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THE AGE OF THE TERRACE SOUTH OF DES MOINES,
IOWA.

JOHN L. TILTON.

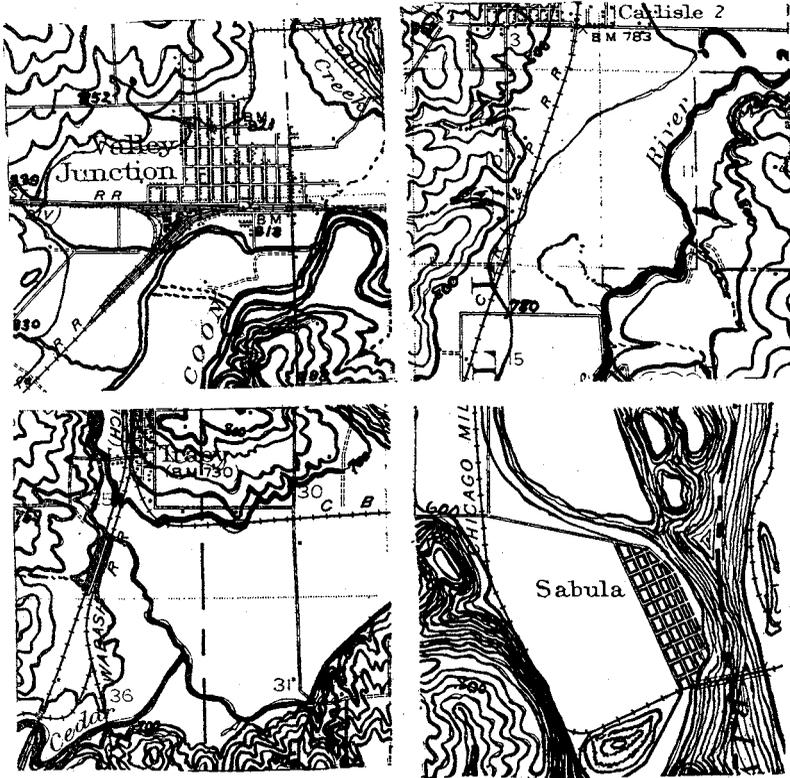
INTRODUCTION.

Along the Raccoon river in Polk county, along the Des Moines river, and along the tributaries of the Des Moines from Warren county there is a terrace, previously noted by geological workers. An important question with the writer has been this: Do the gravels in this terrace form one continuous deposit, or do they form two separate deposits, an upper of Wisconsin or post-Wisconsin age, and an underlying portion that is older than the upper deposit, and possibly of Aftonian age? This question was suggested by a division in the sand recorded in well records, and by the presence of fossils of large mammals that had been found at a depth of perhaps twenty-five feet below the surface of the sand. The identification of these fossils in the spring of 1914 by Professor Oliver P. Hay of the United States National Museum, and the publication of topographic maps of regions along the Des Moines river, make a review of local evidence seem desirable.

THE TERRACE.

The terrace, or second bottom, as it is locally called, is very noticeable along the valleys named in southern Polk and north-eastern Warren counties, where it forms a low plain four or five feet above the flood plain of the rivers. It is less noticeable further southwest up the valleys of North, Middle and South rivers. Valley Junction southwest of Des Moines is built upon it, the low plain southwest of the fair grounds in Des Moines is a continuation of it, and the railroad stations at Avon and Levey are built upon it. The topographic maps of this portion of the state: the Des Moines, Milo, Knoxville and Pella sheets, give as good evidence of the terrace as it seems possible to represent with a contour interval of twenty feet; and farmers all through the area recognize the terrace by the location of houses and buildings upon it, and not upon the lower ground of the first bottom, or flood plain. Along the Mississippi river a simi

Topography taken from the following named sheets.
Des Moines, Iowa. Milo, Iowa.



Pella, Iowa. Savanna, Iowa-Illinois.
Fig. 6.—Topographic maps showing river terraces.

larly related terrace is very evident;² found not only along the river itself but also along the tributaries.

THE TERRACE DEPOSITS.

Near Avon the surface deposits of the terrace are very sandy; but farther up the valleys of the tributaries the surface of the terrace is composed of a dark material, frequently without evident stratification, and always without pebbles. Evidently it has been washed from the upland and deposited along the valleys. Indeed the process is very evident in the spring time where the drainage has been disturbed by the winter's ice. This "gumbo" is like material in the upland, but should not be confused with it. The undisturbed deposit in the upland is a

²Note the location of Sabula. See also, S. Calvin, "Geology of Winneshiek county," Iowa Geological Survey, Vol. XVI (1906), pp. 55-56. The depth of sediment in the valleys of northeastern Iowa is stated by James H. Lees in the Proceedings of the Iowa Academy of Science, Vol. XXI (1914), p. 176, and by A. C. Trowbridge in the same volume, p. 209.

portion of the ground moraine of the Kansan drift sheet. The washed material from this source may be traced down along the floors of the ravines toward the lowland. Beneath this surface deposit along the sides of the river valleys water-bearing sands are found universally. Inspection of excavations for a tunnel at the Des Moines water works revealed no perceptible plane of separation in the sand; and inquiry at the Valley Junction pumping station likewise brought no evidence of a plane of separation in the sand. At Carlisle there are numerous "driven wells", the sandpoints on the pipes resting in the sand at a depth of forty-two feet. At Avon the sand and gravel has been extensively excavated by the Chicago, Rock Island and Pacific Railway to ballast the lines to Allerton, to Indianola, and to Winterset. Here a test-boring is reported as giving continuous sand and gravel to a depth of thirty feet below the surface of the terrace. Beneath this sand and gravel was found two feet of a blue clay without pebbles (silt?). Beneath the clay "quicksand" was found, but the depth of it was not ascertained.

The sand as exposed in the excavations reveals stratification, and numerous pebbles up to an inch in diameter among which greenstones³ are very abundant. One small feature observed in the gravel pit west of the railroad bears upon the question of climate. In a fresh exposure there was a small mass of brownish, unconsolidated sand about four inches in diameter, containing a pebble of greenstone in the lower part of it; as if a small mass of frozen sand, with the lower portion weighted by the greenstone, had sunk to the bottom of the water.

Aside from the record of the test-boring at Avon but one other evidence was found of a division in the sand. A farmer reported that at his well on the edge of the upland there was a resistant, impervious stratum dividing the sand which his well penetrated. This condition part way up a ravine, though suggesting a division in the sand along the valley, may well exist while the sand along the valley forms one continuous deposit. The deposit of clay (silt?) over quicksand reported in the record of the test-boring, may easily have formed in the silting up of a valley. The gravel at the surface of the deposit is finer than that at a depth of six feet; and the gravel from the west

³A complete analysis of the kinds of pebbles found in the gravel has not been made. In general appearance they look like any assemblage of pebbles of equal size that has been washed from Kansan drift.

end of the excavation west of the track is reported coarser than that from the east end of the excavation, which end is farther away from the edge of the upland.

FOSSILS.

In the old gravel pit east of the Chicago, Rock Island and Pacific railroad at Avon a tusk and several large bones thought to be of a mastodon or an elephant are reported by one who saw them. Several other bones found there later are now in the collection at Simpson College. These last specimens were studied by Professor Oliver P. Hay of Washington in 1914 with the following result: "The metapodial and astragalus belong to Bison. The piece of lower jaw and the vertebra are those of a caribou (*Rangifer*). The tooth is one of *Rangifer muscatinensis*. The atlas is that of a musk-ox (*Symbos cavifrons*)."

I had previously expressed to Professor Hay my doubt as to whether the lowest portion of the gravel was really Aftonian in age of deposition, and my reasons for that doubt. After identifying the specimens he wrote, "It seems to me you are right in doubting the Aftonian age of those gravel beds. They are probably Wisconsin or early post-Wisconsin." Later he adds that the bones of the reindeer and musk-ox indicate an ice age, though it "might be later with these bones washed out of a glacial deposit."⁴

SUMMARY.

1. The gravels are in a low terrace along the southern margin of the Wisconsin drift and even extending into valleys in the Wisconsin drift area.

2. From the area above described a low terrace is found along the Des Moines river to the Mississippi. Northward along the Mississippi river a terrace is conspicuous to within the area of Wisconsin drift in Wisconsin, where the terrace is referred to the flooded condition of the streams at the melting of the Wisconsin ice sheet.

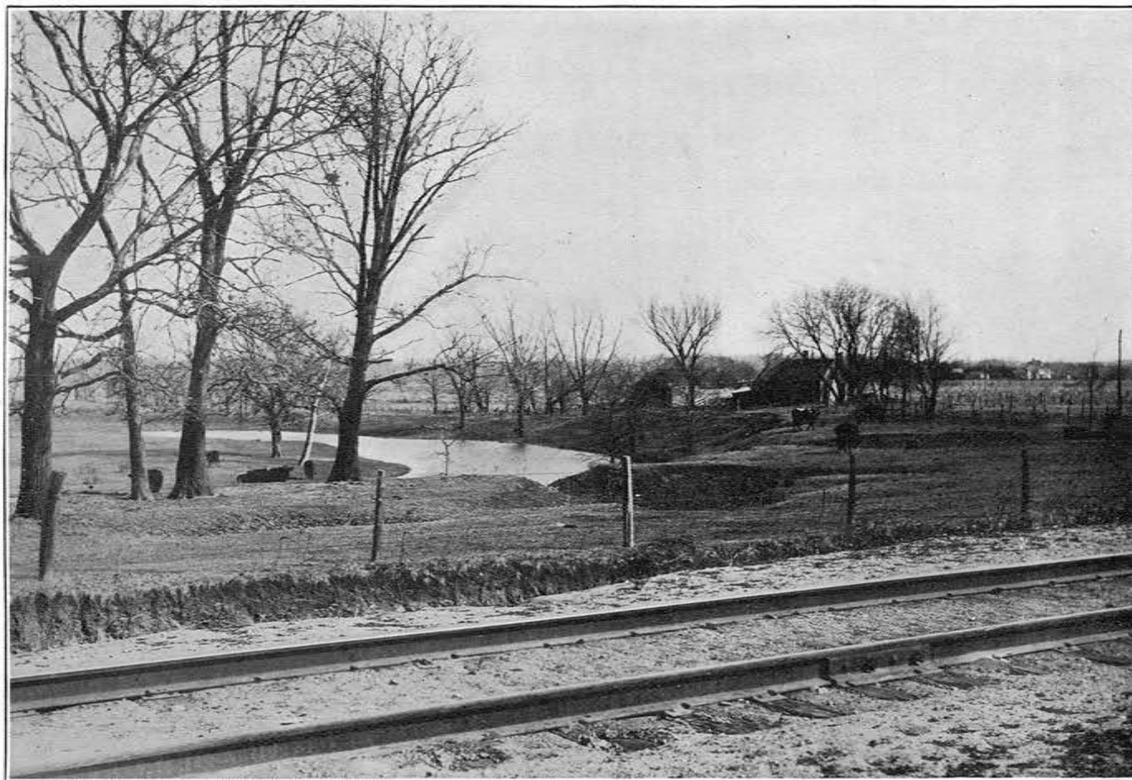
3. The fossils are not pre-Wisconsin; they are Wisconsin in age, or derived from Wisconsin drift. The gravel itself contains an evidence of the presence of ice.

CONCLUSION.

It therefore appears that the sand and gravel in the river valleys and forming a low terrace at Valley Junction, Des Moines, Avon and Carlisle (and elsewhere in this part of the state) were laid down in the closing stages of the Wisconsin ice age. The surface of the terrace has since been modified both by erosion and by deposition.

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⁴Published with Professor Hay's consent.



View east from near the railroad bridge north of Carlisle, Iowa. The flood plain (with bayou) of North river is in the foreground on the left, that of Des Moines river in the background on the left, and that of Middle river between the white house on the right and the distant high ground. The railroad and all of the houses are on the terrace. The low terrace cliff extends in an irregular line from left to right just beyond the houses.

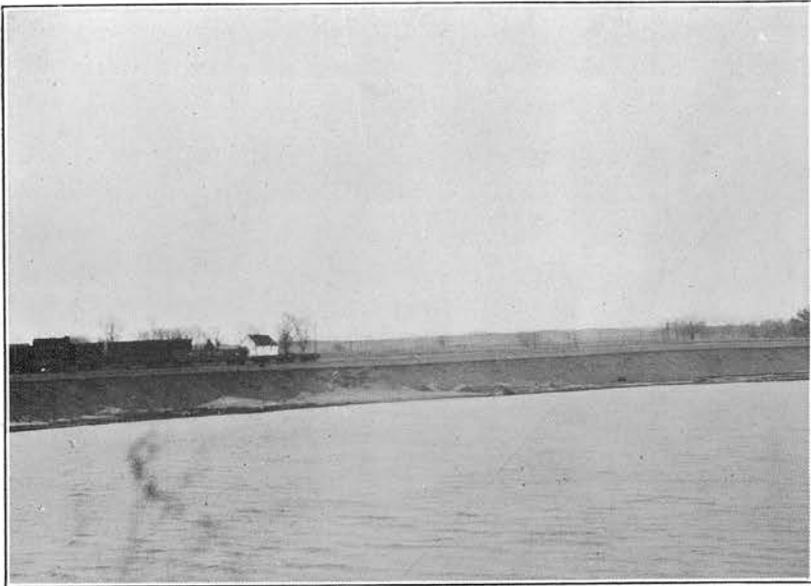


FIG. 1.—View of the recent excavation west of the track at Avon, Iowa, looking northeast across the valley of the Des Moines river. The water in the excavation is said to be eighteen feet deep. A test boring is reported to have revealed continuous sand and gravel to a depth of thirty feet below the surface of the terrace.



FIG. 2.—View of a portion of the old excavation east of the track at Avon, Iowa. Here the water is but three to four feet deep. The stratification of the sand and gravel is very evident in the foreground.