

cops cristata var. pipa; the cephalopods, *Cyrtoceras undulatum* and *Gyroceras trivolve*, and the brachiopods, *Atrypa reticularis*, *Leptaena rhomboidalis*, *Stropheodonta concava*, *S. inaequistriata*, *Spirifer acuminatus* and *S. divaricatus* and others.

### Marcellus beds

#### *Marcellus black shale*

The term Marcellus shale has been generally applied in New York geology to the series of black and dark blue shales which lie immediately on the Onondaga limestone and at the top pass gradually into the lighter colored Hamilton shales. At Marcellus, Onondaga co., from which place the name is derived, only the lower layers are well exposed and observations in that region and in the western part of the State indicate the desirability of restricting the term to the lower shales, exposed at the type locality, thereby obtaining a more exact basis for correlation.<sup>1</sup>

From Ontario county westward the thin Marcellus black shale is delimited upward by the Stafford limestone. The rock is a densely black and highly bituminous slaty shale with a few thin calcareous layers and rows of spherical concretions.

Neither the lower nor upper contacts with the limestones are exposed on this quadrangle, and the shales nowhere come to the surface. The thickness of the formation can therefore only be estimated or obtained from well records.

The beds are 41 feet thick in the Livonia salt shaft and contain a 5 foot stratum of soft limestone, 27 feet below the top. The most western exposure of the Marcellus shale is in the bed of Plumbottom creek at Lancaster, 6 miles east of the east line of this quadrangle. A layer of limestone 1 foot thick forming there the bottom of the outcrop and separated by 18 to 20 feet of black shale from the Stafford limestone probably represents the five foot stratum of the Livonia salt shaft. Since the contact with the Onondaga limestone is not exposed at this locality it fails to furnish information on the entire thickness of the Marcellus shale. This has been obtained in the well on Smoke's creek, previously mentioned, where a total thickness of 55 feet has been measured.

The fauna of the black shales is small and fossils are rare except

<sup>1</sup>N. Y. State Mus. Bul. 63, p. 14.