

additional ones, as new loops immediately below the odd terminal tentacle, being identical with that in the Starfish. Several recent writers on Echinoderms deny the existence of this odd terminal tentacle, the homologue of the odd ocular tentacle of the Starfish (see Embryol. Starfish, pl. viii.). I would refer them to the figures of young *Arbacia* in the Revision of the Echini, p. 735, and of young Echinids (*Strongylocentrotus dröbachiensis*) in the Mem. Am. Acad., 1864, for figures of this terminal tentacle, and to the Revision of the Echini, pl. x. 1872, part 3, and to the figures of young *Goniocidaris canaliculata* in this memoir (Pl. II.). There is nothing to show that the interambulacral zones in the earliest stages at which they can be detected, do not consist at the beginning of several plates, more or less rudimentary, all appearing at the same time. It seems to me more natural to suppose that in the Clypeastroids we have the madreporic body in the neutral position, indicating the mode in which the madreporite passed from an unstable condition, owing to the presence of an apical anal system, to a stable one, due to the withdrawal of the anal system to one of the interambulacral areas, which then became the principal guide in fixing the position of an antero-posterior axis until the madreporic body again had a tendency to encroach upon certain parts of the genital system in the Petalosticha, when the position of the axis was again defined by the position of the anus and of the simple ambulacrum.

Far too much weight has been given to the order of appearance of the plates of the ambulacral and interambulacral areas in this discussion. The coronal plates, as is well shown in young Echinids, while divided into ambulacral and interambulacral areas, do not, as far as we have been able to trace their appearance, develop in such a regular and fixed manner as to enable us to determine the axis of the Echinids from the order of their origin.

#### COMPARISON OF THE CORONAL PLATES OF THE TEST IN DIFFERENT FAMILIES.

Among the Clypeastroids, it is only in the younger stages that the interambulacral plates are connected at the actinostome as in Spatangoids. The actinal ambulacral plates soon increase so fast in width as to drive them apart, and in the older stages of some genera<sup>1</sup> the second row of ambulacral plates forms a continuous ring round the actinostome, while in others<sup>2</sup> the odd posterior interambulacrum still extends connectedly to the actinostome, as it is in the adult of *Echinocyamus* and *Laganum*, and in others forming in part a trivium and a bivium as in *Rotula*, while in *Echinarachnius* it is the odd posterior interambulacrum of which the actinal plates become first disconnected.

*Echinoneus* comes in at once as a marked exception to Lovén's theory, as well as all the Clypeastroids, where in no stage do we find that the actinal plates have the characters upon which Lovén's theory of an axis is based.

Lovén has already called attention to the greater affinity existing between the

<sup>1</sup> *Encope*, *Clypeaster*, *Arachnoides*.

<sup>2</sup> *Mellita*.