

Fig. 124.

*Astarte Laurentiana.*

a. Outside.

b. Inside of right valve.

c. Left valve.

also occurs at an elevated point on the mountain of Montreal, 450 feet above the level of the sea.*

In my account of Canada and the United States, published in 1845, I announced the conclusion to which I had then arrived, that to explain the position of the erratics and the polished surfaces of rocks, and their striæ and flutings, we must assume first a gradual submergence of the land in North America, after it had acquired its present outline of hill and valley, cliff and ravine, and then its re-emergence from the ocean. When the land was slowly sinking, the sea which bordered it was covered with islands of floating ice coming from the north, which, as they grounded on the coast and on shoals, pushed along such loose materials of sand and pebbles as lay strewn over the bottom. By this force all angular and projecting points were broken off, and fragments of hard stone, frozen into the lower surface of the ice, had power to scoop out grooves in the subjacent solid rock. The sloping beach, as well as the floor of the ocean, might be polished and scored by this machinery; but no flood of water, however violent, or however great the quantity of detritus or size of the rocky fragments swept along by it, could produce such long, perfectly straight and parallel furrows, as are everywhere visible in the Niagara district, and generally in the region north of the 40th parallel of latitude.†

By the hypothesis of such a slow and gradual subsidence of the land we may account for the fact that almost everywhere in N. America and Northern Europe the boulder formation rests on a polished and furrowed surface of rock,—a fact by no means obliging us to imagine, as some think, that the polishing and grooving action was, as a whole, anterior in date to the transportation of the erratics. During the successive depression of high land, varying originally in height from 1000 to 3000 feet above the sea-level, every portion of the surface would be brought down by turns to the level of the ocean, so as to be converted first into a coast-line, and then into a shoal; and at length, after being well scored by the stranding upon it, year after year, of large masses of coast-ice, and occasional icebergs, might be sunk to a depth of several hundred fathoms. By the constant depression of land, the coast would recede farther and farther from the successively formed zones of polished and striated rock, each outer zone becoming in its turn so deep under water as to be no longer grated upon by the heaviest icebergs. Such sunken areas would then simply serve as receptacles of mud, sand, and boulders dropped from melting ice, perhaps

* Travels in N. America, vol. ii. p. 141.

† Ibid. p. 99, chap. xix.