

to be a very appreciable amount in the case of the greater mountain-systems. On the other hand, Heim calculates that the earth's diameter has not been shortened even one per cent. by the processes of subsidence and mountain-folding. With regard to the age of the Alps, Heim concludes that the central chains are older than the outer, that the strains have wholly ceased in the inner portions of the Alps, but continued along the northern chains into the youngest Tertiary periods, and are possibly even now in progress.

According to Heim's theory of latent plasticity, the rocks at a depth of nearly 7000 feet would be in a condition that would preclude the possibility of gaping fissures. This assumption is correlated with the characteristic feature in Heim's geological surveys, namely, the pre-eminence of folds in all possible forms, and the subordinate place assigned to faults. These have proved somewhat vulnerable points of attack in an otherwise classic work, and have been called in question by many eminent geologists during the twenty and more years that have elapsed since the publication of the *Mechanismus*.

Gümbel, Broegger, Stapff, Pfaff, Rothpletz, and others have opposed the theory of plasticity upon various grounds. All experimental attempts to reduce rocks by mere compression only caused fragmentation of the material. Pfaff found that many rocks might be subjected to a pressure of more than 20,000 atmospheres without showing any tendency to become plastic. Moreover, it is not in accordance with the known phenomena of volcanoes and earthquakes to assume that crust-fissures cease at comparatively small depths.

The experiments of M. Daubrée and M. Favre are especially noteworthy. Daubrée started from the standpoint that not only horizontal, but also vertical components of force have acted in bending and folding the rocks of the crust. His apparatus consisted of a rectangular iron frame, to contain the material under pressure. The pressure was applied from the side, but sometimes simultaneously from above. Instead of the alternating layers of wool, cotton, and clay which had been used in the experiments of Sir James Hall in Edinburgh, Daubrée arranged different kinds of metal plates and sheets of wax mixed with clay, resin, or turpentine. By varying the conditions of his experiments in respect of the intensity and direction of pressure, and the kinds of material, M. Daubrée