

On the eve of the Cambrian Explosion: Palaeobiology and preservation of the Ediacaran Weng'an Biota(Doushantuo Fm, South China)

Supervisors

Main supervisor: Philip Donoghue (University of Bristol)

Co-supervisor: Professor Zongjun Yin (Nanjing Institute of Geology, Palaeontology and Stratigraphy, Chinese Academy of Sciences)

Co-supervisor: Dr John Cunningham (University of Bristol)

Project enquiries - Email: phil.donoghue@bristol.ac.uk **Contact number:** +44 (0) 01173941209

Host Institution: University of Bristol

Project description

The evolutionary origin of animals transformed the planet, creating new ecological niches, laying the foundations for modern biodiversity, and forever changing global biogeochemical cycles. However, the timing and nature of this formative episode in Earth History remains controversial, principally because of difficulty in interpreting the fossil remains of the earliest animals. The most ancient realistic candidates for the earliest animals occur in the Weng'an Biota of the Ediacaran Doushantuo Formation from which records of various groups have been described, preserved to a subcellular level of preservation, including possible sponges, ctenophores, cnidarians, and bilaterians. However, despite (or perhaps because) of their exceptional preservation, these fossils are difficult to interpret, often preserved only at embryonic stages of development, complicated by complex histories of mineralization in which it can be difficult to discriminate biology from geology. Furthermore, the environments represented by sedimentary facies of the Doushantuo Formation are poorly described and understood, as is their relation to the distribution and preservation of the fossils.

This aim of this project is to characterize the sedimentary facies represented by the Doushantuo Formation, their diagenetic history, as well as their relationship to the distribution of fossil species and their preservation, as well as the palaeobiology of the fossil organisms preserved. This will entail field- as well as laboratory-based research, including sedimentology, as well as petrological and physical characterization of the fossils. The intended outcome of this research project is an evidence-based interpretation of the ecology and environment of the Doushantuo Formation, as well as of the palaeobiology of the Weng'an Biota itself. This will serve to deliver a decisive shift in debate over the affinity of the Weng'an fossils, which is currently dominated more by gainsaying than by new data or insights, as opposing camps seek to confirm or reject interpretations of animal remains among the existing cadre of fossils.

Previous research has frequently graced the pages of the world's leading scientific journals, and our recent discoveries of new fossils forms will provide the basis for further high profile publications and a great start to a career.

The successful candidate will be provided with training in field sedimentology, sedimentary petrology, acid-recovery of microfossils, scanning electron microscopy, electron microprobe analysis, synchrotron X-radiation tomographic microscopy, and computed tomography.

References:

dos Reis, M., Thawornwattana, Y., Angelis, K., Telford, M. J., Donoghue, P. C. J., and Yang, Z. 2015. Uncertainty in the timing of origin of animals and the limits of precision in molecular timescales. *Current Biology*.

Xiao, S., Muscente, A. D., Chen, L., Zhou, C., Schiffbauer, J. D., Wood, A. D., Polys, N. F., and Yuan, X. 2014. The Weng'an biota and the Ediacaran radiation of multicellular eukaryotes. *National Science Review* 1:498-520.