

GEOLOGY OF RANDOLPH COUNTY.

By A. J. PHINNEY, M. D.

Randolph county is situated on the eastern line of the State, and has for its boundaries: Darke county, Ohio, on the east; Jay county, Indiana, on the north; Henry and Delaware on the west, and Wayne county on the south. It is one of the largest counties of the State, and contains 284,177 acres, a good part of which is improved. It is well supplied with railroads. The Cleveland, Columbus, Cincinnati & Indianapolis road is crossed by the Fort Wayne, Richmond & Cincinnati, at Winchester. The Pittsburg, Cincinnati & St. Louis passes through Union City and Ridgeville, while the branch of the I., B. & W., lately completed, affords an outlet for the products of the southern portion. Its principal cities are Winchester, the county seat, and Union City, both of which are enterprising towns, having a steady and permanent growth, and though mostly engaged in commercial pursuits, in both may be heard the busy hum of manufacturing enterprises. The Court House at Winchester is a fine building, and justly deserves to be the pride of the people.

Of smaller towns, the principal are Ridgeville, Farmland, Lynn, Spartansburg, Huntsville, Losantville, Windsor, Harrisville and Macksville, all enterprising towns, Farmland and Ridgeville being the largest, each containing about eight hundred inhabitants. At the last named is located Ridgeville College, which is under the control of the Free-Will Baptist denomination. "It is the aim of the instructors that it shall be free from sectarianism, yet the principles of a sound morality and the higher Christian life are carefully guarded and assiduously inculcated." Although starting under unfavorable auspices, they have secured a fine building, are now nearly free from debt,

and with classes increasing from term to term, its friends are looking forward with high anticipations of a useful and brilliant future. The Faculty is composed of the following able instructors:

REV. S. D. BATES, A. M., President, and Professor of Mental and Moral Philosophy.

REV. THOMAS HARRISON, A. M., Professor of Latin and Greek.

ELIAS BOLTZ, B. S., Professor of Mathematics and German.

MISS JOSEPHINE SUMPTION, B. S., Preceptress and Teacher of French.

MISS EMMA HARKER, Teacher of Instrumental Music.

R. FRICKE, Adjunct Teacher of Instrumental Music.

The courses of study are the Classical, Scientific, English and Normal. The terms are arranged to accommodate those who desire to teach during the winter months. Friends of the college everywhere will bear in mind that donations to its library or museum will be thankfully received.

SURFACE CONFIGURATION.

The surface is generally level or rolling, with the exception of three ridges in the southern part, which might in places be termed hilly. These ridges are highest south of the watershed, owing to the erosion of the valleys during the slow elevation of the divide. The surface near the water-shed is usually level, but grows more hilly as you go towards the south line of the county. North of White river is a low ridge, forming the water-shed of the northern part. The highest land in the State is formed on the middle ridge near Bloomingsport (one and a half miles northwest), on the summit between Green's Fork and Martindale creek, the elevation of the road bed of the L. B. & W. R. R. being here 1,234.40 feet above the ocean. Colonel Moore, Chief Engineer, estimates the elevation of some of the hills south of this point to be at least fifty feet higher, making the highest point in the State about 1,285 feet above the ocean. Hills on the east ridge are nearly as high. The following table of altitudes of the road bed of the L. B. & W. R. R. was furnished by Colonel Moore, Chief Engineer. The base line of this road places the Union Depot, at Indianapolis, at 721.20 feet above the sea level.

TABLE OF ALTITUDES.

Feet Above Ocean.

West line of Randolph county.....	1,171.50
One-half mile south of Losantville.....	1,140.60
Valley of Nettle creek	1,129.40
Summit between West river and Nettle creek.....	1,186.10
West river valley bridge.....	1,120.00
Township line at Hoovers' sawmill	1,220.00
Summit between Martindale creek and Green's Fork..	1,234.40
Crossing of Richmond, Ft. Wayne R. R. near Lynn...	1,173.80
Elevation of Lynn Station.....	1,183.00
Summit on line between Washington and Green's Fork townships.....	1,187.50
Summit west of boundary road.....	1,220.00
Divide of drainage between Noland's Fork and Green- ville creek.....	1,186.00
Summit between Noland's Fork and east fork of White Water.....	1,214.60
State line one mile north of the southeast corner of the county.....	1,180.44
East of the point last named, the descent is gradual to the Miami Valley.	
Low water Mississinewa river, at Ridgeville.....	964.00
Summit between Mississinewa and White rivers.....	1,095.00
Winchester, crossing of Bellefontaine R. R.....	1,088.00
Union City, C., C. & I. R. R.....	1,107.00

The county, as a whole, is one of the most elevated in the State, its southern part forming the water-shed of eastern Indiana. Streams flow in every direction from its summit. The principal rivers are the Mississinewa and its branches, viz.: Elkhorn and Bear creeks and the Little Mississinewa; White river and its tributaries, viz.: Little White river, Cabin creek, Sugar creek and Salt creek, in the central part. South of the divide, West river, Martindale creek, Green's Fork and Noland's Fork of White Water river, while on the east, Greenville and Dismal creeks drain the swampy tracts near the summit. All these streams supply an abundance of water for stock, though none are hardly large enough to furnish much water-power for manufactories. Where streams are not accessible, water can usually be obtained by wells; the depth varying from ten to thirty

feet. Springs are numerous, though mostly small, and the character of the water such as is usually found in limestone regions, though a few were observed which are chalybeate.

Nearly all the larger streams of the county have their sources in broad, swampy tracts, which, when the country was first settled, were almost impassable, and were from one quarter to two miles wide, and the larger from five to six miles long. The water-shed between Noland's Fork and Greenville creek is hardly perceptible, and the broad prairie which now borders both these streams can be traced from the south line of the county, with a direction a little east of north, to a point east of Union City, from thence continuing in the same direction for fifteen miles through the northwestern portion of Darke county, Ohio. South of Union City a branch of this prairie crosses the east ridge and extends in a southwesterly direction to the valley of Green's Fork, forming the broad prairie from which Dismal creek, the east branch of Green's Fork and White river have their sources. Cabin creek and West river rise in another long, swampy tract, which lies to the east of the west ridge. North of West River township, this swampy tract extends for about two miles. Bear creek and the stream from the north, which empties into the Mississinewa river a short distance above the mouth of Bear creek, are in the same line. The streams which occupy these broad valleys could never have excavated them; in fact, until ditches were cut, they had not even made a channel for themselves. They evidently mark the course of glacial rivers, flowing from the northeast to the valley of the Ohio or the ocean. The direction of the flow of these ancient streams, at right angles to the present lines of drainage, shows that the surface at the north was relatively much higher than at present, and that the divide, now so prominent a feature of the surface configuration, hardly had an existence at the close of the Glacial epoch. The three ridges are only remnants of the broad table land which once existed, the glacial streams having carried away the material which once united them. The hills, so prominent a feature of the southern part of the ridges, were carved from the level table land by currents of water. They have nothing in common with those hills of sand and gravel (kames) found so frequently in Delaware county and other portions of the State.

Union City is situated on the east ridge, and the people have always had more or less difficulty in obtaining water. In order to secure a supply for water works, an excavation was made southwest of the city, thirty feet in diameter, and twenty feet deep. A drill was then sunk twenty feet more, striking a vein of water which filled the well and overflowed the top, and has since continued to supply the city with clear, cold water. They evidently tapped the ancient channel which passes a little to the east. In draining the swamps, elks' antlers have been found; some very large and having a spread of six feet. Remains of the mastodon have been occasionally met with.

North of the Mississinewa river, in Jay county, is a ridge known as the Lost Mountain. This ridge has a similar position, and evidently originated in the same manner as the low divide north of White river. Overflows from the Glacial river evidently once covered most of Wayne and White River townships, finding an outlet through the channel marked "probable course of Glacial river." Although no deep channel was formed, enough material was removed to give to the remaining portion the character of a ridge, and the erosive action of White river has still further contributed to that result. A similar condition prevails north of the Mississinewa river, in fact that channel marked "probable course of Glacial river" can be traced through Randolph to Jay county. West of Ridgeville it curves to the east, and with a somewhat circuitous course terminates in the main channel in Darke county, Ohio, making probably the supposition that the ridge is the result of erosion.

GENERAL GEOLOGY.

QUATERNARY AGE.

Under this head may be classed all those deposits which have taken place during and since the close of the Glacial epoch, and it embraces all those accumulations of peat, muck and vegetable mold which are now among the very best farming lands in the county. The largest of these deposits occur in the valleys of those ancient rivers, their channels having been silted

up with sand and gravel, leaving, at first, series of shallow lakes. All depressions in the surface were left filled as the waters slowly receded. These lakes and ponds, after a long period of time, became filled from the accumulations of an aquatic vegetation and the wash from the higher lands. Although shunned by the earlier settlers, the judicious use of ditching has redeemed these wastes, and now, over a great part of these prairies, may be seen the fields of golden grain. The depths of these deposits varies from two to ten feet, the lower part, in places, resembling a marl. The largest of these prairies are found bordering Greenville and Dismal creeks, on the east, and Cabin creek and West river, near the southwestern part of the county. Smaller accumulations of muck occur in every township.

ALLUVIUM.

All the streams of the county being small, no very extensive alluvial deposits are found here. The valleys of the Missis-sinewa and White rivers afford the best example of this formation. Although limited in extent, they are noted for their fertility—a characteristic of these deposits wherever found. Formed from the finer clay and sand washed from the higher lands, and mixed with vegetable detritus, they have every element necessary for the production of magnificent crops.

THE DRIFT.

This deposit covers the whole county, the depth ranging from twenty-five to possibly one hundred feet. It is here a gray and yellowish clay, with some sand and gravel in the deeper portions. From ten to thirty feet of clay is passed through, in digging wells, before gravel is reached. The depth of the surface clays, together with their extent, and the numerous large bowlders which are found on the surface are records of the melting of extensive glaciers. The clays, sand and gravel, which are scattered over such a large extent of territory, tell us of the mighty force which ground to powder the shales, destroyed the cohesion of sandstones, and brought from the Canadian highlands mere remnants of those azoic rocks that were torn from their parent ledges.

If, standing upon the summit of Little mountain, Lake county, Ohio, 750 feet above the surface of Lake Erie, one will

fill, in imagination, that vast vacuity which probably extends to the Canadian shore with the Erie shale, Waverly group and Carboniferous conglomerate, which once occupied it; he will be able to form some conception of the mighty force which excavated the basin of Lake Erie, and scattered the debris over Indiana and Ohio. That great glacier moved from the northeast to the southwest, and the Little mountain, with its precipitous walls facing the lake, indicates the position of the land side of that glacial plow. Probably the low divide, which extends from Northeastern Ohio into Indiana, passing through the southern part of Randolph county, marked the southern border of this glacier. This was followed by the great glacier from the north, which covered the continent as far south as the fortieth parallel of latitude. As this melted, leaving the debris of its work of destruction behind, to be sorted by the volumes of water flowing from it, a depression of the continent took place, the glaciers dropped their loads of gravel, sand, clay and boulders. After this part of the Ice age the surface clays were deposited, and the future wealth of the soil determined. During the period of elevation which followed, the sheet of clay was cut through by the rivers which were draining the waters from the basins of the great lakes. As the rivers flowed across the divide, they excavated those deep and broad valleys now occupied by Greenville and Dismal creeks, Cabin creek, and West river. Portions of the table land separating them were subject to the action of currents of water, which carved those rounded hills, so common near the summit of the divide. As the lake basins became drained, the ancient river channels were silted up, in many places wholly obliterated, leaving only a series of shallow lakes to mark their former course. During this last act in the great drama of water and ice, the surface configuration of the county was marked out. Gradually, with a continued but unequal elevation, the present lines of drainage became established at right angles to those ancient river channels.

BOULDERS.

Boulders are common everywhere, but are found in greater numbers in the southern part, near the summit of the divide, the erosion which this part of the county has suffered having

carried away the finer material, leaving them exposed. East of Windsor and south of White river is a line of bowlders, extending nearly to Macksville, many of which are of large size. In section 29, White river township, range 14 east, 20 north, is one thirteen feet long and five feet above the surface, and with not less than five or six feet imbedded in the earth. West of Fairview and south of the Mississinewa river is another nearly as large. Quartzytes, greenstones and granites are the prevailing kinds. Many of the quartzytes are of great size, and show by their well rounded forms the rough usage to which they have been subjected. The greenstones (Dioryte, with others of the Hornblende series) are, many of them, large, and are usually angular. All forms of granites occur here. The transition into the gneissoid rocks, however, is rare, the tendency of the gradations being towards the Syenites. But few limestones were found. In many places bowlders were so numerous that the farmers were compelled to haul them off their fields. The immense piles along the roadsides afforded ample opportunity for their study.

PALEOZOIC GEOLOGY.

The only rocks found in the county belong to the Niagara period, Upper Silurian age. But few exposures occur, and only along the larger streams. At Macksville, on White river, is an outcrop exposing a thickness of about six feet of a soft, friable and coarse grained limestone of a whitish cream color, becoming yellowish on exposure, judging from what was seen on the surface. This is suitable only for lime, of which it makes an excellent quality. It sets quick, owing to its being nearly a pure carbonate. Mr. J. C. Brickley burns annually about 7,000 bushels, which hardly supplies the local demand. This industry might be much increased if the rock was quarried properly. Instead of taking a few loads from where it can be obtained the easiest, a quarry ought to be opened and worked below the surface of the river, and with a front not less than ten or twelve rods in length. When once opened, rock could be obtained with much less expense than at present, and if a

continual burner was used the cost of production would be much less. Not over two or three feet of stripping is required here, and that principally the alluvial deposits of the river. Although this rock is a magnesian limestone, the amount of magnesia present is much less than in rocks of the same age in Grant and Huntington counties.

The following analysis is taken from Prof. Cox's Report for 1878.

Analysis of Rock at Macksville.

Water expelled at 212° Fahr.....	1.18
Silicic acid.....	1.20
Ferric oxide.....	1.30
Alumina.....	4.40
Lime.....	45.45
Magnesia.....	4.01
Carbonic acid.....	40.11
Sulphuric acid.....	.27
Loss and undetermined.....	2.08
Total.....	100.00

The principal ingredients of this rock, as seen from the above, are carbonate of lime, carbonate of magnesia and alumina. In calcining, probably the greater part of the magnesia is driven off, especially if a white heat is obtained. The strata here range from two to five inches in thickness, and though very soft when first taken from the quarry, become hard on exposure. In the upper layers, casts of *Pentamerus oblongus* are very abundant, many being nearly perfect; but as no pains had been taken to save the finest ones, only weathered specimens could be obtained. Impressions of an *Orthis* and *Spirifer* were observed, and, judging from the description given, *Orthoceras annulatum* and *Platyostoma niagarensis* have been occasionally met with. The direction and amount of dip could not be determined. A small exposure occurs in section 8, West River township, range 13 east, 19 north, on Cabin creek, which was worked for lime, on a small scale, some years ago. No outcrop can be seen at present.

Near Ridgeville the rock is exposed along the Mississinewa river for about two miles. Here is found about six feet of a

whitish, coarse-grained limestone which, though soft and friable when first taken from the quarry, hardens on exposure, and forms the principal stone used in the vicinity for walls and building. The strata range from two to four inches in thickness. This stone makes excellent lime, though none is being burnt at present. This rock differs very little from that at Macksville, as can be seen from the following analysis from the Indiana Geo. Report 1878.

Analysis of Rock at Ridgeville.

Water expelled at 212° F.....	0.90
Silicic acid.....	.70
Ferric oxide.....	2.70
Alumina.....	3.75
Lime.....	45.08
Magnesia.....	4.36
Carbonic acid.....	40.21
Sulphuric acid.....	.44
Loss and undetermined.....	1.86
Total.....	100.00

The presence of iron in the upper layers causes them to turn rusty or yellowish red upon exposure to the air, the oxide becoming a sesquioxide. Numerous impressions of fossils were seen. *Corals* of the genus *Favosites* were numerous, but good specimens could not be obtained. The more common of the fossils found are *Favosites niagarensis*, *F. favosus*, *Strophomena rhomboidalis*, *S. striata*, *Orthis elegantula*, *Pentamerus oblongus*, *P. sp?* *Cladopora reticulata*, *Zaphrentis bilateralis*, *Meristina nitida* and *Platystoma niagarensis*. West of Fairview, near the river, rock is found about two feet below the surface. This differs in no particular from that at Ridgeville, except that the strata are thicker. Only a small amount has been quarried. At neither of these localities could the dip be determined. The rocks of this county differ from that found in Delaware county in the absence of the argillaceous and cherty layers, as well as the more durable and desirable blue stone. The dip in Delaware county being to the southwest, the rock there belongs higher in the series. The difference is not due to a change in the litho-

logical character of the same strata, but to a change in the conditions under which they were deposited.

At the close of the Lower Silurian age the southern portion of that line of upheaval known as the Cincinnati arch was raised above the sea. In the continental ocean surrounding it was deposited the Niagara limestone, the most extensive of any of the formations subsequent to the Lower Silurian. The Cincinnati arch, extending from Nashville, Tennessee, to a point between Toledo and Sandusky, Ohio, was a line of unequal disturbance, which finally culminated in the elevation of the whole arch above the ocean at the close of the Devonian age. This arch is not a single fold, but, as ably shown by Prof. J. S. Newberry, in the geological survey of Ohio, its northern portion consists of at least two distinct folds. During the deposition of the Niagara limestone around the Lower Silurian island, the sea was gradually retiring with the elevation of the arch, and the different portions of the Niagara group, following the retreating waters, were deposited successively further from the old shore line. To-day the most recently formed strata of the Niagara are probably found along the Wabash river, showing that there had been a gradual elevation of this portion of eastern Indiana, during the Niagara period. The dip of the strata is both to southwest and northwest.

The dip of the blue limestone of Delaware county is such that the strata, if continued into Randolph county, would overlap the whitish rock found here. This blue limestone, if traced to the northwest, is found to underlie the yellowish, massive limestone of Grant county, the probable equivalent of the Guelph, Cedarville, or Pentamerus limestone, which is found covered by the whitish limestone along the Wabash. The limestone of Jay is similar to that of this county, but in Wells county the blue limestone appears in the bed of the Wabash.

Above the Niagara group in Ohio, is the Salina, with its beds of gypsum, but if any of this formation was deposited in Indiana, it is either covered by the drift or has been removed by erosion. Immediately succeeding this is the water-lime (Lower Helderburg), which forms the surface rock over a large portion of Ohio, but gradually becomes thinner and disappears before reaching this portion of Indiana. It is possible that this formation may be covered by the drift in the northeastern part

of the State; but so far, where the Devonian is exposed with the Niagara, there has been no water-lime intervening, and the exposures are so numerous along the western border of the arch, that if ever deposited it would have been observed; so far no outcrop of water-lime is found in Indiana. The water-lime of the falls of the Ohio at Louisville, belongs to the Upper Helderberg of Devonian age.

The prevalence of rocks of the Niagara group over so large an extent of territory in this State, together with the absence of the water-lime and salina, indicates that this portion of the State was above the ocean, at the time of their deposition. There is no evidence to show that Randolph and Jay counties were covered by Devonian seas, although they may have been. It is possible, even probable, that investigation will show that the Cincinnati arch, north of the Ohio river, consists of three folds instead of two, and that the older one of these extended from the Lower Silurian island, west of north, far into Indiana.

This county is the highest in the State, because it forms part of the Cincinnati arch which is crossed by the gentle fold extending from Northeastern Ohio into Indiana; everywhere throughout its course it marks a high elevation, and where these two lines of disturbance—if they be such—cross, is found the highest point measured in Ohio and Indiana. The highest points do not necessarily coincide with the water-shed, for deep valleys were excavated through this ridge by the glacial streams, showing that its present relative altitude is of comparatively recent date.

ECONOMIC GEOLOGY.

The soil of this county is its only genuine and real mine of wealth, and most bountifully has it responded to the labors of the husbandman. Although, with the exception of the prairies, the soil is for the most part a heavy clay, it has been enriched by the vegetable accumulations of ages. The clays being the debris of many different formations, contain all the elements necessary for a fertile soil. In the southwestern part of the

county the soil is somewhat sandy; the fields of wheat one can see here, show well the adaptability of the soil. North of White river, the soil is a heavy clay, with occasional patches of muck; but as all this portion admits of draining, but little difference could be seen as regards the prospects of a bountiful harvest. Wheat, corn and grass are the principal productions, and if the prospects for this year are a criterion from which to judge, few counties in the State will have better cause to feel proud of their crops of wheat and grass. Some complaint was heard that the wheat was turning to chaff, but the real difficulty is that the farmer sowed chaff instead of wheat, and now, as harvest is near at hand, he tries to shirk the responsibility by claiming his misfortune to be due to a freak of nature, rather than to the proper cause—his own carelessness—as wheat never turns to chaff, nor chaff to timothy.

In the southern part of the county the prairies and the clays of the high lands are about equally divided, giving more variety of soil than is found in the northern part. All this portion admits of easy drainage, and the farmers are fast learning that labor expended in ditching is repaid many fold. The prairies and tracts of muck are well adapted to corn and wheat, while the clays, in addition, produce heavy crops of grass. Many fields will yield from two to three tons of hay per acre. Blue grass (*Poa pretensis*), is the most abundant of the native grasses, but timothy (*Phleum pratense*), grows equally well.

It must not be supposed that, however fertile a soil, it will continue to produce abundant harvests unless some effort is made to supply that waste of plant food which is lost with every crop harvested. Rotation of crops is a help to prolong the fertility of the soil; but as every crop of grass, corn stalks or straw, removes some of the silica, potash, lime and phosphates, this waste will have to be supplied if the soil is expected to produce with its usual degree of fertility.

Randolph is comparatively a new county, and the vegetable accumulation of ages is still present, but the time will come when this will disappear, as it is constantly exposed to atmospheric agencies, and then over a great part of the county will be found a stiff and unproductive clay. The loss of vegetable material can be supplied by turning under green crops of clover; weeds, corn stalks, etc., but the mineral loss must be replaced

by some of the many fertilizers. There has been very little need of the farmer paying much attention to this subject; but the time will come when the successful farmer will be the one who knows best how to supply to the soil the waste of mineral and vegetable material.

Over parts of the county log houses may still be seen, though they are fast disappearing before the increase in wealth and intelligence. Many fine farms, with their magnificent buildings, are monuments to the industry and intelligence of the people.

LIVE STOCK.

The county is well adapted to this industry, as the soil produces grass of a superior quality. Dairying would be a very profitable business here. Hogs are very numerous, and one of the sources of profit to the farmer. Mr. J. B. McKinney, of Franklin township, is the most extensive stock raiser, and his magnificent herd show what can be accomplished when care is taken in the selection of different breeds.

HORTICULTURE.

Fruits succeed tolerably well, though, owing to the climate, only the hardy varieties are profitable. Of grapes, the Concord is the best, as they ripen early. Of apples, Ben. Davis, Smith Cider, Roman Beauties and Maiden Blush, are the most hardy and profitable. The hills in the southern part of the county afford excellent localities for orchards. Many farmers have located their orchards in the black soil, making a mistake, as the trees do not thrive as well, and are more likely to be killed by cold winters. Mr. D. E. Hoffman, near Winchester, lost about 500 trees during the winter of 1880-'81.

A Horticultural Society has been organized, and its members are active workers. The officers are W. P. Murray, president, and J. P. Lesley, secretary.

BRICK AND TILE.

An abundance of good clay for brick and tile can be easily obtained. Many farmers, building brick houses, burn their own, calculating to sell enough, after using what they need,

to pay the expenses of the whole kiln. Tile kilns are numerous, but usually only enough is burned to supply the local demand. The Martin Brothers, of Winchester, Frist & Fickle, of Lynn, have the largest establishments in the county, and both ship tile to other localities. Nearly all the brick and tile made in the seventeen or eighteen factories are used in the county. This shows that the farmers are wide awake and appreciate the advantages to be derived from thorough drainage. But little has been done in underdraining the clay soils, most of the labor having been expended in redeeming the swamps.

MANUFACTORIES.

The most extensive establishments of this branch of industry are at Winchester and Union City. At the first named are the Bates Bros., flouring mill, one of the largest in the country; Kelley, Macy & Neff, handle factory; Fitz Maurice, foundry and machine shop; Adam Hirsh, planing mill; Stock Co. Wagon Works, Gen. Stone, president; D. E. Hoffman, marble works. At Union City are Peter Kentz, planing mill; Witham, Anderson & Co., planing mill; Union Carriage Manufacturing Co.; Hook Bro., butter-tub and pail works; Sam Carter, handle factory and trunk slats; J. W. Lambert & Co., handle factory. In both cities may be heard the busy hum of many smaller factories which, in the aggregate, are a great source of profit.

GRAVEL AND SAND.

Several of the roads leading to Winchester and Union City are pikes. Recently a system of free pikes has been established, and the county commissioners have in contemplation the building of more. Many of the cross roads ought to be graveled, as parts of the county are almost inaccessible during a portion of the year. Gravel and sand are plenty, and if, instead of turnpiking dirt roads, ditches were cut to let off the water, and the holes filled with gravel, it would be but a few years before all the roads would be nearly as good as pikes.

The careless manner that work is done on the roads, not only here, but in other counties as well, deserves condemnation. Instead of leaving the surface smooth and level, they are left in the worst condition possible; a scraper full here and there,

or the dirt is heaped up in the center of the road, leaving it for the horses and vehicles to wear down smooth. Roads worked in this manner are never good until after they have been worked over with the mud of the following winter and spring, whereas if properly finished they would soon become smooth and passable.

TIMBER.

The county was formerly heavily timbered, and much still remains. In the western part, oak, ash and beech are the prevailing kinds, while over the rest of the county, beech is the most common. Oak, ash and elm are plenty. Some of the elm attain gigantic proportions; maples are abundant in many localities; hickory and white wood (*Liriodendron tulipifera*), are found plenty in some parts, although most of the white wood has been shipped away. The many manufactories of the county are using a great amount of timber, and with care and judicious economy the supply will last for years.

ARCHÆOLOGY.

Evidences of a pre-historic race are abundant, and of such a character, in view of the magnitude of their works, that the observer experiences a feeling akin to reverence toward a mighty people, whose history is only written in their majestic ruins. In nearly every part those relics, as arrow-heads, axes, pestles, etc., have been found. From whence did they come? What their condition of life, their religion, and fate? are questions one intuitively asks when in the presence of their monuments of industry. The largest works of this ancient people are near Winchester, west of the confluence of Sugar creek with White river. It consists of a walled rectangular enclosure, with curved angles, 1,320 feet long, and 1,080 feet wide. Its area is thirty-one acres. Part of the south and west walls lie within the county fair grounds, the remainder in cultivated fields, and they are in a fair way to be entirely destroyed. On the eastern half of the south wall, which has never been disturbed, are

beech trees two feet in diameter. This part of the wall is the highest; and though it may have once been from eight to ten feet in height, it is now not over six feet. In the center of the enclosure is a circular mound one hundred feet across, and about eight feet high. Excavations have been made seven or eight feet in depth, both from the sides and summit, but nothing has ever been found. The east and west walls each have, near their middle, an opening, or gateway. The one on the east is unprotected, but the west one formerly had an embankment in the form of a half circle, which overlapped the gateway. No trace of this remains at present. The mound lies in a direct line between the two passage-ways. No evidence exists of a ditch either on the outside or inside.

Mr. John K. Martin, in removing part of the east wall, north of the opening, reports having found a number of holes about fifteen inches in diameter, and extending seven or eight feet below the summit of the wall. These, evidently, mark the position of posts, and show that the inclosure was further protected by a palisade. Just inside of the embankment, and about three feet from the surface, piles of ashes and charcoal are frequently met with. Their position indicates that they have been covered by the wash from the walls. No relics have been found. Nearly east from the northeast corner of the enclosure is a fine spring.

Southeast of the works along Sugar creek, the bluffs are sandy, and the Mound Builders probably used them for their burial ground, as many human skeletons have been exhumed while digging for gravel. The absence of all implements of warfare shows that this inclosure was not occupied for any length of time as a fortification but as a permanent residence. The streams are small and the bluffs low. Had the inclosure included the spring, the supposition that it was for protection, would have been more probable. It is not unlikely that this was a place for holding council or religious ceremonies. In section 23, range 14 east, Washington township, is a large, circular mound, which, although now somewhat reduced in size, could not have formerly been less than fifteen feet high and one hundred feet in diameter. In section 33, same township, is another, which measured three hundred feet in circumference and fifteen feet high; this was better preserved than the former.

Small bowlders were observed on the summit and sides. No excavations have been made in either of these mounds. Both were evidently built of clay taken from the immediate vicinity. They may have served as points of out-look, as they are only about one mile apart. In section 4, one mile southwest of the one last described, is a very large mound which is considered artificial by the people in that vicinity; but its relation to some small streams suggested that it was more likely one of nature's carving. On the map is marked its location, as future investigations may possibly show that it really belongs with the works of the Mound Builders.

In section 28, range 12 east, 20 north, Stony Creek township, between Stony creek and White river, is a large mound now covered with small oak trees. This is nearly circular, fifteen feet high, 150 feet in diameter. Excavations show that it is composed of clay mixed with charcoal and ashes. At the depth of nine feet a skeleton was found; beneath it was a pile of stone two feet high and three feet in diameter. Mr. Thompson, on whose farm this is situated, has quite a collection of implements found in this vicinity.

In section 10, range 13 east, 2 north, Franklin township, was a circular inclosure, with an area of about one and a half acres. The walls were four feet high. Although when first noticed by the earlier settlers it was in a good state of preservation, it has been destroyed, and no trace of it remains.

North of the Mississinewa river, between Ridgeville and Fairview, are a number of small tumuli, which contain ashes and charcoal. These may have been built by the Indians, as this used to be their camping ground.

Many of the gravel banks have served for the Indians as burial places, as skeletons are frequently met with while digging gravel for pikes. Some of the skeletons were of large size, and deposited with them were articles of ornament, as paint shells, etc. The position of some indicate that they had been buried in a sitting posture.

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