lacustrine deposit before described (p. 204), which had accumulated in a depression of a tract composed of micaceous schist. In the breccias, even to the very summit of the mountain, we find ejected masses of the fresh-water beds, and sometimes fragments of flint, containing Eocene shells. Valleys radiate in all directions from the central heights of the mountain, increasing in size as they recede from those heights. Those of the Cer and Jourdanne, which are more than 20 miles in length, are of great depth, and lay open the geological structure of the mountain. No alternation of lavas with undisturbed Eocene strata has been observed, nor any tuffs containing fresh-water shells, although some of these tuffs include fossil remains of terrestrial plants, said to imply several distinct restorations of the vegetation of the mountain in the intervals between great eruptions. On the northern side of the Plomb du Cantal, at La Vissiere, near Murat, is a spot, pointed out on the Map (p. 195), where fresh-water limestone and marl are seen covered by a thickness of about 800 feet of volcanic rock. Shifts are here seen in the strata of limestone and marl.*

In treating of the lacustrine deposits of Central France, in the fifteenth chapter, it was stated that, in the arenaceous and pebbly group of the lacustrine basins of Auvergne, Cantal, and Velay, no volcanic pebbles had ever been detected, although massive piles of igneous rocks are now found in the immediate vicinity. As this observation has been confirmed by minute research, we are warranted in inferring that the volcanic eruptions had not commenced when the older subdivisions of the freshwater groups originated.

In Cantal and Velay no decisive proofs have yet been brought to light that any of the igneous outbursts happened during the deposition of the fresh-water strata; but there can be no doubt that in Auvergne some volcanic explosions took place before the drainage of the lakes, and at a time when the Upper Eocene species of animals and plants still flourished. Thus, for example, at Pont du Chateau, near Clermont, a section is seen in a precipice on the right bank of the river Allier, in which beds of volcanic tuff alternate with a fresh-water limestone, which is in some places pure, but in others spotted with fragments of volcanic matter, as if it were deposited while showers of sand and scoriæ were projected from a neighboring vent.†

Another example occurs in the Puy de Marmont, near Veyres, where a fresh-water marl alternates with volcanic tuff containing Eocene shells. The tuff or breccia in this locality is precisely such as is known to result from volcanic ashes falling into water, and subsiding together with ejected fragments of marl and other stratified rocks. These tuffs and marls are highly inclined, and traversed by a thick vein of basalt, which, as it rises in the hill, divides into two branches.

Gergovia. — The hill of Gergovia, near Clermont, affords a third example. I agree with MM. Dufrénoy and Jobert that there is no

* See Lyell and Murchison, Ann. de Sci. Nat., Oct. 1829.

† See Scrope's Central France, p. 21.