A Preliminary Study of Echinoderms with the Aid of a Scanning Electron Microscope

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A preliminary study of minute and small echinoderms with the aid of a S4 Cambridge Stereoscan (scanning electron microscope), located in the Zoology Department, The University of Iowa, Iowa City, was made possible by a grant of $150 from the Geological Society of Iowa in 1973. Specimens were plated with a thin carbon coating overlain by gold. The original intention was to study microcrinoids from the McRaney Limestone, Kinderhookian Stage, Mississippian of Franklin County, Iowa. Unfortunately, the surfaces of the specimens were obscured by an overlay of microcrystals. Specimens from the Pella Formation, Meramec Stage, Mississippian Age, of Mahaska County, Iowa were much better subjects for viewing and are considered herein. A microcrinoid, Passalocrinus sp., a camerate crinoid, Dichocrinus sp., and a blastoid, Diploblastus sp., are illustrated.

A portion of dried cirrals from a comatulid is included (Figure 1: I-3) to demonstrate porosity of a modern crinoid. The latticework pattern is known to differ in different parts of a comatulid.

A portion of the extrabasal plate of Passalocrinus sp., as exhibited by Figure 2: 1-2, and Dichocrinus sp. (Figure 2: 3, 4) other than the pronounced lateral growth lines exhibited by Diploblastus. The plates of most crinoids do tend to be thicker than those of most blastoids and therefore must have more numerous overlying series of latticework-like skeletal elements than blastoids, but the difference is not as pronounced as one would be led to believe. For example, many Pentremites develop a special “overlay” on the basals which is so pronounced that it could almost be, and on occasion has been considered as, another set of plates.

A comprehensive study of stereomic microstructure of blastoids made with the aid of an SEM has been recently presented by Macurda (1973).

LATTICEWORK SURFACES

The cirral of the modern crinoid is slightly less than three-fourths solid, with deep voids between the stereom (Figure 1: 3). Diploblastus sp. has such an irregular surface, with series of highs marking the growth lines, that any measurements of voids is superficial; however, very deep apertures (voids) are readily apparent (Figure 2: 2). The rods of Dichocrinus sp. occupy about two-thirds of the surface and one-third is void. There is some collapsing or closing of the apertures deep down. Rods in Passalocrinus sp. are more or less intertwining and have numerous projections. Voids are present but obscure and any measurements would be superficial (Figure 4:1). For several years the writer has thought that Passalocrinus might be the juvenile stage of a blastoid rather than a crinoid. As growth lines which show the dominant lateral growth ascribed to blastoid plates are not present, the affinities of Passalocrinus remain obscure. It is hoped that future studies will provide more information about the matter.

LITERATURE CITED


Figure 1. 1-3. Modern comatulid crinoid cirri: 1. Jointed pair, X53; 2. X500; 3. X2,000; 4. *Diploblastus* sp. (a blastoid) from the Pella Formation, X33.
Figure 3. 1, 2. *Passalocrinus* sp. (crinoid?) from the Pella Formation: 1. Complete theca composed of three circlets of plates (basals, radials and orals), X210; 2. Portion of above, X2,080. 3, 4. *Dichocrinus* sp. (crinoid) from the Pella Formation: 3. Partial crown (composite photograph), posterior view, X24; 4. Portion of radial (see Figure 2: 3, 4), X2,350.

Figure 4. 1, 2. *Passalocrinus* sp. from the Pella Formation: 1. Same as Figure 3: 4, X5,200; 2. Same as Figure 3: 1, X520.
Figure 2. 1, 2. *Diploblastus* sp. from the Pella Formation; 1. Upper left portion (radial plate), (see Figure 1: 4), X550; 2. Same, X2,200. 3, 4. *Dichocrinus* sp. (crinoid) from the Pella Formation: 3. Portion of radial plate of partial crown (see Figure 3: 2), X590; 4. Same, X1,190.