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## Discovery of Volcanic Ash in Iowa

Charles Keyes

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## DISCOVERY OF VOLCANIC ASH IN IOWA

CHARLES KEYES

Of all geological phenomena represented in Iowa those illustrating volcanic action are the rarest. Although we already know of the presence of very ancient lava-flows, which are disclosed in deep-well drillings, these are associated with rocks very much older than any outcropping in the state. These are the Keewenawan porphyries of the Northwest. From that very ancient date to the present there is not the slightest sign of volcanic activity discernible in all our very full geologic record. The finding, a short time ago, in the city of Des Moines, of very considerable beds of typical volcanic ash is therefore a circumstance of more than passing interest.

The ash is that pumaceous glass variety which, during violent volcanic eruptions, is thrown high in the air and wafted far abroad on the wings of the wind. The material is an impalpably fine dust. In the instance of Krakatoa, in the Straits of Sunda,



Fig. 2. Appearance of volcanic ash under the microscope.

in 1883, similar volcanic glass-dust drifted quite around the world, and produced the gorgeous "red sunsets" for many a month afterwards. Because of its abundance and of its thickness at Des Moines, it is not probable that the site of its origin is so far away as the other side of the earth. Most likely the material came from some of the later eruptions in the Rocky Mountains or the Pacific Coast ranges.

That the eruption which furnished the glass-dust for the Iowa deposit was a notable one, wherever it was, is clearly indicated by the depth and volume of the accumulation. In order to attain a thickness of six inches or a foot the dust-cloud from the volcanic vent must have been driven by a strong and prevailing wind.

No doubt a like thickness of ash spread over a very large expanse of country, probably over hundreds, and perhaps even thousands, of square miles. Except in especially favored localities this dust mingled with the soil and the record of its existence was lost. The deposit under consideration manifestly owes its preservation to the circumstances that the dust settled in a small pool of water where it remained undisturbed from further wind action and was fully protected from the erosive influence of the rains.

This notable volcanic ash bed is brought to sky in the course of recent extensive grade-cuttings on Fifth Avenue, between Grand Avenue and School streets, in the city of Des Moines. With it is also exposed one of the finest sections of Glacial deposits ever disclosed within the limits of our state. The longitudinal exposure is over half a mile, and the vertical cut is 50 feet as a maximum. It is essentially a north and south cross-section of West Hill, along a line about a quarter of a mile from the Des Moines river. The best ash sections are near the corner of Crocker street; and the formation is locally christened for brevity the Crocker Ash-bed.

The vertical section displayed at Crocker Corner is as follows:

7.	Soil, black loamy	-----	Feet 2
6.	Till, yellow, bouldery, (Wisconsin)	-----	Feet 10
5.	Sand, very fine, gray (volcanic ash)	-----	Feet 1
4.	Loam, black, pebbleless	-----	Feet 1
3.	Loess, yellow (Peorian)	-----	Feet 15
2.	Till, dark red, bouldery (Kansan)	-----	Feet 6
1.	Shale, variegated (Carbonic) exposed	-----	Feet 4

The bed of the volcanic ash lies mainly in a shallow depression in the top of the loess. It is much disturbed and broken, a feature probably due to the plowing action of the Wisconsin ice. On the

same horizon a few rods away is a bed of coarse gravel and small

boulders containing numerous small logs of charcoal, which evidently were once drift-wood.

The occurrence of the ash-bed immediately beneath the Wisconsin till-sheet and directly upon the Yarmouth-Sangamon-Peorian loess, which was wind-formed, fixes the time of deposition as also interglacial—probably Peorian. This brings the date of deposition very close to us, geologically speaking.

In casting about for the location of the nearest possible source of such volcanic material we naturally look first of all to the Southwest which would be the direction of the prevailing winds. The nearest volcanic eruption of the violent kind that we know of is Mt. Capulin, in northeastern New Mexico. This is an ash cone whose magnitude far surpasses that of the famed Vesuvius. It is 3000 feet high and its crater is half a mile across. But Capulin is very recent. Its last eruption perhaps scarcely antedates the landing of Columbus on the western continent. There are other volcanoes in the Capulin field which might have served, for volcanic outburst there was continuous throughout Quaternary and part of Tertiary time. Spanish Peaks, in southeastern Colorado, seem too early in their last eruptions. Another possibility is the San Francisco group of volcanoes in northeastern Arizona, where more than 400 vents of all sizes and many dates occupy a circumscribed area. Volcanoes of the Pacific coast are all almost out of question.

Although this appears to be the first announcement of an occurrence of volcanic ash in Iowa it is perhaps not nearly so unusual a phenomenon as might be inferred. Now that the exact stratigraphic horizon is determined numerous other deposits may be expected to be speedily found. Because of the fact that the ash beds of the kind under consideration are eolian deposits their positions are unaffected by the ordinary means of deposition. Then, too, the determination of the exact age enables certain similar beds in Nebraska, as noted by Todd,<sup>1</sup> to be placed and correlated. With the western extension of these correlations we may confidentially expect at no distant day the tracing of the deposits to the exact vent of eruption.

The volcanic ash as seen under the microscope (figure 2) appears as sharp, angular fragments of clear, amorphous glass, wholly without trace of crystal structure. The dust is quite characteristic of the pumaceous glasses found in ash cones commonly built around volcanic vents. Associated with the glass-dust in the same

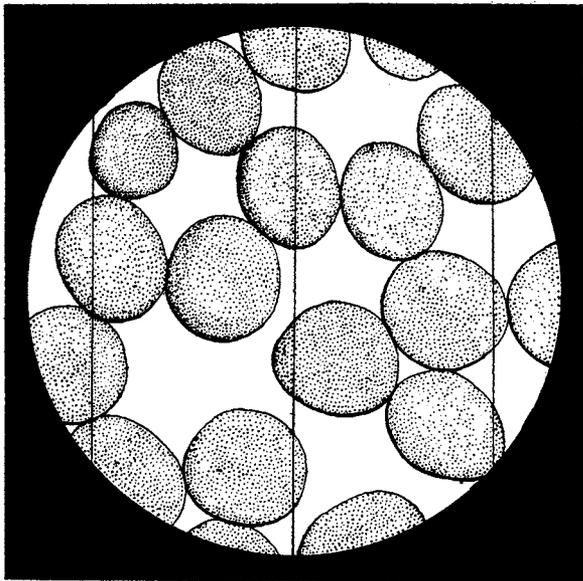


Fig. 3. Appearance of eolian sand under the microscope.

stratum are fine eolian sand grains, which are characterized by their minute size, remarkable uniformity and perfectly rounded form (figure 3). In the illustration the hair-lines are one-tenth of a millimeter apart. It is noted that the grains fall between one-twenty-fifth and one-fiftieth of a millimeter in their size. They are further distinguished from the glass of the pumaceous ash by being perfectly crystal.

The Fifth Avenue street cutting is represented in cross-section in figure 4. Noteworthy features aside from the presence of the volcanic ash-bed are the great loess deposit, designated as the Peoria Clay, and the basal till which is thought to be possibly the Nebraskan drift-sheet. The loess section probably represents continuous epirotic deposition during three interglacial and two glacial epochs, with great probability of its being deposited mainly during the last or Peoria epoch. Great stratigraphic significance is attached to this fact.

It is with some little doubt that the lowest drift deposit is referred to the Nebraska Till. The bed is quite distinct from the local Kansas Till; and the dark red coloration of the latter is sharply set off from the dark blue of the former. It may be a till even older than the Nebraskan. This suggestion arises from the fancy that there may be in Iowa several drift sheets antedating

Keyes: Discovery of Volcanic Ash in Iowa

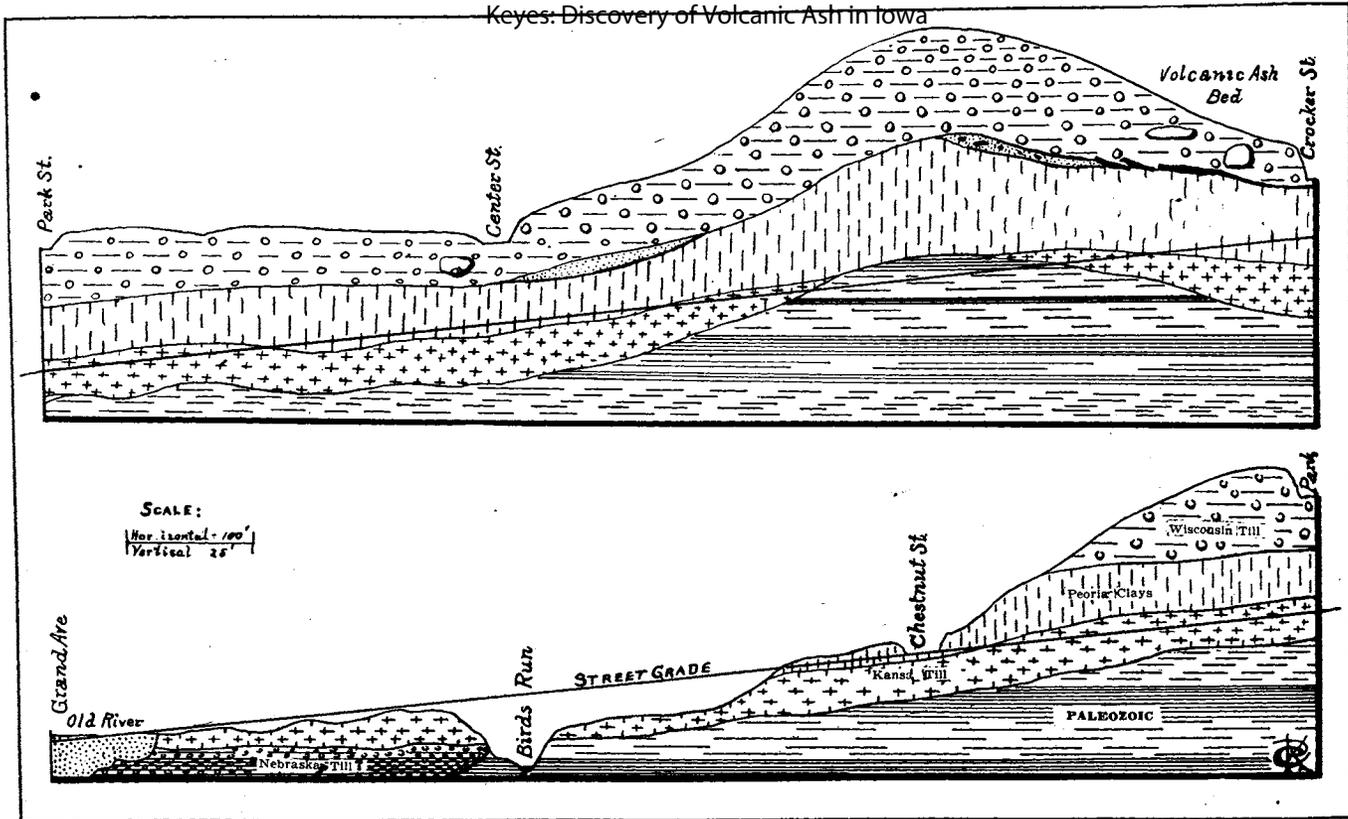


Fig. 4 Glacial deposits in Fifth Street grading, Des Moines.