

a change of which we can follow the traces in successive geological periods. The position of this opening is a very variable one, and in the life history of a young Sea-urchin it passes from its original place near the actinostome to one within the apical system, plainly showing that during the earliest stages of growth the position of the external opening of the extremity of the alimentary canal is still undetermined, and that we must not attempt to find in the geological sequence any explanation of this transfer any more than the position of the genital opening within or without the genital plates gives us in the history of the growth of the Clypeastroids any clue to its causes.

The position of the anal opening among the Spatangoids is in reality, as has been shown by Lovén, not an advance, but the retaining of a structural feature once uniform among the earliest Echinoderms, and which we find in all the Palæozoic Crinoids, but which may nevertheless have very gradually been developed again during the geological succession, as there are indications already in the Palæechinidæ of such an excentric position of the anal system. And we find, as has been so well shown by Lovén, in the older Echinoidea a marked encroachment of the anal system upon one of the genital plates, which culminates in some species of *Acrosalenia*; and we may consider this as the last trace, perhaps, in the regular Echinids of the excentric position of the anal system without the apical system, the last trace of a condition of things which was more universal and which tends gradually to be constituted as we find it in the Echinids of the present day. While in the groups in which we find a retrogression, as it were, to the ancient condition of things we find it accompanied by a renewal of the functions of the genital plates, and at the same time by the encroachment of the madreporic body upon the other plates, thus often occupying the whole central part of the apical system, and thus again giving us an explanation of the many genital plates which may be occupied by parts of the madreporite in the earliest Palæechinidæ, as we find it in several of the genera figured by Bailey, Worthen, and others. And we can gradually trace both in the Echinoneidæ and in the Cassidulidæ the regular geological succession existing between the genera with the anal opening close to the apical system, and those in which at the present day it is found on the actinal surface, and we see that while the circular or globular species are the more ancient, they are little by little replaced by species in which the longitudinal axis becomes more marked, the anal system at the same time gradually passing from the apex towards the ambitus and finally to the actinal side. This forms a striking contrast to the embryological fact that in young Clypeastroids the anal opening is at first always on the abactinal side and gradually finds its way to the actinal surface; which does not seem to accord well with the view that this transposition of the anal opening is of a retrogressive character.

The changes the apical system goes through the moment it has become independent of the anal system are very important, and are connected also with other modifications in the plates of the test which radically affect its whole appearance.