

which is like the last in its rocks. Iddings refers these cones to the early Tertiary. He states that after a long period of eruption of acidic andesytes, basic andesytes and basalts were ejected; and after these had been much denuded, the great outflow of rhyolite took place, forming the Park plateau; and that finally the basalt was poured forth that extends widely over the Snake River plains in Idaho.

Igneous eruptions occurred through all the successive geological ages. But at no time in American history since the Archæan, have they approached in extent those of the Later Cretaceous and Tertiary periods. It was a time of pouring from fissures and of the birth of volcanoes, as never before.

It is not yet certain that a volcano ever existed on the continent of North America before the Cretaceous period; for the published facts relating to supposed or alleged *volcanic* eruptions in the course of the Paleozoic ages are as well explained on the supposition of outflows from fissures and tufa ejections under submarine conditions; and none of the accounts present evidence of the former existence of a volcanic cone, that is, of an elevation pericentric in structure made by igneous ejections. Such cones in the tropical Pacific are now encircled by coral reefs as well as beds of detritus, and are thus in process of burial; and so they might have been buried by limestone and other strata, if an actual fact in Paleozoic North America.

During the Archæan, to its end, igneous ejections were on a vast scale. Even after the cooling had so far advanced that the sedimentary series in progress of deposition attained a thickness of many thousands of feet before a crisis of upturning and metamorphism occurred, the heat from below, which was added to the heat of a dynamical source to produce the metamorphism, was so far the greater of the two that fusion of the lower beds would have generally taken place; and, as a consequence, great effusions of the melted rock through the overlying and much broken metamorphic beds, should have occurred in true bathylithic style, as the facts attest. But there is no evidence that they ever made Archæan volcanic cones. Archæan conditions gradually declined as Paleozoic time was passing, and so also did the power of making bathyliths. Later came the power, not merely of eruption through fissures, which has always existed, but also that of producing lofty volcanic cones.

The volcanoes also of the Andes are supposed to be chiefly of Tertiary origin. In Europe "the grandest volcanic phenomena were those of Oligocene (Lower Miocene) times, to this date belonging the basalts of Antrim, Mull, Skye, the Faroe Islands, and the older series of volcanic rocks in Ireland" (Geikie). The volcanic eruptions of Auvergne, the Eifel, and of Italy, Bohemia, and Hungary are referred mostly to the Tertiary. Asia, if the ranges of islands off its eastern and southern coasts are excluded, is peculiarly free from volcanoes. But the outflow of the Deccan trap in peninsular India, 200,000 square miles in area, was an event of the early Tertiary, and has been supposed to have occurred when the rising of the Himalayas began.

The concurrence during the era from the Later Cretaceous to the close of the Tertiary of the most extensive orogenic work in the world's history, of the chief part of its continental elevation, and unprecedented igneous eruptions, came when the earth's crust had reached a cooled condition that took all past time up to the present era for its production. The inquiry thence