

Foreword

Scientific analysis plays a key role in helping to develop objects in the collection as a global resource for discovery. Our scientists apply state-of-the-art investigative techniques for scholarly and public audiences. This newsletter highlights recent work both in the laboratories in the World Conservation and Exhibitions Centre (opened in 2014) and in the wider Museum, notably our public event, *Zoom in: a closer look at science*, which coincided with National Science and Engineering Week.

I have recently taken up the position of Director of Scientific Research to lead on a Wellcome Trust 'Engaging Science Award'. This research programme will develop and apply molecular and isotopic approaches to objects in the collection to discover new perspectives on contemporary themes of interest, including food and culinary practices, health and disease.

Carl Heron, Director of Scientific Research



Zoom in 2016: taking science into the galleries

Our public event *Zoom in: a closer look at science* took place on 19 March 2016. Coinciding with National Science and Engineering Week, the event in the Great Court provided an opportunity for the public to meet the Museum's scientists and conservators and discover how science unlocks the secrets behind objects in the Museum's collection. Visitors learnt about the techniques used to monitor and preserve the collection, handled different raw materials and saw the latest behind-the-scenes technology in action.



Visit to Shanghai



Quanyu Wang is an expert in the study of early metal technology. In March 2016, she was a guest of the new Centre for Conservation and Scientific Research at the Shanghai Museum. This was funded through the UK-China Year of Cultural Exchange Programme funded by the Department for Culture, Media & Sport. Quanyu was able to share ideas and explore opportunities for collaboration with the Director of the museum and a wide range of specialists. She also met with experts from Beijing on Chinese bronze casting. These discussions helped to interpret the manufacturing technique of a similar bronze vessel in the British Museum's collection prior to its long-term loan to a museum in Korea.

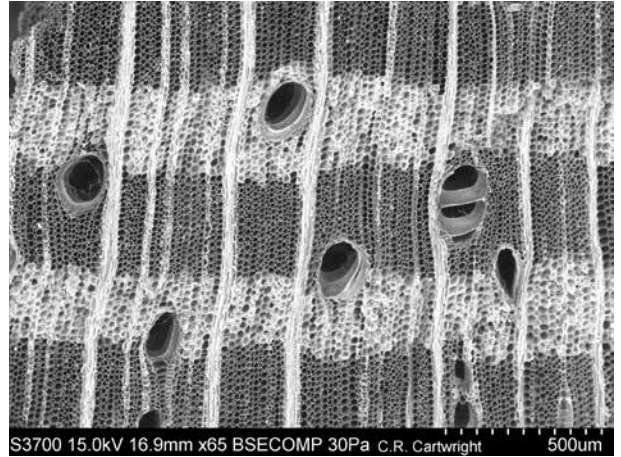
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A ceremonial wine vessel (pou) of the Shang dynasty decorated with four ram heads in the Shanghai Museum.

Quanyu Wang meeting with Professor Rongyu Su, Director of the Centre for Scientific Studies on Culture Heritage, Institute for History of Natural Science, Chinese Academy of Sciences.

Death on the Nile

Gilded face from a coffin, Egypt, New Kingdom, 20th Dynasty, 1186–1069 BC. Caroline identified the wood used to make this face as *Ficus sycomorus* – sycamore fig – a type of fig tree native to Egypt.

Scanning electron microscope image of a transverse section of *Ficus sycomorus*, sycamore fig wood.



The Fitzwilliam Museum in Cambridge presented a major new exhibition called *Death on the Nile: Uncovering the Afterlife of Ancient Egypt*. British Museum scientists Caroline Cartwright and Rebecca Stacey have undertaken many scientific analyses of the funerary objects in this exhibition, and some of their results are published in the accompanying

exhibition catalogue. Caroline Cartwright attended the international conference *Ancient Egyptian Coffins: past – present – future*, held in Cambridge from 7 to 9 April 2016. She presented a paper *Identifying Egyptian coffin woods using scanning electron microscopy*, which included these two images.

Buried treasure

This 15th-century gold mount, engraved with two female saints, was found by a metal detectorist in the Thurleigh area of Bedfordshire. It was reported as an item of potential Treasure in accordance with the 1996 Treasure Act and came to the Department of Scientific Research via the Portable Antiquities and Treasure team at the British Museum, which administers Treasure cases for the whole of England. Treasure is broadly defined as objects that are made of precious metal and are at least 300 years old, hoards of coins, or prehistoric objects of any metal composition. The role of the Scientific Research Department is to examine and analyse potential Treasure items to identify their metal composition in order to verify whether they qualify as Treasure and to characterise gemstones to inform the Treasure Valuation Committee.

This mount is one of around 100 items per year submitted for analysis using surface X-ray fluorescence spectrometry in order to determine the precious metal content, Raman spectrometry to identify gemstones, and optical microscopy to investigate any technological features which might indicate date of manufacture. Due to its age and high gold and silver content, it was designated as Treasure and was subsequently acquired by the British Museum.

Find out more about the Portable Antiquities Scheme and Treasure Act at finds.org.uk and more about X-ray fluorescence and Raman at britishmuseum.org/science



Gold mount of St Anne teaching the Virgin Mary to read. 15th century. Found at Thurleigh, Bedfordshire (BH-313738).

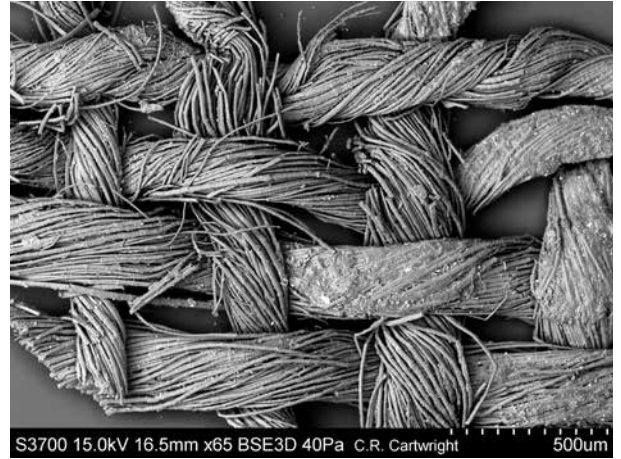
Imaging imminent

A new digital X-radiography and CT scanning facility is soon to be launched at the Museum. This will provide a much more sophisticated imaging platform for some of the largest objects in the collection. The 450 kV X-ray tube will be powerful enough to image heavy metal castings and very large objects such as statuary of any material. Access to the chamber will be possible by forklift truck from the truck lift if necessary, while still keeping the ability to work on smaller and less dense objects. This will broaden the scope for non-destructive investigation of artefacts to study manufacture, joins, hidden cracks and repairs or restoration. It is hoped to have it working safely and staff trained to use it by the end of the summer. The potential for extending its use for commercial applications will be assessed, including a framework for charges and staffing requirements.

Egyptian textile fibres being examined in the variable pressure scanning electron microscope.



Mellon Fellowships



A new project is underway on the analysis of ancient and historic textiles. Research Fellow Dr Diego Tamburini will centre on textiles in the Museum's collection. The aim is to identify the fibres and dyes used to understand processes of textile production and dyeing technology. The funding to support this research comes with the generous support of the Andrew W Mellon Foundation.

A further Mellon postdoctoral fellow, Lucia Pereira-Pardo, started in June. Lucia will be supervised by Dr Capucine Korenberg and will concentrate on testing laser cleaning as a conservation treatment for various materials, ranging from silver objects to archaeological bones. Two lasers will be assessed – a dual wavelength Nd:YAG laser and an Er:YAG laser – and laser cleaning methods will be developed. They will also be involved in all aspects of the department's work, playing a full part in all academic work and of the Museum's wider scholarly programmes and community. Ed Teppo is generously lending us an Er:YAG laser for 12 months. He is retired, but is the founder and former president of Big Sky Laser Technologies.

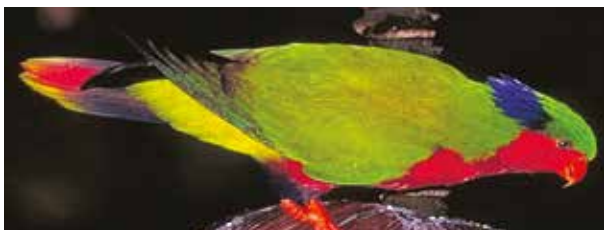
Containing the divine

Recently the Museum's Room 3 was host to the Asahi Shimbun Display *Containing the divine: a sculpture of the Pacific god A'a*, which revealed new findings about this famous Polynesian sculpture. Several of Caroline Cartwright's scanning electron micrographs relating to scientific analyses of human hair and feathers were included in the exhibition. The discovery of a tiny red feather during Caroline's wood sampling procedures in the internal basal recess of the figure caused great curatorial excitement. This feather was identified by colleagues at the Natural History Museum as coming from a Kuhl's lorikeet – an endangered species of bird found on Rimatara, a neighbouring island to Rurutu, where the figure of A'a was made. Red feathers were considered sacred in Polynesia, so the presence of this feather suggests that whatever was stored inside A'a was of the highest cultural significance.

Find out more at britishmuseum.org/pacificgod

Kuhl's lorikeet.

Surface cleaning of a section of a classical frieze in the Museum's laser workshop.



Byzantine glass

In February 2016 Andrew Meek travelled to France with the Museum's entire collection of over 170 Byzantine glass weights. The use and production of these objects is something of a mystery and is currently being investigated by British Museum Curator Chris Entwistle. The weights underwent micro-destructive trace element analysis using laser-ablation-ICP-MS at the Centre National de la Recherche Scientifique, Orléans, with Nadine Schibille and Bernard Gratuze. This technique fires a laser at the surface of the object and ablates a tiny sample of the glass, invisible to the naked eye, which is rapidly analysed for over 50 elements. The results are still being investigated, but have already led to the identification of a number of different glass types in use in the production of the weights. This information will allow us to reconstruct how this part of the glass industry was organised in the 6–7th centuries AD. Preliminary data can be found in 'Early Byzantine Glass Weights: Aspects of Function, Chronology and Composition' in the *British Museum Technical Research Bulletin*, 9, 1–14.

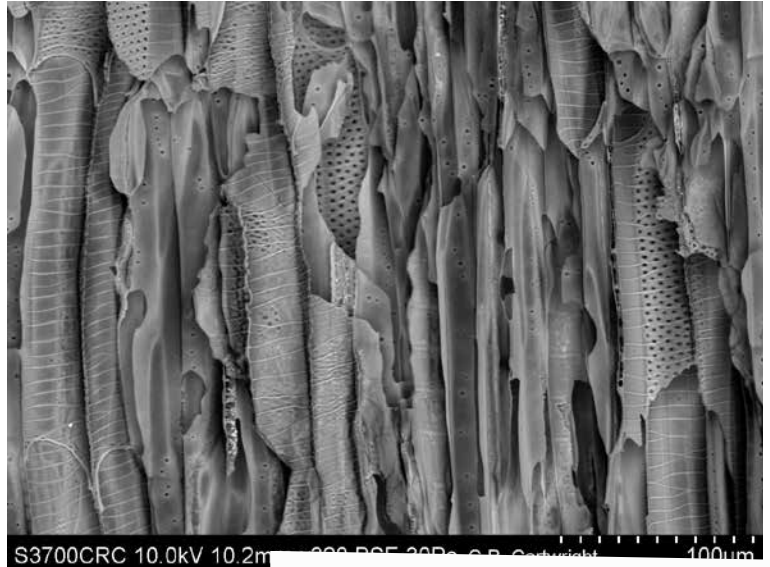


A selection of Byzantine glass weights.

Scanning electron microscope image of a radial longitudinal section of *Tilia europaea*, linden wood.

A mummy portrait of a woman on linden wood. From Rubaiyat, Egypt, c. AD 160–170. EA65346.

APPEAR



The British Museum hosted the second meeting of the international collaborative project APPEAR (Ancient Panel Painting: Examinatic Analysis and Research) led by the Getty. This meeting, on 21 and 22 April 2016, focused on the following aspects that are crucial to understanding Roman period mummy portraits from Egypt – wood, pigments, binding media, other scientific analyses, multispectral imaging, artists/workshops, and stylistic features. Caroline Cartwright, Joanne Dyer and Nicola Newman from the British Museum presented updates of their research on the scientific identification of the woods used, multispectral imaging and conservation. Caroline recently sampled the wood of the mummy portraits from the Kunsthistorisches Museum in Vienna and the Museum of Fine Arts, Budapest. Scanning electron microscopy of these samples has confirmed the remarkable trend for importing high quality linden wood (*Tilia europaea*) into Egypt for the majority of these mummy portraits.



IPERION

Since June 2015, British Museum scientists and conservators have participated EU-funded IPERION CH consortium for Heritage Science. IPERION CH (Integrated Platform for the European Research Infrastructure ON Cultural Heritage) brings together 23 institutions from 12 European countries (plus one in the US) to enhance and develop trans-national infrastructures for heritage science.

Joint research activities financed by the project aim to improve methods of analysis of organic materials, and to advance techniques for non-invasive and portable analyses. Joanne Dyer and Rebecca Stacey are leading a research topic which seeks to model soap formation in ancient encaustic paint media. Regular meetings and conferences organised by the consortium offer the opportunity to connect with researchers from leading research institutes, laboratories and conservation centres in both museums and universities across Europe. The project also provides resources for access to the British Museum's conservation and scientific archives, data and reference collections by international researchers, through the ARCHLAB initiative.

For more information, visit iperionch.eu

Islamic metalwork research meeting at the Louvre

The Department of Islamic Arts at the Musée du Louvre invited Susan La Niece from the British Museum to present a paper on 10th- to 15th-century Iranian metalwork and to share aspects of the Museum's scientific research programme into Islamic metalwork, opening avenues for collaboration with their ISLAMET research programme. The meeting brought together curators and researchers studying metalwork and lustre wares, to discuss the state of scientific knowledge and potential avenues of research which could add context to collections and displays. This is particularly timely with the preparations for the Museum's new Al-Bukhary Foundation Galleries of the Islamic world, due to open in 2017.

Brass ewer, with engraved decoration of astrological symbols, inscribed and inlaid with silver. Made in Herat, Afghanistan, c. 1180–1200.



Research publication

Quanyu Wang has collaborated in a research project on Bronze Age copper and tin ingots from a probable Bronze Age shipwreck off the coast of Salcombe, Devon, with the Department of Britain, Europe and Prehistory, and the Natural History Museum. The composition and microstructure of the tin ingots have been published in *Journal of Archaeological Science* (67, 80–92). Following the publication, provenance study of the tin ingots using tin isotope analysis, a collaborative project with Daniel Berger of Curt-Engelhorn-Zentrum Archäometrie gGmbH, Mannheim, has been developed and is to be carried out shortly.

Raising standards

A publication in *Archaeometry* is another outcome from an international group of museum scientists who have been collaborating to improve the inter-laboratory exchange of analytical data. The group, including Duncan Hook from the British Museum, has defined and commissioned a set of Reference Material standards designed to be used by a wide range of scientists working in the fields of museums, art and archaeology to help improve the accuracy of quantitative analysis of historical and prehistoric copper alloys. The standards increase the number of elements that can routinely be quantified, and the widespread use of a single core set of reference materials should significantly improve inter-laboratory reproducibility. This will allow greater data sharing between researchers and further collaborative study.

To read the abstract, visit <http://ow.ly/w8P23034JH>



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