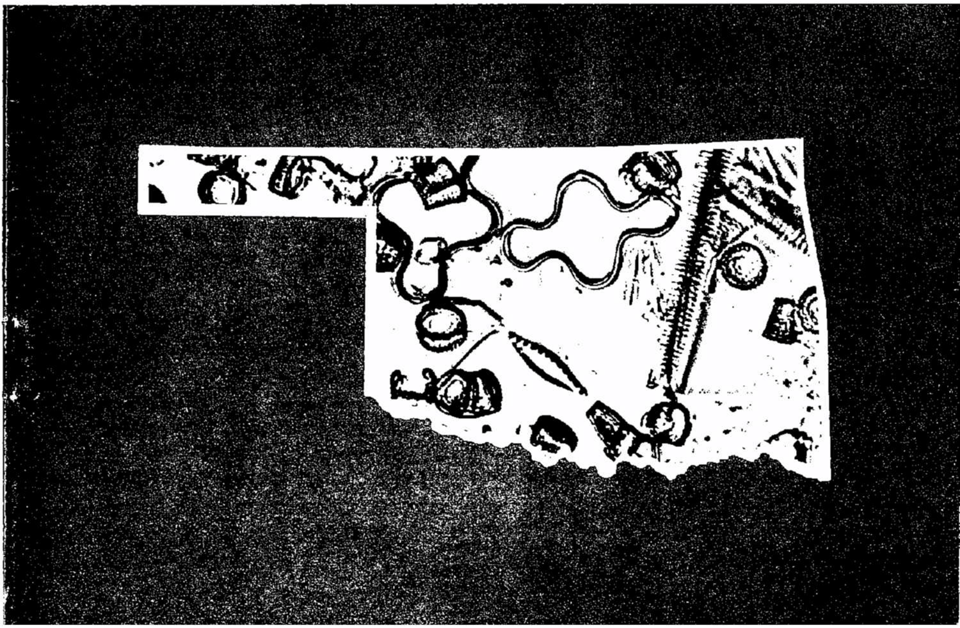
OKLAHOMA GEOLOGY NOTES



VOLUME 26 NUMBER 12 DECEMBER 1966

Cover Picture

LOWER PLIOCENE (LAVERNE) DIATOMS IN OKLAHOMA

The cover picture is a photomicrograph (x800) of diatoms from an unusual Tertiary lake deposit southeast of Beaver in Beaver County, Oklahoma. This deposit, a ledge of soft, white, chalklike rock, was noted by early investigators in this region and has received sporadic attention throughout the years, largely because of associated fossil plant leaves and vertebrates.

In 1881, F. W. Cragin termed the deposit a "chalk marl" and referred it to the "Loupe Fork Tertiary" upon the basis of some mammalian remains he collected. Cragin cited the identification of six species of diatoms in the marl by Rev. Francis Wolle, to whom he had sent a sample for identification. This is the first known reference to fossil diatoms in Oklahoma.

C. N. Gould and J. T. Lonsdale, in their account of the geology of Beaver County (Okla. Geol. Survey, Bull. 38) published two photographs of the deposit to illustrate the occurrence of the Laverne Formation in the area. The Laverne Formation had been named and described in an unpublished manuscript by V. V. Waite, which was extensively cited by Gould and Lonsdale. In 1936, R. W. Chaney and M. K. Elias, in an account of late Tertiary floras of the High Plains, published by the Carnegie Institution of Washington (Pub. 476-I), referred to the deposit as a diatomaceous marl and cited the identification of 37 species of diatoms by E. K. Lohman.

Quantitative analyses of several channel samples show that the dry rock consists of about 90 percent of material soluble in hydrochloric acid. The soluble material is chiefly (85 percent) fine calcium carbonate. The insoluble part consists almost entirely of siliceous frustules of diatoms and siliceous spicules of sponges. The cover picture, by L. R. Wilson, illustrates four genera of diatoms, the most abundant of which is the circular *Melosira*. The cross-shaped forms are referable to *Tetracyclus*, the single fusiform to *Pinnularia*, and the elongate one to *Navicula*.

—*Mart P. Schemel*

Pennsylvanian Slate-Pencil Sea Urchin from the Oologah Limestone, Oklahoma

P. A. Chenoweth*

Although echinoids have been relatively common components of shallow-water faunas since the Early Paleozoic, well-preserved fossil specimens are exceedingly rare. The tests are composed of nearly discrete polygonal plates held together during life by delicate fusion and by a complex musculature. Because of their fragility, shells of the dead animals are rapidly broken by currents and by scavengers. The spines, which are entirely exterior and are balanced upon small pedestals by a type of ball-and-socket joint, fall off almost at the moment of death. Pieces of the crushed and broken tests are soon scattered. Recovery of an articulated and identifiable fossil Paleozoic echinoid would be, therefore, a noteworthy event. Despite the abundance in some formations of loose plates and spines, few echinoid species have been identified in the Paleozoic strata of Oklahoma.

A slab of limestone has been recovered from the Oologah Formation bearing the remains of what must have been a large blunt-spined sea urchin of the genus *Archaeocidaris* (fig. 1). The sizes of the interambulacral plates and the spines (figs. 2, 3) indicate that this form somewhat resembles the modern slate-pencil sea urchin, a relatively common resident of South Pacific waters (Buchsbaum, 1938, p. 308). The cluster of spines and plates found on this slab are the only parts recovered despite an exhaustive search which turned up numerous loose plates and the barbed spines of another species.

The specimen illustrated was found in the quarry of the Chandler Materials Company, sec. 28, T. 20 N., R. 14 E., Tulsa County, Oklahoma. Quarrying operations are concentrated in the lower (Pawnee Limestone) member of the Oologah Formation of the Marmaton Group (Desmoinesian). The Pawnee at this locality is about 35 feet of heavy irregular beds of fossiliferous calcilutite and calcarenite separated by thin partings of calcareous shale. Light gray is the dominant color; weathering produces a khaki-colored outer surface, and many bedding planes near the ground surface show this characteristic. C. J. Mankin (in Oklahoma City Geol. Soc., 1964, p. 65) has identified a sample of the Pawnee from a nearby locality as a partly recrystallized bryozoan-brachiopod algal biolithite. Regional studies indicate that this unit changes rapidly southward to a brittle, cherty, and calcareous shaly limestone, essentially a dolomitic calcilutite. In the vicinity of Broken Arrow, T. 18 N., R. 14 E., it becomes a calcareous shale. Northward, at the latitude of Claremore, the member contains a number of large moundlike reefs composed in part of crinoidal calcirudites. In northern Oklahoma the unit is dominantly calcilutite. These relationships indicate in general that this formation was laid down upon a Kansas-Oklahoma shelf, the basinward margin of which lay somewhat

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south and east of Tulsa. Waters upon the shelf probably did not exceed 10 meters in depth; whether the limiting factor of limestone deposition south of Broken Arrow was depth of water or an increasing influx of siliceous clastics (mud and silt) from the south is a question which remains to be answered.

The ecology of modern echinoids is well known; presumably the Pennsylvanian forms occupied corresponding ecologic niches. Although some sea urchins inhabit waters of great depth, by far the largest

Figure 1. Slab of Pawnee Limestone from Tulsa County bearing broken fragments of a large echinoid, probably Archaeocidaris sp. **The largest spine visible is about 6 inches long. Other fossils include productid brachiopods and bryozoans.**

Figure 2. Spine of Archaeocidaris sp., approximately x1.2, from the Oologah Limestone. Specimen shows some evidence of abrasion as the milled ring is partly worn away.

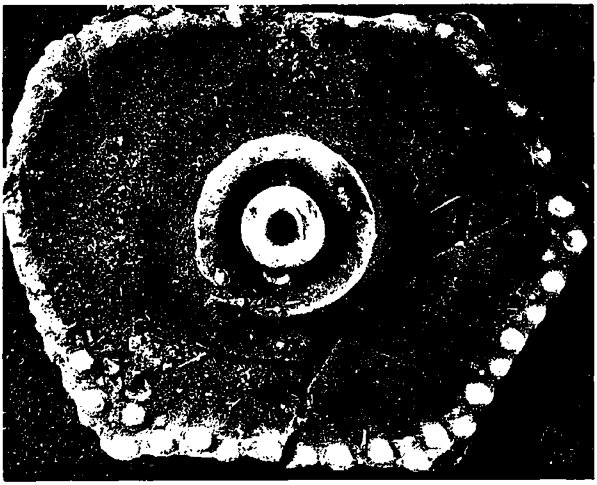

Figure 3. Interambulacral plate of Archaeocidaris sp., x3.3. Secondary tubercles are aligned along the margins; a shallow circular depression rings the primary tubercle.

number of varieties is found in shallow well-aerated marine waters. On reefs and on the agitated sandy bottoms near reefs echinoids are often found in great abundance. Certain sand-ingesting species dwell in the littoral zone, browsing slowly across the sand or slightly below its surface. Owing to their water-vascular system, echinoderms are sensitive to slight variations in salinity and hydrogen ion activity of water and generally shun areas of elevated or reduced saline content and higher alkalinity, preferring normal marine waters. Preliminary studies of the Oologah Limestone and its fauna lead to the conclusion that this sediment was deposited, as mentioned above, in shallow, probably normal, marine waters. Associated algae, found in considerable abundance, attest to the relative shallowness of the water. The Chandler quarry is south of the main tract of Pawnee reef development and is in an area that probably was a slightly deeper seaward shelf. Presumably the reefs did not grow on a steep seaward-facing escarpment as do many modern coral reefs; rather they favored a slightly shallower bank margin where strong wave action was somewhat dampened.

The echinoid debris here illustrated probably belongs to the genus *Archaeocidaris*. Species bearing some similarity to these fragments have been described from the Permian of Great Britian (*Archaeocidaris verneuiliana* King) and from the Pennsylvanian near Wingate, New Mexico (*A. ornatus* Newberry, identified by White, 1877, p. 104, pl. 6, fig. 7a). Although White and others have named species of echinoids from scattered spines and plates, this investigator prefers to await the recovery of more complete remains. As modern coral reefs are crowded with sea urchins, which inhabit every available nook and cranny, it seems quite possible that detailed studies of the Oologah bioherms may lead to the discovery of specimens better preserved than this one.

References Cited

Buchsbaum, Ralph, 1938, Animals without backbones: Chicago, Univ. Chicago Press, 371 p.

Oklahoma City Geological Society, 1964, Description of stops, in Variations in limestone deposits: Oklahoma City Geol. Soc. and Okla. Geol. Survey [Guidebook], Field Conf. 1964, p. 65-79.

White, C. A., 1877, Report upon the invertebrate fossils collected in portions of Nevada, Utah, Colorado, New Mexico, and Arizona, by parties of the expeditions of 1871, 1872, 1873, and 1874: U. S. Geog. Survey West 100th Meridian, vol. 4, pt. 1, 219 p.

Variation in an *Eothalassoceras* from the Seminole Formation, Oklahoma

A. G. Unklesbay

A well-preserved specimen of *Eothalassoceras inexpectens* has been collected from nodules above the Dawson coal in the Seminole Formation.

This specimen is subglobular and involute. The maximum diameter is 24 mm and the maximum width is 13 mm. The whorls are rounded ventrally and laterally. The umbilical shoulder is distinct and the umbilicus is small, deep, and closed. At a break which discloses a cross section the width is 10.8 mm, the height is 7.3 mm, and the dorsoventral height is 5.2 mm.

The test, portions of which are preserved, is thin. The outer surface is marked by sinuous growth lines. Each forms a ventral sinus, a

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1 2

Eothalassoceras inexpectens, OU 5598, Seminole Formation, Oklahoma

Figure 1. Lateral view, x3.75.
Figure 2. Septal view, x3, at break which exposes inner whorls.

low rounded lateral salient, a broadly rounded lateral sinus, and a rounded dorsolateral salient over the umbilical shoulder.

The sutures are well preserved. The ventral lobe is bifid with digitate prongs. The digitations are not identical in each suture, but in most cases there are five or six points, of which two are more prominent that the others. The first lateral saddles are U-shaped with nearly parallel sides. The lateral lobe is also digitate with two or three prominent points. The second lateral saddle is asymmetrical and broadly rounded. It curves into a small lobe at the umbilicus; this lobe, in contrast to the others, is nondigitate. Along the center of the lateral zone the sutures are in contact along the ventral side of the lateral lobe.

This specimen is similar to those previously described from this same locality by Miller and Owen (1937, p. 418-421, pl. 52) and Unklesbay (1962, p. 116-118, pl. 15), but it differs slightly in details of the sutures. In this specimen the lobe at the umbilicus is nondigitate whereas in specimens of *E. inexpectens* previously described it is weakly digitate. In this respect this specimen is similar to *E. caddoense* (Plummer and Scott, 1937) but differs from that species in being somewhat more globose and less discoidal.

Both *E. inexpectens* and *E. caddoense* are based on few specimens and it is conceivable that if a larger number of specimens were available these slight differences in suture pattern and shape might be only minor variables within a species and that those specimens described are not separate and distinct.

More specimens are available in the collection at the University of Iowa and will be studied in detail at a later date.

Occurrence.—This specimen was collected by H. L. Strimple from a nodule above the Dawson coal in the Seminole Formation on the east side of U. S. Highway 75, C SE¼ NW¼ sec. 32, T. 22 N., R. 14 E., Tulsa County, Oklahoma.

Repository.—University of Oklahoma 5598.

References Cited

Miller, A. K., and Owen, J. B., 1937, A new Pennsylvanian cephalopod fauna from Oklahoma: Jour Paleontology, vol. 11, p. 403-422, 3 pls.

Plummer, F. B., and Scott, Gayle, 1937, Upper Paleozoic ammonites in Texas: Texas, Univ., Bull. 3701, 516 p., 42 pls.

Unklesbay, A. G., 1962, Pennsylvanian cephalopods of Oklahoma: Okla. Geol. Survey, Bull. 96, 150 p., 19 pls.

New Theses Added to O. U. Geology Library

The following Master of Science thesis was added to The University of Oklahoma Geology Library in October 1966:

Petrology of the Duncan Sandstone (Permian) of south-central Oklahoma, by Robert P. Self.

In November, the following Master of Science theses were added:

An investigation of an ultrasonic, high pressure waterflood in a linear porous medium, by Charles Allen Ellis.

Palynology of the Francis Shale (Pennsylvanian) from near Ada, Oklahoma, by William A. Edwards.

In the announcement of new theses which appeared in the May 1966 issue of the *Notes* (p. 140), the name Lawrence J. Olson, Sr., was misspelled as Olsen.

—L. F.

ADDENDUM
to
Techniques of Pollen and Spore Electron Microscopy Part I.—Staining, Dehydration, and Embedding

(Oklahoma Geology Notes, vol. 26, no. 7, p. 179-186)

Critical application of the catalyst DMP-30 for embedding with Araldite-Epon resins has been emphasized (Skvarla, 1966, p. 182-183). Of particular concern was the amount of DMP-30 to add to the resin mixture, and it was stressed that, as the DMP-30 aged, this amount would undergo significant change. It was recommended that test samples be made prior to exine embedding in order to determine the correct porportion of catalyst.

Concern for properly hardened resins for thin sectioning, at least from the standpoint of catalyst, can be alleviated by substituting benzyldimethylamine, commonly called BDMA, for DMP-30 (Mollenhauer, 1964). This catalyst has been used as a standard with Maraglas (Spurlock, Kattine, and Freeman, 1963) and Araldite (Finck, 1960) resins, but is less commonly adapted to Araldite-Epon mixtures. The principal advantage of the more fluid BDMA is the considerably longer storage life (and therefore lesser change in properties) than that of DMP-30. For most pollen and spore work, 6 to 8 drops of BDMA per 4 ml of Araldite-Epon will produce satisfactory blocks for thin sectioning. If a harder block is required the concentration should be increased to 10 to 12 drops.

References Cited

Finck, H., 1960, Epoxy resins in electron microscopy: Jour. Biophys. Biochem. Cytology, vol. 7, p. 27-30.

Mollenhauer, H. H., 1964, Plastic embedding mixtures for use in electron microscopy: Stain Technology, vol. 39, p. 110-114.

Spurlock, B. O., Kattine, V. C., and Freeman, J. A., 1963, Technical modifications in Maraglas embedding: Jour. Cell Biology, vol. 17, p. 203-204.

Skvarla, J. J., 1966, Techniques of pollen and spore electron microscopy. Part I.—Staining, dehydration, and embedding: Okla. Geol. Survey, Okla. Geology Notes, vol. 26, p. 179-186.

—J. J. S.

Recent Cutoffs on the Kiamichi River

Carl C. Branson

In southern Pushmataha County, Oklahoma, east of Antlers, the Kiamichi River flows on resistant Jackfork sediments, crosses the buried trace of the Boktukola fault, and flows on a broad alluvial deposit between hills of Cretaceous Antlers Sand. North of the Choctaw County line, in secs. 26, 35, T. 4 S., R. 17 E., the river swings back northward in a hairpin turn.

The hairpin turn is shown in the vertical airplane photograph of figure 1 as it existed on April 14, 1949. At that time the meander extended into secs. 1, 2, T. 5 S., R. 17 E. An abandoned eastward part

Figure 1. Vertical airplane photograph of a meander on the Kiamichi River in Pushmataha County, taken for the U. S. Department of Agriculture by Southwestern Aerial Surveys, 1949.

is now wooded and can be seen at the bottom-center of the picture. All of the area south of the meander is occupied by Pleistocene sand and gravel. Across the center of the meander a bar of sand shows the line of a potential cutoff.

An index sheet of photographs taken in 1955 by Aero Service Corporation shows the cutoff forming about 100 yards north of the presently established cutoff as shown in figure 2.

Figure 2 shows the meander as it appeared on November 9, 1962. A well-defined cutoff leaves nearly 2 miles of the old channel abandoned. The once-cultivated area on the cutoff spur is now under heavy plant cover. The entire channel is deeply entrenched in alluvium and the process of straightening and shortening will be slow.

The history of a smaller cutoff near Sawyer, about 20 miles down-

Figure 2. Vertical airplane photograph of the same area shown in figure 1, taken in 1962 for the U. S. Department of Agriculture by General Aerial Surveys.

Figure 3. Vertical airplane photograph of a meander and cutoff as they were in 1962. The town at the lower right is Sawyer, Choctaw County. The meander is near old Rock Chimney ferry, sec. 23, T. 6 S., R. 18 E.

stream, is also shown in a series of photographs. The cutoff was barely started in 1949, had become a distinct drainage in 1955, and was the main channel by 1962 (fig. 3). It has shortened the stream course nearly a mile.

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*Reference is to first page of article containing indexed item.

ERRATA

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Number 10, October 1966, page 257, line 8: For **Jour. Geology** read **Jour. Paleontology**
Number 11, November 1966, page 276, line 8: For **magnetic mixture** read **magnetic mixer**

Publication Dates, **Oklahoma Geology Notes,** Volume 26

The twelve numbers of this volume of the Notes were issued on the following dates during 1966:

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