

latitude, or a third of the circumference of the globe, were undergoing simultaneous orogenic movements, with like grand results.

The deposit-making, preparatory to the Laramide system of ranges, began, as has been stated, in the Cambrian, and went forward, with some large interruptions, until the subsidence in the geosynclines of deposition amounted to 25,000 feet. While the Laramie epoch was passing, there was a deepening of 10,000 feet in some places during the Cretaceous period alone, and in Montana over 7000 feet if the estimates of thickness are right.

As once before stated, it is not supposable that the Archæan ridges bounding such troughs participated in the great subsidence. Assuming the load of sediments to have caused the sinking, in accordance with the isostatic theory, the trough would have been made in the waters off the shores, and would have been greatest a little distance out from the shores; and the same might be a consequence if lateral pressure were the cause of the subsidence. The denudation of the ridges would have caused them to rise rather than sink.

The earlier movements connected with the upturning appear to have begun before the Laramie depositions were completed, producing, according to Cross, a small unconformity in bedding between the Lower Laramie and the Denver beds, besides unconformity by erosion. The latter is described by Weed as marking the junction of the Lower Laramie and the Livingston beds. But the erosion-plane occurs at a level 200 feet below that of a brackish-water bed, abounding in Oyster shells, like those of the Lower Laramie, showing that true Laramie conditions still prevailed, and that the erosion was an event of minor importance. If the orogenic work had actually begun, violent currents in the water may have been produced where quiet deposition had before been in progress; and then great excavations of the earlier-made beds may have been occasioned, followed by depositions of conglomerates and other coarse beds. Moreover, earthquakes and earthquake waves from the adjoining sea may have been an agent in producing erosions of the unconsolidated strata.

The erosion at the base of the Upper Laramie has been supposed to amount to several thousands of feet and to have taken place as a result of an elevation of the region to this height; and this elevation has been thought necessary for the supply of the Paleozoic material of the conglomerates. But such a lift of the region would have changed the climate, and through consequent river-erosion would have cut down the Laramie formation into mountain valleys and ridges; and it would also have exterminated the fauna and flora; when, in fact, horned Dinosaurs existed after it, while the Denver beds were in course of deposition, and their bones are associated with those of various other Dinosaurs in regions not far distant.

Igneous eruptions were also a feature of the early stages of the orogenic movements, and also of its latest. The Wasatch, as described by King (see map, page 360), had its outflows of trachyte chiefly from the region of greatest wrenching between the main range and the Uinta plateau.