

able; their small size, the gigantic size and often small number of their primary tubercles, as well as the peculiar shape of the primary radioles, all remind us of the early stages of our present *Cidaridæ* to a degree which can hardly be realised without a direct comparison of the figures of such *Cidaridæ* as are given by Laube (*Fauna d. Schichten v. St Cassian*, pls. viii.<sup>b</sup> and ix.) with those of some young *Cidaridæ* I have myself figured (*Revis. Echini*, pl. ii.<sup>c</sup> fig. 7); and the variety of form in the radioles found associated with those in the St Cassian beds rivals the disproportions noticed in the spines of young *Echinidæ* and *Cidaridæ* such as I have figured in the chapter on young *Echini* in the *Revision* (pl. ii.<sup>c</sup> figs. 7-13; pl. v. fig. 9; pl. viii. fig. 16; pl. ix.; pl. x.), and in the *Embryology of Echinoderms* (*Mem. Am. Acad.*, 1864). It is interesting in the description of the variation in the shape of the spines which we find in *Goniocidaris* to see how early in geological times this variation already existed as a character of the family, and has persisted to the present day.

The oldest species of *Cidaris* in the Trias were small species with smooth tubercles, and the variety of radioles already apparent was considerable. Nearly all the types are represented, but it is almost impossible to separate them, as there is a gradual passage from one to the other. There is a great predominance of clavellate types, a great variety of radioles with secondary spines, and a nearly total absence of the long cylindrical radioles so characteristic of many of the Cretaceous, Tertiary, and recent species. This variation in the spines and gradual transition recalls to us embryonic stages where one and the same species passes rapidly from the state of embryonic species to the state characteristic of the fully grown individuals. When we come to the Jurassic type of radioles the varieties are less closely connected. They arrange themselves more easily into two great types—the glandiarii and the aculei as Desor has named them,—but we must remember that there are still transitional forms, or rather elongated glandiarii with narrow necks approaching the aculei form of the others, and that this formation is characterised by the far greater development of the elongated type of radiole than in the preceding formation, their larger size corresponding to the increase in the size of the test, and the immense development of species characteristic of the Jura which have also mainly crenulated tubercles. This crenulation, however, disappears again during the Cretaceous period, during which the *Cidaridæ* have smooth tubercles, but, as is the case also in recent species, do not on that account carry smaller radioles. On the contrary, the latter are remarkable for their great length, their greater variety in shape compared with those of the Jurassic period, and more particularly, as has been so well shown by Desor, for the first appearance of the spreading into a corolla of the extremity of the spines so characteristic of some Tertiary genera, and which seems to culminate at the present period in the cupuliform spines of *Goniocidaris*. The glandiform radioles attain a degree of extreme development unknown in the older formations, and they nearly disappear during the Tertiary period,