

tures which would seem at first sight to lend support to the view of its igneous origin. The serpentine-rocks here occupy an area of a little over thirteen square miles, in the northern half of the island, and form a ridge, presenting a succession of rounded hills, from a mile and a half to two miles or more in width, extending in a northeast and southwest course, with an average height of 200 feet, but rising in one part to 420 feet above the sea. Along the western base of this ridge lie the red sandstones of the trias, but the contact of these with the serpentine is concealed beneath the soil. A long ridge of diabase-rock, similar to that which penetrates the trias on the west bank of the Hudson, runs through the sandstones for a length of nearly six miles, nearly parallel to the serpentine-belt, and at a distance of from half a mile to a mile. Along the southern and eastern borders of the serpentine are spread horizontal cretaceous clays, partially overlaid by drift, while on the north side of the island, where the serpentine hills rise abruptly at a little distance from the shore, are the only known outcrops of other rocks; one a ledge of anthophyllite-rock like that accompanying the serpentine in New York city, and another, a few hundred feet distant from the latter, and from the serpentine, consisting of a coarse pegmatite, having all the aspect of an ordinary concretionary granitic vein, and containing besides crystals of orthoclase, sometimes twelve inches in length, small portions of a white triclinic feldspar and rare crystals of red garnet. A second smaller outcrop of a similar kind is found near by. These granitic and anthophyllite-rocks appear from beneath the water and the sands of the beach.

§ 23. Such an occurrence of serpentine, rising from out of the nearly horizontal and low-lying mesozoic strata of the island, was well calculated to sustain the notion of the eruptive nature of this rock which was put forth by Mather in his description of this locality. He, in his report, above cited, included the serpentine in his "Trappean Division," in the same category with the adjacent diabase, regarding the serpentine "as due to the action of the same general causes, modified in a manner unknown to us." *

The history of this area of serpentine becomes intelligible when studied in the light of the facts already mentioned above. It was apparently, in triassic time, a range of hills left by the disintegration of the adjacent gneiss, the lower-lying surfaces of which are concealed beneath the newer sediments of the region. Since that time, as I have elsewhere pointed out, † the serpentine itself has undergone a process of subaërial change, as is evident by the layer of decayed matter, with included masses of limonite, which, in those portions that have escaped erosion, still covers the serpentine to the depth of ten or twelve feet. For many of the above details of this region I have availed myself of a description of its geology, with map and sections, published in 1880, by Dr. N. L. Britton, ‡ of the School of Mines, Columbia College, New York, with whom I have lately had the advantage of visiting this interesting locality, and to whom I desire to make my grateful acknowledgments for valuable information respecting it.

§ 24. The serpentine-rock which is seen at Castle Hill, Hoboken, on the west bank of the Hudson, opposite New York city, is believed by Dr. Britton to be a continuation of that of Staten Island, and, like it, lies on the eastern border of the trias; while the

* Loc. cit., p. 283.

† Amer. Jour. Science, (3) xxvi, 206.

‡ The Geology of Richmond Co. (Staten Island), N. Y., Ann. New York Academy of Sciences, Vol. II., No. 6.