

observes that the facts from the Devonian of Manitoba and Mackenzie rivers described by Whiteaves confirm this view.

5. **Mollusks.**—(a) *Lamellibranchs*.—Fig. 912, *Orthonota undulata* Con.; 913, *Pterinea flabella* Con.; 914, *Grammysia bisulcata* Con. (*Hamiltonensis* of Verneuil), also European, in the Eifel; 915, *Microdon bellistriatus* Con. Of the genera of Lamellibranchs represented, *Grammysia* has 15 species (all in the Hamilton), *Modiomorpha* 9 (all Ham., 1 also Marc.), *Aviculopecten* 15, one, *A. princeps*, occurring in New York, Ontario, Kentucky, and Indiana. *Nucula* 9 (all Ham.), *Leda* 4 (all Ham.), *Paracyclas* (*Lucina*) 4, *Schizodus* 3, *Solemya* 1, *Orthonota* 4 (all Ham.), *Lunulicardium* 5 (all Marc., and 2 continuing into the Hamilton).

(b) *Gastropods*.—Of the 10 species of *Platyceras*, *P. conicum*, *P. erectum*, *P. carinatum*, *P. thetis*, *P. symmetricum* and *P. rectum* come up from the Corniferous. There are a dozen species of *Bellerophon*, several of them like *B. patulus*, large and beautiful, much exceeding, in both respects, any of the Silurian species.

(c) *Pteropods and Cephalopods*.—For figures and descriptions of many species, see Hall, vol. v.; also publications of Meek and Worthen, Whitfield, Beecher, Billings, and others. Among the species are *Orthoceras crotalum* H. (*Spyroceras* of Hyatt); *Gomphoceras oviforme* H. (*Acleistoceras* Hyatt); *Gyroceras transversum* H. (*Rutoceras* Hyatt); *Nautilus buccinum* H. (*Nephriticeras* Hyatt, a type having many Hamilton species); *Goniatites* (*Discites*) *Marcellensis* Van. (*Centroceras* Hyatt); *Goniatites discoideus* H. (*Parodiceras* Hyatt).

6. **Crustaceans.**—For figures of the Hamilton (and other Devonian) species of these tribes, see Hall, *N. Y. Pal.*, vol. vii.; Beecher, *Rep. Geol. Pa.*, vol. PPP, 1884; Packard, *Monograph on N. A. Phyllop.*, 1883; Whitfield, *Am. Jour. Sc.*, xix., 1880; and J. M. Clarke, *Am. Jour. Sc.*, xxiii., 1882; and *ib.*, xxiv., 1882 (on *Turrilepas*). *Dithyrocaris Belli* Woodw. (*Geol. Mag.*, 1871) is from Gaspé.

Some of the characteristic Marcellus fossils are: *Productella truncata* H., *Orbiculoidea minuta* H., *Leiorhynchus limitare* H., *Chonetes mucronatus* H., *Leiopteria lævis* H., *Pleurotomaria virgulata* H., *Styliolina fissurella* H., *Orthoceras subulatum* H.

The Iowa Hamilton has afforded species of *Megistocrinus*, *Taxocrinus*, *Synbathocrinus*, *Pentremites*; *Orthis suborbicularis* H., *O. Vanuxemi* H., *O. Iowensis*, *O. inæqualis*, *O. prava*, *Stropheodonta arcuata* H., *S. nacrea* H., *S. reversa* H., *S. demissa*, *S. perplana*, *Productus dissimilis* H., *Productella pyxidata* H., *P. subalata* H., *Productus Shumardianus* H., *Spirifer Hungerfordi*, *S. Whitneyi* H., *S. fimbriatus* Con., *S. bimesialis* H., *S. asper* H., *S. Parryanus* H., *S. pennatus* Owen, *S. Marionensis* Shumard, *Cyrtina umbonata* H., *C. triquetra* H., *Gypidula occidentalis* H., *Atrypa aspera*, *A. reticularis*, *Euomphalus cyclostomus* H.

4. CHEMUNG PERIOD, OR LATER DEVONIAN.

ROCKS—KINDS AND DISTRIBUTION.

The Chemung Period includes (1) the PORTAGE epoch, represented by the Genesee shale below, and the true Portage group above; and (2) the CHEMUNG epoch. The Catskill group, which has usually been made to represent a third epoch, is mainly, as stated on page 576, the sea-border part of the Upper Devonian.

The *Genesee shale*, at the base of the Portage, is black and bituminous, like the Marcellus shale, and rather sparingly fossiliferous. It is 100 to 150 feet thick in central New York, along Cayuga Lake, where it overlies