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Synchrotron microtomography imaging of archaeological textiles

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Archaeological textiles from temperate climates are particularly difficult to study due to their state of degradation. The main mechanism of preservation, referred to by archaeologists as mineralisation, involves the nucleation and growth of mineral phases formed from metal cations from an adjacent archaeological artefact. Mineralisation makes it possible to preserve a cast or imprint of textile shapes for thousands of years. Synchrotron techniques, in particular semi-quantitative synchrotron X-ray micro-computed tomography (µCT), coupled with complementary synchrotron and laboratory techniques, such as scanning electron microscopy coupled to energy dispersive X-ray spectrometry, ultra-high performance liquid chromatography –photodiode array –high-resolution mass spectrometry and second harmonic generation imaging microscopy, have improved our understanding of the chemical mechanisms leading to the preservation of ancient textiles [1-3]. At larger length scales, we have been able to virtually reconstruct the weaving patterns of extremely degraded millimetre- and centimetre-sized textile fragments from Early Iron Age sites in France and the Netherlands, enabling them to be studied in detail [4,5]. These new modes of study and visualisation also open up new possibilities for designing tools and approaches for chemical education [6].

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Primary author: BERTRAND, Loïc (Université Paris-Saclay)

Co-authors: Dr REYNAUD, Corentin (Université Paris-Saclay); JOOSTEN, Ineke (Cultural Heritage Agency of the Netherlands); Dr DESPLANQUES, Elsa (Sorbonne Université); Dr PROAÑO GAIBOR, Art (Heritage Agency of the Netherlands); Dr PIARD, Jonathan (Université Paris-Saclay); Dr IACCONI, Clémence (Université Paris-Saclay)

Presenter: BERTRAND, Loïc (Université Paris-Saclay)

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