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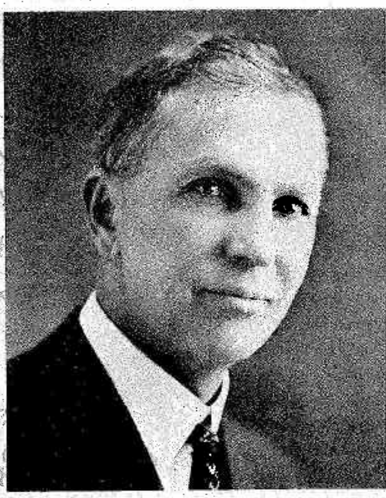
OKLAHOMA GEOLOGY NOTES



CHARLES NEWTON GOULD

OKLAHOMA GEOLOGICAL SURVEY • THE UNIVERSITY OF OKLAHOMA • NORMAN, OKLAHOMA

Cover Picture

Charles Newton Gould

In 1638, eighteen years after the landing of the Mayflower, Zaccheus Gould arrived from England and settled at Topsfield, north of Boston. Charles Newton Gould was the ninth in direct line of descent from Zaccheus.

Dr. Gould was born in a log cabin in Ohio, in 1868. The family moved to Kansas in 1887, where "poor folks lived in dugouts, partly underground, and aristocrats lived in sod houses, above ground." In 1889 a chance lecture at a teachers' summer course fired him with a lasting desire to study geology. He set for himself three objectives: first, to occupy the chair of geology in some state university; second, to become state geologist of some state; and third, to know as thoroughly as one might know, in the course of his life, the geology and mineral resources of the southern part of the Great Plains and the Southwest.

By alternately studying and teaching, he received the B.S. degree in 1899 from Southwestern College and the M.S. degree in 1900 and the Ph.D. degree in 1906, both from the University of Nebraska.

Gould's determined pursuit of his three objectives yielded incalculable contributions to the science and profession of geology in the State. In achieving the first objective he established the department of geology at The University of Oklahoma in the fall of 1900. With his private library of 100 volumes he started a departmental geology library which has become one of the best in the nation. The library now contains more than 66,000 volumes and countless other items of use in geological research. His second objective was attained in 1908, when he founded the Oklahoma Geological Survey, which he ably directed during the periods 1908-1911 and 1924-1931.

The fulfillment of Gould's third objective is attested to by his authorship of nearly 300 publications and by his inspiration of many papers written by others. His *Geology and Water Resources of Oklahoma,* published in 1905 by the U. S. Geological Survey as Water Supply and Irrigation Paper 148, contains the *Preliminary Geologic Map and Sections of Oklahoma Territory.* This map is the first of regional scale to be published for such a large part of the State. Gould also directed the compilation and publication of Oklahoma Geological Survey Bulletin 40, *Oil and Gas in Oklahoma,* issued between 1926 and 1930 as 50 separates and between 1928 and 1930 as three bound volumes. This monumental work, the combined effort of 43 dedicated authors, still ranks as a primary reference, despite its age. Only a man of Dr. Gould's personality and integrity could have inspired such a cooperative effort and carried it through to completion.

—M. C. O.

A Boulder in the Gunter Sandstone, Northeastern Oklahoma

Philip A. Chenoweth*

Only in few instances is it possible to identify a boulder in the cuttings of oil wells. Ordinarily such boulders are composed of essentially the same material as the matrix within which they are enclosed, and the grinding action of the drill bit reduces them to fragments too small to be identified as boulders. The occurrence of an exotic block of igneous rock in the sandstones and dolomites of the Arbuckle Group in northeastern Oklahoma is therefore a noteworthy event, not solely because of its recognition in well cuttings but also because of the stratigraphic implications.

The Lucien Conner 2 Grace Nichols "A" well in sec. 14, T. 22 N., R. 14 E., Rogers County, encountered about 5 feet of igneous rock at a depth of 2,340 feet, passed through this material, and thence through 170 feet of medium- to coarse-crystalline dolomite before reaching the basement. The basement rock is an orange-red porphyritic rhyolite weathered to a dark gray at the upper surface. The phenocrysts are predominantly orange-red or pink feldspar, although some dark greenish-black inclusions are also present. This material is a common and widespread basement rock in northeastern Oklahoma and southern Kansas. Directly above the basement the rock consists of medium-crystalline medium-gray dolomite. Pyrite crystals are common. A few grains of well-rounded fine quartz sand are present, as are also smooth nodules of porcellaneous white chert. If a basal conglomerate is present, it is probably only a few inches thick.

The 5 feet of igneous rock encountered 170 feet above the basement is essentially the same as that of the basement. It occurs in the lower part of the Gunter Sandstone Member of the Gasconade-Van Buren Formation (Ordovician) and rests directly upon the upper beds of the Eminence Dolomite (Cambrian). This level is regarded as an unconformity of regional extent, but nowhere in Oklahoma is there evidence of much relief at that horizon. Sandstone and sandy dolomite are common and widespread directly above the unconformity, and locally the sandstone is quite coarse. The Chapman Ranch Sandstone Member of the McKenzie Hill Formation in the Arbuckle Mountains area is an equivalent; it is locally arkosic but is not reported as bearing boulders. In northeastern Oklahoma and in adjacent states the Gunter is normally fine- to medium-grained well-rounded white quartz sandstone in thin layers and beds intercalated between strata of fine- to medium-crystalline light-gray dolomite. The dolomite is generally sandy; the sandstones are generally dolomitic (fig. 1).

The upper occurrence of igneous rock in this well is interpreted as a boulder, although several alternate explanations are possible. It could, for example, represent a dike, sill, lava flow, fault slice, or even

* Sinclair Oil & Gas Co., Tulsa.

a buried overhanging cliff. These conditions have not been encountered in other wells in the area, however, and they are regarded as less likely explanations for this occurrence. On the other hand, a large number of buried igneous mountain peaks have been discovered in northeastern Oklahoma by oil-well drilling operations. Most of them were not submerged by Cambrian seas, and several remained as islands even as late as Mississippian time. That the Nichols well was drilled near the flanks of such a buried peak seems quite likely owing to the

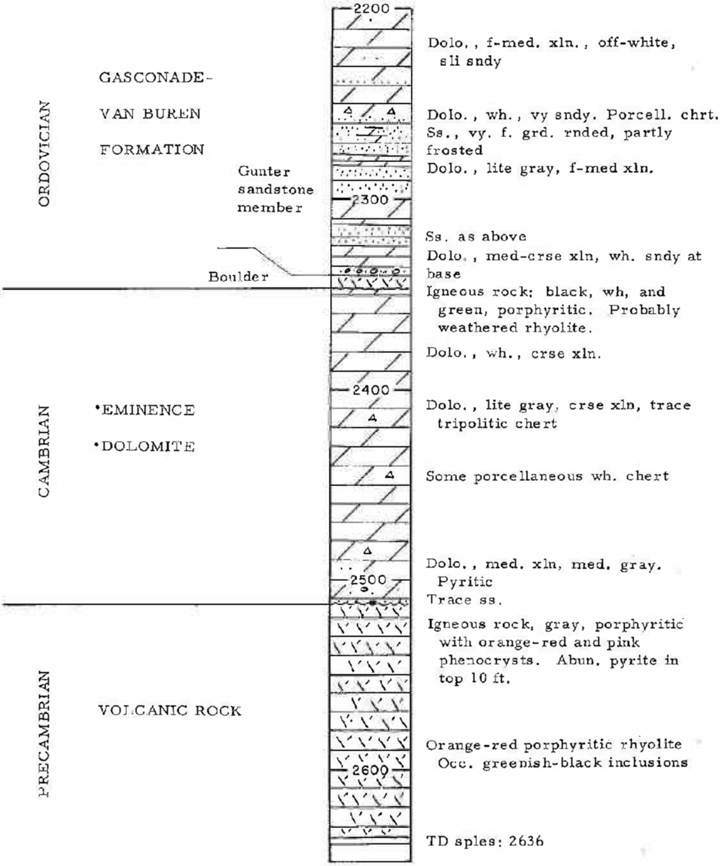


Figure 1. Partial sample log of Lucien Conner 2 Nichols "A" well, Rogers County, Oklahoma. About 5 feet of igneous rock encountered at 2,340 feet is interpreted as a boulder washed from a nearby cliff face during earliest Ordovician time.

absence in the borehole of the basal Cambrian units, Lamotte and Bonneterre Formations. A nearby well, the C. L. Reed and Sons 1-A Koenig, sec. 27, T. 19 N., R. 17 E., had about 120 feet of Lamotte Sandstone and 230 feet of Bonneterre Dolomite intervening between the basement and the Eminence Formation.

It is assumed that during either the brief period of emergence following deposition of the Eminence Formation or during the subsequent advance of the Ordovician waters a block of basement material broke loose from the sea cliffs around a granitic island and slid or was washed to its present position. Other exotic blocks of this sort and of this mode of origin are to be expected in the vicinity of former islands like this, but the chances of encountering them in drilled wells seems extremely remote.

Volume Twelve of Russian Paleontological Treatise

Carl C. Branson

The next to last volume of the 15-volume Osnovy Paleontologii of Orlov (the last will be volume 11, on fishes) has been issued. It consists of 722 pages and has 703 text-figures. The groups treated are amphibians, reptiles, and birds.

One defect noted is the attribution of the family Lysipterygiidae (misspelled Lysipterygidae) to Romer, 1947. Branson named the family in 1935. The authors refrained from creating numerous new names such as marred many of the previous volumes. Those noted are:

Cyclotosauridae Shishkin, new family (p. 96), for Capitosauroidea.
Eobrachyopinae Shishkin, new subfamily (p. 109), for Brachyopoidea.
Lysorocephalidae Tatarinov, new family (p. 158), for Lysorophia.
Variodentidae Tatarinov, new family (p. 306), for Trilophosauria.
Macrobaenidae Sukhanov, new family (p. 391), for Pleurosternoidea.

The announced purpose of the Osnovy is to describe and illustrate forms which occur in Russia or which can be expected to be found in Russia. The contribution of Russian fossils, authors, and illustrations to the volume is meager. More than nine-tenths of the genera treated and illustrated are non-Russian. Nearly all of the illustrations are from such authors as Marsh, Broom, Huene, Cope, Welles, and Romer. It is probably a good guess that the University of Chicago Press collected no reproduction fees.

The volume is Osnovy Paleontologii, vol. 12, Zemnovodnye, presmykayushchiesya i ptitsy.

Section of Beds Overlying the Springer (?) Formation in Ti Valley, Pittsburg County, Oklahoma*

Thomas A. Hendricks†

A thick sequence of alternating beds of sandstone and shale of previously unknown age overlies beds of the Springer (?) Formation between the Pine Mountain and Ti Valley faults in the frontal part of the Ouachita Mountains in southeastern Oklahoma (fig. 1). This sequence of beds is terminated at the top by a fault in all known sections. The beds are weakly resistant and poorly exposed. No fossils have been reported from them.

In May 1938, the author measured an almost completely exposed section of nearly 400 feet of these beds in the dry course of a northward-flowing stream in SW¼ sec. 7, T. 2 N., R. 15 E., Pittsburg County, Oklahoma (fig. 1). In the fall of 1959, while on a field trip conducted by the author, Carl C. Branson collected samples from several promising beds in the section for palynological analysis. Subsequent studies by L. R. Wilson have revealed a well-preserved flora of spores and pollen. The section is published herewith in order to present the available field stratigraphic data to accompany Wilson's description of the microflora, which appears on pages 11-18 of this issue of *Oklahoma Geology Notes*.

These beds were mapped as part of the Atoka Formation by Hendricks and others (1947) on sheet 1, of the preliminary map of the western part of the Ouachita Mountains. However, in the text accompanying the map, it was stated that the strata mapped as Atoka Formation in the structural block southeast of the Pine Mountain fault may actually be a part of the Springer Formation. The field relations are such that the strata can only be classed as younger than the Caney

* Publication authorized by the Director, U. S. Geological Survey.

† U. S. Geological Survey, Denver, Colorado.

Key to Figure 1

Quaternary

Qal **alluvium**

Pennsylvanian

Pa **Atoka Formation**

Pc **Chickachoc Chert**

Ps **sandstone and shale**

Pennsylvanian and Mississippian

PMs **Springer Formation**

PMj **Johns Valley Shale**

Mississippian

Mc **Caney Shale**

Mj **Jackfork Sandstone**

Ms **Stanley Shale**

Mississippian and Devonian

MDw **Woodford Chert**

Devonian

Dpl **Pinetop Chert and unnamed limestone**

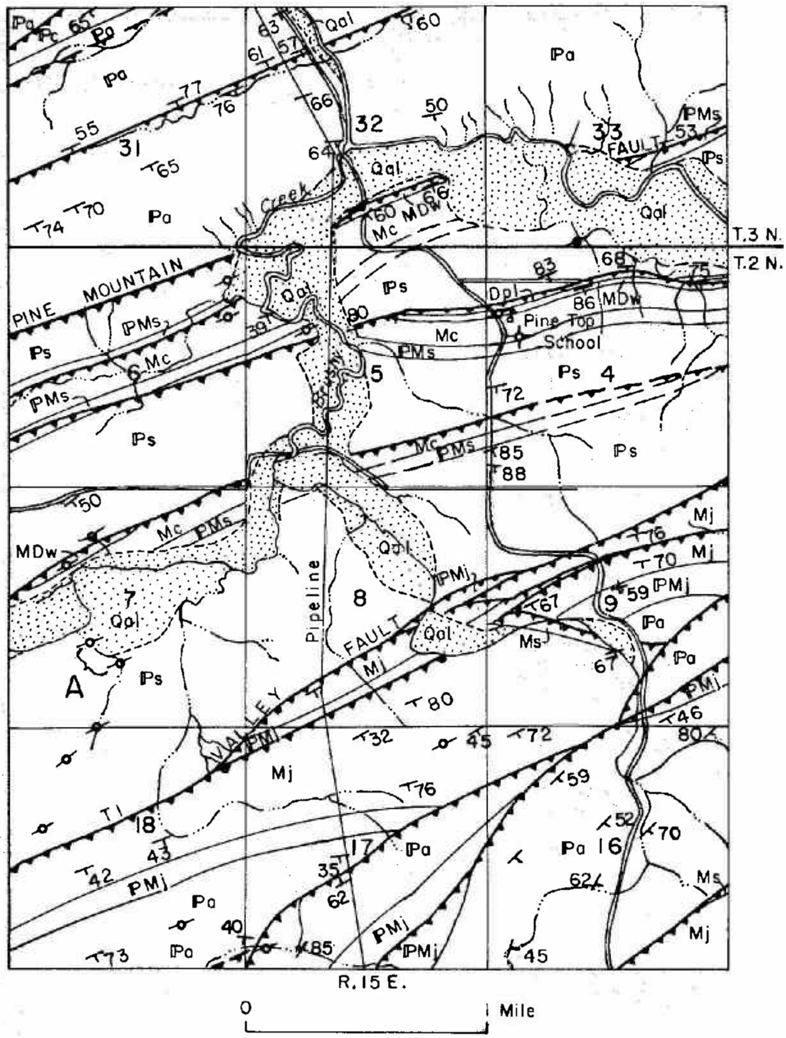


Figure 1. Geologic map of part of Pittsburg County, Oklahoma. Conventional symbols denote contacts, faults, strike, and dip; key to map units is on opposite page. Location of measured section described herein is indicated by bracket at A in section 7.

(Modified from Hendricks and others, 1947)

Shale of Mississippian age and older than the Hartshorne Sandstone of Pennsylvanian (Desmoinesian) age.

Detailed section of beds of Early Pennsylvanian age measured in SW¼ sec. 7, T. 2 N., R. 15 E., Pittsburg County, Oklahoma

	Thickness Feet	Thickness Inches
Bottom of exposed section.		
1. Siltstone, dark-gray, laminated	1	
2. Shale, olive-gray, clayey, blocky to nodular	4	
3. Sandstone, brownish, fine-grained, limonitic	0	6
4. Shale; like no. 2	5	
*5. Sandstone, gray, fine-grained, micaceous, laminated, fairly hard; abundant plant fragments on some laminae; weathers buff	1	
6. Shale, gray; weathers spheroidal to flaky; contains several 1-inch layers of fine-grained, micaceous, carbonaceous, laminated sandstone	8	
7. Sandstone; like no. 5	1	
8. Shale, gray, clayey; weathers spheroidal	4	
9. Sandstone; like no. 5	1	
10. Shale, brown, clayey; weathers to small spheroids	3	
11. Sandstone; like no. 5; thickness ranges from 2 to 4 feet owing to step faulting of base and not of the top	4	
*12. Shale, gray, soft, poorly laminated; where fresh is blocky siltstone containing abundant plant fragments	4	
13. Covered	12	
†14. Shale, greenish-gray, soft, clayey; weathers to small flakes; similar to Stanley Shale	8	
15. Sandstone; like no. 5	4	
16. Shale; like no. 12	12	
*17. Sandstone, olive-gray, medium-grained, very micaceous, lenticular, carbonaceous, limonitic	1	
18. Shale; like no. 12	10	
19. Sandstone, light-brown, fine-grained, laminated, soft	1	
20. Shale; like no. 12	2	
*21. Limonite concretion band	0	2
22. Shale; like no. 12	0	8
23. Sandstone; like no. 17	1	
24. Shale, gray, soft; weathers to gray clay	7	
*25. Limonite concretion band	0	2
*26. Shale; like no. 12 with plates and lenses of olive-gray, fine-grained, micaceous sandstone; with plant fragments. **Palynological assemblage described by Wilson on pages 11-18**	4	
27. Covered	15	
28. Shale and sandstone; like no. 26	8	
*29. Limonite concretion and sandstone lens zone	0	4
30. Shale; like no. 12	1	
31. Sandstone; like no. 17	0	6
32. Shale, gray; weathers to gray clay	5	

* Marks beds with lithology repeated several times in the section.

† Marks beds with lithology particularly similar to known formations elsewhere.

†33. Shale, coal-black, soft, clayey; weathers to small smooth nodules and then to clay; lithology is similar to the softer beds of the Caney Shale	1	
34. Shale and sandstone; like no. 26	20	
35. Sandstone, gray, medium-grained, micaceous; contains plant fragments	0	4
36. Shale; like no. 12	3	
37. Sandstone; like no. 35	0	8
38. Shale; like no. 12	9	
39. Shale, gray to brown, angular, blocky, soft; alternating with brown, fine-grained, laminated, soft sandstone	13	
40. Shale; like no. 12	21	
41. Covered	35	
*42. Shale, gray to brown, silty, angular, blocky, soft	6	
*43. Sandstone, light-brown, fine-grained, laminated, soft	0	6
44. Shale; like no. 12	24	
45. Sandstone; like no. 43	1	
46. Covered	18	
*47 Shale; alternating bands of brown, silty, hackly shale and greenish-gray, clayey, flaky shale that is somewhat similar to Stanley Shale	15	
48. Sandstone; like no. 43	2	
49. Shale and sandstone; like no. 39	12	
50. Sandstone; like no. 43	1	
51. Shale; like no. 42, poorly exposed	10	
52. Shale, gray, soft, clayey	2	
53. Sandstone; like no. 43	0	8
54. Shale; like no. 42	1	6
55. Sandstone; like no. 43	1	
56. Shale; like no. 42	3	
57. Sandstone; like no. 43	0	8
58. Shale, gray, soft, very clayey	2	
59. Shale; like no. 42	3	
*60. Limonite concretion band	0	3
61. Shale; like no. 47	2	
62. Sandstone; like no. 43	1	6
63. Shale; like no. 42	2	
64. Sandstone; like no. 43	0	8
65. Shale; like no. 47	5	
66. Shale; like no. 42	6	
67. Sandstone, brown, fine-grained, micaceous, hackly; contains plant fragments	0	6
68. Shale; like no. 42	3	
69. Sandstone; like no. 43	2	
70. Shale; like no. 47	21	
71. Sandstone, brown, fine-grained, laminated, micaceous, soft	1	
72. Shale, greenish-gray, micaceous, clayey; weathers to small spheroids	3	
73. Sandstone; like no. 43	0	6
74. Shale; like no. 72	2	6
75. Sandstone; like no. 43, lenticular	1	
76. Shale; like no. 42	4	
77. Sandstone; like no. 43	0	8
78. Shale; like no. 42	3	
79. Sandstone; like no. 43	2	6

Reference Cited

Hendricks, T. A., Gardner, L. S., and Knechtel, M. M., 1947, Geology of the western part of the Ouachita Mountains of Oklahoma: U. S. Geol. Survey, Oil and Gas Inv. (Prelim.) Map OM-66, sheet 1.

Dolese Brothers Plant at Richards Spur Described

The crushed-limestone plant of the Dolese Brothers Company at Richards Spur, north of Lawton, is the subject for a comprehensive article recently published in *Rock Products* (Levine, 1964), a leading national trade journal. With a plant capacity of dry stone at the rate of 750 tons per hour, and a capacity of washed products at the rate of about 400 tons per hour, the Richards Spur installation is the largest of its kind in Oklahoma.

Featured in the article are the washing plant and the plant for producing limestone sand, both recently installed to meet more exacting aggregate specifications. These and other facilities were used in producing about 80 percent of the coarse aggregate for approximately 85 miles of the newly constructed Southwest Oklahoma Turnpike.

Established by Dolese Brothers at this site in 1907, the quarry is one of the oldest in continuous operation within Oklahoma.

Large reserves of massively bedded high-quality limestone of the Arbuckle Group are worked in open-face quarries from treeless hills that rise more than 200 feet above the surrounding plain.

Reference Cited

Levine, Sidney, 1964, Crushed stone plant increases facilities to meet stringent specifications: Rock Products, vol. 67, no. 9 (Sept.), p. 92-95.

—W. E. H.

New Theses Added to O. U. Geology Library

The following Master of Science theses were added to The University of Oklahoma Geology Library in December 1964.

The igneous geology of the Navajoe Mountains, Oklahoma, by Samuel Hessa.

Clay mineral geochemistry of the Kramer borate district, Kern County, California, by John Robert Porter, Jr.

Areal geology of Elk City area, Beckham and Roger Mills Counties, Oklahoma, by Alvin H. Smith.

A Master of Geological Engineering thesis, *A subsurface study of Tuscaloosa (Gulfian Cretaceous) formations in the area of Tensas Parish, Louisiana,* by Jon R. Withrow, was also added.

Palynological Age Determination of a Rock Section in Ti Valley, Pittsburg County, Oklahoma*

L. R. Wilson

Stratigraphic ranges of fossil spores and pollen have been studied in Oklahoma for more than a decade, and these fossils have become useful indicators of the geological age of the rocks in which they occur.

The present paper is from a study made of a shale sample from Ti Valley, Pittsburg County, Oklahoma. The rock was supplied to the writer by T. A. Hendricks and C. C. Branson for palynological age determination. Megafossils are unknown from the sequence, and the age of the rocks has been doubtful. A description of the rock section is given by Hendricks in the paper beginning on page 6 of this issue of *Oklahoma Geology Notes*. The rock section is in SW¼ sec. 7, T. 2 N., R. 15 E., and consists of alternating beds of shale, siltstone, and sandstone, and bands of limonite concretions. These rock types range in thickness from as little as 2 inches to as much as 24 feet and total nearly 400 feet. Shale is the predominant rock type of the 79 units measured by Hendricks. The top of the section is terminated by a fault, and the base is covered by slump.

Several samples of shale were processed for palynological study, but only one, a 4-foot section, proved fossiliferous. This sample, collected from unit 26 in Hendricks' measured section, consists of shale, with plates and lenses of olive-gray, fine-grained, micaceous sandstone, and contains plant fragments.

The palynological flora of the Ti Valley shale section contains a large and varied assemblage, but many of the forms, although previously observed in other studies, are as yet undescribed. Several manuscripts, master's theses, and doctoral dissertations on the Caney, Goddard, and Springer Formations (Mississippian), and Morrow, Atoka, Hartshorne, McAlester, and Des Moines rocks (Pennsylvanian) of Oklahoma have been drawn upon for the age determination of the Ti Valley sequence, but new generic and specific names appearing in manuscripts are not used because they are not yet validated.

Some of the fossils in the Ti Valley assemblage consist of well-preserved spores and pollen that are yellow or brown and readily stained by Safranin O, whereas others are poorly preserved specimens that are black and do not take a stain. Fossils of the first group in the assemblage are predominantly Pennsylvanian types and those of the second group are Mississippian. This mixture of fossils showing different degrees of preservation and different ages is commonly found in shales and is evidence that older fossils have been recycled into younger assemblages (Wilson, in press).

The better preserved yellow to brown fossils range stratigraphically downward into the Morrow (Pennsylvanian) rocks, whereas most of the poorly preserved black fossils range stratigraphically up-

(text continues on page 18)

* One project supported by National Science Foundation Grant GB-1850.

Explanation of Plate I

Figure 1. Punctatisporites sp., OPC 198-2-11. 37 x 43 μ. Range: Pennsylvanian (Morrow).

Figure 2. Convolutispora sp., OPC 198-5-4. 39 μ diameter. Range: Pennsylvanian (Morrow).

Figure 3. Granulatisporites sp., OPC 198-2-2. 35 x 37 μ. Range: Mississippian (Springer)-Pennsylvanian (Morrow-Missouri).

Figure 4. Granulatisporites sp., OPC 198-4-7. 30 x 33 μ, granules 1 μ. Range: Mississippian (Springer)-Pennsylvanian (Morrow).

Figure 5. Granulatisporites granularis Kosanke, OPC 198-5-3. 27 x 32 μ, granules 1 μ. Range: Pennsylvanian (Morrow-Missouri).

Figure 6. Granulatisporites sp., OPC 198-5-22. 29 x 33 μ, granules 1 μ. Range: Mississippian (Springer)-Pennsylvanian (Morrow-Missouri).

Figure 7. Granulatisporites adnatus Kosanke, OPC 198-5-8. 33 x 37 μ. Range: Pennsylvanian (Morrow-Missouri).

Figure 8. Acanthotriletes sp., OPC 198-6-17. 29 x 29 μ, spines 2 to 4 μ. Range: Mississippian (Springer)-Pennsylvanian (Morrow).

Figure 9. Stenozonotriletes sp., OPC 198-4-3. 33 x 35 μ. Range: Mississippian (Springer)?-Pennsylvanian (Morrow).

Figure 10. Stenozonotriletes sp., OPC 198-6-18. 51 x 63 μ. Range: Ti Valley section.

Figure 11. Acanthotriletes sp., OPC 198-2-17. 28 x 29 μ, spines 1 to 2 μ. Range: Mississippian (Springer)-Pennsylvanian (Morrow-Des Moines).

Figure 12. Savitrisporites sp., OPC 198-5-7. 39 x 47 μ. Range: Mississippian (Springer)-Pennsylvanian (Morrow).

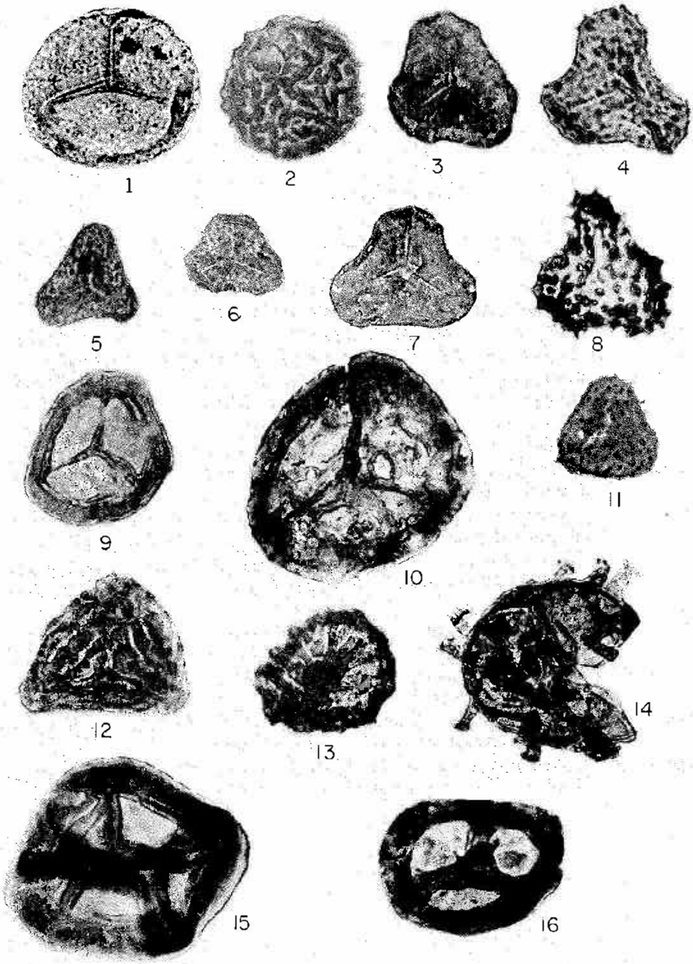
Figure 13. Radiaspora sp., OPC 198-6-19a. 33 x 39 μ. Range: Mississippian (Stanley).

Figure 14. Raistrickia sp., OPC 198-4-9. 49 x 53 μ, processes 6 to 10 μ. Range: Mississippian (Stanley)-Pennsylvanian (Morrow-Des Moines).

Figure 15. Knoxisporites sp., OPC 198-4-2. 49 x 50 μ. Range: Mississippian (Springer)-Pennsylvanian (Morrow).

Figure 16. Knoxisporites sp., OPC 198-6-10. 43 x 49 μ. Range: Mississippian (Springer)-Pennsylvanian (Morrow).

Plate I



Explanation of Plate II

Figure 1. Densosporites covensis **Berry, OPC 198-6-16. 30 x 31 μ. Range: Mississippian (Springer)-Pennsylvanian (Morrow).**

Figure 2. Densosporites **sp., OPC 198-2-10. 32 x 40 μ. Range: Mississippian (Springer)-Pennsylvanian (Morrow-Des Moines).**

Figure 3. Densosporites **sp., OPC 198-5-16. 40 x 40 μ. Range: Mississippian (Springer)-Pennsylvanian (Morrow-Des Moines).**

Figure 4. Densosporites **sp., OPC 198-5-15. 39 x 49 μ. Range: Mississippian (Springer)-Pennsylvanian (Morrow-Des Moines).**

Figure 5. Densosporites **sp., OPC 198-5-10. 35 x 39 μ. Range: Mississippian (Springer)-Pennsylvanian (Morrow).**

Figure 6. Densosporites **sp., OPC 198-6-9. 41 x 49 μ. Range: Mississippian (Springer).**

Figure 7. Lycospora torquifer **(Loose) Potonié and Kremp (?), OPC 198-5-14. 31 x 39 μ. Range: Pennsylvanian (Morrow).**

Figure 8. Cirratriradites saturni **(Ibrahim) Schopf, Wilson, and Bentall, OPC 198-2-19. 69 μ. Range: Pennsylvanian (Morrow-Des Moines).**

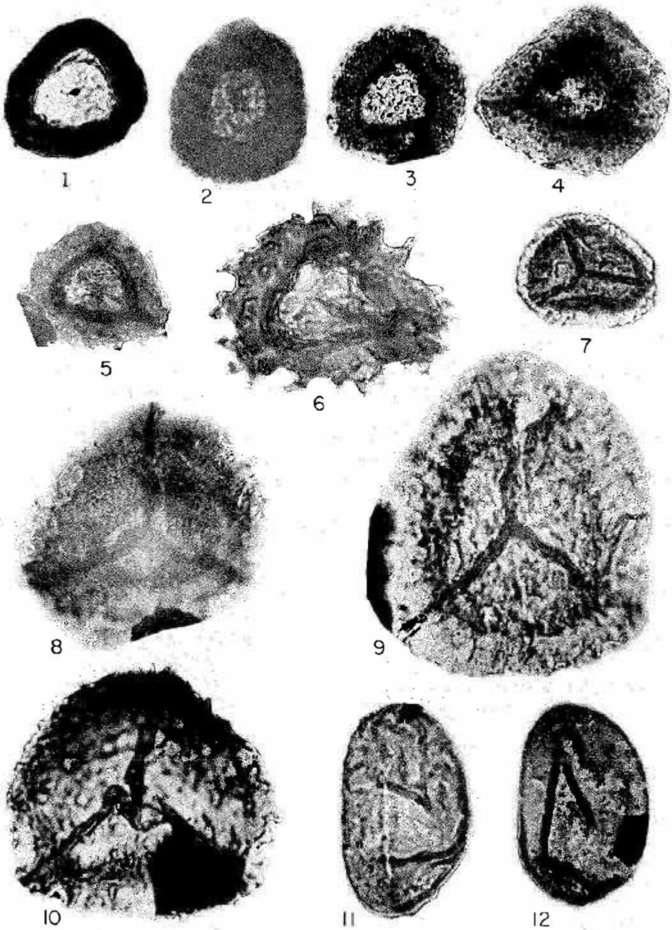
Figure 9. Cirratriradites **sp., OPC 198-4-6. 63 x 72 μ. Range: Mississippian (Springer)-Pennsylvanian (Morrow).**

Figure 10. Spinozonotriletes **sp., OPC 198-6-8. 55 x 63 μ, spines 2 to 3 μ. Range: Pennsylvanian (Morrow).**

Figure 11. Laevigatosporites ovalis **Kosanke, OPC 198-2-21. 30 x 49 μ. Range: Pennsylvanian (Morrow-Virgil).**

Figure 12. Laevigatosporites ovalis **Kosanke, OPC 198-6-7. 27 x 41 μ. Range: Pennsylvanian (Morrow-Virgil).**

Plate II



Explanation of Plate III

Figure 1. Endosporites angulatus **Wilson and Coe, OPC 198-5-1. 79 x 89 μ, endospore 35 x 45 μ. Range: Pennsylvanian (Morrow-Missouri).**

Figure 2. Endosporites ornatus **Wilson and Coe, OPC 198-5-19. 60 x 70 μ, endospore 36 x 40 μ. Range: Pennsylvanian (Morrow-Missouri).**

Figure 3. **Sporomorph A, OPC 198-5-20. 50 x 60 μ, endospore 41 x 50 μ. Range: Pennsylvanian (Morrow).**

Figure 4. **Sporomorph B, OPC 198-2-22. 63 x 75 μ. Range: Mississippian (Springer)-Pennsylvanian (Morrow).**

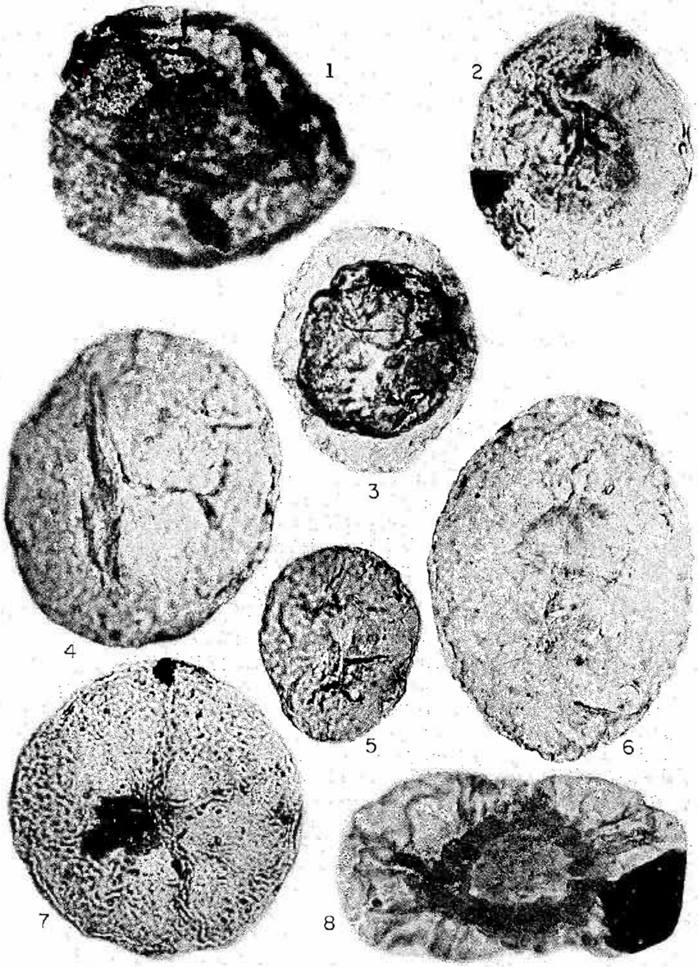
Figure 5. Florinites pellucidus **(Wilson and Coe) Wilson, OPC 198-6-1. 51 x 61 μ, endospore 20 x 24 μ. Range: Mississippian (Springer)-Pennsylvanian (Missouri).**

Figure 6. **Sporomorph C, OPC 198-2-13. 87 x 118 μ. Range: Mississippian (Springer)-Pennsylvanian (Morrow).**

Figure 7. Wilsonites **sp., OPC 198-6-4. Diameter 110 μ. Range: Mississippian (Springer)-Pennsylvanian (Morrow).**

Figure 8. **Sporomorph D, OPC 198-1-3. 39 x 73 μ, central body 30 x 33 μ. Range: Mississippian (Springer)-Pennsylvanian (Morrow).**

Plate III



(continued from page 11)
ward into the Springer (Mississippian), and a few into the Morrow. The palynological assemblage of the Ti Valley section indicates that the age of the rocks is Morrowan, Early Pennsylvanian, and that an older palynological element was recycled during that time from rocks of Late Mississippian age.

The fossils illustrated represent the more common forms observed in the residue preparations of the Ti Valley rock sample, and the microscope slides containing the specimens are in the palynological collection of the Oklahoma Geological Survey.

Reference Cited

Wilson, L. R., in press, Recycling, stratigraphic leakage and faulty techniques in palynology: Grana Palynologica (Internat. Jour. Palynology), Stockholm.

Oklahoma Pennsylvanian Conularida

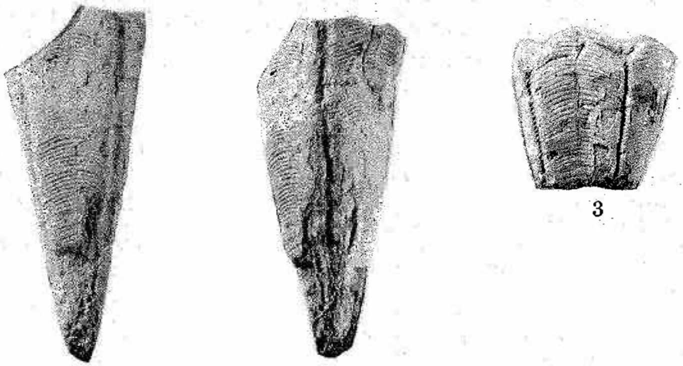
Carl C. Branson

Girty described as a variety *Conularia crustula holdenvillae* (Girty, 1911, p. 125; 1915, p. 44, pl. 5, figs. 1-3) from the Wewoka Formation of Hughes County, Oklahoma. Ries collected specimens of *Conularia* from upper shale of the Seminole Formation 0.24 miles east of NW cor. sec. 3, T. 12 N., R. 10 E., Okfuskee County. Twenty-two specimens are in this lot (OU 1639). Ries (1949, p. 117-118) described from this lot the form *Conularia crustula magna* (as *magnus*), new variety. No holotype was selected, and Ries later (1954, p. 51) listed the form as *Paraconularia crustula* (White). His museum label read *Conularia crustula.* Ries measured specimens up to 53 mm long and emphasized the large dimensions of specimens.

The genus *Calloconularia* (Sinclair, 1952) is in large part distinguished from *Paraconularia* by its small size. Known forms are *Calloconularia strimplei* and *C. holdenvillae. Paraconularia crustula* was described from specimens collected from Pennsylvanian rocks at Kansas City, Missouri (White, 1880, p. 170, pl. 42, fig. 4a), but much of the knowledge of the species is based upon specimens from near Taos, New Mexico (White, 1881, p. xxviii, pl. 3, fig. 4b), considered by White to be conspecific. Keyes (1894, p. 219, pl. 35, fig. 2) illustrated a specimen said to be in the Museum of the Missouri Geological Survey, but he gave no new information. *C. crustula* is an imperfectly known species.

Ries' variety is here raised to specific rank as *Paraconularia magna* (Ries), new combination. The name *magna* would seem to be a probable homonym among the many specific names in the genus *Conularia,* but a partial check does not reveal such a name.

Ries' description is in The Biologist, a publication of Phi Sigma



1 2 3

Paraconularia magna **(Ries, 1949), natural size, Seminole Formation, Okfuskee County.**

Figure 1. Lateral view of the holotype.
Figure 2. Corner view of the holotype.
Figure 3. View near aperture of shell.
(Photographs by Jan Cannon)

Society, and his variety was not illustrated. Two specimens were selected for illustration from the type lot (OU 1639). The more complete specimen is here designated holotype (figs. 1, 2). The holotype is 54.5 mm in preserved length. A fragment of well-preserved shell is figured (fig. 3). *Paraconularia crustula* of Girty (not White) (1915, p. 42-43, pl. 5, figs. 4, 4a, 5) is of the same general size as *P. magna* and is best referred to that species.

References Cited

Girty, G. H., 1911, On some new genera and species of Pennsylvanian fossils from the Wewoka formation of Oklahoma: N. Y. Acad. Science, Annals, vol. 21, p. 119-156.

__________ 1915, Fauna of the Wewoka formation of Oklahoma: U. S. Geol. Survey, Bull. 544, 271 p.

Keyes, C. R., 1894, Paleontology of Missouri, part II: Mo. Geol. Survey, vol. 5, 266 p.

Ries, E. R., 1949, A new Pennsylvanian variety of **Conularia crustula** from the Seminole formation of the basal Missouri Series: The Biologist, vol. 31, p. 117-119.

__________ 1954, Geology and mineral resources of Okfuskee County, Oklahoma: Okla. Geol. Survey, Bull. 71, 120 p.

Sinclair, G. W., 1952, A classification of the Conularida: Chicago Nat. History Museum, Fieldiana, Geology, vol. 10, p. 135-145.

White, C. A., 1880, Fossils from the Carboniferous rocks of the interior states: U. S. Geol. Geograph. Survey Terr., 12th Ann. Rept., p. 155-171.

__________ 1881, Report on the Carboniferous invertebrate fossils of New Mexico: U. S. Geog. Survey West of the 100th Meridian, Rept., vol. 3, supp., app., p. i-xxxviii.

Frisco Formation (Devonian) in Borehole, Jackson County, Oklahoma

Louise Jordan

One of the puzzling areas to map in preparing the forthcoming map showing the distribution of pre-Woodford rocks in Oklahoma (Tarr, Jordan, and Rowland, in press) was that of the western part of the eastern Palo Duro (Hollis) basin in Harmon and Jackson Counties, southwestern Oklahoma. The Mississippian and older rocks are primarily carbonates. The Sylvan Shale, present to the southeast in Tillman County, is absent. Whether the shale thins westward because of truncation, gradation into a carbonate section, or nondeposition is not known. The Woodford Shale is absent in the entire basin. These two formations are exceedingly useful in the subsurface in separating Hunton and Fernvale-Viola carbonates, or Mississippian and earlier carbonates. Because the shale formations are absent and the units are relatively thin, geologists who have studied the area do not agree about which formation rests below the Mississippian carbonate or even, at places, about where the boundary with older rocks occurs.

Mississippian strata in the area rest upon rock sections which may be a Hunton, Fernvale-Viola, Simpson, or Arbuckle carbonate. Southeastward in Tillman County the Simpson strata contain green shale and sandstone as well as carbonate rocks, but the latter type, in my opinion, becomes more dominant in Harmon and Jackson Counties.

Bozovich (1963) studied the pre-Mississippian carbonate rocks in the eastern Palo Duro basin and attempted to correlate these rocks by studying their lithologic type in thin section. He compared the rocks which he found in Tillman County, where the formations are fairly well recognized, with those that he found in Harmon and Jackson Counties. Some well sections were readily divisible, and reasonable correlations were made. Figure 1 is a northwest-southeast cross section showing his correlation and lithologic determinations except for the Tidewater 1 Johnson well.

Bozovich did not carefully study the rock cuttings in the Tidewater 1 Johnson test (sec. 19, T. 3 N., R. 23 W.). Although cores had been cut in this hole, he was unable to locate them. Sears (1951, p. 48) mentioned that C. E. Decker identified a fossil from a core taken in this well from 7,520 to 7,565 feet as being a Silurian-Devonian transition form. Upon further investigation and discussion about the problem of correlation in this area with John W. Broadhead of Cities Service Oil Company in Oklahoma City, it was discovered that cores and fossils from this well had been sent to G. A. Cooper of the Smithsonian Institution, U. S. National Museum, by John H. Webb of Phillips Petroleum Company.

The core (no. 13, depth 7,514.5-7,565 feet, recovery 50.5 feet) was divided by Mr. Webb into an upper part, a fossiliferous white crystalline limestone, and a lower part, a brownish limestone. He considered that the upper part lithologically resembled Hunton more closely than

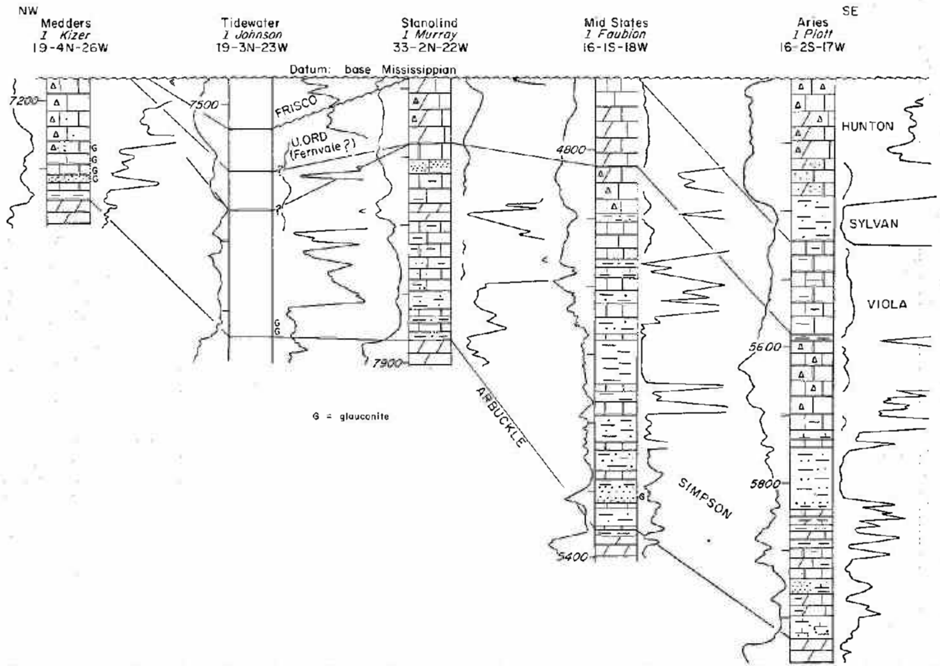


Figure 1. Northwest-southeast stratigraphic cross section in eastern Palo Duro (Hollis) basin showing lithology and correlation by Bozovich (1963) except in regard to Tidewater 1 Johnson test (fig. 2).

anything else, and that the lower brownish limestone was a Viola-type lithology. Mr. Cooper replied as follows:

> The specimens from 7,514 to 7,565 are very interesting indeed because they indicate the presence of the Frisco limestone. The brownish limestone which you suggest as of Trenton age I should say is probably Upper Ordovician or Oklahoma Fernvale. This piece of core contained a strongly convex rafinesquinoid which is suggestive of Upper Ordovician rather than Trenton.
>
> The Frisco pieces, which would represent what you call the upper part of the core, and are in sacks 1 and 2 [upper 20 feet of core], contain **Atrypa,** a **Rensselaeria,** a small chonetid such as occurs in the Oriskany and Gaspé, **Uncinulus,** and a fragment suggesting **Costellirostra.** Another brachiopod occurring in these cores is **Meristella,** but the real clincher for Oriskany age is the **Rensselaeria.**

These fossils and core pieces were deposited by Mr. Webb at the University of Nebraska but have recently been obtained by the Oklahoma Geological Survey and deposited in the collection of T. W. Amsden. Dr. Amsden agrees that the fossils are certainly Oriskany in age and therefore are from the Frisco Formation.

Description of the core by the well-site geologist is as follows:

Top 1 foot (7,414′6″-7,415′6″). Limestone, white to light-gray, coarse-crystalline with pore space filled with fine-crystalline limestone; brachiopods. Spotted fluorescence with good fluorescence along fractures.

2nd 9′8″ (7,515′6″-7,525′2″). As above, fluorescence in fractures only, good odor along fractures; numerous brachiopods.

3rd 1′6″ (7,525′2″-7,526′8″). Limestone, white to light-gray, fine-crystalline with fluorescence along fractures; brachiopods.

4th 9′11″ (7,526′8″-7,536′7″). Limestone, light-brown, coarse-crystalline, dense, with fluorescent spots along fractures; rare calcite crystals; rare laminae of green shale; some asphaltic residue; numerous brachiopods.

5th 26′2″ (7,536′7″-7,562′9″). Limestone, brown, fine- to coarse-crystalline, dense; with fewer brachiopods. No show.

Bot 2′3″ (7,562′9″-7,565′). Limestone, brown, fine-crystalline, tight; rare laminae of gray shale having a green cast.

The top of the Frisco rock type occurs in the 7,450- to 7,460-foot cutting sample, and the top of the unit is placed at 7,456 feet on the electric log (fig. 2). From the core description and the electric log, the base of the Frisco is placed at 7,536 feet, giving a thickness of 80 feet. The top of the Simpson is tentatively placed at 7,600 feet because the underlying section is a limestone with rounded and frosted quartz grains which grades downward into a calcareous sandstone in the 7,620- to 7,630-foot sample. Traces of green shale are present in the cuttings between 7,600 and 7,610 feet. Unfortunately the samples below 7,646 feet to the total depth are poor because of drilling problems, such as twisting off of drill pipe and lost circulation. Sears (1951) placed the top of the Simpson at 7,650 feet, and Schramm (1964) called the 20-foot section below 7,665 feet the Corbin Ranch, uppermost formation of the Simpson Group. The section from 7,536 to 7,650 or 7,665 feet

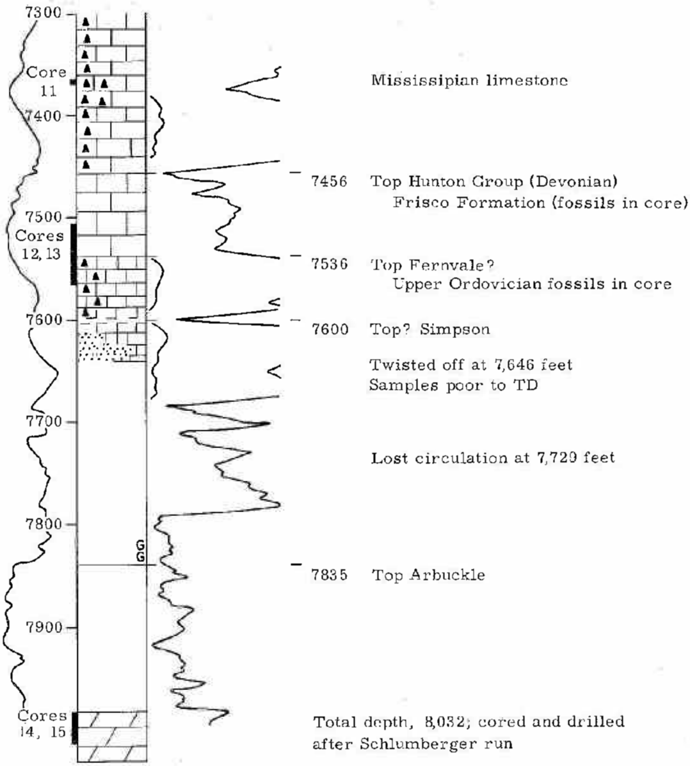


Figure 2. Electric log and formation tops in pre-Mississippian section of Tidewater 1 Johnson test (NE¼ NE¼ SE¼ sec. 19, T. 3 N., R. 23 W.; elevation datum: 1,499 feet), Jackson County, Oklahoma. Standard lithologic symbols are used.

could contain both Fernvale and Viola Limestones. Upon the basis of the electric log, the top of the Arbuckle is placed at 7,835 feet.

Large core pieces and well cuttings collected by Baroid Well Logging Service were found in the Sample Library at The University of Oklahoma. William E. Ham of the Survey staff examined and described two core specimens of Frisco and one of Fernvale from thin sections as follows:

Frisco Limestone. **Depth: 7,514.5-7,524.5 feet** (fig. 3). Crinoidal dolomitic mudstone.

Matrix 70% Dolomitic argillaceous mudstone, consisting of (a) calcite in a mosaic of grains (5-10 μ in diameter), (b) intergranular clay, and (c)

	dolomite rhombs (0.025-0.05 mm in diameter). Also contains some finely divided skeletal debris and calcareous sponge spicules.
Grains 30%	Dominantly crinoid fragments, some with syntaxial overgrowths, mostly of medium to coarse sand size, together with a few fragments of brachiopods. Chert absent. (Jk-1-1, TS H-1096)
Frisco Limestone.	**Depth: 7,524.5-7,534.5 feet.** Skeletal calcite mudstone interstratified with skeletal calcarenite cemented by sparry calcite.
Mudstone:	Inequigranular matrix (50%) of calcite containing rhombs of dolomite. Grains, mostly of medium and coarse sand size, 50%, crinoid fragments dominating over fragments of brachiopods and corals.
Sparry calcarenite (fig. 4):	Debris of crinoids, brachiopods, corals, bryozoans, and trilobites. Contains some entrapped calcite mud, but most of interstitial space is sparry calcite. Grain size as large as that of very-coarse sand (2 mm). (Jk-1-2, TS H-1097)
Fernvale Limestone.	**Depth: 7,544.5-7,554.5 feet** (fig. 5). Biocalcarenitic mudstone.
Mudstone matrix 60%	5-μ calcite grains containing much fossil debris of medium- to coarse-silt size. About 5%

Figure 3. Photomicrograph (x23) of crinoidal dolomitic mudstone, Frisco Limestone, depth 7,514.5-7,524.5 feet. Crinoidal debris, some fragments showing clear syntaxial overgrowths, occurs with brachiopod fragments (lower left) in a dolomitic mudstone matrix. In the matrix are euhedral dolomite rhombs of coarse-silt size.

(Photograph by T. L. Rowland)

	recrystallized to coarse sparry calcite. Dolomite absent.
Grains 40%	Poorly sorted fine to very-coarse skeletal remains mostly of crinoids but with a conspicuous representation of trilobites and brachiopods. Incipient silicification of a few skeletal parts.

(Jk-1-3, TS H-1098)

Strongly affecting Simpson-through-Hunton deposition in the Palo Duro basin was the Texas arch, a mid-Paleozoic structural spur extending southeastward from the old Transcontinental arch in northeastern New Mexico (Adams, 1954). Mississippian rocks rest upon basement in the central part, and upon Arbuckle rocks along the flanks of the arch. The effect of the arch extended into the eastern portion of the Palo Duro (Hollis) basin, and rocks of later age were deposited along the northern flank in Tillman, Jackson, and Harmon Counties. These units, Simpson, Fernvale-Viola, Sylvan, and Hunton (ascending order), all thicken northeastward until interrupted by faults which bound the southern part of the Wichita Mountains complex. Adams (1954) pointed out that the Texas peninsula was similar to the present Florida Peninsula, and discussed the remarkable similarity of sediments deposited on opposite sides—in the Oklahoma basin and in the West Texas basin.

At the time of uplift of the arch most of the area was covered by Ellenburger (Arbuckle) carbonates, and the supply of clastics to the bordering seas was limited. Shoreline deposits consisted primarily of

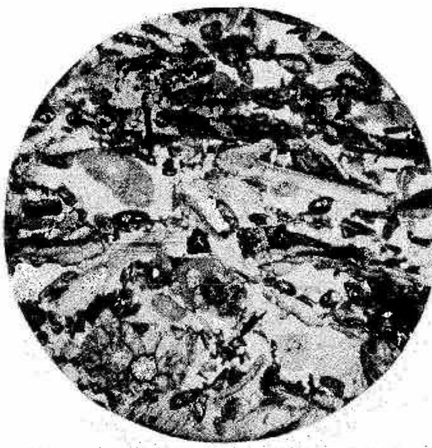


Figure 4. Photomicrograph (x6.5) of skeletal calcite-cemented calcarenite, Frisco Limestone, depth 7,524.5-7,534.5 feet. The skeletal fragments include crinoids, bryozoans, corals, trilobites, and brachiopods, all set in a cement of coarsely crystallized sparry calcite.
(Photograph by T. L. Rowland)

carbonates, but some siliceous clastics were carried in by longshore currents. Adams (1954) considered that shoreline deposits were largely removed from the Oklahoma side of the peninsula by pre-Mississippian erosion, but are better preserved on the southwest flank. Younger strata onlapped the older as the sea progressively encroached upon the peninsula, which was finally submerged during Early Mississippian time.

It seems quite possible that the Woodford Shale was not deposited in the Hollis basin area. In Harmon and Tillman Counties, the Frisco Formation, uppermost unit of the Hunton Group, rests unconformably upon probable Fernvale. The Viola Limestone is probably present, and several formations of the Simpson Group are absent in its thin representation. Schramm (1964) indicated that only some parts of the Oil Creek, McLish, and Corbin Ranch Formations are present in these counties. The Bromide and Joins Formations were probably not deposited in the area. The Oil Creek is present along a northwestward-trending band adjacent to the uplift block which contains the Altus horst. His fence diagram (p. 1167), showing stratigraphic variations within the Simpson Group, indicates that most of the Simpson section in his southwesternmost well (Tidewater 1 Johnson, sec. 19, T. 3 N., R. 23 W.) is the McLish Formation, 150 feet thick, and that it is overlain by 20 feet of Corbin Ranch carbonate.

In this area along the edge of the pre-Woodford Oklahoma basin, onlap and offlap conditions of deposition occurred which are difficult to understand in light of the relatively few tests drilled, most of which were not cored. In most of the tests even the sequence of rock type is uncertain where the beds are thin. In such an area, knowledge of rock

Figure 5. Photomicrograph (x6.5) of skeletal mudstone, Fernvale Limestone, depth 7,544.5-7,554.5 feet. Skeletal fragments, chiefly crinoids, are floating in a nondolomitic mudstone matrix.
(Photograph by T. L. Rowland)

type and fossils is needed to make any kind of definite correlation and conclusion.

References Cited

Adams, J. E., 1954, Mid-Paleozoic paleogeography of central Texas: Oklahoma City Geol. Soc., Shale Shaker, vol. 4, no. 6 (Feb.) p. 4-5, 8-9, **also in** Shale Shaker Digest, vol. 1, p. 238-241 (1955).

Bozovich, Slobodan, 1963, Pre-Mississippian carbonate rocks in the Hollis basin of Oklahoma: Okla., Univ., unpublished Master of Science thesis.

Schramm, M. W., Jr., 1964, Paleogeologic and quantitative lithofacies analysis, Simpson Group, Oklahoma: Amer. Assoc. Petroleum Geologists, Bull., vol. 48, p. 1164-1195.

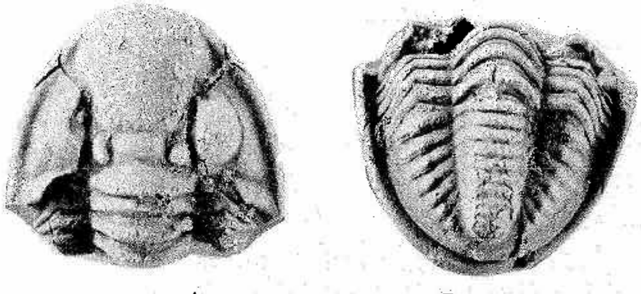
Sears, J. M., 1951, The Hollis basin, southwestern Oklahoma: Okla., Univ., unpublished Master of Science thesis.

Tarr, R. S., Jordan, Louise, and **Rowland, T. L.,** in press, Geologic map and section of pre-Woodford rocks in Oklahoma, showing surface and subsurface distribution: Okla. Geol. Survey, Map GM-9, scale 1:750,000.

Trilobite from the Lenapah Limestone

Carl C. Branson

A fine specimen of a proetid trilobite (fig. 1) was collected by C. M. Cade, III, during his work on the Marmaton Group and listed as *Griffithides* sp. indet. (Cade, 1952, p. 37). The specimen (OU 24) belongs to *Ditomopyge parvulus* (Girty), described from the middle shale of the Wewoka Formation in sec. 2, T. 6 N., R. 9 E., and a locality in sec. 5, T. 6 N., R. 9 E., and sec. 32, T. 7 N., R. 9 E., Hughes County (Girty, 1911, p. 154; Girty, 1915, p. 268-270, pl. 18, figs. 14, 15). Girty placed the species in *Griffithides*, but Weller (1936, p. 711)



A B

Figure 1. Ditomopyge parvulus **(Girty, 1911), Weller 1936. Perry Farm Shale Member of Lenapah Limestone.**

A. View of cephalon and anterior thoracic segments, x4.
B. View of pygidium and posterior thoracic segments, x4.
(Photographs by Jan Cannon)

transferred it to *Ditomopyge*. Girty did not select a holotype and figured two specimens. The original of his figures 14 and 14a is here designated holotype. Our specimen agrees in detail with the holotype. It was collected from the Perry Farm Shale Member of the Lenapah Limestone in the Peerless Rock Company quarry, 1½ miles north of Lenapah, SE¼ sec. 30, T. 27 N., R. 16 E., Nowata County, Oklahoma. Oakes (1952, fig. 3) has demonstrated the equivalence of the Lenapah to the Wewoka, and the occurrence of the trilobite species in the two formations supports his conclusion.

References Cited

Cade, C. M., III, 1952, The geology of the Marmaton Group of northeastern Nowata and northwestern Craig Counties, Oklahoma: Okla., Univ., unpublished Master of Science thesis, 49 p.

Girty, G. H., 1911, On some new genera and species of Pennsylvanian fossils from the Wewoka formation of Oklahoma: N. Y. Acad. Science, Annals, vol. 21, p. 119-156.

__________ 1915, Fauna of the Wewoka formation in Oklahoma: U. S. Geol. Survey, Bull. 544, 353 p.

Oakes, M. C., 1952, Geology and mineral resources of Tulsa County, Oklahoma: Okla. Geol. Survey, Bull. 69, 234 p.

Weller, J. M., 1936, Carboniferous trilobite genera: Jour. Paleontology, vol. 10, p. 704-714.

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