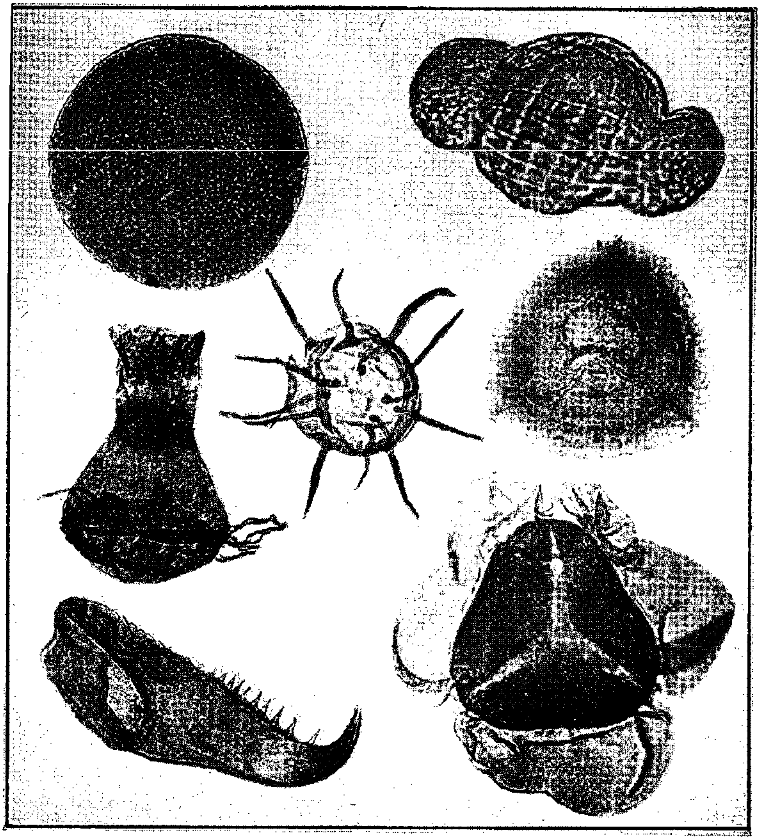
OKLAHOMA GEOLOGY NOTES



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New Theses Added to O. U. Geology Library

The following Master of Science theses were added to The University Oklahoma Geology Library during the month of October, 1960:

Subsurface geology of south-central Pawnee County, Oklahoma, by Richard A. Berryhill.

Subsurface geology of a portion of southern Hughes County, Oklahoma, by Ralph Leon Harvey.

The Mesaverde formation of the northern and central Powder River basin, Wyoming, by Tom E. Purcell.

Areal geology of the Creta area, Jackson County, Oklahoma, by Robert W. Richter.

Areal geology of the eastern Mount Ida area, Montgomery County, Arkansas, by Marion G. Robb.

A subsurface study of the "Cherokee" group, Grant County, and a portion of Alfalfa County, Oklahoma, by Gregory E. Stanbro, Jr.

A geologic study of the post-Meramec pre-Missouri sediments of Bradley area in central Oklahoma, by Ronald C. Withers.

Dimensional grain orientation studies of recent Canadian River sands, by Leonard M. Young.

Subsurface geology of east Pauls Valley area, Garvin County, Oklahoma, by Robert T. Young.

One doctoral dissertation, *The subsurface geology of the McAlester Basin, Oklahoma*, by Ralph W. Disney, was also added to the library, but will be restricted until June 15, 1962.

Common Minerals, Rocks, and Fossils of Oklahoma

Guide Book X of the Oklahoma Geological Survey, *Common minerals, rocks, and fossils of Oklahoma*, by William E. Ham and Neville M. Curtis, Jr., was issued on November 7, 1960. The guide book is especially designed to accompany a set of twenty specimens of rocks, minerals, and fossils which are being made available to teachers in Oklahoma schools. These sets and the guide book will be sent free of charge to qualified schools in the Oklahoma school system. Inquiry should be made of the Director, Oklahoma Geological Survey, Norman.

The guide book alone, may be purchased by the general public for $1.00 per copy. The purpose of the guide book is to introduce the pre-college student to the science of geology and to make him aware of the importance of the mineral resources of his State. It consists of 28 pages, containing descriptions of nine mineral species, eight rock types, and three fossil types. The book also gives a brief account of the geologic history of Oklahoma as well as a summary of the status of the mineral industry of the State. It is illustrated by 27 photographs and a colored geologic map of Oklahoma.

OIL AND GAS IN KINGFISHER COUNTY

LOUISE JORDAN

Exploration and development for oil and gas production has been rapid in Kingfisher County during the year 1960. Such a pace is the culmination of the last four years of exploration during which 25 wildcats were drilled and three old holes were reinvestigated resulting in 17 discoveries (table I). Already this year twelve wildcats have found reserves in new areas or in extensions of earlier discoveries. Two new field discoveries are the result of working over holes drilled in 1947 and 1950. Only four wildcat tests have been dry. Several fields named in 1959 have merged. More than 65 development wells increased the areas of production and found new zones of accumulation. No development wells have been unsuccessful. Average cost per well, including drilling and equipping, is more than $70,000. At North Okarche, the cost of a gas well is reported as $112,000 with Chester production at 8,200 feet (Bike, 1960).

Oil or gas or both have been found in commercial quantities in 14 of the 25 townships of the county. Four townships have not been explored and nine have less than three tests each in their 23,040-acre areas (or 13 tests in 207,360 acres). Figure 1 shows the locations and field names of productive areas and gives the names of the producing zones which range in age from Ordovician to Late Pennsylvanian. Hydrocarbon production has been found in sandstone or limestone at ten stratigraphic positions in the county. These are, in ascending order: Wilcox (Ordovician); Hunton (Silurian-Devonian); Meramec, Manning, and Parvin (Mississippian); Bartlesville, Red Fork, Oswego, Cleveland, and True Layton (Pennsylvanian).

Geology. Kingfisher County is located on the eastern flank of the Anadarko basin in a down-faulted area just west of the north-south trending Nemaha Ridge fault zone which defines the westward extent of the Central Oklahoma arch. Rock units dip and, with a few exceptions, thicken southwestward toward the basin.

More than 10,000 feet of rock, ranging in age from Permian to Ordovician, has been penetrated in the search for oil. The deepest well of the county, located in the southwest (sec. 14, T. 15 N., R. 8 W.), penetrated the upper part of the Simpson group and was abandoned as a dry hole at 10,140 feet. Three wells in the eastern tier of townships (Tps. 17, 18, and 19 N., R. 5 W.) have been drilled into the Arbuckle group.

Permian formations from Garber sandstone to Dog Creek shale, crop out successively to the west and southwest. Permian rocks increase in thickness from 2,200 feet in the northeast to about 4,000 feet in the southwest. A structure map (Arnold, 1956, pl. 1) at the base of the Wellington anhydrite shows a dip of 30 to 35 feet per mile.

Pennsylvanian rocks of the Virgil, Missouri and Des Moines series are about 2,500 feet thick in the northwest and 5,000 feet thick in the southwest. A map contoured at the base of the Pennsylvanian (Arnold, 1956, pl. 3) illustrates an average regional dip of approximately 75 feet per mile. Producing oil and gas reservoirs are in the lower 1,000 to 1,200 feet of the Pennsylvanian section. In descending order, the producing units are: Layton (below the Hogshooter) and Cleveland sands in the lower part of the Missouri series;

Oswego lime, Red Fork, and Bartlesville sands in the Des Moines series. The Oswego lime, described as an oolitic brown to tan limestone which is locally oolicastic, is the principal Pennsylvanian reservoir being developed. Reserves are estimated at 100 barrels per acre-foot (Respess, 1960, p. 94).

In general, Mississippian rocks dip and increase in thickness toward the southwest. The approximate eastern extent of the uppermost series, Chester, is shown in figure 1. Because erosion previous to Pennsylvanian deposition beveled the Chester series eastward, the thickness increases generally westward to approximately 600 feet in the northwest corner of the county and possibly as much as 700 feet in the southwest corner. The section decreases in thickness northward in the northwestern part of the county toward the regional line of truncation as shown by Pate (1959, fig. 10, p. 50). As a result of beveling, the two productive levels in Chester rocks, Parvin* and Manning zones of limestone or, at places, sandstone, are truncated along a general north-south line across the county. Greater than normal thickness is preserved in the northeast corner of the county and extends into southeast Garfield County as the result of either downwarping or faulting previous to Desmoinesian deposition. The west-east cross section (fig. 2) shows eastward decrease in thickness of the Chester series and truncation of the Parvin and Manning units due to pre-Desmoinesian erosion.

Accumulation of oil or gas in Chester rocks is primarily stratigraphic with reservoirs existing where a sandstone or limestone unit becomes less permeable updip or is in contact with and sealed by Pennsylvanian shale. Most fields exist on small structural noses contoured at the base of the Pennsylvanian. Secondary porosity in limestone members appears to be, in part, the result of weathering at the updip limit of the members, and some primary porosity is probably due to the oolitic character of the limestone. Fracturing is also present (Respess, 1960, p. 95). Production from the Manning is primarily oil at North Dover Field and in the Hennessey district. West and south of Kingfisher Manning production is gas. The Manning gas producer in sec. 5, T. 15 N., R. 7 W. is outstanding with 25 million cubic feet per day. Oil potentials range from 80 to over 800 barrels per day, some wells producing naturally (Respess, 1960, p. 95). Parvin zone production is gas with some condensate.

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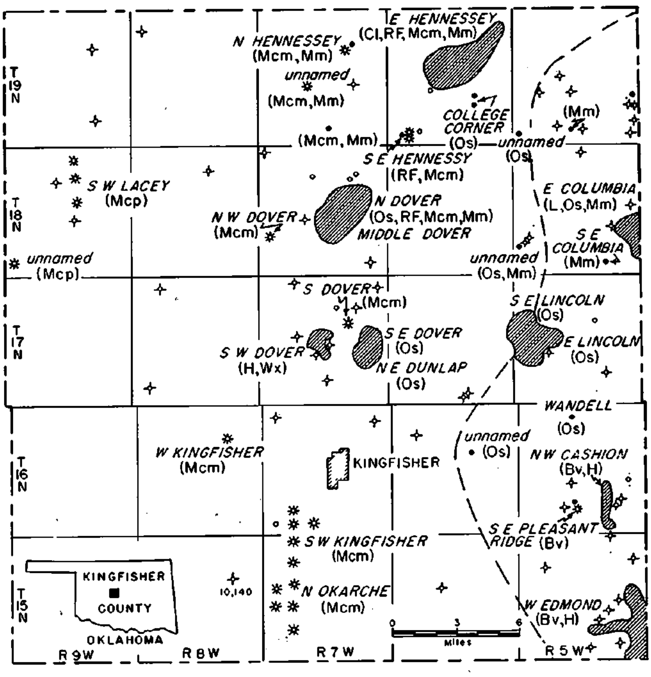
* Name published in **Oil and Gas Journal**, vol. 55, no. 47 (Nov. 25), 1957, p. 167, in reference to new pay discovery in Southwest Lacy Field, Kingfisher County.

Name from the small community of Parvin in NW¼ sec. 32, T. 19 N., R. 9 W., an early trading center near a famous crossing of the Cimarron River. Pay discovered in the Utah Southern Oil Company No. 1 Pope (SW¼ SE¼ NW¼ sec. 10, T. 18 N., R. 9 W.) and mistakenly called Manning zone. Name applied in January 1957 in an unpublished geological report by R. H. Biggart, after consultation with other geologists, to the pay zone in the Utah Southern Oil Company No. 1 Hill (C NE¼ SW¼ sec. 3, T. 18 N., R. 9 W., elevation 1,121 feet).

The Parvin zone consists of two limestone members separated by shale: upper from 7,344-7,377 feet, lower from 7,413 to 7,455 feet in Utah Southern No. 1 Hill. Base of Pennsylvanian at 7,340 feet, top of Manning zone at 7,580 feet. Because of high gas pressure and introduced lost-circulation material it was impossible to be certain of the type of limestone of the Parvin zone in this well (letter from R. W. Biggart, December 31, 1957).

Type log is shown on figure 2, well No. 1.

Oil and gas is being found in calcareous siltstones or highly silty limestones which are Meramec in age and are called "Mississippi lime" by some operators. A thin section of limestone made from a core taken from 6,225 to 6,234 feet (two feet recovery) in Big Chief Drilling Company No. 2 Oltmanns (sec. 25, T. 18 N., R. 5 W.) is illustrated (fig. 4) and the rock is described by C. J. Mankin, School of Geology, The University of Oklahoma. First production in the area from this stratigraphic level was found by the Big Chief Drilling Company in the East Columbia Field (T. 18 N., R. 5 W.), where Pennsylvanian rocks directly overlie the Meramec. Here oil has accumulated beneath the pre-Desmoinesian unconformity under structural and stratigraphic conditions. Cores taken from Meramec rocks at East Columbia exhibit strong vertical fractures and no porosity has been observed in rock cuttings (Miller, 1959, p. 43).



L - Layton Cl - Cleveland Os - Oswego RF - Red Fork
Bv - Bartlesville Mcp - Parvin Mcm - Manning Mm - Meramec
H - Hunton, Misener Wx - Wilcox
— — — Approximate eastern extent of Chesterian rocks

FIGURE 1. Map of Kingfisher County showing oil and gas fields (October 1960) and productive pays in field areas.

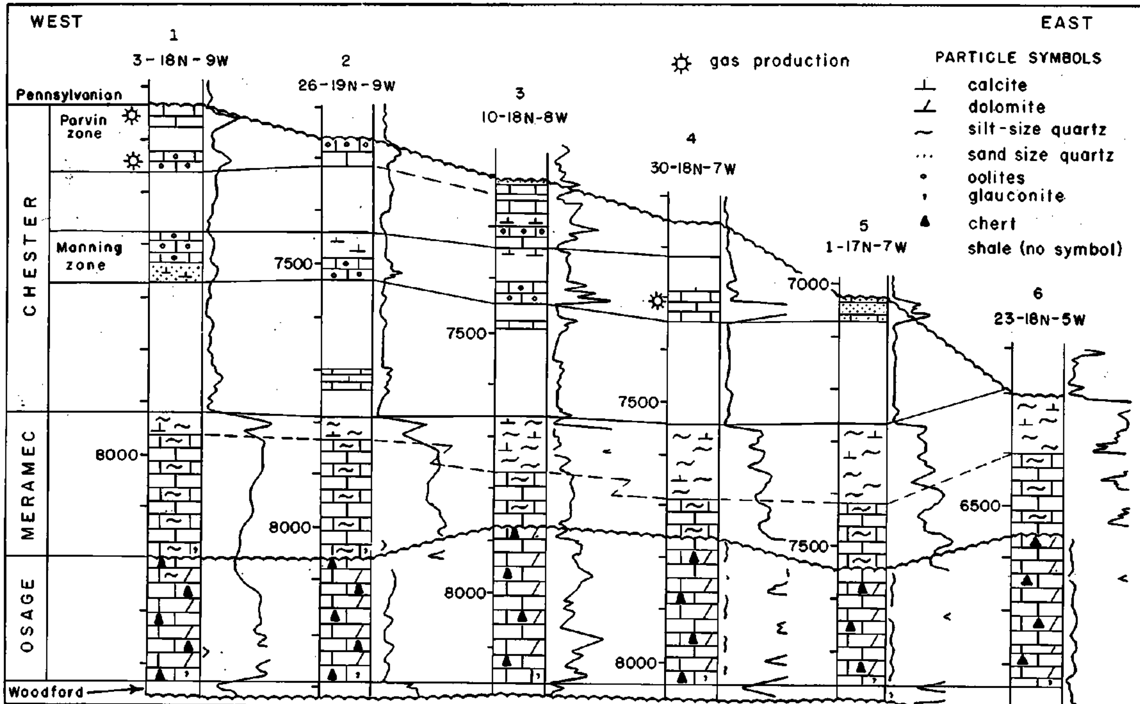


FIGURE 2. West-east cross section showing generalized lithology of Mississippian rocks in Kingfisher County. Datum is top of Woodford shale. Name and location of wells listed in appendix.
(Modified after T. L. Rowland, 1958)

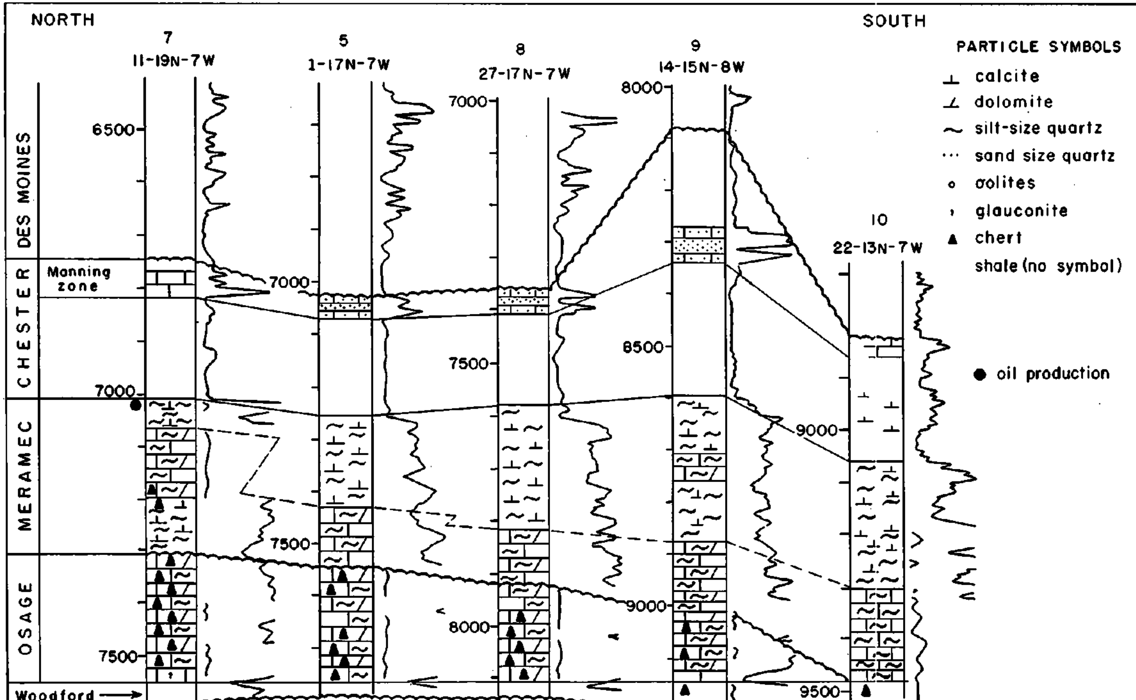


FIGURE 3. North-south cross section showing generalized lithology of Mississippian rocks and thinning and/or truncation of rocks assigned an Osagean age from north-central Kingfisher County into Canadian County. Datum is top of Woodford shale. Name and location of wells listed in appendix.
(Modified after T. L. Rowland, 1958, and R. T. Ellzey, 1960)

TABLE I.—EXPLORATORY HOLES AND FOOTAGE DRILLED, KINGFISHER COUNTY, 1939-1959

	Oil	Gas-condensate	Dry	Total	Footage
1939	0	1	3	4	27,675
1940	0	0	1	1	9,123
1941	0	0	0	0	....
1942	0	0	1	1	8,225[1]
1943-44	0	0	0	0	....
1945	2	0	3	5	37,852
1946	0	0	1	1	7,205
1947	0	0	5	5	38,649
1948	0	1	0	1	9,026
1949	0	0	2	2	12,674
1950	0	0	4	4	33,154
1951	0	0	6	6	37,871[1]
1952	0	0	2	2	13,717[1]
1953	0	0	3	3	24,541
1954	0	0	1	1	8,508
1955	0	0	1	1	6,688
1956	2	2	1	5	36,681
1957	1	1	2	4	28,255
1958	3	2	3	8	55,017[2]
1959	6	0	2	8	46,766[3]
Total	14	7	41	62	441,627

[1] Dry hole reinvestigated, resulting in discovery of hydrocarbon in late 1950's.
[2] Footage of reinvestigated hole, resulting in Northwest Dover discovery, excluded.
[3] Footage of two reinvestigated holes, resulting in East Lincoln and North Hennessey discoveries, excluded.

During current exploration, production is being found at North Hennessey, East Hennessey, and North Dover Fields near or at the top of the Meramec where it is overlain by Chester rocks. Respess (1960, p. 96) states that horizontal and vertical fractures "form the reservoir and establish the drainage pattern for migration of oil into the well bore." Some type of well stimulation is normally required for production from the Meramec. Initial potentials of more than 1,500 barrels of oil have been recorded. At East Hennessey, most wells are dually completed in Manning and Meramec zones. C. M. Cole (1960) advocates drilling into the Meramec with air and the use of parallel strings of tubing and of a side-winder jet gun for perforating the Manning zone.

The term "Mississippi lime" is used in northern Oklahoma to refer either to a section which includes rocks of Meramec, Osage, and Kinderhook age, or to one containing only Osage and Kinderhook rocks where the Meramec has been removed. Thickness of the section in Kingfisher County in the area where Meramec is overlain by Chester ranges from 440 to 550 feet. Because of limited control available, no discernible pattern can be seen in the distribution of the thickness. In eastern townships where Chester rocks are absent, thickness depends upon pre-Desmoinesian structure and erosion. Rowland (1958) divided the "Mississippi lime" into four lithologic units in

Kingfisher County and concluded that unconformities exist at the top and at the base of the Meramec as he, McDuffie (1958), and Thornton (1958) defined the unit. Such unconformities are present at these horizons in northeastern Oklahoma (Huffman, 1958, p. 52, 62).

Three divisions of the Mississippian section (basal Kinderhook unit, not everywhere present, is included with the Osage) are shown in figures 2 and 3. In the north-south cross section (fig. 3) the Osage unit thins southward to extinction and Meramec rock rests upon the Chattanoogan Woodford. Jordan and Rowland (1959, p. 129) demonstrated that the Osage unit thickens northward in northern Oklahoma. The Meramec unit is thickest in western Oklahoma. It must be admitted that the division of the "Mississippi lime" is arbitrarily based on lithology, and that it is difficult to make the division even where well cuttings are studied. The possible presence of unconformities within and at the top of the limestone section poses a problem in making true structure maps and in interpreting a thickness pattern in the area. Weathering of the Meramec unit may have taken place before the deposition of Chester shale. Secondary porosity as well as fractures may be present at places near or at the top of the "Mississippi lime."

Rock units below the Mississippian include (descending order): Woodford and underlying Misener pay, Hunton, Sylvan, Fernvale-Viola, Simpson, and Arbuckle. All units dip to the southwest. A map contoured at the top of the Fernvale-Viola shows a regional dip of approximately 100 feet to the mile (Arnold, 1956, pl. 6). Thickness of the Woodford in western Kingfisher County ranges from 25 feet in the north to 75 feet in the south, but increases to about 150 feet (Arnold, 1956, pl. 9) in the northeastern townships (Tps.

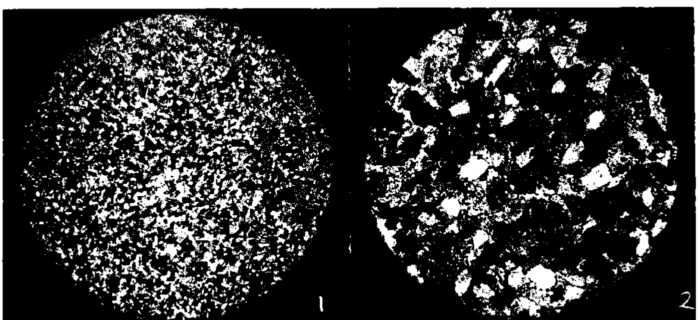


FIGURE 4. Thin section of "Mississippi lime," Meramecian age, from a core fragment taken at a depth of approximately 6,230 feet in Big Chief Drilling Co. No. 2 Oltmanns (NE NW NW 25-18N-5W), Kingfisher County, Oklahoma.

Left: 4 mm diameter, ordinary light
Right: 0.9 mm diameter, crossed nicols

Description: Very coarse siltstone; calcite-cemented pellet-bearing orthoquartzite (Folk classification). Rock is composed of well-sorted angular quartz silt (45%) and carbonate pellets (10%), each with a median diameter of 0.05 mm. Feldspar and other accessory minerals amount to less than 3 percent. The calcite (42%) is very coarse grained (poikilitic); locally the feldspar (plagioclase) has been replaced by calcite.

(Photographs by R. E. Denison, description by C. J. Mankin)

18 and 19 N., R. 5 W.) in the area where Hunton rocks are absent (Tarr, 1955, p. 1855).

Because the older rocks are not being explored in Kingfisher County at the present time, these units will not be discussed. As noted on figure 1, oil production has been found at West Edmond and Northwest Cashion in Hunton rocks, and at Southwest Dover Field in Misener, Hunton, and Simpson. An unpublished Master of Science thesis at The University of Oklahoma by B. M. Arnold, Sr. (1956) describes stratigraphy and structure of the entire rock section penetrated in Kingfisher County, and illustrates the geologic knowledge at that time with 10 structure and isopach maps. Acknowledgment is made to Mr. Arnold for the assistance that his study gave to the writer in preparing this limited report on the geology of the county.

History of exploration. Early records show that approximately 20 tests were drilled in Kingfisher County during the years 1917-1938. Most of the holes are stratigraphically shallow and are not shown on figure 1. All the dry holes shown in figure 1 tested the entire Pennsylvanian section and some were drilled into the upper part of the Ordovician rock section. Among these, two wells drilled in 1930 (sec. 6, T. 16 N., R. 7 W. and sec. 25, T. 19 N., R, 5 W.), one in 1934 (sec. 16, T. 15 N., R. 6 W.), and two in 1939 (sec. 20, T. 19 N., R. 5 W. and sec. 34, T. 17 N., R. 6 W.) were early exploratory tests of rocks as old as Ordovician and increased geologic knowledge of the area.

In 1939, the first production for the county was found by Anderson-Prichard in its No. 1 Geis (C NE¼ SW¼ sec. 15, T. 18 N., R. 9 W.) with an estimated 10 to 12 barrels of condensate and three million cubic feet of gas per day perforated at 7,330-7,352 feet in a Pennsylvanian limestone which is correlated at present with Inola limestone. The test was deepened to the Wilcox (Ordovician) to a total depth of 8,507 feet in 1940 and was the deepest hole in Kingfisher County (Arnold, 1956, p. 71). Gas production of such an amount and distance from a pipe line was not considered important at that time and the well was plugged in 1940 and recorded as dry in the Corporation Commission report. This test might be called the discovery well of the Southwest Lacy Field rather than the Utah Southern Oil Company No. 1 Pope completed one mile to the north in 1956 and producing a similar amount of gas from the same stratigraphic level.

The West Edmond Field was discovered in 1943 in adjacent Oklahoma County, and by 1945 drilling had extended production from Bois d'Arc limestone of the Hunton group into Kingfisher County. Also in 1945, the Northwest Cashion Field, a few miles north of the West Edmond Field, was opened by the Phillips Petroleum Company No. 1 Jirick (C SW¼ SW¼ sec. 25, T. 16 N., R. 5 W.); and Southeast Pleasant Ridge, producing oil from the Bartlesville sand, was found that year also by Phillips Petroleum in the No. 1 Hasley (C SE¼ SE¼ sec. 28, T. 16 N., R. 5 W.).

As a result of these Hunton discoveries, six exploratory holes were drilled in the 1946-1947 period. In 1948, Southwest Dover was opened by Superior Oil Company No. 1 Long (SE¼ SE¼ SE¼ sec. 16, T. 17 N., R. 7 W.). The well was dually completed in Bois d'Arc limestone and Simpson dolomite flowing 11 barrels of condensate and an estimated 8.2 million cubic feet of gas per day. Subsequently production was found in Misener, a sandstone below the Woodford shale and above the Hunton limestone. Development of the field has yielded 14 commercial wells out of 18 tests (Arnold, 1956, p. 72).

In the seven-year period, 1939-1945, 37 exploratory tests totaling 274,908 feet discovered two oil and two gas-condensate productive areas. Of these, only Northwest Cashion and Southwest Dover were developed. Table I lists 19 dry tests amounting to 137,153 feet drilled after the 1948 discovery in the seven years, 1949-1955. However, in the four-year period, 1956-1959, exploratory activity resulted in 12 new oil areas, five gas-condensate fields and eight dry holes from 166,719 feet of new hole. Fracture treatment and acidization of reservoirs has been an important factor in the discoveries. M. C. Respess (1960) discusses the modern well-stimulation techniques used in Kingfisher County for the Oswego, Manning, and Meramec pays. Three holes, abandoned as dry previous to 1956, were reinvestigated and three new areas of production (North Hennessey, Northwest Dover, and East Lincoln) were thus discovered. The footage of these reinvestigated holes is included in table I in the year when the test was originally drilled and not in the year to which the discovery is credited under the oil or gas-condensate column.

The following record of 1956-1959 discoveries (new fields, new pays, and extensions) and results are listed, with a few minor changes, from the annual yearbooks of National Oil Scouts and Landmen's Association.

1956

East Columbia

(a) Discovery *Layton oil* pay. Tennessee Gas Transmission No. 1 Oltmann, NE SW NE 24-18N-5W. Elev. 1083. Pay top 5,394, net pay 22 feet. IP flg. 241 b/d oil, gvty 41.3°, choke 18/64, tbg. press. 250.

(b) New *oil* pay, *Oswego and Meramec*. Big Chief Drlg. Co. No. 1 Oltmann, NE NE NW 25-18N-5W. Elev. 1117. Pay top Oswego 5.940, net pay 20 feet, Meramec 6,219, net pay 6 feet. IP flg. Oswego 170, Meramec 240 b/d oil, gvty. 45°/40°, chokes 20/64, 12/64, tbg. press. 100, csg press-/600.

Southwest Lacy

Discovery *Inola gas-condensate* pay. Utah Southern Oil No. 1 Pope, SW SE NW 10-18N-9W. Elev. 1112. Pay top Inola 7,260, perforated 7,265-7.275, net pay 10 feet. IP 4,000 MCF/d gas, cond. 7 b/d, gvty. 48°, choke 24/64, tbg. press. 450. Inola pay discovered by Anderson-Prichard No. 1 Geis in 1939.

South Dover

Discovery *Manning (Chester) gas-condensate* pay. L. H. Armer No. 1 Gazin, NE NW 14-17N-7W. Elev. 1029. Pay top 7,100, perforated 7,115-7,125, net pay 10 feet. IP 1,050 MCF/d gas, cond. 3 b/d, gvty. 56.8°, tubing press. 2,250, csg. press. 2,280.

1957

Southeast Columbia

Discovery *Meramec oil* pay. Big Chief Drlg. No. 1 Koch, NE NE SE 35-18N-5W. Elev. 1,140. Pay top 6,397, net pay 26 feet. IP flg. 4 b/d oil, wtr 1 b/d, choke open.

Southwest Lacy

Extension *Inola* and discovery *Parvin gas* zones. Utah Southern Oil No. 1 Hill, C NE SW 3-18N-9W. Elev. 1.121. Pay top 7,254, upper Parvin 7,344-7,377, lower Parvin 7,413-7,455 perforated 7,254-64, 7,308-10, 7,350-77, 7,424-45, 7,458-66, net pay 66 feet. IPOF 1,500 MCF/d gas, tbg. press. 385, SIP 3,100.

1958

East Columbia

Extension *Meramec oil* pay 0.5 miles south. Big Chief Drlg. No. 1 Smith, NE NW NE 36-18N-5W. Elev. 1,155. Pay interval 6,290-6,332, net pay 42 feet. IP flg. 7 b/d oil, gvty. 39°.

North Dover

Discovery *Manning (Chester) oil* pay. Jones, Shelburne & Pellow No. 1 Myers, C SW SE 15-18N-7W. Elev. 1,065. Pay interval 7,019-7,029, net pay 10 feet. IP flg. 400 b/d oil, choke 18/64, tbg. press. 525.

Northwest Dover

Discovery *Manning (Chester) gas-condensate* pay. L. H. Armer No. 1 Hobbs, C NW NE 30-18N-7W, originally drilled by Allied Materials in 1951. Elev. 1086. Pay interval 7,309-7,340, net pay 31 feet. IP 1,780 MCF/d gas, cond. 6 b/MMCF, choke 1/2, SITP 2340.

Southeast Lincoln

Discovery *Oswego oil* pay. Texas No. 1 Ash, SE NW NE 19-17N-5W. Elev. 1,018. Pay interval 6,292-6,312, net pay 20 feet. IP flg. 292 b/d oil, gvty. 44°, water 83 b/d, choke 22/64, tbg. press, 425, gas-oil ratio 970/1.

North Okarche

Discovery *Manning (Chester) gas-condensate* pay. Calvert Drlg. No. 1 Grummer, C NE 19-15N-7W. Elev. 1210. Pay interval 8,200-8,210, net pay 10 feet. IPOF 13,164 MCF/d gas, cond. 25 b/MMCF, gvty. 60°, SITP 2,800.

1959

Northeast Dunlap

Discovery *Oswego oil* pay. Calvert Drlg. No. 1 Perdue, NW SE 23-17N-7W. Elev. 1,086. Pay interval 6,787-6,789; 6,795-6,801, 6,713-15, 6,806, net pay 11 feet. IP flg. 320 b/d oil, gvty. 43°, water 5 b/d, choke 24/64, tbg. press 290.

Southeast Dover

Discovery *Oswego oil* pay. Calvert Drlg. No. 1 Corr, SE NW 13-17N-7W. Elev. 1,022. Pay interval 6,649-6,661, net pay 12 feet. IP flg. 300 b/d oil, gvty. 41°, choke 2, SIP 2,320.

East Hennessey

(a) Discovery *Meramec oil* pay. Jones & Pellow No. 1 Schimanek, NE NE 16-19N-6W. Elev. 1,122. Pay interval 6,769-6,836, net pay 67 feet. IP flg. 176 b/d oil, gvty. 39°, choke 15/64, tbg. press. 300.

(b) New *Manning (Chester) oil* pay. Jones & Pellow No. 1 Rickey, C NE SE 16-19N-6W. Elev. 1,134. Pay interval 6,609-15, net pay 6 feet. IP flg. 206 b/d oil, gvty. 38°, choke 16/64, tbg. press. 450.

North Hennessey

Discovery *Meramec oil* pay. Slats Honeymoon No. 1 Brown, SW SE NW 11-19N-7W, originally drilled by Union Oil in 1942. Pay interval 7,016-7,026, net pay 10 feet. IP flg. 168 b/d oil, gvty. 38° choke 14/64, tbg. press. 850.

East Lincoln

Discovery *Oswego* oil pay. Bilinda Petr. No. 1 Shuttler, SW SW 16-17N-5W, originally drilled by Shamrock Drlg. in 1952. Elev. 1,062. Pay interval 6,279-6,281, 6,257-6,262, net pay 7 feet. IP flg. 40 b/d oil, gvty. 43°, water 1 b/d, choke 1/4, tbg. press. 750.

Middle Dover

Discovery *Manning (Chester) oil* pay. King Stevenson No. 1 Wells, NW NW 27-18N-7W. Elev. 1,057. Pay interval 7,050-7,060, net pay 10 feet. IP flg. 35 b/d oil, gvty. 39°, choke 24/64, tbg. press. 520.

1960

The final count for Kingfisher County in 1960 cannot be made at the present time (October) but previously named fields, North and Middle Dover, Southeast and East Lincoln, and South Kingfisher and North Okarche, have merged. Decisions of the Oklahoma Nomenclature Committee are necessary to determine what names these producing areas will have in the future. College Corner and Southeast Hennessey in T. 19 N., R. 6 W., West Kingfisher in T. 16 N., R. 8 W., Wandell, in T. 16 N., R. 5 W. (a reinvestigated hole) have been discovered and named. Unnamed areas of new production are found in the southwest corners of T. 18 N., R. 5 W.; T. 18 N., R. 9 W.; and T. 19 N., R. 5 W., and near the centers of T. 16 N., R. 6 W. (a reinvestigated hole) and T. 19 N., R. 7 W. New pays, Cleveland and Red Fork, have been discovered with development drilling. Only five tests, one drilled in West Edmond Field and four wildcats, have resulted in dry holes in the entire county area. With the assurance that crude and gas pipelines will be laid by Champlin Oil and Refining Company and Oklahoma Natural Gas Company respectively (Petroleum Week, 1960, p. 23) development as well as exploratory drilling will continue in the sixties to extend and increase in number the areas where multiple pay zones are present.

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Appendix

List of Wells used in Figures 2 and 3

1. Utah Southern Co., No. 1 Hill, NE SW sec. 3, T. 18 N., R. 9 W.
2. Atlantic Refining Co., No. 1 Choate Unit, C SE SW sec. 26, T. 19 N., R. 9 W.
3. Champlin Refining Co., No. 1 Wiley, C NW NE sec. 10, T. 18 N., R. 8 W.
4. L. H. Armer (Allied Materials), No. 1 Hobbs, C NW NE sec. 30, T. 18 N., R. 7 W.
5. Foundation Oil Co. et al., No. 1 Martin, C NW SE sec. 1, T. 17 N., R. 7 W.
6. Amerada Petroleum Co., No. 1 Oltmanns, SW SW SE sec. 23, T. 18 N., R. 5 W.
7. Slats Honeymoon Drlg. Co. (Union Oil Co.), No. 1 Brown, SW SE NW sec. 11, T. 19 N., R. 7 W.
8. Magnolia Petroleum Co., No. 1 Kuntz, C SW SW sec. 27, T. 17 N., R. 7 W.
9. Camco Oil & Trust Co., No. 1 Parrington, NW NW NE sec. 14, T. 15 N., R. 8 W.
10. Southern Union Gathering Co., No. 1 Schumacher, C NE NE sec. 22, T. 13 N., R. 7 W.

Oklahoma Geologists and Geophysicists

A *Directory of Oklahoma geologists and geophysicists*, containing the names and addresses of approximately 2,500 Oklahoma members of 14 national and 7 local professional societies related to the geological sciences, was issued by the Survey in November. Copies of the directory may be purchased from the Survey at $1.00 each.

THE TYPE SPECIES OF ORBITREMITES AUSTIN AND AUSTIN 1842, AND ELLIPTICOBLASTUS, A NEW MISSISSIPPIAN GENUS

ROBERT O. FAY

The type species of *Orbitremites* Austin and Austin 1842 is *Pentremites derbiensis* Sowerby 1825, many specimens of which are in the British Museum of Natural History. Four specimens were loaned to the author by Dr. Harold Beaver, Humble Oil & Refining Co., Houston, Texas. The type species occurs in the Carboniferous limestone of Derbyshire and Lancashire, England. The name *Orbitremites*, as first used by Gray (1840, p. 64), is here considered to be a nomen nudum.

ORBITREMITES DERBIENSIS (Sowerby) 1825
Plate I, figures 1-6

An excellent description of *Orbitremites derbiensis* is given by Etheridge and Carpenter 1886 (p. 250), but certain points of morphology of the anal side and the nature of contact of the radials with the deltoids along the suture were not clear. The deltoid plates, which extend to the aboral side of the specimens, overlap the radial plates at a low angle. The anal interradius is occupied by an epideltoid plate and a hypodeltoid plate, with the anal opening between. There appear to be two small unnamed plates, one on either side of the anal opening, which are overlapped by the adoral part of the hypodeltoid. The stem is about 1 mm in diameter with about 50 crenellae extending about one-half the radial distance from the periphery toward the small rounded central lumen. The lancet plate is exposed along the medial one-third of its length except near the extreme aboral tip where it is covered by the side plates. The four spiracles pierce the adoral ends of the deltoids and are elliptical in outline, with thick raised margins. The anispiracle is about twice the size of any one of the other four and is bluntly rounded aborally. The oral opening is concavo-convex, with the concave surface toward the anal side, surrounded by the five deltoid lips. There is one hydrospire fold on each side of an ambulacrum, with a large rounded loop and relatively short walls that form a hydrospire plate that ends beneath the margins of the side plates. There are approximately twice as many pores as side plates, with one pore located near the middle of a side plate and the other placed even with a suture between side plates. The pores appear to be well within the substance of the margins of the deltoid and radial plates, and the thickened portions next to the radial plate are above the admedial wall of the hydrospire fold (medial referring the line of the food groove). This thickened portion is what would be termed the "hydrospire plate," but actually the hydrospire plate is the thin wall of the hydrospire next to the lancet plate and it is slightly thicker at the line of contact between the lancet plate and the radial or detoid plates, and is actually beneath the thickened portion that is pierced by the hydrospire pores. There are about 30 side pates in 10 mm, each broadly rectangular, with broadly triangular secondary side plates resting upon the bevelled adoral and abmedial edges of the primary side plates. A pore canal or furrow is prominent, extending from the center of each primary side plate to the adjacent marginal aboral pore, and a smaller canal or depression extends laterally to a pore near the center of the marginal face of each of the side plates. The brachiolar pit is near the center of the admedial suture between the primary and secondary side plates, with approximately three side cover-plate sockets per side food groove, and five main cover-plate sockets per side plate along the main food groove. The basals are three, small, normal, occurring in a small depression but not deeply impressed.

The stratigraphic range and geographic distribution of species of this genus are not well understood. It is here suggested that the range is limited to the Mississippian and the distribution to England and surrounding area. Further research on other species may extend these limits. The author doubts that *Orbitremites* occurs in North America.

The closest related genus to *Orbitremites* is *Globoblastus*, which is similar to *Orbitremites* in many respects, but differs in that *Globoblastus* has short deltoids, the radials overlap the deltoids, the lancet plate is competely

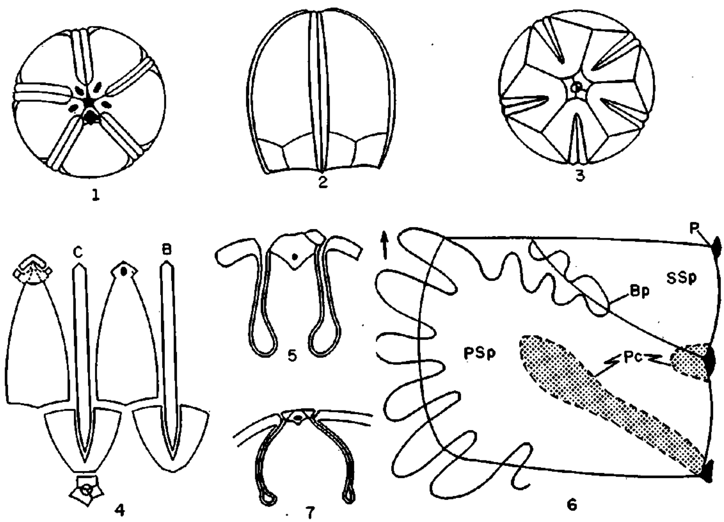

PLATE I

FIGURE 1. *Orbitremites derbiensis* (Sowerby) 1825. Oral view x3.3, after Etheridge & Carpenter 1886.
FIGURE 2. Same, left posterior ambulacral (D) view, x3.3.
FIGURE 3. Same, aboral view, x3.3.
FIGURE 4. Same, plate layout showing B and C radials only, x3.3.
FIGURE 5. Same, cross-section of an ambulacrum, x6.0.
FIGURE 6. Detailed view of side plates, drawn from specimen loaned by Dr. Beaver, specimen no. 4, given to him by Dr. Joysey of Cambridge University, x90.0.
FIGURE 7. Cross-section of an ambulacrum of *Ellipticoblastus orbicularis* (Sowerby) 1834, approximately x3.3, after Etheridge and Carpenter 1886.

covered by the side plates for most of its length, and there are two hydrospire folds beneath each side of an ambulacrum. *Orbitremites ellipticus* (Sowerby) 1825 probably belongs to *Orbitremites*. In this species the deltoids are much shorter than in *O. derbiensis*, but the deltoids overlap the radials and there is one short hydrospire fold with a broadly rounded inner fold. I examined only one specimen of *O. ellipticus*, kindly loaned to me by Dr. Beaver.

Concerning *Orbitremites orbicularis* (Sowerby) 1834, the radials overlap the deltoids, and the one hydrospire fold on each side of an ambulacrum is elongate, with a small rounded inner fold. I have examined two specimens of *O. orbicularis* in the collection of the Philadelphia Academy of Natural Sciences. On the basis of my observations I would strongly recommend that a new genus, here termed *Ellipticoblastus*, be erected to receive similar blastoids, with the type being *Pentatrematites orbicularis* (Sowerby) 1834, pl. 33, fig. 5. This species is essentially identical in all respects to *Orbitremites ellipticus*, except for the above characters. A more complete description will be given in a paper on the blastoids in the collection of the Philadelphia Academy of Natural Sciences. A cross section of an ambulacrum is shown for this species in plate 1, fig. 7. *Ellipticoblastus* differs from *Globoblastus* in that the deltoids are long, there is one hydrospire fold on each side of an ambulacrum, and the lancet plate is exposed almost to the top of the ambulacrum in *Ellipticoblastus*, but not in *Globoblastus*.

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Paragassizocrinus in Oklahoma

Circular 55, *The genus Paragassizocrinus in Oklahoma*, by Harrell L. Strimple, was issued by the Survey in November. The book consists of 37 pages, 2 text-figures, and 3 plates. Eight new species of *Paragassizocrinus* are described. Copies of the report may be purchased from the Survey at $0.75 each.

XXI International Geological Congress

The Norden countries of Denmark, Finland, Iceland, Norway and Sweden were hosts to about 3,000 geologists and accompanying wives from 90 countries at the Twenty-First Session of the International Geological Congress held in Copenhagen, Denmark, August 10 through 25, 1960. Seventy field trips to study the geology of Norden were taken by geologists previous to and following the session. The volume of abstracts lists 688 papers which were presented before the members of the Congress during the six and one-half days of technical meetings. Meetings were divided into 20 sections according to the geological subjects which had been selected for discussion.

All the arrangements for the Congress sessions and the field trips were accomplished by some 400 geologists of the five Norden countries. Probably the greatest accomplishment of these men and women was the editing and publishing of all the presented technical papers, and the preparation of guidebooks of the field trips by August first. Thus, for the first time in the history of the Congress, an attending member could purchase guidebooks for all the field trips, and receive the proceedings of the Congress upon arrival. The Proceedings consisted of 21 volumes, one for each section, a volume of abstracts and the Proceedings of the International Paleontological Union. The set weighed eight pounds, and contained 4,416 pages of technical papers with illustrations. Each volume is called a part of the Report of the Twenty-First Session, Norden.

The titles and numbers of pages of the parts, and the authors and titles of papers which deal with or contain illustrations of Oklahoma geology are listed below.

Part I. Geochemical cycles, 148 p.

Part II. Geological results of applied geochemistry and geophysics, 215 p.
Application of wire-line well logging to subsurface geology, by H. G. Doll, Maurice Martin, and M. P. Tixier.

Part III. Pre-Quaternary absolute age determination, 45 p.
The geological time scale, by J. L. Kulp.

Part IV. Chronology and climatology of the Quaternary, 157 p.

Part V. The Cretaceous-Tertiary boundary, 215 p.

Part VI. Pre-Quaternary micropaleontology, 143 p.
Early Mississippian (Lower Carboniferous-Tournaisian) micropaleontology in the United States, by Raymond C. Gutschick.

Part VII. Ordovician and Silurian stratigraphy and correlations, 157 p.

Part VIII. Late pre-Cambrian and Cambrian stratigraphy, 118 p.
Early Paleozoic tectono-stratigraphic patterns in the United States, by H. E. Wheeler.

Part IX. Pre-Cambrian stratigraphy and correlations, 206 p.

Part X. Submarine geology, 72 p.

Part XI. Regional and structural problems in oil geology, 123 p.

Part XII. Regional paleogeography, 212 p.
Middle Permian evaporites in southwestern Oklahoma, by William E. Ham.

Part XIII. Petrographic provinces, igneous and metamorphic rocks, 451 p.

Silicic differentiates of lopoliths, by Warren Hamilton.

Part XIV. The granite-gneiss problem, 215 p.

Part XV. Genetic problems of uranium and thorium deposits, 614 p.

Part XVI. Genetic problems of ores, 260 p.

Part XVII. Minerals and genesis of pegmatites, 136 p.

Part XVIII. Structure of the earth's crust and deformation of rocks, 454 p.

Part XIX. Caledonian orogeny, 163 p.

The pre-Devonian unconformity in North America, by W. C. Gussow.

Part XX. Applied geology, 93 p.

Part XXI. Other subjects (includes planets, glaciology and glacial geology, regional geology and geomorphology, petrography and sedimentation, paleontology and stratigraphy), 294 p.

Part XXII. International Paleontological Union, 123 p.

Meetings of the Council and of the Bureau of the IGC were held daily after the technical sessions. The official languages of the Congress, as determined by statute, are English, French, German, Italian, Russian, and Spanish. The Organizing Committee of the Norden Congress encouraged the use of English, which is understood by more than twice as many members of the Congress than is any other official language. However, at the meetings of the Council, which consisted of official delegates from member countries and societies, delegates spoke in any one of the official languages and simultaneous translation was given through ear phones as in done at the United Nations.

In addition to these meetings, Commissions of the Congress met to discuss progress of committee work on: 1) The Earth's Crust, 2) The Geological Map of Europe, 3) The Geological Map of the World, 4) The Distribution of the Gondwana System (Karroo), 5) Meteorites, 6) Stratigraphy (Divided into subcommissions on the Stratigraphic Lexicon, Stratigraphic Terminology, Carboniferous Stratigraphy, Mediterranean Neogene, Terminology of the Silurian and Ordovician, and Quaternary Stratigraphy), 7) The Study of Clays, and 8) International Geological Abstracting Service.

The International Paleontological Union, Association of Sedimentology, International Association of Hydrogeologists, International Mineralogical Association, The Geochemical Society, Association des Services Géologiques Africains, Committee for the 2nd International Symposium on Arctic Geology, and a micropaleobotanical group held meetings during the Congress sessions.

In the Council of the Congress, it was agreed that an International Union of Geology be formed. Invitations to hold the 22nd Session of the Congress in 1964 were extended by India and by New Zealand, and India's invitation was accepted. The place and exact dates have not been decided.

There were 145 official delegates from the United States. Five from Oklahoma were R. H. Dott and A. R. Denison, representing the American Association of Petroleum Geologists; W. E. Ham, the Oklahoma Geological Survey; Louise Jordan, Oklahoma City Geological Society, B. H. Parker, Government of the United States and American Association of Petroleum Geologists. Other Oklahoma Geologists who were listed as attending the IGC in Copenhagen are R. W. Edmund, B. M. Kerr, and Marcelle Mousley from Oklahoma City; H. M. Geham, C. H. Keplinger, J. A. Kornfeld, R. A. Pohly, and G. H. Westby from Tulsa; W. F. Gouin from Duncan: J. M. Westheimer from Ardmore; and J. A. Norden from The University of Oklahoma, Norman.

W. E. Ham took the field trip into central Sweden where Cambrian, Ordovician, and Silurian rocks were examined. Two field trips were made by Louise Jordan, one to study the geomorphology and general geology of parts of western Norway and another to examine the geology of northeastern Jutland, the islands of Sjaelland (Zealand) and Mön (Möen), Denmark.

—L. J.

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