as of aqueous and sedimentary origin. The views of the present school of Italian geologists, as well as Dieulefait and Lotti, will be noticed in part VI.

§ 6. In the United States, we find Edward Hitchcock, in 1841, reviewing the opinions of Macculloch, Brongniart, De la Beche and others, and deciding that the serpentines of Massachusetts are to be regarded as stratified rocks.* Emmons, in 1842, after noticing the conclusions of Hitchcock as to serpentine, regarded it, nevertheless, as an unstratified rock, but distinguish it from trappean rocks, inasmuch as, according to him, it is never found in injected veins or dykes.† Later, however, in 1855, he separated it from so-called pyroplastic rocks, like "basalt, trap and greenstone," and included it in both divisions of his pyrocrystalline class: that is to say, (1) as laminated serpentine with gneiss, micaceous, talcose and hornblendic slates and limestone, and (2) as massive serpentine, with granite, syenite, etc.‡

§ 7. J. D. Whitney, in 1851, included hornblende and serpentine rocks, together with magnetic and specular oxyds or iron, under the title of "Igneous," and the sub-title of "Trappean and Volcanic Rocks."§ Henry D. Rogers, in 1858, described the steatite belt on the Schuylkill River, in Pennsylvania, as formed from the mica-schists of the region through impregnation from "the dyke of serpentine which everywhere adjoins it," thus implying the posterior origin and eruptive character of the latter. Elsewhere he describes the crystalline rocks of the same region as including "true injected serpentines." He, however, looked on veins of quartz and epidote, and even of carbonate of lime, as also of eruptive origin.‖ Lieber, at the same time, in his report on the geology of South Carolina, regarded not only the serpentines of that region, but the associated steatite and actinolite-rocks as eruptive.

§ 8. In opposition to these plutonic views, the geological survey of Canada from an early date (1848,) insisted upon the stratified character of the serpentines found in the northern extension of the Green Mountain range in eastern Canada. They were shown to be accompanied by hornblendic, steatitic, dioritic and other schistose rocks, as well as by dolomites and magnesites. The writer, in discussing the relations of these in 1863, announced "the conclusion that the whole series of rocks . . . from diorites, diallages, and serpentines to tales, chlorites and epidosites, have been formed under similar conditions," and were aqueous deposits.¶

§ 9. Here, it will be seen that we approach the second question mentioned in § 1, namely that of the origin and mode of formation of serpentines, which, in the view of those who maintain its indigenous character, is, of course, closely connected with the problem of the origin of its associated crystalline rocks. The notions of the earlier geologists with regard to this latter problem were, in most cases, very vague, some of them holding the view still taught in our own day by Hébert, that these rocks, including gneisses,

* Geology of Massachusets, II., 616.

† Geology of New York. Northern District, pp. 67-70.

‡ American Geology, I., 43.

§ Geology of Lake Superior, II., 2.

‖ Geology of Pennsylvania, vol. I. passim. See also the author, 2nd Geol. Survey of Penn., Azoic Rocks, pp. 15-19.

¶ Geology of Canada, p. 612. See also the author's Contributions to the History of Ophiolites, 1858. Amer. Jour. Sci. xxv. 217-226, and xxvi. 234-240.