

THE GEOLOGICAL COLUMNAR SECTION AT MONMOUTH, ILLINOIS, AS REVEALED BY THE NEW DEEP WELLS.

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Two wells have recently been drilled at Monmouth to a depth of 2,445 feet, and the complete sets of sample cuttings permit some observations of interest concerning the strata which underlie that part of Northwestern Illinois.

Loess and glacial drift have been deposited to a thickness of 95 feet to the level of the Glaciated Plains in this locality. The lower part of the drift contains sand and gravel lenses. Reports of "chip piles" in a few other wells in the vicinity suggest that an old soil zone is present below the upper part of the drift, and that both the Kansan and Illinoisan tills are here represented.

The coal at the top of the Pennsylvanian is doubtless the Rock Island coal, as detailed study of rock outcrops north of town would suggest. The 15 feet of sandy shale and coal would therefore belong to what has thus far been considered as the Pottsville formation. These 15 feet represent not only the eroded edge of the Pennsylvania strata but in fact the thinning out of the coal measures at the western edge of the coal basin.

The Chester, Ste. Genevieve, and Meramec deposits, of great thickness elsewhere, are not present here, the first having never reached so far north and the others having probably been eroded off. The Burlington limestone is very similar to that at the type section at Burlington, 25 miles southwest of Monmouth. At the top it is light gray to white; the lower 35 feet are increasingly dolomitic. There are thick beds, lenses, and nodules of chert throughout. The magnesian limestone in the samples of the lower 35 feet is buff with a greenish tint, the green probably being an iron compound which readily oxidizes, so that in outcrops the rock is designated as "brown magnesian limestone."

Conformable with the Burlington is the soft bluish or greenish gray shale of the Kinderhook. It is calcareous throughout, and the samples suggest the presence of thin

limestone layers toward the top. In the upper part also are thin beds of very fine, gray, calcareous sandstone. The Kinderhook is noted for its variability from place to place, but the shale is most common, and is the same as is seen along the Mississippi River bluffs below Burlington.

The contact between the bottom of the Kinderhook and the top of the Sweetland Creek shale, of Devonian age, is not one easily noted by study of the samples. Here the Sweetland Creek is only slightly less green, and a little more gray, than the shale above, grading down, however, into the typical chocolate brown, well known to deep-well drillers over a large part of the State. Large pieces of shale which caved from the zone of contact, and which were therefore not broken up by the drill, show a thin interlamination of brown and green shale, suggesting that here an unconformity, elsewhere recognized, does not exist. The top of the Sweetland Creek is placed as the highest horizon at which the small resinous *Sporangites huronense*, the spores of a fern-like plant, were noted. The shale is only slightly dolomitic. At the base of the formation is a brown, very silty bed of shale, containing thin leaves of bright charcoal.

Devonian limestones of Cedar Valley and Wapsipicon age are described by Savage and Udden¹ in their report on the geology of the Edgington-Milan Quadrangles, 40 miles north of Monmouth. There the two formations were not differentiated, and it is not possible to do so here. The limestone is brown to light gray, shaly towards the top, and contains some sandstone layers. Throughout the 95 feet found in this well there are many fragments of brachiopods and small crinoid stems.

Here the Niagaran dolomite is only 40 feet thick, whereas in northeastern Illinois, it, together with the underlying Alexandrian series, is 450 feet thick. There seems no variation in the dense, mottled gray, cherty dolomite to suggest the existence of the Alexandrian at this place.

The Maquoketa is a light bluish gray shale, with thin calcareous layers at the bottom. Although the Maquok-

¹T. E. Savage and J. A. Udden: Bulletin 38, Illinois State Geological Survey, pp. 136-140.

keta in Iowa and Wisconsin contains layers of shaly dolomite and limestone at several horizons, most wells of northern Illinois report only blue shale.

The Galena-Platteville is separated in this section into three prominent divisions, the upper being 90 feet of gray to brown argillaceous dolomite which has a very distinct layer of brown, gritty, non-plastic shale at the bottom; the middle being 230 feet of tan and pinkish-gray dolomite, very dense and tough; the lower being 90 feet of brownish-gray, dolomitic limestone. The top of the Platteville is probably at the top of the limestone, for that is the distinction of the Platteville from the Galena in this part of the State. However there are calcareous layers above the limestone here designated and it is not easy to draw the line. A three-foot layer of blue shale, 57 feet above the base, is probably related to the Glenwood shale which commonly separates the Platteville from the St. Peter sandstone. After passing through this shale the casing was set in the limestone, and the size of the hole was reduced, as is generally done below the Glenwood horizon. Nevertheless there are large cavings of blue shale, with the characteristic splintery fracture, in samples of the St. Peter indicating the existence of at least one other shale layer, probably at the contact of the Platteville with the sandstone.

The white sandstone of the St. Peter is here 175 feet thick. The lower part, resting unconformably upon the old land surface of the Shakopee, consists of 25 feet of interlaminated soft, green shale, sandy shale, sandstone, and chert conglomerate. White, oolitic, weathered chert pebbles, half an inch in diameter, were brought up by the sand bucket.

There is a pink tint to the Shakopee dolomite throughout its entire thickness, being very pronounced near the base. The rock is very brittle and finely crystalline so that in acid it slowly crumbles to a mass of sharply defined microscopic dolomite crystals. There is considerable oolitic chert in the formation, and several sandy layers are in the upper part.

The driller reports 5 feet of white sandstone below this pink dolomite. One is impressed immediately, on ex-

aming this sand under the microscope, with the fact that secondary growth has transformed many of the rounded grains to small quartz crystals with the frosted spheres inside. This is characteristic of the New Richmond sandstone which is reported to be 188 feet thick at Deer Park, La Salle County.

The Oneota dolomite is very different from the Shakopee, and the two formations would be divided on lithologic differences at the place indicated, regardless of the New Richmond sandstone. It is very light gray to white, finely to coarsely crystalline, porous, and contains very much chert, some samples being over 50 per cent of white chert.

The Jordan sandstone of the Cambrian period is much like the St. Peter in being composed of white, rounded and frosted grains. However it is cemented with much dolomite and is reported to grade southward into sandy dolomite and lose its identity as a formation. The maximum thickness in southern Wisconsin is 75 feet. Here the thickness is 30 feet.

The older name "St. Laurence" was rather loosely defined and Thwaites¹, who has most recently studied the outcrops and well records of Northern Illinois and Southern Wisconsin, applies the name "Trempealeau", proposed by Ulrich, to designate those fine grained varicolored dolomites under the horizon of the Jordan sandstone. The formation contains several fine, sandy layers. It thickens from 35 feet in Northeastern Wisconsin, to 100 feet in Southwestern Wisconsin, and 255 feet at Monmouth. The lower 25 feet are calcareous, with a few scattered grains of glauconite.













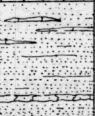

The Franconia fine, angular-grained sandstone is in sharp color contrast to the dolomite above. This is due to the large proportion of glauconite, which in some cases constitutes over half of the samples. It is called a "limestone" in the driller's log because the grains of sand are so fine and so firmly cemented with dolomite. The formation contains some dolomite layers near the base.

¹ F. T. Thwaites: "Paleozoic Rocks Found in Deep Wells in Wisconsin and Northern Illinois", *Journal of Geology*, Vol. 31, p. 547. (1923.)

The greatest thickness reported by Thwaites in Northern Illinois is 175 feet. Here it is 245 feet thick.

The soft Dresbach sandstone, loosely cemented by a little yellow dolomite, is the horizon to which a large number of wells in Northern Illinois now penetrate. This sand is also much like the St. Peter in grain, being perhaps a little coarser. The thickness at Chicago is 180 feet. It is not known if these 115 feet represent the total thickness in this region, for at the bottom of the well the drill stopped in the same sandstone.

GEOLOGIC SECTION AT MONMOUTH, ILLINOIS.

SYSTEM	FORMATION	SECTION	THK.	CHARACTER OF ROCKS
Pleistocene			35	Pebbly clay, sand and gravel.
Pennsylvanian			15	Sandy shale, with 1 ft. coal at top.
Mississippian	Burlington		80	Crinoidal limestone, very cherty, lower 35 ft. dolomitic.
	Kinderhook		110	Soft greenish gray shale, calcareous.
Devonian	Sweetland Creek		165	Shale, greenish gray, light gray, and brown; <i>Sporangites huronense</i> .
	Cedar Valley Wapsipinicon		95	Shaly limestone, brown to light gray.
Silurian	Niagaran		40	Dense dolomite, gray, cherty.
	Maquoketa		30	Light bluish gray shale.
Ordovician	Galena- Platteville		410	Argillaceous dolomite, gray to brown, 12 ft. layer brown gritty shale at bottom; thickness 90 ft. Dense dolomite, tan and pinkish, calcareous layers, thickness 230 ft. Limestone, dolomitic, thin blue shale 57 ft. above base. Thickness 90 ft. <i>Glenwood shale?</i>
	St. Peter		175	White sandstone, loosely cemented; 25 ft. blue and green shales, sandstone, and chert conglomerate at base.
	Prairie du Chien	Shakopee	215	Fine grained dolomite, light gray and pink, cherty.
		New Richmond	5	White sandstone, showing secondary growth.
		Oncota	245	Cherty dolomite, white and light gray.
	Jordan		30	White sandstone, very dolomitic.
Cambrian	Trempealeau (St. Laurence)		255	Dolomite, pink, purple, and gray; no chert.
	Franconia		245	Green sandstone, fine grained, very dolomitic, containing layers of dolomite, much glauconite.
	Dresbach		115	Sandstone, yellow to white, medium to coarse grained.