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A contribution toward understanding the relative integration of graptolite colonies

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Transmission electron microscope investigation of ultrathin microtomesections of graptoloid graptolite periderm forming nema and virgula walls in a didymograptid, an orthograptid, and monograptids indicates that these structures had certain similarities as well as differences in ultrastructure. Similarities include: An internal canal that is partly hollow and partiy filled with loosely woven fibrous material, layered walls, layers in the walls formed of electron dense, homogenous sheet fabric bounding compact fabric formed of densely-packed fibrils; and holes: or vesicles that perforate the compact fabric. Two aspects of colony growth may be recognized among graptolites. One is: extension of those tissues related to nema or virgula formation, and the other is zooidal budding. The two growth aspects appear to be little, if at all, related in didymograptids and other graptolites with a nema. They mayor may not be related in orthograptids and other biserial scandent graptolites. Study of peridermal ultrastructure suggests that they 'may have been closely related in monograptids because the outer layers of the virgula wall develop into thecal wall growth increments. Graptolite colonies, particularly uniseriaI graptolites, resemble physonectid siphonophores in certain gross morphological aspects as well as in having two similar aspects of colony growth. Physonectid colonies are highly integrated. Physonectids may provide a model for use in suggesting potential graptolite colony function and degree of colony integration. The close relationship between the two growth aspects, in rponograptids suggests that they could have been the most highly integrated graptolite colonies. Members of the colony may have acted together to generate efficient flow of water currents past the zooids for feeding and waste disposal. Perhaps, too, tissues related to virgula development were connected with buoyancy and mobility, by analogy with the functiqns of the physonectid nectosome. Inasmuch as uniserial graptolites essentially replaced piserials, and the biseI:ials replaced many graptolites with a nema, these developmental steps may have been those leading toward increasingly greater degrees of colony integration. Ultrastructural studies thus may provide insights into not only colony function and integration, but also into graptolite evolutionary adaptive strategy.

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