

MINGLING OF PLEISTOCENE FORMATIONS¹

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INTRODUCTION

Among the difficulties which beset the student of Pleistocene deposits in the field, none cause greater perplexity than the real or apparent intermingling of strata or masses belonging to different portions of this period. It thus sometimes appears as if masses of different drifts are transposed or interglacial formations are out of place.

PREVIOUS WORK

Such intermingling has already been noted, particularly in connection with the Aftonian, at Afton Junction, and Thayer, Iowa, by Calvin,² and in western Iowa by Calvin³ and the writer.⁴

¹ Manuscript received by the Secretary of the Society December 29, 1911.

² Proceedings of the Davenport Academy of Sciences, vol. x, 1905, pp. 18-30.

³ Bull. Geol. Soc. America, vol. 20, 1909, pp. 137-139.

⁴ Ibid., vol. 20, 1909, pp. 406-7; vol. 21, 1910, p. 133; Iowa Geological Survey, vol. xx, 1910, pp. 351-2, 355 and 371.

RECENT OBSERVATIONS

ILLUSTRATIONS OF MINGLING

During the past year two striking illustrations of such mingling were observed by the writer, the one at Des Moines, Iowa, showing a transposition of yellow and gray loesses and a mixing of fossiliferous gray loess with Wisconsin drift, and the other at Sioux Falls, South Dakota, showing fossiliferous silt apparently between two drifts.

THE DES MOINES SECTION

Location.—This section was exposed for a short time in the excavation made for the heating plant of the East Des Moines High School. The locality lies near the border of the Des Moines lobe of the Wisconsin drift sheet, and loess is here frequently found under Wisconsin till.⁵

In a portion of the section under consideration, however, an unusual mingling of Pleistocene materials was observed during a visit made by the members of the staff of the Iowa Geological Survey, which was subsequently more closely investigated by the writer.

The loesses.—Throughout the region under consideration two loesses appear in many places. The lower is the usual bluish gray post-Kansan loess, which is here frequently fossiliferous, and the upper is the common yellow later loess.

The Wisconsin drift.—In the same region the Wisconsin till presents a common yellow phase, throughout which small boulders and pebbles are irregularly scattered. In the section under consideration a thickness of 10 to 15 feet is exposed.

Mingled loess and drift.—In the lower 6 to 8 feet of this section there appear gray bands and irregular streaks and masses which can not be distinguished from the gray post-Kansan fossiliferous loess, excepting for the presence of occasional pebbles, and, moreover, in a portion of the section a larger stratum of this gray material lies above yellow loess, thus producing an apparent transposition of the loesses.

A careful study of the section on the north and west sides of the excavation, however, revealed the cause of this unusual relation.

On the west side at the base the section (plate 41, figure 1) exposes about 5 feet of yellow loess with few fossils (*c.* figure 1). Above this is a stratum of gray loess 2 to 4 feet in thickness, with a few pebbles, and scattered shells of terrestrial mollusks for the most part broken. The remaining 10 to 12 feet of the section show Wisconsin drift, in the lower

⁵ See also McGee and Call on the Löss and associated deposits of Des Moines. *American Journal of Science*, 3d ser., vol. xxiv, 1882, pp. 202-323.



FIGURE 1.—SECTION AT EAST DES MOINES HIGH SCHOOL

a. Yellow loess; *b.* Gray loess mingled with Wisconsin pebbles; *c.* Wisconsin drift



FIGURE 2.—SECTION AT SIOUX FALLS

a. Gray silt with broken shells; *b.* Kansan drift

SECTIONS SHOWING MINGLING OF PLEISTOCENE FORMATIONS

half of which there are masses and layers of gray loess containing a few broken fossil land shells.

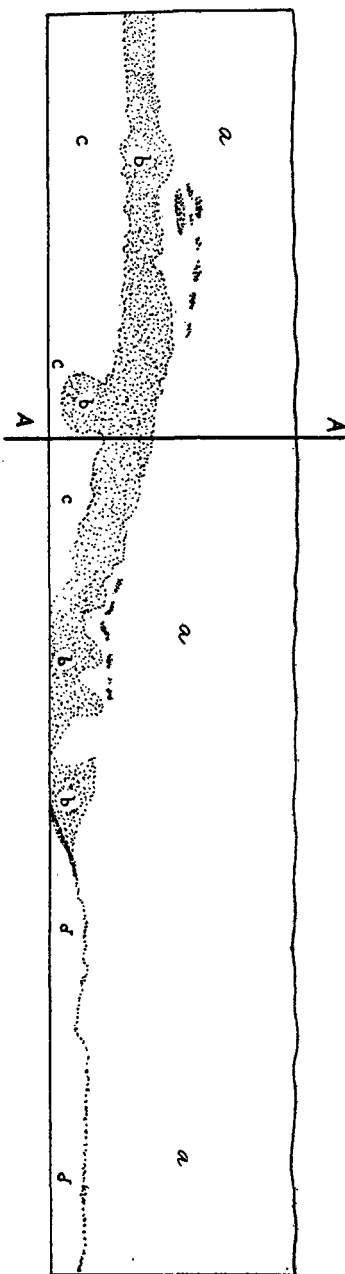


FIGURE 1.—Section at Heating Plant of East Des Moines High School

The line A-A represents the northwest corner of the excavation, the part to the right being the north side and that to the left the west side. The distance from A-A to d-d is about 50 feet. (a) Wisconsin drift, 10 to 12 feet thick, containing mixed masses of gray loess similar to (b), sometimes containing fragments of loess shells. (b) An irregular mixed stratum, 2 to 4 feet thick, consisting chiefly of gray loess, but more or less intermingled with Wisconsin drift, and containing loess fossils, derived evidently from (d). (c) Yellow loess, somewhat fossiliferous, younger than (d). (d) Gray, post-Kansan loess, undisturbed, containing entire loess shells. In (b) what is apparently a gray loess overlies the younger yellow loess (c), thus seemingly reversing the usual order, but its materials are older than (c).

On the north side the yellow loess soon disappears, as shown in figure 1 in the text, but the mixed gray layer, here distinctly folded, extends for about 50 feet to the east.

In this portion of the section the lower 6 to 8 feet of the Wisconsin also contains masses of fossiliferous gray loess.

To the eastward, on the north side, the section shows a distinct stratum of typical fossiliferous and apparently undisturbed gray loess, exposed for 50 feet to a depth of 2 to 3 feet.

A study of the entire section, as shown in text figure 1, suggests that the Wisconsin ice, moving in a southerly or southwesterly direction, somewhat as indicated by the arrow, pushed the mixed gray mass (b) from its position above (d) and deposited it above the yellow loess (c), which was also more or less disturbed, as indicated by a lateral excavation westward, which shows an irregular mass of yellow loess lodged above the mixed gray layer (b).

THE SIOUX FALLS SECTION

Location.—The Sioux Falls section here discussed

is located on the west side of Dakota avenue, north of West Third street, in Sioux Falls, South Dakota. It presents another example of interstratification which is of interest in this connection.

Briefly, the section shows a mass of gray silt lying between a lower stratum of Kansan drift, of which 7 to 8 feet are exposed, and an upper stratum of the same drift thickening northward to 10 or 12 feet.

The Kansan drift (plate 41, figure 2, *b*).—Both drift strata present the usual characteristics of the western Kansan. The heavy bluish joint clay is very calcareous and contains scattered pebbles and boulders.

The silt (plate 41, figure 2, *a*).—The silt is gray, calcareous, occasionally mingled with broken fresh-water mollusk shells of the pond types. The mass is exposed for about 75 feet, and distinctly dips downward toward the south. Its greatest thickness is 3 feet, and at the north it appears as if crowded or folded. Smaller masses of the same silt occur in the lower part of the upper drift stratum.

Another section, on McClellan street opposite Main avenue, shows the folding and crowding much better. Here a mass of silt, 20 feet long and 4 to 5 feet deep, imbedded in and completely surrounded by Kansan drift, shows, on its northern side, distinct evidence of pushing and folding.

The conclusion that these masses of fossiliferous silt are older than the Kansan, and that they were brought to their present position by the Kansan ice, is certainly warranted. The silt is evidently Aftonian.

CONCLUSION

If narrow vertical sections of the two exposures here discussed were made they would appear somewhat as follows:

The Des Moines section, west side:

Wisconsin drift, 10 to 12 feet (with bands of gray loess).

Gray, fossiliferous loess, 2 to 4 feet.

Yellow loess, 5 feet.

A normal section should show these loesses reversed and the larger section here shows how the reversal had taken place.

The Sioux Falls section:

Kansan drift, 10 to 12 feet.

Fossiliferous silt, 3 feet.

Kansan drift, 7 to 8 feet.

In this case it would be easy to jump to the conclusion that the silt is interglacial, separating two distinct drifts. The larger section shows that the Kansan is continuous and that the silt is intraglacial.

Manifestly, in both cases such sections would not show the true relation, and both show the need of great care in drawing conclusions from sections of limited lateral extent.

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Notes

