Euendoliths versus Ambient Inclusion Trails from Early Cambrian Kuanchuanpu Formation, South China

*Xiaoguang Yang[1,2], Jian Han[2], Xing Wang[2], James Schiffbauer[3], Osamu Sasaki[4], Tsuyoshi Komiya[1]

1. Department of Earth Science & Astronomy Graduate School of Arts and Sciences The University of Tokyo, Komaba, 2. Department of Geology and State Key Laboratory of Continental Dynamics, Northwest University, 3. Department of Geological Sciences, University of Missouri, 4. Tohoku University Museum, Tohoku University

Abundant microstructures have been discovered in small skeletal fossils (SSFs) and embryo-like fossils collected from the Lower Cambrian Kuanchuanpu Formation (ca. 535 Ma) in Xixiang County, Shaanxi Province, China. These involve two co-occurring structures: long, unbranched cylindrical filaments, which are comparable with phosphatic casts of microborings constructed by euendolithic cyanobacteria *Endoconchia lata* in morphology and preservation pathway; and meandering micro-tubes or grooves on fossil moulds (and steinkerns) of a wide range of sizes and morphological diversities, discerned as ambient inclusion trails (AITs). Herein, we also report a new type of AIT propelled grains as organic carbon spherules and their implications on morphological diversity of AITs. From the direct comparisons of endolithic traces and AITs, we propose a mechanism to account for their notably different preservation, and further attempt to offer an explanation for their co-occurrence. Their differential preservation suggests a chronological sequence of their formation, such that *E. lata* microborings formed prior to phosphate sedimentation, while the AITs are likely generated in a later phase of (or after) phosphorite precipitation but before calcareous re-cementation. In that sense, we have identified the diagenetic stage of AITs forming in phosphatized fossils. Dissecting the sequence of these structures and detailed morphological observations assists in distinguishing true biologically produced endoliths from otherwise abiogenically produced microstructures.

Keywords: Cambrian, Kuanchuanpu, microfossils, micro-CT, Cambrian Explosion, Biological evolution

