Durham University
Department of Earth Sciences

Dr Martin Smith: martin.smith@durham.ac.uk
Dr Russell Garwood (University of Manchester)

DO CLADES EXHIBIT AN EARLY BURST OF DISPARITY?

1. Background

It has often been claimed that major groups are characterized by an early burst of disparity (e.g. Hughes et al. 2013; Oyston et al. 2015). Extrinsic and intrinsic factors have been proposed, but no satisfactory explanation is forthcoming.

2. Aims and methods

In the context of recent work by Budd and Mann, we suggest that two null models may offer a satisfactory account for this claim:

1. High early disparity is a prerequisite for becoming a 'major clade';
2. High early disparity is an artefact of using phylogenetic datasets, which do not contain autapomorphies.

3. Scientific approach

This project will use the software REvoSim to simulate evolutionary data in order to compare observed patterns of disparity to expected values under unconstrained evolutionary change. This will make it possible to test whether 'early bursts' of evolution represent an authentic feature that requires a macroevolutionary explanation, or whether they represent an necessary prerequisite for survival to the present and thus an emergent feature of natural selection in the presence of extinction.

4. Training

As a MScR student in the Durham Earth Sciences Department you will become part of a vibrant research culture in which ~70 postgraduate students work on a wide range of Earth Science research projects. In particular, you will closely collaborate with the academic staff, postdoctoral researchers and fellows, and postgraduate students in your research group. Training will be provided in the range of techniques being applied. The aim of this training is to broaden your understanding of the applications of geoscience and provide you with additional skills valued by future employers, or for future academic research.

5. Further reading & information

Budd, Graham E., and Richard P. Mann. 2018. 'History Is Written by the Victors: The Effect of the Push of the Past on the Fossil Record'. *Evolution* 72 (11): 2276–91. https://doi.org/10.1111/evo.13593.

———. 2020. 'The Dynamics of Stem and Crown Groups'. *Science Advances* 6 (8): eaaz1626. https://doi.org/10.1126/sciadv.aaz1626.

Hughes, Martin, Sylvain Gerber, and Matthew Albion Wills. 2013. 'Clades Reach Highest Morphological Disparity Early in Their Evolution'. *Proceedings of the National Academy of Sciences* 110 (34): 13875–79. https://doi.org/10.1073/pnas.1302642110.

Oyston, Jack W., Martin Hughes, Peter J. Wagner, Sylvain Gerber, and Matthew A. Wills. 2015. 'What Limits the Morphological Disparity of Clades?' *Interface Focus* 5 (6): 20150042. https://doi.org/10.1098/rsfs.2015.0042.

Details of the Smith research group, and other potential MScR project topics, can be found at https://smithlabdurham.github.io/#!masters

For further information contact: Dr Martin Smith, Dept of Earth Sciences, University of Durham, martin.smith@durham.ac.uk