ILLINOIAN DRIFT IN EASTERN OHIO.

In George W. White's paper "Illinoian drift in eastern Ohio" in the March 1939 issue of this Journal the limits of the Wisconsin drift seem to me to need revision especially in the part north from Latitude 40° as given in his Fig. 2. The map as revised is here reproduced under the same title.

I should perhaps explain that I worked continuously in southeastern Ohio, with topographic maps in hand, from July 21 to October 28, 1925, and a few days in June 1926, revising my earlier work in that region, carried on before topographic maps were available, the results of which were presented in Monograph xli, U. S. Geological Survey, published in 1902. This later study was quite detailed in the area embraced in Fig. 2. I have been planning to publish the results of these studies in a report that will embrace the entire drainage basin of the Ohio River above Cincinnati, giving results of studies down to the time of my retirement in 1929.

My mapping of the Wisconsin and Illinoian drift borders is in fairly close agreement with White's from Latitude 40° southward but is not in accord with it in most of the district north of this parallel. He has included moraines in the Illinoian drift that I think should be referred to the Wisconsin. I will endeavor to set forth briefly my reasons for so referring them.

In Fig. A, showing drainage changes near Newark, Ohio, a morainic loop is shown to extend about seven miles east of White's Wisconsin border, and terminate within a mile of the Illinoian border. I attach much significance to the fact that the outwash plain bordering the end of this loop is about 100 feet lower than that of the Illinoian outwash at its nearest approach north of Hanover, its altitude being 800-820 feet, while the Illinoian outwash is above 900 feet. Licking River was diverted into a new course east from Hanover, and the new valley was deepened about 100 feet between the Illinoian and Wisconsin glacial stages. The Muskingum River was also thrown into a new course by this filling with Illinoian outwash near Hanover, its pre-Illinoian course having been westward in the reverse direction of the present Licking River from Hanover to Newark and thence into the Scioto basin. The new course leads south from Dresden past Zanesville to the Ohio River at Marietta. A similar interval between the Illinoian and Wisconsin valley gravels is found on the Muskingum as that near Hanover on the Licking. At Philo, Ohio, ten miles south of Zanesville, the Illinoian gravel is up to 840 feet, while the Wisconsin gravel is 760 feet, or 80 feet lower. The altitude of the Illinoian gravel at Philo is probably
White's Fig. 2.—Hatched thick broken line = revision of Wisconsin drift border by Frank Leverett.

about the same as that of the col crossed by the Muskingum a few miles south of Philo. The altitude of the col crossed by the Licking east of Hanover must have been below 900 feet to allow for the river to be diverted across it. The deepening of the gorges on each river is thus in essential accord, and plainly referable to the inter-glacial interval between the Illinoian and Wisconsin glacial stages. The Muskingum is now down to 661 feet at Philo, or about 100 feet below the Wisconsin gravel train. The Licking is down to about 740 feet at the east end of the gorge at Black Hand, three miles below Hanover.

A second line of evidence that the morainic loop east of Newark is post Illinoian is found in drainage diversions on its borders. One on the north side and another on the south are shown in Fig. A. There was a tract free from ice both north and south of this morainic loop that had been covered at the Illinoian stage of glaciation. In addition to these lines of evidence in support of the Wisconsin age of the morainic loop, the drift itself has the freshness characteristic of the Wisconsin. It is free from a coating of loess such as is found on the Illinoian drift where the topography is favorable for its retention, as in the vicinity of Lancaster. That district has exposures of loess between the Wisconsin and Illinoian drifts, as well as outside the Wisconsin border. As noted in White's paper the surface is generally so cut up by erosion that loess would not be retained.

Turning now to Fig. B, whose area falls in the northern part of the district embraced in White's paper, I have given the Wisconsin border a position ten to 12 miles outside that given in his Fig. 2. Here, as in the district east of Newark, the moraine near Danville, and a lobe in Flat Run valley are in harmony with a Wisconsin gravel terrace on Mohican River, and not with the Illinoian gravel train, which stands 60 feet higher than the Wisconsin opposite the mouth of Flat Run, and 80 feet higher at Walhonding. The outwash gravel east of the moraine at Danville sets in at 960 feet and thus is in accord with the Wisconsin gravel terrace. Here, as in the loop near Newark, the moraine has a freshness consistent with Wisconsin age.

It is probable that the difference in our interpretations in this district is due mainly to the discontinuity of a morainic topography along the border I have drawn. There is, however, a practically continuous sheet of ground moraine out to this line, putting it in contrast with conditions outside, where till is found only in small patches. The scarcity of till is noted by White as characteristic of a large part of the Illinoian area. We each have found that only occasional erratics are present in much of the area to testify to Illinoian glaciation. The elaborate soil profile given in his Fig. 3 has exceedingly rare development in this district.
FIG. A. DRAINAGE CHANGES NEAR NEWARK, OHIO, IN WISCONSIN GLACIAL STAGE. BY FRANK LEVERETT.
Fig. B. Relation of Drifts to Stream Terraces in Central Ohio.

By Frank Leverett
Discussions.

The extreme scantiness of the Illinoian drift on this side of the Scioto glacial lobe is in striking contrast with the definite sheet of Illinoian till found in southwestern Ohio. I discussed this matter with Prof. T. C. Chamberlin at the close of my field work in 1925. I recall that he made the remark that it seemed to him an evidence that this district stands on the lee side of an ice lobe that was being nourished by winds from the west, and thus indicates that there was not an effective anticyclone over the lobe. Had it been working the east side should have been better nourished. This raises the question of how far anticyclonic conditions failed to work on other pronounced glacial lobes. It seems doubtful if an anticyclone was doing effective work in the lobe of Iowan drift in northern Iowa and southern Minnesota, for its east side has such extreme scantiness of drift that the limits have never been definitely determined. But on the west side I was able to map the border without difficulty in its entire exposed length of 200 miles.

In the above discussion reference has been made to shiftings of drainage that attended the Illinoian and the Wisconsin glacial stages. The shiftings of drainage in Ohio that were effected by the early Quaternary glaciation merit a few words. It was at that early glacial stage that the Big Kanawha was diverted from a northward course in Ohio to the present course down the Ohio past the Manchester col. The Muskingum drainage, which had met the old Kanawha near Circleville, Ohio, and had continued westward or northward from there, was diverted southward down the present Scioto to the Ohio River at Portsmouth. It held this course during the long Yarmouth interglacial stage, generally estimated to have been fully 300,000 years, and was turned into its present course to the Ohio at Marietta only about 200,000 years ago. Evidence is now accumulating to indicate that the preglacial drainage of the Monongahela and lower Allegheny through the Beaver and Grand rivers to the Lake Erie basin was only temporarily turned down the present Ohio valley by the early Quaternary glaciation, and resumed its preglacial course when the early Quaternary ice disappeared. There appears to have been only a small stream occupying the Ohio valley above the mouth of the Big Kanawha, that headed near the north end of the West Virginia panhandle. This small stream had only cut down to within about 200 feet of the present river level along the panhandle in the long Yarmouth period, but before reaching the Big Kanawha it had deepened the valley its full depth by Illinoian time. It was at the Illinoian stage that the Ohio was permanently given its present course.

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