

Petrological Characters.—The prevailing rocks and materials composing the Permian series are red sandstones, conglomerates, and marls. The conglomerates are composed of crystalline and older Palæozoic rocks, mica schist, granite, quartzite, and various sandstones, &c. The argillaceous type consists of the marl slate or "*Kupferschiefer*" (a bituminous shale or marl, so called in Germany from its containing ores of copper). The limestone type (or *Dyas*) is the chief repository of the Permian invertebrate fauna; the dolomite, of the variety "*Rauchwacke*" is either cavernous or crystalline, or granular and crumbling (*Asche*), associated with bands of gypsum and rock-salt. In the south-west of Scotland the older part of the Permian system contains contemporaneous eruptive masses, among which occur *Melaphyre*, *Porphyrite*, and *Quartz-Porphry*. Coarse breccias occur in the lowest portion, composed of angular fragments of older rocks; and the beds at "*Corncockle Muir*," in Annandale, afford, or have exhibited, the footprints of *Labyrinthodontia*.

Probably of Fresh-water Origin.—The Permian rocks, from their lithological and mineral characters, were evidently deposited in isolated basins, probably of fresh water, and more or less shut out from the sea. The water in these basins must have undergone extreme concentration and chemical precipitation, so as to have resulted in the accumulation now presented of dolomites, saliferous clays, rock-salt, gypsum, and anhydrite. Changes in the physical geography of the Carboniferous rocks probably excluded the sea from that region wherein the Permians were being deposited, extensive lagoons occupying the area; these, as the Carboniferous land became depressed, spread over the older barriers, the result being the overlapping or unconformity of the Permian rocks to the Carboniferous or older rocks still.

Types.—THE LOWER PERMIAN ROCKS of the western and central parts of England may be arranged under two distinct types,—one represented by the strata or deposits at *Enville* in Shropshire, and the other by the sandstone of *Collyhurst* near Manchester.

- A. The *Salopian type* embraces the whole of the Permian rocks in Shropshire, Staffordshire, and Warwickshire.
- B. The *Lancashire type* is illustrated by the rocks of this formation, as developed at Stockport in Cheshire, in South Lancashire, and in Cumberland, &c.
- I. The rocks of the *Salopian type* attain a thickness of 1500 feet, and comprise—
 - a. Red and purple sandstones and marls; breccias, calcareous conglomerates, marls, and sandstones; purple, red, brown, and white sandstones, often calcareous.
- II. The rocks of the *Lancashire type* include—
 - b. Red marls, with numerous beds or bands of fossiliferous limestone, worked for lime, 130 feet thick. (These western beds without doubt represent the *magnesian limestones of Yorkshire and Durham* (*Dyas type*), on the eastern side of the Pennine chain.)
 - c. Bright red and variegated sandstone, about 1500 feet thick.

Lower Sandstones.—The red rocks comprising this sub-division attained their greatest development in the Vale of Eden, where they