calculations of Colonel Totten, cited on p. 508, Lyell estimated that a mass of red sandstone one mile thick, having its temperature augmented 200° Fahr., would raise the overlying rocks 10 feet, and that a portion of the earth's crust of similar character 50 miles thick, with an increase of 600° or 800°, might produce an elevation of 1000 or 1500 feet.[230] But this computation, as Mr. Mellard Reade has pointed out, takes account only of linear expansion. If from any cause the mass of rock whose temperature was augmented could not expand horizontally it would rise vertically, and unless some of the surplus volume could be disposed of by condensation of the rock, the uprise would be three times as much as the linear extension. Taking this view of the case, we find that a mass of the earth's crust twenty miles thick, heated 1000° Fahr., and prevented from extending laterally, would rise 1650 feet.[231]

Again, rocks expand by fusion and contract on solidification. Hence, by the alternate melting and solidifying of subterranean masses, upheaval and depression of the surface may possibly be produced (see pp. 508, 516).

But evidently processes of this nature can only effect changes of level limited in amount and local in area. When we consider the wide tracts over which terrestrial movements are now taking place, or have occurred in past time, the explanation of them must manifestly be sought in some far more widespread and generally effective force in geological dynamics. It must be confessed, however, that no altogether satisfactory solution of the problem has yet been given, and that the subject still remains beset with many difficulties.

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230 "Principles," ii. p. 235.

231 Mellard Reade, "Origin of Mountain Ranges" (1886), pp. 112, 114.