

significance is the igneous origin of a large part of the formation. Sheets of basic igneous rocks, partly amygdaloids, with others of felsyte, porphyry, and granite, are interstratified with the sandstones and conglomerates, and the latter are largely made of water-worn detritus of like igneous origin. The beds are wholly unmetamorphic to the bottom, and hence there is nothing in them to prove that the formation is Archæan. At the same time, no fossils have been found to prove it Cambrian. Still, inasmuch as it overlies unconformably the upturned Huronian, it must be of subsequent origin; and as no Cambrian rocks occur in Wisconsin older than the Middle Cambrian, it is reasonable to suppose that it may represent the Lower Cambrian. The absence of fossils may be owing to the region's having been under fresh water, or to the igneous action. The copper veins of the Keweenaw region have been discussed on page 341, under the head of Veins.

It is important to note, however, that the igneous effusions which accompanied the deposition of beds below the Lower Cambrian in southeastern Pennsylvania and the adjoining borders of Maryland, are similar, as Williams remarks, to the rocks of the Keweenaw series not only in kinds, but also in the presence of much metallic copper. Walcott and Williams conclude that the eruptions in the two areas were simultaneous and alike pre-Cambrian.

Bearing of the facts connected with the distribution of the Cambrian on questions as to the upturning preceding the era. — From the facts observed in connection with the distribution of the Cambrian over the Archæan of northern New York and Canada and in Archæan troughs to the eastward, it appears to follow that the mountain ranges in eastern America that were made at the close of the Archæan, and that stand as the time-boundary between the Archæan and Paleozoic, include the Adirondacks, the Appalachian protaxis, and other more eastern ridges; and that these mountains consist, in part, if not largely, of rocks that were laid down as sediments during the long Huronian era, though now crystalline or metamorphic and in part massive crystalline. The disturbances closing Archæan time do not appear to have extended their effects alike over the whole surface of the continent, but to have produced their chief uplifts along the mountain borders; that is, in those regions in which the most extensive mountain-making occurred in later time. Over the Continental Interior, the Huronian sediments were thinner, the upturnings at the epoch of disturbance less prominent, and the metamorphism feebler, where not wholly wanting.

Walcott has classified the areas of geographic distribution of the surface outcrops of the Cambrian strata as follows (*Bull.* 81, *U. S. G. S.*, page 358): —

A. Atlantic or Eastern Border Province: *a*, Eastern or Nova Scotia Basin; *b*, South-eastern Newfoundland, Eastern New Brunswick and Massachusetts Basin; *c*, Interior Deposits of Gaspé, Quebec, Maine, New Hampshire, Vermont, Massachusetts.

B. Appalachian or Interior Eastern Border Province.

C. Rocky Mountain or Western Border Province.

D. Interior Continental Province: D¹, Central Interior, or Upper Mississippi and Missouri; D², Eastern Interior, or Adirondack of New York and Canada; D³, Western Interior, or Dakota, Wyoming, etc.; D⁴, Southwestern Interior, or Arizona and Texas.