thrust up bodily, and where we may conceive it to have been distended laterally by the repeated injection of fresh supplies of melted materials.*

CHAPTER XXXV.

METAMORPHIC ROCKS.

General character of metamorphic rocks—Gneiss—Hornblende-schist—Micaschist—Clay-slate—Quartzite—Chlorite-schist — Metamorphic limestone—Alphabetical list and explanation of the more abundant rocks of this family— Origin of the metamorphic strata—Their stratification—Fossiliferous strata near intrusive masses of granite converted into rocks identical with different members of the metamorphic series—Arguments hence derived as to the nature of plutonic action—Time may enable this action to pervade denser masses—From what kinds of sedimentary rock each variety of the metamorphic class may be derived—Certain objections to the metamorphic theory considered—Partial conversion of Eocene slate into gneiss.

WE have now considered three distinct classes of rocks: first, the aqueous, or fossiliferous; secondly, the volcanic; and, thirdly, the plutonic, or granitic; and we have now, lastly, to examine those crystalline (or hypogene) strata to which the name of *metamorphic* has been assigned. The last-mentioned term expresses, as before explained, a theoretical opinion that such strata, after having been deposited from water, acquired, by the influence of heat and other causes, a highly crystalline texture. They who still question this opinion may call the rocks under consideration the stratified hypogene, or schistose hypogene formations.

These rocks, when in their most characteristic or normal state, are wholly devoid of organic remains, and contain no distinct fragments of other rocks, whether rounded or angular. They sometimes break out in the central parts of narrow mountain chains, but in other cases extend over areas of vast dimensions, occupying, for example, nearly the whole of Norway and Sweden, where, as in Brazil, they appear alike in the lower and higher grounds. In Great Britain, those members of the series which approach most nearly to granite in their composition, as gneiss, mica-schist, and hornblende-schist, are confined to the country north of the rivers Forth and Clyde.

However crystalline these rocks may become in certain regions, they never, like granite or trap, send veins into contiguous formations, whether into an older schist or granite, or into a set of newer fossiliferous strata.

Many attempts have been made to trace a general order of succession

* For the geology of Arran consult the works of Drs. Hutton and MacCulloch, the Memoirs of Messrs. Von Dechen and Oeynhausen, that of Professor Sedgwick and Sir R. Murchison (Geol. Trans. 2d series), Mr. L. A. Necker's Memoir, read to the Royal Soc. of Edin. 20th April, 1840, and Mr. Ramsay's Geol. of Arran, 1841. I examined myself a large part of Arran in 1836.