southerly direction by the force of expansion; and the advance and retreat of these glaciers accumulated the moraines and produced the striæ and embossed appearance (*roches moutonnees*) upon the rocks. In Europe the centre of origin was in Scandinavia, whence the glaciers proceeded outward in all directions. In North America this sheet must have been 5,000 feet thick; and by vicissitudes of climate, irregular retreats and advances of the glacial sheet would produce the markings not coinciding with the first set. When the temperature was raised, the melting of the immense sheet of ice produced vast currents of water, which would lift up and bear along huge icebergs loaded with detritus, and thus scatter bowlders over wide surfaces.

Some advocates of this theory suppose that the continents were elevated several thousand feet higher than at present, thus reducing the temperature, and that all the phenomena of drift may be explained by glaciers radiating from the summits, like those now existing in the Alps.

Modified drift, by this theory, is produced by the blocking up of gorges by moraines, thus forming lakes and ponds, in which clay and sand might have been deposited, and afterwards the barriers of these lakes, consisting of loose matter, may have been cut through, and the waters gradually drained off, forming beaches and terraces.

And it is also held that, subsequently to the glacial period, the ocean rose upon the land 500 feet, when the Champlain clays were deposited. Thus this theory supposes an elevation of the continent, then a depression below its present level, and subsequent return to its present height. The elevations are supposed to have been paroxysmal.

This theory was first suggested by Venetz, a Swiss engineer; then advocated by Charpentier; and more recently brought out in its full proportions by Agassiz, in his *Etudes sur les Glaciers*.

General objection.—Against all the preceding theories of drift there lies one general objection. While each one explains some of the phenomena satisfactorily, it leaves others unexplained. They are true causes, but they are not singly sufficient. By combining all these theories, as far as possible, we may find a satisfactory theory, both for drift and modified drift, from the close of the tertiary period to the present moment.