

Dawson thereupon observes that "the trill and hum of insect life must have enlivened the solitudes of the strange old Devonian forests." Insects appear to have been the only winged life of the Devonian and Carboniferous ages.

8. **Vertebrates.** — Remains of Fishes occur sparingly in the Hamilton beds, while abundant in the overlying Genesee and Portage beds. Those observed are the plates or fragments of jaws of Placoderms, or teeth or fin-spines of Selachians. One of the large fin-spines, from the Hamilton beds of Yates County, N.Y., called *Ctenacanthus Wrighti* by Newberry, is nine inches long and an inch and a half in diameter at base.

#### *Characteristic Species.*

**PLANTS.** — The seaweed, *Spirophyton*, occurs in the Hamilton and through the later Devonian. Fig. 894, of *Lepidodendron primævum* Rogers, shows only the inner surface of the bark, and not the true surface scars. Fig. 896 is one of a group of leaves of *Cordaites Robbii*, figured by Dawson; and Figs. 897, 898, from Dawson, are portions only of his figures. For J. M. Clarke's papers on *Sporangites*, see *Am. Jour. Sc.*, xxix., 1885.

**ANIMALS.** 1. **Spongiozoans.** — *Sphaerospongia tessellata* (Fig. 902) is associated with *Terebratula (Eunella) Sullivanti* Hall, of the Corniferous, *Spirifer fimbriatus* Con., *Pentamerus comis*, *Atrypa reticularis*, *Nucula lirata* Hall, of the Hamilton shales, *Paracyclas elliptica* Hall, of the Corniferous and Hamilton, *Goniophora perangulata* Hall, of the Schoharie grit, etc.; also, the following European species, not known from the United States, *Murchisonia turbinata*, *Euomphalus annulatus*, *Stringocephalus Burtini*, *Loxonema priscum*, *Macrochilina subcostata*, etc. The *Stringocephalus* is characteristic of the "Stringocephalus zone" of the Middle Devonian of Europe. The Devonian fossils of Manitoba, according to Whiteaves, have close relation to those of Europe, while many differ in species from those of the United States.

2. **Actinozoans.** — Fig. 903, *Heliophyllum Halli* E. & H., N.Y., *H. obconicum* H., *H. confluens* H., *Cyathophyllum robustum* H., *C. nanum* H., *C. conatum* H.; *Zaphrentis Halli* E. & H., *Z. simplex* H., *Cystiphyllum varians* H., *C. Americanum* E. & H., *C. conifollis* H., *Amplexus Hamiltoniæ* H.; *Michelinia stylopora* Eaton, *Favosites placenta* Rominger, *F. arbuscula* H., *F. Hamiltoniæ*, *F. Argus*, all from a "coral-reef" area of the N.Y. Lower Hamilton, near Canandaigua, N.Y. (Clarke), and nearly equally abundant to the westward in New York and Ontario.

3. **Echinoderms.** — The forms, described under the generic name, *Heteroschisma*, by Wachsmuth, from Iowa, show a relation between *Codaster* and *Pentremites* (*Ill. G. Rep.*, vii., 1883).

4. **Molluscoids.** — Large numbers of *Bryozoans* are described in Hall's vol. vi., of the N. Y. Geological Survey.

**Brachiopods.** — Fig. 904, *Atrypa aspera* Schloth, also European; 905, *A. reticularis*, larger than the same in the Corniferous, and fuller, sometimes nearly 2 inches broad; 906, *Tropidoleptus carinatus* H., New York, Illinois, Iowa, Europe; 907, *Spirifer mucronatus* Con., very common; 908, *Athyris spiriferoides* Eaton; 909, *Ambocœlia umbonata*, N.Y. and the West; 910, *Chonetes setigerus* H., in the Marcellus and Genesee shales, and also the Chemung; 911, *Productella subalata* H., Rock Island, Ill.; *Spirifer granuliferus* H., a large species, having a granulated surface.

The *Rhynchonella cuboides* is characteristic of the Tully limestone; and as beds containing this species and others associated with it in England and Europe are referred to the base of the Upper Devonian, the "Frasnian stage," the limestone, according to H. S. Williams, ought to be arranged with the Upper Devonian in New York, etc. He