

Another fact may be explained on the same principles. If we examine a rock formation over its whole horizontal surface, we shall find sometimes that it has undergone very different degrees of metamorphism in different parts. In one portion of the field we find that the original rock has been transformed into gneiss, and in another into mica schist, (as in the Hoosic Mountain range in Massachusetts), in another part (as in Canada), but little altered, and containing organic remains. The statements above made show us how these different degrees of metamorphism might have occurred, either by the different degrees of fusibility in the materials, their different composition, or the greater or less amount of heat introduced into them.

The above facts and reasonings authorize a more sweeping conclusion, viz., that almost every rock is capable by metamorphism of being converted into almost any other. It is usual to suppose that we are to find in the metamorphic rock only the ingredients that exist in that from which it was derived. But if the latter be made plastic by aqueo-igneous agency, why may not the water present contain other ingredients not in the original rock? And who can set limits to the varieties of rocks that might thus be produced.

In view of such facts, also, we can readily assent to Bischoff's conclusion, when he says, "the mineral kingdom, therefore, contains nothing that is unchangeable, unless, perhaps, it be the noble metals, gold and platinum."

A third important agency in metamorphism is the atmosphere. Its four constituents, nitrogen, oxygen, carbonic acid, and aqueous vapor, all act upon the rocks, not merely at the surface, but by means of water they are carried deep into the earth, to furnish probably a large part of the chemical agents that are active in metamorphism. Thus nitrogen and oxygen uniting form nitric acid, and nitrogen combining with the hydrogen resulting from organic changes, forms ammonia; and both these agents, nitric acid and ammonia, carried by water into the crust of the earth, form very energetic agents of change, we know not how deep. Carbonic acid, also, is soluble in water, and is thus introduced among the rocks, which it dissolves by direct action and by uniting with other ingredients to form other reagents. There is enough in the atmosphere to contain 2,800 billion pounds of car-