but it was curved toward the aboral surface. The joints formed by contact of the first arm marginals with the interradial marginals are all gently concave aborad and suggest sliding or shallow ball and socket joints. The movement may have been something like that of the Ophiuroidea, the side arms being lifted and set forward and the epineurals holding like anchors or helping in the forward thrust. In that case our orientation, based in part on arm position, may be in fault. Aside from the ability of the long epineurals to open widely and close, the angle at the fixed end of about 85 degrees indicates an ability to swing their free ends through an arc of some 95 degrees in a radial direction. We have already noted that the preserved plates on the two arms are set in opposite directions if considered radially. With reference to the environment, however, they are set in the same direction and are in the position we should expect if they had been used to assist in thrusting the creature in the direction of the third interradius.

SOME GENERAL CONSIDERATIONS.

We all know that the more primitive Echinodermata possessed food grooves with covering plates such as we find in Cystidea, Crinoidea and Edrioasteroidea. In 1907[1] I described the covering plates in Parablastoidea (Blastoidocrinus) and in 1911[2] after further work on the same species I endeavored to show that with regard to Pentremites we must "accept Doctor Carpenter's contention that the mouth, food grooves and pores were covered with small but well fitting plates." We now have found undoubted covering plates in the Stelleroidea.

I desire to point out that the food groove with a double row of flooring plates covered by a double row of epineurals and flanked by one or more marginal plates on either side is a very primitive type of food groove and I believe that *Protopalaeaster narrawayi* not only points out the fact that the Stelleroidea arose from such a type but that the Echinoidea also had a similar parentage.

With so simple a form before us we must ask ourselves if the ambulacra and interambulacra of Echinoidea and the "vertebral ossicles" and "lateral arm plates" of Ophiuroidea are not strictly homologous with the adambulacra and marginals of our type and of the Edrioasteroidea.

The very evident specialization of the peristomial covering plates of *P. narrawayi* for food capture and mastication would

[1] "On Some Pelmatozoa from the Chazy Limestone of New York." In New York State Museum Bulletin 107, p. 112.

[2] "Studies of some Early Seluric Pelmatozoa." In New York State Museum Bulletin 149, p. 208.