DOE CREEK LIMESTONE

The cover photograph is a vertical view of one of the larger outcrop areas of the sandy Doe Creek Limestone Member of the Marlow Formation in Woodward County. The Marlow is the basal member of the Whitehorse Group (Guadalupian). The area, two miles square, includes the southern half of sections 23 and 24, the whole of sections 25 and 26, and the northern half of sections 35 and 36, T. 25 N., R. 18 W. Within the area are outcrops of the Blaine Formation and overlying Dog Creek Shale of the El Reno Group (Guadalupian).

The northeastward-trending butte, which forms the drainage divide diagonally across the area, is capped by the resistant Doe Creek Limestone Member. The Doe Creek is unique in that it forms a discontinuous linear outcrop pattern normal to the regional strike. It has been mapped, by Alton O. Riley, from sec. 5, T. 22 N., R. 20 W. (Woodward County) to sec. 20, T. 28 N., R. 16 W. (Woods County). Beyond these points it is covered by the Rush Springs Sandstone (upper part of Whitehorse Group).

Although the Doe Creek Member does not resemble a limestone, it contains 65 percent or more calcium carbonate. The rock is composed of coarse- to fine-grained sand with marine fossils and oolites.
It is uniformly cross-bedded and erodes to a rough, vuggy surface. It has a distinctive orange-pink color and is a firm, resistant rock because of the lime cement. In cross section the deposit is characteristically channel-like and interfingers laterally with the normal Marlow sandstones. Because of this and because of its elongate linear trend and its composition, it is probable that the Doe Creek is a channel sediment that was deposited in a marine strait or a tidal outlet.

The gypsum members of the Blaine Formation (in ascending order: Medicine Lodge, Nescatunga, Shimer, and Haskew) appear as white bands in the escarpments flanking the valleys in the upper left and lower right parts of the picture. The Blaine is overlain by the Dog Creek Shale and the contact can be traced only by field observation. The Dog Creek is overlain by the Marlow Formation; the Marlow is a soft friable sandstone forming low rolling hills. Because of creep, it covers the Marlow-Dog Creek contact, which can be mapped in the field only where it is exposed by recent gullying.

A. J. M.

Oklahoma Section of
National Association of Geology Teachers

The National Association of Geology Teachers (NAGT), a vigorous and rapidly growing organization, seeks, in the words of its constitution, “to foster improvement in the teaching of the earth sciences at all levels of formal and informal instruction, to emphasize the cultural significance of the earth sciences, and to disseminate knowledge in this field to the general public.” Although several other societies are also keenly interested in these objectives and likewise promote them in various ways, NAGT is the only organization devoted primarily to geological education. It welcomes into membership any person genuinely interested in any phase of its work.

From modest beginnings in 1937, the Association has grown to a present membership in excess of 700, distributed throughout ten regional sections representing nearly all of the 50 states, as well as the District of Columbia and British Columbia. The purposes of the Association are implemented primarily by the members through the framework of the various sections. The National Association is affiliated with the American Geological Institute, the American Academy of Arts and Sciences, and the Geological Society of America, and holds its national meetings with this latter organization. NAGT also publishes semi-annually the Journal of Geological Education, soon to be issued quarterly.

On December 15, 1961, a small group of interested people met in Stillwater, Oklahoma, in connection with the annual meetings of the Oklahoma Academy of Science, and decided upon the formation of an Oklahoma Section of the National Association of Geology Teachers.
A set of temporary by-laws was adopted, and Edward C. Stoever, Jr., of The University of Oklahoma, was elected acting president. Plans were made to organize formally the section during the fall, 1962, meetings of the Oklahoma Academy of Science, to be held in Stillwater. During the current year the Oklahoma membership will be expanded, and a program planned for the organizational meeting.

Under the membership rules many persons in addition to teachers qualify for membership by reason of their interest in, "disseminating geological information." Annual dues of $3.00, of which $0.50 is payable to the section with which a member is affiliated, include a subscription to both the Journal of Geological Education and to GeoTimes, the publication of the American Geological Institute. Interested parties are urged to get in touch with Edward C. Stoever, Jr., School of Geology, The University of Oklahoma, Norman, Oklahoma.

Reference

Fryxell, Fritiof, 1961, National Association of Geology Teachers: GeoTimes, July-August, vol. 6, no. 1, p. 17-23, 43, 8 illus., approx. 7 refs.

E. C. S., Jr.

New Survey Publications

In February 1962 the Oklahoma Geological Survey issued two circulars.

Circular 49, Permian plant microfossils from the Flowerpot Formation, Greer County, Oklahoma, was written by L. R. Wilson, professor of geology, The University of Oklahoma. The report is a description of a partial assemblage of spores and pollen taken from an olive-gray shale bed, approximately 12 inches thick, in a stratigraphic section that is otherwise unfossiliferous. The assemblage consists of 23 genera and 27 species of which 9 genera and 22 species are new. This circular has 50 pages, 2 figures, and 3 plates. The plates comprise 32 color illustrations of representatives of 20 genera. Price: $1.00 paper bound.

Circular 58, Correlation of Paleozoic rocks from Coal County, Oklahoma, to Sebastian County, Arkansas, was prepared by Sherwood E. Frezon, geologist for the U. S. Geological Survey, Denver, Colorado. The report presents data concerning the extent and lithology of the Paleozoic rock units in the subsurface in the western part of the Arkoma basin and the correlation of these rocks with formations in the Arbuckle Mountains and the Ozark uplift. In the pocket of this 53-page circular are two regional cross sections, one showing correlation of all Paleozoic rocks and the other showing correlation of only the pre-Woodford rocks. Lithologic and electric logs for 17 selected wells were used in making the cross sections, each of which has a vertical scale of 1 inch = 200 feet and a horizontal scale of 1 inch = 6 miles. Price: $2.00 cloth bound; $1.25 paper bound.
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Prepared by KENNETH S. JOHNSON

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Arkansas Geological and Conservation Commission, see University of Oklahoma, School of Geology, and others.


Barby, B. E., 1961a, Panhandle gas hunt sets hot pace: Oil and Gas Jour., vol. 59, no. 22 (May 29), p. 210-217 incl. ads, 4 figs., 1 table.

——— 1961b, Reserves may spell success for the Panhandle: Oil and Gas Jour., vol. 59, no. 23 (June 5), p. 128-130, 2 figs.

Beghtel, F. W., see Furnish, W. M., and Beghtel, F. W.

Bell, R. J., 1961, Pre-Pennsylvanian subsurface geology of the East Lindsay area, Garvin County, Oklahoma: Okla. City Geol. Soc., Shale Shaker, vol. 11, no. 7 (Mar.), p. 2-16, 11 figs.


囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟囟ใ}
Castagno, J. L., see Johnston, K. H., and Castagno, J. L.
Cobban, W. A., see Gill, J. R., and Cobban, W. A.
Cunningham, B. J., 1961, Stratigraphy Oklahoma-Texas Panhandles, in Oil and gas fields of the Texas and Oklahoma Panhandles: Panhandle Geol. Soc., p. 45-60, 2 figs. Precambrian through Quaternary.
Dodd, C. G., see Ham, W. E., Dodd, C. G., and Ray, Satyabrata.
Eddleman, M. W., 1961, Tectonics and geologic history of the Texas and Oklahoma Panhandles, in Oil and gas fields of the Texas and Oklahoma Panhandles: Panhandle Geol. Soc., p. 61-68, 2 figs.
City Geol. Soc., Shale Shaker, vol. 12, no. 2 (Oct.), p. 2-20 incl. ads, 8 figs., 1 table.


Enright, R. J., 1961, Marietta basin dazzles gas hunters: Oil and Gas Jour., vol. 59, no. 6 (Feb. 6), p. 82-84. Southeast Marietta Field, Love County.


1961c, Geologic map of Blaine County, Oklahoma. Advance publication of geologic map to accompany Okla. Geol. Survey, Bull. 89, in press.

Fay, R. O., *see* Reimann, I. G., and Fay, R. O.


Graft, R. D., see Bailey, O. F., and Graft, R. D.
Grandone, Peter, see McDougal, R. B., and Grandone, Peter.
—, see McDougal, R. B., Grandone, Peter, and Ham, W. E.
Guerrero, E. T., and Stewart, F. M., 1961, How to find original oil in place by the volumetric method: Oil and Gas Jour., vol. 59, no. 7 (Feb. 13), p. 89-91, 3 figs., 4 tables. Example used is Northwest Triume Field, Tillman County.
Guest, M. E., see Wilson, L. R., and Guest, M. E.
—, 1961e, Oklahoma Bryozoa under study: Okla. Geol. Survey, Okla. Geology Notes, vol. 21, p. 334. Bryozoans from the Oil Creek Formation (Ordovician) in the Arbuckle Mountains are being studied.
Ham, W. E., see McDougal, R. B., Grandone, Peter, and Ham, W. E.


Joensuu, Oiva, see Marshall, R. R., and Joensuu, Oiva.


1961g, Oil and gas in Kingfisher County, Oklahoma: Kansas-Oklahoma Oil Reporter, vol. 3, no. 10 (Jan.), p. 38-43 incl. ads, 4 figs. Development and geology.


Leonard, A. R., see Ward, P. E., and Leonard, A. R.


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Moses, P. L., 1961, Geothermal gradients now known in greater detail: World Oil, vol. 152, no. 6 (May), p. 79-82, 1 fig., 1 table. Includes map of Oklahoma with contours in degrees per 100 feet.

Murphey, J. J., see Pate, C. O., Murphey, J. J., and Orth, R. P.


Oil and Gas Journal, 1961, Deep drilling marks Oklahoma’s Anadarko: Oil and Gas Jour., vol. 59, no. 50 (Dec. 11), p. 135-136, 141, 1 fig.
Orth, R. P., see Pate, C. O., Murphey, J. J., and Orth, R. P.


Planalp, R. N., see McClain, K. M., and Planalp, R. N.


Reeves, C. C., Jr., 1961a, Cross-sections show Marietta basin’s Pennsylvanian strata: World Oil, vol. 153, no. 6 (Nov.), p. 120-121, 3 figs. (Augments Reeves, C. C., Jr., 1961b.)

Reeves, C. C., Jr., 1961b, Facies changes are key to Marietta basin’s oil future: World Oil, vol. 153, no. 5 (Oct.), p. 137-143, 3 figs. (Augmented by Reeves, C. C., Jr., 1961a.)


Robertson, J. R., see Pitt, W. D., Madeley, H. M., and Robertson, J. R.

Rogatz, Henry, 1961, Shallow oil and gas fields of the Texas Panhandle and Hugoton, in Oil and gas fields of the Texas and Oklahoma Panhandles: Panhandle Geol. Soc., p. 8-37, 6 figs.

Rogers, R. G., and Tinsley, J. D., 1961, Developments in Texas and
Schleicher, J. A., see Ham, W. E., Mankin, C. J., and Schleicher, J. A.
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Survey, Okla. Geology Notes, vol. 21, p. 225-229, 1 pl. Description of Pennsylvanian crinoids: *P. wapanucka* from the Wapanucka Limestone, Pontotoc County; *P. johnstonensis* from the Pumpkin Creek Limestone, Johnston County; and *P. atoka* from the Atoka Formation, Coal County.

——— 1961f, New species of *Brongnathocrinus* and *Stuartwellcrinus* from the Carboniferous of Oklahoma: Okla. Geol. Survey, Okla. Geology Notes, vol. 21, p. 186-189, 1 pl. Description of crinoids: *B. cherokeensis* from the Hindsville Formation (Mississippian), Cherokee County; and *S. praedecta* from the Wapanucka Formation (Pennsylvanian), Pontotoc County.


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——— 1960 [1961]c, Surface water supply of the United States,
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Wheeler, R. R., 1960, The structural map of the Midcontinent from Denver to the east Texas Gulf Coast: Robert R. Wheeler, Dallas, Texas. Scale: 1 inch = 6 miles. Central Series (consisting of 3 Sheets) covers Oklahoma from T. 24 N., southward into north Texas: Eastern Sheet extends from Oklahoma-Arkansas state line to R. 7 W.; Center Sheet extends from R. 8 W. to R. 11 ECM.; Western Sheet includes T. 1 N., Rs. 1 to 10 ECM.
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1960 [1961]c, Surface water supply of the United States,

University of Oklahoma, Department of Business and Industrial Services, Extension Division, see University of Oklahoma, School of Geology, and others.


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Weiner, J. L., see Gutschick, R. C., Weiner, J. L., and Young, Leighton.


Wheeler, R. R., 1960, The structural map of the Midcontinent from Denver to the east Texas Gulf Coast: Robert R. Wheeler, Dallas, Texas. Scale: 1 inch=6 miles. Central Series (consisting of 3 Sheets) covers Oklahoma from T. 24 N., southward into north Texas: Eastern Sheet extends from Oklahoma-Arkansas state line to R. 7 W.; Center Sheet extends from R. 8 W. to R. 11 ECM.; Western Sheet includes T. 1 N., Rs. 1 to 10 ECM.


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In 1961, the mineral industry of Oklahoma produced 19 minerals and mineral fuels valued at an estimated $791.2 million, according to the Bartlesville, Oklahoma, office of the Bureau of Mines, U. S. Department of the Interior. The 1960 value was $780.9 million. Gains were reported in total production value of helium, natural gas, natural-gas liquids, cement, clays, lime, pumice, salt, sand and gravel, and stone; decreases were reported in total value of coal, petroleum, asphalt, bentonite, gypsum, tripoli, lead, and zinc. Mineral fuels accounted for 94 percent of the 1961 total value, nonmetals for almost 6 percent, and metals less than 1 percent.

**MINERAL FUELS**

*Coal.*—Output of coal in Oklahoma continued to decline in 1961. Closed in August 1960, Lone Star Coal Co. reopened its Carbon No. 5 mine in Pittsburg County in June. New type mining equipment—used in some British coal mines—was being installed at the mine.

*Natural gas.*—Marketed production of natural gas from 65 counties in 1961 increased 6 percent from the 1960 production. Value of the 1961 volume increased about 7 percent from 1960. New gas pools discovered during the year were added to the gas reserves.

Roger Mills County became the 66th county to report natural gas production when an abandoned well was deepened and opened in November. The reworked well was located 23 miles north of the Southwest Mayfield Pool in Beckham County.

Helium was extracted from natural gas at the Federal Bureau of Mines’ Keyes plant.

*Natural-gas liquids.*—Natural-gas liquids, recovered by 69 natural-gasoline plants and 4 cycling plants, reached a new record of 1,331 million gallons, an increase of nearly 3 percent above 1960. The natural-gasoline and cycle-products component decreased slightly and the LP-gas component gained 5 percent.

Underground storage capacity for LP gas, nearly doubled by completion of Continental Oil Co.’s 300,000-barrel storage facility at Ponca City in April, will be further increased as the company had a 150,000-barrel facility under construction in a Grant County salt layer. Gulf Oil Corp. also was constructing an LPG storage unit of undisclosed capacity in a salt formation at Warren Petroleum’s gas plant in Beaver County.

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**Geologist, U. S. Bureau of Mines, Division of Mineral Resources, Region IV.*
Three new natural-gasoline plants were completed or under construction in 1961. Continental Oil Co. placed on stream its new absorption and refrigeration type natural-gas-liquids plant at Medford. At Hennessey, the Company built a $1.75 million natural-gas-products plant having daily input capacity of 30 million cubic feet. In the same area, Humble Oil & Refining Co. was also building a gas processing plant. This plant, with an ultimate capacity of 77 million cubic feet per day, will serve some 275 wells in the Dover-Hennessey area connected by an 85-mile gathering system.

**Petroleum.**—Production of an estimated 191 million barrels of crude petroleum was reported in 1961, a decline for the third consecutive year. Under the Interstate Oil Compact, the allowable production was adjusted to maintain a balance with demand. The allowable of 515,000 barrels per day for January was increased to 535,000 barrels for March—highest in 13 months—then was reduced to 505,000 barrels for July through October and raised to 525,000 barrels for December.

The State Corporation Commission approved a new formula for allocating oil production; first application was in December. The depth-acreage formula will be subjected to a monthly demand factor; all wells will be allowed to produce only a fixed percentage of the basic allowable.

Activity in 1961 was centered primarily in development-well drilling. The Oil and Gas Journal reported that a total of 5,290 exploratory and development wells were drilled in the first 11 months of 1961 compared with 4,348 wells for the same period in 1960. This represents an increase of 30 percent in development drilling and a decline of 14 percent in test-well drilling from the corresponding period in 1960.

As of January 1, 1961, Oklahoma had 15 refineries operating, according to the Oil and Gas Journal. These had a total capacity of 409,680 barrels of crude oil daily, a gain of 2 percent over 1960. In October, the Kerr-McGee Oil Industries, Inc., Cushing refinery began a cutback in manufacture of gasoline and fuel oils to concentrate on manufacture of high-quality lubricating oils. Bell Oil and Gas Co. revamped the Ben Franklin refinery at Ardmore. Crude petroleum formerly handled at Bell's Grandfield plant will now be processed at Ardmore; Grandfield will be converted into a terminal for asphalt and other products.

D-X Sunray Oil Co., at its West Tulsa refinery, placed a new 85,000 barrel per day crude-oil distillation unit on stream. The unit replaced five units having a combined capacity of 75,000 barrels per day. Champlin Oil & Refining Co. placed on stream a new delayed-coking unit at its Enid refinery. The unit will produce 100 tons of coke, 1,000 barrels of gasoline, and 300 barrels of burning oil per day.

**Nonmetals**

The estimated value of nonmetals (native asphalt, cement, clays, gypsum, lime, pumice, salt, sand and gravel, stone, and tripoli) produced in Oklahoma during 1961 totaled $47.0 million, 19 percent more than in 1960.

Dewey Portland Cement Co., Division of American-Marietta Corp.,
dedicated its $12-million cement plant east of Tulsa; the plant has an annual capacity of 1.25 million barrels. Oklahoma Cement Co. was planning to increase its facilities. Dewey Portland Cement Co. halted production at its Dewey plant in October to bring production in line with shipments; there was no indication when production would resume.

Construction by the U. S. Army Corps of Engineers (Tulsa District) continued at three dams: Oologah dam on the Verdigris River, Eufaula dam on the Canadian River, and Keystone dam on the Arkansas River. The multipurpose structures will provide flood control, municipal and industrial water supply, and hydroelectric power. On October 18, Public Service Company of Oklahoma dedicated its 170,000-kilowatt electric generating station southeast of Oologah.

**Metals**

Mine production in terms of recoverable lead and zinc, all from Ottawa County, declined 51 percent in 1961. Concentrates recovered during 1961 amounted to 600 tons of recoverable lead and 1,000 tons of recoverable zinc.

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<td>Helium (thousand cubic feet)</td>
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<td>Total Oklahoma</td>
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¹Production as measured by mine shipments, sales, or marketable production (including consumption by producer).
²Excludes bentonite; included with "Value of items that cannot be disclosed."
³Included with "Value of items that cannot be disclosed."
⁴Excludes crushed granite; included with "Value of items that cannot be disclosed."
⁵Total adjusted to eliminate duplicating value of clays and stone.
⁶Revised figure.
Smelters.—Three horizontal-retort zinc plants were operated throughout 1961: American Metal Climax, Inc., at Blackwell; National Zinc Co., at Bartlesville; and The Eagle-Picher Co., at Henryetta.

Tri-State district.—Depressed lead-zinc markets, which led to the general shut down in mid-1958 of all major mining operations in the Tri-State district, continued throughout 1961. Legislation, designed to assist small producers of lead and zinc by providing subsidies to the operators, was authorized by the President. At yearend, funds were not yet available for approved payments to producers. Producers began reconditioning long-closed mines and mill operators were preparing their equipment in anticipation of the increased activity.

FIRST PRODUCTION IN ROGER MILLS COUNTY, OKLAHOMA

LOUISE JORDAN

Roger Mills, a western county of Oklahoma bordering the Texas Panhandle, has become the seventy-second county in Oklahoma in which oil or gas production has been discovered. The area is underlain by south-dipping rocks on the north limb of the Anadarko syncline. The westward-trending axis of the syncline is shown in part by the outcrop pattern of Permian rocks at the surface and it passes through the southern townships of the county (Arbenz, 1956). However, the axis of the basin as revealed by older sedimentary rocks lies 10 to 15 miles to the south. Thus the discovery of gas in Roger Mills County is in the deep, but not the deepest, part of the Anadarko basin, and at a total depth of 17,558 feet the hole did not test the entire rock sequence of Pennsylvanian age.

The wildcat discovery, No. 1 Hartley (NE¼ NE ¼ NW¼ sec. 34, T. 14 N., R. 26 W.) * was drilled originally to 12,384 feet and abandoned in 1953 by the Carter Oil Company. Shows of gas were obtained at that time at approximately 9,250 and 10,900 feet. In 1961, Gulf Oil Corporation re-entered and deepened the hole to 17,558 feet. Perforations were made first between 17,127 and 17,435 feet in “Lower Morrow” sandstones. A possible new producing-depth record for the State seemed possible when gas flowed at a rate of 2.25 million cubic feet daily through a ½-inch choke, but the gas flow died. The hole was plugged back to 15,148 feet, perforations were made from 14,960 to 14,980 feet in an “Upper Morrow” sandstone, and the hole was treated to flow 4 million cubic feet of gas daily through ½-inch choke, with 3 barrels of condensate per million. Both sandstones tested are considered to be of Morrowan age by company geologists. The well contains probably the deepest commercial production yet discovered in rocks of this age in the State. However, deeper production in Morrow rocks may be expected because the Gulf No. 1 Tabor (sec. 24, T. 8 N., R. 15 W., Washita County), recently plugged, had an excellent show of gas at 16,660 to 16,704 feet.

*Now officially designated as the West Reydon Field.
Figure 1. Map showing location of Gulf Oil Corporation No. 1 Hartley, first commercial gas discovery in Roger Mills County, location of dry holes, and of gas and oil fields in the vicinity.
At the well site of the No. 1 Hartley (elevation: 2,447 feet) the Pliocene Ogallala Formation crops out at the surface and is probably less than 200 feet thick. Underlying Permian rocks were penetrated to a depth of 6,078 feet. The base of the redbed-evaporite sequence, which contains salt in the Flowerpot Shale and in the section above and below the Cimarron anhydrite, and anhydrite in the Blaine and Wellington Formations, is reached at 4,420 feet. In most of the county, the thickness of the base-Blaine to base-Wellington section changes relatively little, ranging from 3,350 to 3,450 feet. The lower third of the Permian sequence (Wolfcampian) is mainly dolomite and limestone with minor thicknesses of shale. This section has been penetrated by all the wells (fig. 1) which went to depths of 6,000 to 7,000 feet.

Rocks of Virgilian, Missourian, Desmoinesian, Atokan, and Morrowan age, consisting of shale, sandstone, and some limestone, were penetrated in the Hartley well to its total depth of 17,558 feet, giving a thickness of more than 11,510 feet for rocks of Pennsylvanian age. Geologists estimate that the total thickness is approximately 12,000 feet at this site with an estimated subsea datum of 15,750 at the top of the Chester limestone. The depths below surface of Pennsylvanian subdivisions are reported as follows: Virgil, 6,078 feet; Missouri, 8,923 feet; Des Moines (tentative), 10,110 feet; Atoka (tentative), 13,850 feet; Morrow (tentative), 14,552 feet.

Only eight tests in the county have penetrated an appreciable thickness of Pennsylvanian rocks. One of these, Mobil Oil Company No. 1 Young (sec. 3, T. 15 N., R. 24 W.), completed as a dry hole in 1960, reached the top of the Chester limestone of definite Mississippian age at a depth of 15,622 (—13,297) feet having drilled through 9,870 feet of Pennsylvanian rocks. South of the Hartley well, the only test to have penetrated the top of the Mississippian is the deep Shell Oil Company test, No. 5 Rumberger in the Elk City Field, Beckham County, (fig. 1), which reached definite Mississippian rocks at a depth of 22,948 (—20,929) feet having drilled through a Pennsylvanian thickness of 16,468 feet (Jordan, 1960, p. 89). Between the Mobil No. 1 Young in north-central Roger Mills County and the Shell No. 5 Rumberger in the Elk City Field, Pennsylvanian rocks increase about 6,600 feet in thickness or at an approximate rate of 175 feet per mile. The base of the Pennsylvanian dips from a subsea datum of 13,296 feet at the north to 20,929 feet at the south or at a rate of about 200 feet per mile.

Figure 1 shows the location of fourteen significant tests with a total drilled footage of 146,682 feet. Other tests indicated by a plus sign are less than 4,500 feet deep, and for the most part were not drilled through the Permian redbed-evaporite section and thus furnish little geological information relative to hydrocarbon productive strata.

References Cited

The type species of *Pleuroschisma*, a Devonian blastoid from New York

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The type species of *Pleuroschisma* Reimann, 1945, is *Pentremites lycorias* Hall, 1862. This genus is a Devonian fissiculate blastoid with four anal deltoid plates (a superdeltoid, two cryptodeltoids, a hypodeltoid); ten hydropire fields, with six to eight hydropire slits in each field, not reduced in number on the anal side; moderately obconical form; lancet covered by side plates; narrow, steep, linear ambulacra that extend aborally; and moderately long radial processes on the radial lips. The three described species of this genus may be distinguished on form and on the relative height of deltoids. *P. hibbardi* Reimann, 1945, is narrow, with vault/width ratio 1.3, and low deltoid crests. *P. ontario* Reimann, 1945, is wide, with vault/width ratio 1.0, and low deltoid crests. *P. lycorias* (Hall), 1862, is wide, with vault/width ratio 0.7, and moderately high deltoid crests. The three species occur in

![Diagram](image)

Plate 1

*Pleuroschisma lycorias* (Hall), 1862. Lectoparatypes, E 11,800 (fig. 1) and E 16,305 (fig. 2), Buffalo Society of Natural Sciences Museum, Kashong Shale Member of Moscow Shale, West Alden, New York.

Figure 1. “B” ambulacral view of a specimen in rock, x4.1.

Figure 2. “A-B” interambulacral view of a damaged specimen, x3.5.

B—basal plate
D—deltoid plate
R—radial plate
Z—azygous basal plate
the Devonian Hamilton Group: *P. hibbardi* from the Centerfield horizon, near East Alexander, New York; *P. ontario* from the Coral zone of the Hungry Hollow Formation, near Thedford, Ontario; and *P. lycorias* from the Kashong Member of the Moscow Shale, near West Alden, New York, and from the Tichenor Limestone, near Springbrook, New York. The type specimen was described by Hall (1862), as coming from Hamilton shales, western New York. The type was never illustrated, and could not be located in Albany, New York City, or Chicago. Presumably the type is lost and a lectotype must be selected. The neotype is here designated: neotype, or new holotype, E 15,700; and two hypotypes, E 11,800 and E 16,305, from Kashong Shale Member of Moscow Shale, West Alden, New York, on deposit at the Buffalo Society of Natural Sciences Museum.

*Pleuroschisma lycorias* (Hall), 1862
Plate I, figures 1, 2; plate II, figures 1-4

*Pentremites lycorias* Hall, 1862, p. 151.

*Pleuroschisma lycorias* (Hall), Reimann, 1945, p. 24-25, pl. 5, figs. 10-13.

The neotype is approximately 13.5 mm long by 6.5 mm wide, slightly crushed and damaged, with ambulacra mostly filled with brachiolar plates, composed of dark crystalline calcite. Theca obconical, periphery at radial lips above mid-height, with vault 6.0 mm long, pelvis 7.5 mm long, and pelvic angle almost 43 degrees. Basalia steeply conical, 4 mm long by 4 mm wide, composed of 3 normally disposed basals, with basiradial sutures just below mid-height of pelvis. Radials 5, each 9 mm long by 3.5 mm wide, elongate, subpentalongal, with deep, narrow sinus 5 mm long by 2 mm wide, with hydropore slits along margins of all ambulacra. At the radial lip of each ambulacrum, an elongate projection is prominent along the midline of each ambulacrum. The radial limbs extend to the summit, meeting at a point in a moderately high coronal process, overlapping the deltoids and almost completely concealing them in side view.

Deltoids four, wedge-shaped, short, 2 mm long by 1 mm wide, extending into moderately high coronal process, with approximately five or more (eight?) hydropore slits on each side of an ambulacrum, extending to the adjacent radial limbs. On the anal side, the specimen is damaged, but apparently there were four anal deltoid plates: a superdeltoid adjacent to the mouth (present), two cryptodeltoids aborally resting upon the superdeltoid, presumably overlapped by a hypodeltoid (missing). The hypodeltoid would abut against the adjacent radial

Plate II

*Pleuroschisma lycorias* (Hall), 1862. Lectotype (new holotype), E 15,700, Buffalo Society of Natural Sciences Museum. Kashong Shale Member of Moscow Shale, West Alden, Livingston County, New York.

Figure 1. Oral view, x6.5.
Figure 2. Aboral view, x6.5.
Figure 3. "D" ambulacral view, x6.5.
Figure 4. "D" ambulacral view, x10.4.

B—basal plate
CD—cryptodeltoid plate
D—deltoid plate
Hs—hydropore slit
R—radial plate
Sp—side plate
SD—superdeltoid plate
Z—azygous basal plate

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limbs, and the radial limbs would slightly overlap the cryptodeltoids. The hydropopire slits on the anal side are excavated in the cryptodeltoids. On the right side ("C" ambulacral side) of the anus, there are apparently four to five hydropopire slits excavated in the cryptodeltoid on that side, and presumably the same number on the left side. Thus there are ten exposed hydropopire fields, with possible reduction
in number of hydrospire slits on the anal side, and four anal deltoid plates.

Ambulacra five, linear, each 6.5 mm long by 1.0 mm wide, with lancet covered by side plates, and 24 side plates in 10 mm length of an ambulacrum. Side plates large, subquadrangular, with outer side plates normally disposed on the adoral-ab medial bevelled corner of each primary side plate. Brachioles biserial, with each brachiolar semi-elliptical, about 0.5 mm long by 0.125 mm wide, arranged alternately, forming a zig-zag suture pattern, with small oral food groove. The brachiolar facets on the side plates are arranged in a manner that suggests that one of the first pair of brachiolars was attached to a secondary (or outer) side plate, and the other to the adjacent (aborally directed) primary side-plate handle. The surfaces of the calyx plates are ornamented with fine growth lines subparallel to plate margins.

Types and occurrence.—Hall's (1862) original types are presumably lost. Neotype, new holotype (herein selected), E 15,700; hypotypes, E 11,800 and E 16,305. Kashong Shale Member of Moscow Shale, West Alden, Livingston County, New York; in Buffalo Society of Natural Sciences Museum, Buffalo, New York. Another specimen with brachioles (a hypotype), E 15,987, is from a locality near the salt shaft, Wadsworth, Livingston County, New York, from the Kashong Shale Member.

References Cited

Hall, James, 1862, Contributions to palaeontology; comprising descriptions of new species of fossils from the Upper Helderberg, Hamilton and Chemung groups; Preliminary notice of some of the species of Crinoidea known in the Upper Helderberg and Hamilton groups of New York: New York State Cabinet Nat. History, Ann. Rept. 15, p. 115-153, 11 pls., 2 figs.


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