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The University of Wisconsin
Geological and Natural History Survey

Information Circular Number 8

Paleozoic Stratigraphic Nomenclature For Wisconsin

By Meredith E. Ostrom*

INTRODUCTION

The Paleozoic stratigraphic nomenclature shown in the column is a part of a broad program of the Wisconsin Geological and Natural History Survey to re-examine the Paleozoic rocks of Wisconsin and is a response to the needs of geologists, hydrologists and the mineral industry. The column was preceded by studies of pre-Cincinnatian cyclical sedimentation in the upper Mississippi valley area (Ostrom, 1964), Cambro-Ordovician stratigraphy of southwestern Wisconsin (Ostrom, 1965) and Cambrian stratigraphy in western Wisconsin (Ostrom, 1966).

A major problem of correlation is the tracing of outcrop formations into the subsurface. Outcrop definitions of formations based chiefly on paleontology can rarely, if ever, be extended into the subsurface of Wisconsin because fossils are usually scarce or absent and their fragments can seldom be recognized in drill cuttings. Those which do survive drilling are commonly undiagnostic. For those reasons a classification based on lithostratigraphy as defined by the American Commission on Stratigraphic Nomenclature (1961) has been developed by the Survey as shown in the column.

The purpose of this discussion is to explain briefly the departure of the nomenclature used in the column from that scattered elsewhere throughout the geological literature. Arguments for the proposed changes are published in detail elsewhere or have been developed as a result of current studies by the Survey.

AGE OF THE ORONTO GROUP OF NORTHERN WISCONSIN

Thwaites (1912) described the Oronto Group as transitional with underlying interbedded volcanics and sediments of Keweenawan age and as conformable with the overlying Bayfield Group, although he considered it possible that the upper contact might be unconformable. Because of the transitional character of the basal contact he assigned the Oronto a Precambrian age and selected the basal contact at the top of the uppermost volcanic bed. It is now known that the Oronto is unconformable with older rocks in some areas as for example at Fond du Lac, Minnesota, where the Outer Conglomerate and Nonesuch Shale are missing and the younger Freda Sandstone rests on the Thompson Slate (Raasch, 1950; Goldich et al, 1961). An unconformity at the upper contact in the Upper Peninsula of Michigan has been postulated by Hamblin (1961) and in northwestern Wisconsin where Atwater and Clement (1935) describe unconformities between flat-lying quartz sandstone (either Mt. Simon, Bayfield, or Hinckley) and older westward dipping Keweenawan volcanics and arkosic sandstone.

From the above data it would appear that arkosic rocks of the Oronto Group are unconformable with both overlying and underlying strata. Unfortunately neither fossils nor datable minerals are known in the Oronto to verify its age. Thus, on the basis of present knowledge, the Oronto can be dated only as younger than the youngest known Precambrian and older than the oldest known Cambrian. The advantage of this classification is that it is based on facts and does not make impositions on, or distort, our interpretation of geologic history while at the same time it makes us aware of a lack of knowledge.

AGE OF THE BAYFIELD GROUP OF NORTHERN WISCONSIN

The Bayfield Group is questionably assigned to the Cambrian System. The Bayfield is probably unconformable with older strata, at least in some areas, as was discussed in the preceding section. In the area of Bayfield Sandstone outcrop younger rocks are absent, or unknown, however, the Bayfield has been correlated at least in part with the Hinckley Formation of Minnesota (Atwater, 1935; Tyler et al, 1940) and the Jacobsville Formation of the Upper Peninsula of Michigan (Irving, 1883; Thwaites, 1912; Tyler

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et al, 1940) and in both these areas younger rocks are present.

In Minnesota the Hinckley Formation is overlain by the Mt. Simon Sandstone which is overlain by, and is transitional with, the Eau Claire Sandstone assigned to the Dresbachian Stage on the basis of fossils (Howell et al, 1944). The nature of the contact between the Hinckley and Mt. Simon is poorly known and then only from the subsurface (Stauffer and Thiel, 1941); slight differences in mineralogy, lithology, and texture between the two are based on analyses of samples collected from outcrops spaced about 100 miles apart which allows room for speculation that the differences may be the result of lateral change in a single formation. As the Hinckley and Mt. Simon are differentiated with difficulty, if at all, and as the Hinckley is considered equal to the Bayfield, it is possible that the Bayfield is equal, at least in part, to the Mt. Simon and hence assignable to the Cambrian rather than the Precambrian. If it should be found that the Hinckley is unconformable with younger rocks, as for example the Mt. Simon, then its age can only be defined as younger than the Oronto which is younger than known Precambrian and as older than known Upper Cambrian.

The thickness of the Bayfield Group is estimated at 4,300 feet in the Lake Superior syncline (Thwaites, 1912). In eastern Minnesota its equivalent, the Hinckley together with the overlying Mt. Simon, is shown to overlap and to thin onto the Wisconsin dome from west to east (Stauffer and Thiel, 1941). On the dome, as for example at the type section of the Mt. Simon in Eau Claire, the Mt. Simon rests on crystalline rocks and is about 250 feet thick. Because of these relationships and because the Mt. Simon closely resembles the nonfeldspathic upper part of the Bayfield in texture, mineralogy, and color it is believed that the Mt. Simon correlates, at least in part, with the upper part of the Bayfield Group but that it was deposited on the Wisconsin dome after much of the filling of the Lake Superior syncline with arkosic sandstone and feldspathic quartz sandstone of the Oronto and lower Bayfield had been accomplished.

In the Upper Peninsula of Michigan the Jacobsville Formation, which is the Bayfield equivalent, is separated from older and younger rocks by erosion surfaces (Hamblin, 1958; 1961). Beneath the Jacobsville are Precambrian crystalline rocks and above it is the Munising Formation assigned to the Upper Cambrian. Fossils or datable minerals are not known in the Jacobsville so that its age is unknown. However, the fact that it is correlated with the Bayfield Group suggests that the Jacobsville is also Cambrian and indeed the Michigan Geological Survey has assigned it to the Lower and Middle Cambrian (1964).

The possibility that the Jacobsville correlates with the Freda Sandstone of the Oronto Group rather than with the Bayfield must be considered because of the similarity of mineralogy, texture, and stratigraphic position of the two units. The Freda and Jacobsville are predominantly very coarse- to fine-grained feldspathic sandstones with thin beds and lenses of shale and flat-pebble conglomerate whereas the Bayfield is predominantly a medium- and coarse-grained quartz sandstone which contains feldspar and scattered pebbles in its lower part. The Bayfield is similar in composition, texture, and stratigraphic position to the Hinckley of Minnesota with which it is correlated. If it should be found that the Bayfield does not correlate with the Jacobsville this would not alter the correlation of the Bayfield with the Hinckley.

REVISION OF THE DRESBACH GROUP AND FRANCONIA FORMATION (OSTROM, 1966)

Replacement of the names Dresbach and Franconia and revision of the nomenclature of these rocks is necessary to avoid duplicate use of terms for both lithostratigraphy and biostratigraphy and to establish subdivisions which coincide with recognizable lithic changes.

The names Dresbach and Franconia have found wide application in biostratigraphy as stages of the St. Croixan Series (Lochman, 1956; Lochman-Balk and Wilson, 1956). Unfortunately the biostratigraphic boundaries do not coincide with the lithic changes that are used for field or subsurface mapping. It is therefore proposed that the names Dresbach and Franconia be reserved for use as stage names in biostratigraphy and that the names Elk Mound and Tunnel City be used as lithostratigraphic replacements with minor modifications.

The Elk Mound Group is defined as the quartzose sandstones, shaly sandstones, and shales below the finer-grained Franconian sandstones and above the basement and the Hinckley Sandstone and incorporates those strata previously referred to the Dresbach plus the overlying coarse-grained and poorly-sorted Ironton Member of the Franconian (Ostrom, 1966). By this definition the Ironton Member forms the upper unit of a new formation, namely the Wonewoc Sandstone. The lower member of the Wonewoc is the Galesville Sandstone. Combination of the Galesville and Ironton sandstones into a single formation is desirable because of the similarity of their lithologies, the difficulty of distinguishing between the two units in the field and the subsurface, and their marked difference from the underlying and overlying finer-grained, argillaceous, calcareous and glauconitic sandstones. The Wonewoc is separated from older strata by an erosion surface (Ostrom, 1964; 1966).

The Tunnel City Group is defined to consist of all strata above the Elk Mound Group and below the St. Lawrence Formation or the Jordan Sandstone (Ostrom, 1966). It is divided into a glauconitic and/or shaly sandstone and a non-glauconitic sandstone. The glauconitic sandstone has been assigned the name Lone Rock Formation (Ostrom, op. cit.) whereas the name Mazomanie is retained for the non-glauconitic sandstone (Berg, 1954) although its rank is elevated from member to formation. The Lone Rock Formation encloses the Mazomanie Formation and is subdivided into the Birkmose, Tomah, and Reno Members (Berg, op. cit.). The Mazomanie Formation is a tongue of clean sandstone which extends southward along the axis of the Wisconsin arch to the vicinity of Madison in southern Wisconsin (Ostrom, 1966).

THE JORDAN SANDSTONE

The Jordan Sandstone includes the Norwalk and Van Oser sandstones (Stauffer and Thiel, 1941; Ostrom, 1965) and the Sunset Point Member (Raasch, 1951; Ostrom, op. cit.). The Jordan is separated from older strata by an erosion surface and is conformable with overlying rocks (Ostrom, 1964).

The Sunset Point Member is assigned to the Jordan Formation because its lithology, which consists of sandy dolomite, sandstone, and shaly dolomite, more closely resembles the Jordan than the overlying Oneota Dolomite and because of the difficulty in selecting its contact with the underlying Van Oser. In addition, the fact that it contains Cambrian trilobites (Raasch, 1950) dictates against its being assigned to the overlying Oneota Dolomite which is of Ordovician age.

SUBDIVISIONS OF THE ONEOTA DOLOMITE

Raasch (1952) studied the Oneota Dolomite in the Stoddard Quadrangle, Vernon County, Wisconsin, and subdivided the formation into four members on the basis of lithologic differences based on presence or absence of sand grains, chert, oolites, and algae. These members can be traced eastward at least as far as Madison with little dif-

ficulty (work in progress).

REVISION OF THE SHAKOPEE FORMATION

Revised nomenclature for the Shakopee Formation was presented by Davis (1966). Contact of the New Richmond Member with older strata is unconformable and is marked by an erosion surface (Andrews, 1955; Ostrom, 1964).

THE ST. PETER SANDSTONE

The St. Peter Sandstone includes a basal conglomerate, a middle fine- and medium-grained white sandstone, and an upper poorly-sorted, shaly and dolomitic sandstone and a shale. The basal conglomerate was deposited on an erosion surface. It is easily identified and is herein assigned the name Readstown Member for exposures in the vicinity of Readstown, notably one at the east side of Highway 14 and west of the village in the center of the NE 1/4, Sec. 27, T.12N., R.4W., Vernon County, Wisconsin (Ostrom, 1964). The name Kress was proposed by Buschbach (1964) for the conglomerate, but is rejected because the type section is taken from a well near the headwaters of Kress Creek in northeastern Illinois rather than from an outcrop. The conglomerate consists of fragments of red, green, and gray shale, of white chert, sand and sandstone, and dolomite all in a sand or clay matrix.

The clean quartz sandstone overlying the Readstown Member was named the Tonti by Templeton and Willman (1963). It is herein designated a member of the St. Peter Formation. The Tonti is overlain by the Glenwood which consists of poorly-sorted clayey and dolomitic sandstone, of shale, and of calcareous shale and siltstone. Templeton and Willman (op. cit.) assigned the Glenwood a formation status and subdivided it into members which in ascending order are the Nokomis, Harmony Hill, and Hennepin. The Glenwood is considered by the Wisconsin Geological and Natural History Survey to be a member and its subdivisions are designated beds. Although the Hennepin, a calcareous and silty shale, was assigned to the overlying Platteville Dolomite by Templeton and Willman, study in progress at the Survey indicates that the Hennepin should be placed in the Glenwood Member because: (1) it consists of over 50 percent clastics (clay and silt) and thus is lithologically more similar to the Glenwood than to the overlying Platteville Formation which consists chiefly of carbonates, (2) it has limited geographical extent in comparison to members of the Platteville, and (3) it has an apparent angular contact relationship with the Platteville.

THE SINNIPEE GROUP

The name Sinnipee Group is being proposed by the Wisconsin Geological Survey, in a study now ready for publication, for the carbonate rocks above the Glenwood Member of the St. Peter Formation as herein defined and below the Maquoketa Shale in the upper Mississippi valley area. Although Swann and Willman (1961) proposed the term Ottawa Megagroup for this unit, and specifically excluded the Glenwood, recent usage by Calvert in Ohio (1962) and Templeton and Willman in Illinois (1963, p. 13, fig. 2) has included the Glenwood. Furthermore, the fact that the name derived from Ottawa, Canada, far from the upper Mississippi valley area and that it is synonymous with Ordovician St. Peter Sandstone mined at Ottawa, Illinois, and with Cambrian Jordan Sandstone mined at Ottawa, Minnesota, is believed to be sufficient reason to reject the term in favor of Sinnipee.

REVISION OF THE GALENA DOLOMITE

Preliminary work by the Survey has led to adoption with modifications of a portion of the classification proposed by Templeton and Willman (1963) for the Galena Dolomite. The Galena is assigned formational status and its major subdivisions are regarded as members. For convenience of those unfamiliar with the new terminology some of the older divisions are included in the column for reference, namely Ion, Prosser, and Stewartville.

THE MAQUOKETA SHALE

Subdivisions of the Maquoketa Shale noted in the column are those of Templeton and Willman (1963). These subdivisions are easily recognized in southwestern Wisconsin but may be unclear in eastern Wisconsin. Contact of the Maquoketa with older strata is suspected of being unconformable. It is described as resting unconformably on older formations in the upper Mississippi valley area by Templeton and Willman (1963) and in Indiana and adjacent stated by Rooney (1966). Core samples from a test hole drilled near Sheboygan in eastern Wisconsin reveal up to 1 foot of conglomerate at the base of the formation.

THE NEDA FORMATION

The age of the Neda Formation is not definitely known. Savage and Ross (1916) assigned the formation to the Ordovician on the basis of fossils and state that it is unconformable with the underlying Maquoketa and that it is truncated by the overlying Silurian. Workman (1950) suggested the possibility that the Neda is Silurian and that it formed as a transgressing Silurian sea reworked and redeposited fossils from the underlying Maquoketa Shale of Ordovician age. Templeton and Willman (1963) included the Neda in the top of their Maquoketa Formation. Whitlow and Brown (1960; 1963) assigned the Neda to the Maquoketa Formation and state that it is separated from the overlying Silurian by an erosion surface with a relief of 135 feet in the Dubuque South Quadrangle, northeastern Iowa.

The fact that a systemic boundary is involved requires that the age of the Neda be determined as precisely as possible before assigning the unit to one or the other age. For this reason the Neda is not assigned to either system in the column.

THE SILURIAN SYSTEM

The classification of Silurian rocks shown for eastern Wisconsin was given by Shrock (1939) and that for southwestern Wisconsin was given by Heyl and others (1959). These rocks have not been subjected to critical review. A major problem of the Silurian is the difficulty of correlating strata in southeastern Wisconsin with those in the northeast. Preliminary steps to study these rocks are in process.

THE DEVONIAN SYSTEM

Devonian strata crop out at only one place in Wisconsin and are otherwise known only from drill cuttings. They were examined by Raasch (1935) who assigned them a Middle Devonian age. The overlying shale formation known as Kenwood was assigned an Upper Devonian age by Edwards and Raasch (1921). Although it was subsequently assigned to the Mississippian (Cooper in Weller, et. al., 1948, p. 156) recent studies by Schumacher (1967) support the work of Edwards and Raasch for an Upper Devonian age. The Kenwood is the youngest Paleozoic formation in Wisconsin.

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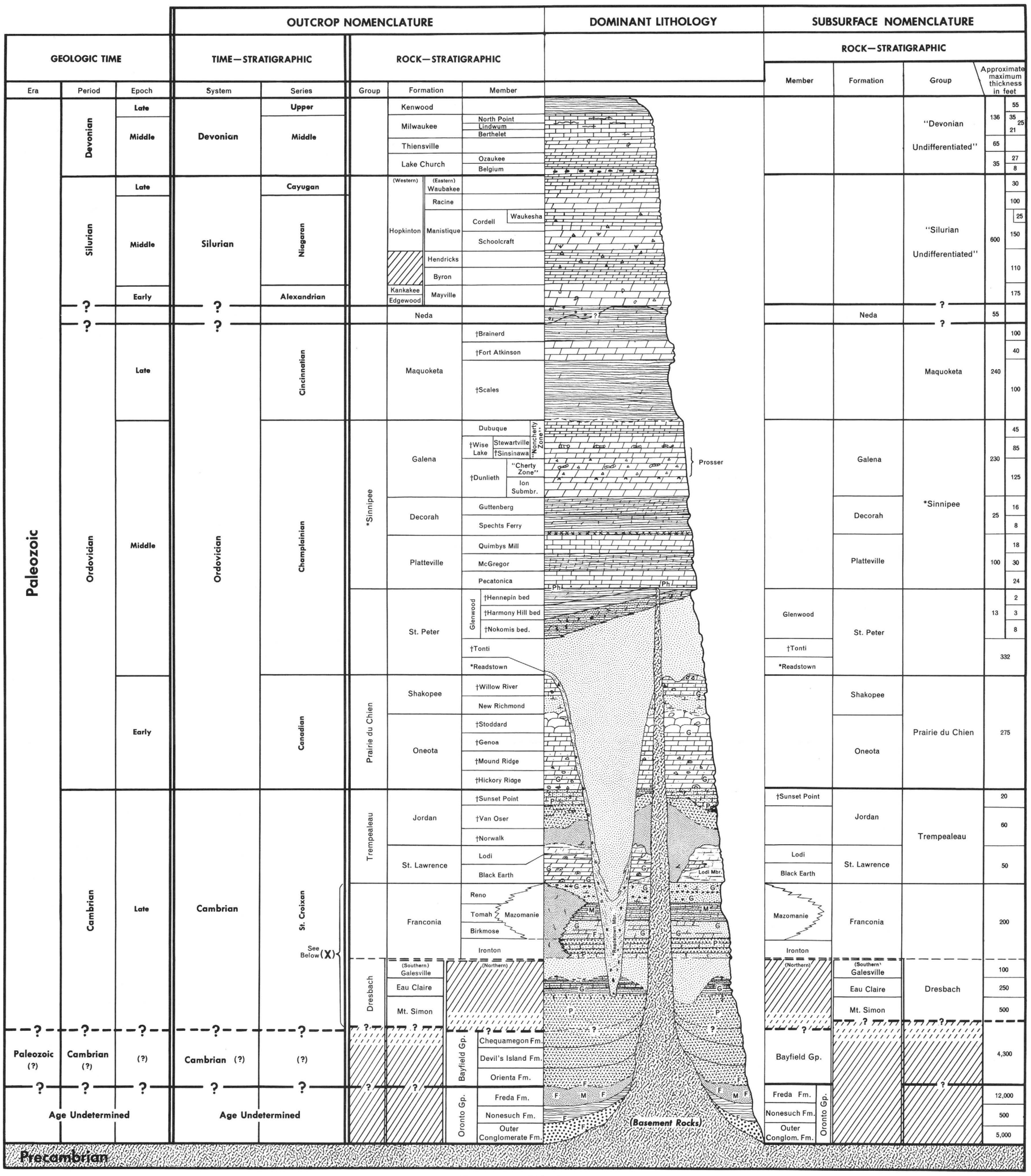
PALEOZOIC STRATIGRAPHIC NOMENCLATURE FOR WISCONSIN

WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

George F. Hanson, State Geologist and Director



*New names proposed (informal).

†Name being considered for adoption.

KEY TO SYMBOLS

Δ	chert
Δ	oolitic chert
⊙	oolites
⌓	openings (vugs, etc.)
∠	dolomitic
~	silty
XXX	bentonite
G	glauconite
P	pyrite
M	mica
F	feldspar
Ph	phosphate pellets
Ψ	pentamerus
⊛	Receptaculites
∩	Prasopora
⊓	algae
ʃ	burrows
⊙	conglomeratic
?	questionable relationship

Limestone
dolomitic
sandy
shaly
Dolomite
calcitic
sandy
shaly
massive
Sandstone
coarse
medium
fine
coarse, medium and fine
Conglomerate
Siltstone
Shale

(X) Revisions Being Considered For Adoption+

Group	Formation	Member	Stage
*Tunnel City	Mazomanie / *Lone Rock	Reno	Franconian
		Tomah	
		Birkmose	
*Elk Mound	*Wonewoc	Ironton	
		Galesville	Dresbachian
	Eau Claire		
	Mt. Simon		

Revision of the Dresbach and Franconia as suggested here is deemed essential for several reasons. First, the contact of the Galesville with the Ironton is difficult and locally impossible to detect in the subsurface even though it is the one now being used to separate the Dresbach from the Franconia. Second, the Ironton is lithologically and mineralogically clearly more closely allied with the Galesville than with the overlying greensands of Franconian age. And third, the names Franconia and Dresbach are being used in a biostratigraphic sense as stages of the St. Croixan Series and, unfortunately, these stages do not coincide with a lithologic change that is usable for either field or subsurface mapping and, thus, they cannot be applied to economic studies. The revisions under consideration make no change in stage designation but they do redefine the lithostratigraphic units to coincide with easily recognized changes in lithology.

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