Chapter 1 : Archaeological chemistry | School of Chemistry | University of Bristol

Archaelogical Chemistry # Analytical Techniques and Archaeological Interpretation Michael D. Glascock, Robert J. Speakman, and Rachel S. Popelka-Filcoff.

Mummies and characterizing the embalming agents Introduction Archaeological chemistry belongs to the broader research field of archaeometry, which represents the application of various scientific analytical techniques to archaeological artefacts. These can include physics, chemistry, biology, palaeoanthropology, mathematics, computer science, etc. Many archaeological artefacts and sediments are porous and absorbent pottery, bones, textiles, soil , which represents an excellent environment for trapping these molecules and slowing down their degradation during the post-depositional period. With the application of analytical chemistry, these can then be related back to previous vessel use, ancient diet, trade and economy. Although this interdisciplinary research began more than 25 years ago, the archaeological audience is slowly getting familiar with its scope and potential, despite the fact that, according to the recently published Analytical Chemistry in Archaeology Pollard et al. Due to the nature of archaeological excavation, which is always a destructive process, the need for complementary research is therefore essential in order to extract the most information, which can in turn enhance archaeological interpretations. The basic analytical approach, adopted by the Organic Geochemistry Unit OGU , relies upon the identification of preserved molecules biomarkers ; matching their distribution to the compounds present in organisms that were most likely to have been exploited in the past. Back to top Organic residue analysis of archaeological pottery Lipid residues of cooking and the processing of other organic commodities have been found to survive in archaeological pottery vessels as components of surface and absorbed residues for several thousand years. Following extraction, using a combination of modern analytical techniques, including: Characterisation of lipid extracts to commodity type is only possible through detailed knowledge of diagnostic compounds and their associated degradation products formed during vessel use or burial. An increasing range of commodities is being detected in pottery vessels, including animal products meat and milk , leafy vegetables, specific plant oils and beeswax. Animal fats are by far the most common residue identified from archaeological pottery with the use of compound-specific stable carbon isotope analysis allowing detailed characterisation of their source. Further reading Evershed, R. Using organic residue analysis to understand early farming practice. Environmental Archaeology Advance article. Immediate replacement of fishing with dairying by the earliest farmers of the northest Atlantic coast. Proceedings of the Royal Society B Neolithic dairy farming at the extreme of agriculture in Northern Europe. Reconstructing aquatic resource exploitation in human Prehistory using lipid biomarkers and stable isotopes. Pulque production from fermented agave sap as a dietary supplement in Prehispanic Mesoamerica. Proceedings of the National Academy of Sciences Earliest evidence for cheese making in the sixth millennium BC in northern Europe. Immediate replacement of fishing with dairying by the earliest farmers of the northeast Atlantic archipelagos. Proceedings of the Royal Society B doi: What was a mortarium used for? Organic residues and cultural change in Iron Age and Roman Britain. Contrasting patterns of resource exploitation on the Western and Northern Isles during the Late Iron Age and Norse period revealed through organic residues in pottery. Journal of the North Atlantic. Journal of Environmental Archaeology Back to top Investigating the diet of ancient people Another very abundant and important archaeological artefact is human osteological material, which survives predominantly as remains of burials or as accidental preservation e. Archaeological plant remains, like charred seeds, can also provide insights into their exploitation and revealing the ancient practices of manuring the domesticated crops. Further reading Corr, L. Journal of Archaeological Science 32, Complementary use of marine lipid biomarker and carbon isotope signatures as novel indicators of a marine diet. Journal of Archaeological Science 35, Geochimica et Cosmochimica Acta 74, Journal of Archaeological Science 53 0: The molecules of meals: Proceedings of the Royal Irish Academy C doi: Classes of compounds, like sterols and bile acids from these anthropologically modified sediments provide and interesting insight into the world of past agricultural activities manuring , waste water disposal or reveal traces of burial practices and ritual activities. The latter was put to test, when

ancient sediments, originating from the royal Syrian tomb of Qatna, where analysed and remains of the purple dye pigments revealed in connection to the microscopic fossilised textiles. Further reading Bull, I. Journal of Archaeological Science 38 8: Vessel form and function Evershed, R. Formation of long-chain ketones in ancient pottery vessels by pyrolysis of acyl lipids. Tetrahedron Letters 36 Evidence from absorbed lipid residues dating to the British Iron Age. Journal of Archaeological Science 32 4: New chromatographic, mass spectrometric and stable isotope approaches to the classification of degraded animal fats preserved in archaeological pottery. Journal of Chromatography A 2: Resource exploitation Dudd, S. Unusual triterpenoid fatty acyl ester components of archaeological birch bark tars. Pine wood origin for pitch from the Mary Rose. Beeswax in lamps and conical cups from late Minoan Crete. New chemical evidence for the use of combed ware pottery vessels as beehives in Ancient Greece. Journal of Archaeological Science 30 1: Back to top Mummies and characterizing the embalming agents The world of the ancient Egyptians has been under the scientific scrutiny for a long time. Although most of the domestic activities, engineering work and Egyptian culture can be reconstructed by using the historical and archaeological data, the same cannot be said for the process of mummification. Without any substantial early historical reports the earliest being Herodotus , the chemical analysis is the only means to identify the complex mixtures of natural products that were used in the process. The biomarkers, present in either tissue samples, bone surfaces or bandages, show that animal fats were used as an inexpensive base, to which more exotic substances were added to enhance the smell, prevent microbial degradation and change the plasticity, such as myrrh, frankincense, pistachio resin, beeswax etc. Further reading Buckley, S. Organic chemistry of balms used in the preparation of pharaonic meat mummies. Back to top The basic analytical approach, adopted by the Organic Geochemistry Unit, relies upon the identification of preserved molecules biomarkers ; matching their distribution to the compounds present in organisms that were most likely to have been exploited in the past.

Chapter 2 : From a small patch springs varieties of paddy - The Hindu

During the past 50 years, the chemistry of archaeological materials has increasingly been used to address a broad spectrum of anthropological topics, including preservation, dating, nativity, exchange, provenance, and manufacturing technology.

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