

of India, the beds above the Nummulitic formation at the top of the upturned series are probably Miocene, as indicated by the plant beds, one species, the *Sabal major*, ranging from Lower to Middle Miocene in Europe. The Siwalik Tertiary beds (of the Sub-Himalayas), many thousand feet thick, along the length of the Himalayas, which are Pliocene with probably Upper Miocene at top, rest on the inferior Mesozoic and Paleozoic rocks along what appears to be an enormous fault-plane. This steep "fault-plane," as shown by Medlicott, is really an original limit of deposition, in part almost cliff-like, to the north of which the Siwalik beds never extended. These beds are, therefore, not included in the disturbed region. There appears to be doubt remaining whether the epoch of upturning followed the close of the Nummulitic Eocene or that of the Miocene.

The mountain chains to the north of the Himalayas for 22° of latitude are nearly parallel to it, and this has led to the suggestion that all this great region in Asia was involved in one system of orogenic movements.

*Epeirogenic movements during the Tertiary era.* — Through the Tertiary, changes of level went slowly forward by geanticlinal bendings of the earth's crust and slippings along old or new fracture planes, giving great altitude to vast continental areas, and especially those within 800 miles of the seaborder, and affecting all the continents alike with the same stupendous results. The continuing of the movements through all Tertiary time, and also beyond it, during part of the Quaternary, teaches that they were extremely slow in general progress; yet sudden slips of scores and hundreds of feet were probably among the events.

In the Rocky Mountain region the change was slight during the Eocene, and yet it was sufficient to modify the outlines and positions of the Eocene lakes. With the close of this period, the land was so far raised that the Eocene lakes were drained; but the elevation attained was so small, as Hayden first remarked, that vast Miocene lakes covered a large part of what now constitutes the eastern slopes of the mountains, and continued into the Pliocene. The long continuance of the lakes indicates not only slowness of emergence, but also that the movements were interrupted through long intervals. The western margin of the Nebraska lacustrine beds is 3500 feet above the level of the eastern, the former having a height of about 6000 feet and the latter of 2000 feet. This is proof that the elevation of the mountains went on through the Pliocene, for the rise to the westward could not have made much progress in the Miocene without drying up the lake.

The height which the Rocky Mountains had reached by this change of level is not ascertained. This much is known: (1) that the Cretaceous areas were originally at or near the sea level; and (2) that within the area of the United States the present height of the upper beds is now, in part, 13,000 feet. Moreover, the corresponding height in central Mexico is 10,000 feet, and in British America, toward the Arctic seas, 4000 feet.

During the progress of these changes over western North America there were also, according to Gilbert, Powell, LeConte, and others, faults along