

SKELETAL MICROSTRUCTURE INDICATES CHANCELLORIIDS AND  
HALKIERIIDS ARE CLOSELY RELATED

by SUSANNAH M. PORTER

Department of Earth Science, University of California at Santa Barbara, Santa Barbara,  
CA 93106, USA; e-mail: porter@geol.ucsb.edu

**Abstract:** Chancelloriids are problematic, sac-like animals whose sclerites are common in Cambrian fossil assemblages. They look like sponges, but were united with the slug-like halkieriids in the group Coeloscleritophora Bengtson and Missarzhevsky, 1981 based on a unique mode of sclerite construction. Because their body plans are so different, this proposal has never been well accepted, but detailed study of their sclerite microstructure presented here provides additional support for this grouping. Both taxa possess walls composed of a thin, probably organic sheet overlying a single layer of aragonite fibres orientated parallel to the long axis of the sclerite. In all halkieriids and in the chancelloriid genus, *Archiasterella* (Sdzuy, 1969), bundles of these fibres form inclined projections on the upper surface of the sclerite giving it a scaly appearance. On the lower surface of the sclerite, the projections are absent. This microstructure appears to be unique to chancelloriids, halkieriids, and their relatives, siphogonuchitids and sachitids. (The sclerites of another putative halkieriid relative, *Wiwaxia* Walcott, 1911, are unmineralized making direct comparisons impossible.) Thus, similarity both at the level of sclerite construction and the level of sclerite microstructure suggests that chancelloriid,

halkieriid, sachtid, and siphogonuchitid sclerites are homologous. The difference in chancelloriid and halkieriid body plans can be resolved in two ways. Either chancelloriids represent a derived condition exhibiting complete loss of bilaterian characters, or chancelloriids represent the ancestral condition from which the bilaterally symmetric halkieriids, and the Bilateria as a whole, derived. The latter scenario, proposed by Bengtson (2005), implies that coeloscleritophoran sclerites ('coelosclerites') are a plesiomorphy of the Bilateria, lost or transformed in descendent lineages. Given that mineralized coelosclerites appear in the fossil record no earlier than c. 542 Ma, this in turn implies either that the Ediacaran record of bilaterians has been misinterpreted or that coelosclerite preservability increased at the beginning of the Cambrian Period. The former is difficult to reconcile with Ediacaran trace and body fossil evidence, but the latter may be possible, reflecting either independent mineralization of organic-walled sclerites in chancelloriids and halkieriids, or the opening of a taphonomic window that favours coelosclerite preservation.

**Key words:** chancelloriids, halkieriids, biomineralization, microstructure, sclerites, Coeloscleritophora.