

to dust continuously under the effects of the great and sudden differences of temperature between day and night, and between the sun-warmed and shade-cooled sides of the block. R. W. Pumpelly found the surface of the older moraines wind-swept to a floor of even smoothness, the large and small blocks of rock being represented only by flat surfaces flush with the floor, in which they produce the effect of a mosaic. Here we observed both factors at work in the process of loess transportation, for the waters from the early melting snows bring down great quantities of the finer products, which are soon dried on the dry deltas and plains, and all through the day cyclonic columns of the dust are seen moving rapidly across the field of vision to disappear beyond the mountains. Again, in the great Alai grass-covered valley, 10,000 feet above the sea, at the northern foot of the Pamirs, we observed all stages of the process. Moraines of 1,000 to 1,500 or more feet high, and stretching 10 to 15 miles across the valley and belonging to the earlier glacial epoch, are mantled to a depth of several feet with loess, while the younger moraines, though abundantly grass-covered, have only a thin covering. The streams that descend from the snows and glaciers of the lofty Trans-Alai valleys have flood-plains several miles wide, which are nearly dry except during the spring floods. Here one can often see the fine dust carried by the wind from the flood-plains to the grass-covered moraines, and there can be no doubt that the loess on the moraines was brought by the winds from the neighboring flood-plain. In view of this it would seem probable that a great part, perhaps the greater part, of the loess of many regions has undergone previous transportation by water. The loess of China owes its origin, doubtless, both to deflation of the Mongolian deserts and to wind-sifting of the flood-plain of the Yellow River, which carried an immense load of glacial flour during the glacial period.

Loess, whether originally a product of deflation or of glacial grinding, must, where its whole pre-eolian existence has been passed in desert conditions, retain a greater or less amount of the soluble products of disintegration and decomposition. For, even when leached and transported by water, more or less of these constituents remain in the silts left dry by evaporation, not only on desert depressions and dry deltas, but on broad flood-plains as well.

The structure and constitution of a loess-mass vary according to the conditions under which it was built up: where it is deposited on an elevation, it grew up after covering this, as a homogeneous formation, unstratified and free from interbedded detritus; where it forms on mountain declivities, it contains layers of detritus washed down from above; where it borders an aggrading flood-plain it alternates with occasional gravels; and where it forms on the "dry deltas" of streams emerging from the mountains, it assimilates the fine sediments, which, like itself, are retained by the grass, and impresses loess characteristics upon the resultant product.

We have seen that the lofty mountains intercept most of the moisture brought by air-currents from the ocean, and that the fiery column of air rising from the heated barren plains prevents precipitation except in winter; but there is a zone between the deserts and the mountains on which sufficient moisture falls in spring