

mountains of Scandinavia, Scotland, and Switzerland, may have been less elevated than at present. But if in both of the polar regions a considerable area of elevated dry land existed, such a concurrence of refrigerating conditions in both hemispheres might have created for a time an intensity of cold never experienced since; and such probably was the state of things during that period of submergence to which I have alluded in this chapter.

*Alpine erratics.*—Although the arctic regions constitute the great centre from which erratics have travelled southwards in all directions in Europe and North America, yet there are some mountains, as I have already stated, like those of North Wales and the Alps, which have served as separate and independent centres for the dispersion of blocks. In illustration of this fact, the Alps deserve particular attention, not only from their magnitude, but because they lie beyond the ordinary limits of the "northern drift" of Europe, being situated between the 44th and 47th degrees of north latitude. On the flanks of these mountains, and on the Subalpine ranges of hills or plains adjoining them, those appearances which have been so often alluded to, as distinguishing or accompanying the drift, between the 50th and 70th parallels of north latitude, suddenly reappear, to assume in a more southern country their most exaggerated form. Where the Alps are highest, the largest erratic blocks have been sent forth, as, for example, from the regions of Mont Blanc and Monte Rosa, into the adjoining parts of France, Switzerland, Austria, and Italy, while in districts where the great chain sinks in altitude, as in Carinthia, Carniola, and elsewhere, no such rocky fragments, or a few only, and of smaller bulk, have been detached and transported to a distance.

In the year 1821, M. Venetz first announced his opinion that the Alpine glaciers must formerly have extended far beyond their present limits, and the proofs appealed to by him in confirmation of this doctrine were afterwards acknowledged by M. Charpentier, who strengthened them by new observations and arguments, and declared, in 1836, his conviction that the glaciers of the Alps must once have reached as far as the Jura, and have carried thither their moraines across the great valley of Switzerland. M. Agassiz, after several excursions in the Alps with M. Charpentier, and after devoting himself some years to the study of glaciers, published, in 1840, an admirable description of them, and of the marks which attest the former action of great masses of ice over the entire surface of the Alps and the surrounding country.\* He pointed out that the surface of every large glacier is strewed over with gravel and stones detached from the surrounding precipices by frost, rain, lightning, or avalanches. And he described more carefully than preceding writers the long lines of these stones, which settle on the sides of the glacier, and are called the lateral moraines; those found at the lower end of the ice being called terminal moraines. Such heaps of earth and

\* Agassiz, *Études sur les Glaciers, and Système Glacière.*