

A lost world in sausage-shaped packages: synchrotron microtomography of fossil droppings as a tool for investigating ancient ecosystems

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Fossilised excrement, known as coprolites, are not uncommon in the fossil record. It has long been known that they contain inclusions such as bones and scales that give clues to the diet of the producer. However, until now they have received little attention from scientists, largely because it is very difficult to get an overview of their contents by means of traditional techniques. These techniques involve either sectioning the coprolite, which gives only a two-dimensional cross-section view of a small part of the content, or macerating the entire coprolite, which destroys the internal spatial organisation and damages the contents. We have pioneered full 3D visualisation of coprolite contents by propagation phase contrast synchrotron microtomography (PPC-SR μ CT), performed at ESRF beamline ID19. The results are remarkable [1-4]: fully visualised contents in vertebrate coprolites of Devonian to Triassic age (approximately 382 to 201 million years old) include foraminifera, beetle wing cases, crushed clam shells, a partly articulated fish, and skull bones of a previously unknown tetrapod (Figure 1).

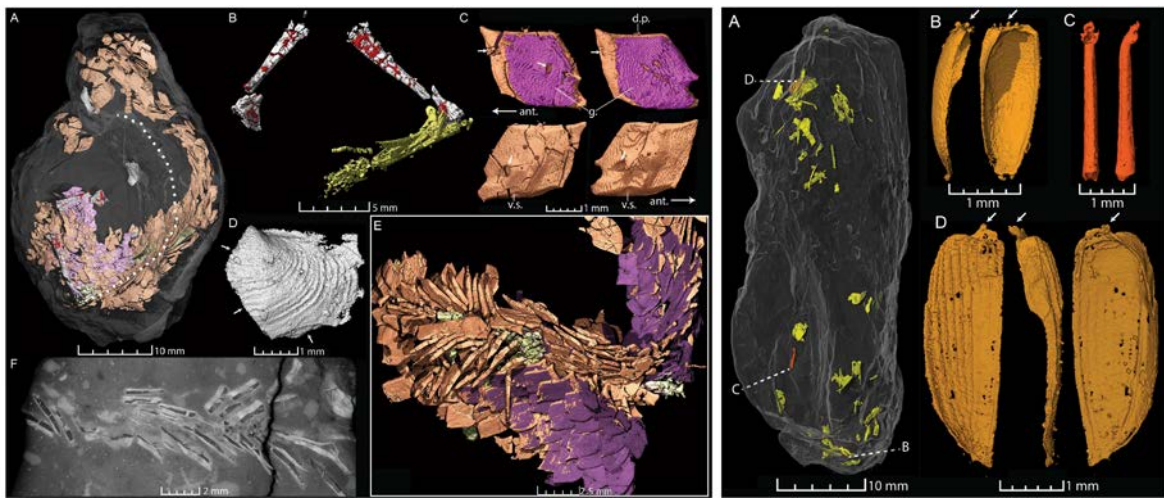


Figure 1: Fish remains and a clam shell (left) and beetle remains (right) from two Late Triassic coprolites [1].

The quality of the data creates wholly new possibilities for reconstructing the food webs of ancient ecosystems, which until now have been largely based on educated guesswork, and for understanding the lifestyles of individual coprolite producers [2-4].

References

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