

rivers to the west, then began, while the continent over this interior region was still at high elevation, its discharge by the Red River of the North into the Minnesota, and the Mississippi became emphatically the "Great Mississippi."

It was at this time of the departure of the ice from the lake region to the country north of Lake Superior, before a subsidence had made much if any progress, that the areas of the Great Lakes were fluvial areas, carrying on vigorously the work of excavation under the high southward slopes due to more northern elevation; that Michigan was discharging its abundant waters through the Illinois or the Kankakee channel to the Mississippi; Erie, with probably Huron, through the Wabash, to the Ohio; and Superior, through the Fox or Wisconsin, to the Mississippi. The waters of Ontario are supposed to have gone eastward to the valley of the Mohawk, but for want of satisfactory evidence as to any other course.

The following are the views of Chamberlin and Leverett, with regard to the stages in the interval between the time of maximum extension and that of the Kettle moraine: (1) Partial deglaciation, and the formation of a sheet of drift perhaps 20' in thickness, with occasional layers of soil interbedded in the drift. (2) Interval of deglaciation of great length, the surface of old drift sheet deeply oxidized, leached, much eroded, with thick widespread soil above. (3) Deposition of main body of loess and associated silts along the Mississippi, Illinois, Wabash, and Ohio rivers, and between the Illinois and Mississippi, and the material in southern Indiana and southwestern Ohio called "White Clay." (4) Long interval of deglaciation, and deep erosion, cutting large valleys in the loess. (5) Formation of a thick sheet of drift terminated by the Shelbyville moraine, 75' to 100' deep, the maximum advance of the ice after the long deglaciation having terminated at or near the line of this moraine; and, following the deposition of the Shelbyville moraine, other moraines in succession at short intervals up to the Kettle moraine series. (6) An interval during which ice-lobes and ice-currents were shifted. (7) Moraines of the Kettle moraine series of Illinois and Wisconsin. In remarks on these stages, it is stated that as far as the correlation of the Kettle moraine has been made out, the Shelbyville series of moraines is represented in western Ohio by only a single moraine, and in eastern Ohio and northwestern Pennsylvania, it is nowhere in view, and is supposed to be concealed by the Kettle moraine series. The correlate line across western Indiana of the Kettle moraine is difficult to make out. In eastern Ohio the outer belt from the Scioto River to southwestern New York has knobs and basins like the Kettle moraine; and the moraine south of the Finger Lakes (Cayuga, Seneca, and others) is made the probable continuation of the Kettle moraine series. The overwash from the Lake Michigan and Erie moraines over Saginaw moraine in northern Indiana seems to show that the ice had withdrawn from the Saginaw moraine while it was forming the series west of Lake Erie. With regard to the conclusions of Chamberlin and also of Leverett here and elsewhere cited, they say that their observations are still in progress, and their statements are not to be taken as final.

Upham names as follows the Iowa-Minnesota moraines, commencing at the south: 1, the Altamont; 2, the Gary; 3, the Antelope; 4, the Keister; 5, the Elysian; 6, the Waconia; 7, the Dovre; 8, the Fergus Falls; 9, the Leaf Hills; 10, the Itasca; 11, the Mesabi; 12, the Vermilion (Final Rep. *Geol. Minn.*, vols. i., ii., and 22d Ann. Rep.).

*Lateral moraines* are seldom well marked over any part of glaciated North America, because the mountains, with rare exceptions, were beneath the ice-sheet; and there were no true valley glaciers, except occasionally