OKLAHOMA MICROCRINIOIDS

Microcrinoids are tiny crinoid calyces, many of them less than one millimeter high. Only one species had been made known from Oklahoma Mississippian rocks, an undescribed species of Catillo-
crinus noted by Laudon in the Pitkin limestone. Harrell L. Strimple
of Bartlesville and John W. Koenig of Rolla, Missouri, have just
described and illustrated 6 species from the St. Joe limestone near
Tahlequah, and 5 species from the shale under the Welden lime-
stone near Ada; one of the species occurring in both localities.
Several forms are described from the Nunn member of the Lake
Valley limestone, Otero County, New Mexico.

The Oklahoma species are:
Allagecrinus sculptus n. sp.: Nunn mem. of New Mexico, and St.
Joe ls., N.E. Okla.
Kallimorphocrinus angulatus n. sp.: Nunn mem. of New Mexico,
and St. Joe ls., N.E. Okla.
Kallimorphocrinus weldenensis n. sp.: “sub-Welden sh.”, S. Okla.
Kallimorphocrinus tintinabulum n. sp.: “sub-Welden sh.”, S. Okla.
Trophocrinus variabilis n. sp.: “sub-Welden sh.”, S. Okla.
Trophocrinus biconis n. sp.: St. Joe ls., N.E. Okla.
Trophocrinus brevis n. sp.: St. Joe ls., N.E. Okla.
Lampadosocrinus minutus (Peck) n. gen., n. comb.: St. Joe ls.,
N.E. Okla.
Passalocrinus triangularis Peck: “pre-Welden sh.”, S. Okla.; St.
Joe ls., N.E. Okla., and Nunn mem., New Mexico.

The specimens are beautifully illustrated by camera lucida
drawings. The paper is an excellent one.

Microcrinoidal taxonomy has been more than normally
plagued by faulty word formation. Weller erected Kallimorpho-
crinus by transliterating the Greek kappa as k rather than as c.
The present authors have given us Lampadosocrinus by using the
entire Greek noun rather than the root. The correct form would
have been Lampadocrinus.

This reviewer collected the sample from which the New Mexico
forms were separated. The locality is a small area of bare
weathered rock in a dry wash on the steeply dipping west slope
of the Sacramento Mountains. The wash is low in the slope south
of Marble Canyon very near the southwest corner of section 22,
Township 16 S., Range 10 E., Otero County, New Mexico. The col-
lection was made in 1946.

The article is “Mississippian microcrinoids from Oklahoma
1225-1247, September 1956.

CCB
BROMINE IN BRINES OF THE RED FORK—EARLSBORO SANDS (PENNSYLVANIAN) IN THE SEMINOLE AREA OKLAHOMA

Neville M. Curtis, Jr.

Introduction

Since the end of World War II, sales of bromine and of bromine compounds have increased enormously in response to a greater market for gasoline using bromine antiknock compounds. Most automobiles are now powered by high-compression motors for which "ethyl" gasoline is recommended. Ethylene dibromide, the essential constituent of "ethyl" gasoline, is the principal form in which bromine compounds are sold. Total sales of ethylene dibromide, bromine, and other bromine compounds in 1955 were 216.7 million pounds valued at 39.8 million dollars, an increase since 1946 of more than 250 percent.

In the United States bromine is recovered from sea water, well brines, and lake brines, and in 1955 the operating companies were distributed as follows:

"The Ethyl-Dow Chemical Co. recovered bromine from sea water at Freeport, Texas, and Westvaco Chemical Division of Food Machinery and Chemical Corp. operated at a seawater plant in the San Francisco Bay area. The following firms recovered bromine from well brines in Michigan: The Dow Chemical Co., Midland and Ludington; Great Lakes Chemical Corp., Filer City; Michigan Chemical Corp., Eastlake and St. Louis; and Morton Salt Co., Manistee. The Westvaco Chemical Division at South Charleston, W. Va., also treated well brines. American Potash and Chemical Corp. recovered bromine from the brine of Searles Lake in California."

Present Investigation

A preliminary investigation of oil field brines from various formations in the Seminole area of east-central Oklahoma, conducted by the Oklahoma Geological Survey in 1953, revealed through chemical analyses that oil field brines from the Red Fork—Earlsboro sands have a relatively high content of bromine and might be a commercial source of that element. The Red Fork—Earlsboro sands are in the Des Moines series of Middle Pennsylvanian age and are well known oil-producing sands. In the area of present investigation they occur at an average depth of approximately 3,275 feet and have an average thickness of 62 feet. The brines in the sands are produced and wasted as a byproduct in the production of petroleum.

To test their possible economic value, brines from 21 Red Fork—Earlsboro wells were sampled in four producing oil districts of the Seminole area in Seminole and Pottawatomie Counties (Fig. 1 and Table I). Analyses of these brines show that bromine ranges from 540 to 1,020 ppm, an abnormally high concentration com-

Figure 1. Location of Red Fork-Earlsboro brine. Samples (black dots) in the Seminole area.

pared with normal oilfield brines, but probably not high enough for commercial bromine recovery. Brines from commercial bromine wells elsewhere generally contain at least 1,500 ppm.

Samples were collected in 1-gallon glass containers that first were washed clean with the sample water itself. These brine samples were taken either from the well "head" or from the separator that served wells producing only from the Red Fork-Earlsboro sands. Bromine was determined in the chemical laboratory of the Oklahoma Geological Survey by T. E. Hamm.

For assistance in collecting the samples and supplying other essential information, appreciation is gratefully extended to Fred-

Red Fork-Earlboro Brines

Brines from the Red Fork-Earlboro sands are similar in most respects to brines from other sands of Pennsylvanian, Devonian, and Ordovician age in the Seminole area. Thirty analyses cited by Burwell show that the total dissolved solids in most brines from the Pennsylvanian-Ordovician rocks in this area average about 160,000 ppm, ranging upward to 178,000 ppm and downward to about 135,000 ppm. The salts of all these brines consist essentially of sodium and calcium chlorides. Analyses of a typical Red Fork-Earlboro brine from the Seminole area, in parts per million, is as follows:

- Specific gravity: 1.115
- Sodium (Na, K): 47,126
- Total solids: 161,179
- Bicarbonate (HCO₃): 104
- Calcium (Ca): 11,520
- Sulfate (SO₄): 10
- Magnesium (Mg): 2,430
- Chloride (Cl): 99,989

The critical point of distinction is that the Red Fork-Earlboro brines have a higher bromine content than the other brines. The data in Table II show this comparison and demonstrate that Red Fork-Earlboro brine has 2 to 3 times more bromine than Cromwell and Wilcox brines.

Table II. Bromine in Oilfield Brines in the Seminole Area

<table>
<thead>
<tr>
<th>Pennsylvaniaan</th>
<th>Ordovician</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Fork-Earlboro sands</td>
<td>Cromwell sand</td>
</tr>
<tr>
<td>540-1,020 ppm</td>
<td>200-400 ppm</td>
</tr>
</tbody>
</table>

Referring to the analyses in Table I, it is apparent that bromine has unequal concentration within the Red Fork-Earlboro sands, the concentration differing variously with geographic location, depth, and thickness of the producing sand. These relations are summarized in Figure 2.

The highest bromine content is in the Bowlegs field, where 7 analyses show an average of 923 ppm, whereas in the nearby Keokuk field the average of 11 samples is 680 ppm. Strangely, one of the samples in the Bowlegs field was the lowest of all analyzed. The highest concentration of all the analyzed samples is 1,020 ppm, found in the St. Louis district in the Sinclair Lee Kelley 2-A. This sample also is one of the deepest tested, yet two other brines from greater depth in the same district had only intermediate concentrations.

Because none of the brines tested is a commercial source of bromine, and also because there is neither a significant geographic trend nor any apparent relation of bromine concentration to depth

---

or thickness of the Red Fork-Earlsboro brines, it is concluded that there is no basis for further bromine investigations in the Seminole area.

**Figure 2.** Relation of bromine in Red Fork-Earlsboro brine to depth and thickness of the sand.

---

**First Paleotectonic Maps Released**

The first unit of the paleotectonic map project has been issued by the U. S. Geological Survey as Miscellaneous Geologic Investigations, Map 1-175. The publication is a folio of 6 pages and 9 maps on a scale of 1-5,000,000 dealing with the Jurassic system. The maps show control points, paleogeology, lithofacies (4 maps), paleogeography, and environments. Oklahoma barely enters into the picture with its panhandle area and with a theoretical sea invasion in the extreme southeast corner. The folio is available for $5.00. It is more than worth the price.
New Quarries Supplying Northeast Turnpike Needs
Edward C. Stoever, Jr.

Quarries supplying crushed rock used in the construction of the Northeast Turnpike were located and examined on October 5th and 6th, 1956. There are, in all, eighteen quarries along the route of the turnpike, and seventeen of these are newly opened. The locations and a brief description of each, are given in the accompanying chart.

It is now possible to drive along the right-of-way for the entire length of the turnpike. All cutting and filling has been completed, and all bridges and road crossings are open, although work continues on overpasses and interchanges. Driving southwest from the northeast end of the eighty-eight mile long turnpike, one sees the road-bed in all stages of completion, with, in general, a higher degree of completion toward the southwestern end.

Going southwestward along the turnpike, rocks of successively younger age are encountered, and this is reflected in the crushed rock used for construction. Mine chat, and stream gravels consisting principally of rounded chert pebbles from the Boone formation are used between the northeast end of the turnpike and Miami. Between Miami and a point on the turnpike six and one-half miles northeast of the Claremore interchange there are three quarries in the Osagean Boone formation and eight quarries in Hindsville formation of Chester age. The remainder of the southern end of the turnpike is supplied by two quarries in the Fort Scott limestone and two quarries in the Oologah formation. Both of these formations are of Des Moines age.

Quarrying is usually done on a six or a twelve foot face, although these figures are sometimes exceeded. Deeper quarrying necessitates two or more benches. Overburden is usually less than six feet. An exception to this is a quarry near Tulsa which was operating before construction began on the turnpike. In this operation, five feet of soil and six feet of weathered limestone are stripped from above a 35 foot quarry face.

Quarried rock is crushed right at the quarry site, utilizing portable crushing equipment. A coarse material suitable for sub-base is produced, and also a mixture of coarse and fine material for the aggregate layer. Oversize material, too large to fit into the crushe, is generally pushed to one side and abandoned.

These quarries afford excellent exposures of limestones not otherwise as well-exposed. They will be useful in evaluating the limestone resources of northeastern Oklahoma, and also in studying the stratigraphy of the area. Of particular interest will be the quarries in the Hindsville formation, as there has been some confusion regarding the use of this name. "Hindsville," as used here-in, follows the usage established by Huffman (1953) and Slocum (1955), and reflects the current opinion of the Oklahoma Geological Survey.
### Quarries Supplying Crushed Rock For Northeast Turnpike

<table>
<thead>
<tr>
<th>Location</th>
<th>Formation</th>
<th>Tonnage Ht. of Face</th>
<th>O.B.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sec.19, T.29N., R.25E.</td>
<td>Stream gravel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sec. 5, T.28N., R.24E.</td>
<td>Stream gravel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sec.20, T.28N., R.24E.</td>
<td>Stream gravel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SE1/4, Sec. 5, T.27N., R.23E.</td>
<td>Hindsville Ls.</td>
<td>100,000T</td>
<td>12</td>
<td>0-5 No longer worked.</td>
</tr>
<tr>
<td>NW1/4, Sec.31, T.27N., R.23E.</td>
<td>Hindsville Ls.</td>
<td>100,000T</td>
<td>12-14</td>
<td>5 No longer worked.</td>
</tr>
<tr>
<td>SW1/4, Sec.24, T.26N., R.22E.</td>
<td>Hindsville Ls.</td>
<td>1000T/day</td>
<td>24</td>
<td>6 Boone chert forms quarry floor. Not visited.</td>
</tr>
<tr>
<td>S1/2, Sec.12, T.25N., R.22E.</td>
<td>Boone chert (?)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NE1/4, Sec. 4, T.25N., R.21E.</td>
<td>Hindsville Ls.</td>
<td>*130,000T</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>NW1/4, Sec.32, T.25N., R.21E.</td>
<td>Hindsville Ls.</td>
<td>*38,000T</td>
<td>15-18</td>
<td>4</td>
</tr>
<tr>
<td>NW1/4, Sec. 8, T.24N., R.20E.</td>
<td>Keokuk</td>
<td>70,000T</td>
<td>12</td>
<td>4-6</td>
</tr>
<tr>
<td>NW1/4, Sec.10, T.24N., R.20E.</td>
<td>Keokuk</td>
<td>29,000T</td>
<td>12</td>
<td>4-6</td>
</tr>
<tr>
<td>SE1/4, Sec.32, T.24N., R.20E.</td>
<td>Hindsville Ls.</td>
<td>29,000T</td>
<td>12</td>
<td>4-6 Some oil staining. No longer worked.</td>
</tr>
<tr>
<td>SE1/4, Sec.24, T.23N., R.19E.</td>
<td>Hindsville Ls.</td>
<td>+100,000T</td>
<td>36</td>
<td>0-5 81/2 feet heavily oil saturated limestone. No longer worked.</td>
</tr>
<tr>
<td>S1/2, Sec.30, T.23N., R.20E.</td>
<td>Hindsville Ls.</td>
<td>2500T/day</td>
<td>28</td>
<td>5 No longer worked.</td>
</tr>
<tr>
<td>NW1/2, Sec.24, T.22N., R.15E.</td>
<td>Fort Scott Ls.</td>
<td>170,000T</td>
<td>22</td>
<td>1-5 Clay filled sink noted.</td>
</tr>
<tr>
<td>NW1/2, Sec.33, T.21N., R.15E.</td>
<td>Fort Scott Ls.</td>
<td>50,000T</td>
<td>111/2</td>
<td>5 In operation six years.</td>
</tr>
<tr>
<td>S1/2, Sec.16, T.20N., R.14E.</td>
<td>Oologah Ls.</td>
<td>5000T/day</td>
<td>35</td>
<td>11 Not visited.</td>
</tr>
<tr>
<td>SE1/4, Sec.16, T.20N., R.14E.</td>
<td>Oologah Ls.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Estimated Final Total Production
Bibliography of Recent Published Material Pertaining to
Geology along the Northeast Turnpike


ADDITIONAL FOSSILS FROM THE HUNTON GROUP,
OKLAHOMA

Thomas W. Amsden

In June 1956 the writer's catalog of Hunton fossils was published by the Oklahoma Geological Survey. Five additional names have subsequently been found and should be added to this list.

HARAGAN FORMATION
TRILOBITA

DICRANURUS HAMATUS (Hall) 1859. (Whittington 1956, pp. 518-519, pl. 60, figs. 9-11, 15). Whittington's illustrated specimens are from the Haragan formation, Arbuckle Mountain region, Oklahoma; repository, U. S. National Museum, and Museum of Comparative Zoology, Harvard University.


LEONASPIS WILLIAMSI Whittington 1956 (pp. 509, 510, pl. 57, figs. 10-16; pl. 58, figs. 1-4, 6, 7). Arbuckle Mountain region, Oklahoma; holotype, White Mound, sec. 20, T. 2 S., R. 3 E., Murray County, Okla.; holotype, U. S. National Museum; figured specimens, Museum of Comparative Zoology, Harvard University.

HENRYHOUSE FORMATION
CEPHALOPODA

LEUROTROCHOCERAS STEVENSI Miller and Collinson 1952 (pp. 622-623, pl. 84, figs. 1, 2). Holotype, NE1/4, SW1/4, sec. 4, T. 2 N., R. 6 E., Pontotoc County, Oklahoma; State University of Iowa, 9813.

CHIMNEYHILL LIMESTONE?

CLIFTONIA (CLIFTONIA) BELLULA Ulrich and Cooper 1936 (p. 387, pl. 48, figs. 14-16, 19). The holotype came from a "Boulder in the Johns Valley shale, thought to have come from the Chimney Hill limestone, of Early Silurian (Med-

REFERENCES


OIL SEEPAGES NEAR ADAIR, OKLAHOMA

Edward C. Stoever, Jr.

During the examination of new quarries supplying crushed rock to the Northeast Turnpike, an occurrence of petroleum-bearing limestone was noted in a large quarry three miles northeast of Adair, Oklahoma. This quarry presents an unusually good exposure of the Hindsville limestone of Chester age. The face of the quarry is probably in excess of 35 feet, although the quarry was partly flooded at the time of investigation, and only the upper 24.5 feet were exposed. The section exposed is:

Soil and weathered limestone overburden............. 0 to 5 feet
Light gray and greenish gray interbedded flaggy fine-grained silty limestone and calcareous siltstone, all exhibiting cross-bedding........................................... 4 feet
Dark gray, coarse-grained, massive crinoidal limestone, heavily saturated with petroleum; some stylolites present ....................................................... 8.5 feet
Light gray, fine-grained, massive, silty limestone ................................................. 12 feet exposed

The quarry face of 35 feet probably represents the whole of the Hindsville limestone, as its maximum thickness in this area, as reported in recent Master of Science theses of the University of Oklahoma, is 36 feet. Unfortunately, no information could be obtained as to the nature of the quarry floor. The upper 4 feet of the face, however, is typical of the transition zone between the Hindsville limestone and the overlying Fayetteville shale.

The petroleum is confined to the 8.5 foot coarse, crinoidal limestone, and no trace of petroleum was noted in adjacent beds. The rock is quite heavily saturated, particularly in the upper 2 to 3 feet, and five well-developed seeps have formed on the quarry walls. A sample from within the upper 3 feet of the oil-saturated zone was found to contain 2.84% hydrocarbon by weight.

Oil seeps and shows are not uncommon in northeastern Oklahoma, but the occurrence of a reservoir rock of this thickness and permeability below the Fayetteville should be of interest.
BLAINE COUNTY ADDED TO GAS AREA

Louise Jordan

Blaine County, in the northwestern part of the state, becomes the sixty-eighth county to produce petroleum products with the discovery of gas in the Chesterian rocks of the Mississippian system. This rank wildcat and discovery well (John W. Coyle, Jr. and Perkins Brothers No. 1 Dougherty, SW¼ SW¼ SW¼ sec. 10, T. 19 N., R. 11 W.), thirteen miles south of the Ringwood field, flowed 3,755,000 cubic feet of gas per day from a depth of 7,415 to 7,570 feet. In December, 1955, Johnston was added to the list of producing counties with a flow of gas from a depth of 1,134 feet in the Wapanucka formation of Morrowan age. Probably Dewey, Woodward and Roger Mills Counties will be the next areas added to the list, leaving Adair, Cherokee, Choctaw, Delaware, Harmon, and Pushmataha as unproductive.

1956 Field Trip of SEPM

The Permian Basin Section of the Society of Economic Paleontologists and Mineralogists was held May 11 and 12 in Parker County, Texas. The guide book of 78 pages was prepared by several geologists. Dr. Leo Hendricks was the leader and his map of southwestern Parker County prepared for the Texas Bureau of Economic Geology is issued in preliminary form in the packet. Dr. O. D. Weaver wrote a general chapter on the Fort Worth Basin, Dr. B. J. Scull presented his sedimentary analysis of the Meek Bend sandstone, which shows that deposition was by long-shore currents. Fusulinids of the Hill Creek beds are described by W. E. King. R. J. Cordell used his method of comparing peak occurrences of ostracode species for stratigraphic purposes. An ostracode occurrence chart of the Desmoinesian of the Ardmore Basin is his Fig. 2. The generalized structural map (by Mark Clement and R. C. Weart) is on the top of the Ellenburger and on top of the Arbuckle in Love, Carter, Jefferson, Cotton and Tillman Counties, Oklahoma.

Copies of the symposium are obtainable for $5.00 each from E. A. Vogler, Treasurer, Shell Oil Co., Midland, Texas.

The Axioms of Uranium Mining (14)

1. Over the long pull, the biggest profits lie in a well planned, long term exploration program.
2. Regardless of quantity or quality of experience elsewhere, the record shows that it takes about two years for engineers, prospectors and geologists to become effective in uranium exploration.
3. Make sure that you learn both state and federal mining laws, and equally important, find out what is the prevailing local custom regarding the mining laws.
4. Think of mining in terms of pounds of uranium rather than necessarily in tons of ore, but don't get the idea that this eliminates large enterprises.
5. There is generally more profit in mining than in milling.
6. If you seriously intend to explore and mine uranium, you can get a lot of helpful information and save yourself time and money by talking with on-the-spot AEC officials first.

7. If you are going into the uranium business by buying uranium stocks, be careful.

**THE BERENDS FAUNA OF BEAVER COUNTY**

A review by David B. Kitts

The Berends fauna consists of organisms preserved in Pleistocene deposits above the Pearlette volcanic ash 4.5 miles north and one mile west of Gate, Beaver County, Oklahoma. In the past, molluscs (Taylor, 1954), fish (Smith, 1954), mammals (Rinker and Hibbard, 1952; Taylor, 1954; and Smith, 1954) and a bird (Mengel, 1952) have been recorded from the locality. A paper by Starrett (Pleistocene mammals of the Berends fauna of Oklahoma, Jour. Paleontology, Vol. 30, 1956, pp. 1187-1192) deals with recent additions to the mammalian fauna including a prairie vole, a pocket gopher, a pocket mouse, a meadow vole, a new species of muskrat, the common shrew, the shorttail shrew, a coyote, two species of beaver, a new species of deer mouse, a horse, a rabbit, and an elephant. From nearby deposits of apparently equivalent age, an incisor of a very large rodent was found. It has been tentatively referred to the Sciuridae, or squirrel family. Starrett's conclusion that these mammals lived during a cool moist period is consistent with the conclusions of other workers based upon analyses of the other faunal elements and on the pollen found in the deposits.

---

**INDEX**

**OKLAHOMA GEOLOGY NOTES, Volume 16, 1956**

Prepared by Neville M. Curtis, Jr.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate, lightweight, new plant in Tulsa</td>
<td>56</td>
</tr>
<tr>
<td>Ahloslo member of the Caney shale (Meramecian)</td>
<td>102</td>
</tr>
<tr>
<td>Amsden, T. W., Additional fossils from the Hunton group</td>
<td>138</td>
</tr>
<tr>
<td><em>Isorthis arcuaria</em> from the Henryhouse and Brownsport</td>
<td>78</td>
</tr>
<tr>
<td>Arbuckle Mountain field trip (announcement)</td>
<td>6</td>
</tr>
<tr>
<td>Axioms of uranium mining</td>
<td>140</td>
</tr>
<tr>
<td>Basic magnesium carbonate from dolomite</td>
<td>91</td>
</tr>
<tr>
<td>Berends fauna, mammals (a review)</td>
<td>141</td>
</tr>
<tr>
<td>Beroni, Ernest P., Recent uranium discoveries in Western</td>
<td></td>
</tr>
<tr>
<td>Oklahoma</td>
<td>107</td>
</tr>
<tr>
<td>Blaine County added to gas area</td>
<td>140</td>
</tr>
<tr>
<td>Branson, Carl C., A little-known Oklahoma fossil</td>
<td>126</td>
</tr>
<tr>
<td>Branson, Carl C., Coal beds of Oklahoma Virgilian and Wolf-</td>
<td>85</td>
</tr>
<tr>
<td>campian rocks (table showing coal seams)</td>
<td></td>
</tr>
<tr>
<td>Branson, Carl C., Cyclic formations or mappable units</td>
<td>122</td>
</tr>
</tbody>
</table>
Branson, Carl C., Hartshorne formation, early Desmoinesian, Oklahoma (table showing stratigraphic units) 93
Branson, Carl C., New stratigraphic names for Oklahoma rock units 102
Branson, Carl C., Preview of Northeast Turnpike geology (general geologic column) 63
Branson, Carl C., Revised general geologic column available 92
Branson, Carl C., Uranium in Oklahoma phosphatic black shale 104
Bromine in brines of the Red Fork-Earlsboro sands (Pennsylvanian) in the Seminole area, Oklahoma 131
Burwell, A. L., Basic magnesium carbonate from dolomite 91
Burwell, A. L., Potash agstone in Oklahoma 12
Burwell, A. L., Regarding some natural inorganic fertilizers 100
Burwell, A. L., Shales and clays 75
Burwell, A. L. Survey by the Structural Clay Products Institute 55
Button corals are rare Oklahoma fossils 67
Chiton, rare fossil, from Ada, Oklahoma 65
Christian, H. E., Recent developments in the Turner Turnpike area 61
Coal beds of Oklahoma Virgilian and Wolfcampian rocks 85
Conocardi um snideri 126
Croweburg, flora of (announcement of publication) 67
Curtis, Neville M., Jr., Bromine in brines of the Red Fork-Earlsboro sands (Pennsylvanian) in the Seminole area, Oklahoma 131
Curtis, Neville M., Jr., Some facts about Oklahoma uranium 106
Cyclic formations or mappable units 122
Delaware Creek member of the Caney shale (Meramecian) 102
Duodicedesusa 23
Feldspar from Oklahoma granites (Table of chemical analyses) 18
Fertilizers, regarding some natural inorganic 100
Flora of Croweburg coal described (announcement of publication) 67
Fossil locality and new snail, Oklahoma (a review) 101
Frederickson, E. A., Rare fossil chiton from Ada, Oklahoma 65
Fusulines, new Oklahoma, (a review) 103
Gene Autry shale member of the Golf Course formation (Morrowan) 103
Ham, W. E., Mineral industries of Oklahoma in 1954 and 1955 27
Ham, W. E., New lightweight aggregate plant in Tulsa 56
Geologic column, available, revised general 92
Geologic map announcements
- Ground-water reservoirs 6
- Minerals of Oklahoma 7
- Golf Course formation (Morrowan) 103
- Granites, Oklahoma (Table of chemical analyses) 17
- Ham, W. E., Major increase in consumption of portland cement in Oklahoma 42

142
Ham, W. E., Oklahoma sixth in production of lead in 1955 66
Ham, W. E., Pumicite deposit sold 65
Harper County fossils, report on released (a review) 5
Hartshorne formation, early Desmoinesian, Oklahoma 93
Henryhouse and Brownport formations, notes on Parmortthis brownportensis and Isorthis arcuaria from 78
Highway geology of Oklahoma (book announcement) 6
Hunton group catalogued, fossils of (announcement) 99
Hunton group, additional fossils described 138
Hugh’s Hues (Oklahoma) 68
Isorthis arcuaria 83
Jellyfish, fossil Oklahoma 23
Jordan, Louise, Blaine County added to gas area 140
Kitts, David B., Berends mammal fauna (a review) 141
Koenig, John W., Oklahoma microcrinoids, (a review) 130
Lake Murray formation (Atokan) 103
Laverne formation 3
Levena subcarinata 80
Lukert, L. H., Notes on the stratigraphy along the Turner Turnpike 59
Maddox, G. C., The relationship between surface and subsurface formations along the Turner Turnpike (abstract) 64
Manning zone fossils, report on, issued (announcement) 100
Meteorite, new Oklahoma 5
Microcrinoids, Oklahoma, (a review) 130
Mineral industries of Oklahoma
1953-1954, Production (Table) 28
1953-1954, value produced by counties (Table) 33
1954 (Final advanced summary) 27
1954-1955, Production (Table) 37
1955 (Preliminary annual summary) 36
Mineral map of Oklahoma released (announcement) 7
Mountain Lake member of the Bromide formation (Mohawkian) 102
Netzeband, F. F., Mineral industries of Oklahoma in 1954 and 1955 27
New publications of Oklahoma Geological Survey 2, 42, 74
Novacekite (a review) 67
Oil seepages near Adair 139
Oketaella lenensis 103
Oklahoma
Geologic column available, revised general 92
Highway geology (a review) 6
Lead, sixth in production in 1955 66
Mineral industries, 1954 and 1955 27
Mineral production, 1953-1954 (Table) 28
Mineral production, 1954 (final advance summary) 27
Mineral production, 1954-1955 (Table) 37
Mineral production, 1955 (preliminary annual summary) 36
Publications on Oklahoma geology, 1955 43
Stratigraphic names for Oklahoma rock units, new 102

143
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tektite recorded</td>
<td>102</td>
</tr>
<tr>
<td>Value of mineral production by Counties, 1953-54, Table</td>
<td>33</td>
</tr>
<tr>
<td>Paleotectonic map, first</td>
<td>135</td>
</tr>
<tr>
<td>Parmorthis brownsportensis</td>
<td>78</td>
</tr>
<tr>
<td>Phormograptis (a review)</td>
<td>7</td>
</tr>
<tr>
<td>Pippograptus (a review)</td>
<td>7</td>
</tr>
<tr>
<td>Pooleville member of the Bromide formation (Mohawkian)</td>
<td>102</td>
</tr>
<tr>
<td>Potash agstone in Oklahoma</td>
<td>12</td>
</tr>
<tr>
<td>Portland cement in Oklahoma, major increase in consumption of</td>
<td>42</td>
</tr>
<tr>
<td>Published papers on Oklahoma geology in the year 1955</td>
<td>43</td>
</tr>
<tr>
<td>Pumicite deposit sold</td>
<td>65</td>
</tr>
<tr>
<td>Redoak Hollow sandstone member of Goddard shale</td>
<td>103</td>
</tr>
<tr>
<td>Rhoda Creek formation (Springeran)</td>
<td>103</td>
</tr>
<tr>
<td>Sand Branch member of the Caney shale (Chesterian)</td>
<td>102</td>
</tr>
<tr>
<td>Schoff, Stuart L., Laverne formation</td>
<td>3</td>
</tr>
<tr>
<td>Shales and clays</td>
<td>75</td>
</tr>
<tr>
<td>Soil forming igneous material (Table of chemical analyses)</td>
<td>19</td>
</tr>
<tr>
<td>Soil forming shales and clay (Table of chemical analyses)</td>
<td>20</td>
</tr>
<tr>
<td>Soil forming limestones and dolomites (Table of chemical analyses)</td>
<td>21</td>
</tr>
<tr>
<td>Society of Economic Paleontologists and Mineralogists, 1956, field trip</td>
<td>140</td>
</tr>
<tr>
<td>Starrett, Andrew, Mammals of the Berends fauna (a review by D. B. Kitts)</td>
<td>141</td>
</tr>
<tr>
<td>Stoever, Edward C., Jr., New quarries supplying Northeast Turnpike needs</td>
<td>136</td>
</tr>
<tr>
<td>Stoever, Edward C., Jr., Oil seepages near Adair</td>
<td>139</td>
</tr>
<tr>
<td>Stratigraphic names for Oklahoma rock units, new</td>
<td>102</td>
</tr>
<tr>
<td>Strimple, Harrell L., Oklahoma microcrinoids (a review)</td>
<td>136</td>
</tr>
<tr>
<td>Structural Clay Products Institute, survey by</td>
<td>55</td>
</tr>
<tr>
<td>Taaffe, F., Published papers on Oklahoma geology in the year 1955</td>
<td>43</td>
</tr>
<tr>
<td>Tektite, Oklahoma, recorded</td>
<td>102</td>
</tr>
<tr>
<td>Tribble, P. E., Mineral industries of Oklahoma in 1954 and 1955</td>
<td>27</td>
</tr>
<tr>
<td>Turner Turnpike</td>
<td></td>
</tr>
<tr>
<td>Features studied (field trip)</td>
<td>64</td>
</tr>
<tr>
<td>Recent development in area</td>
<td>61</td>
</tr>
<tr>
<td>Stratigraphy along</td>
<td>59</td>
</tr>
<tr>
<td>Turnpike, northeast</td>
<td></td>
</tr>
<tr>
<td>Geologic column, general</td>
<td>71</td>
</tr>
<tr>
<td>Geology, preview of</td>
<td>68</td>
</tr>
<tr>
<td>Quarries, new, supplying needs</td>
<td>136</td>
</tr>
<tr>
<td>Uranium discoveries in Western Oklahoma, recent</td>
<td>107</td>
</tr>
<tr>
<td>Uranium in Oklahoma phosphatic black shales</td>
<td>104</td>
</tr>
<tr>
<td>Uranium, rare mineral, found in Oklahoma (a review)</td>
<td>67</td>
</tr>
<tr>
<td>Uranium, some facts about Oklahoma</td>
<td>106</td>
</tr>
<tr>
<td>Viola fossils described, new (a review)</td>
<td>7</td>
</tr>
<tr>
<td>Wedekindellina ardmorensis</td>
<td>103</td>
</tr>
</tbody>
</table>