



## **Charred veg with Swiss: Synchrotron-based X-ray Tomographic Microscopy of Mississippian charcoalified pteridosperm fertile organs and their significance.**

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Pteridosperms underwent a major radiation in the Mississippian with the diversification of lyginopterids and the evolution of medullosan pteridosperms. Our understanding of this radiation is based mainly on permineralized specimens and their study involves time-consuming serial sectioning. Charcoalified plants preserve excellent plant anatomy. These plants may be readily examined using Scanning Electron Microscopy, but elucidating internal anatomy involves sectioning, causing the destruction of the specimen. Abundant charcoalified pteridosperm pollen organs, ovules and cupules have been recovered from Late Viséan (Mississippian) limestones from Kingswood, Fife, Scotland and these show a hitherto unknown diversity, especially in pollen organ types. To overcome limitations of data collection from these fossils, which may be only a few millimetres in all dimensions, we have used Synchrotron-based X-ray Tomographic Microscopy to study the fossils, utilising the TOMCAT beamline at the Swiss Light Source. This technique has not only revealed the internal structure of the fossils, but has also allowed three-dimensional reconstructions that permit virtual dissection, allowing a much deeper understanding of their anatomy. A greater diversity of taxa have been recognised using this technique. We will present results from a number

of pollen organs and ovules to demonstrate this technique.