the northern parts of Europe and North America. Unquestionably a large proportion of these blocks have been transported far from their original position, for between them and the parent rocks we now find, not unfrequently, deep seas and valleys intervening, or hills more than a thousand feet high. To explain the present situation of such travelled fragments, a deluge of mud has been imagined by some to have come from the north, bearing along with it sand, gravel, and stony fragments, some of them hundreds of tons in weight. This flood, in its transient passage over the continents, dispersed the boulders irregularly over hill, valley, and plain; or forced them along over a surface of hard rock, so as to polish it and leave it indented with parallel scratches and grooves, — such markings as are still visible in the rocks of Scandinavia, Scotland, Canada, and many other countries.

There can be no doubt that the myriads of angular and rounded blocks above alluded to, cannot have been borne along by ordinary rivers or marine currents, so great is their volume and weight, and so clear are the signs, in many places, of time having been occupied in their successive deposition; for they are often distributed at various depths through heaps of regularly stratified sand and gravel. No waves of the sea raised by earthquakes, nor the bursting of lakes dammed up for a time by landslips or by avalanches of snow, can account for the observed facts; but I shall endeavour to show, in the next book, chap. 16*, that a combination of existing causes may have conveyed erratics into their present situations.

The causes which will be referred to are, first, the carrying power of ice, combined with that of running water; and second, the upward movement of the bed of the sea, converting it gradually into land. Without entering at present into any details respecting these causes, I may mention that the transportation of blocks by ice, is now simultaneously in progress in the cold and temperate latitudes, both of the northern and southern hemisphere, as, for example, on the coasts of Canada and Gulf of St. Lawrence, and also in Chili, Patagonia, and the island of South Georgia. In those regions the uneven bed of the ocean is becoming strewed over with ice-drifted fragments, which have either stranded on shoals, or been dropped in deep water by melting bergs. The entanglement of boulders in drift ice will also be shown to occur annually in North America, and these stones, when firmly frozen into ice, wander year after year from Labrador to the St. Lawrence, and reach points of the western hemisphere farther south than any part of Great Britain.

The general absence of erratics in the warmer parts of the equatorial regions of Asia, Africa, and America, confirms the same views. As to the polishing and grooving of hard rocks, it has lately been ascertained that glaciers give rise to these effects when pushing forward sand, pebbles, and rocky fragments, and causing them to grate along the bottom. Nor can there be any reasonable

* See also Elements of Geology, 2d edit. vol. i. ch. 10, 11. 1841.