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KGS
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OPEN FILE REPORT

Upper Ordovician and Devonian Conodonts from Supposed Viola Rocks
in Subsurface of Southwestern Kansas

by

Goebel, E. D., Sweet, W. C., and Hilpman, P. L.

Compiled by Doris E. Nodine-Zeller

Conodonts were recovered from Core #3 (7838-7861 feet) in supposed Viola Limestone in the Mobil Oil Company #1 Cunningham Estate borehole, C SW SE section 13, T 34 S, R 37 W, Stevens County, Kansas.

An abstract for a paper delivered at the North Central Section of the Geological Society of America in 1969b (Goebel, Sweet, and Hilpman) follows:

Carbonate strata of undoubted Devonian age have not previously been reported from western Kansas, where Mississippian rocks, some with reworked Devonian conodonts, lie unconformably on Middle and Lower Ordovician carbonate rocks in many places. However, conodonts from the upper 18 feet of a 23-foot core between 7838 and 7861 feet in the Mobil Oil Company No. 1 Cunningham Estate bore hole verify the presence of Devonian rocks in the Voorhees Field of Stevens County, Kansas. On the basis of lithologic correlation by the petroleum industry, the strata in question have been identified as Middle Ordovician Viola Limestone or "Simpson Group."

To a depth of 7856 feet, acetic-acid insoluble residues from 22 samples in the cored interval yield a mixture of Middle and Upper Ordovician conodonts (e.g., Belodina, Panderodus) with a few Middle or Upper Devonian specimens (e.g., Icriodus, Palmatolepis). Specimens exhibit little evidence of reworking. Other genera represented include: Apatognathus, Cordylodus, Cyrtoniodus, Dichognathus, Drepanodus, Oistodus, Ozarkodina, Phragmodus, Polygnathus, Spathognathodus, and Trichonodella. We conclude that the rocks from 7838 to 7856 feet are Devonian (probably Upper Devonian), and that they do not represent the Viola or Simpson strata with which they have been identified.

In the ensuing years, Sweet has completed field work on rocks of similar age, viz. the Whitewood Dolomite (Upper Ordovician) in South

1983: Cunningham Estate remains an unsolved mystery to this time. - DZ

Dakota (overlies Deadwood Formation, Cambrian; underlies Englewood dolomite, Devonian-Mississippian, with angular unconformity). He (1979) states:

In the summer of 1968, I was sent the acid residues from 24 samples, taken at one-foot intervals between 7838 ft and 7861 ft in the Cunningham Estate borehole. Of these, 23 contained conodonts; only one (7860) was barren. Altogether, as the enclosed data sheet shows, I collected 2,614 Upper Ordovician conodonts from these samples. There are 3 re-worked Middle Ordovician forms scattered through the 24 samples, and there are also 159 specimens that are certainly post-Silurian and were identified as Upper Devonian forms by Paul Hilpman. The distribution of all of these specimens is shown in the enclosed table [Table 1.]

Except for a copy of Kansas Sample Log Service Log 8880 [Davies log], I have no other information about the rocks or other fossils from the Ordovician rocks in this borehole. It is unfortunate that I was unable to get any material from the 173 ft of cherty dolomite above 7838 ft, which is also logged as "Viola," but evidently such material was just not available.

Sometime in late 1968 or early 1969, I sent the "Devonian" conodonts I had collected from samples between 7838 and 7853 ft to Paul Hilpman, who identified a number of specimens (including Icriodus and Palmatolepis) that he regarded as Upper Devonian. Subsequently, the slides with these specimens were returned to me so all the Cunningham Estate material would be in one place. However, upon checking through the non-Ordovician slides, I am unable to identify any specimens as Icriodus or Palmatolepis. Probably, Paul kept the identifiable forms (or at least the stratigraphically significant ones) in Lawrence, for I believe he was working on his dissertation at the time. Amongst the specimens logged as "Devonian/Mississippian conodonts" on the enclosed table, however, there are a few that look like Apatognathus, quite a number that are Polygnathus and Spathognathodus (in form-taxonomy), and a large number of fragmentary ramiform elements, which are not much help except to indicate a post-Silurian age.

As indicated on the second sheet enclosed [Table 2], this fauna is Late Edenian and earliest Maysvillian in age. Elsewhere in the Kansas subsurface, components of this fauna are found with specimens of Amorphognathus ordovicicus (species 1 on the diagram enclosed), but species 37 (Pseudobelodina? obtusa) drops out, so I believe those rocks are younger. However, I would expect to see P. obtusa disappear somewhere in the 173 ft of dolomite above the cored interval in Cunningham Estate, too, and perhaps also to find specimens of A. ordovicicus somewhere in that interval.

Were it not for the "Devonian or Mississippian" specimens in numerous samples from the so-called "Viola" in the Cunningham Estate core, I would not have suspected that there was anything wrong with the sequence. The Ordovician association is quite typical; the specimens do not seem to be in especially bad shape; and even fragile ones are preserved. The "Devonian/Mississippian" specimens, on the other hand, are all fragments, except for a very few that are complete enough to identify, and all of them appear to be somewhat considerably "beat up."

In 1969, when the Goebel-Sweet-Hilpman abstract was written, it seemed most logical that the Upper Ordovician forms were re-worked and that the "Devonian/Mississippian" specimens were "telling the stratigraphic truth." Particularly because there are also a few re-worked Middle Ordovician forms here and there in the cored interval.

However, since then, I have encountered almost the same situation in a surface section of the Whitewood of South Dakota. In that section, there is no doubt but that the rocks are Upper Ordovician. They are overlain by Mississippian strata (the Englewood), and there has been obvious solution of the Whitewood prior to deposition of the Mississippian. Despite very careful sampling, however, we still came up with at least a few, very "beat up" Mississippian conodonts in virtually every Whitewood sample from the upper half of the section. So, it is obviously possible for such "leaks" to be very subtle, and I am no longer as confident as I was in 1969 that the Cunningham Estate well provides an example of extensive late Devonian re-working of Upper Ordovician conodonts.

The 2,614 Upper Ordovician conodonts from the Cunningham Estate borehole are parts of a distinctive fauna that is quite widespread in the North American Midcontinent Province. It is typical of at least the lower part of the "Fernvale" of northern Arkansas and northeast Oklahoma; it also occurs in the Whitewood of South Dakota, the lower massive Bighorn of northern Wyoming; the Fish Haven of northeast Utah; the Fremont of Colorado; and the Second Value Formation (Upham Member) of the Montoya Group in west Texas and southern New Mexico.

Perhaps your studies will add some concrete evidence to the puzzle. Since I have never seen the rocks, or any of the other fossils (if any) from this part of the CE borehole, I can go no further in the way of interpretations. Quite obviously, however, strata of "Fernvale" age were present in this part of Stevens County at one time.

Note

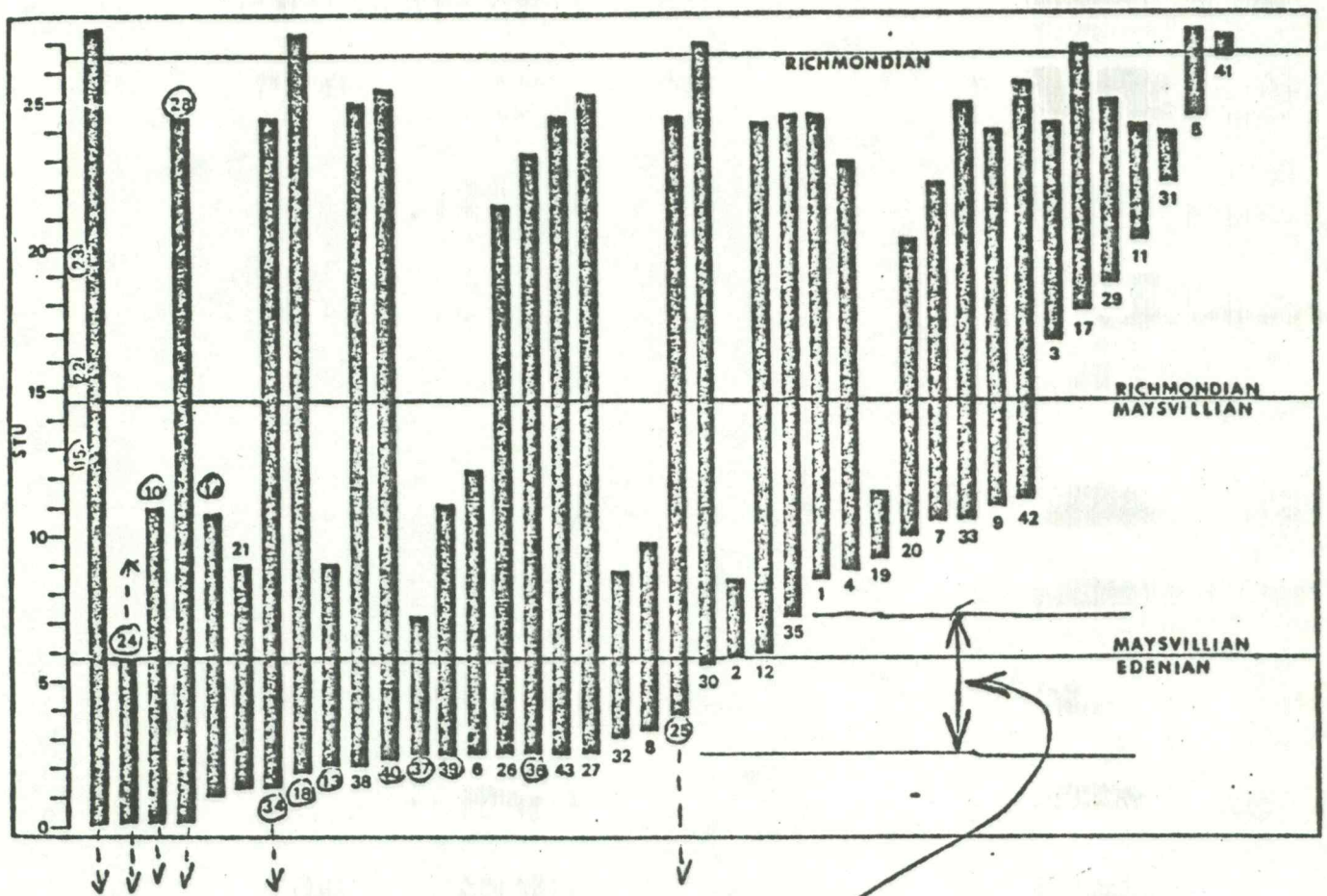
stratigraphic
leak

Perhaps all of the ones logged as "Viola" really are Late Ordovician rocks that have been extensively fractured by solution channels, into which Devonian and/or Mississippian conodonts have "leaked." Or, possibly the whole works is younger than logged.

References

- Goebel, E. D., Sweet, W. C., and Hilpman, P. L., 1969a, [Abstract] Devonian Rocks in Kansas and Their Epeirogenic Significance: Geol. Soc. America, Abstracts with Programs, pt. 6, p. 10.
- _____, 1969b, [Abstract] Late Devonian Age of a Mixed Conodont Fauna from a Core in Southwestern Kansas: Abstracts with Programs for 1969, Geol. Soc. America, North-Central Section, Columbus, Ohio, Part 6, p. 18.
- Hilpman, P. L., 1969a, Western Mid-Continent Stratigraphy and the Kaskaskia Sequence: Programs for 1969, Pt. 2, p. 14.
- _____, 1969b, Devonian Rocks in Kansas and Their Epeirogenic Significance: Unpub. Ph.D. dissertation, Dept. Geol., Univ. of Kansas, 73 p.
- Sweet, W. C., 1979, personal communication with D. E. Nodine-Zeller, letter of January 21, 1979.

TABLE II



Known ranges of conodont species in the Upper Ordovician of the western Piedmontian Province, U.S. (Composite of range data from Whitewood, Bejbar, Fish Haven, Fremont and Montoya).

probable stratigraphic interval represented by the Ordovician conodonts in the Cunningham Estate 'Viola' between 1838-1856.

Numbered circles are species also represented in samples between 1838

1/30/99 - Personal talk with Ed. Doebel about getting
out this info. in published form. Saw him copy of this
correspondence. - DZ

Mail
#1 Cunningham Estate
T 34 S, R 31 W OSU
C 5 W SE 13
Stevens Co., Ks.

The Ohio State University

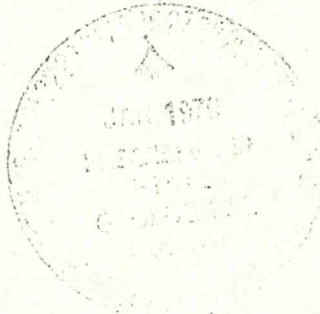
COPY

Department of Geology
and Mineralogy

107 Mendenhall Laboratory
125 South Oval Mall
Columbus, Ohio 43210
Phone 614 422-2721

January 21, 1979

Doris Zeller
Kansas Geological Survey
University of Kansas
Lawrence, Kansas



Dear Doris:

Enclosed is the information I promised to send you on the Cunningham Estate well and its conodonts. Sorry I didn't get it to you at the end of last week, when I promised, but the end of this one is so close (as my schedule goes) that this is right on time!

In the summer of 1968, I was sent the acid residues from 24 samples, taken at one-foot intervals between 7838 ft and 7861 ft in the Cunningham Estate borehole. Of these, 23 contained conodonts; only one (7860) was barren. Altogether, as the enclosed data sheet shows, I collected 2614 Upper Ordovician conodonts from these samples. There are 3 re-worked Middle Ordovician forms scattered through the 24 samples, and there are also 159 specimens that are certainly post-Silurian and were identified as Upper Devonian forms by Paul Hilpman. The distribution of all of these specimens is shown in the enclosed table.

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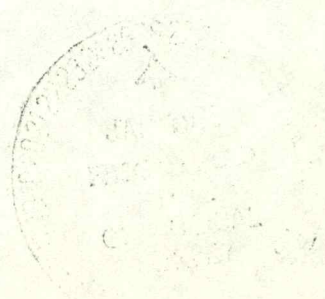
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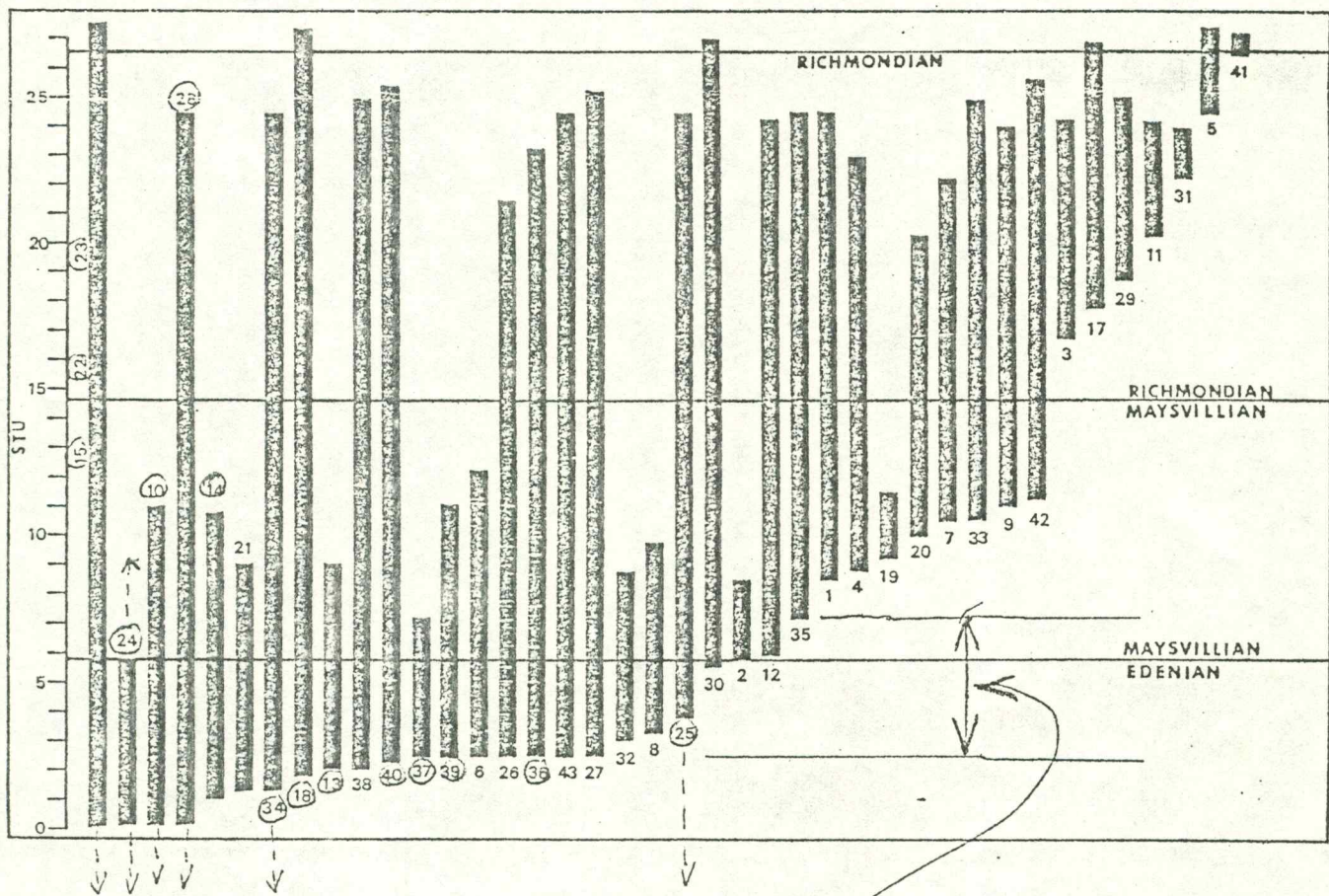
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Hope this information will help for now. If you think more should be made of it, let me know and I'll help in any way I can. It would still be nice to have samples from the upper 173 ft of the 'Viola', but the material may just not be available.

Best regards,


Walter C. Sweet
Professor





Known ranges of correlative species
in the Upper Ordovician of the
western Piedmontian Province,
U.S. (Composite of range data from
Whitehead, Bejbaru, Fish Haven,
Fremont and Montoya).

probable stratigraphic interval
represented by the Ordovician
conodonts in the Cunningham
Estate 'Viola' between 7838-7856' (1780

Numbers circled are species also represented in samples between 7838-7856
in Cunningham Estate core, SW Kansas.

REPORT

MOBIL OIL CO. #1 CUNNINGHAM ESTATE
C SW SE sec. 13, T 34 S, R 37 W
Stevens Co., Kansas
Elev. 3149 TD8714

April 14, 1977

8740 - Devonian palynomorphs (spores) recorded by me at this depth.
(Referred to Viola (M. Ord.) on top card) (June 1972)
Spore size: 0.011 mm

Hilpman (1969) states (p. 36):

"^{the}undoubted Devonian carbonate rocks have never been reported anywhere in Southwest Kansas Basin prior to this investigation, and rocks comprising unit D have been generally considered to be Viola Limestone (Middle Ordovician). "

"In both cores, unit D rests unconformably on underlying Ordovician rocks. In the No. 1 Elsea well, there is little doubt that the underlying strata represent the Viola Limestone, but in the No. 1 Cunningham Estate well there is insufficient data at present to make such a judgment. Unit D is overlain unconformably by unit E and ranges in thickness from zero at the erosional margins to 191 feet in the No. 1 Cunningham Estate well."

Two additional cores of unit D were studied by W. C. Sweet and E. D. Goebel, and they contained a Devonian fauna, also. See Goebel, Sweet, & Hilpman, 1969 (Abstract), Late Devonian age of a mixed conodont fauna from a core in southwestern Kansas; Geol. Soc. America, North-Central Section. (Not published that I know of)

Doris E. Nodine-zeller
Micropaleontologist