

## ANCIENT DRAINAGE BETWEEN THE OLD CUYAHOGA AND THE OLD PITTSBURGH RIVERS.\*

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The area involved lies between Willoughby, on Lake Erie, on the north, and the headwaters of the Mahoning, on the south. So far as has been known up to the present, the history of the Mahoning river was uneventful. That the old Pittsburgh River flowed by Beayer Falls, Newcastle, Sharon, Youngstown, Warren, and on northward, has long been recognized, and it was thought that the Mahoning joined it at or near Leavittsburgh. It was known that the present Mahoning flows on glacial till from its headwaters to a point about three miles north of Alliance; that from there to Lake Milton it is generally on rock, although crossing several times zones of till, with considerable depths of fill known near the course; and that between Lake Milton and Newton Falls it is on till, at Newton Falls on rock, and thence to Leavittsburgh on till. It was therefore assumed that the preglacial and interglacial courses had been maintained with variations until the present time.

It was on this assumption that the work of definitely plotting the course was begun in the fall of 1931, under the direction of Professor G. F. Lamb of Mount Union College, by Glenn Goss, Austin Schadle, and Robert Scranton. Exploration of the river course itself from its headwaters for about twelve miles downstream confirmed what had been thought before concerning this section. Well records at Alliance showed a depth of as great as two hundred feet, placing the rock floor at about eight hundred forty feet above tide. Another well in the valley of the tributary Beech Creek showed till to a depth of three hundred feet. This part of the river flows consistently on till, with rock at or near the surface on each side of the valley. The first surprise came where the river turns eastward, crossing the Lexington Road about three miles north of Alliance. At this place, at a bridge

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about a quarter of a mile south of the county line (see A. on Map I), drillings revealed that on the west side of the road rock was struck at one hundred forty feet, but on the east side, thirty feet distant, rock lay at ninety feet. This developed into a focal point.

For from that time on, no depth could be found in all the region north or east of this point, east of Atwater and south of Palmyra, which comes at all close to the level necessary to handle any drainage whose level is eight hundred forty at Alliance. The river's course, it is true, is on fill in spots, but the fill is shallow, apparently representing mere irregularities of surface on a rolling rock topography.

Very careful combing of the region revealed what at first seemed to be two leads. One is a till filled valley extending south from Newton Falls, to just east of Palmyra, but no trace of it could be located south of the latter village. On the contrary, the rock is well up. The second is a deep, filled valley leading south on Silver Creek from a point just west of Wayland. It seemed to lead south toward the Atwater region by passing east and south of Edinburgh, but ended southeast of there.

On the other hand, a few wells showing good depth were picked up northwest of the Lexington Road bridge, north of Limaville, at Atwater, west of Edinburgh and near Rootstown Station, and near Campbellsport, which is situated on the West Branch of the Mahoning, southwest of Ravenna. All these wells indicate a considerable depth, quite capable of handling any level to the south. They all lie on an axis bearing northwest from the bridge toward Ravenna.

Inasmuch as it was known before hand that there is a deep till-filled valley along the course of the West Branch, it was then thought that the course of the preglacial Mahoning might have been from Alliance to Ravenna, thence eastward to Newton Falls, although the anomaly of such a sharp turn in midcourse was recognized. Investigation seemed at first to indicate a slight fall of the rock floor in this valley, from west to east. No rock was found, all wells being in drift, but successively deeper wells eastward seemed to justify the idea. However, at Newton Falls, there loomed up a barrier. No depth could be found south of Newton Falls, or northwest of the town, capable by from eighty to one hundred feet of handling the depths consistently shown heretofore. The most ex-

haustive field work showed that no deep valley does exist connecting the valley of the West Branch with that of the old Pittsburgh. The rock floor to the west lies at seven hundred fifty feet above tide, but the very lowest point near the Falls is at eight hundred thirty feet above tide. The prevailing level was slightly above this, but no deep narrow valley could be present, as abundant well data proved.

Frustrated at this point, investigation turned west. Traces had been found of a valley north of Campbellsport, east of Ravenna, and it was hoped that this might offer a solution, but wrongly. Westward from Campbellsport, however, there is evidence of an old filled valley. A series of wells indicate that the rock level dips from north and south into a filled valley lying just south of Ravenna leading toward Kent. Other shallow wells show only glacial drift. But just east of Kent a deep well reveals the rock floor at seven hundred seventy-eight feet above tide. Although there is not all the data that one could desire west of Ravenna, yet the data available indicates the presence of a deep valley, and the well at Kent shows the rock floor sufficiently low to care for the valley depth northward from Alliance.

North of Kent, going was easy. Remarkable depths were found at Twin Lakes, west of Streetsboro, Geauga Lake, East of Solon, at strategic points around Chagrin Falls, at Gates Mills, Eagle Mills, north to Pleasant Valley, which is on the Chagrin River about five miles south of Willoughby. These depths occur between rock walls which appear at or near the surface on the east and west for practically the whole distance. The rock floor seems to drop consistently from about seven hundred feet above tide at Geauga Lake to five hundred twenty-five feet above tide at Wilson Mills and five hundred seventy-five feet above tide at Pleasant Valley.

At this point, however, another apparent barrier was struck. This is in keeping with the findings of the late Professor Cushing. Absolutely no till was to be found north of Pleasant valley lower than six hundred thirty feet above tide. As a matter of fact, further investigations revealed that the depths at Pleasant Valley, close to five hundred seventy-five feet above tide, could not be positively connected with the depths at Wilson Mills to the south. There seems to be a hole at Pleasant Valley, although this could not be established certainly. In view of the consistent fall of the rock floor

from the south, this was most surprising, and it must be admitted, disappointing.

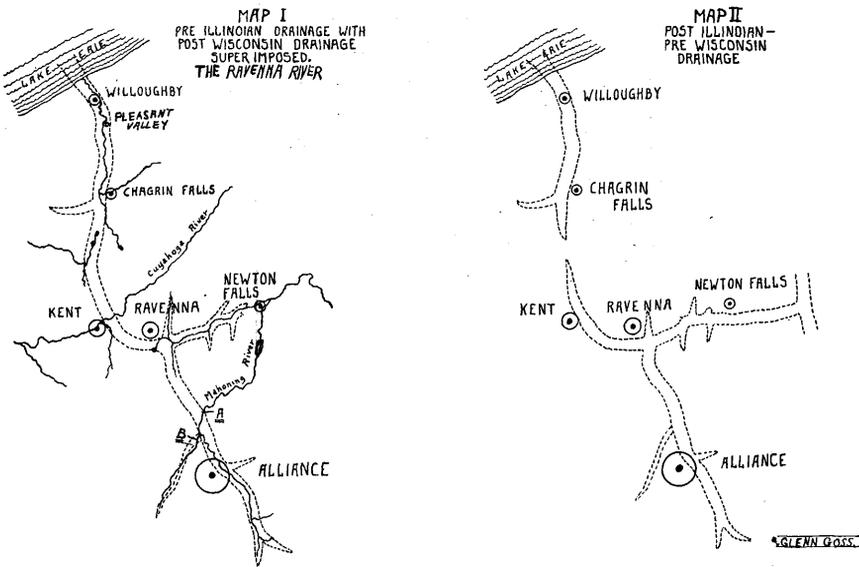
Attempts were made to establish a connection from the Chagrin Valley near Pleasant Valley to a till filled valley found to extend south of Mentor. The latter was the old valley of the East Branch of the Chagrin River, to the east. No joining to the two could be made. It was also attempted to establish a valley northeast from Chagrin Falls along the valley of the East Branch of the Chagrin, but this failed. A lead was followed beginning from a point south of Chagrin Falls, through Solon. A channel was established westward, but its floor ascends toward the west, and it ends just west of Randall. It is thus made clear that the passage was not west by Solon. A stark cul-de-sac in every direction seemed to exist.

An explanation was begun based on the principle of glacial scour. For it is not necessary to assume that the extreme deepening of this and other channels was accomplished entirely by stream action. A clue was found later in a small valley extending east of Pleasant Valley. Here the small stream is flowing on Illinoian drift and on rock. This indicates that the stream, which had eroded a pre-Illinoian valley, had taken its bed down to a level of above seven hundred feet above tide. It was then interrupted by Illinoian glaciation, and in the time since has been able to reduce its bed only to pre-Illinoian Level. Furthermore, field evidence indicates that the deep inner valleys of the various pre-glacial streams of the region were excavated after earliest glaciation, but before the Illinoian.

Thus it would seem that the extreme depths to five hundred seventy-five and five hundred twenty-five feet above tide were not made by stream action, but by glacial scour. This is corroborated by the apparent pocket at Pleasant Valley. Here the valley is about a quarter of a mile wide. The rock is at the surface on the surrounding high ground, approximately one hundred feet or more above the river. Drift is found as far down as one hundred feet below the river, in some places in a nearly vertical drop. The northern end is practically a vertical drop of one hundred feet from river level, and the southern end seems to be blocked off by a rock floor lying higher than the lowest depths. Other corroboration is to be found in the peculiar depth of three hundred feet on

Beech Creek, near Alliance (see B on Map I), in some otherwise inexplicable depths on the West Branch of the Mahoning, and in other scour features of the region.

According to this hypothesis, the drainage lines of the Tertiary toward the north were resumed after early glaciations, up to the Illinoian. Prior to Illinoian, there was a river whose course was from the region of the present headwaters of the Mahoning, passing by Alliance, Ravenna, Kent, Chagrin Falls, and Willoughby, into the Lake Erie Basin. At Ravenna it



received a stream flowing westward in the valley now occupied by the West Branch, and in addition, probably another stream from the southwest. Since the river headed in the same region as the present Mahoning and was cut by several modern lines of drainage, and parts of its course are included by several modern lines, it is obvious that a distinctly individual system is being considered. It may be called the Ravenna River, since Ravenna is at the conjunction of its principal tributaries and at the midpoint of its course. It is shown on Map I.

The Ravenna River was not permanently diverted until Illinoian time, when it was forced before the ice front to a new outlet through the valley of the West Branch, passing south

of Newton Falls, probably, where it broke over a divide and proceeded into the old Pittsburgh River. This second course was maintained through Illinoian time. It is thought that the Illinoian terminal moraine lay to the north of Ravenna, as no Illinoian till has been found as far south as that town, so that on the retreat of the ice sheet the moraine formed a divide that maintained the eastward diversion through the followed interglacial stage as illustrated on Map II.

In that part of the area in question north of the terminal moraine, it is thought that the greatly diminished drainage was barely able to cut through the Illinoian till and therefore the rock floor in the vicinity of Willoughby and southward was lowered little if any before the Wisconsin advance.

The proposed course of the river from early Illinoian to Wisconsin is based on the following points. First, the present course from about three miles north of Alliance to Pricetown is obviously a new channel. Second, there is a definite ancient channel from Alliance to Campbellsport and eastward passing Newton Falls, over a divide. And third, we have no reason for believing that the Illinoian ice sheet ever reached farther south than a few miles north of Ravenna.

The second drainage was disturbed by Wisconsin glaciation. Till carried and dropped by this ice sheet obliterated the valley from Alliance to Ravenna. On the retreat of the ice, the waters found their way out by their present course, from Alliance directly to Newton Falls.

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#### Evolution.

A scholarly presentation of the basic facts supporting the theory of evolution, written in an exceedingly readable style. The subject is discussed largely from the modern genetic view-point. Following an introductory explanation of chromosomes and the chromosome hypothesis of heredity, attention is directed to the influence of selection, natural and artificial. A discussion of mutation is included. Embryonic development, including a critique of the recapitulation theory, forms the basis for an interesting chapter, followed by a thoroughly scientific attack on the inheritance of acquired characters. Evolution in its relation to the human race is discussed, and the book closes with a valuable presentation and comparison of various mechanistic and metaphysical theories of evolution. The volume is highly recommended for the general reader and the serious student of biology.—L. H. S.

**The Scientific Basis of Evolution**, by T. H. Morgan. 286 pp., incl. bibliography. New York, W. W. Norton and Co., Inc., 1932.