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The Pleistocene of Capitol Hill

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THE PLEISTOCENE OF CAPITOL HILL.

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The Pleistocene exposures on Capitol Hill at Des Moines have become classic through the studies made by McGee and Call which demonstrated the presence of glacial drift overlying loess. The results of these studies were published in the American Journal of Science, Volume 24, 1882, pp. 202-223.

Recent extension of the Capitol grounds has necessitated extensive grading on the south part of Capitol Hill. This has revealed the strata to considerable depths and made possible more complete examination of the Pleistocene deposits than McGee and Call could make. The grading thus far has been done on East Court avenue between 10th and 12th streets and so includes the localities of McGee's sections 3 and 4. For the sake of comparison these sections are here reproduced verbatim.

SECTION 3.

N. side Court Av. bet. E. 10th and E. 11th Sts.—Alt. 880± 3 ft.

1. Light reddish-buff unstratified drift clay containing numerous rounded, subangular and angular pebbles, mainly erratic, up to six inches in diameter, bits of coal and a lenticular mass of Carboniferous clay three feet long, and six inches thick. Seven feet.
2. The same, obscurely and irregularly stratified, interstratified with bands of loess, and sometimes contorted, containing loess-kindchen, tubelets and fossils (often fragmentary), in the drift strata in direct association with pebbles, as well as in the bands of loess. Five feet.
3. Loess, similar to and continuous with that observed in sections 1 and 2, abounding in loess-kindchen, tubelets and fossils.

SECTION 4.

S. side Court Av. bet. E. 10th and E. 11th Sts.—Alt. 882± 3 ft.

1. Reddish-yellow sandy clay containing numerous rounded, subangular and angular pebbles up to twelve inches in diameter, associated toward the base with loess-kindchen and fossils. About eight feet.

2. Loess, light buff, somewhat sandy and pebbly above, containing numerous loess-kindchen, tubelets and fossils. Six feet.

The formations above the loess, as described by McGee, are not visible at present, as they have been in part concealed, in part removed, by later building operations. However, on the south side of Court avenue, between 10th and 11th streets the following section is revealed and must lie below McGee's section:

1. Loess, yellow with gray spots and streaks and masses, especially where rootlets have penetrated. Ferruginous "pipe stems" are quite numerous in the gray portions of the loess. No fossils were seen in the lower three or four feet, but above this zone they are quite abundant, in places to the top of the exposure. No kindchen were seen in this exposure. The lower foot of the body of loess grades down from yellow to reddish brown with gray streaks. In one place a four inch band of finely jointed reddish clay with starchy structure lies four inches from the base of the loess. It contains some small sandstone pebbles and extends along the face for a few feet. Apparently the loess is all one body. The great mass, with the exceptions noted, is uniform from top to bottom in color, texture and general appearance. Fifteen feet from level of 11th street.
2. Geest, residual from Coal Measures shale; reddish brown, sticky clay containing small pebbles of sandstone and shale. Contact with loess above sharp, no gradation. One foot near 11th street, thicker near 10th street, where cover is thin.
3. Coal Measures shales, red, purple, blue, green, one to three feet; succeeded by solid bed of light blue shale, with a two inch band of black shale six feet below the top. Exposed fifteen feet to grade at 10th street.

The upper surface of the geest is practically horizontal, while the ground surface slopes to the west toward the Des Moines valley bottoms. Hence the loess thickens from a thin veneer at 10th street to fifteen feet at 11th street. A number of years ago an excavation above the level of 11th street revealed about six feet of gray loess with "pipe stems" and concretions. Still farther back from the present exposure the surface rises about ten feet and probably the loess here is overlain by drift.

Another section on the south side of Court avenue midway between 11th and 12th streets is representative of the material along this part of the cut:

1. Till, weathered, brownish. About three feet.
2. Till, buff, pebbly. About five feet, grading into No. 1.
3. Till, gray, pebbly, grading into buff above. Four feet.
4. Till, gray, alternating with sand streaks. Two feet.
5. Loess, gray and buff, banded, abundant shells, lower surface sloping to east. One to two feet.
6. Clay, buff, somewhat sandy in places, abundant pebbles, for most part rather small, some up to two inches, elsewhere six to eight inches in diameter. Pebbles are fresh limestones, quartzes, greenstones, and granites, some of which are badly disintegrated. Shells of loess types also are abundant in this clay in places, while in others they are rare or absent. Between this member and No. 5 are rolled masses of gray loess with concentric lamination well developed. Two to three feet.
7. Clay, brown, jointed, loess shells abundant, no pebbles, probably a weathered loess. One and one-half feet.
8. Loess, gray, shells abundant. One foot.
9. Loess, buff, fossiliferous. Three feet.
10. Loess, gray, fossiliferous. One foot.
11. Sand, in lens extending 100 feet along Court avenue; here two feet thick, at its maximum, fifty feet west, six feet thick. The sand is fine, yellow with brown streaks, and presents masses of coarser, reddened material near the top. It is strongly cross-bedded. The lens dips slightly toward the northeast, in which direction it thins to about two feet, but attains a length of over 150 feet.
12. Loess, gray for about one foot, then grading down into buff. Shells are abundant and of the usual loess types. At several localities along the line of this section there are shown masses of dark blue loess which is rather harder than the buff variety. Fossils are abundant here also. These masses are enclosed by the buff loess and some of them are as much as five feet in height and ten to twelve feet long. This blue loess does not seem to be distinct from the buff loess in anything except color and doubtless is occupying its original position. Exposed in gas main trench ten feet. Shales were not reached at this locality.

The lower body of loess, No. 12, is continuous with the loess of the first section given, but it rises about ten feet higher in the first section, as there apparently it was undisturbed by the overriding glacier and by glacial waters.

It is evident from its situation that the gray loess is an alteration product from the buff loess. It is found uniformly above

the buff loess, and both above and below the sand lens, where water percolation is more easy than elsewhere, the loess assumes the gray color. Loess kindchen and "pipe stems" are found in the gray loess, not in the original buff type. Wherever the loess is more than a very few feet thick it is buff with depth. It is clear that the gray loess is not to be interpreted as a distinct deposit and the same may be affirmed of the dark blue masses found in the yellow loess.

These exposures, together with numerous others between Des Moines and Keokuk, seem to indicate that the gray loess so common in the lower Des Moines valley may have been changed from a buff original, one similar to the loess of the Missouri valley except for the absence of kindchen in the Des Moines yellow loess and their abundance in the Missouri valley deposit.

The pebbly fossiliferous clay, number 6 of the above section, is to be considered, perhaps, as in part a result of the washing by waters from the Wisconsin ice of the loess with its contained fossils, and the mingling of this with clay, sand and gravel from the till. No doubt it is partly the result also of the eroding, mixing work of the ice itself. In character and general appearance it is intermediate between till and loess. In places it is gray, and appears as if composed of mingled gray, unoxidized Wisconsin till and gray loess. It is very common and its general relations are well shown just east of 11th street along the north face of the cut. Here are exposed in horizontal succession: drift, pebbly, yellow above and gray below, twenty-five feet; grading into shell-bearing pebbly gray clay, fifteen feet; replaced abruptly, but with no *line* of division, by loess, grayish above, yellow below, thirty feet; succeeded again by fossiliferous, yellow pebbly clay, twenty feet exposed. Under all of these lies the sand lens, two to three feet thick, and under this in turn is gray loess. A few feet of yellow or brownish Wisconsin till forms the surface material along all of this exposure, which is about twenty feet in height.

To show the extreme variability in materials within short distances the following section from the intersection of 12th street and Court avenue is added. This is not over two hundred feet from the second section given. Below the level of 12th street the following succession was shown:

1. Fill and altered drift, yellow, in places with a thin line of calcareous nodules at the base. Two feet.
2. Drift, yellow, pebbly. Two feet.
3. Silt, brownish, no fossils. Two feet.
4. Silt, red, no fossils. Two feet.
5. Clay, buff, bearing both pebbles and fossils. Five feet. Laterally this gives way without a break to alternating gray and buff loess, with many fossils and a few concretions, which here is four feet thick. Below it is exposed one foot of dark blue fossiliferous loess. At the contact there were found several iron-coated limestone pebbles two inches long. Two feet above the base of the buff loess was found a chert pebble two inches long, and at several points both the blue and buff loess show layers and pockets of sand, about six inches thick and several square feet in area. Pieces of wood are quite common in loess of both colors.

A few feet from the above section a mass of Carboniferous shale was shown in the wall. It was twenty feet long by three feet thick and was underlain by typical gray, pebbly Wisconsin till while above it lay altered till which contained lime concretions.

While the great sand lens described in the second section is overlain by loess on the south side of the cutting, on the north side it lies directly beneath modified drift and loess which evidently have been disturbed. It seems probable that it represents an immense sand bowlder which was forced into its present position by the ice. The contorted character of some of the coarser parts tends to bear out this theory.

Aside from showing the presence of a young drift on the loess these exposures reveal unusually well the work of the glacier at the extreme limit of its advance. The intermingling of the drift and the loess with its fragile shells, many of which are still entire; the variation of materials within small intervals of space; and the presence of a great lens of sand lying on the body of loess—all these are features which show how gentle and yet how irresistible was the action of the ice.

The stages of alteration of the Wisconsin drift were well shown in several localities. The second section described is quite typical. The thinness of the drift in this general region is to be expected, but the fact that it changes from unaltered

gray through buff to brownish within ten feet or less shows how brief, relatively, has been the period during which this sheet of till has been exposed to the elements.

It will be noted that there is in the first section no trace of a drift beneath the loess. All of this had been swept away and the Coal Measures shales leveled off and a layer of geest formed before the loess was deposited. The cuts indicate also that the Wisconsin drift in turn was spread out on a mature topography developed on the older surface.

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DES MOINES.