CHANCELLORIID SCLERITE FORMATION – TURNING THE PROBLEM INSIDE-OUT

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The Cambrian chancelloriids were generally regarded as sponges until 15 years ago. It was then suggested that the structure of their star-shaped sclerites is incompatible with their having been formed by sponge sclerocytes. This removed the presumed homologies with sponges, and the affinities of the chancelloriids were instead suggested to lie with other Cambrian problematic groups having hollow calcareous-walled sclerites, such as halkieriids and siphogonuchitids, together making up the Coeloscleritophora. Recently, Butterfield has revived the sponge interpretation, arguing that chancelloriid sclerites are modified organic fibres homologous to those occurring in modern demosponges.

New material of bodily preserved chancelloriids from the Burgess Shale and Stephen Formation in British Columbia and from the Wheeler Shale in Utah confirm the basically sponge-like architecture of the chancelloriid genera *Chancelloria, Allonnia,* and *Archiasterella*. They were sack-like animals, attached with their narrow end to the sea bottom. At least *Allonnia* appears to have been anchored in the soft sediment by lumps of coarser sediment. *Archiasterella*, in particular, had a rather tough integument that is often preserved as distinct folded pieces. The sclerites formed a more or less dense cover of cactus-like spines on the outer surface. Body symmetry appears to have been radial; no traces of bilateral symmetry have been observed. Growth of the animal took place by generation of new body wall and sclerites in the apical region.

Whereas the radially symmetrical, sack-like body is consistent with the classical sponge interpretation, a constructional-morphological analysis of chancelloriid sclerites shows that Butterfield's proposed homology with demosponge fibres is untenable. The latter are built up from the outside by spongocytes, much in the same way as sponge spicules are formed by sclerocytes. The composite chancelloriid sclerites were formed by adpression of individual unit rays with soft walls, resulting in extensive, flat contact facets between the respective walls. The stiffening of the walls by aragonite took place later, and they have the same thickness and structure whether they face the exterior medium or an adjacent ray, in which case the two adpressed walls form a double wall between the two rays. Thus the physiologically active tissue that secreted the sclerites was inside them, not outside, as spongocytes and sclerocytes, and the same topological argument can be used to rule out a direct homology of chancelloriid sclerites with either mineralized spicules or spongin fibres of modern sponges.

Morphologically, chancelloriid sclerites may be compared both with the solid calcitic six-rayed spicules of heteractinid sponges such as *Eiffelia* and *Astraeospongium* and with the hollow aragonitic sclerites of coeloscleritophorans such as *Eremactis* and *Hippopharangites*. With regard to structure and composition, and, by implication, mode of formation, comparisons support homologies with the coeloscleritophoran sclerites rather than with the heteractinid spicules.

Thus chancelloriid sclerites do not appear to be homologous with any known structures in sponges. However, the possibility remains that chancelloriids belong to an extinct group of sponges that formed calcareous 'spicules' from the inside. This interpretation is consistent with the sponge-like architecture and sessile mode of life of chancelloriids, which are different from those of the other coeloscleritophorans.

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