

Mississippi on either side, of the Tombigbee and Tennessee, as well as of the Sabine, there is a steady increase of gravel. It occasionally contains, even in Mississippi, stones of 10 to 100 pounds in weight, and rarely 150 pounds. There are also some local clayey beds. The stones show that the material came from the northward; many have in them Paleozoic fossils. The beds are irregularly stratified, sometimes structureless for 20 feet of thickness, but have generally the *flow-and-plunge* structure, illustrated in Fig. 63, page 93. The facts prove, as Hilgard states, that there was a vast and violent flow of waters down the broad Mississippi valley, bearing an immense amount of sand and coarser detritus, and also some floating ice for the transportation of the larger stones. Hilgard therefore concluded that it must have been made during the melting of the ice, while the continent had still the elevation characterizing the Glacial period. These conditions are those of the First Retreat.

There were cotemporaneous depositions from streams descending the Atlantic and southern slopes of the then snow-clad Appalachians; and large areas of the Lafayette formation in these regions and elsewhere have been defined and mapped by McGee.

The "Orange sand" is often 40' to 100' thick, and in some places over 200' according to Hilgard, and toward the Gulf it has still greater thickness. In an Artesian well, near the Calcasieu River, 200 miles west of New Orleans, beds referred to the Lafayette are 450' thick, beneath 160' of clay of the Port Hudson group; and at New Orleans 760'. This thickness along the Gulf is supposed to be evidence of a gradual subsidence of its border to the great depth stated, as deposition went forward.

The actual limit of the formation is in doubt because it contains no fossils, and the criterion usually appealed to in its correlation, — kinds and color of gravels, — is admitted to have, whatever the rock series, almost no value. In Texas, some beds referred to the Lafayette were found by G. D. Harris to contain Tertiary fossils.

In his early account of the formation, Hilgard stated, on the authority of Tuomey and LeConte, that the formation passed from Alabama eastward, around the higher Appalachian highlands into the Carolinas, and thence north to Virginia and Maryland. McGee described, in 1888, similar beds of orange-colored sands and clays along the Appomattox River and other points in Virginia, and also others, in North Carolina and beyond, to which he gave the name of the *Appomattox formation*, and he has since studied the beds in the Mississippi valley. He argues that part of the borders of the Atlantic and Mexican Gulf were 200' to 800' below their present level at the time, making the beds in part marine. No marine fossils or other marine relics have been described in evidence of the submergence. Moreover the formation is made *preglacial* by McGee, and others.

The term *Lafayette* was substituted in 1892, by agreement, for the older names of *Orange sand* and *Appomattox*.

Mr. Hilgard's last paper on the subject is in the *Am. Jour. Sc.*, xliii., 1892; and Mr. McGee's first on the Appomattox in *Am. Jour. Sc.*, xxxv., 1888, and his last on the Lafayette formation in vol. xii., *Rep. U. S. Geol. Surv.*, 1892.

3. *River channels filled by the drift.* — The discharge of drift from the melting glacier sometimes filled up and blocked river channels at places, and compelled the river to make a new cut.

The Ohio River, according to Newberry, formerly had a more southern