

*ceras crebrisepalum* H., besides *Maclurea arctica* Haughton, a species near *M. magna* of the Chazy. Moreover, the formation of thick strata of limestone shows that life like that of the lower latitudes not only existed there, but flourished in profusion.

#### BIOLOGICAL PROGRESS.

1. **General Progress.** — During the Lower Silurian era progress in animal life was marvelously great. Before it closed, nearly all the grander divisions of marine invertebrates were represented. And these grand divisions were displayed under nearly all their subdivisions. The Actinozoans were represented by Alcyonoids and Madreporids, as well as by Cyathophylloids; Lamellibranchs, by Monomyaries, related to the modern *Avicula* and *Pecten*; Heteromyaries, related to *Modiola* and *Mytilus*; Dimyaries, both of the Integripallial section related to *Arca* and *Nucula*, and of the Sinupallial section related to *Cypricardia* and *Tellina*; Pteropods, by more types and much larger species than now exist; Gastropods, by the species of the *Trochus* and *Pleurotomaria* types; Trilobites, by many new genera; and in addition there were Eurypterids of large size. Besides all these, there were Fishes, the first of Vertebrates.

The chief divisions of marine Invertebrates supposed to be absent are: Crustaceans above Entomostracans, that is, the typical Tetracapods and Decapods; the Dibranchs, or Squids and Cuttles, among Cephalopods; the Echinoids among Echinoderms, and the Actinoids, or modern type of Corals, among the Actinozoans. The exhibition of marine Invertebrates was, therefore, very wide in range and far advanced in grade. There was diversity enough to have afforded material for quite a full work on Invertebrate zoölogy.

But, in addition to life in the waters, there was already life over the land, and life, also, that could fly, and so bring the air above the land into new service. The water-margins and moist places of the growing continents were green with acrogenous plants that gave promise of future forests. Insects, as the one specimen reported proves, were common almost everywhere. Hemipters are the so-called "Bugs" and Aphides. They are incomplete in metamorphosis, like other low-grade Insects, and, therefore, are a kind that might be among the earliest in geological time; but until the discovery in 1892, no fossil Paleozoic species had been reported. It has already been remarked that terrestrial animal species rarely become fossilized; among the rarer of these are Insects, and of the rarest are Myriapods and Spiders, and those Insects that do not frequent water-margins. Myriapods were probably part of the terrestrial population, and perhaps, but less probably, Spiders.

2. **Culmination of the types of Graptolites, Cystoids, Pteropods, Trilobites, and Ostracoids.** — The Graptolite, Cystoid, Pteropod, Trilobite, and Ostracoid types appear to have reached, in the Lower Silurian era, and passed, their time of highest display.