carbonate of magnesia:" which solutions have resulted from the decomposition of sulphate or chloride of magnesium by bicarbonate of soda.—*Am. Jour. Sci., vol. xxviii.*, p. 383.

Serpentine and other varieties of rock that come under the general denomination of Ophiolites, are essentially hydrous silicates of magnesia. Talc, chlorite, and steatite, have so nearly the same chemical constitution, that they may easily pass, and doubtless have often passed, into one another—more often probably from the schist into serpentine than the reverse; and that, too, most likely, in the wet way, although serpentine is usually as unstratified as granite, and sometimes has in it distinct veins of chlorite; as at New Farne, in Vermont. Greenstone and diorite, also, pass into serpentine, which is probably formed out of them. Hornblende, feldspar, and mica, have likewise been converted into serpentine. In the very probable opinion of Sir William E. Logan, the abundant serpentines of the Green Mountain range have resulted from changes in silicious dolomites and magnesites. Other minerals and rocks might be named as capable of producing serpentine by metamorphism; such as garnet, olivine, chondrodite, gabbro, etc. As it is one of the final products of mineral alteration, it is one of the most permanent of rocks.

Quartz rock, being insoluble by water or acid, "appears," in the opinion of Bischoff, "in all cases to be a product of the decomposition of silicates in the wet way." This opinion certainly seems plausible. But when we examine mountains of almost pure compact quartz, certainly 1,000 or 2,000 feet high, it seems difficult to conceive how all the other ingredients could have been separated so entirely, and leave the quartz in such enormous solid masses; and we must think that geologists have yet something to learn as to its origin, and that they will find that in some way or other it has been in a plastic state.

The changes that are found to have taken place in the ores of iron, are a good example of metamorphism. Starting with the carbonate, it is first changed into hematite, both hydrous and anhydrous, next into specular ore, and then into the magnetic protoxide.

Carbonaceous matter affords another good example. Peat, which is partially decomposed vegetable matter, is the first stage of the metamorphosis. This, permeated for ages by water, and covered by aqueous deposits, will become lignite, or brown coal. The next step develops bitumen, even without much increase of heat above the ordinary surface temperature. By still more powerful metamorphic action, probably heat expels the bitumen and leaves anthracite. A further step in the process produces graphite, or black lead, and perhaps the ultimate produce is diamonds.

Change of slate schistose rocks, conglomerates, and breccias into granitic rock is metamorphism. Theory makes such changes quite possible and probable, and observation shows that they have been made. For example, along the west side of Connecticut River, in Vermont and Massachusetts, are numerous hills and mountains of syenite and granite. In several places, as in Granby, Mt. Barnet, Ascutney, and Whately, the granitic rocks are a syenitic conglomerate, that is, the syenite contain rounded pebbles of quartz and schist, and on the margin of the deposit, as on Little Ascutney, we find the original conglomerate from which the syenite is formed. There is reason to suppose that a large part of the granitic rocks of New England are merely transformed slates, schists, and conglomerates. Granite seems to be the most complete form of metamorphosis.

The following statements may be regarded as inferences from the doctrines of metamorphism as above developed.