

sulphur in greatly reducing the fusing point of iron. He alludes to the experiments of Schafhautl and Wöhler, which show that quartz and apophyllite may be dissolved by heated water under pressure and recrystallized on cooling. He recalls the aqueous fusion of many hydrated salts, and finally suggests that the presence of a small amount of water, perhaps five or ten per cent., may suffice at a temperature which may approach that of redness, to give to a granitic mass a liquidity, partaking at once of the characters of an igneous and an aqueous fusion.

This ingenious hypothesis, sustained by Scheerer in his discussion with Durocher,* is strongly confirmed by the late experiments of Daubrée. He found that common glass, a silicate of lime and alkali, when exposed to a temperature of 400° C., in presence of its own volume of water, swelled up and was transformed into an aggregate of crystals of wollastonite, the alkali with the excess of silica separating, and a great part of the latter crystallizing in the form of quartz. When the glass contained oxyd of iron, the wollastonite was replaced by crystals of diopside. Obsidian in the same manner yielded crystals of feldspar, and was converted into a mass like trachyte. In these experiments upon vitreous alkaliferous matters, the process of nature in the metamorphosis of sediments is reversed, but Daubrée found still farther that kaolin, when exposed to a heat of 400° C. in the presence of a soluble alkaline silicate, is converted into crystalline feldspar, while the excess of silica separates in the form of quartz. He found natural feldspar and diopside to be extremely stable in the presence of alkaline solutions. These beautiful results were communicated to the French Academy of Sciences on the 16th of November last, and as the author well remarked, enable us to understand the part which water may play in giving origin to crystalline minerals in lavas and intrusive rocks. The swelling-up of the glass also shows that water gives a mobility to the particles of the glass at a temperature far below that of its igneous fusion.

I had already shown in the Report of the Geological Survey of Canada for 1856, p. 479, that the reaction between alkaline silicates and the carbonates of lime, magnesia and iron at a temperature of 100° C. gives rise to silicates of these bases, and enables us to explain their production from a mixture of carbonates and quartz, in the presence of a solution of alkaline carbonate. I there also suggested

* NOTE.—See for the arguments on the two sides, Bulletin of the Geol. Soc. of France, Second series, vol. iv., p. p. 468, 1018; vi., 644; vii., 276; viii., 500; also, Elie de Beaumont, Ibid. vol. iv., p. 1312. See also the recent microscopical observations of Mr. Sorby, confirming the theory of the aqueous-igneous origin of granite.—*L. E. & D. Phil. Mag.*, February, 1858.