

the Tully limestone, and 25 feet on Lake Erie, and 200 to 300 in west central Pennsylvania. Along one or two levels there are great numbers of large and small calcareous concretions which are often septate (page 97), so as to make the concretions look a little like the backs of turtles. In western New York a layer of bituminous limestone, six inches to two feet thick, occurs near the middle, which is mostly made up of shells of a Pteropod, the *Styliolina fissurella* Hall (Fig. 916), and is called the *Styliolina limestone*. With it occur remains of fossil fishes, *Dinichthys*, *Palæoniscus*, and other species.

The *Portage group*, of New York (so named from the village of Portage, Livingston County, N.Y.), outcrops along a wide belt extending eastward from the south shore of Lake Erie. It is well displayed about the south end of Cayuga and Seneca lakes. Its beds are shales and flags, or shaly sandstones, — the *Naples group*, — and, above these, the Portage sandstone, which has relations to the Chemung. The rocks have a thickness of 1000 feet on the Genesee River, and 1300 to 1400 near Lake Erie. The rocks are in general very sparingly fossiliferous. They abound in ripple-marks and mud-cracks, and the sandstones are often cross-bedded. But a portion in central New York, called the *Ithaca group*, — prominently displayed on the Cascadilla and Fall creeks, near Ithaca, — abounds in fossils. According to H. S. Williams, the fossils, which are largely Brachiopods, have near relations to those of the Chemung group, and also about as close to Hamilton species; and as they are overlaid by 500 or 600 feet of sandstones, mostly barren, but containing some Portage species, they are referred to the Portage group. They are the only part of the beds that give much knowledge of the life of the period; and this is imperfect, as Trilobites, Corals, Crinoids, and other species of purer waters, are absent.

In eastern central New York, in Delaware, Otsego, and Chemung counties, there is a sandstone formation, the *Oneonta sandstone* of Vanuxem, which resembles the Catskill beds; but it is overlaid by beds containing Portage fossils; and in some places, Chemung species. It indicates the existence, at these localities, of Catskill conditions during the Portage and Chemung epochs, if not also during part of the Hamilton period. (H. S. Williams.) On the distribution of the Oneonta beds, see Darton, *Am. Jour. Sc.*, 1893.

In central and western Pennsylvania the limit between the Portage and Chemung is not clearly ascertained. The thickness of the two in Monroe County, eastern Pennsylvania, is about 2500 feet; Fulton County, south central Pennsylvania, about 3600 feet, of which 400 are referred to the Portage. Along the south shore of Lake Erie, the lower part of the "Ohio shales" is referred to the Portage, and the rest to the Chemung. Near Cleveland, O., the thickness of the "Ohio shales" is about 1350 feet, and farther west, at Elyria, 950; but at Wellsville on the Ohio, 2600 feet.

The *Chemung* beds in New York are a continuation of the Portage, with little change in the rocks, except that they are slightly more arenaceous, and of a lighter color, but with a great change in the abundance of fossils and