micaceous, chloritic and hornblendic schists, were all formed by some unexplained process during the cooling of the globe, without the intervention of water.* With few exceptions however, they admitted, with Werner, the aqueous origin of these, whether holding with De la Beche, and with Daubrée, that they were deposited successively from the highly heated waters of a primeval sea,† or the more commonly received view, that the sediments were laid down under conditions of temperature not unlike those of the present time, and were afterwards the subject of internal change (*diagenesis*), or of indefinite replacement and substitution (*metasomatosis*).

§ 10. The latter doctrine, which, in the hands of some of its disciples, has found an extension limited only by their imaginations, was at once applied to explain the origin of serpentine. Silicated rocks, destitute of magnesia, and carbonated rocks destitute of silica could alike, it was maintained, be converted in serpentine, which was held to be the last term in the metasomatic changes of a vast number of mineral species. Hence it was no longer necessary to suppose the direct deposition of a magnesian sediment, or an irruption of an igneous magnesian rock to explain the presence of contemporaneous or of injected serpentines. The legitimate outcome of this hypothesis is found in the teaching of Delesse, in 1858, (when he yet held the eruptive nature of serpentine, which he classed with other "trappean rocks,") that "granitic and trappean rocks" may, in certain cases, be changed into a magnesian silicate, which may be serpentine, talc, chlorite or saponite.‡

§ 11. I have elsewhere shown how Delesse three years later abandoned alike the metasomatic hypothesis and the notion of the eruptive origin of the serpentines in favor of that view which I had put forth in 1859 and 1860, that the serpentines were "undoubtedly indigenous rocks, resulting from the alteration of silico-magnesian sediments." At the same time, as a concession to those who maintained the occurrence of eruptive serpentines, it was said that "the final result of heat aided by water on silicated rocks would be their softening, and, in certain cases, their extravasation as plutonic rocks," which were to be regarded as "in all cases altered and displaced sediments."§ It may still be an open question, however, whether certain eruptive rocks such as as basalts, may not be portions of an original igneous mass, which antedated the appearance of liquid water at the surface of the globe. Hence, in re-stating this point in 1880, I have said that, in my opinion, "the eruptive rocks (or, at least, a large portion of them) are softened and displaced portions of ancient neptunian rocks, of which they retain many of the mineralogical and lithological characters."‖

§ 12. After careful studies, alike in the field and in the laboratory, I was led, in 1860, to maintain that the origin of serpentine and related magnesian rocks was to be found in deposits of hydrous silicates, like the magnesian marls of the Paris basin, and in 1861 we not only find Delesse teaching this doctrine of the origin of these rocks from the alteration, or so-called metamorphism of such magnesian precipitates, but declaring, in the spirit of

* Bull. Soc. Geol. de Fr., 1882, xi. 39. See for farther illustrations of this view, the author's Chemical and Geological Essays, p. 294.

† Chemical and Geological Essays, p. 301.

‡ Ann. des Mines (5) xii. 509, and xiii. 393, 415.

§ Chem. and Geol. Essays, pp. 316-318.

‖ Amer. Jour. Sci., xix., 270.