

macograptus Scharenbergi. In the Upper Llandeilo rocks graptolites of the type of *Cryptograptus tricornis* and *Climacograptus Scharenbergi* are abundant, also species of *Cœnograptus* with *Dicellograptus sectans* (zone of *Cœnograptus gracilis*). Trilobites are characteristic fossils of the group, upward of fifty species belonging to eighteen or twenty genera being known. These include characteristic forms which do not range beyond the group, *Asaphus tyrannus*, *Calymene cambrensis*, *Trinucleus Lloydii*, and *T. favus* being found in the lower subdivision, and *Barrandia Cordai*, *Cheirurus Sedgwickii*, and *Ogygia Buchii* in the upper. The phyllopod *Peltocaris aptychoides* is also peculiar. The brachiopods include the genera *Acrotreta*, *Crania*, *Discina*, *Leptæna*, *Lingula*, *Orthis*, *Rhynchonella*, and *Strophomena*, some of which here make their first appearance. The lamelli-branches are represented by species of *Cardiola* (*C. interrupta*) and *Modiolopsis* (*M. expansa*, *M. inflata*), the gasteropods by *Cyclonema*, *Euomphalus*, *Murchisonia*, *Pleurotomaria*, *Raphistoma*, and *Turbo*, the heteropods by *Bellerophon*, *Ecculiomphalus*, and *Maclurea*, the pteropods by *Conularia* and *Theca*, the cephalopods by *Cyrtoceras*, *Orthoceras*, and *Endoceras*.

3. Caradoc and Bala Group.—Under this name were placed by Murchison the thick yellowish and gray sandstones of Caer Caradoc in Shropshire, and the Horderley and May Hill Sandstone. It was afterward ascertained that the gray and dark slates, grits, and sandstones, described by Sedgwick as occurring round Bala in Merionethshire and regarded by him as the higher part of his Cambrian system, were really slightly different lithological developments of the same stratigraphical division. In the Shropshire area, some of the rocks are so shelly as to become strongly calcareous. In the Bala district, the strata contain two limestones separated by a sandy and slaty group of rocks 1400 feet thick. The lower or Bala limestone (25 feet thick) has been traced as a variable band over a large area in North Wales. It is usually identified with the Coniston limestone of the Westmoreland region. The upper or Hirnant limestone (10 feet) is more local. Bands of volcanic tuffs and large beds of various felsitic lavas occur among the Bala beds, and prove the contemporaneous ejection of volcanic products. These attain a thickness of several thousand feet in the Snowdon region.<sup>76</sup>

<sup>76</sup> For accounts of the volcanic phenomena of the Caradoc-Bala series of Wales, see A. C. Ramsay's "Geology of North Wales," forming vol. iii. of the