or by the simultaneous action of heat and water, or only by the latter element, are questions whose solution we must still expect from the future. In the meantime the real mode in which the primitive rocks have been formed, is still involved in such obscurity, that they may, with complete justice, be termed cryptogenous rocks.

Note to the preceding paper; by T. Sterry Hunt, M.A., F.R.S.

The foregoing sketch of the progress of theoretical views as to the origin of the crystalline rocks, gives an excellent statement of the question up to 1857; since which time more definite notions as to the nature of the metamorphic process, as understood by Hutton and Boué, have begun to be entertained. The problem of rock metamorphism is the conversion of mechanical or chemical sediments into definite mineral species, by molecular changes; that is to say, by crystallization, and a re-arrangement of their particles; or by chemical reactions between the elements of the sediments. Pseudomorphism, which is the change of one mineral species into another, by the introduction, or the elimination of some element, presupposes metamorphism; since only the definite mineral species of metamorphic or plutonic rocks can be the subjects of this process. To confound metamorphism with pseudomorphism, as Bischoff, and others after him have done, is therefore an error. It may be further remarked, that, although certain pseudomorphic changes may take place in some mineral species, in veins, and near to the surface; the alteration of great masses of silicated rocks by such a process, is as yet an unproved hypothesis.

The study of the local metamorphism of sediments in the vicinity of intrusive rocks, goes far to show, in opposition to the opinions of some authors quoted above, that heat has been one of the necessary conditions of metamorphism. In 1857, I showed by experiments, that besides heat and moisture, certain chemical reagents might be requisite, and that water impregnated with alkaline carbonates or silicates, would at a temperature not above that of boiling water, produce chemical reactions among the elements of many sedimentary rocks; dissolving silica and generating various silicates. Some months subsequently, Daubrée found that in the presence of solution of alkaline silicates, at temperatures above 700° F., various silicious minerals, such as quartz, feldspar and pyroxene, could be made to assume a crystalline form; and that alkaline silicates, under these conditions,