Cover Picture

TERTIARY ROCKS IN NORTHWESTERN OKLAHOMA

OGALLALA FORMATION

Pictured on the cover is a portion of a butte formed in the Ogallala Formation. The summit area is approximately 10 acres and is in SW¼ sec. 19, T. 21 N., R. 20 W., Woodward County.

The Tertiary Ogallala Formation consists of alluvial sand and gravels and forms the High Plains physiographic province, which extends from the Dakotas to Texas. In Oklahoma the Ogallala is present in the Panhandle and in Harper, Ellis, Roger Mills, and Woodward Counties. At one time it must have extended farther to the east, but much of it has been eroded away. Although it contains no continuous beds, the formation is lithologically distinct from the rocks above and below and can be traced as a unit.

In Woodward County the Ogallala Formation has a maximum thickness of 195 feet and consists of beds of moderately well-sorted to poorly sorted sand and gravel, some of which are partially cemented by calcium carbonate. The sand is generally buff colored, but in some places it is chalky white. The basal part contains small pebbles of red Permian sandstone. Caliche forms the cap rock for the various buttes. Once the caliche cap rock has been removed the underlying sands are readily eroded.

Because of its porosity and permeability, the Ogallala is a good aquifer and water from it is extensively used for irrigation.

Another butte of about the same size is half a mile to the southwest in sec. 24, T. 21 N., R. 21 W. The Antelope Hills in Roger Mills County are similar buttes which have formed in the Ogallala.

—A. J. M.

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The Mineral Industry of Oklahoma in 1962*
(Advance Summary)

Robert B. McDougal†

Total value of mineral production in Oklahoma increased almost 7 percent to $843 million—$51.5 million more than in 1961, according to the Bartlesville, Oklahoma, office of the Bureau of Mines, U. S. Department of the Interior. The increase resulted from improved petroleum, helium, natural gas, and coal sales in the fuels segment of the mineral industry and cement, stone, gypsum, zinc, lead, lime, tripoli, and salt sales in the minerals portion of the industry. Seventeen minerals—helium, four mineral fuels, and twelve minerals—were produced in 74 of 77 counties. Oklahoma ranked third as a producer of natural gas, fourth in petroleum, and fifth in natural-gas liquids. Anadarko basin in western and northwestern Oklahoma completed another successful year. Success which Kingfisher County enjoyed for three years spread into southern and southwestern Garfield County as twelve new oil and gas fields were opened. In southeastern Oklahoma and western Arkansas, Arkoma basin continued to hold promise as a large gas reserve. Several pipeline companies have proposed or are seeking authority to build pipelines into the basin to provide access to markets. Lead and zinc production rose significantly as funds became available to small operators under the Lead-Zinc Stabilization Program (Public Law 87-347). Total construction (residential, nonresidential, and public works) exceeded the record established in 1961 as rising income and industrial expansion resulted in a phenomenal growth in construction; value reached $1.3 billion, a 23.5 percent increase over 1961.

MINERAL FUELS

Coal.—A decline in coal production which began five years ago was halted as output increased less than 2 percent. Sixteen operators at 18 mines—6 underground and 12 strip—in 10 counties mined one million tons valued at $6.9 million.

Natural gas.—Marketed natural gas increased 19 percent. Roger Mills County became the 65th county in which gas was found; however, the well which opened the West Reydon pool was shut in pending further development of the area. Seven gas-storage fields were in use

*This report, U. S. Bureau of Mines, Mineral Industry Surveys Area Report IV-159, has been prepared under a cooperative agreement between the Bureau of Mines, U. S. Department of the Interior, and the Oklahoma Geological Survey, Dr. William E. Ham, Geologist, for collecting information on all minerals except fuels. The report was prepared August 1, 1963. Preliminary figures were published in Area Report IV-151, which appeared in the February 1963 issue of the Oklahoma Geology Notes, pages 23-25.
†Geologist, U. S. Bureau of Mines, Division of Mineral Resources, Region IV.

by the natural-gas industry in eight counties. Permanent gathering systems and compression facilities were being installed in the West Edmond reservoir in Kingfisher and Logan Counties.

Natural-gas liquids.—Output of natural-gas liquids recovered increased about 4 percent. New natural-gas-liquids recovery facilities placed on stream in Kingfisher County were the 30-million-cubic-foot-per-day Hennessey plant of Continental Oil Co.; the 77-million-cubic-foot-per-day Dover-Hennessey plant of Humble Oil & Refining Co.; the 32-million-cubic-foot-per-day North Okarche plant of Pan American Petroleum Corp.; and in Love County, the 23-million-cubic-foot-per-day Enville plant of Texaco Inc. Cabot Corp. completed its 30-million-cubic-foot-per-day plant in Beaver County.

Petroleum.—Crude-petroleum production amounted to nearly 199 million barrels—a 3 percent increase over that of 1961—from 80,799 oil wells. Petroleum was produced in 63 counties, of which Osage, Stephens, Carter, Garvin, Kingfisher, and Creek Counties led in order of value. Estimated proved recoverable crude-oil reserves totaled nearly

TABLE I.—MINERAL PRODUCTION IN OKLAHOMA[1]

MINERAL	1961 QUANTITY	1961 VALUE (THOUSANDS)	1962 QUANTITY	1962 VALUE (THOUSANDS)
Clays[2] (thousand short tons)	792	$ 801	737	$ 756
Coal (thousand short tons)	1,032	6,784	1,048	6,978
Gypsum (thousand short tons)	[3]	[3]	509	1,668
Helium (thousand cubic feet)	313,244	5,872	284,214	9,917
Lead (recoverable content of ores, etc.) (short tons)	980	202	2,710	499
Natural gas (million cubic feet)	892,697	108,016	1,060,717	135,772
Natural-gas liquids:				
Natural gasoline and cycle products (thousand gallons)	521,237	33,358	552,795	35,764
LP gases (thousand gallons)	817,082	30,141	838,903	25,223
Petroleum (crude) (thousand 42-gallon barrels)	193,081	561,866	198,616[4]	579,959[4]
Salt (common) (thousand short tons)	3	19	5	25
Sand and gravel (thousand short tons)	5,310	5,513	4,436	4,736
Stone (thousand short tons)	14,981	16,561	14,666	18,819
Zinc (recoverable content of ores, etc.) (short tons)	3,148	724	10,013	2,303
Value of items that cannot be disclosed: Bentonite, cement, gem stones, lime, pumice, tripoli, and value indicated by footnote 3	----	21,920	----	20,853
Total Oklahoma	----	$791,777[5]	----	$843,272

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producer).
[2]Excludes bentonite; included with "Value of items that cannot be disclosed."
[3]Figure withheld to avoid disclosing individual confidential data.
[4]Preliminary figures.
[5]Revised figure.

1.8 billion barrels—a 3 percent drop from the previous year. These reserves were equivalent to nearly nine barrels of recoverable crude oil underground for each barrel of oil produced in 1962. Fourteen refineries had combined daily crude-oil capacity of 409,380 barrels and daily cracked-gasoline capacity of 252,770 barrels on January 1, 1962. These refineries processed about 67 percent of the State's production.

HELIUM

Helium, extracted from natural gas at the Keyes helium plant, decreased 7 percent in quantity. Total value increased 69 percent as the direct result of the unit-price increase effective November 18, 1961.

NONMETALS

Ten nonmetals produced in 1962 were valued at $47.8 million, nearly 6 percent of the State's total mineral production value. Of the five principal nonmetal commodities—cement, clay, gypsum, sand and gravel, and stone—only cement and gypsum increased in quantity and value; stone decreased in quantity yet increased in value.

Cement.—Output of finished cement was more than 6 percent greater and shipments were about 2 percent greater in value in 1962 than in the previous year. Oklahoma Cement Co. completed a $5-million expansion program which doubled production capacity to 2 million barrels annually at its Pryor plant. The Dewey plant of Dewey Portland Cement Co., Division of Martin-Marietta Corp., resumed full production in January after closing in October 1961. In April 1962, the company announced a partial cutback in operation and termination of employment for some 100 workers.

Gypsum.—Output of crude gypsum increased moderately to more than 509,000 short tons valued at almost $1.7 million. Most of the gypsum was used in manufacture of wallboard and plaster products; the remainder was used as soil conditioner and in portland cement.

Lime.—Produced from limestone in Sequoyah County, output of lime increased 11 percent from the previous year.

Sand and gravel.—Choctaw, Johnston, Muskogee, Oklahoma, Pontotoc, Pushmataha, and Tulsa Counties supplied 67 percent of the quantity and 76 percent of the value of sand and gravel produced in 25 counties. Sand and gravel output was 16 percent below that of last year.

Stone.—Output of stone, including limestone used to manufacture cement and lime, was 2 percent below that of the previous year, yet total value was 14 percent greater. Tulsa, Comanche, Murray, Mayes, Sequoyah, and Pontotoc Counties accounted for 59 percent of all stone production in the State and 56 percent of the total value.

METALS

Lead and zinc output increased substantially from the previous year as $4.6 million was made available to administer the lead-zinc stabilization program—Public Law 87-347—for the first year.

Lead.—Nineteen producers reported output of lead from 36 operations compared with 15 producers at 21 operations the year before.

Output of recoverable lead mined in Ottawa County increased 177 percent and the value 147 percent.

Zinc.—Recoverable zinc output in Ottawa County increased 218 percent in tonnage and value from the previous year. Twenty producers reported zinc-ore output from 40 operations, compared with 15 producers at 21 operations in 1961.

TRI-STATE DISTRICT

Passage of the Lead-Zinc Stabilization Act late in 1961 and appropriation of more than $4 million to operate the program the first year materially boosted production of these two metals. Lead and zinc concentrates recovered were nearly 51 percent and 140 percent greater, respectively, over quantity recovered in 1961. Kansas produced 26 percent of the district's lead concentrate and 28 percent of its zinc concentrate; Oklahoma produced 74 percent of the district's lead concentrate and 72 percent of the zinc concentrate. The last year of reported production from the Missouri (southwest) portion of the district was in 1957.

New Theses Added to O. U. Geology Library

The following Master of Science theses were added to The University of Oklahoma Geology Library in October 1963:

Areal geology of northwestern Dewey County, Oklahoma, by Joe M. Birchum.

Palynology of the Weir-Pittsburg coal (Pennsylvanian) of Oklahoma and Kansas, by Thomas A. Bond.

Pre-Mississippian carbonate rocks in the Hollis basin of Oklahoma, by Slobodan Bozovich.

Areal geology of the Chewey-Watts area, Adair County, Oklahoma (including a part of western Arkansas), by James M. Hancock, Jr.

Geology of east-central Caddo County, Oklahoma, by Brian E. O'Brien.

Areal geology of the Christie-Westville area, Adair County, Oklahoma, by Jackson M. Langton.

Areal geology of the Spavinaw Lakes area, Delaware County, Oklahoma, by Donald L. Reese.

Mississippian rocks in the subsurface of the Bartlesville area, Oklahoma, by Earl William Kitchen.

Mississippian rocks in the subsurface of the North Tulsa area, Oklahoma, by David Hendrix Glenn.

Stratigraphy and paleoecology of the Checkerboard Formation (Pennsylvanian) of northeastern Oklahoma, by Michael S. Wolfson.

A Master of Geological Engineering thesis, *Clay mineralogy of the Vermejo Formation (Upper Cretaceous), Canon City, Colorado,* by David Gardiner Hunt, was also added.

Elimination of Bleeding of Safranine O Stain in Clearcol

Robert T. Clarke*

Many palynological residues are stained to accentuate morphological features of palynomorphs which are bleached in chemical processing. An important factor in determining the choice of a stain should be the resulting photographic quality of the palynomorphs. Safranine O is one of the more widely used palynological stains, and its effect on the photographic quality of stained material is generally excellent. However, one defect of safranine O is its tendency to bleed from stained palynomorphs when mounted in Clearcol (see Wilson, 1959, for a discussion of Clearcol as a palynological mounting medium). The bleeding, a consequence of the greater solubility of safranine O in Clearcol than in water, results in the formation of a red halo around each stained object. The halo is objectionable because it reduces the contrast between the object and the background. Repeated washing of stained samples reduces bleeding only slightly.

The following technique eliminates bleeding of residues stained with safranine O. A diluted solution of sodium hypochlorite (1:1 with water is adequate) is prepared in a watch glass prior to making the microslides. Sodium hypochlorite has previously been used in palynological techniques as an oxidizing agent and as a bleaching agent (Hoffmeister, 1960). One to two drops of Clearcol are placed on a cover glass and a drop of sample placed directly in the Clearcol. A flat toothpick is dipped into the sodium hypochlorite solution and then used to mix and spread the sample evenly over the cover glass. The amount of sodium hypochlorite on the toothpick is sufficient to bleach the excess stain from the background but does not noticeably bleach the stained objects. The procedure is repeated and, to prevent contamination of the sodium hypochlorite solution, a new toothpick is used for each additional microslide. No bleeding of the stain is possible once the sample has hardened to complete the permanent microslide.

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Hoffmeister, W. S., 1960, Sodium hypochlorite, a new oxidizing agent for the preparation of microfossils: Okla. Geol. Survey, Okla. Geology Notes, vol. 20, p. 34-35.

Wilson, L. R., 1959, A water-miscible mountant for palynology: Okla. Geol. Survey, Okla. Geology Notes, vol. 19, p. 110-111.

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Permian Salt

Bulletin 102, *Permian salt and associated evaporites in the Anadarko basin of the western Oklahoma-Texas Panhandle region,* by Louise Jordan and David L. Vosburg, was issued by the Oklahoma Geological Survey on October 10, 1963. This report consists of 76 pages, 3 plates, 15 figures, and 1 table. The two main plates are "Stratigraphic cross sections of Permian evaporites" (in color) and "Structure and thickness maps of Permian evaporites." Bulletin 102 is available at the Survey offices, $4.00 cloth bound, and $3.00 paper bound. Parts of the published abstract are given below.

Permian salt and associated evaporites within a 20,000-square-mile region in western Oklahoma and the Texas Panhandle are Leonardian and Guadalupean, and possibly Ochoan, in age. This report is concerned chiefly with the subsurface geology of the three principal evaporite sequences, each of which is 300 to 1,000 feet thick and consists mainly of rock salt and salty shale interbedded with anhydrite. These evaporite sequences contain all the rock salt known in Oklahoma. The evaporites occur with red clastic sediments in a sequence 4,000 feet thick, embracing all strata from the base of the Wellington Formation to the top of the Dog Creek Shale. Included in the report are stratigraphic sections illustrating the distribution and facies relationships of these beds, as well as structural maps and maps showing distribution, thickness, and depth from surface of the principal salt beds.

Together the evaporites have a maximum thickness of 2,500 feet, and locally one bed of massive rock salt is more than 400 feet thick. The evaporite strata, excluding clastics, consist of halite (about 80 percent), anhydrite, and thin beds of dolomite (less than 5 percent). Salt reserves in western Oklahoma are estimated to be more than 21 million million (21,000,000,000,000) short tons. Although much of the salt is thick and nearly pure, the reserves are virtually unexploited.

Aeromagnetic Profiles over Northeastern Oklahoma

The U. S. Geological Survey has placed on open file at the Oklahoma Geological Survey a copy of *Total intensity aeromagnetic profiles over northeastern Oklahoma,* by G. E. Andreasen and R. W. Bromery. The copy is a transparent film positive that can be fitted over maps of the U. S. G. S. 1:250,000-scale topographic-map series. The map areas included are Enid 1955, Tulsa 1945, Oklahoma City 1948, and Fort Smith 1946. The aeromagnetic survey was flown in 1957 at 1,400 feet above ground. Magnetic values in gammas are relative to an arbitrary datum.

The eight numbered profiles are plotted along traverse lines passing through the following townships:

North-south lines:

1. Tps. 14-29 N., R. 5 E.
2. Tps. 13-28 N., R. 11 E.
3. Tps. 13-27 N., R. 17 E.
4. Tps. 14-27 N., R. 21 E.

East-west lines:

5. T. 16 N., Rs. 4-22 E.
6. T. 20 N., Rs. 1-25 E.
7. T. 24 N., Rs. 2W.-24 E.
8. T. 28 N., Rs. 2W.-22 E.

Reproductions can be made at private expense from the copy available at the Oklahoma Geological Survey, or ozalid prints may be purchased at cost from the Survey, $2.00 per copy.

Magnetic Profile Control of Basement Configuration, Northern Cherokee County, Oklahoma

J. A. E. Norden and J. M. Langton

INTRODUCTION

Vertical-magnetic-intensity surveys conducted in northern Adair County, Oklahoma (Norden and Langton, 1963), yielded new evidence of the value of this geophysical method in the delineation of basement configuration. The fact that the sedimentary rocks, ranging from Pennsylvanian to Ordovician in age, in Adair County exhibit low magnetic susceptibility in contrast with the magnetic Precambrian basement led to the use of the magnetic method in the study.

In the Adair County study it was found that the average magnetic susceptibility of Spavinaw Granite, as a representative member of the basement, was about $1{,}190 \times 10^{-6}$ cgs unit. The highest magnetic-susceptibility measurement in the Pennsylvanian-Ordovician sedimentary section was 41×10^{-6} cgs unit obtained from a sample of the Noel Shale Member of the Chattanooga Shale (Mississippian-Devonian). Measurements made on other samples of the section ranged from 0.9×10^{-6} to 24.2×10^{-6} cgs unit. Based upon the assumption of a strong magnetic contrast between the sedimentary rocks and the basement complex, the depth to basement was mapped in detail by magnetic means in the Christie-Westville area of Adair County, and the interpretations derived therefrom checked out with well data and other geological information regarding the thickness of the sedimentary section above the basement.

The results of the Adair County study led the Oklahoma Geological Survey to the use of the magnetic method in investigating the basement configuration in northern Cherokee County, adjacent to Adair County on the west. Because the sedimentary sequence above the basement in Cherokee County is similar to and is a continuation of that in Adair County, successful application of the magnetic method in Cherokee County could be expected.

To complement her regional study of the basement configuration in Oklahoma, Louise Jordan, geologist with the Oklahoma Geological Survey, suggested that the authors run a vertical-magnetic-intensity survey along profiles tying to several wells in northern Cherokee County. These wells were reported to have been drilled into the basement; however the depth datum for the basement in two wells was questionable owing to poor logs.

PROFILE LINES OF THE MAGNETIC SURVEY

The wells along the line of the magnetic profiles are listed in table I and their locations are shown in figure 1.

The magnetic profile lines were selected to tie as closely as possible to these wells; however stations in the vicinity of the wells

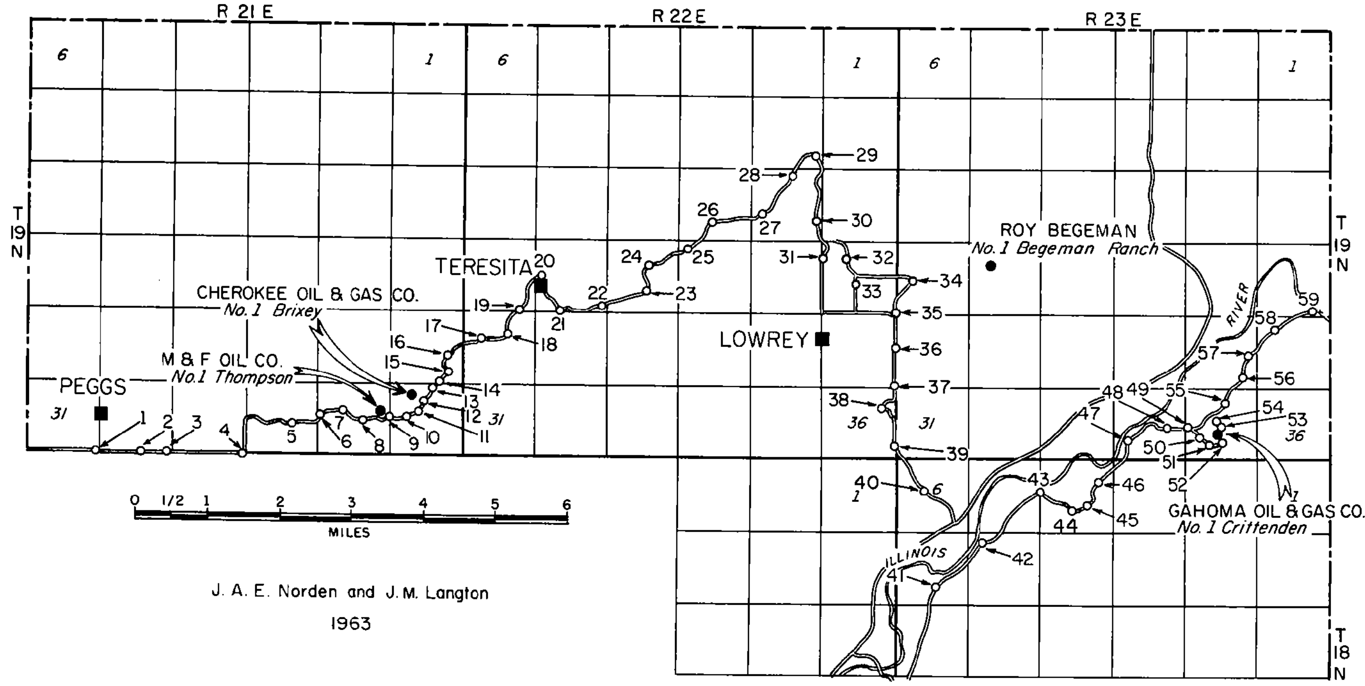

Figure 1. Map of northern Cherokee County, Oklahoma, showing locations of observation stations and control wells for magnetic survey of basement configuration.

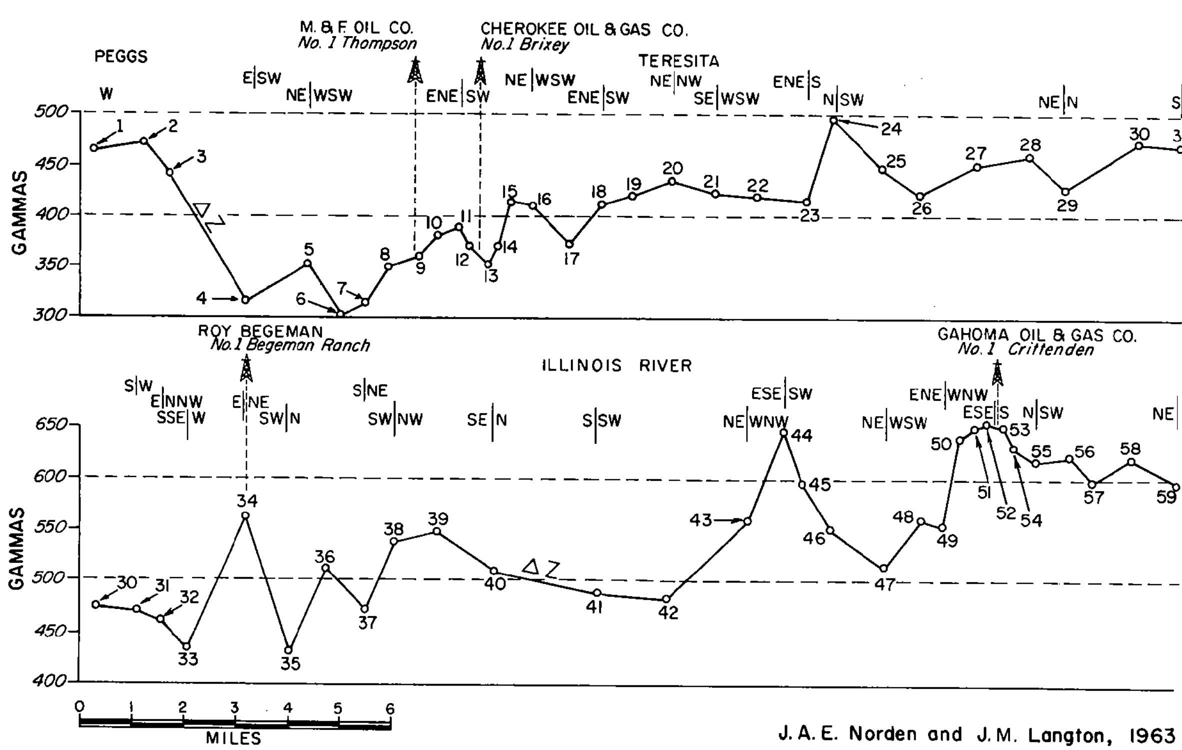

Figure 2. Magnetic profile of lines shown in figure 1. Lower profile is the continuation of the upper profile with the plots of stations 30 and 31 repeated.

were carefully selected to prevent any effect caused by casings left in the holes.

Barret (1931) pointed out that at 260 feet from a well a 10-inch casing, 206 feet long, would produce no effect on the vertical magnetic variometer and that at 250 feet from a well a composite casing, 4,609 feet long, would not affect the variometer. The casings of the wells involved in this magnetic survey could not exceed the dimensions given above. The nearest approach to a hole was about 600 feet, which is well within the safety margin. The map of the magnetic profiles and the locations of the observation stations are shown on figure 1.

VERTICAL-MAGNETIC-INTENSITY SURVEY

The instrument used in the vertical-magnetic-intensity survey was a Ruska type V-3 vertical magnetometer, serial no. 5708. The instrument sensitivity was set to 10.29 gammas per scale division. The temperature correction factor was +0.1 gamma per 1°C. Observed field data, after corrections for temperature, diurnal, and geomagnetic latitude and longitude variations and after reduction to an Adair County magnetic base station, were plotted (fig. 2). Reduction of the data to the Adair County magnetic base station permitted a tie comparison with the Adair County data and the possibility of comparing the depth data under tie control. On two occasions during the survey the senior author received field assistance from David L. Vosburg of the University of Rhode Island, which is gratefully acknowledged

RESULTS OF THE VERTICAL-MAGNETIC-INTENSITY SURVEY

Figure 2 shows a combined tie of several magnetic profiles based upon measurements at 59 stations. The general regional gradient of the vertical-magnetic-intensity field is about 7.5-gammas-per-mile increase to the east.

Comparison of the depth-to-basement data derived from the magnetic survey with those derived from well logs and cuttings were made for the four wells along the profile. In two of the wells drilled in 1961 and 1962, the M. & F. Oil Co., 1 Thompson and the Roy Begeman, 1 Begeman Ranch, the correspondence of the data is fairly close. In the case of the Thompson well, the depth to basement estimated from magnetic data along the profile, which approached the well site at about 800 feet, is 1,850 feet, and the depth determined upon the basis of rock cuttings and driller's log is 1,800 feet. In the vicinity of the Begeman Ranch well, the magnetic profile indicates that the well was drilled on a magnetic high and that the depth to basement is about 1,390 feet. The sample and driller's log of the Begeman Ranch well give a depth of 1,399 feet, a difference of only 9 feet.

The depth-to-basement values reported for the other two wells for which only drillers' logs are available, the Cherokee Oil & Gas Co., 1 Brixey and the Gahoma Oil and Gas Co., 1 Crittenden, drilled in 1919 and 1922 respectively, differ from the values computed from magnetic observations by more than 550 feet. The magnetic data indicate a depth to basement of about 1,850 feet in the vicinity of the Brixey well, whereas the depth was placed at 2,513 feet by Ireland (1955) and 1,115

TABLE I.—LIST OF WELLS ALONG LINE OF MAGNETIC PROFILE

1. M. & F. Oil Co., 1 Thompson
   C SE¼ NE¼ sec. 35, T. 19 N., R. 21 E.
   Top of basement at 1,800 feet by rock cuttings.
   Drilled in 1961.
2. Cherokee Oil & Gas Co., 1 Brixey
   SW¼ NE¼ NW¼ sec. 36, T. 19 N., R. 21 E.
   Top of basement placed by Ireland (1955) at 2,513 feet and by Cram (1930) at 1,115 feet, from a poor driller's log.
   Drilled in 1919.
3. Roy Begeman, 1 Begeman Ranch
   NW¼ SE¼ NW¼ sec. 20, T. 19 N., R. 23 E.
   Top of basement at 1,399 feet, by rock cuttings.
   Drilled in 1962.
4. Gahoma Oil & Gas Co., 1 Crittenden
   NE¼ NE¼ SW¼ sec. 35, T. 19 N., R. 23 E.
   Top of basement reported at 1,761 feet, poor-quality driller's log.
   Drilled in 1922.

feet by Cram (1930) upon the basis of a poor driller's log. The driller's log (Cram, 1930) records white lime from 1,776 to 1,850 feet, brown sand showing oil from 1,850 to 1,860 feet, and red lime from 1,860 to 1,990 feet. For a depth of 2,513 feet the magnetic profile curve should have dropped to a value of about 70 gammas, whereas the minimum value recorded near the well was 352 gammas. As this corresponds to a depth to basement of 1,850 feet, of the several "red limes" listed in the driller's log, the one at 1,860 feet most probably represents the top of the basement.

Similarly, the log of the Crittenden well (Cram, 1930) records granite at 1,761 feet, a value which would correspond to a drop in the field intensity to a value of about 400 gammas, whereas the magnetic profile shows values of more than 650 gammas in the area of the well site, indicating a depth to basement of 1,190 feet. The driller's log of the Crittenden well poorly describes the section penetrated, listing very hard white lime from 784 to 1,552 feet, coarse black lime from 1,552 to 1,761 feet, and red granite from 1,761 feet to total depth at 1,831 feet. In this area of Cherokee County the magnetic profile reveals an over-all general rise of the basement surface from west to east, and it is probable that the basement surface was penetrated in the Crittenden well somewhere near the middle of the interval logged as "very hard white lime" by the driller.

Depth-of-basement measurements from the magnetic survey correlate well with depths given in records of recently drilled holes where definite and accurate well-sample control permitted reliable identification of the top of the granite. As far as the two old wells, 1 Brixey and 1 Crittenden, are concerned, the magnetic survey does not agree with the depth data for the basement as formerly interpreted from poor drillers' logs.

CONCLUSION

Vertical-magnetic-intensity surveys in Adair County, Oklahoma (Norden and Langton, 1963), were successful in the delineation of the basement-surface configuration because of the strong susceptibility contrast between the weakly magnetic sediments and the magnetic basement complex.

The magnetic survey has been extended to Cherokee County, which has geological conditions similar to those in Adair County. In Cherokee County a magnetic profile was run with ties to four well sites, where the depth of the granite was reported by drillers' logs. Depth of the basement, reported in recently drilled wells with good sample control, closely checked out with the depth estimation for the basement given by magnetic survey. Depth data of two old wells with poor drillers' logs did not agree with the magnetic data.

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Norden, J. A. E., and **Langton, J. M.,** 1963, Magnetic delineation of the basement surface, Christie-Westville area, Adair County, Oklahoma: Okla. Geol. Survey, Okla. Geology Notes, vol. 23, p. 241-248.

Well-Sample Descriptions—Anadarko Basin

Guide Book XIII, *Sample descriptions and correlations for wells on a cross section from Barber County, Kansas, to Caddo County, Oklahoma,* by W. L. Adkison and Mary G. Sheldon of the U. S. Geological Survey, was issued by the Oklahoma Geological Survey September 26, 1963. This book gives detailed sample descriptions and stratigraphic terminology of strata, Cambrian to Permian in age, that were penetrated in 19 key wells drilled in the Anadarko basin and on the northern platform of the Anadarko basin. These wells were previously shown on a cross section by Adkison (1960): U. S. Geological Survey, Oil and Gas Inv. Chart OC-61, 1960.

The book consists of 139 pages, 2 figures, and 1 table, and is available at the offices of the Oklahoma Geological Survey. Price: $3.50 paper bound.

Pentremoblastus, A NEW LOWER MISSISSIPPIAN BLASTOID FROM ILLINOIS

ROBERT O. FAY AND JOHN W. KOENIG*

No occurrence of Lower Mississippian pentremitid blastoids in North America has previously been reported. Recently specimens were found in the McCraney Limestone of the North Hill Group in western Illinois. The specimens, collected by the junior author, belong to a new genus, here termed *Pentremoblastus*. The genus is intermediate in character between *Devonoblastus* (Devonian) and *Pentremites* (Middle Mississippian and higher), and is comparable to *Petaloblastus* from Lower Mississippian rocks of Germany.

Family PENTREMITIDAE d'Orbigny, 1851

Conical to subconical theca, with five spiracles around mouth.

Genus *Pentremoblastus* Fay and Koenig, new genus

Type species—*Pentremoblastus conicus* Fay and Koenig, new genus and new species.

Conical to obconical spiraculate theca with five elongate U-shaped spiracles (including anispiracle), with superdeltoid, subdeltoid, and hypodeltoid; lancet exposed full width, with one pore between side plates; three to five hydrospire folds on each side of an ambulacrum; elongate radials overlap short deltoids along an inverted V-shaped suture; deltoids barely visible in side view; stem round. Lower Mississippian, Illinois.

Remarks.—*Pentremoblastus* is similar to *Devonoblastus, Petaloblastus*, and *Pentremites*, but differs by having a subdeltoid plate. *Devonoblastus* has two cryptodeltoids, *Petaloblastus* has an epideltoid, and *Pentremites* has a single anal deltoid. The spiracles of *Pentremoblastus* are split-elliptical, whereas the spiracles of the other genera are more rounded and complete. The name *Pentremoblastus* refers to the fact that the genus has five spiracles.

Pentremoblastus conicus Fay and Koenig, new species

Plate I, figures 1a, 1b

Theca calcitic, 6.5 mm long by 4 mm wide, strongly pentagonal in top view, with flat summit, almost vertical vault 2.5 mm long and steeply conical pelvis 4 mm long, with pelvic angle of 50 degrees; stem round, about 0.5 mm in diameter, with small round lumen; basalia steeply conical, 2.5 mm long by 3 mm wide, composed of three normally disposed basals.

Radials each 3.5 mm long by 2 mm wide with almost vertical sides; radial body 1.25 mm long with slightly flaring radial lip, and basiradial

*Missouri Geological Survey and Water Resources.

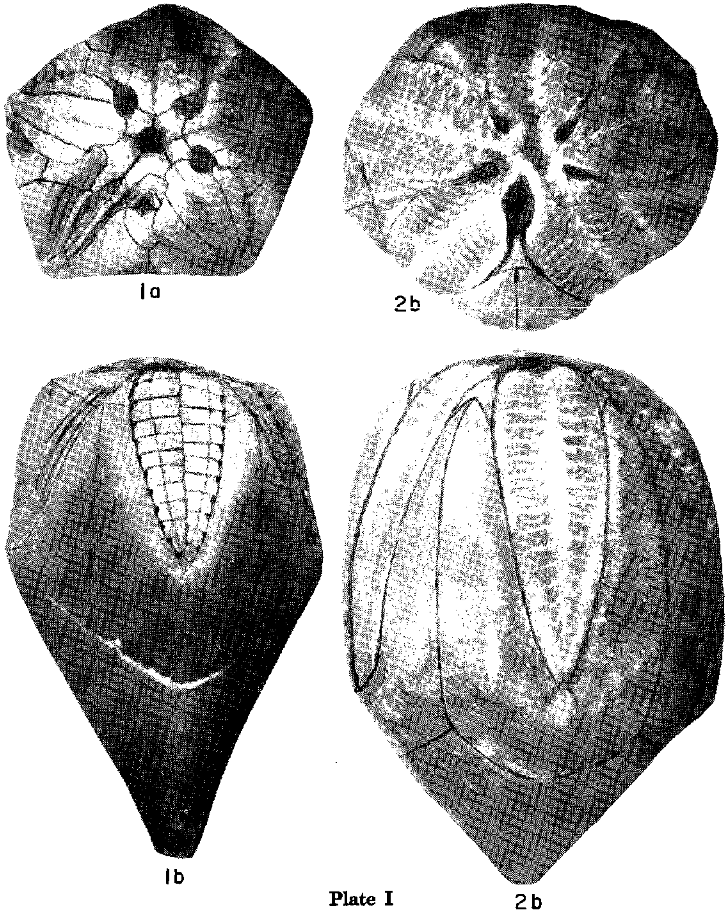

Plate I

Pentremoblastus Fay and Koenig, new genus
McCraney Limestone, Seahorn Hollow, Adams County, Illinois

Figure 1. Pentremoblastus conicus **Fay and Koenig, new species, holotype 15,180, University of Missouri, x12.6**
a. Oral view.
b. (C) ambulacral view.

Figure 2. Pentremoblastus subovalis **Fay and Koenig, new species, holotype 15,188, University of Missouri, x14.0.**
a. Oral view.
b. (C) ambulacral view.

suture angle of 110 degrees; radial limbs 2.25 mm long, meeting adjacent limbs adorally in a point, overlapping deltoids, forming an inverted V-shaped radiodeltoid suture; radial sinuses broad, slightly flattened, broadly petaloid, each 2.5 mm long by 2 mm wide.

Deltoids four, short, inverted V-shaped, with each deltoid body 1 mm long by 1 mm wide, barely visible in side view and almost covered by radial limbs; adorally each deltoid septum is at the surface, loosely meeting adjacent side plates, forming an elongate split-elliptical spiracle between the deltoid lip, lancet stipe, side plates, and septum; deltoid lips subhexagonal, each about 0.5 mm wide by 0.25 mm long, together with the superdeltoid and lancet stipes, surrounding the pentagonal oral opening; on anal side is an anispiracle between side plates, lancet stipes, superdeltoid, subdeltoid, and hypodeltoid; the superdeltoid and hypodeltoid are comparable in size and shape to the deltoid lip and deltoid body of the other four deltoids respectively; the small rounded subdeltoid on the aboral face of the superdeltoid, with two deltoid septa, is comparable to the deltoid septum of each of the other four deltoids; hydrospires two to three on each side of the anal opening, and five on each side of the other ambulacra.

Ambulacra five, broadly petaloid, each 2 mm wide by 3 mm long, with lancet exposed its full width and a single pore between adjacent side plates; each side plate is subquadrangular, about 0.5 mm long by 0.25 mm wide, with a large subtriangular outer side plate on the adoral-abmedial corner of each side plate; ten side plates on each side of an ambulacrum or about 33 in 10 mm length of an ambulacrum, with about five cover-plate lobes per side plate along the main food groove; lancet stipes each 0.25 mm long by 0.25 mm wide.

The surface ornamentation of the basals and radials is composed of fine lirae subparallel to plate margins. The description is mainly that of the holotype.

Types and occurrence.—Holotype, 15,180; seven paratypes, 15,181-15,187, University of Missouri, Columbia, Missouri. Lower Mississippian, McCraney Limestone, two feet above the base, SW¼ NE¼ SW¼ sec. 31, T. 3 S., R. 7 W., creek bluff on south side Seahorn Hollow, about half a mile north of Seahorn, Adams County, Illinois.

Pentremoblastus subovalis Fay and Koenig, new species

Plate I, figures 2a, 2b

Theca calcitic, 8.5 mm long by 6 mm wide, with suboval vault 6 mm long and broadly conical pelvis 2.5 mm long, with pelvic angle of 80 degrees; summit subrounded in side view and rounded pentagonal in top view; sharp ridges extend from basals along interradial sutures to deltoids; basalia 3 mm long by 4 mm wide; radials each 5 mm long by 3 mm wide, with sharp prominent deltoid lip flaring out about 0.5 mm from the tip of the broad sinus; deltoids each 2 mm long by 1.5 mm wide, visible in side view; spiracles five, split-elliptical; anal deltoids, ambulacra, and ornamentation are similar to those of *P. conicus*. The description is that of the holotype.

This species differs from *P. conicus* by having a longer, more rounded vault, a shorter pelvis, and a more rounded outline in top view.

Types and occurrence.—Holotype, 15,188; two paratypes, 15,189, 15,190, University of Missouri, Columbia, Missouri. Lower Mississippian, McCraney Limestone, two feet above base, north side of Seahorn Hollow, SW¼ NE¼ SW¼ sec. 31, T. 3 S., R. 7 W., half a mile north of Seahorn, Adams County, Illinois.

Second Volume of Orlov's *Fundamentals of Paleontology*

Carl C. Branson

The second volume of the fifteen-volume set is the ninth one to be received here (August 21, 1963). New taxa are well concealed in this volume. Six are new names for families of sponges (p. 42, 46, 62). The name *Tschernyschevo-Stuckenbergia* Zhuravleva is used for *Stuckenbergia* Tschernyschev, 1899 (p. 63), for no apparent reason, but she may earlier have noted *Stuckenbergia* Tservinskiy, 1898, Isoptera.

Replacement names for homonyms of sponges are:

Neoaulocystis Zhuravleva (p. 44), for *Aulocystis* Schulze, 1885 (homonym(?) of *Aulocystis* Schlueter, 1885, Coelenterata).

Neomoretia Zhuravleva (p. 46), for *Moretia* Herenger, 1944 (homonym of *Moretia* Robineau-Desvoidy, 1863, Diptera).

Geoditesia Zhuravleva (p. 51), for *Geodites* Carter, 1871 (homonym of *Geodites* Rafinesque, 1832, Reptilia).

Batosphaera Zhuravleva (p. 54), for *Batotheca* Oppliger, 1915 (homonym of *Batotheca* Enderlein, 1905, Hymenoptera).

Occultus Krasnopeeva (p. 58), for *Archaeospongia* Krasnopeeva, 1937 (homonym of *Archaeospongia* Billings, 1861, Porifera).

The curious entry "?*Gerthiella* Zhuravleva, 1956, nom. nov. (*Palaeojerea* Gerth, 1926)" (p. 54) seems in error, but may arise in part from the possible homonymy of Gerth's generic name with *Palaeoierea* Laube, 1864. It is here believed that Gerth's name is a homonym because it was derived from the generic name *Jerea* Lamouroux, 1821, and Laube's name was derived from Fromental's *Ierea,* an illegal emended spelling of the same generic name. Either Zhuravleva did not name the genus in 1956 or the present citation is not "nom. nov."

Sushkin (p. 83) erects the new order Receptaculitida for *Receptaculites, Ischadites,* and related forms. *Ischadites* has recently been shown to be an alga. Several other new orders or suborders and new families are proposed in various classes. New taxa at the generic or lesser level are the following:

Enniskillenia Kabakovitsh, new genus (p. 323), for *Zaphrentis enniskilleni* Edwards and Haime, 1851, and *Z. curvilinea* Thomson is referred to the genus by implication (Tetracoralla, pl. 12, fig. 9).

Chaetetella Sokolov, 1939 (p. 172), but type species *C. filiformis* Sokolov, 1939, is said on explanation of Chaetetida, plate 2, figure 6 to be a nude name. *Chaetetella* Sokolov, 1939, discussed by him in 1955 (Vnigri, Trudy, new series, vol. 85, p. 99), but the species he figured was *C.* n. sp. (pl. 90, fig. 8). Validity of the genus and of its subgenus *Chaetetiporella* seems in doubt.

The following new species are figured in the plates, but are not described. Names are regarded as nude.

Neomphyma pseudofritchi Soshkina, new species (expl. Tetracoralla, pl. 19, fig. 1, Givetian).

Taimyrophyllum sibiricum Soshkina, new species (expl. Tetracoralla, pl. 19, fig. 2, Middle Devonian).

Billingastraea uralica Soshkina, new species (expl. Tetracoralla, pl. 20, fig. 2, Eifelian).

Pseudoptenophyllum sergiense Soshkina, new species (expl. Tetracoralla, pl. 22, figs. 5, 6, Eifelian).

Rennensismilia didyma (Goldfuss) new var. *godoganiensis* Bendukidze (expl. Hexacoralla, pl. 6, fig. 7, Upper Cretaceous). The new Code of Zoological Nomenclature provides (art. 15) that a new name proposed as a variety is not available.

Porites abichi Bendukidze, new species (expl. Hexacoralla, pl. 7, fig. 8, Oligocene).

Cladangia armeniana Bendukidze, new species (expl. Hexacoralla, pl. 10, fig. 1, Oligocene).

The volume consists of 485 pages. Numbering of figures and plates is confusing and is difficult to use.

Porifera	124 text-figures,	9 plates
Archaeocyatha	128 text-figures,	9 plates
Coelenterata		
Hydrozoa	17 text-figures,	3 plates 1-3
Stromatoporoidea		9 plates
Chaetetida	8 text-figures,	3 plates
Protomedusae	1 text-figure,	1 plate
Dipleurozoa	1 text-figure,	1 plate
Scyphozoa	4 text-figures,	1 plate
Conulata	8 text-figures,	2 plates
Tabulata	75 text-figures,	18 plates
Heliolitoidea	4 text-figures,	6 plates
Tetracoralla	108 text-figures,	23 plates
Hexacoralla	68 text-figures,	10 plates
Octocoralla	15 text-figures,	1 plate
Vermes	46 text-figures,	5 plates

The book is Osnovy Paleontologii, (vol. 2), Gubki (Porifera), Arkheotsiaty (Archaeocyatha), Kishechnopolostnye (Coelenterata), Chervi (Vermes), 485 pages, 1962. General editor, B. S. Sokolov. Published by Akademii Nauk SSSR.

Senior Foreign Scientist at The University of Oklahoma

Dr. Hans Frebold of the Geological Survey of Canada is Senior Foreign Scientist under the National Science Foundation at The University of Oklahoma for the first semester of the 1963-1964 academic year. Dr. Frebold is a specialist on the geology of the Arctic regions. He is holding a seminar on Arctic geology for graduate students. On October 17, he spoke at a meeting of the local chapter of Sigma Gamma Epsilon on the Jurassic of western Canada. He presented evidence to show that the Jurassic sea was not divided by a stable land barrier and that the Sundance sea did not directly connect with the Arctic Sea.

ERRATA

Oklahoma Geology Notes, September 1963, Volume 23, Number 9

Page 224, line 14: For **Lepodus** read **Lenodus.**

Page 227, heading: For D. R. Potter read D. E. Potter.

Page 228, lines 7, 8: For **dikyotus** read **diktyotus.**

Page 230, line 21: For **nuda** read **nudus.**

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