RIPLEY COUNTY.

BY WM. W. BORDEN.

Ripley county was organized in 1818, and named in honor of Gen. E. W. Ripley, an officer of the war of 1812, and is bounded on the north by Decatur and Franklin, on the east by Dearborn and Ohio, south by Switzerland and Jefferson, west by Jennings.

This county contains 450 square miles, with a total area, according to assessment, of 279,165 $\frac{28}{100}$ acres.

Enumeration of children for schools, in 1870, was 7,613; in 1875, 7,937.

The largest part of the county is level, and large areas, called "flats," are met with. The broken or rolling land borders on the streams. The drainage of the county is poor, excepting along the watercourses, where there is a local drainage, and the streams flow into the Ohio river on the east, and to White river on the southwest.

The principal streams of the county, are Big and Little Graham. The former rises near the summit of the Lower Silurian, in the central part of the county, and flows west of New Marion. The latter rises on the "flats," a little east of North Marion, and flowing over the Niagara rocks, to the southwest, unites with the main stream in Jennings county, and forms a junction with Big creek below Paris. The next streams of note are Big and Little Otter creeks, being thus designated above their junction, which occurs a short distance east of Butlerville. These streams are the head waters of the South Fork of the Muscatatuck. Big Otter creek rises in the "flats," a short distance southwest

of Napoleon, and flows over the Niagara rocks, and cuts the Lower Silurian at its junction with Little Otter, which rises in the "flats," southwest of Osgood. The North Fork of the Muscatatuck slightly washes Jackson township on the west. Laughery creek rises a short distance southeast of Napoleon, flows over the Niagara rocks to the north, and soon cuts the Lower Silurian formation. The flow is then east to its junction with Little Laughery at Ballstown, thence south and southeast, and finally north by east, into the Ohio river below Aurora. North and South Hogan flow from the eastern border of the county. There are numerous small streams, Cedar creek, Castaters branch, Pendleton creek, Ripley, Plum, Raccoon and Tanglewood.

This county is well watered in the eastern part by constant springs and by numerous streams, also in the western division by the streams flowing with the dip of the Niagara formation to southwest. A water supply can be secured in any locality at a reasonable depth. The most broken or rolling section of the county is in the eastern or northeastern part, bordering on Laughery and the head waters of Hogan. These streams, coming in contact with the clay and shaly layers of the Cincinnati Epoch, which are very friable in some parts, soon cut down the strata to a great depth, which gives rise to a very rolling country with far-reaching vistas, as in Dearborn county to the east, or as along Laughery, which is comparatively a short stream, with precipitous bluffs of one hundred to two hundred feet, and a broad alluvial valley. Many of the prominent bluffs along the latter stream afford picturesque views.

Judging from the numerous mounds found on the border of this stream it was a favorite resort of a prehistoric race. Laughery creek was named after Col. Archibald Laughery, of Westmorland county, Pennsylvania, who was tomahawked and scalped near the mouth of the creek, and about forty of his men killed, when on their way to join the command of General Clarke, at the Falls of the Ohio. The party went on shore for the purpose of cooking some buffalo meat, when they were attacked by the Indians.

GENERAL SECTION OF RIPLEY COUNTY.

Quaternary Beds.

1.	Alluvium, recent		2 to 25 feet.
2.	Champlain	10	35 feet.
3.	Glacial Drift		

PALEOZOIC GEOLOGY.

The rock strata of this county comprise two members of the Upper Silurian, and one of the Lower Silurian Age, as follows:

UPPER SILURIAN AGE.

Niagara Period.

4.	Niagara limestone; stratified, gray and white, a good building stone, and when burned produces a good lime	42 feet.
	Clinton epoch	a trace.

LOWER SILURIAN AGE.

Trenton Period.

Cincinnati epoch ..... 190 feet to ——

The oldest formation in this county belongs to the Cincinnati epoch,* and is more or less noticeable along most of the streams in the county, attaining on the eastern border an altitude of one to two hundred feet above the

*PROF. W. W. BORDEN:

DEAR SIR:—In your Report on the Geology of Jefferson county you place the line of division between the Lower and Upper Silurian rocks, at Madison, at the *Tetradium*.beds, altitude 319 feet, and have, inadvertently, no doubt, credited me with it. Such, however, is not my view. In 1873, or earlier, I discovered a stratum bearing Hudson fossils, which lies 49 feet above the *Favistella* bed on Michigan road hill, and 351 feet above low water mark in Ohio river. It overlies 32 feet of non-fossiliferous limestone, the banded limestone of Owens' Report. This stratum I regard as the true boundary between the Lower and Upper Silurian rocks at this place. I gave notice to the public of this discovery in an essay on the Geology of the Madison hills, published in the *Indianapolis Journal* of July 10th, 1874, and which was copied into the Madison Courier within a day or two afterward.

I am, Dear Sir, very respectfully yours,

W. T. S. CORNETT.

Madison, Indiana, January 27, 1876.

beds of the streams. Commencing in the southwestern part of the county there occurs at New Marion, Shelby township, the following section, on B. D. Bacon's spring branch:

1.	Ocherous clay soil, with sand.....	6 to 10 feet.
2.	Niagara stratified limestone, gray, weathering rough, and shows brown streaks, from decomposed pyrites; also fossil crinoid stems. Strata 12 to 14 inches...	10 to 12 feet.
3.	White stratified limestone in strata of 14 to 16 inches, burns readily into lime, weathers very smooth where exposed...	20 in. to 2 ft.
4.	Stratified limestone, unevenly imbedded, thin layers, gray with brown spots.....	4 feet.
5.	Thin stratified gray limestone with clay partings and terminating in 6 in. clay shale below, with an abundance of crinoid stems.....	1 ft. 9 in.
6.	Brown and gray stratified limestone, thin layers at the crop, with crinoid stems, *Zaphrentis*, *Calymene blumenbachii* and shells; also plates of *Caryocrinus ornatus*	6 to 10 feet.
7.	Thin, stratified, unevenly imbedded magnesian limestone, projecting and making water falls.....	10 to 12 feet.
8.	Dark blue shale, containing aulopora stems, etc., and thin limestone layers, with Cincinnati fossils.....	5 to 6 feet.
9.	Dark blue, stratified limestone, with a trace of spar, three to 5 ledges, 8, 12 and 14 in.	4 to 5 feet.
10.	Dark, shaly limestone to the bed of Big Graham.....	5 to 8 feet.

Higher up the stream, Graham creek flows over No. 10 of the above section, which forms a smooth bottom. No. 9, which superimposes it, appears along the shore, showing a uniform but rapid dip to the south and west. No. 2 of the above section forms cliffs along Graham, and frequently large detached masses occur, with trees growing upon them. An out-crop on the New Marion and Versailles road, at Graham creek, section 30, range 11, shows:

1.	Ocherous clay soil, brown and white chert, with a trace of sand and numerous small boulders.....	6 to 10 feet.
2.	Magnesian limestone, rough.....	?
3.	White stratified limestone.....	?
4.	Not exposed.	

5.	Gray stratified limestone, crinoid stems, corals and shells	4 to 5 feet.
6.	Brown shale, with crinoid stems and corals	5 feet.
7.	Thin, stratified magnesian limestone	8 to 10 feet.
8.	Limestone	10 to 12 feet.
9.	Dark blue stratified limestone, 8 to 14 in...	5 feet.
10.	Magnesian limestone to the bed of Big Graham	5 feet.

An abundance of sand for all ordinary purposes is found along the road-side and streams in this locality. A section on Big Graham at the crossing of the Marion and Butlerville road, shows:

1.	Light colored clay soil with darker shades at the bottom, and white chert	8 to 10 feet.
2.	Magnesian limestone, weathering rough...	10 to 12 feet.
3.	White limestone, weathering smooth	2 to 4 feet.
4.	A course-grained limestone containing stems and crinoid roots	10 feet.
5.	Various grades of limestone	12 to 15 feet.
6.	Thin layers of hard blue limestone and shales, with Cincinnati fossils	10 feet.
7.	Dark blue and lighter shades of stratified limestone in strata of 12 to 14 inches, same as No. 9 of the above sections, contains pockets with calc spar	3 to 5 feet.
8.	Decomposing mottled magnesian limestone, cropping at low water and in the bed of the creek, Cincinnati	2 to 4 feet.

The dark blue stone of No. 7 and 9 of the above sections stands the weather well and is good for foundations. By reason of the rapid dip of this strata, a short distance below this point the stone disappears beneath the surface. These crops are nearly due east of Butlerville where sections have been obtained on the South Fork. From New Marion to Holton the "flats" intervene, and two miles southwest of Holton, on Otter creek, at the crossing of the North Vernon and Versailles road, this section occurs:

1.	Light colored clay, with darker shades at the bottom, sand and boulders in the ditches	10 to 20 feet.
2.	Gray stratified limestone, Niagara	12 to 20 feet.

3. White stratified limestone, good for lime... 15 to 25 feet.
4. Dark gray, shaly limestone, with clay layers and fossils, Cincinnati, to bed of creek..... 8 to 12 feet.

An abundance of crystalline Niagara limestone is seen in all this region along the bluffs. Some distance below this, on the land of S. Lane, section 8, above the railroad crossing of Otter creek, the following strata show:

1. Ocherous clay with sand, white and yellow chert and boulders..... 10 to 20 feet.
2. Grey stratified limestone, (Niagara), thick and thin beds ..... 30 feet.
3. White stratified limestone in flagging layers, 4 to 7 in..... 12 feet.
4. One or more thin strata of coarse-grained limestone, a mass of fossil crinoid stems on the surface..... 5 in. to 12 in.
5. Dark and light clay shale, commencing the Cincinnati outcrop, thin layers of stone above ..... 10 to 12 feet.
6. Otter creek marble, one or two layers of mottled or variagated, fine grained limestone, which takes a good polish and is suitable for inside ornamentation..... 1 ft. 8 in.
7. Shaly limestone to the bed of Big Otter creek..... 5 to 6 feet.

Southwest of Osgood, on Otter creek, the Cincinnati rocks are seen in the bluffs and on the rolling lands bordering Otter creek, and are thirty to forty feet thick, with the Niagara above, but as the country becomes more level in the direction of Napoleon, only the Niagara rocks are seen. This finishes the localities of the Lower Silurian in the western part of the county, and the section given will show the thickness of outcrop on the eastern border.

This formation (Cincinnati) shows a greater thickness in the eastern part of the county; and Laughery creek, which flows through the county from the northwest to the southeast, may be considered the boundary between the Lower Silurian and Niagara rocks; the greater portion of the out-crop east of that stream belongs to the former series.

In Brown township, in the southern part of the county,

about Cross Plains, there are extensive "flats" which form the water shed between Raccoon on the north, and Paw's branch, Indian-kentuck and Laughery creek on the south and east. The rocks seen in this section are mostly Cincinnati. The soil is a light-colored, siliceous clay. North of this, on Raccoon creek, the country is very broken, and the out-crop is chiefly Lower Silurian, as seen about the junction of this stream with Laughery a short distance above Hart's mill. The crop on Cæsar creek to the east is the same as the above. Also, on Laughery, above Hart's mill, in the vicinity of a large mound on the land of widow Praute, northeast quarter section 2, township 6, range 12, the bluffs here on Laughery show from one hundred and fifty to two hundred feet of the lower rocks. North of this point the same members continue to Versailles, the county seat. These crops give a broken appearance to the country, with elevated bluffs along the large streams. The bluffs on Laughery, above and below Versailles, are very abrupt in places, and present a good outcrop of Lower Silurian, with numerous rich fossil localities that are much resorted to by collectors. A section east of Versailles, on the Steinmetz land, shows from the high lands to the bed of the streams:

1.	Ocherous, siliceous clay soil with occasional boulders.....	8 to 20 feet.
2.	Dark, granular magnesian limestone, massive in some localities.....	?
3.	Light blue stratified limestone, firm, in layers of 6, 9, 11, 14 and 20 in., with water markings on the lower face, sometimes cavernous.....	5 feet.
4.	Blue and light colored clay shales, with *Tetradium fibratum* (coral).....	4 to 10 feet.
5.	Very hard blue limestone, thin layers, with shale and Lower Silurian fossils...	100 feet.
6.	Strata of blue clay shale, with layers of very hard blue limestone, containing *Rhynconella capax*, *Orthis sinuata*, *O. plicata*, *O. lynx*, varieties, *O. occidentalis*, *Strophomena alternata*; also, *Pleurotomaria*, *Murchisonia bicincta*, *M. bellicinta*, and slabs containing *Chætetes turberculata.*	

7. Three or more layers of stratified limestone, and good slabs with *Leptæna sericea*..... 3 to 4 feet.
8. Blue shale, containing *Petraia corniculum* and *Rhynconella*.
9. Two or three inches of hard yellow shale, containing an abundance of pentagonal, round and square crinoid stems; also, *Heterocrinus heterodactylus, Hetrocrinus subcrassus*, Meek & Worthen, *Anadontopsis milleri, Asaphus gigas, and A. megistos;* in the blue shale below are also found *Orthis testudinaria, Strophomina striata, S. alternata*, and *Calymenes senaria*, to the bed of Laughery..... 190 feet.

The strata at this point have a very perceptible dip to the southwest. On the bluff of the creek, a short distance above the latter locality, in company with C. B. Dyer, of Cincinnati, Ohio, collected a square celled coral, and a species of *Chaetetes, Strophomina alternata* and *S. striata* with a number of other characteristic fossils. Below this point and opposite the mouth of Cedar creek, we collected *Lachneocrinus dyeri, Orthis testudinaria*, etc. The land is very much elevated three miles north, about the head of Cedar creek, and a section at the Devil's Elbow, the highest point, shows:

1. Ochreous clay, with white chert and sandy layers, large boulders of a variety of colors, and blue clay at the base..... 12 to 25 feet.
2. A very hard, rough, flinty limestone.....? 8 inches.
3. Ocherous layers of various shades, and sandy beds, partially covered with debris..... 9 feet.
4. At the Falls, 2 to 3 strata of bituminous limestone, 6 to 8 in..... 1 ft. 8 in.
5. Shaly limestone to foot of the Falls..... 20 to 25 feet.
6. Lower Silurian to the bed of Laughery creek .....150 to 190 feet.

On the Versailles and Moore's Hill road, two and one half miles east of Versailles, on Pleasant Hill, in company with Dr. W. H. H. Hunter, I was shown a good fossil locality for *Tetradium fibratum*, curved in form, and occurs

near the top of the hill; also, a rare crinoid, *Lichenocrinus terberculatus*, and some other fossils are found here.

From the above locality east, the flats intervene to North Hogan, and between that stream and South Hogan the land is gently rolling; nearing the latter the land becomes very rolling. It is believed that the *Murchisonia* which occurs in the bed of Cedar creek, near the mouth, above Versailles, is near the summit of the hills, at Moore's Hill. Collected on South Hogan, near the railroad depot, *Strophomena rugosa*, *S. incurvus*, *Calymene senaria*, and many other good fossils. A good outcrop of the Cincinnati is met with on North and South Hogan. A section on the Versailles and Osgood pike, at the crossing of a branch of Cedar creek, shows the following crop:

1. Ocherous clay with a trace of sand and gravel..... 5 to 12 feet.
2. Show of white limestone containing crinoid stems, (Niagara).
3. Yellow shales with dark layers..... 8 to 12 feet.
4. Dark-blue limestone, rough with corals.
5. Dark-blue stratified limestone in layers of 8 to 12 inches, and terminating below in thicker layers with partings of shale, 16 to 18 feet.
6. Along the stream, Cincinnati rocks below.

It will be seen from these sections, that the crop here is almost entirely Lower Silurian. East of Osgood the rocks are almost exclusively Cincinnati, and thus continues to the east in the direction of Delaware. On Laughery, below the mouth of Pendleton, and on the south side, the outcrop is as follows:

1. Ocherous clay soil with a trace of sand and boulders..... 20 to 30 feet.
2. Covered, (Cincinnati).
3. Blue shaly limestone and clay layers; an abundance of Cincinnati fossils..... 25 to 30 feet.
4. Blue clay shale, with fossils *Petraia corniculum*..... 3 to 4 feet.
5. Thin blue limestone layers with shale containing *Strophomena alternata*, *Leptæna sericea*, parts of *Asaphas gigas*..... 20 to 25 feet.

Along Plum creek some thick strata of limestone occur in the Lower Silurian, but as seen in the piers of the railway bridge over Castater's branch, the Plum creek stone is not durable; but the Vernon stone, in the same abutments, shows no sign of disintegration. The land along Castater's branch is broken; flat land intervenes between it and Laughery on the west, but the country again becomes broken along the latter stream. At Blackmore mills, on Laughery, the following section is seen:

1. Light colored clay, ochre shades below, with sand and large boulders..... 25 to 30 feet.
2. Dark blue shaly limestone with Cincinnati fossils ..... 150 feet.

Orthis lynx, O. dentata, O. sinuata, Trilobites;
10 feet above the bed of Laughery.

The outcrop in this section is exclusively Lower Silurian, as will appear from the following section on the State Road at J. T. Dashiell's, section 31, township 9, Delaware township:

1. Clay soil, sand and boulders ..... 5 to 20 feet.
2. Stratified gray limestone, weathers white, in dark blue layers..... 10 to 15 feet.
3. Good layer of *Tetradium fibratum* and other fossils..... 3 to 5 feet.
4. Blue shale, and dark blue shaly limestone with fossils to Branch..... 10 to 25 feet.

North of this, on the southern exposure, fragments of the rare fossil crinoid, *Lichenocrinus tuberculatus*, was seen. To the north of this, along Ripley creek, heavy beds of sand from the drift covers the outcrop of rocks and occasionally boulders of large size are met with. In this locality, about the mouth of Ripley creek, and above on Laughery, the drift is heavy, producing clay and sandy shores to the streams. The water courses here, abound in mollusca, which were seen plowing through the sandy beds of the streams. Large numbers were washed out, at the time of our visit, by the recent high water, and were destroyed in large quantities by hogs that range along the streams and feed upon them.

About Ballstown, in Laughery township, on Laughery creek, the land is broken as usual, but the bluffs are not so abrupt on its head waters as they are lower down the stream. An outcrop on the land of John Wilson, in this stream shows twenty to thirty feet of Lower Silurian rocks. To the west of this the Niagara comes in. Having traced the oldest formation in the county along Laughery to near the head-waters, almost the entire beds to the east of this are composed of Lower Silurian, with some firm and durable strata in the quarries about Milan, as follows:

1.	Clay, soil and sand	2 to 10 feet.
2.	Dark gray stratified limestone	2 to 4 in.
3.	Dark gray stratified limestone	6 to 8 in.
4.	Dark gray stratified limestone	18 to 20 in.
5.	Dark gray stratified limestone	14 to 18 in.
6.	Dark gray stratified limestone	18 to 22 in.
	Total	10 feet.

East of Milan on Hogan the land is very rolling. A quarry opened on the land of E. Shockly, section 19, township 13, range 8, and one mile northeast of the station, (South Milan) on the O. & M. railroad, shows as follows:

1.	Clay soil	2 to 6 feet.
2.	Blue stratified limestone	18 in.
3.	Blue stratified limestone	14 in.
4.	Blue stratified limestone	12 in.
5.	Flagging, blue limestone below.	

Adams township, in the northeastern part of the county, is principally flat, with but little outcropping rocks. Along Pipe creek, which rises on the "flats" at Sunman, and flows north into Whitewater, in Franklin county, a show of Lower Silurian rocks is to be seen, one mile west of Pennsylvaniaburg. A trace of Niagara was found on the most elevated lands near Sunman, which is five hundred feet above Lawrenceburg, on the Ohio river, and twenty miles distant by the I. C. & L. railroad. The clays are so deep and the land so flat, but little outcrop could be found. In the western part of this township, two miles south of Batesville, and on the head waters of Laughery creek, the

land becomes rolling, and stone is quarried at outcrop as follows:

1. Light-yellow clay, sand and glacial drift below ..... 12 to 30 feet.
2. Two to three layers, flagging limestone, Niagara.
3. Thin layers of blue limestone, with Cincinnati fossils.
4. Thicker strata of blue limestone..... 2 to 5 feet.

Extensive quarries of white limestone, (Niagara), are worked to the west of this, in Decatur county, and especially at Greensburg, and on Flat Rock creek, in Shelby county.

I have traced the oldest formations seen in the county, from an exposure in which it is represented by only a few feet of strata, to where it has reached a development of about 200 feet, on the eastern and northeastern borders of the county. The sections obtained in these localities show a succession of limestones, shales and clay (matrix of *Tetradium fibratum*), the whole capped in some places with dark blue, close-textured, thick-bedded limestone. This section is succeeded by strata belonging to the Upper Silurian age, and the prevailing fossil forms of the preceding age give place to new and well marked types, which serve as guides for the classification of the strata.

NIAGARA EPOCH.

It will be seen from the sections hereafter given, that the Niagara limestone is in considerable force in the southwestern part of the county, on Graham and in the western part, on Otter creek. A good outcrop is seen along Little Graham, from its junction with the main stream at San Jacinto, in Jennings county, to the head waters of that stream, one mile south of New Marion, on the land of Daniel Holman, section 1. In this locality the stream flows over thin layers of limestone, with the dip of the rocks, which is considerable, to the southwest. These rocks contain some fossil stems, and an abundance of *Othoceratites* from 6 inches to 3½ feet in length, and 2 to 3 inches in

diameter, others of great length but of small diameter. They are very much abraded, and good specimens could not be obtained for the cabinet.

Workable beds of Niagara limestone are found on Tanglewood and the head waters of Big Graham, in Johnson township, section 15, three miles southwest of Versailles, on the land of John Jackson, Sen. At the quarry, at present worked by him, there occurs the following layers of compact, light gray limestone:

1.	Loamy soil	0 to 3 feet.
2.	Five ledges of stratified, light gray limestone, Niagara, 4 to 5 in each	1 ft. 6 in.
3.	Sixth ledge	6 in.
5.	Nine ledges, 4 to 5 in. beds, as far as worked, with some heavier layers below	3 ft. 5 in.

This stone is quarried and worked for steps, flags, sills, etc. Mr. Jackson also burns this stone for lime, using wood for fuel, and sells lime at the kiln at 20 cents per bushel. This quarry is three miles south of Osgood, where the same stone is worked, with some thicker layers by Messrs. Ashman & Glasgow, in Center township, section 28, on the O. & M. railway, and shows as follows:

1.	Light colored clay, and terminating below with blue clay, sand, gravel and boulders	2 to 6 feet.
	(NIAGARA.)	
2.	White stratified limestone in layers, as follows: one ledge, 7 or 8 inches, ("Flat Rock") burns into good lime; 3 ledges —one 7 inches, and two ledges 6 inches	26 to 27 in.
3.	White stratified limestone	7 to 8 in.
4.	White stratified limestone	4½ in.
5.	White stratified limestone	6 in.
6.	White stratified limestone, with fossil *Orthocerata*, many layers	4 in.
7.	White stratified limestone, with fossil *Orthocerata*, many layers	7 in.
8.	White stratified limestone, with fossil *Orthocerata*, many layers	5 in.
9.	White stratified limestone, with fossil *Orthocerata*, many layers	7½ in.
10.	Stratified limestone continues as far as worked	6 to 7 feet.

Ashman & Glasgow employ on an average about 25 hands when the weather is suited for out-door work. This stone is easily worked, and is free from cherty concretions or spar, and when dressed has a very white appearance. It is cut into coping, ashlers, curbing, gutter flags, also for cellars and sidewalks. The principal market for this stone is Cincinnati, where large quantities are sold. The Niagara limestone outcrops to the west of this on the head waters of Otter creek and continues to Napoleon, in Jackson township. It is exposed on the head waters of Laughery creek, which rises in the "flats" south of Napoleon, and flows north.

1. Light colored clay soil, with ochre shades below, sand and an occasional boulder.. 4 to 15 feet.
2. Blue and gray mottled limestone, in layers 14, 10, 8 and 3 inches; it has a rough surface as at Flat rock, and is in all..... 15 to 20 feet.
3. Light-brown stratified limestone, with crinoid stems, and fragments of Trilobites, *Calymene blumenbachii*, also occasional clay layers..... 8 to 10 feet.

A short distance east of this Laughery creek flows over the summit of the Lower Silurian, but before its junction with the Ohio river, below Aurora, has cut down the Cincinnati rocks to a great depth. The elevation by railroad levels, at South Milan, in Franklin township, on the O. & M. railway, is 507 feet above the Ohio. An abundance of good building limestone, (Niagara), crops about Napoleon, and is easy of access. Quarries could be opened at many localities, which would afford good stone for foundations, superstructure, flagging or for lime, but there being no demand for stone at this place, and no facilities for transportation, this interest lies dormant. Having traced the Niagara formation for three seasons past, from the Falls of the Ohio, in Clarke county, where it is marked by the chain coral, *Halysites catenulata*, and at Utica, in the same county, by *Caryocrinus ornatus*, and many other fossil forms, I find the beds to be very uniform, and charged with characteristic fossils throughout its course, *Othocerata* being

especially abundant. The Niagara rocks thin out to a line on the east, where they lap upon the Lower Silurian.

This survey has shown the eastern border of the sub-carboniferous to be in Floyd, Clarke and Scott counties; the Devonian in Jefferson and Jennings, and lastly, the Niagara in Ripley county, while to the east are heavy beds of Lower Silurian.

QUATERNARY.

The Quaternary beds in this county rest immediately on the Paleozoic rocks, which are Cincinnati and Niagara. The thickest beds of glacial sand and clay, with boulders, are to be found in the northern part of the county. Numerous hills of yellow sand occur in the northeastern part of Adams township, near the county line bordering on Dearborn and Franklin counties. These sands lie quite evenly bedded, showing dark and lighter shades of color, and are from ten to fifteen feet in thickness, and in some localities covered with thick beds of clay. Good beds of brown sand are seen along the sand ridge on the land of John Schlicht, four to five miles north of Sunman, near the Dearborn county line, section 32, range 13. The drift is of moderate thickness along Plum creek, in this township, composed of sand and boulders. Evidences of glaciation are to be seen over the entire county, and doubtless the Paleozoic rocks will be found marked by the abrading forces then at work. The cutting away of solid rock strata is evident from what is developed by the well at South Milan, on the O. & M. railway. In this locality, heavy beds of very hard limestone are at the surface, (see section at quarry of E. Shockley, above given). These limestone beds are very continuous about South Milan, and some quarries are opened on the "flats" adjoining the town. The O. & M. Railway Co. had occasion to sink a well at this place for a water supply, and the following is a section of what it passed through:

1.	Light colored clay soil.....	10 to 14 feet.
2.	Yellow clay, with flint gravel and fossil corals	12 feet.
3.	Blue glacial clay.....	12 feet.

4.	Coarse yellow sand with recent shells and water	8 feet.
5.	Blue clay, muck, containing roots and limbs of trees	8 feet.
	Total of	54 feet.

Without reaching stone, as has been shown, compact beds of limestone occur in the immediate vicinity.

Here we have evidence of a deep glacial cutting that was subsequently filled by deposits of the Champlain period. There are extensive "flats" in this county about the head waters of Laughery creek and to the west of that stream, and lying between the head waters of Otter creek, Graham and other streams. The "flats" are composed of a light colored surface clay, with a trace of sand, and terminating downwards in clay of various shades of color. An average section of this deposit was obtained at Henry Dawson's. He is mining clay for the tile and brick works of R. W. Smith and H. Dawson, at Sunman, Adams township.

1.	Light colored clay with a trace of iron, used for brick	3 feet.
2.	Light blue to deep blue, used for tiles	4 feet.
3.	Ocherous shades with blue	2 to 3 feet
4.	Blue and yellow, clear blue sand with water	?

The clays of this period throughout the county have the same general appearance, with a trace of black sand, which is to be seen in streaks and in the washings on the road-side. It readily adheres to the magnet when dry. The alluvium found along the streams or hillsides is the result of the weathering of limestones and shales of the Niagara and Cincinnati epochs, decayed vegetation and the sand and clays of the glacial drift. This commingling of various strata forms a highly productive soil.

ANTIQUITIES.

More than the usual number of pre-historic relics are found in this county, comprising stone axes, arrow points, spear heads, knives, fleshers, and ornaments of various forms. I have discovered in this county, over twenty

mounds of various sizes and shapes, principally along Laughery creek, which flows through the county and empties into Ohio river, below Aurora. It is not surprising that along so large a stream as this, with elevated bluffs, and in close proximity to the Ohio river, pre-historic works should be abundant. It is worthy of note, that there is a greater variety of structure in these mounds than in the counties on the south. In company with James W. Pate, County Clerk, and others, I visited a large earth mound in Brown township, one mile north of Hart's mill, east bluff of Laughery, northeast quarter, section 2, township 6, range 12, land of widow Praute. This mound is some seventy-five feet in diameter at the base, and, as I was informed, was originally fifteen to twenty feet in hight, but at the time of our visit, measured near twelve feet. The owner of the land had recently attempted to plow it down. This earth mound was opened by some parties a few years since, and found to contain animal bones, mussel shells, ashes, coals and glazed pottery. I was informed by Wm. L. Cornell, a very intelligent man who settled here in 1818, but came west from Fayette county, Penn., as early as 1803, that eighteen rods west of the large mound, there was another mound covered with stones in which human bones were found. Mr. Cornell also informed me that he and his son, some years ago, opened a vault, some forty rods southeast of the large mound mentioned above. This vault was covered with loose stones, resting on a covering of flag-stones, laid with broken joints so as to exclude the soil. Upon removing the covering they found three skeletons lying east and west. The length of these skeletons was respectively five feet, four and a half feet, and three and a half feet. Another mound, one hundred rods from the large mound, also covered with stone, contained human bones. At the time of my visit we opened an earth mound, three-eighths of a mile southwest of the large mound. This mound was sixty feet in diameter, and found to contain nothing but a few arrow points. A short distance west of the latter we opened a flat mound, made by

setting stones on edge, and forming a hollow space in the center, in which we found fragments of human skulls, and other animal bones. This is, perhaps, the most noted cluster of mounds in the county, and all traces of them will soon be lost. The bluffs of Laughery, on which the large mound is located, are very elevated, and afford a commanding view; the stream is seen wending its way to the south, along the base of the bluffs, which are lined with dense forests, and fertile alluvial lands.

Another earth mound, 66 feet in diameter, is to be seen in this township, section 28, and three quarters of a mile southeast of Cross Plains, on the land of A. Rowe; numerous flint chips were seen here, and a few flint arrow-points collected. The greater part of the implements found in this county are made of the native chert.

Two miles below Versailles, section 12, land of J. Warman, there is, on an elevated bluff of Laughery creek, an earthwork of quadrilateral form, with the parallel sides slightly deviating from north and south. The earth is thrown up from the center, and the walls are two feet high on the inside, and three feet on the outside; length of the walls 30 and 40 feet on the outside, and 15 and 20 feet on the inside. The view from here is, as usual, very good, and overlooks another earth mound in the valley below.

East of Osgood, below the mouth of Plum creek, in company with J. M. Roberts, I examined a circular embankment situated on a second bottom of Laughery creek, which measured about 360 feet in circumference. The earth is thrown from within, leaving an elevation in the centre, which is connected with an entrance-way from the north. The grounds around are strewn with flint chips. Some other conical earth mounds are found within a half mile of this. In company with J. T. Dashiel, I examined an earth mound on Laughery above the mouth of Ripley creek. This mound had previously been opened and found to contain bones and charcoal, with large boulders. We also examined an earthwork on the bluffs of Ripley creek, rather

elliptical in shape, and measured near 300 feet in circumference on the center of the embankment, which is 12 feet at the base. Here the earth was also thrown from the inside, leaving a raised center which, connected with an entrance-way from the west. This earthwork was located in a very dense forest swarming with mosquitos, and the ground is thickly covered with ferns, of which I collected the following varieties: *Aspidium angustifolium, Aspidium* (?), *Phegopteres hexagonoptera* (?), *Adiantum pedatum* (?), *Phegopteris cystopteris* (?), *P. polypodiodes.*

In company with Dr. William H. H. Hunter, I visited a rather unique mound on a high bluff, a short distance southwest of Versailles, and located on the old Hunter farm. This work was composed of stones set on edge, and near the form of a cross; also, some upright stones, rising one above another like steps. An earth mound was seen in the orchard on the second bottom below. An earth mound of considerable dimensions is situated in the cemetery at Versailles. A short distance above this locality at "Prospect Spring," which issues from near the summit of the bluffs, and furnishes a constant flow of cool water, on the land of Mrs. J. H. Smith, mound builders' relics are frequently found, which leads to the inference that this was a favorite camping ground.

In company with Wm. M. Pullaim, I examined a mound on the land of Elijah Stark, east of Versailles, situated on the bluffs of Cedar creek. This is an earth mound, 45 feet in diameter, and recently opened by Mr. Pullaim, who, at the depth of about four feet, exhumed human skull bones partially burned, samples of which I saw. He also found in the mound several inches of ashes, with charcoal. It is impossible at present to give more than a short sketch of a few of the numerous mounds found in this county. Altogether, this is an interesting field for the study of prehistoric works.

AGRICULTURE.

The usual farm crops of the State are cultivated in this county: corn, oats, wheat, grass, potatoes and buck-wheat.

The agriculturists of this county have two distinct grades of farm lands. First, on the "flats," so-called, a retentive clay soil, with but a few inches of vegetable mold. This land is a cold, compact, tenacious clay, with a little sand in some parts. These lands should be under-drained to render them productive. Second, lands that are made up from the weathering of limestone, drift, clay and sand, and vegetable mold. These lands constitute the most productive in the county. The drainage here is better, and the soil being porous, it is not so much effected by excessive drouth or rains. The bottom lands along Laughery creek are a detritus of the Lower Silurian, and are of remarkable fertility.

Hops are grown in some of the northern townships of the county, but formerly more extensively than at present. G. W. Perine, in Delaware township, a short distance from Rei Station, O. & M. Railway, cultivates several acres of hops. Other farmers in this township also cultivate a few acres. Adams township was formerly the most extensive field for hop culture, and a considerable area is still devoted to that object. Hops are planted like corn, but in much wider rows and are stuck with three poles, 14 to 16 feet in length, to the hill. A planting of hops will last for several years. They are cultivated like corn, by plowing and hoeing. The yield per acre is from 200 to 700 pounds, rarely 1000 pounds. The average yield is about 500 pounds per acre. The price varies from ten to fifty cents per pound, baled. I heard of one extra crop raised some years ago that gave 11,000 pounds from nine acres and brought in the market 12½ cents per pound. Rolling land with a deep, loose, clay sub-soil is considered the best for the growth of hops. The grub is found troublesome about the roots of plants of long standing.

Buckwheat is also extensively grown in this county, and a large area was sown this season on account of the failure of the wheat crop. This grain blooms late and affords a good resort for bees.

TIMBER.

Ripley county had, originally, a very heavy growth of timber. In sections of the northern part, the growth is almost exclusively white oak; in other sections, exclusively beech, while in other localities the two are combined and interspersed with other varieties. The forests on the "flats" are remarkable for the abundance and size of the trees and the occasional thick undergrowth, woven together with grape vines which add much to the density of the woods. The cutting of white oak for staves has deprived these forests of their best timber, yet some scopes of wood which have been preserved bear testimony to large and abundant growth of the primitive forests. The timber on the rolling land and along the streams, are poplar, black and white walnut, white oak, black oak, water oak, gum, hackberry, ash, water maple, elm, sycamore, etc.

There are a number of saw mills throughout the county. I am indebted to Mr. J. L. Stiles, manufacturer and wholesale dealer in lumber and in heavy timber, at Milan, for the lumber products of the county. There are at present, in the county, twenty saw and twelve grist mills. The approximate amount of lumber cut during the past year, is 2,000,000 feet, or, 100,000 for each mill. J. L. Stiles, with two mills, has cut about 300,000 feet. The depressed market for lumber has resulted in a much less amount cut this year than in 1873, when it was estimated at 5,000,000 feet.

List of saw mills: Daniel Stevenson & Sons, Sunman; Jacob Walters, Sunman; John Gro, Rei; Sage & Bro., Rei; M. Clark & Bro., Rei; C. A. Kenlog & Bro., Milan; J. S. Jorden, Pierceville; O. T. Googins, Pierceville; T. & W. D. Wilson, Osgood; Wm. Sheem, Holton; Mr. Henten, Holton; J. Pearsons & Bro., Versailles; Thompson & Alexander, Milan; Degner & Co., Elrod; B. Heaton, Elrod; Joseph Jackson, Delaware; Mr. Thackery, Ballstown; J. L. Stiles, one heavy and one light steam saw mill.

CONCLUSION.

In conclusion thanks are due to the citizens of Ripley county for courtesy and assistance in my work. The following named, rendered special aid: Benjamin F. Harrell, Benjamin D. Brown, of New Marion, Shelby township; Lewis Roszt, County Commissioner, Henry Schmolsmire, John Sweazy, M. D., Alpheus Hunter, Cross Plains, Brown township; Dr. Wm. H. H. Hunter, James W. Pate, County Clerk, J. B. Rebuck, Attorney at Law, Wm. M. Pullaim, C. C. Bryant, John H. Wernke, Auditor Ripley county, Versailles, Johnson township; R. W. Glasgow, Robert Young, J. B. Foy, J. M. Roberts, Osgood, Center township; C. B. Johnson, Napoleon; Dr. Clark, Rev. Wm. H. Burton, J. H. Drake, M. D., J. T. Dashiel, G. W. Perrin, Rei, Delaware township; D. B. Abbott, M. D., E. Shockly, J. L. Stiles, Milan, Franklin township; A. Hazen, Richard W. Smith, Henry Dawson, John Schlicht, Herman Nieman, Dr. Davis, J. Severinghouse, Esq., Adams township.