

Range, Utah, and the lower part of the Pogonip limestone, in the White Pine and Eureka districts.

To the Trenton period are referred limestone beds at the Big Cottonwood Cañon, over the Cambrian, part of the Pogonip limestone; Prospect Ridge, Fish Creek Mountain, etc., in the Eureka district, Nevada, and later Trenton limestone (Hudson epoch?) in Lone Mountain, with 500' of quartzite between the two (Hague, Walcott); beds at Silver City and Upper Mimbres Mining Camp, New Mexico, referred to Hudson epoch; in South Park, Arkansas Cañon, etc. (Stevenson, Wheeler Exp., 1876); in British America, graptolitic Utica shales in the Kicking Horse Pass (Can. Rep., 1886).

In the Trenton, near Cañon City, Colorado, occurs the Harding sandstone, in which Walcott discovered, in 1890, the plates of Placoderm Fishes, described on page 510. Walcott gives the following section of the rocks: At the base is a reddish gneiss. This is followed by 22½' of reddish arenaceous limestone with thin interbedded layers of chert, carrying fossils of Upper Cambrian type. Above this limestone lie 51' of pinkish arenaceous limestone, carrying *Ophileta*, *Straparollus*, etc., characteristic of the base of the Lower Silurian, or the Calciferous fauna of New York; over this a series of sandstones (Harding sandstone) 101' thick, in which occur, along with an abundant invertebrate fauna, the plates of the Placoderm Fishes. A massive bedded, gray, arenaceous limestone succeeds the sandstone with a thickness of 110', and this is followed by a thin band of Carboniferous limestone.

*d. Arctic region.* — Lower Silurian beds have been identified on North Devon, Cornwallis, Griffith, west coast of King William Land, Boothia, in Frobisher Bay, from Hall's collections, on the shores of Kennedy Channel. (For a review of the facts respecting Arctic geology and a geological map, see G. M. Dawson's paper, *Can. Rep.* for 1886.)

*The Taconic system of Emmons.* — The Taconic system was first announced by Emmons in 1842, in his *N. Y. Geological Report* of that year, and pronounced pre-Potsdam on the general ground of the kinds of rocks and the assumed absence of fossils. In 1844, fossils having become known to him from beds at Bald Mountain, in Washington County, N.Y., that had been included by him within the Taconic, he divided the Taconic series into the *Upper Taconic*, or that containing fossils, and the *Lower Taconic*. Later discoveries proved that his *Upper Taconic* rocks were really the oldest. The rocks of the so-called *Lower Taconic* were quartzite, limestone, and schists in several belts, — situated along and near the Taconic range on the western boundary of New England, in Berkshire and eastern New York, and thence extending northward and southward, and also westward to the Hudson River. Although the "Lower Taconic" rocks are metamorphic, and coarsely so in Berkshire, they were afterward found at many points to contain fossils, and are now known to be mainly of Cambrian and Lower Silurian age.

These discoveries were made as follows, and chiefly in the limestone: 1857 to 1861, Vermont survey, under C. H. Hitchcock and A. D. Hager, *Geological Report*, 1861; 1871, A. Wing, the fossils of the Chazy from West Rutland, Vt., reported on by E. Billings in 1872; 1865 to 1877, A. Wing, fossils in central Vermont, of the age of the Calciferous to the Trenton, reported in 1877; 1879, T. N. Dale of the Hudson age, from the slates near Poughkeepsie, N.Y.; 1879 to 1890, W. B. Dwight, fossils from Dutchess County, N.Y., of Cambrian to Trenton and Hudson, and in Canaan, N.Y., 1886 to 1890; C. D. Walcott, fossils of Cambrian age in the quartzite of southern Vermont, almost down to the Massachusetts line, and in shales or limestone of Washington and Rensselaer counties, N.Y.; also Trenton or Calciferous fossils in the limestone of Bennington, Vt., and in Williamstown, Mass., on the west flank of Greylock, and in Berlin, N.Y., the region of the original Lower Taconic. Further, J. E. Wolff and Foerste have found Cambrian fossils in the limestone of Vermont, near Rutland, and elsewhere.

It has thus been established that the Lower Taconic is a combination of Lower Silurian and Cambrian formations, as already stated. The author's stratigraphical inves-