

## CORRELATIONS OF WELL DRILLINGS IN NORTHERN ILLINOIS, WITH OUTCROPPINGS OF EARLY PALEOZOIC BEDS IN WISCONSIN

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The correlation of the Lower Paleozoic formation in Illinois is somewhat difficult because of incomplete data.

The St. Peter sandstone outcrops at several places along the LaSalle anticline and in LaSalle County where its entire thickness is exposed. The Lower Magnesian or Prairie du Chien group is seen only in a few scattered outcrops and there only the top member is partially exposed. The nearest exposure of Cambrian rocks is near Janesville, Wisconsin, but most of the Cambrian formations outcrop near Madison Baraboo or farther north. These are traced into northern Illinois, a distance of 250 miles, by means of deep well records. Both the Illinois Geological Survey and the Wisconsin Geological Survey try to procure records and, if possible, to secure samples from the wells in their respective states. By this means only can subsurface formations be traced with certainty. The greater the number of well records available the more complete will be the data at hand and hence the more accurate will be the correlations that can be made.

Fossils are ground up in the well cuttings. Therefore, little or no paleontological evidence is offered to assist in the correlation of well cuttings.

The problem is entirely a stratigraphic one. The correlation is made by means of "key" horizons, or horizons which are recognized by certain peculiar characteristics which are maintained over wide areas. Formations may change lithologically from place to place because conditions for sedimentation were not the same. Nearest the shore the coarser materials are deposited. Farther out on the mud flats shale is deposited, and still farther out in quiet water lime mud which cements to form limestone is deposited. During the Jordan sea invasion central Wisconsin was near the shore, and the formation is a sandstone there, whereas during the same time northern Illinois was farther from the shore where clear water prevailed and limestone was deposited. For

the same reason sandstones in Wisconsin may become shales in Illinois. For similar reasons, formations underlying northeastern Illinois may differ from those underlying northwestern Illinois and vice versa.

Formations often pinch out laterally, giving a different stratigraphic succession of formations in northeastern Illinois from that in northwestern Illinois. Under these conditions it is necessary to have a large number of well records to note the progressive changes taking place at a distance from the out-crop.

F. W. Thwaites of the Wisconsin Survey gives the following succession of Cambrian, Ordovician, and Silurian rock formations in southern Wisconsin:

Silurian—	Feet
Niagaran limestone "Clinton" formation	300-670
Ordovician—	
Maquoketa shale	100-200
Galena-Platteville dolomite and limestone	200-450
St. Peter sandstone	325
Prairie du Chien	700
Shakopee limestone	
New Richmond sandstone	
Oneota limestone	
Cambrian—	
Madison limestone	50
Jordan sandstone, grades to limestone towards the south	75
St. Lawrence sandstone, grades to dolomite below	35-150
Mendota dolomite	0-20
Devils Lake sandstone, local depth unknown	
Franconia sandstone	90-175
Mazomania sandstone, gray to red	100±
Dresbach sandstone	40-180
Eau Claire sandstone and shale	70-410
Mt. Simon, coarse to medium ss.	

Not all of these formations are recognizable in northern Illinois and probably all are not present. The Niagaran, a light gray dolomitic limestone, caps the hills in north-

western Illinois, and in Cook County it is the first stratum to be penetrated by the drill.

The Maquoketa shale lies immediately below the Niagara, and in northwestern Illinois some difficulty is encountered in differentiating it from the clays of the glacial drift as the unindurated material above it caves and glacial pebbles fall in and re-mix with the samples.

The Galena and Platteville limestones are 170 to 450 feet thick. The Galena is dolomite; the Platteville is a calcareous shale or limestone. These formations outcrop in broad irregular belts extending north and south in north central Illinois, in east and western parts of the State. The Platteville is found only in drill records. It lies uncomfortably on the St. Peter. This is of the same general horizon if not identical with the Platten of southern Illinois. The Galena dolomite is about equivalent to the Kimmswick of Missouri.

The St. Peter sandstone outcrops in a small area near Ottawa, LaSalle, Sheridan, and Troy Grove. This is a key horizon, and the sand grains are more rounded than those of any other sandstone formation. They are perfectly sorted and are very uniform in size. The St. Peter maintains the same characteristics over wide areas. There is an unconformity at the base where it overlies the Shakopee limestone. It ranges in thickness from 65 to 325 feet.

The Lower Magnesian group is composed of three divisions: The Shakopee dolomite, New Richmond sandstone and the Oneota dolomite. Only the Shakopee outcrops in this State. The outcrops are at Split Rock near Utica and a few scattered inliers along the LaSalle anticline. Nowhere is its entire thickness exposed. The New Richmond sandstone is a medium to coarse sandstone about 20 to 70 feet thick. The Oneota dolomite is the lower member of the lower Magnesian group. It is known only in well cuttings, a light gray somewhat cherty dolomite. The three members can be recognized in the northwestern part of the State as far east as Dixon, Amboy and LaSalle. Farther east the New Richmond and probably the Shakopee are absent. If they were deposited there it is probable that they were eroded away



in the post Prairie du Chien erosion period. The base of the Oneota is glauconitic and in some wells there are about 15 to 25 feet of glauconitic sandstone at the base.

Underlying the Oneota sediments are the rocks of the Cambrian period. These in Wisconsin are about 1000 feet thick, and in Illinois they have been penetrated to nearly that depth. It is from these strata that most of the artesian water in northern Illinois is obtained.

The Madison limestone is absent in the Illinois section.

The Jordan formation which outcrops as a sandstone in Wisconsin become more calcareous southward, becoming a dolomite in Illinois where it can not be distinguished from the underlying St. Lawrence limestone.

The St. Lawrence is a dolomite, either pinkish, purplish or dark gray in color. The combined thickness of the St. Lawrence and Jordan dolomites is about 150 to 175 feet; one or both of these formations are known from Dixon westward, but neither one has been recognized in the eastern part of the State.

The Mendota dolomite may be present near Chicago, but can not be distinguished from the Oneota. Its presence is indicated by the thickness of the Oneota dolomite, which is greater than that of the Oneota formation northward, and part of this increased thickness may be the St. Lawrence dolomite.

In Illinois the Devils Lake and Franconia formations are either absent or indistinguishable from the Mazomanie formation. The Mazomanie formation is a sandstone, containing some limestone and shale lenses. The sandstone is angular or subrounded, and poorly sorted. It has often been confused with the Jordan sandstone in this State. It is the first thick sandstone below the Oneota. This immediately underlies the Oneota in Kane and Dupage counties and probably in Cook and Lake counties.

The Dresbach sandstone is in most places a medium white sand. However, in Cook and Lake counties it may contain dolomite and shale. There is the possibility that the Mazomanie formation does not extend as far east as Cook County, and that the first Cambrian sandstone penetrated in Cook and Lake counties is the Dresbach, and

that the dolomite and shale belongs in the Eau Claire formations which is quite variable in its lithology. This interpretation would make the Eau Claire considerably thicker there than elsewhere. The Eau Claire in the northwestern part of Illinois is a gray or pinkish sandstone with a thin shale showing in some wells. It is a rather variable formation and in northeastern Illinois it consists of shale, sandstone, or red marl. This red marl is rather persistent. In the eastern part of the State the formation is 65 to 175 feet thick. At Savanna there is a conglomerate at the base.

The Mt. Simon sandstone is an unsorted sand with medium angular to subrounded grains, which are rather coarse toward the base. This is the basal formation of the Cambrian of Wisconsin, and probably of northern Illinois also. F. T. Thwaites claims that the Dixon and Rockford wells both penetrate this formation and enter the Huronian below\*. If this is true the sediments below the Mt. Simon are sandstones resembling those of the Mt. Simon. They would probably be Keweenawan sediments instead of Huronian quartzites such as occur in the Baraboo region and appear in some of the records of Wisconsin wells. It seems more probable to the writer that those lowest sandstones are of Cambrian age and belong to the Mt. Simon formation. More definite information will be available after a larger number of well samples have been sent to the Geological Survey office and studied so that the data will be more complete.

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\* Norton, W. H., Hendrixon, W. S., and Simpson, H. E., Muzner. U. S. G. S. Water Supply paper 293, pp. 67-78.