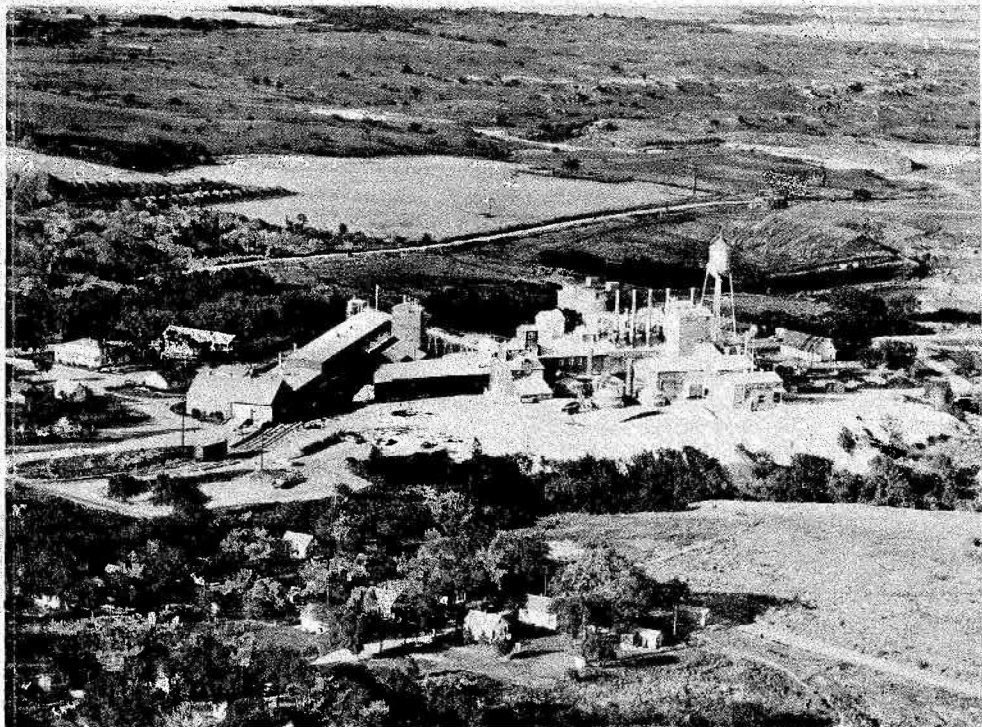


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OKLAHOMA GEOLOGY NOTES



GYPSUM PLANT, BLAINE COUNTY

Cover Picture

MINERAL INDUSTRIES OF OKLAHOMA

GYPSUM

Enormous reserves of high-purity gypsum exist in the Permian strata of western Oklahoma. Occurring mainly in the Blaine and Cloud Chief Formations, individual beds of gypsum and/or anhydrite are from several feet to as much as 100 feet thick. Small lenses of anhydrite are found at the surface locally, but at most places gypsum alone crops out and anhydrite is present underground only where the bed has an overburden of from 25 to 100 feet. Maximum aggregate thicknesses of gypsum beds in the State are: 60 feet in the Blaine Formation of northwestern Oklahoma, 150 feet in the Blaine Formation of southwestern Oklahoma, and 100 feet in the Cloud Chief Formation of west-central Oklahoma.

The first recorded production of gypsum products in Oklahoma was in 1894. From a modest beginning, an annual production averaging 12,000 tons during the years 1894-1900, the State's production reached a peak of 509,000 tons in 1962. This increase in production has not been a slow, continuous rise. Because gypsum is principally used in making plasters and wallboard and as retarder for portland cement, sharp yearly rises and declines have reflected periods of fluctuating construction activity. The cumulative production of gypsum from 1894 through 1963 is approximately 14 million tons, which is but a small fraction of the 125 billion tons of surface and near-surface reserves conservatively estimated by C. N. Gould in 1907.

Eight plants are currently operating in the State, and all gypsum is being mined by strip methods. One plant is operating in each of Caddo, Canadian, and Custer Counties, two plants are producing in Washita County, and three plants are operating in Blaine County. In addition a new plant, being constructed in Jackson County, should begin wallboard production in the summer of 1964.

The cover picture is an aerial view of the U. S. Gypsum Company plant at Southard, in Blaine County.

—K. S. J.

(Photograph courtesy of U. S. Gypsum Company)

TWO ORDOVICIAN TRILOBITES FROM SOUTHERN OKLAHOMA

E. A. FREDERICKSON

Two well-preserved nearly complete trilobite specimens of Ordovician age were recently purchased from Allen Graffham of Ardmore, Oklahoma, by the Oklahoma Geological Survey. The trilobites are from the Bromide Formation of the Simpson Group and are representatives of different genera.

One specimen, *Encrinuroides capitonis*, new species, is from the Pooleville Member of the Bromide Formation and was collected at Rock Crossing in the Criner Hills in Carter County, sec. 35, T. 5 S., R. 1 E. The other specimen, *Calliops divaricatus*, new species, is from the Corbin Ranch Member of the Bromide Formation south of Fittstown, Pontotoc County, sec. 12, T. 1 N., R. 6 E.

The specimens were cleaned of matrix and prepared prior to purchase by the Survey. No defects due to cleaning are observable on the specimen of *Encrinuroides*. The *Calliops* specimen, however, lacks both eyes and free cheeks, and it shows definite evidence of removal of material in the eye area by emery wheel. Frequently, free cheeks of trilobites are lost prior to fossilization, and it is probable that this was the situation with the *Calliops* specimen. Unfortunately the absence of the eyes and free cheeks necessitates speculation upon their nature in a description of the species.

Family ENCRINURIDAE Angelin Subfamily ENCRINURINAE Angelin

Encrinuroides capitonis, new species Plate I, figures 1-5

The entire trilobite is small, measuring 24 mm in length (sag.); cephalon measuring 6 mm, the thorax, 11 mm and the pygidium, 7 mm. The trilobite is convex (tr.), with the glabella and axial lobe raised above the cheeks and pleurae.

Cephalon subsemicircular, strongly convex (sag.). Glabella bulbous, narrowest across *1p* lobes and expanding forward to widest frontal lobes; strongly convex anterior of glabella overhanging frontal area; anterior of glabella containing short median furrow, which intersects preglabellar furrow forming large pit.

Three pairs of lateral glabellar lobes, *1p* lobes shortest (exsag.), other lobes subequal; furrows nearly vertical on steep sloping sides of glabella, *1p* furrows deepest and longest (tr.) but not approaching midline. Occipital ring convex, level with rear of glabella. Deep axial furrows diverging anteriorly and becoming confluent with lateral border furrows, thus separating cheeks from frontal area. Preglabellar furrows deep at intersection with axial furrows, becoming fainter around corners of glabella and flaring ventrally at midline in wide V, with apex immediately ventral to junction with median longitudinal furrow. Frontal area vertical to slightly overturned, consisting of the

preglabellar field and the anterior border, which is half the length (exsag.) of the median-indented prelabellar field; anterior border underhanging prelabellar field and separated by a shallow continuous anterior furrow, which is interrupted at the midline by a narrow (tr.) rostrum that extends from the border margin to the facial suture. Fixed cheeks horizontal, convex, wide; eyes stalked, directed anterolaterally; free cheeks triangular, descending vertically to narrow deep lateral border furrows. Facial sutures as in the type species for the genus (Whittington, 1950, p. 536). Posterior border convex, well-defined, narrow (exsag.); short, thick genal spine.

Thorax with 11 segments; axial rings strongly convex, raised above pleurae and curving forward across midline. Pleurae horizontal in inner part, bent down steeply in outer part; pleural terminations broadly pointed; no pleural furrows.

Pygidium triangular, wider (tr.) than long (sag.). Axis convex, raised above pleurae, tapering posteriorly; 14 axial rings defined by furrows which become progressively less distinct posteriorly; furrows deepest laterally, poorly defined across axis after fourth ring. Eight pairs of ribs; first six pairs defined by deep furrows and directed progressively more strongly backward, seventh and eighth pairs nearly parallel to axis, indistinctly defined and fused with the tongue-shaped postaxial ridge, which extends to pygidial margin. Terminations of first to fourth pairs of ribs blunt and free; terminations of the fifth to eighth pairs of ribs fused with postaxial segment. There is no border.

Ornamentation of the cephalon consists of tubercles on the glabella and frontal area, coarse pits alternating with larger tubercles on the cheeks, and small granules on the posterior and lateral borders. Axis of thorax and pygidium thickly granulated, pleural areas with scattered granules. The last seven axial rings of the thorax have a double row of large granules consisting of one large granule on each side of the median line of each axial ring.

Remarks.—This new species displays all of the criteria by which the genus *Encrinuroides* is distinguished from *Encrinurus* (Whittington, 1950, p. 538), including the shallow anterior furrow, the more

Explanation of Plate I

Figures 1-5. *Encrinuroides capitonis*, new species. Holotype OU 3412; x3, except where otherwise stated.

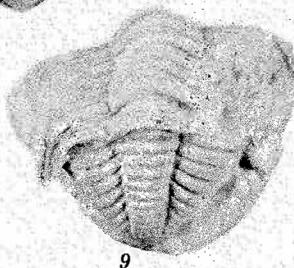
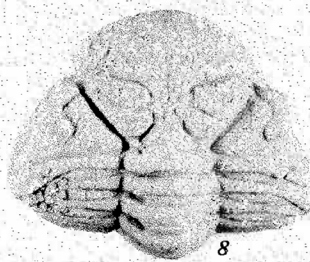
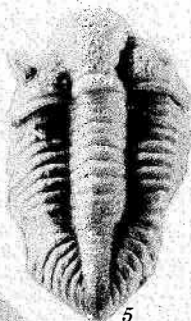
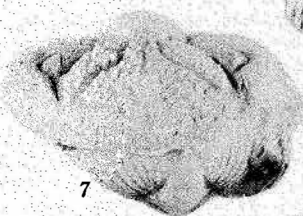
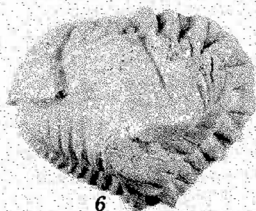
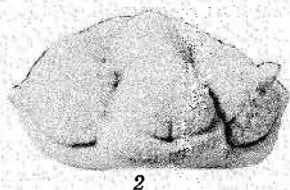
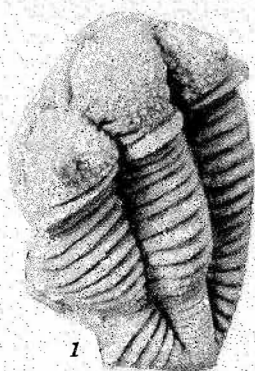
1. Anterolateral oblique view.
- 2, 4. Anterior oblique and anterior views, showing frontal area and median cleft in glabella.
3. Dorsal view of pygidium.
5. Dorsal view, x2, showing protuberant glabella.

Figures 6-9. *Calliops divaricatus*, new species. Holotype, OU 5209, x2.

6. Lateral view.
7. Anterior view.
8. Dorsal view of cephalon area.
9. Dorsal view of pygidial area.

(Photographs by Jan Cannon)

Plate I



distinct lateral furrows and anterior medial furrow of the glabella, and a pygidium which is wider than long. *E. capitonis*, new species, may be distinguished from other species by the median depressed preglabellar furrow, in having only 14 axial rings in the pygidium contrasted with 20 for the type species, and in having a shallow, continuous anterior furrow. The specific name *capitonis* (one that has a large head) refers to the prominent, forward-thrusting cephalon of this new species.

Occurrence.—Middle Ordovician. Pooleville Member of the Bromide Formation, Rock Crossing, Carter County, sec. 35, T. 5 S., R. 1 E.

Repository.—OU 3412, The University of Oklahoma paleontology collection.

Family PTERYGOMETOPIDAE Reed
Subfamily PTERYGOMETOPINAE Reed

Calliops divaricatus, new species
Plate I, figures 6-9

Cephalon subsemicircular, moderately convex, width (tr.) nearly twice the length. Glabella convex, expanding markedly forward, bounded by straight, deep, diverging axial furrows, narrowest at occipital furrow, widest at elliptical frontal lobe, which is equal in width (tr.) to the length (sag.) of the glabella plus the occipital ring. Central area raised, merging anteriorly with frontal lobe, defined by shallow longitudinal furrows. Three pairs of unequal lateral lobes, *1p* lobes smallest, narrowing abaxially, terminating in two poorly defined nodes; *2p* lobes rhomboid, twice the length (exsag.) of *1p* lobe; *3p* lobes largest, triangular, expanding abaxially. *1p* furrows trending inward and curving forward, *3p* furrows running inward and backward, both furrows confluent with longitudinal furrow, thus isolating *2p* and *3p* glabellar lobes; *2p* furrows shallowing abaxially but continuing to axial furrows. Occipital ring convex, raised above posterior of glabella; occipital furrow wide (sag.), moderately impressed with two deep pits impressed into margin of occipital ring at position of *1p* glabellar nodes. Preglabellar furrow shallow in front of glabella, unknown laterally; preglabellar area short (sag.), limited to narrow (tr.) flange. Free cheeks and eyes not preserved. Fixed cheeks triangular, widest (tr.) at junction with posterior border furrow. Palpebral lobes elevated, but not above glabella, crescentic, short (exsag.) for the genus, not extending to posterior border furrow. Palpebral furrow sigmoidal, extending forward to meet the axial furrows near front of *3p* lateral lobes, posteriorly fading into the fixed cheek. Anterior and lateral borders not known; posterior border convex, narrow near axial furrow, widening laterally towards probable (not preserved) rounded genal angle. Facial suture not preserved anteriorly, cutting backward from anterolateral margin of frontal lobe around palpebral lobe, then outward and forward in sweeping sigmoidal curve to cut backward again across lateral border in front of genal angle.

Thorax with 11 segments; axis a little more than one-third the width; articulating half-rings equal in length (sag.) to axial rings;

inner portions of pleura flat, outer parts bending downward and backward. Pleural furrows deep, continuing to ends.

Pygidium rounded triangular, with bluntly pointed terminus; axis with 10 well-defined axial rings and 6 faintly indicated rings. Pygidium markedly convex (tr.), pleural regions steeply sloping; nine pairs of ribs becoming smaller and fainter posteriorly, with last pair parallel to axis, anterior four pairs of ribs with shallow furrows.

The glabella is ornamented with coarse tubercles, and fine granules occur on the first few axial rings of the thorax.

Remarks.—The specific name is utilized to refer to the strong anteriorly diverging axial furrows of the cephalon, which is one of the features distinguishing this species from others of the genus. The wide (tr.) glabella, which measures 14 mm in the type specimen as compared to its short length (11 mm) is another unique feature of this genus. The marked longitudinal furrows, although not characteristic in general of species of *Calliops*, are also found in forms such as *C. mesleri* Cooper, *C. buttsi* Cooper, *C. narrowayi* Okulitch, and, to a lesser degree, in *C. strasburgensis* Ulrich and Delo. The posterior width (tr.) of the fixed cheek and the relatively short (exsag.) palpebral lobes, which do not extend to the posterior border furrows, are, to my knowledge, unique to this species.

Occurrence.—Middle Ordovician, Corbin Ranch Member of Bromide Formation, Simpson Group, at highway roadcut, 3 miles south of Fittstown, Pontotoc County, sec. 12, T. 1 N., R. 6 E.

Repository.—OU 5209, The University of Oklahoma paleontology collection.

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Aelurodon, AN ADDITION TO THE DURHAM LOCAL FAUNA,
ROGER MILLS COUNTY, OKLAHOMA

DAVID B. KITTS

In 1959 the writer and Craig Black described a local fauna from Pliocene deposits in SE $\frac{1}{4}$ sec. 15, T. 16 N., R. 26 W., Roger Mills County, Oklahoma. This assemblage, designated the Durham local fauna, consists of specimens representing ten vertebrate species and was judged to be of Clarendonian age.

In August 1959, while examining the Durham deposits, Mr. William McMullen discovered the remains of a large canid. The specimen (OUSM 40-4-S50) consists of a badly weathered right ramus of the lower jaw with M_1 and M_2 (fig. 1). The roots of the canine, P_3 and P_4 , are preserved. P_1 , P_2 , and M_3 are missing, but their alveoli are present. The ascending ramus and symphysis are absent. The specimen was resting upon the upper channel sand layer of the Durham deposits when discovered (Kitts and Black, 1959, p. 30).

The Durham specimen is similar to the canid specimens from the Arnett locality, which lies twenty miles north of the Durham locality in Ellis County. In 1957 the writer (Kitts, 1957, p. 10-13) referred the Arnett canids to *Aelurodon* cf. *A. mortifer* (Cook) 1914.

TABLE I.—MEASUREMENTS OF THE TEETH OF *Aelurodon*
FROM DURHAM AND ARNETT

(Where teeth are missing alveoli have been measured. All measurements are in millimeters.)

SPECIMEN	P_3	P_1-P_4	P_1-M_2
Arnett			
40-4-S26	11.4	49.7	99.5
40-4-S29	9.9	45.2	
40-4-S31	10.3	48.1	96.4
Durham			
40-4-S50	13.8	49.8	97.2

The premolars of the Durham specimen are somewhat closer together than are those of any of the Arnett specimens, and the P_3 is somewhat larger (table I). These minor differences are all that distinguish the Durham specimen from the Arnett specimens. The Durham canid may be referred to *Aelurodon* and is probably conspecific with the Arnett *Aelurodon*.

The Arnett local fauna is of late Clarendonian or early Hemphillian age. The presence of *Aelurodon* in the Durham fauna is consistent with the view that it is Clarendonian, probably middle Clarendonian, in age.

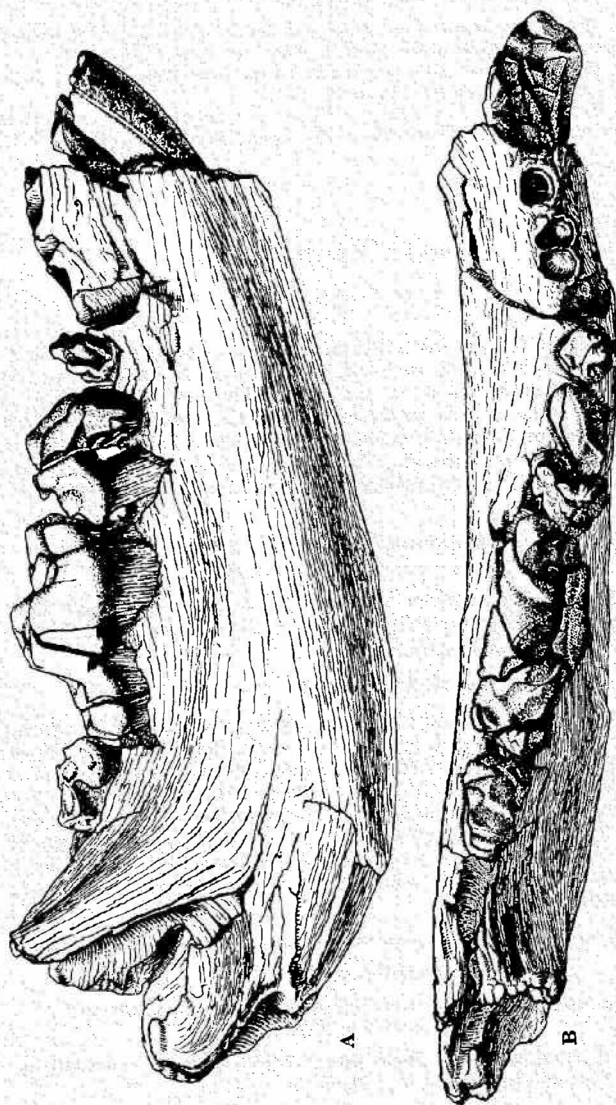


Figure 1. *Aelurodon*, OUSM 40-4-S50, x1, right ramus of lower jaw with M_1 and M_2 and fragments of other teeth.
A. Lateral view. B. Crown view.
(Drawings by Nancy Halliday)

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Kitts, D. B., 1957, A Pliocene vertebrate fauna from Ellis County, Oklahoma: Okla. Geol. Survey, Circ. 45, 27 p.
Kitts, D. B., and Black, C. C., 1959, A Pliocene vertebrate local fauna from Roger Mills County, Oklahoma: Okla. Geol. Survey, Circ. 48, p. 27-47.

A CHINESE EDESTID SHARK

CARL C. BRANSON

The difficult state of international scientific communication is illustrated by a paper recently received. It is written in Chinese and has a Russian summary. Some of the illustrations are recognizable as having come from an early paper of mine (1935), and it seemed well to have the recent paper translated. Two graduate students in geology at The University of Oklahoma, Wong Her Yue and Huang Ying-yan, did the translation, and the pertinent and original parts are here reproduced.

Helicoprionid Discovered in China

Liu Sen-tin and Chang Mee-man

In 1962 a fossil collected from the upper part of the Upper Permian of the Changning district, Chekiang Province, was determined as a member of the family Helicoprionidae.

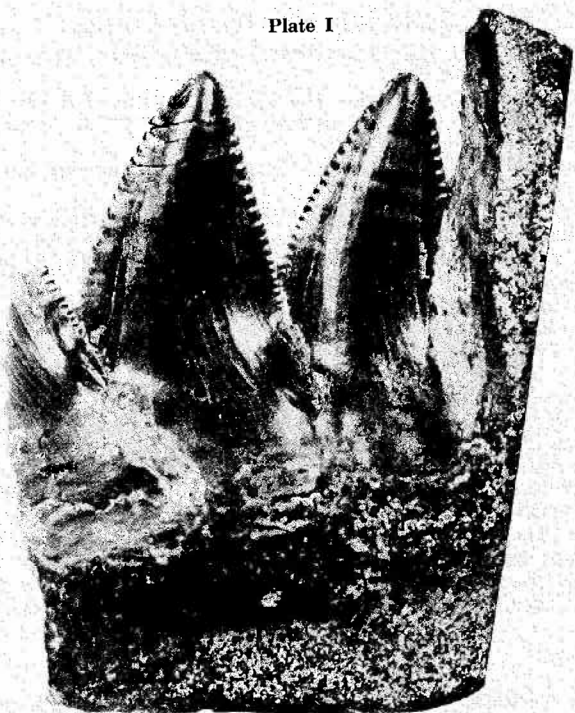
Sinohelicoprion, gen. nov.

Characteristics of genus: Teeth of serrate type. Surface of cutting blade smooth, no trace of wear, with zigzag front and rear edges. Lateral flanges short, in a broad beltlike shape, slightly extended toward the anterior lower part, tip flat and tapering. The anterior part of the lateral flange has fine serrations, and the posterior is irregular or has irregular serrations. The lateral flanges are close together, without space for enamel layer. The tubular bony layer is well developed, but a spongy bony layer was not found. The groove at the base of the tooth series is shallow and broad.

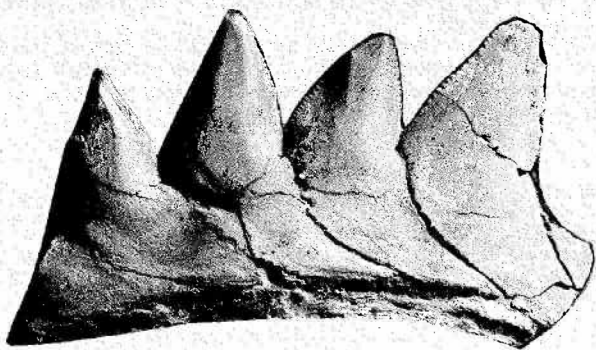
Explanation of Plate I

Comparison of *Helicampodus changhsingensis* (Liu and Chang) and *H. kokeni* Branson

- Figure 1. *H. changhsingensis*. Right side of holotype, x2 (reproduced from Liu and Chang, 1963, pl. 1, fig. 1).
Figure 2. *H. kokeni*. Right side of holotype, x0.8 (reproduced from Branson, 1935, pl. 1, fig. 3).



1



2

Sinohelicoprion changhsingensis, gen. et sp. nov.

Holotype: A portion of the tooth series with four teeth preserved, two of which are perfect.

Locality and stratigraphic position: On the rear hill of Changching Coal Mine, Changhing district, Chekiang Province. Changhing Limestone, Upper Permian.

Specific characteristics: The same as the characteristics of the genus.

Description: [Here greatly abridged.] Tip of teeth inclined anteriorly, anterior edge straight and steep (short), posterior edge arcuate (long). Edges of teeth serrate on anterior and posterior. The bony base is covered and unobservable.

The surfaces of the teeth and the lateral flanges are covered with enamel which has numerous small pits that are openings of the dentine tubules. Judging from a longitudinal polished section the enamel is thin.

When first discovered the specimen was more than one foot long. The tooth series could have been a semicircle but was probably a spiral.

Comparison and discussion: Because the lateral flanges extend forward and the tooth bases extend backward, the species should be classified in the *Helicoprionidae*. Among the seven known genera of *helicoprionids* the species is most similar to *Helicampodus kokeni* Branson. The differences between the Chekiang form and *Helicampodus* are: the surface of the cutting blade is smooth, the anterior of the lateral flange has fine serrations, the tip is broad and flat, unlike that of *Helicampodus* which becomes sharper and narrower toward the tip.

(End of abridged translation)

The specimen is well illustrated and the detailed description excellent. Because the basal units are poorly preserved, an accurate assignment of affinities is impractical, but it is here believed that the Chekiang specimen differs only in specific characters from *Helicampodus kokeni* and should probably be known as *Helicampodus changhsingensis* (Liu and Chang).

The holotype specimen of the type species of *Helicampodus* was collected from the Upper Productus limestones of the Salt Range of Pakistan, and the stratigraphic position could well be much the same as that of the Chinese specimen.

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- Liu Sen-tin and Chang Mee-man, 1963, *Helicoprionid* discovered in China: *Academia Sinica, Vertebrata Palasiatica*, vol. 7, no. 2, p. 123-129, 1 pl., 4 text-figs.

AN OUTLINE CLASSIFICATION OF THE BLASTOIDEA

ROBERT O. FAY

Approximately 75 genera of blastoids have been described to date, but no attempt has been made to classify them into natural families and subfamilies. The purpose of this article is to present a workable classification, with the hope that it will be the basis for the classification used in the forthcoming *Treatise on Invertebrate Paleontology*. New names should not be introduced in the treatise, and the present classification may not be adopted. Any comments or criticisms are welcome.

Class BLASTOIDEA Say, 1825

Hydrospire-bearing, stemmed echinoderms; theca composed of 18-21 plates; comprising three basals, surmounted by five radials, above which and alternating with them are five deltoids; five lancet plates occur in radial position in radial sinuses; the anal side may comprise one, two, three, four, or six anal deltoids; hydrospires external or internal; pores and spiracles present mainly in forms with internal hydrospires. Silurian-Permian, world wide.

Order FISSICULATA Jaekel, 1918

Blastoids with exposed hydrospire slits or spiracular slits. Silurian-Permian, world wide.

Family PHAENOSCHISMATIDAE Etheridge and Carpenter, 1886

Fissiculate blastoids with 10 exposed or partly exposed hydrospire fields. Silurian-Permian, world wide.

Subfamily Phaenoschismatinae Etheridge and Carpenter, 1886

Epideltoid and hypodeltoid present on anal side. Mississippian-Permian.

1. *Phaenoschisma* Etheridge and Carpenter, 1882. Club-shaped theca; lancet covered by side plates; slits reduced in number on anal side Mississippian
2. *Conoschisma* Fay, 1961d. Conical theca; lancet covered by side plates; slits not reduced in number on anal side Mississippian
3. *Hadroblastus* Fay, 1962b. Discoidal theca; lancet exposed; slits reduced in number on anal side Mississippian
4. *Phaenoblastus* Fay, 1961d. Conical theca; lancet exposed; slits reduced in number on anal side Mississippian
5. *Nymphaeoblastus* von Peetz, 1907. Ellipsoidal theca; lancet covered; many slits exposed on anal side Mississippian
6. *Dipteroblastus* Wanner, 1940. Cup-shaped theca; lancet covered; slits reduced in number on anal side; with only two ambulacra (B and D) Permian
7. *Neoschisma* Wanner, 1924a. Cup-shaped theca; slits reduced in number on anal side, but with many slits in other ambulacral areas (more than any other known genus) Permian

8. *Notoblastus* Brown, 1941. Flattened discoidal theca; slits reduced in number on anal side; radials winged Permian
9. *Sundablastus* Wanner, 1924a. Subglobular theca; lancet covered; one slit in each ambulacrum Permian
10. *Thaumatoblastus* Wanner, 1924b. Cup-shaped theca, strongly winged; lancet exposed; slits reduced in number on anal side Permian

Subfamily **Decaschismatinae**, new subfamily

A superdeltoid, subdeltoid, and hypodeltoid present on anal side. Silurian.

11. *Decaschisma* Fay, 1961d. Silurian

Subfamily **Hyperoblastinae**, new subfamily

Superdeltoid, two cryptodeltoids, and hypodeltoid present on anal side. Silurian-Devonian.

12. *Hyperoblastus* Fay, 1961d. Slits almost completely covered on anal side and other sides, with formation of pores and spiracles Devonian
13. *Deltoschisma* Fay, 1961d. Slits exposed, reduced in number on anal side Devonian
14. *Pleuroschisma* Reimann, 1945. Slits exposed, not reduced in number on anal side Devonian
15. *Polydeltoideus* Reimann and Fay, 1961. Slits exposed, not reduced in number on anal side; with two paradeltooid plates Silurian

Subfamily **Sphaeroschismatinae**, new subfamily

Epideltoid present; hypodeltoid missing or atrophied. Permian.

16. *Sphaeroschisma* Wanner, 1924b Permian

Family **BRACHYSCHISMATIDAE** Fay, 1961d

Nine exposed hydrospire fields; the D anal field absent. Devonian.

17. *Brachyschisma* Reimann, 1945 Devonian

Family **CODASTERIDAE** Etheridge and Carpenter, 1886

Eight exposed hydrospire fields; those on the anal side absent. Devonian-Permian.

Subfamily **Codasterinae** Etheridge and Carpenter, 1886

Epideltoid present; hypodeltoid missing or atrophied. Mississippian-Permian.

18. *Codaster* McCoy, 1849. Conical theca, with wide hydrospire fields; slits excavated in deltoids and radials Mississippian
19. *Agmoblastus* Fay, 1961c. Subcylindrical theca, with restricted hydrospire fields; slits excavated in deltoids and radials Pennsylvanian
20. *Paracodaster* Yakovlev, 1940. Subglobular theca, with restricted hydrospire fields; slits in deltoids only Permian

Subfamily **Heteroschismatinae**, new subfamily

Superdeltoid and subdeltoid present, with hypodeltoid missing or atrophied. Devonian.

21. *Heteroschisma* Wachsmuth, 1883 Devonian

Family **OROPHOCRINIDAE** Jaekel, 1918

Fissiculate blastoids with 10 spiracular slits. Mississippian-Permian.

Subfamily **Orophocrininae** Jaekel, 1918

Epideltoid and hypodeltoid present. Mississippian-Permian.

22. *Orophocrinus* von Seebach, 1864. Conical to club-shaped theca; lancet exposed; with fused hydrospire plate Mississippian
23. *Pentablastus* Sieverts-Doreck, 1951. Subglobular theca; lancet covered; with fused hydrospire plate Pennsylvanian
24. *Anthoblastus* Wanner, 1924b. Conical to club-shaped theca; lancet exposed; deltoids extended into coronal processes Permian
25. *Indoblastus* Wanner, 1924a. Pear-shaped theca; lancet covered Permian
26. *Timoroblastus* Wanner, 1924a. Star-shaped theca; lancet covered Permian

Subfamily **Microblastinae**, new subfamily

Epideltoid present; hypodeltoid missing or atrophied. Permian.

27. *Microblastus* Eykeren, 1942 Permian

Family **ASTROCRINIDAE** Austin and Austin, 1843

Eight spiracular slits present; the anal pair absent. Devonian-Permian.

Subfamily **Astrocrininae** Austin and Austin, 1843

Epideltoid and hypodeltoid present. Devonian-Permian.

28. *Astrocrinus* Morris, 1843. Theca small, star-shaped; plates irregular; with short D ambulacrum Mississippian
29. *Cryptoschisma* Etheridge and Carpenter, 1886. Theca large, conical; plates regular; lancet exposed Devonian
30. *Angioblastus* Wanner, 1931. Theca large, subglobular; plates regular; lancet covered Permian
31. *Nannoblastus* Wanner, 1924b. Theca large, conical, winged; plates regular; lancet covered Permian

Subfamily **Pentephyllinae** Bather, 1899

Anideltoid? present (not well understood, based on one fragmentary specimen). Mississippian.

32. *Pentephyllum* Haughton, 1859 Mississippian

Subfamily **Sagittoblastinae**, new subfamily

Epideltoid present; hypodeltoid missing or atrophied. Permian.

33. *Sagittoblastus* Yakovlev, 1937. Theca globular Permian
34. *Ceratoblastus* Wanner, 1940. Theca conical Permian
35. *Pterotoblastus* Wanner, 1924a. Theca cup-shaped, winged Permian

Subfamily **Pentremitideinae**, new subfamily

Superdeltoid, subdeltoid, and hypodeltoid present. Devonian.

36. *Pentremitidea* d'Orbigny, 1850. Devonian

Order SPIRACULATA Jaekel, 1918

Blastoids with hidden hydrosfire slits that open into hydrosfire canals, with definite spiracles and hydrosfire pores. Silurian-Permian, world wide.

Family TROOSTICRINIDAE Bather, 1899

Five paired spiracles; theca conical. Silurian-Mississippian.

37. *Troosticrinus* Shumard, 1866. Ambulacra directed outward; hydrosfires freely pendant in body cavity Silurian
38. *Metablastus* Etheridge and Carpenter, 1886. Ambulacra directed downward; deltoids not visible in side view; hydrosfires pendant Mississippian
39. *Schizotremites* Reimann, 1945. Ambulacra directed downward; deltoids visible in side view; hydrosfires pendant Devonian
40. *Tricoelocrinus* Meek and Worthen, 1868. Hydrosfires in substance of radial plates; ambulacra directed downward Mississippian

Family DIPLOBLASTIDAE, new family

Five paired spiracles; theca globular. Mississippian.

Subfamily Diploblastinae, new subfamily

Superdeltoid, two cryptodeltoids, and hypodeltoid present on anal side. Mississippian.

41. *Diploblastus* Fay, 1961d. Mississippian

Subfamily Nodoblastinae, new subfamily

Epideltoid and hypodeltoid present on anal side. Mississippian.

42. *Nodoblastus* Fay, 1963 Mississippian

Family GRANATOCRINIDAE Fay, 1961d

Eight spiracles and anispiracle present. Mississippian-Permian.

Subfamily Granatocrininae Fay, 1961d

Epideltoid and hypodeltoid present. Mississippian.

43. *Granatocrinus* Hall, 1862. One fold present on each side of an ambulacrum; radials overlap deltoids; lancet covered; hydrosfire plate present Mississippian
44. *Carpenteroblastus* Rowley, 1901. Two folds present on each side of an ambulacrum; radials overlap deltoids; lancet exposed Mississippian
45. *Crioblastus* Hambach, 1903. Two folds present; radials overlap deltoids; lancet covered; hydrosfire plate present Mississippian
46. *Heteroblastus* Etheridge and Carpenter, 1886. Deltoids overlap radials; lancet covered; deltoids with coronal processes Mississippian
47. *Monadoblastus* Fay, 1961d. One hydrosfire fold on each side of an ambulacrum; radials overlap deltoids; lancet partly exposed; hydrosfire plate present; pores absent along deltoid margin Mississippian
48. *Monoschizoblastus* Cline, 1936. One fold present on each side of an ambulacrum; deltoids overlap radials; lancet exposed Mississippian

49. *Poroblastus* Fay, 1961d. One fold present on each side of an ambulacrum; radials overlap deltoids; lancet partly exposed; hydrosfire plate present; one pore per side plate along deltoids, but two along radials ----- Mississippian
50. *Ptychoblastus* Fay, 1960a. One fold present on each side of an ambulacrum; radials overlap deltoids; lancet partly covered; hydrosfire plate present ----- Mississippian

Subfamily **Cryptoblastinae**, new subfamily

Superdeltoid, two cryptodeltoids, and hypodeltoid present. Mississippian.

51. *Cryptoblastus* Etheridge and Carpenter, 1886. Two hydrosfire folds on each side of an ambulacrum; hydrosfire plate present ----- Mississippian
52. *Mesoblastus* Etheridge and Carpenter, 1886. Three folds on each side of an ambulacrum; hydrosfire plate present ----- Mississippian
53. *Tanaoblastus* Fay, 1961d. Two folds on each side of an ambulacrum; hydrosfire plate absent ----- Mississippian

Subfamily **Calycoblastinae**, new subfamily

Epideltoid present; hypodeltoid missing or atrophied. Permian.

54. *Calycoblastus* Wanner, 1924a ----- Permian

Family **SCHIZOBLASTIDAE** Fay, 1961d

Ten spiracles present, with anus separate; cryptodeltoids absent or hidden. Devonian-Permian.

Subfamily **Schizoblastinae** Fay, 1961d

Epideltoid and hypodeltoid present on anal side. Devonian-Permian.

55. *Schizoblastus* Etheridge and Carpenter, 1882. Two hydrosfire folds on each side of an ambulacrum; deltoids overlap radials; lancet narrowly exposed ----- Mississippian
56. *Strongyloblastus* Fay, 1962a. Five folds on each side of an ambulacrum; radials overlap deltoids; lancet widely exposed ----- Devonian
57. *Lophoblastus* Rowley, 1901. Three folds on each side of an ambulacrum; deltoids overlap radials; lancet exposed; hypodeltoid hooded ----- Mississippian
58. *Deltoblastus* Fay, 1961a. Two folds on each side of an ambulacrum; radials overlap deltoids; lancet widely exposed ----- Permian

Subfamily **Acentrotrematinae**, new subfamily

Anideltd present on anal side. Mississippian.

59. *Acentrotremites* Etheridge and Carpenter, 1883 ----- Mississippian

Subfamily **Auloblastinae**, new subfamily

Superdeltoid, two cryptodeltoids, and hypodeltoid present on anal side. Mississippian.

60. *Auloblastus* Beaver, 1961. ----- Mississippian

Family **NUCLEOCRINIDAE** Bather, 1899

Ten spiracles with anus separate; two cryptodeltoids well exposed on anal side. Devonian.

Subfamily **Nucleocrininae** Bather, 1899

Superdeltoid hidden. Devonian.

61. *Nucleocrinus* Conrad, 1842. Devonian

Subfamily **Elaeocrininae**, new subfamily

Superdeltoid well exposed on anal side. Devonian.

62. *Elaeocrinus* Roemer, 1851. Eighteen to twenty-one oral plates --
..... Devonian
63. *Placoblastus* Fay, 1961d. Six or seven oral plates Devonian

Family **PENTREMITIDAE** d'Orbigny, 1851

Five spiracles; theca conical. Devonian-Permian.

Subfamily **Pentremitinae** d'Orbigny, 1851

Anideltooid present on anal side. Mississippian.

64. *Pentremites* Say, 1820. Many small imbricate oral plates present
..... Mississippian-Pennsylvanian
65. *Ambolostoma* Peck, 1930. Five large oral plates present Mississippian

Subfamily **Eleutheroocrininae** Bather, 1899

Superdeltoid, two cryptodeltoids, and hypodeltooid present. Devonian.

66. *Eleutheroocrinus* Shumard and Yandell, 1856. D ambulacrum
short; plates irregular Devonian
67. *Cordyloblastus* Fay, 1961d. Ambulacra normal; plates regular;
deltoids not visible in side view Devonian
68. *Devonoblastus* Reimann, 1935. Ambulacra normal; plates regular;
deltoids seen in side view Devonian

Subfamily **Pentremoblastinae**, new subfamily

Superdeltoid, subdeltoid, and hypodeltooid present on anal side. Mississippian.

69. *Pentremoblastus* Fay and Koenig, 1963. Mississippian.

Subfamily **Petaloblastinae**, new subfamily

Epideltoid and hypodeltooid present on anal side. Mississippian.

70. *Petaloblastus* Fay, 1961d. Mississippian

Subfamily **Rhopaloblastinae**, new subfamily

Epideltoid present; hypodeltooid missing or atrophied. Permian.

71. *Rhopaloblastus* Wanner, 1924b. Permian

Family **ORBITREMITIDAE** Bather, 1899

Five spiracles; theca globular; superdeltoid, two cryptodeltoids, and hypodeltooid present on anal side. Mississippian.

72. *Orbitremites* Austin and Austin, 1842. One hydrospire fold on each
side of an ambulacrum; deltoids overlap radials Mississippian
73. *Doryblastus* Fay, 1961b. Three? folds on each side of an ambula-
crum; radials overlap deltoids Mississippian
74. *Ellipticoblastus* Fay, 1960b. One fold on each side of an ambula-
crum; radials overlap deltoids Mississippian
75. *Globoblastus* Hambach, 1903. Two folds on each side of an
ambulacrum; radials overlap deltoids Mississippian

In the above classification, the terminology used is that of Fay (1961d), and the phylogenetic trends of most of the above families are discussed in that work. The unique part of this classification is the introduction of subfamilies, based upon anal deltoid characters. The philosophy of anal deltoid evolution is essentially one of amalgamation of component plates and reduction or atrophy of hydrospires on the anal side. A primitive blastoid is one which has many anal deltoid plates; for instance, *Troosticrinus* with a superdeltoid, two cryptodeltoids (infolded into hydrospires), and a hypodeltoid. An example of a slightly more advanced genus is *Devonoblastus*, in which the deltoids have migrated downward and are seen in side view. A further trend is that in *Pentremoblastus*, which shows amalgamation of the cryptodeltoids into one plate (subdeltoid, infolded into hydrospires), whereas the superdeltoid and hypodeltoid remain the same. With further amalgamation of the subdeltoid with the superdeltoid, a form such as *Petaloblastus* could have evolved, with an epideltoid (the limbs of which are infolded into hydrospires) and a hypodeltoid. The end product would be *Pentremites* which has a single anal deltoid (termed anideltoid) present on the anal side. Thus, in the above series, coalescing of anal elements is in the evolutionary theme.

In the Fissiculata, the above type of trend can be reproduced, but, along with amalgamation of parts, there is apparently a reduction or atrophy of entire hydrospire fields or plates on the anal side. For instance, *Decaschisma*, with a superdeltoid, subdeltoid (infolded into hydrospires), and hypodeltoid, could have given rise to *Brachyschisma* simply by means of atrophy of the hydrospire field on the D side of the anus. Or, *Heteroschisma* could have been derived from *Decaschisma* by atrophy of fields on both sides of the anal opening and partial or complete atrophy of the hypodeltoid plate. *Codaster* could have come from *Heteroschisma* by amalgamation of the superdeltoid and subdeltoid into an epideltoid, void of hydrospires. *Paracodaster* could easily have been derived from *Codaster* by atrophy of hydrospire slits in the radial limbs. Thus the classification of *Heteroschisma*, *Codaster*, and *Paracodaster* under one family seems natural, based upon comparative morphology of many plates. In turn each family and subfamily has been studied in this manner, with the resulting classification. It is hoped that paleontologists will adopt this classification in their work.

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NEW CODE OF ZOOLOGICAL NOMENCLATURE

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Zoologists and paleozoologists by unanimous agreement and practical necessity abide by rules set by the International Commission on Zoological Nomenclature. The code is that adopted by the Fifteenth International Congress of Zoology, London, July 1958, and its effective date is the day of its publication, which is November 6, 1961, for the English-French edition. Publication was delayed, and throughout the code the words "before 1961" must be read "before November 1961."

Several new rules affect paleozoological nomenclature profoundly. Article 15 provides that after 1960 a name proposed as the name of a "variety" or "form" is not available. Paleozoologists must now realize that their varieties are in almost all cases meant to be subspecies. Article 23 (b) is potentially the most likely to cause confusion and controversy. It reads "A name that has remained unused as a senior synonym in the primary zoological literature for more than fifty years is to be considered a forgotten name (*nomen oblitum*)," and (Article 23 (b) (ii)) "is not to be used unless the commission so directs." One

potential evil of the rule is that it opens the way for an unethical scientist to reject names as nomina oblita and to give new names to the objects. Interpretation of the word "primary" seems needed. In paleozoology many groups and faunas have not been examined every fifty years. For instance, Girty's monograph on the Guadalupean fauna (published in 1909, although the date 1908 appears on the title page) contains names of many species which have not been studied since 1909. Tscherdyncey (1914) described many species the names of which have not since been used in primary literature, and these become nomina oblita in 1964. Faunas from remote parts of the Earth are quite likely to remain unexamined for more than fifty years. For example, little has been written on fossils of Tasmania since Johnston (1888). Under present political control it is unlikely that faunas of Timor, of Sumatra, of Cuba, or of parts of Africa will be accessible for new work for many years.

On the other hand it is desirable that, by restrained and careful application of the rule, names of certain poorly founded taxa disappear from the literature. Some of these are:

- Bothroconis plana* King, 1850, supposedly a sponge
- Spongia eiseliana* Geinitz, 1861, a concretion?
- Spongia schubarthi* Geinitz, 1861, a concretion?
- Fusulina elongata* Shumard, 1858, not figured, types lost. Diener's 1911 citation more than questionable
- Orthis sicala* Gemmellaro, 1892 (not figured, unrecognizable)
- Spirifer paucicostatus* Sowerby, 1844 (not figured)
- Siphonotreta? curta* Dana, 1849
- Spiriferina ambonensis* Boehm, 1908 (pre-Jurassic)
- Allorisma? curta* Swallow, 1858, (not figured, locality inexact, types lost)
- Turbo? guadalupensis* Shumard, 1859
- Lilinthiceras* Diener, 1903 (no valid species assigned, but before 1931 not required)

Nautilus permianus Swallow, 1858 (not figured, type lost)

Paleozoologists will be pleased to have an opportunity to forget de Gregorio's ill-conceived, badly described, inexcusably poorly figured species, but the rule cannot accomplish this until 1980. The rule will, in paleozoology, produce a selective elimination of specific names. Clams and snails normally are poorly preserved and are less studied. Some microfossil faunas once described offer little value in being re-studied. Fossil insect species, once described, need not be redescribed nor refigured unless better specimens are found. Probably a third of the names of Permian invertebrates would be eliminated were the rule to be rigidly enforced.

The Commission has taken unto itself greatly increased power, not only in Article 23, but in Articles 75 (f), 65 (b), 61, 55 (a), 41, 40 (a) (i), 30 (a) (i), and 86 (a). This writer does not trust a commission overwhelmingly dominated by zoologists to decide paleozoological matters, and suggests that a committee of paleozoologists be established to study and recommend upon questions in their field. Already de-

cisions to preserve the name *Spirifer* and to establish its type species, and to define the genus *Schwagerina*, have been ill-advised and have caused confusion, whereas strict adherence to the rules would have served science better.

Family (and subfamily and superfamily) names are brought under the rules of priority and synonymy, ill-advisedly in the present writer's view. Many familial names were proposed in syntheses, not by scientists familiar with the fossils. The family name Pentameridae was proposed by McCoy in an offhand way. The new name Callodictyonellidae was given by Zhuraleva in a list. In any case the burden of nomenclatorial research is already ridiculously heavy, and searching out priorities on suprageneric names is not worth the effort. Articles 25 to 41 are here regarded as largely unwise.

Article 59 (c) clarifies the matter of secondary homonyms to some extent, but still leaves the vast number of cases created by synthesizers as creating homonyms, excepting those created after 1960.

In general, the new code clarifies and tightens up the rules. Several hundred scientists have given unstintingly of time and thought in bringing the code to completion, and they deserve our thanks.

The appendices contain the Code of Ethics, suggestions for transliteration of Greek words, for Latinization of geographical and proper names, and recommendations. Some of the recommendations are so sensible that one wishes that they were rules. That names should be short is a fine recommendation, but it can have no effect unless made a rule, for instance one that no name is valid if it contains more than 10 letters. Race horses' names may have 13 under the American code on thoroughbred racing.

The present reviewer applauds and wishes the recommendations against combining classical prefixes and words with patronymics, suffixes "ides" or "oides" with proper names, or using Latin adjectives as generic names were rules. Such names as *Sinclairoceras*, *Stuart-wellerocrinus*, *Pseudodorlodotia*, *Sublonsdaleia*, *Roemeripora*, *Bryantodus*, and *Cooperoceras* are nonclassical and are grammatically objectionable. Consistently violated recommendations are those against incomprehensible abbreviations of authors' names (W & S, B & M, H & C) and generic names with no etymologies and no statement of gender.

Ceratoleperditia arbucklensis IN CRINER HILLS OF OKLAHOMA

REGGIE W. HARRIS, JR.*

Harris (1960, p. 211) erected the ostracode genus *Ceratoleperditia* to embrace relatively large (to $\frac{1}{8}$ inch) Middle and Upper Ordovician eoloperditiids with a prominent outward-downward projecting submedian node or spine on each valve. The type species, *C. arbucklensis* Harris, was collected from uppermost West Spring Creek (Arbuckle) outcrops along U. S. Highway 77, on the south side of the Arbuckle Mountains. Here the species is limited stratigraphically to the uppermost 50 feet of the West Spring Creek Formation, which lies unconformably beneath a 15-inch bed of red-mottled, glauconitic basal conglomerate of the Joins Formation (Simpson). The species was recovered also from the same stratigraphic position from outcrops on West Spring Creek, 12 miles west of U. S. Highway 77.

During the summer of 1959, the writer completed field work on the ostracode fauna and age of the Simpson birdseye limestone of the Criner Hills (Harris, 1961). Among other problems of the investigation was the establishment of the Simpson-Arbuckle contact. The basal Simpson Joins Formation was measured and the Simpson-Arbuckle contact examined in detail in NW $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 16, T. 5 S., R. 1 E., in the Pruitt limestone quarry, approximately 1,650 feet south of the east-west section-line road and 1,800 feet east of the north-south section-line road. The Simpson-Arbuckle contact has the same relationships here as it has along U. S. Highway 77; that is, an oxidized, glauconitic basal conglomerate of the Joins Formation rests unconformably upon the ceratoleperditian limestone in the uppermost part of the West Spring Creek Formation (Arbuckle). So large and numerous are specimens of *C. arbucklensis* in freshly broken topmost Arbuckle limestones here that the characteristic submedian spine of the species is readily visible to the naked eye (fig. 1). Microscopic examination revealed numerous other associated characteristic Arbuckle ostracodes. Stained, pitted, and fragmented reworked specimens of *C. arbucklensis* were recovered from the overlying 18-inch basal conglomerate.

The Joins Formation is 182 feet thick (dip 55°E) at the Pruitt quarry. The base of the formation is characterized by the basal conglomerate in unconformable contact with the underlying West Spring Creek Limestone, and the top is characterized by thin-bedded, fossiliferous, arenaceous to conglomeratic limestones in unconformable contact with an overlying 12-inch basal conglomerate (limestone pebbles up to 6 inches) of the Oil Creek Formation.

Discovery of the diagnostic Arbuckle ceratoleperditiids in the Criner Hills necessitates reassignment of strata previously considered as Joins (basal Simpson) to the West Spring Creek (Arbuckle). The adjustment may vary as much as several hundred feet, depending upon varying concepts of exact field position of Simpson-Arbuckle contact

*Dominion Oil Limited, Trinidad, W. I.

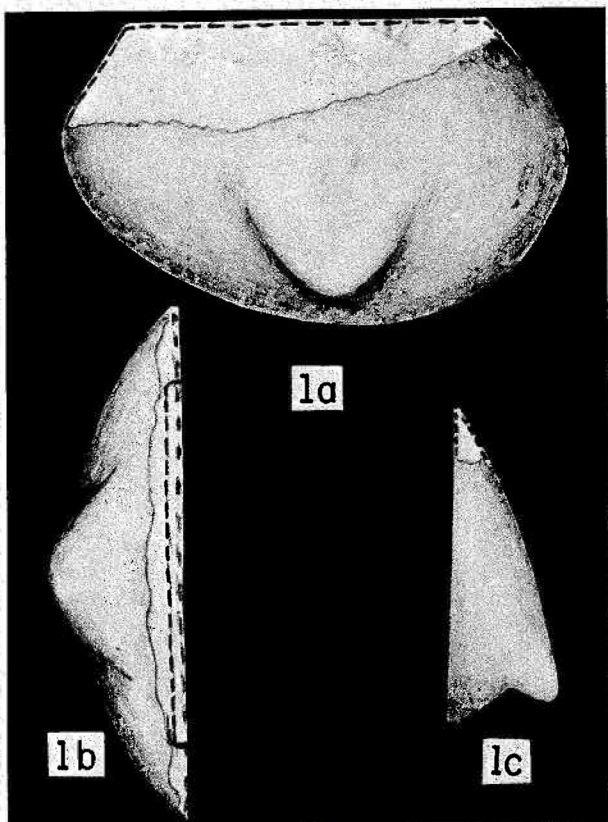


Figure 1. *Ceratoleperditia arbucklensis*, x12.

a. Lateral view left valve.

b. Dorsal view.

c. Anterior view.

and upon varying angles of dip employed in calculating stratigraphic thickness. For instance, Decker (1941, p. 666) measured 198.8 feet of Joins at this locality at the north end of Criner Hills. He intimated that stratigraphic calculations were based upon a dip of approximately 70°; if so, apparently no adjustment is necessary, for Decker's upper and lower boundaries of the Joins Formation are the same as are those of this report. Frederickson (1957), on his map of the Criner Hills, apparently included some uppermost Arbuckle strata in the basal Simpson.

Decker (1941, p. 666) reported the graptolites *Didymograptus artus* and *D. bifidus* 185.8 feet above the base of the Joins Formation (dip approximately 70°E) at the north end of Criner Hills. This graptolite horizon is 170 feet above the base of the 182-foot Joins Formation (55° dip) of this report.

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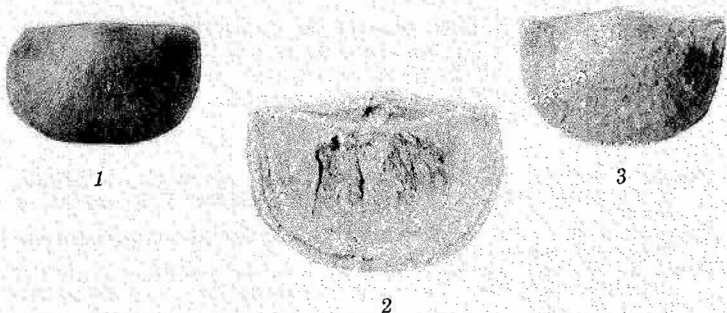
Neochonetes oklahomensis (SNIDER)

CARL C. BRANSON

Many Pennsylvanian and Permian chonetids were assigned by Muir-Wood (1962) to her new genus *Neochonetes*, with type species *Chonetes dominus* R. H. King, 1938. Sadlick (1963) named a genus *Quadranetes* and selected *Chonetes dominus* as type, a fact that makes his genus an objective synonym, as he recognizes (letter of July 29, 1963). To his genus he assigned *Chonetes suttoni* Branson, 1937, *Chonetes pseudoliratus* Easton, 1962, and *Chonetes kingi* Elias, 1957, all of Late Mississippian age.

Chonetes oklahomensis was described by Snider (1915, p. 76-77, pl. 3, figs. 12-15). The three cotypes are No. 16196 in the paleontology collections at the University of Chicago, and these were lent to me by Matthew H. Nitecki. All are conjoined valves. Snider figured only the two smaller specimens, of which the original of his figures 14 and 15 is here selected as holotype. The holotype is 15 mm wide and 13 mm long. Snider's description is accurate for the external characteristics, but none of the three cotypes displays the interior. The University of Oklahoma collection contains 11 specimens of the species (OU 5238), each of which shows the interior of a valve.

The interior of the pedicle valve is as follows: hinge teeth thick, wedgelike; surface marked by diagonal linear ridges, median septum short, thick, thickened posteriorly by callus, extending about one-quarter of the length of the valve; adductor muscle scars small, petaloid, adjacent to the median septum, surface irregularly papillate; diductor scars leaf-shaped, rugose, bordered posteriorly by prominent shell fold; vascular trunks distinct, low, surface of valve papillose, papillae roughly aligned radially, small in marginal belt.



Neochonetes oklahomensis (Snider), x2, University of Chicago 16196.

Figure 1. Pedicle valve of the smallest cotype, here designated holotype.

Figure 2. Brachial valve of an original cotype.

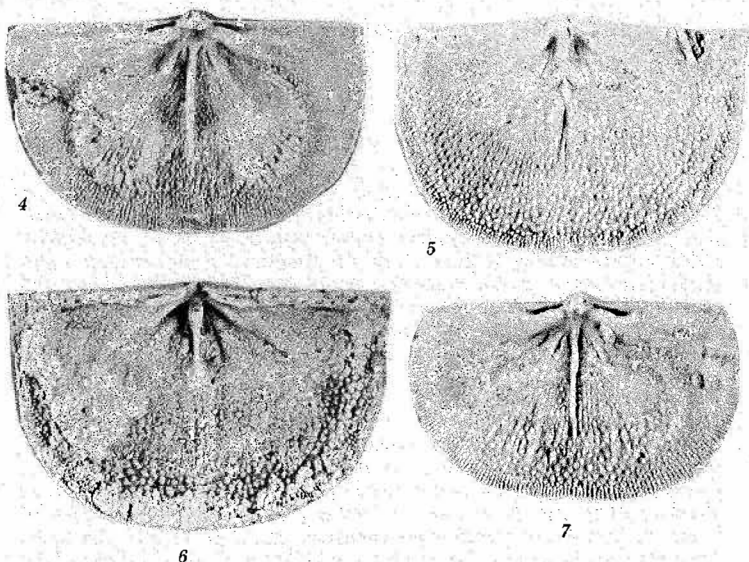
Figure 3. Pedicle valve of an original cotype.

(Photographs by Jan Cannon)

Interior of brachial valve with prominent bifid cardinal process, well-developed linear deep hinge socket on each side, with adjacent rounded, curved shell fold; alveolus distinct, round, shallow; median septum prominent, narrow, extending from alveolus to three-quarters the length of the shell; lateral septa short, diverging at an angle of 25 degrees from median septum; anterior and posterior adductor scars obscure but apparent; diductor scars large, petaloid, with radial papillose rugosities; anterior margin of diductor scars elevated, papillose, the papillae larger and higher than those which cover the interior marginal shell surface.

The hinge spines are eight on each side of the umbo, smaller and closely spaced near the umbo. The spines are inclined outward at a 45 degree angle.

The generic assignment of the species is not entirely satisfactory. Muir-Wood's *Neochonetes* clearly would receive the species in every way excepting that all of her assigned species are Pennsylvanian or Permian and that she considers the hinge spines of the genus to parallel the hinge. Sadlick's genus *Quadraneles*, unfortunately the name an objective synonym, is Namurian excepting for the type species, *Chonetes dominus*, which is Morrowan or Atokan. The genus *Rugosochonetes* Sokolskaya, 1950, is based upon the poorly known species *Orthis hardrensis* Phillips, 1841. In Muir-Wood's concept, this genus contains species from throughout the Mississippian and into the Westphalian. The sole clear distinction from *Neochonetes* is that the spines of *Rugosochonetes* rise from the hinge at a high angle. It is here considered that *Rugosochonetes* must be left virtually dead in that it is tied to a type species which is little known and cannot be well described. The genus *Neochonetes* should be enlarged to include the species that Sadlick assigned to *Quadraneles* (including *Chonetes*



Neochonetes oklahomensis (Snider), x3, OU 5238.

Figure 4. Interior of brachial valve of a typical specimen.

Figure 5. Interior of a pedicle valve to show adductor scars and ornamentation.

Figure 6. Weathered interior of a pedicle valve to show median septum.

Figure 7. Interior of a brachial valve.

(Photographs by Jan Cannon)

oklahomensis) and the definition altered to embrace Mississippian forms and some species which have hinge spines at a high angle.

Snider's types of *Neochonetes oklahomensis* were collected from the Fayetteville Shale in NE $\frac{1}{4}$ sec. 11 and NW $\frac{1}{4}$ sec. 12, T. 25 N., R. 21 E., Craig County, Oklahoma. Our specimens (OU 5238) were collected by Allen Graffham and purchased in the Harlow collection. They came from the Fayetteville Shale three miles east of Vinita, on Will Rogers Turnpike, SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 18, T. 25 N., R. 21 E., Craig County, Oklahoma.

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BARNACLE BURROWS IN SHELLS OF OKLAHOMA FOSSILS

CARL C. BRANSON

A recent careful investigation of burrows in Texas Upper Paleozoic fossils (Rodda and Fisher, 1962) has revived interest in such occurrences in Oklahoma. The one Oklahoma specimen cited is in a specimen of *Septimyalina orbiculata* Newell, 1942, listed as from the Lenapah Limestone of Okmulgee County. In as much as no true Lenapah occurs in that county, the matter was investigated. On Oakes' (1963) geologic map of the county, the limestone is shown as the lenticular limestone in the highest part of the Holdenville Shale, the same unit as that from which Strimple (1961) described a crinoid fauna from an exposure less than one mile to the west. This fact had not been noted by me in the paleontology section of Oakes (1963, p. 70).

Condra and Elias (1944) described and figured specimens of *Bascomella*. By their selection of a holotype of *B. gigantea*, the type species, they emended Morningstar's concept. They placed the presumed burrowing types as incertae sedis. Separation of the stoloniferous forms from the burrows would seem to place *Rhopalonaria permiana* Bassler, 1929, and *R. timorensis* Bassler, 1929, from the Permian of Timor as burrows of acrothoracic barnacles (p. 40-41, pl. 235, figs. 1-3). Such also would seem to be Condra and Elias' specimens of *Bascomella gigantea* (pl. 9, fig. 5) from the Cass Limestone near South Bend, Nebraska, and the specimens (pl. 10, figs. 4-11) from the McArthur Limestone of Ohio, the Cass Limestone, the Wamego Shale of Kansas (pl. 9, fig. 8), and the Winterset Limestone Member of the Hogshooter Formation "west of Tulsa" (near Sand Springs?), Oklahoma.

Their species *Bascomella fusiformis* (pl. 10, figs. 12-14) would seem to be barnacle burrows and not a species of *Bascomella*. The species is from the Cass Limestone of Nebraska.

Elias (1957, p. 389-390) further clarified the affinities of the specimens and pointed out that the penetrant vesicles do not belong to *Bascomella*.

Oklahoma occurrences are:

In shell of *Septimyalina orbiculata*, limestone lentil in uppermost beds of Holdenville Shale, NW $\frac{1}{4}$ sec. 19, T. 15 N., R. 12 E., Okmulgee County (Rodda and Fisher, 1962).

In pedicle valves of *Linoproductus*, Red Eagle Limestone, NE $\frac{1}{4}$ sec. 36, T. 26 N., R. 5 E., Osage County (OU 58).

In *Septimyalina*, Grayhorse Limestone, NE $\frac{1}{4}$ sec. 30, T. 15 N., R. 6 E., Lincoln County (OU 776).

In *Septimyalina*, Admire Formation, NW $\frac{1}{4}$ sec. 17, T. 18 N., R. 5 E., Payne County (OU 864).

In *Myalina copei*, Winfield Limestone, NW cor. sec. 20, T. 24 N., R. 3 E., Noble County (OU 748).

In *Septimyalina*, Admire Formation, SE $\frac{1}{4}$ sec. 10, T. 18 N., R. 5 E., Payne County (uncatalogued OU specimen).



1



2

Burrows of acrothoracic barnacles (OU 58)

Figure 1. Closely spaced burrows on shell of *Linoproductus* from Red Eagle Limestone, x6.

Figure 2. Another specimen from same lot to show random orientation, x6.

(Photographs by Jan Cannon)

In *Derbyia*, Winfield Limestone, SE $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 18, T. 26 N., R. 3 E., Kay County (Collection of Stephen Hall).

On *Neospirifer*, Neva Limestone, Pawnee County (uncatalogued OU specimen, collected by P. B. Greig).

On crinoid columnal and spined axial plate, Foraker Formation, Pawnee County (uncatalogued OU specimen, collected by P. B. Greig).

On *Myalina* (*Orthomyalina*) *subquadrata*, Grayhorse Limestone, Pawnee County (uncatalogued OU specimen collected by P. B. Greig).

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New Survey Publications

Circular 64, *Copper in the Flowerpot Shale (Permian) of the Creta Area, Jackson County, Oklahoma*, by William E. Ham and Kenneth S. Johnson, was issued by the Survey, February 18, 1964. The book has 32 pages, 10 figures, 2 plates, and 3 tables. Plate I, a geologic map with cross sections, and plate II, a measured-section diagram showing analyses for copper and boron in the area, are in the pocket. Price: \$1.00 paper bound.

On March 3, 1964, the Survey issued Bulletin 104, *Biostratigraphy and Rugose Corals of the Lower Pennsylvanian Wapanucka Formation in Oklahoma*, by Charles L. Rowett and Patrick K. Sutherland. Nineteen species are described and are referred to nine genera and two new species are described. The history of deposition of the Wapanucka Formation in the Arbuckle Mountains area is outlined in three stages. The book has 124 pages, 13 figures, 9 plates, and 12 tables. Price: \$2.00 paper bound and \$3.00 cloth bound.

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