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Shell microstructures in Early Cambrian molluscs

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The affinities of a considerable part of the earliest skeletal fossils are problematical, but investigation of their microstructures may be useful for understanding biomineralization mechanisms in early metazoans and helpful for their taxonomy. The skeletons of Early Cambrian mollusc-like organisms increased by marginal secretion of new growth lamellae or sclerites, the recognized basal elements of which were fibers of apparently aragonite. The juvenile part of some composite shells consisted of needle-like sclerites; the adult part was built of hollow leaf-like sclerites. A layer of mineralized prism-like units (low aragonitic prisms or flattened spherulites) surrounded by an organic matrix possibly existed in most of the shells with continuous walls. The distribution of initial points of the prism-like units on a periostracum-like sheet and their growth rate were mostly regular. The units may be replicated on the surface of internal molds as shallow concave polygons, which may contain a more or less well-expressed tubercle in their center. Tubercles are often not enclosed in concave polygons and may co-occur with other types of textures. Convex polygons seem to have resulted from decalcification of prism-like units. They do not co-occur with tubercles. The latter are interpreted as casts of pore channels in the wall possibly playing a role in biomineralization or pits serving as attachment sites of groups of mantle cells. Casts of fibers and/or lamellar units may overlap a polygonal texture or occur without it. They may reflect an inner layer consisting of aragonitic fibers fused into more or less well-developed lamellar units. It seems that nacreous and crossed-lamellar aragonitic microstructures evolved in the Cambrian from such lamellar aragonitic microstructures independently in different groups of molluscs.

Key words: Biomineralization, molluscs, Early Cambrian.

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