Constraining the nature of Ediacaran Palaeopascichnus using morphology and geochemistry

Charlotte Kenchington (1,2), Alex MacBeath (1), Jack Matthews (1,3), and Duncan McIlroy (1)

(1) Department of Earth Sciences, Memorial University of Newfoundland, St. John's, CANADA, (2) Department of Earth Sciences, University of Cambridge, Cambridge, UK, (3) Oxford University Museum of Natural History, Oxford, UK

The Palaeopascichnida are an enigmatic and comparatively understudied component of the Ediacara biota. Members of this geographically widespread group are found in sections from Newfoundland (Canada), Siberia, China and Australia, and their stratigraphic range extends across the late Ediacaran. Study of Palaeopascichnida has typically relied comparative morphological analysis to extant taxa. Comprised of serially-repeated oval-shaped sections, they have been previously interpreted as movement and feeding traces, and alternatively as body fossils of various affinities. Among the most convincing analogues for Palaeopascichnus are the xenophyophores, an extant group of large (up to 200 mm) foraminifera found in deep marine benthic habitats and typified by their large agglutinated tests filled with stercomata.

Here, we test the biological construction and interpretations of phylogenetic affinity for Palaeopascichnus using specimens from the late Ediacaran succession at Ferryland, SE Newfoundland, Canada. Detailed morphological analysis of 20 well-preserved specimens reveals complex branching structure and constrained growth patterns. In addition, we have examined 8 thin sections taken perpendicular and parallel to the beddings planes hosting Palaeopascichnus, using traditional petrographic analysis combined with SEM backscatter imaging and elemental mapping. This has revealed details of the microstructure of the walls and interiors of the oval-shaped sections, including anomalously high concentrations of Ti in the walls of some specimens. Our findings indicate that the oval-shaped sections are indeed body chambers, and their growth patterns support a foraminiferan affinity. We further demonstrate that the walls of these foraminifera were agglutinated, with evidence of preferential grain selection.