road. Cotype, U. S. N. M. No. 83498-a.

Acheilops dilatus Ulrich, n. sp.

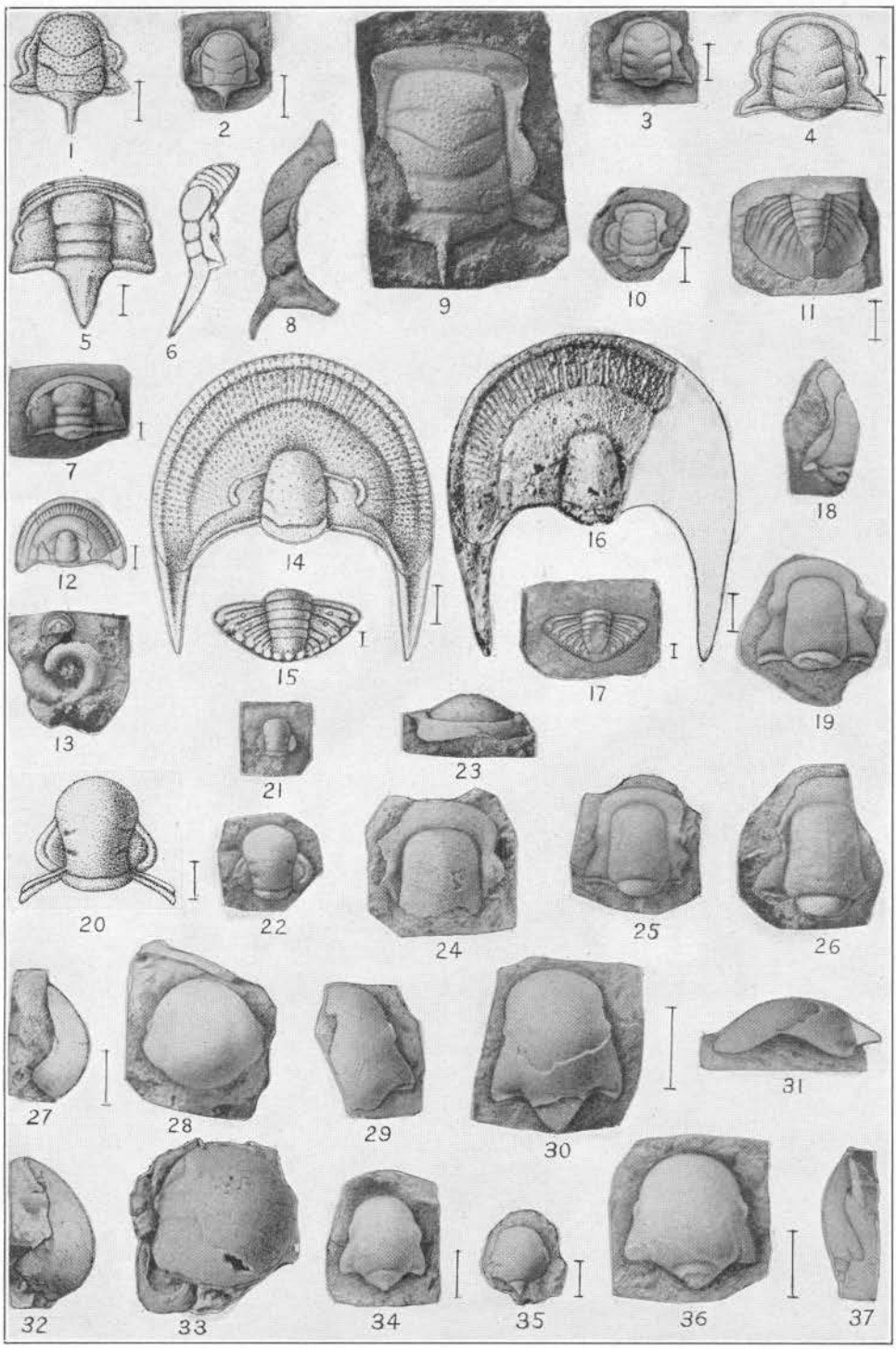
20. Outline drawing of a cranidium x 3 to show the generic characters. Drawn from the holotype.
21. Cranidium x 1. Eminence dolomite, locality 102-j, 15 miles southwest of Eminence, Mo. Holotype, U. S. N. M. No. 83499.
22. Same as Fig. 21 x 2.

Plethopeltis platymarginatus Ulrich, n. sp.

23-24. Frontal and dorsal views of an incomplete cranidium x 1. Eminence dolomite, locality 102-h, 4 miles west of Eminence, Mo. Holotype, U. S. N. M. No. 83500.

Plethopeltis buehleri Ulrich, n. sp.

18-19. Lateral and dorsal views of a cranidium x 1. Eminence dolomite, locality 100-b, near the old Slater Mine, 1.5 miles east of Eminence, Mo. Cotype, U. S. N. M. No. 83502-a.
25. Dorsal view of another specimen from the same locality x 1. Cotype, U. S. N. M. No. 83502-b.
26. Dorsal view of an imperfect cranidium x 1. Eminence dolomite, locality 102-x, .7 mile southeast of Eminence, Mo. Paratype, U. S. N. M. No. 83503.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Plethometopus convexus (Whitfield)

29. Dorsal view of an incomplete cranidium x 1. Eminence dolomite, locality 103-t, 3 miles southeast of Fredericktown, Mo. Plesiotype, U. S. N. M. No. 83504.

30-31. Dorsal and lateral views of a smaller cranidium x 2. Eminence dolomite, locality 238-n, 0.5 mile east of the St. Francois River, on the Piedmont-Marble Hill road. Plesiotype, U. S. N. M. No. 83505.

Plethometopus modestus Ulrich, n. sp.

34. Dorsal view of a cranidium x 2. Eminence dolomite, locality 103-t, 3 miles southeast of Fredericktown, Mo. Cotype, U. S. N. M. No. 83506-a.

35. Dorsal view of a much smaller cranidium x 2. Eminence dolomite, locality 100-i, 5 miles northwest of Eminence, Mo. Paratype, U. S. N. M. 83508.

36-37. Dorsal and lateral views of a large cranidium x 2. Eminence dolomite, north bank of Current River at old Chicopee Ferry, about 1 mile east of Van Buren, Mo. Paratype, U. S. N. M. 83507.

Stenopilus latus Ulrich, n. sp.

32-33. Lateral and dorsal views of a large cranidium x 1. Eminence dolomite, locality 102-g, 2.5 miles northwest of Van Buren, Mo. Holotype, U. S. N. M. No. 83509.

27-28. Lateral and dorsal views of a small cranidium, doubtfully referred to this species, x 2. Eminence dolomite, locality 100-b, near old Slater Mine, 1.5 miles east of Eminence, Mo. Plesiotype, U. S. N. M. No. 83511.

PLATE XX

PLATE XX

Rhachopea typica Ulrich and Bridge, n. sp.

1. Dorsal view of an average specimen. Cotype, U. S. N. M. No. 83525-a.

2-3. Dorsal and lateral views of a wax squeeze from an unusually perfect internal mould showing the spire and the surface markings. The mould is a paratype. U. S. N. M. No. 83526.

4-5. Ventral and lateral views of another specimen. Cotype, U. S. N. M. No. 83525-b. Specimens shown in figures 1, 4, and 5 are from cherts of the Van Buren formation at locality 102-e, about one mile southeast of Eminence, Mo., in the NW¼ SE¼ sec. 35, T. 29 N., R. 4 W. Specimen shown in figures 2 and 3, from the same horizon, locality 261-o, three miles southeast of Eminence at top of hill on Highway 19, SE¼ NE¼ sec. 1, T. 28 N., R. 4 W.

Rhachopea transitans Ulrich and Bridge, n. sp.

6-7. Dorsal and lateral views of the holotype. U. S. N. M. No. 83527, Van Buren formation, locality 438-r-1 on south slope of hill, along old woods road, .5 mile west of Eminence.

Sinuopea cingulata Ulrich and Bridge, n. sp.

8. Lateral view of a large incomplete specimen. Cotype, U. S. N. M. No. 83528-a.

9-10-11. Lateral, dorsal and umbilical views of a smaller specimen. Cotype, U. S. N. M. No. 83528-b. Both specimens from cherts of the Van Buren formation at locality 102-e, about one mile southeast of Eminence in the NE¼ SE¼ sec. 35, T. 29 N., R. 4 W.

Sinuopea vera Ulrich and Bridge, n. sp.

12-13. Dorsal and lateral views of the holotype. U. S. N. M. No. 83529. Van Buren formation. Same locality as the preceding.

Sinuopea umbilicata Ulrich and Bridge, n. sp.

14-15-16-17. Dorsal and lateral views of the cotypes. U. S. N. M. No. 83530-a-b Van Buren formation. Same locality as the preceding.

Sinuopea basiplanata Ulrich and Bridge, n. sp.

18-19. Ventral and lateral views of the holotype. U. S. N. M. No. 83531. Van Buren formation. Same locality as the preceding.

Hypseloconus compressus Ulrich and Bridge, n. sp.

20-21-22. Lateral, posterior, and dorsal views of the holotype. U. S. N. M. No. 83532. Van Buren formation. Same locality as the preceding.

Hypseloconus ozarkensis Ulrich and Bridge, n. sp.

23-24-25. Lateral, posterior, and dorsal views of a small specimen. Cotype, U. S. N. M. No. 83533-a.

26. Lateral view of a larger specimen. Cotype, U. S. N. M. No. 83533-b. Both from Van Buren formation. Same locality as the preceding.

Dakeoceras subcurvatum Ulrich and Foerste, n. sp.

27-28. Dorsal and lateral views of one of the cotypes. U. S. N. M. No. 83535. Van Buren formation. Same locality as the preceding.

Dakeoceras normale Ulrich and Foerste, n. sp.

29. Lateral view of a paratype. U. S. N. M. No. 83556. Van Buren formation. Same locality as the preceding.

Burenoceras expandum Ulrich and Foerste, n. sp.

30-31. Lateral and apical views of the holotype. U. S. N. M. No. 83536. Van Buren formation. Same locality as the preceding.

Burenoceras pumilum Ulrich and Foerste, n. sp.

32-33. Lateral and apical views of the holotype. U. S. N. M. No. 83537. Van Buren formation, locality 456-p, sec. 13, T. 36 N., R. 3 E., Washington County, Missouri.

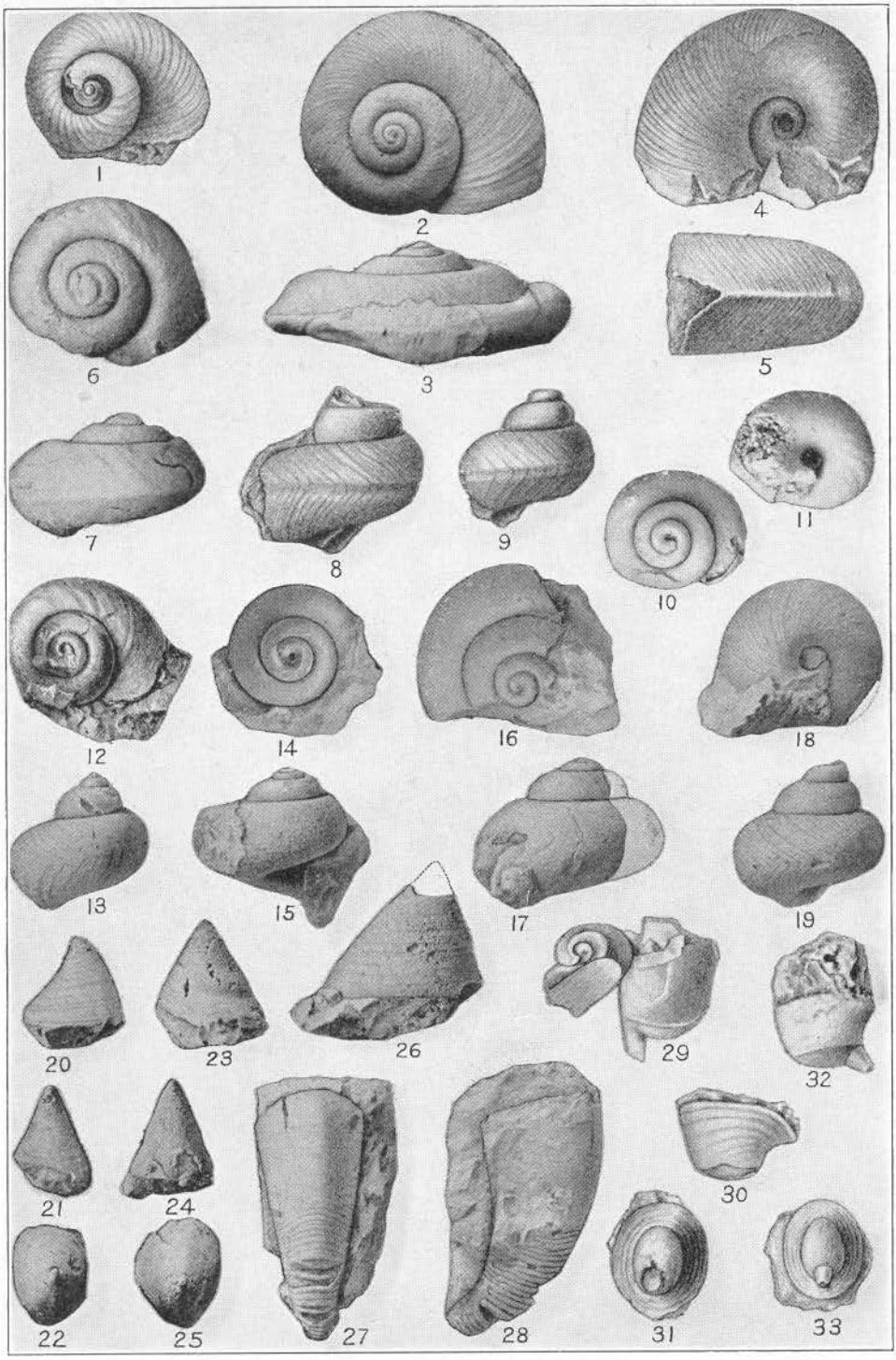
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PLATE XXI

PLATE XXI

Hystricurus missouriensis Ulrich, n. sp.

1-2. Dorsal and lateral views of a cranidium, the holotype. Chert of the Gasconade dolomite, locality 101-v, 1.25 miles north of Decaturville, Mo. U. S. N. M. No. 83538.

Sinuopea regalis Ulrich

3. Lateral view of a cotype. Gasconade dolomite. Locality 238, on Highway 8, 1 mile west of the junction of Huzzah and Dry Creeks, 10 miles east of Steelville, Mo. U. S. N. M. No. 71436.

Ozarkina complanata Ulrich and Bridge, n. sp.

4-5. Dorsal and lateral views of the holotype. Fig. 5 drawn from a photograph. Gasconade dolomite, locality 101-t, near Horner School, 10 miles southeast of Eminence, Mo. U. S. N. M. No. 83540.

Ophileta grandis Ulrich

6. Dorsal view of a specimen from Gasconade dolomite. Locality 238-a, near Boyler's Mill, Miller County, Missouri. Paratype, U. S. N. M. No. 65095.
7. Outline drawing showing the cross-section of the whorl.

Ozarkina typica Ulrich and Bridge, n. sp.

8. Dorsal view of a wax cast made from an internal mould. Residual cherts from the Gasconade dolomite, locality 104-j, 1.5 miles northwest of pegmatite dike at Decaturville, Mo. The internal mould is the holotype. U. S. N. M. No. 83541.

Ophileta supraplana Ulrich and Bridge, n. sp.

9. Dorsal view of a specimen from the Gasconade dolomite of Missouri, exact locality unknown. Paratype, U. S. N. M. No. 83542.
10. Outline drawing showing the cross-section of the last three whorls. x 2.

Gasconadia putilla (Sardeson)

11. Lateral view of an unusually complete specimen, preserving the lip and notch. x 2.
12. Same specimen as seen from the front, natural size. Showing the flaring lip and the depression which marks the position of the tooth. Gasconade dolomite, locality 238-d. Meramec Spring, Mo.
13. View of another specimen showing a complete spire. Same locality as the preceding. Plesiotypes, U. S. N. M. No. 83543.

Cameroceras huzzahense Ulrich and Foerste, n. sp.

14. An unusually perfect specimen showing the living chamber, siphuncle and narrow camerae. x. 8. Gasconade dolomite, locality 238 on Highway 8, one mile west of the junction of Huzzah and Dry Creeks, and 10 miles east of Steelville, Mo. Cotype, U. S. N. M. No. 83544.

Rhachopea grandis Ulrich and Bridge, n. sp.

15-16. Dorsal and lateral views of an unusually perfect specimen. The outer whorl has been restored at one place. Gasconade dolomite, locality 238 on Highway 8, one mile west of the junction of Huzzah and Dry Creeks and 10 miles east of Steelville, Mo. Cotype, U. S. N. M. No. 83545-a.

Euomphalopsis involuta Ulrich and Bridge n. sp.

17-20. Ventral and lateral views of one of the cotypes. U. S. N. M. 83547-b.
19. Portion of the dorsal surface of the same specimen, showing the growth lines and the shape of the apertural notch. x 3. Gasconade dolomite, locality 238-d, Meramec Spring, Phelps County, Missouri.

Euomphalopsis robusta Ulrich and Bridge, n. sp.

18. Ventral view of the holotype. The lip of the specimen is fractured, giving the appearance of a notch. Gasconade dolomite, locality 238-d. Meramec Spring, Phelps County, Missouri. U. S. N. M. No. 83548.

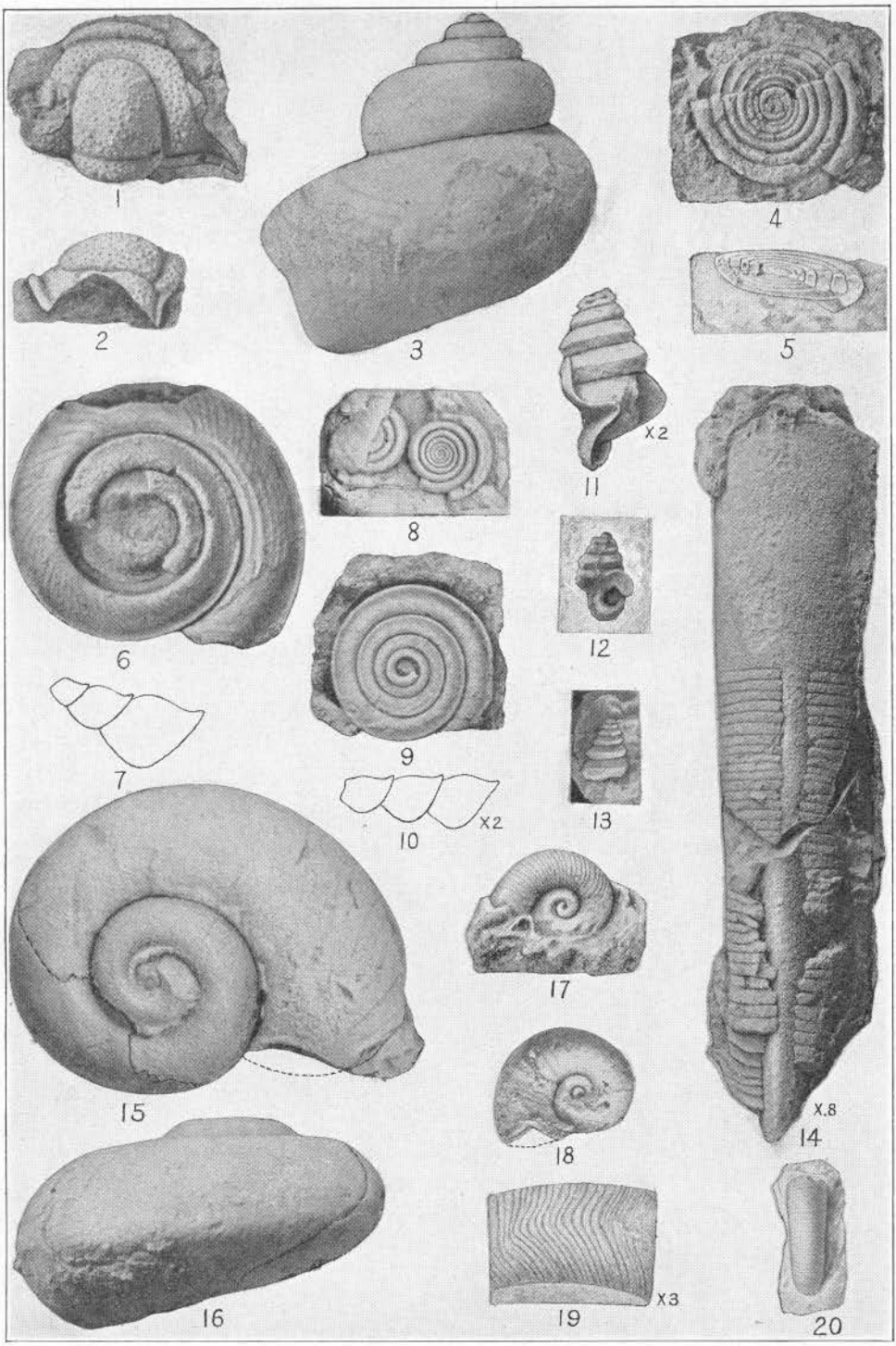
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PLATE XXII

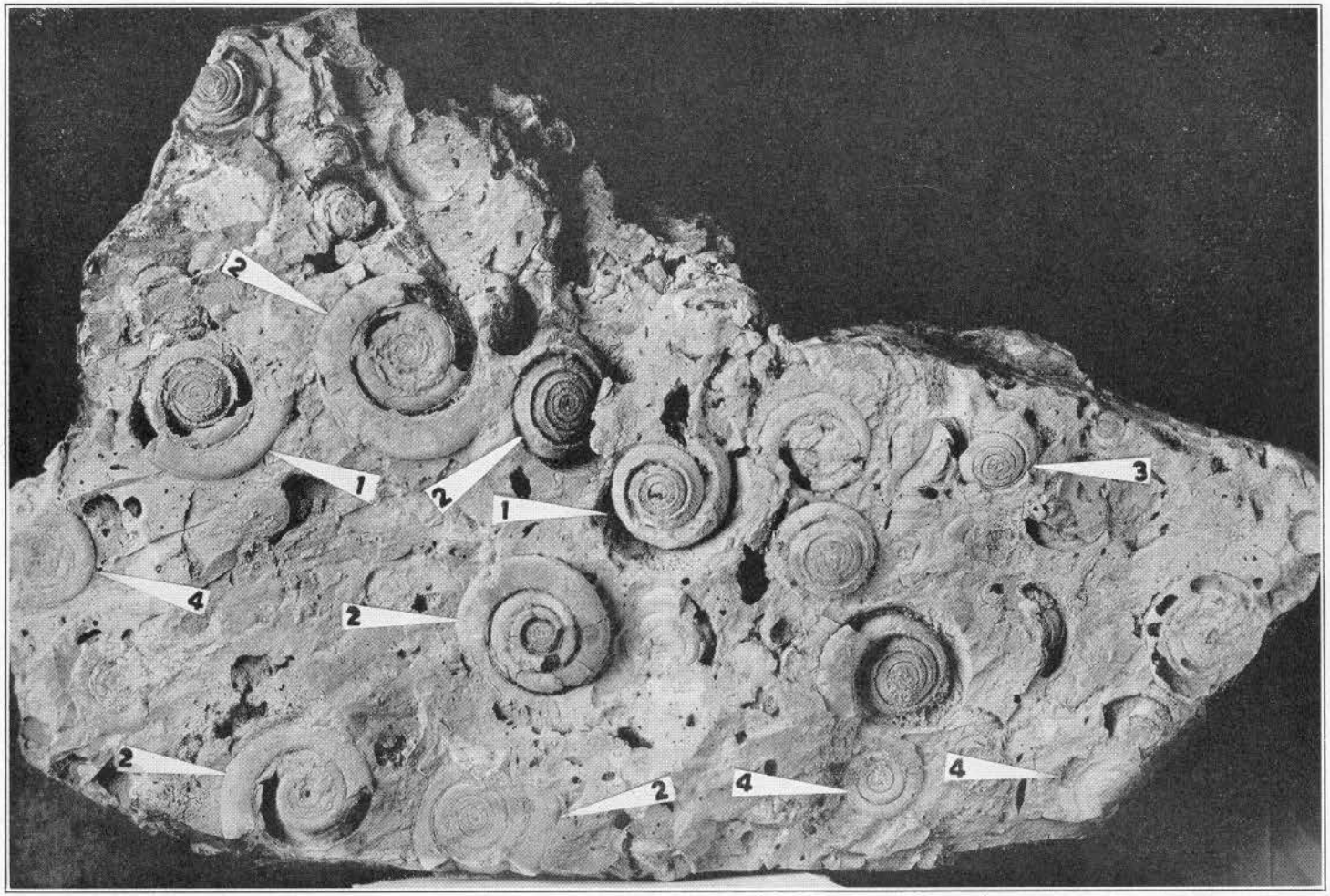
PLATE XXII

Slab of chert showing several species of Lecanospira. x. 5.

1. *Lecanospira compacta* (Salter)
2. *Lecanospira sigmoidea* Ulrich and Bridge, n. sp.
3. *Lecanospira salteri* Ulrich and Bridge, n. sp.
4. *Lecanospira biconcava* Ulrich and Bridge, n. sp.

Roubidoux formation, M. S. M., locality 90.10 in road ditch on divide between Pumpkin Hollow and Carr Creek, Reynolds County, Missouri.

Mo. Sch. Mines, Dept. of Geology No. 3074. J. Bridge, collector.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