SECTION VI.

METAMORPHISM OF ROCKS.

THE metamorphism of a rock is its transformation from one kind into another. Consequently it takes place after the original formation of the rock.

The term "metamorphic rocks" has been used by Sir Charles Lyell and others in a much more limited sense, to designate a class of rocks (mica schist, talcose schist, gneiss, etc.) that have been so transformed as to have become crystalline, and to have lost, for the most part, their original structure. But this is only one case of metamorphism. Professor John Phillips, also, limits metamorphism to rocks that have been altered by heat; whereas it appears that water and other agents have played quite as important a part in the change as heat.

Agents of Metamorphism.—Heat is a most important agency, and a certain degree of it is probably indispensable; and yet other agencies effect important transformation of rocks at a temperature not above that of the atmosphere generally. Yet the most striking examples of metamorphism were first observed in the vicinity of trap dykes, where chalk was changed into crystalline limestone, clay into clay slate and mica schist, and fossils were obliterated. Hence it was natural to suppose that whenever such effects were seen, dry heat had been the cause, since the trap dykes were regarded as having been once in a melted state. But it has been found that other agencies might be concerned even in the case of dykes.

Water is one of these agents. It acts in two ways: first in connection with heat, secondly by its power of dissolving all rocks, and as the carrier of chemical reagents to aid in the work. There is a third mode in which it sometimes prepares the way for chemical metamorphic action, viz., by freezing in the minute fissures of rocks, and thus opening them to the influence of decomposing agencies.

Professors W. B. and R. E. Rogers subjected forty-eight species of silicious minerals, rocks, glass, porcelain, etc., to the action of pure water and of water charged with carbonic acid. The minerals and rocks were such as feldspar, hornblende, augite, shorl, mica, talc, chlorite, serpentine, epidote, dolomite, chalcedony, obsidian, gneiss, greenstone, lava, etc., and the result was, that all of them were acted upon by the carbonated water, and in a slight degree by pure water. Quartz was not among them. This, in a pure state, is absolutely insoluble by water or by any acid save the fluoric. There is a form