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The problem of graptolite affinities in the light of ultrastructural studies on peridermal derivatives in pterobranchs

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The ultrastructure of the organic coenecium in living *Cephalodiscus* (*Cephalodiscus*) *inaequatus* (Andersson) studied with the transmission electron microscope reveals a fabric and pattern very similar to that recognized in living *Rhabdopleura compacta* (Hincks) by Dilly (1971). The same techniques used to study the ultrastructure of Jurassic *Rhabdopleura kozlowskii* Kulicki and Ordovician *Rhabdopleurites primaevus* Kozłowski indicate that the nature of the fibrous unit elements of the periderm and their characteristic pattern remain unchanged within the Pterobranchia, at least since the Ordovician. The results combined with those of previous studies on the ultrastructure of peridermal derivatives in graptolites (Towe & Urbanek, 1972; Urbanek & Towe, 1974, 1975), reveal a substantial difference at the submicroscopic level between the fusellar component of the periderm in the pterobranchia and that of the Graptolithina. The presumed homology between fusellar tissues of both groups constitutes the main argument in Kozłowski's suggestion (1938, 1949, 1966a) of a close affinity between pterobranchs and graptolites. A reevaluation of his line of reasoning enables us to conclude that Kozlowski's main criterion of homology was the specificity of the structures involved. This requirement is not fulfilled at the ultrastructural level because of substantial differences in the nature of the unit elements and their pattern. Moreover, other data on the ultrastructural anatomy of graptolites (very early deposition of cortical tissue over juvenile thecae; presence of cortical deposits over the inner surface of thecae; simultaneous secretion of successive fuselli and corresponding layers of cortical tissue) contradict the mode of secretion of the graptolite skeleton as suggested in the classical Kozłowski hypothesis. In contrast to the independent origin of fusellar and cortical tissue suggested by Kozłowski,each being secreted by a different part of the body, the ultrastructural data are indicative of a uniform mode of secretion. A secretion of the entire periderm within an epithelial evagination - the perithecal membrane - appears to be more readily compatible with the ultrastructural studies. Substantial differences in fabric, pattern, and mode of secretion of fusellar extracellular tissues in pterobranchs and graptolites produce serious obstacles for homology between them. Accordingly, there is little reason to suggest an immediate phylogenetic relationship between pterobranchia and Graptolithina. The systematic position of the ratter group within the Bilateria remains an unresolved problem.

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