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# The Glenwood - Platteville Disconformity

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Roberts, M. C., 1963, Some empirical regularities of the Humber River drainage net: *Iowa Acad. Sc. Proc.*, V. 70, p. 321-326.
Watt, A. K., 1955, Pleistocene geology and ground-water resources of the township of North York, York County: V. 64, Part 7, *Ann. Rept. Ont. Dept. Mines*, p. 1-64.

# The Glenwood - Platteville Disconformity

E. CHARLES GULDENZOPF

*Abstract.* Evidence for a disconformity between the Glenwood Member of the St. Peter Formation and the Pecatonica Member of the Platteville Formation is advanced in this report.

Physical lines of evidence are the presence of floating St. Peter sand grains and the presence of phosphate grains and pebbles in the basal Pecatonica at several localities in Iowa, Wisconsin and Illinois.

Faunal evidence for a disconformity consists of the distribution of four conodont genera within these two units. *Chirognathus* spp. is found in the Glenwood and the basal Pecatonica, but no higher, while the genera *Polyplacognathus, Belodina* and *Eobelodina* first appear in the Pecatonica and are not found in the Glenwood. The presence of a "mixed fauna" at the base of the Pecatonica is taken as evidence of an erosion surface in which Glenwood conodonts have been reworked and redeposited along with Pecatonica forms.

## INTRODUCTION

An abundant conodont fauna was secured by the author from the Middle Ordovician Glenwood Shale and Pecatonica Dolomite in northwestern Illinois, southwestern Wisconsin and northeastern Iowa. The study was carried out under the supervision of Dr. W. M. Furnish of the University of Iowa from 1962 to 1964.

Of 1,883 identifiable conodonts recovered, 755 were from the Glenwood, 1,086 from the Pecatonica and 42 from the McGregor Limestone. Of the conodonts in the Pecatonica, 537 of them were found in the lower six inches of the unit and most of these are abraded and fragmented.

On the basis of the stratigraphic distribution of four conodont genera and associated physical characteristics of the rocks themselves a disconformity between the Glenwood and Pecatonica is recognized here.

The Glenwood Shale was named by Calvin (1906) for outcrops in Glenwood Township, Winneshiek County, Iowa and the Pecatonica was named by Hershey (1894) for exposures found

in the Pecatonica valley near the Wisconsin line and northward." The term fell into disuse until it was resurrected by Kay in 1935.

In this report, the following stratigraphic units are recognized:

Platteville Formation
  McGregor Member ..... Unconformity?
  Pecatonica Member
    Medusa Beds
    New Glarus Beds
    Dane Beds
    Chana Beds
    Basal sandy bed* (informal) ..... Unconformity
St. Peter Formation
  Glenwood Member
    Harmony Hill Beds
    Loughridge Beds
    Daysville Beds
    Kingdom Beds ..... Unconformity?
  Tonti Member

This classification is adapted and modified from Templeton & Willman (1963), but the stratigraphic units have been reduced in rank.

*Hennepin Member of Templeton & Willman (1963)

## Localities

Three sections in which the Pecatonica-Glenwood contact is exposed will be discussed. Samples were taken at 1½–to 2-foot intervals and reduced for their conodont faunas, thus assuring rather close stratigraphic control. The localities cited in this report are described in greater detail in Guldenzopf (1964). The locality numbers here are also from the same source.

*Locality* 2–Ravine section 3 miles southwest of Oregon, Ogle County, Illinois, in the NE¼, NE¼, Sec. 24, T. 23 N., R. 9 E. The lower part of the Dane Beds, the Chana Beds and the Basal sandy bed of the Pecatonica are exposed here. The entire Glenwood is exposed at this locality. The Harmony Hill Shale immediately underlies the Pecatonica. The sequence is summarized as follows:

| | Thickness Ft. | In. |
|---|---|---|
| Platteville Formation | | |
| Pecatonica Member | | |
| Dane Beds – Dolomite: pure, thin-bedded. ..... | ±10 | 0 |
| Chana Beds – Dolomite: increasingly sandy and phosphatic toward base ..... | 8 | 10 |
| Basal sandy bed – Dolomite: arenaceous; very sandy, phosphatic, abundant fresh and abraded conodont materials ..... | 0 | 8 |
| Total Pecatonica ..... | 19 | 6 |
| St. Peter Formation | | |
| Glenwood Member | | |
| Harmony Hill Beds – Shale: glauconitic; green, thinly-laminated, abundant fresh conodont materials ..... | 6 | 0 |
| Loughridge Beds – Sandstone; argillaceous; coarse-grained, angular to subangular ..... | 6 | 6 |

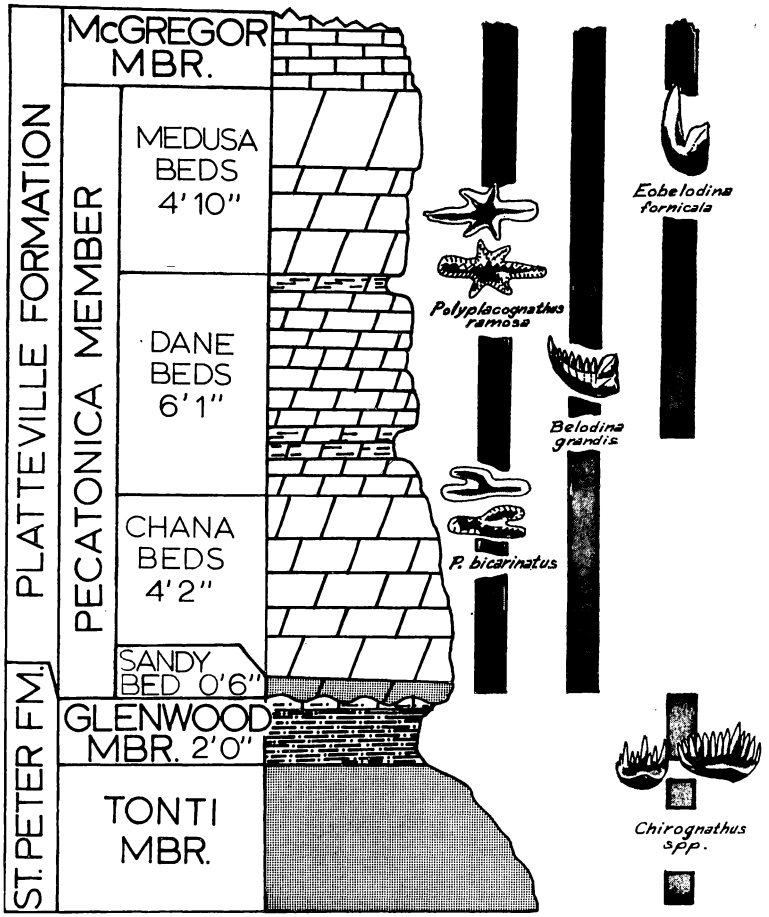


Figure 1. Section at McGregor, Iowa, showing the distribution of *Polyplacognathus, Belodina, Eobelodina* and *Chirognathus* and the Glenwood — Platteville Disconformity.

| | | |
|---|---|---|
| Daysville Beds — Dolomite: glauconitie | 4 | 8 |
| Kingdom Beds — Sandstone: glauconitic, coarse-grained, subround | 8 | 0 |
| Total Glenwood | 24 | 2 |
| Tonti Member | 9 | 0 |
| Total St. Peter | 33 | 2 |

*Locality* 3—Roadcut of U. S. Highway 151 between Platteville and Dickeyville, Wisconsin in the SW¼, SW¼, 1, T. 2 N., R. 2 E. A complete section of both the Platteville Formation and the Glenwood Member is available here:

| | Thickness Ft. | In. |
|---|---|---|
| Platteville Formation | | |
| McGregor Member | | |
| Pecatonica Member | | |
| Medusa Beds — Dolomite | 2 | 3 |
| New Glarus Beds — Dolomite | 4 | 9 |
| Dane Beds — Dolomite | 8 | 9 |
| Chana Beds — Dolomite: contains phosphate grains | 5 | 6 |
| Total Pecatonica | 21 | 3 |
| St. Peter Formation | | |
| Glenwood Member | | |
| Dolomite: light olive gray, thin-bedded, contains an abundant conodont fauna | 0 | 7 |
| Shale | 1 | 6 |
| Total Glenwood | 2 | 1 |
| Tonti Member | | |

*Locality 5*—Roadcut leading to Pike's Peak State Park, south of Mc Gregor, Clayton County, Iowa, in the E½, SW¼, Sec. 27, T. 95 N., R. 3 W. A complete section of Platteville and Glenwood is found here:

| | Thickness Ft. | In. |
|---|---|---|
| Platteville Formation | | |
| McGregor Member | | |
| Pecatonica Member | | |
| Medusa Beds — Dolomite | 4 | 10 |
| Dane Beds — Dolomite | 6 | 1 |
| Chana Beds — Dolomite: increasingly sandy toward base | 4 | 2 |
| Basal sand bed — Dolomite: arenaceous; contains abundant fresh and reworked conodont material, frosted sand grains, phosphate grains | 0 | 6 |
| Total Pecatonica | 15 | 5 |
| St. Peter Formation | | |
| Glenwood Member | | |
| Limestone: argillaceous | 0 | 3 |
| Shale: glauconitic; abundant conodont material, glauconite, frosted sand grains, scalecodonts | 1 | 9 |
| Total Glenwood | 2 | 0 |
| Tonti Member | | |

## Physical Criteria for a Disconformity

The presence of frosted sand grains like those in the St. Peter and of phosphate grains and pebbles in the lowermost Platteville has been widely known for the last fourty years. Pettijohn (1926) interpreted the occurrence of a phosphate pebble zone in the basal Platteville in the Twin Cities as a disconformity due to nondeposition in an anaerobic environment.

Elder (1936) came to the same conclusion, based upon physical relations of the Platteville to the Glenwood at Oregon, Illinois (Locality 2) and other localities. He noted the great lithological contrast between the two units, the rounded grains of sandstone and the occurrence of phosphate pebbles in the basal Platteville

(Pecatonica) and cited these facts as evidence that the Glenwood and Platteville are separated by a disconformity.

Templeton & Willman (1963, p. 49) state, "The presence of a diastem locally accompanied by minor erosion between the Glenwood and the Pecatonica strata is suggested..." by the abrupt lithologic and faunal change which takes place at the Glenwood-Pecatonica contact, the occurrence of pebbles of Daysville Dolomite in the Pecatonica and the apparent pinch-out of the Pecatonica near Brookville, Ogle County, Illinois, where the McGregor directly overlies the Glenwood.

## Faunal Criteria for a Disconformity

Elder (1936) noted a striking difference in the megafauna of the lower Platteville, which is more or less fossiliferous, and the Glenwood, which is sparingly fossiliferous, containing the inarticulate brachiopod *Lingula,* for the most part. The Platteville, on the other hand, contains articulate brachiopods, gastropods and trilobites. Templeton & Willman (1963, p. 49) also take note of this abrupt faunal change.

The major objection to the above argument is that brachiopods, trilobites and gastropods and trilobites are benthonic forms and are, therefore, affected by changes in bottom conditions. The presence of phosphatic nodules in the basal Platteville and glauconite in the Glenwood may simply represent a reducing enviroment which only linguloid brachiopods could tolerate. The sudden break in fauna, then, would represent a change in environment rather than a break in time. This change might even be time-transgressive and the contained fossils a "facies fauna."

Conodonts collected from the Glenwood and Pecatonica by the author also show an abrupt change in character from one unit to the next. A number of palmate, fibrous conodonts of the genus *Chirognathus* were recovered from the Glenwood at three localities. A few abraded and rounded chirogathids were found in the basal sandy bed of the Pecatonica, but none were found to extend any further into the Pecatonia, nor is *Chirognathus* found in any overlying unit.

Conversely, the conodont species *Belodina grandis, Eobelodina fornicala, Polyplacognathus ramosa* and *P. bicarinatus* were recovered from the Pecatonica and the overlying McGregor, but were not found in an abundant Glenwood fauna. Indeed, at the McGregor locality, a fresh, amber polyplacopgnathid fragment was found in the basal sandy bed in the same sample which contained abraded and blackened chirognathid fragments. The occurrence of such a "mixed fauna" is interpreted as a sign

of emergence and erosion elsewhere at the onset of Pecatonica deposition.

It is worth nothing, in this connection, that the fauna recovered from the Glenwood also displays a mixture of fresh, unbroken and little altered condodonts along with blackened, broken and abraded specimens of the same genera and species. This would indicate a very irregular pattern of erosion and deposition during Glenwood time.

The occurrence of *Belodina grandis* and *Eobelodina fornicala* in the Pecatonica are the oldest known for condonts belonging to these genera. The Pecatonica polyplacognathids are among the oldest of this genus known. *Polyplacognathus* is also significant in that it is the most ancient of the platform-type conodonts. The distribution of these four condont genera is regarded by the author as being of great significance, implying the existence of a disconformity between the Pecatonica and the Glenwood.

The arguments applied to the other fossil groups do not apply here, for although the zoologic affinities of the conodonts are not known, their stratigraphic and lithologic distribution indicate that they were derived from a pelagic organism. They are widely distributed and are quite independent of facies, for conodont zones have been traced across facies. (Collinson, 1963 pp. 1-2). As a case in point, *Polyplacognathus ramosa* was first found in the Decorah Shale (Spechts Ferry Member) by Stauffer (1935) and has since been found in shales and carbonates. *Belodina* and *Eobelodina* are also found in the Decorah Shale as well as several other shales, while *Chirognathus* has been recovered from carbonate rocks. Long-ranging genera are found in all manner of sedimentary rocks, including some sandstones.

## Conclusions

Based upon physical evidence alone, there is reason to suspect that a disconformity exists between the Pecatonica Dolomite and the Glenwood Shale. This argument is based upon two lines of evidence:

1. The presence of subrounded, frosted sand grains of St. Peter aspect in the basal Pecatonica at Oregon, Illinois and McGregor, Iowa, in places making 77% of the rock (Elder, 1936).
2. The presence of Phosphate grains and pebbles in the basal Pecatonica at all three localities.

The faunal evidence is more convincing, since the conodont-bearing organisms were most likely pelagic, having a wide distribution and a rapid evolutionary history; thus we may regard the appearance of new species as being essentially contemporaneous. The distribution of the four genera previously mentioned is summarized in Figure 1. This succession is found at all

three localities, so it may be assumed that the disconformity is at least 150 miles in extent.

Although this evidence is quite persuasive, the knowledge of the geologic and geographic distribution of Middle Ordovician conodonts is far from complete. Subsequent work in this area could well alter the conclusions drawn here.

### Literature Cited

Calvin, S. (1906), *Geology of Winneshiek County;* Iowa Geol. Survey Ann. Repts., v. 16, pp. 37-146.

Collinson, C. (1963), *Collection and preparation of conodonts through mass production techniques;* Illinois State Geol. Survey Circular 343, 16 pp.

Elder, S. G. (1936), *The contact between the Glenwood and Platteville formations;* Illinois State Acad. Sci., Trans., v. 29, no. 2, pp. 164-166.

Guldenzopf, E. C. (1964), *The conodont fauna and stratigraphy of the Pecatonica Member of the Platteville Formation;* Unpubl. Master's Thesis, Univ. Iowa, Iowa City, 254 pp.

Hershey, O. H. (1894), *The Elk Horn Creek Area of St. Peter Sandstone in northwestern Illinois;* Amer. Geologist, v. 14, p. 175.

Kay, G. M. (1935), *Ordovician system in the Upper Mississippi Valley;* Kans. Geol. Soc. 9th Ann. Fld. Conf. — Upper Mississippi Valley, pp. 281-295.

Pellijohn, F. J. (1926), *Intraformational phosphate pebbles of the Twin City Ordovician;* Jour. Geology, v. 34, pp. 361-374.

Stauffer, C. R. (1935), *The conodoont fauna of the Decorah Shale (Ordovician);* Jour. Paleo., v. 9, pp. 596-620.

Templeton, J. S. & Willman, H. B. (1963), *Champlainian Series (Middle Ordovician) in Illinois;* Illinois State Geol. Survey Bull., 89, 260 pp.

# Geologic Interpretation of Magnetic Map, Keokuk County, Iowa[1]

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*Abstract.* In 1964, surface measurements of the vertical component of the earth's magnetic field were made in Keokuk County, Iowa. The geologic conditions responsible for the magnetic anomalies can be attributed almost entirely to changes in the lithology of the Precambrian crystalline basement complex about which no direct information is available. The basement complex probably includes granitic, basic igneous and/or metavolcanic rocks, and the estimated depth to the top of the complex is about 3,000 feet. There is little correlation between the magnetic anomalies and known Paleozoic structures, but knowledge of the structures is very limited.

[1] Presented with the permission of Dr. H. Garland Hershey, State Geologist, and Director of the Iowa Geological Survey.

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