(GS06) Taphonomy

Date: August 27
Place: Room 5334 (oral)

Oral Presentation

Aug. 27 [PM3] Room: 5334

Chair: Arata Momohara

16:20-16:40 **Biomineralizations in extant mosses: a key to finding unrecognized fossils?** GS06-O01 (119)

Belén Estébanez Pérez, Rut Caparrós Callejo

16:40-17:00 **High fidelity: evaluating amber as a medium for preserving unusual details** GS06-O02 (465)

Leyla J. Seyfullah, Alexander R. Schmidt

17:00-17:20 **Resin production in Araucariaceae: enlightening amber deposition?** GS06-O03 (464)

Leyla J. Seyfullah, Christina Beimforde, Vincent Perrichot, Jouko Rikkinen, Alexander R. Schmidt

GS06-O01 (119)
Biomineralizations in extant mosses: a key to finding unrecognized fossils?

Belén Estébanez Pérez[1], Rut Caparrós Callejo[2]

[1] *Universidad Autónoma de Madrid, Spain, belen.estebanez@uam.es*
[2] *Universidad de Valencia, Spain*

Bryophytes are the second most diverse plant group (after angiosperms), and are regarded as the extant organisms most related with the ancestor to all land plants. Remarkably, fossil remains of these unlignified, non-vascular plants, are difficult to find. The most conservative molecular clock estimations suggest at least an Ordivician origin for the group, but no uncontroverted evidence of their occurrence before Middle Devonian is available. This scant fossil record restricts their use in phylogenetic and paleoclimatic reconstructions. However, in the course of our research, we have found living mosses to produce frequent biomineralizations in internal tissues, sometimes large-scale, which could be interpreted as broadly defined phytoliths. These mineralized tissues could constitute a possible target in the search for fossil record. Here we present an overview on mineral accumulations in extant mosses. Biomineralizations are present across a wide taxonomic spectrum of mosses, and their composition depends on the substrate, as a metastable form of the soil minerals. We have found them to be unequivocally detectable using Edax probes coupled with electron microscopy, but cheaper, less time-consuming methods are available, especially those addressing silicon detection: crystal violet lactone and methyl red methods (light-field microscopy) and the use of methoxysilane derivatives coupled to FITC (fluorescence microscopy). We show how usual protocols for phytolith extraction result in damage or loss of these large biomineralizations. Their striking resistance to strong acids (excepting nitric acid), and the remains after these treatments, are described, and as some of these treatments mimic taphonomic processes, we discuss how these biomineralizations may contribute to the preservation of moss tissues and thus help finding hitherto

unrecognized bryophyte fossils. We present some preliminary results on recovering them from recent soils, and point out the pressing need for adequate protocols to extract them from sediments, in order to evaluate their possible presence across the fossil record.

Keywords: bryophytes, intra-tissue minerals, phytoliths, silicon detection, preservation.

GS06-O02 (465)
High fidelity: evaluating amber as a medium for preserving unusual details

Leyla J. Seyfullah, Alexander R. Schmidt

Courant Research Centre Geobiology, Georg-August-Universität Göttingen, Germany, leyla.seyfullah@geo.uni-goettingen.de

Amber has been highly prized for centuries, but the value of the diversity of the organisms trapped in the amber (inclusions) is immense for understanding the palaeoecology of amber forests. Numerous studies have focussed on the often exquisitely preserved zoological remains (like spiders, insects, vertebrates), with the botanical and microbial inclusions being often overlooked since they are usually fragmentary and deemed difficult to assign taxonomically. Additionally, the assumption has been that certain plant and microbial fragments do not preserve well, if at all, in particular, pollen. This study firstly documents the various preservational modes of organisms. Different preservational modes affect the amount of the original biological information being retained. These taphonomic differences mean that the inclusions can retain high fidelity surface cellular details, or less well preserved specimens that have become mummified and partially to wholly replaced by pyrite growth. New preparation techniques and a closer look are making sure that a steady stream of new information is emerging on the previously neglected non-zoological components of the amber forests.

Keywords: amber preparation, fossil fungi, palaeobotany, palynology.

GS06-O03 (464)
Resin production in Araucariaceae: enlightening amber deposition?

Leyla J. Seyfullah[1], Christina Beimforde[1], Vincent Perrichot[2], Jouko Rikkinen[3], Alexander R. Schmidt[1]

[1] *Courant Research Centre Geobiology, Georg-August-Universität Göttingen, Germany, leyla.seyfullah@geo.uni-goettingen.de*
[2] *CNRS UMR 6118 Géosciences, Université Rennes 1, France*
[3] *Department of Biosciences, University of Helsinki, Finland*

Amber can be defined as cross-polymerised fossil plant resin. There are many conflicting ideas about which species may have produced it and under what conditions in such large amounts. Numerous chemical studies show that amber, particularly the older fossil resins, was predominantly produced by coniferous trees, with much smaller quantities being produced by angiosperms. Key questions in amber studies are: which plants produced the resin and why. One way to try to resolve this is performing studies on modern conifers to try to understand at least some of the reasons for resin production. This study focuses on the highly resinous species of *Agathis* Salisbury and

Araucaria Jussieu within the family Araucariaceae, which is now restricted predominantly to the southern hemisphere. Exant Araucariaceae representatives were chosen for this study as their resin appears to have chemical similarities to the fossil resins found from numerous different localities and geological ages. In New Zealand both extant and in situ subfossil *Agathis* resin were observed and collected for further analysis. Healthy and diseased/dying trees of the New Zealand Kauri, *Agathis australis* (D. Don) Loudon, were compared for resin production type and sites to aid examination of whether disease hypotheses of large resin deposition could be supported. The New Zealand subfossil 'swamp' resin/copal was used to help examine the appropriateness of 'disaster' hypotheses. In New Caledonia, the modern centre of diversity for these conifers, *Agathis* and *Araucaria* species were examined to test different ideas of resin production. Hypotheses tested included resin production in response to insect damage (*Araucaria humboldtensis* Buchh), mechanical damage (*Agathis ovata* Moore ex Vieill. Warb., *Araucaria columnaris* (J.R. Forst.) Hooker) and fire (*Araucaria columnaris*).

Keywords: *Agathis*, *Araucaria*, New Caledonia, New Zealand, palaeobotany.