

## ARCHÆAN TIME IN OTHER COUNTRIES.

South America has its northern region of Archæan rocks between the equator and the Orinoco, which would probably have a much larger superficial area but for the great alluvial and Tertiary area of the Amazon and other rivers, which bound it for 150 miles on the north and two to three times this width on the west. Archæan ranges also occur in Brazil, and in different parts of the chains of the Andes.

In the continent of Europe the great Archæan region is the Scandinavian, or that covering the most of Sweden, Norway, Lapland, and Finland. The rocks also occupy a large part of the northern half of Scotland and the Outer Hebrides; portions of western Ireland, at Donegal and Galway, and of eastern, in Wicklow; at St. David's, in southwest Wales; in Anglesey, off northwest Wales; in western England, in the Malvern Hills; and probably on the south coast of Devon and Cornwall. They also cover areas in Saxony, Bavaria, and Bohemia; in Brittany, Vosges, and the Central Plateau of France.

Crystalline rocks cover, according to Blanford (1879), very large areas in India. "More than half of Peninsular India is taken up by the eastern gneissic series." They extend, with scarcely an exception, from Cape Comorin to Colgong on the Ganges, 1400 miles. The mean breadth of the area is 350 miles. There are also in the peninsula a northwestern area, the Arvali; and, to the north of the Vindhyan plateau, the Bundelkhand area. But it is not certain that all are Archæan. Besides these, there are also large areas of semi-metamorphic rocks. The main Himalayan range has a gneissic or granitic axis, but the limits are not yet laid down; and in the Zanskar range, its continuation to the northwest, there is a center of gneiss. But the precise relations of these and other gneissic ridges to the later formations has not been ascertained.

The rocks of Scotland, Norway, Sweden, and other Archæan regions are much like those of North America in general constitution, and in the range of the associated minerals; and in Scandinavia there are great iron ore beds. The massive gneisses of the Hebrides and northern Scotland were called the Lewisian group by Murchison (1858), after the island of Lewis in the Outer Hebrides. Like the massive and the thick-bedded or foliated rocks, which contain the iron ore beds of Scandinavia, they have been pronounced on petrological grounds to be of igneous origin. But, for reasons already stated, they are in all probability, wherever igneous, metamorphic-igneous, or the result of fusion attending metamorphic work. The foliation of the gneisses and other rocks represents, in general, on this view, true bedding. The iron ore beds are the best of evidence of metamorphism. The crystalline rocks east of the "Great glen" in Scotland include thin schists and quartzite with gneiss, and have been called the Grampian group by H. Hicks, and later the Dalradian group by Geikie; it is supposed to be younger than the Lewisian.