

*Origin of the Metamorphic Strata.*

Having said thus much of the mineral composition of the metamorphic rocks, I may combine what remains to be said of their structure and history with an account of the opinions entertained of their probable origin. At the same time, it may be well to forewarn the reader that we are here entering upon ground of controversy, and soon reach the limits where positive induction ends, and beyond which we can only indulge in speculations. It was once a favorite doctrine, and is still maintained by many, that these rocks owe their crystalline texture, their want of all signs of a mechanical origin, or of fossil contents, to a peculiar and nascent condition of the planet at the period of their formation. The arguments in refutation of this hypothesis will be more fully considered when I show, in the last chapter of this volume, to how many different ages the metamorphic formations are referable, and how gneiss, mica-schist, clay-slate, and hypogene limestone (that of Carrara, for example) have been formed, not only since the first introduction of organic beings into this planet, but even long after many distinct races of plants and animals had passed away in succession.

The doctrine respecting the crystalline strata, implied in the name metamorphic, may properly be treated of in this place; and we must first inquire whether these rocks are really entitled to be called stratified in the strict sense of having been originally deposited as sediment from water. The general adoption by geologists of the term stratified, as applied to these rocks, sufficiently attests their division into beds very analogous, at least in form, to ordinary fossiliferous strata. This resemblance is by no means confined to the existence in both occasionally of a laminated structure, but extends to every kind of arrangement which is compatible with the absence of fossils, and of sand, pebbles, ripple-mark, and other characters which the metamorphic theory supposes to have been obliterated by plutonic action. Thus, for example, we behold alike in the crystalline and fossiliferous formations an alternation of beds varying greatly in composition, color, and thickness. We observe, for instance, gneiss alternating with layers of black hornblende-schist, or of green chlorite-schist, or with granular quartz, or limestone; and the interchange of these different strata may be repeated for an indefinite number of times. In the like manner, mica-schist alternates with chlorite-schist, and with beds of pure quartz or of granular limestone.

We have already seen that, near the immediate contact of granitic veins and volcanic dikes, very extraordinary alterations in rocks have taken place, more especially in the neighborhood of granite. It will be useful here to add other illustrations, showing that a texture undistinguishable from that which characterizes the more crystalline metamorphic formations has actually been superinduced in strata once fossiliferous.