

THE ST. JOSEPH AND THE KANKAKEE AT SOUTH BEND. BY CHAS. R. DRYER.

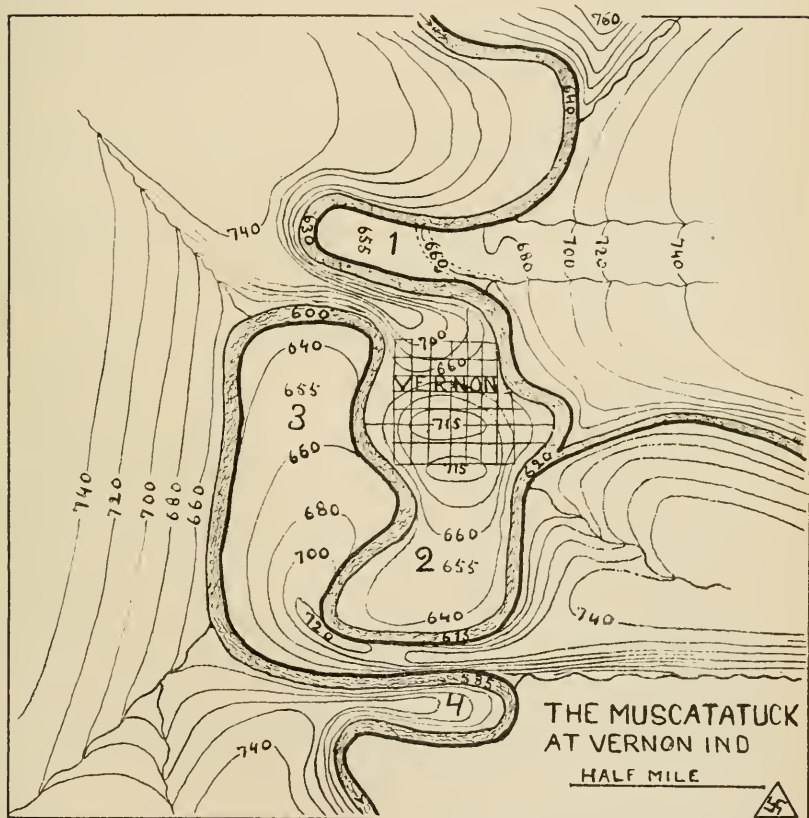
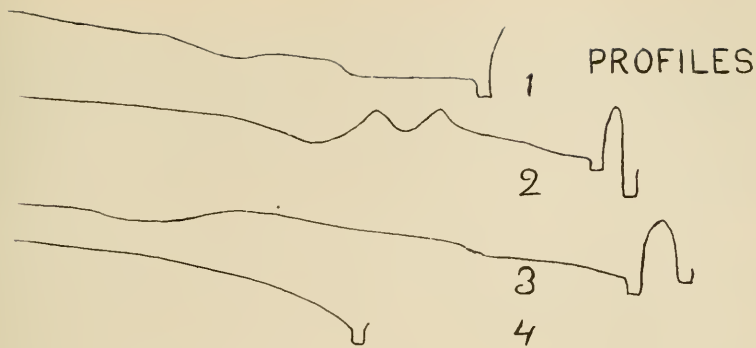
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THE MEANDERS OF THE MUSCATATUCK AT VERNON, INDIANA. BY CHAS. R. DRYER.

At Vernon, Ind., the Muscatatuck River presents a remarkable group of meanders. In a course of six miles it forms four loops, enclosing four tongues of land which are connected with the mainland by very narrow necks. The distance in a straight line from the upper end of the first loop to the lower end of the fourth is less than a mile and a half, and the perpendicular fall about fifty feet. The general level of the upland on both sides of the valley is about 750 feet; the level of the river varies from 630 to 580 feet. Three of the enclosed tongues slope quite regularly from neck to point. Tongue No. 1 is crossed at about its middle by a twenty-foot terrace, below which the surface is at a uniform level of 655 feet, corresponding with the top of the hard Niagara limestone. The tip of the point is alluvial deposit. Tongue No. 2 is occupied by the town of Vernon, and differs from the rest in that the surface slopes from a high and narrow neck rapidly to the 600-foot level, then rises in a double-peaked hill to 715 feet, then slopes gradually to a broad point near the 655-foot level. Tongue No. 3 has a neck only 300 feet wide at the bottom and about ninety feet high. The body of it is about one-fourth of a mile wide and one mile long with a very uniform slope. There is a slight terrace at the 670-foot level, a decided flattening at 650 feet and a rather broad alluvial tip. Tongue No. 4 is the smallest of the group and has the steepest and most symmetrical slope.

The channel of the Muscatatuck is 200 to 300 feet wide and cut down from twenty to fifty feet into the Niagara limestone, which forms bluffs of corresponding height on both sides of the stream. There is practically no flood plain.

The origin of these meanders is a difficult problem. They are very unlike ordinary flood-plain meanders, in which the tongues of land are flat and but little above stream level. They differ also from upland meanders, in which not only the channel but the whole valley winds, the tongues maintaining a uniformly high level and terminating in a bold headland. These are shown in great perfection by the Osage River of



Missouri. Meanders with sloping tongues, form a class by themselves, and have been most fully discussed by C. F. Marbut of the Missouri Geological Survey.\* He publishes maps of the meanders of the Grand and Flat Rivers, but none of them are quite equal to the Vernon tangle of the Muscatatuck.

Two hypotheses have been suggested to account for meanders which are not due to flood-plain conditions. Prof. W. M. Davis has suggested† that they may be superimposed or inherited from a former flood-plain condition. In some previous period the stream has reached base level and developed flood-plain meanders. The basin has been subsequently elevated and the stream in its new cycle has cut its old meanders straight down into the plateau. This may serve to explain meanders in which the tongues are headlands, but evidently will not apply to those of the Muscatatuck, which are not cut straight down.

Winslow‡ thinks such meanders are due to a normal growth and development from an originally crooked consequent course. The germ of the present remarkable loops existed in the slightly irregular surface of the country over which the stream first began to flow. As it corraded its channel more deeply it cut away the convex sides of its bends. It thus became more and more crooked, and by a combination of vertical and lateral corrasion, it slid or sidled down the long slopes of the tongues.

The meanders of the Muscatatuck seem to be better accounted for by development than by inheritance; but the process has been somewhat modified by peculiar conditions. During the cutting of the first seventy or eighty feet, lateral corrasion was more rapid than vertical, and the long gentle slopes of the tongues were formed. At about the 675-foot level vertical corrasion, for some reason, became more rapid and a twenty-foot terrace was formed. At the 655-foot level the stream came down upon the hard and massive Niagara beds, or the corniferous limestone which thinly overlies them. Vertical corrasion seems to have ceased for a long period, during which the stream slid laterally and planed off the broad, flat points of Tongues No. 1 and No. 3. Then came a decided change, probably an elevation of the land and an increase of the slope, which has enabled the stream to cut its channel almost vertically downward into

\* Missouri Geological Survey, Vol. X, p. 98.

† Science, Vol. 22, p. 276.

‡ Science, Vol. 23, p. 31.

the Niagara limestone to a depth of from twenty to fifty feet. The small alluvial deposits at the tips of the present tongues show that lateral cutting has not entirely ceased. The hill on Tongue No. 2 may possibly be due to a cut-off formed at about the 660-foot level. The possible course of the stream at about the 670-foot level need not then have been very crooked. Most of its tortuousness has been developed since it struck the Niagara limestone. The nomenclature of the subject is somewhat unsettled. The land enclosed by a meander is called a neck, point or tongue. I propose that the word *tongue* alone be used to designate that feature; that the name *neck* be reserved for the often narrow portion where the tongue joins the mainland, and the name *point* be used only for the tip or extremity of the tongue. In cases where the point is high, as on the Osage River, the term *headland* is natural and descriptive of the whole tongue. For those tongues which slope regularly from an elevated mainland or neck to a low point I propose the analogous term *tailland*.

Taillands are probably not peculiar to the Muscatatuck. I have observed good specimens on Sand Creek at Brewersville and on Laughery Creek at Versailles. The subject is now broached, as far as I am aware, for the first time in Indiana and would probably repay further investigation.

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OLD VERNON—A GEOGRAPHICAL BLUNDER. BY CHAS. R. DRYER.

The town of Vernon, the county seat of Jennings County, Indiana, was founded in 1816 at the forks of the Muscatatuck River, which was the head of flat-boat navigation. It is located upon a high, rocky tongue of land, surrounded by the gorge of the river, except at one point, where a neck 130 feet high and just wide enough at the top for a roadway connects it with the mainland. The area enclosed is about one-fourth of a square mile, which is bounded, except at a few points, by perpendicular bluffs from 40 to 90 feet high. It rises at the center in a double-peaked hill 100 feet above the river. As a site for a medieval castle with a cluster of cabins around it, designed primarily for defense, it is unrivaled. It is a Hoosier Ehrenbreitstein. As a site for a modern commercial town it is a failure. In 1850 the Ohio & Mississippi Railroad passed about two miles north of it, and the business center was soon transferred to its station, North Vernon. Other railroads have come to North Vernon since,