

The stretching and probable fracture of the strata at some miles below the surface will have allowed the injection of the lower rocks amongst the upper ones, and the phenomena, which we should expect to find according to Mr. Davison's theory, are eminently in accordance with observation. It therefore appears to me that his view has a strong claim to acceptance."

Further, Mr. Darwin cited, in 1892, the recent calculations of Rudski of Odessa, which showed that if the initial temperature of the sphere be not uniform through the mass, that is, if, as in the case of the earth, the initial temperature increased from the surface to the center, the level of no strain lies deeper than he had made it. As to the actual depth thus indicated he made no statement. (*Phil. Mag.*, Sept., 1892.)

3. *The process of mountain-making according to the Contraction Theory.* — The making of the preparatory geosyncline, with its included series of strata, was slow in its progress. As it included, in the case of the Appalachians, all of Paleozoic time to the close of the Carboniferous, the rate of subsidence — the depth being 40,000 feet — was, if the time was 40,000,000 years, about 1 foot in 1000 years; if 10,000,000 years, 1 foot in 250 years. The rate, on either supposition as to the elapsed time, was so slow that the subsidence may have been a result of the loading of the area with the sediments. Yet it cannot be asserted that lateral pressure in the crust was not concerned; for if it was the prime cause of movements at the crisis, it could hardly have been dormant through the long preceding ages when the trough was in progress. The subsidence went forward, so far as can be discovered, without much displacement of the beds within them, beyond such as were due to unequal compression by gravitation, drying, and some solidification. The pile of beds had great breadth as compared with its depth, and varied much in thickness, owing to irregularities in the Archæan floor beneath, and to varying rates in the progress of the subsidence. Limestones indicate much slower movement downward than coarse sediments of like thickness; and intercalated beds of coal prove that long periods of slight emergence were among the alternations.

When the mountain-making crisis was at hand, the temperature at the bottom of the deposits was already high from the rise of the geothermals with the increase of thickness. With a thickness of 40,000 feet, and the rate of increase of temperature downward 1° F. in 50 feet, it would be 800° F. But the rate was probably as rapid as 1° F. in 40 feet or less, making the temperature at bottom 1000° F. or higher. At either temperature the trough would have been greatly weakened below, as first explained by Herschel. In a letter addressed to Lyell, dated February, 1836, and in another to Murchison, dated November, 1836, which are published in the Appendix to Babbage's *Ninth Bridgewater Treatise* (1837), he presents, besides the view that heat will rise from below into an accumulating series of strata, as had been done by Babbage, the suggestion that "the thicker the deposit, the hotter will its lower portions tend to grow, and if thick enough they may grow red-hot, or even melt. In the latter case, their supports, being also melted or softened, may wholly or partially yield *under the new circumstances of pres-*