Experimental decay and fossilization of soft tissues

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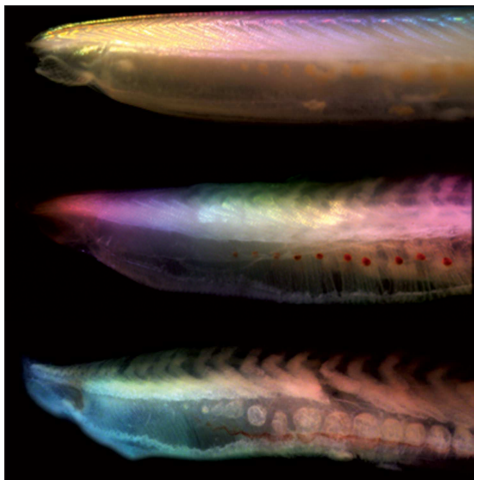
Introduction:

The exceptionally preserved fossil record of soft tissues sheds unique and powerful light on evolutionary events as diverse as the Cambrian explosion of animal diversity and the colour of dinosaur feathers. Soft tissues are, however, distorted and transformed during decay and fossilization. To make sense of these changes and the data that the fossils provide, it is necessary to experimentally investigate decay in laboratory settings. The resulting patterns and processes can completely transform our understanding of fossils and the inferences drawn from them (Sansom et al 2010, Raff et al 2008). In many senses however, the links between experimental decay data and empirical fossil data remains unclear. Are the chemical, biological and physical parameters of experiments realistic given geological parameters? Can results be generalized given variability in sediments and microbial ecology? How do these considerations affect interpretations of the fossil data? This project aims to test the validity of experimental taphonomy by investigating processes of decay, their applicability to the fossil record and thus the evolutionary inferences drawn.

Project Summary

This project aims to test the validity and applicability of experimental decay in the context of soft tissue morphology in fossils. In order to be able to assess the impact of fossilization on the evolutionary inferences drawn from fossils, the principal experimental focus will be on change and loss of morphology during decay and fossilization. Firstly, the role of sediments in decay will be experimentally investigated. Secondly, the role of microbial fauna will be assessed through the manipulation and characterization of the microbial environment and ecology. Thirdly, the identified patterns of morphological change and loss in the laboratory under the various conditions will be compared with the that observed in empirical fossil deposits. The combined experiments will therefore provide a better understanding of not only the geological processes of soft tissue fossil formation and the conditions necessary, but also how morphology is transformed during decay and its impact on evolutionary interpretations.



Morphological change during decay in the chordate *Branchiostoma*

The studentship will involve a diverse array of analytical techniques supported by the multi-disciplinary specialist experience of researchers in both the Faculty of Life Sciences and the School of Earth, Atmospheric and Earth Sciences. The majority of experiments will be conducted in the dedicated taphonomy wet-lab involving dissection and photography. Microbial fauna will be characterized using DNA and 16/18S rRNA sequencing. Decay specimens may also be assessed using 3D-tomography. Palaeontological data will also be incorporated through direct observation and analysis of fossil material. The student will therefore receive training in a range of analytical techniques. The project would suit students with a background in either geology or biology with some experience of palaeobiology. Additional experience in any of microbiology, comparative anatomy, sedimentology or phylogenetics is also desirable, but not expected in combination.

References

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