

the shell). The distal apex is commonly simple, conical or pyramidal, rarely bifid or truncate. The edges of the spines are commonly smooth, rarely denticulate or serrate.

The apophyses, or the lateral transverse processes of the radial spines, in the *Dorataspida* assume the greatest variety and complexity in form, size, mode of ramification, and in composition of the shell. An expert and practised observer may determine easily the range of each spine, whether it be an equatorial (*c*), or a tropical (*b*, *d*), or a polar spine (*a*, *e*, Pls. 133–138). The two opposite apophyses of the *Diporaspida*, as well as the four crossed apophyses of the *Tessaraspida*, lie constantly in certain meridian planes of the spine, which have a legitimate signification for each of the five zones. The comparative morphology of this regular disposition of the apophyses and the regular meeting of their branches is of the greatest interest, and necessary for the complete understanding of the complicated structure of these wonderful shells.

The pores or meshes of the spherical shell, offering the most varied forms, may generally be divided into two different groups, into sutural and parmal meshes. The sutural pores are bordered by the meeting branches of the apophyses of two, three, or four neighbouring spines, and therefore also by the sutures in which they meet. The parmal pores on the other hand are bordered only by the united branches of the apophyses of a single spine and pierce the shield or lattice-plate formed by them. Therefore the shell-meshes of the *Cladophracta* are all sutural pores (Pl. 137, figs. 1–8; rarely and only in a part of the spines parmal pores also: *Zonaspis*, *Dodecaspis*); whereas the shell-meshes of the *Peltophracta*, piercing the shields or lattice-plates of all twenty spines, are always partly sutural, partly parmal pores (Pls. 135, 136, 138). The parmal pores again may be divided into two different groups—aspinal and coronal pores. Aspinal pores (“ad spinam”) are those which lie immediately on the sides of the radial spine and are bordered by the primary branches of its apophyses; therefore constantly only two in the *Diporaspida*, four in the *Tessaraspida*. Coronal pores on the contrary are those which lie in the periphery of the lattice-plates, surrounding in a circle or crown the aspinal pores and not touching the spine itself. In *Dorataspis*, *Ceriaspis*, *Tessaraspis*, *Lychnaspis*, &c., all parmal meshes are only aspinal pores (Pl. 135, figs. 2–5; Pl. 136); whilst in *Coscinaspis*, *Acontaspis*, *Icosaspis*, *Hylaspis*, &c., one part of the parmal pores is aspinal, one part coronal (Pl. 136). The number, form, and size of the coronal pores is very variable and often very large (sometimes more than a hundred in one plate).

The *Cladophracta* exhibit a comparatively simple shell-formation; either all twenty spines or at least a part of them not forming lattice-plates. The most primitive form among these is *Phractaspis* (Pl. 137, figs. 1, 2). The forty apophyses of its twenty spines are simply forked, and their eighty fork-branches united by forty sutures, enclosing twenty-two sutural meshes: two square polar meshes (between the four polar spines on the poles of the spineless axis, *a a a a* and *e e e e*); eight triangular