

The vast beds of quartz in South America, which rise in mountains 7000 or 8000 feet in height, are, probably, but transformed beds of sandstone.

The ribboned jaspers of Orsk, in the Ural, according to Gustav Rose, are, in all instances, in direct contact with greenstone porphyry, and are but highly silicified schists.

Murchison and de Verneuil have observed, in the Ural, the sandstones, limestones and shales of the Silurian and carboniferous systems passing into chlorite, talcose, and quartzose rocks, with beds of crystalline marble, as they approach the lines of eruptive agency.

It is needless to cite further examples of metamorphism. From the countless analogies which exist, we are authorized in the inference that gneiss is a highly metamorphosed form of shale, quartz of sandstone, and saccharoidal marble of calcareous beds. We shall, therefore, in treating of the various schists, marbles and quartzose rocks, regard them as sedimentary deposits, transmuted by eruptive agency. We shall recognize no rock as purely igneous, unless it occur in vast, irregular masses, like granite; in dome-shaped, or crater-like summits, like basalt, or trachyte; in long lines, like dykes, or elvans, cutting through the incumbent strata; in ramifying veins, like granite; or broad lava sheets, like trap. Yet, with these restrictions, there are many rocks in this district which almost defy classification.

In the earlier periods of the earth's history, igneous causes operated with greater force and intensity, and hence it is, that the ancient sedimentary deposits differ so widely from those belonging to more recent epochs.

This system, as its name implies, is characterized by an entire absence of the remains of animal, or vegetable life. It is reasonable to suppose that there was a time in the history of our planet, when its crust was subject to constantly-recurring volcanic paroxysms, when ineptitic vapors were escaping through extensive fissures communicating with the interior, and when the waters were in a heated condition, and differed perhaps chemically from those of the existing oceans. Under such conditions, we ought not to look for any types of animal, or vegetable life.

Many eminent geologists maintain that the lowest stratified rocks are but portions of the Silurian, or Cambrian system; and that, from long-continued exposure to heat, the lines of stratification have become obscure, and all traces of organic remains obliterated. Our investigations in this district have led us to a different conclusion. If the Potsdam sandstone rests at the base of the palæozoic series, if from that epoch we are to date the dawn of animal creation, there is in this district a class of obscurely stratified rocks interposed between the Silurian system and the granite,—rocks distinct in character, unconformable in dip and destitute of organic remains. They have been so far transformed by direct or transmitted heat as to exhibit few traces of their original character. Sandstone has been converted into massive quartz, limestone into saccharoidal marble and shales into hard crystalline schists. If we found these rocks graduating into stratified deposits of sandstone, shale and limestone, as we receded from the lines of igneous outburst, and enveloping the remains of animals and plants, we should be led to a different conclusion; but, so far from it, the evidence is ample that the strata which form the base of the Silurian system repose on the upturned edges of the metamorphosed rocks, and that the causes by which their metamorphism was effected had ceased to operate before the deposition of the fossiliferous strata. Between the two systems there is a