

Since the mean height of the present continents is about 2000 feet, and the mean depth of the oceans 12,000 feet, and since the continental areas were already outlined and partly emerged, during later Archæan time, this mean depth of the oceanic depressions must also have been then acquired; and only an addition of 1500 to 2000 feet was needed to give the continents their present mean altitude. Of this, more than one half was added in the Tertiary and Quaternary.

## 2. OROGENIC WORK, OR THE MAKING OF MOUNTAINS.

1. In ordinary mountain-making, the rock material to be made into the mountain range has comprised a thick, conformable series of sedimentary strata, resting upon an uneven floor of upturned and usually crystalline rocks which were part of the underlying earth's crust. The Appalachian and Laramide strata were laid down on an Archæan floor; the Palisade beds of the Triassic, from New York southwestward, on one that was partly Archæan and partly consisted of Archæan and Cambro-Silurian terranes combined.

The great facts to be explained in a theory of mountain-making relate (1) to the preparatory geosyncline or trough and its load of strata for the mountain structure; (2) to the mountain-making events; the upturning, flexing, and faulting of the strata, and all other effects of the movements in progress. On any theory of origin, such mountain ranges are *synclinoria*, as they have been termed by the author, from the Greek for *syncline*, and *ōpos*, *mountain*, — they having had their beginning, as first recognized by Hall, in a preparatory geosyncline of accumulation. The geosyncline occupied the area of the future mountain range. It was slowly formed, while the crisis of upturning was relatively short. For the Appalachians the geosyncline, judging from the thickness of the included beds, had a maximum depth of 40,000 feet; for the Laramide Range, north of Montana, 34,000 feet (McConnell) and for the Wasatch portion, 31,000 feet (C. King); for the Alps, at the close of the Miocene, 50,000 feet (Heim); for the Australian Alps, 35,000 feet (Hector); for the Palisade ranges, 3000 to 5000 feet.

The subsidence in the case of the Appalachian Range occupied all of Paleozoic time; of the Wasatch Range and other ranges of the Laramide system, all of Paleozoic and Mesozoic time, — which means many millions of years for each. Again, there is the remarkable fact that the subsidence has not always been continuous, but sometimes alternated with emergences, or ceased for long periods. In the case of the Ouachita Mountains, Arkansas, whose history runs parallel with that of the Appalachians, there was a cessation through the whole of the Upper Silurian and Devonian, for these eras are unrepresented by rocks. Moreover, the area of the geosyncline, as the deposits show, varied, as the ages passed, in width; varied in the position of the belt of maximum subsidence, from one side to the other, or from one part to another; varied in the depth of water in which the deposits