

Subsequently to the deposition of the Coal Measures, and previously to the production of the Appalachian Mesozoic strata, the numerous plications in the Appalachian ranges were produced. The time of plication is known by the fact that there are folds in the Upper Carboniferous strata and none in the later rocks. Trunks of carboniferous trees, originally upright, are inclined at various angles, according to the amount of dislocation.

Inasmuch as fissures would be produced during these disturbances, through which heat would escape from the interior and penetrate through all portions of the strata, perhaps in connection with water and other essential agents of alteration, we may suppose that the azoic rocks along the Atlantic coast were metamorphosed during the time of these disturbances, or the Permian period. In the absence of any evidence, we may conjecture that a large part of the azoic strata forming the basis of the Rocky Mountain ranges were metamorphosed during the same period. But there is evidence to show that rocks are undergoing rapid alteration on the Pacific coast still later, even during the Alluvial period, as the action of heat is very great there at the present day. The metamorphism of these palæozoic rocks along the coasts must not be confounded with the alteration of the Laurentian series, for the latter were elevated and metamorphosed previous to the deposition of the Potsdam sandstone.

At the close of the Palæozoic periods the form of the continent resembled its present shape, but the amount of land above the ocean covered only about two thirds of its present surface. Yet the general continental features, the mountains and plains, were the same as now.

#### OLDER MESOZOIC SYSTEMS.

The older Mesozoic rocks are included upon the map with the Cretaceous groups, which are the most abundant, the former occupying comparatively little space. In the eastern British Provinces, New Brunswick and Nova Scotia, we first find the red sandstones, conglomerates, and shales of Mesozoic age. They are next admirably developed in the valley of Connecticut River in Massachusetts and Connecticut, where the most remarkable fossils, the ichnites, have been discovered. The dip of the rocks in this terrain is almost invariably to the east.

In going south of Hudson River the same rocks are found in several basins, all dipping to the west. The series appears first in New Jersey, where it forms a wide belt southeast of the Highlands. Thence it passes through Pennsylvania, from Bucks to York counties; thence into Frederick county, in Maryland; thence into Virginia. Throughout the whole extent of this deposit, from Nova Scotia to Virginia, ores of copper, bituminous shales and limestones, and protruding masses of greenstone, are associated with it. In Virginia the deposit appears to be eminently calcareous; and one of its lowest beds is the well-known brecciated Potomac marble. In North Carolina there is another basin, somewhat irregular in its shape, 150 miles long, from Tar River to Wateree River. Here the strata also dip west. This is the basin examined by Professor Emmons.

Several characteristic fossils of the Liassic were found by Captain McClintock in the Arctic basin. The extent of the strata containing them was not ascertained, and hence they are not represented upon our map.

There has been, and still is a great variety of opinions expressed in regard to the age of these sandstones, it being generally assumed, perhaps incorrectly, that all the terrains are precisely contemporaneous. The older geologists (Maclure, Eaton, Silliman, and Cleveland) regarded those in the Connecticut