Workshop / Department Of Archaeology / 5 April 2018

the FUTURE of the PAST

New archaeological science approaches to cultural interaction and biological exchange in prehistory

Organised by Alison Crowther

Max Planck Institute for the Science of Human History

The University Of Queensland AUSTRALIA

The Future of the Past:

New archaeological science approaches to cultural interaction and biological exchange in prehistory

A joint workshop between The University of Queensland and
Max Planck Institute for the Science of Human History

Thursday 5 April 2018

The global spread of people, plants, animals and things in prehistory brought new cultures and ideas into contact with one another and had profound impacts on shaping natural and social landscapes around the world. This workshop brings together specialists from the University of Queensland in Brisbane, Australia and the MPI-SHH in Jena to showcase research from Africa, Asia, and Australasia that applies the latest cutting-edge archaeological science techniques to shed light on global processes of cultural interaction and biological exchange; for example, tracking human arrivals in new regions, the emergence of long-distance trade links, biological exchange and the spread of farming, species extinctions, the creation of novel anthropogenic landscapes, etc. A key aim of the workshop is to discuss ways of building new collaborative links between UQ and the MPI-SHH, by connecting people, projects and methods across these institutions. The workshop will address the potential for new archaeological science methods to inform on human interaction, migration and exchange in the Old World, what key questions can be answered by these new archaeological science methods, and how research synergy between UQ and MPISHH can advance this research program.

Funded by The University of Queensland (Global Strategy and Partnerships Fund, Humanities and Social Science Faculty, and School of Social Science), and the MPI-SHH

MAX-PLANCK-GESELLSCHAFT

THE UNIVERSITY OF QUEENSLAND
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Schedule

9.00–9.10 **Nicole Boivin (MPI-SHH)**
Welcome and overview of the Department of Archaeology, MPI-SHH

9.15–9.25 **Andrew Fairbairn (UQ)**
Overview of archaeology at the University of Queensland

9.30–9.40 **Michael Petraglia (MPI-SHH)**
Hominins on the move: An assessment of anthropogenic shaping of environments in the Palaeolithic

9.45–9.55 **Andrea Picin (MPI-SHH, Friedrich Schiller Universität Jena)**
Hunter-gatherers mobility and technological organizations

10.00–10.10 **Sam Brown (MPI-SHH)**
The FINDER project: Identifying Palaeolithic hominin remains in Northern Asia using ZooMS

10.15–10.25 **Nils Vanwezer (MPI-SHH)**
Developed methods, new lands: Macro GIS approaches to the Palaeolithic of the Inner Asian Mountains

10.30–11.00 ***Coffee Break***

11.00–11.10 **Tiina Manne & Phoebe Heddell-Stevens (UQ)**
Prospects and challenges of northern Australian zooarchaeology

11.15–11.25 **Noel Amano (MPI-SHH)**
In Times of Change: Some Case Studies on Late Pleistocene to Mid-Holocene Human-Animal Interactions in South and Southeast Asia

11.30–11.40 **Courtney Culley (UQ)**
The Orangutan: From the Pleistocene to Modern Conservation

11.45–11.55 **Shevan Wilkin (MPI-SHH)**
Using proteomics to uncover ancient diet and economy

12.00–12.30 ***Discussion 1***

12.30–13.30 ***Lunch***

13.30–13.40 **Patrick Roberts (MPI-SHH)**
Stable isotope analysis at the MPI-SHH

13.45–13.55 **Anneke Janzen (MPI-SHH)**
New species, new environments: Using stable isotope analysis to document animal mobility and distributions in the past

14.00–14.10 **Anna Florin (UQ)**
Plant food use at Madjedbebe: Using archaeobotanical and isotopic methods to understand the adaptation of early modern humans to new environments in Sahul

14.15–14.25 **Jillian Swift (MPI-SHH)**
Sharing the *Umu*: Commensal diet and human niche construction in Polynesia

14.30–14.40 **Ricardo Fernandes (MPI-SHH, Cambridge)**
Presenting IsoMemo: a global initiative for the centralization of isotope and radiocarbon data

14.45–14.55 **Üstünkaya Cemre (UQ, Cambridge)**
The role of archaeobotany in climate change studies

15.00–15.30 ***Coffee Break***

15.30–15.40 **Nathan Wright (UQ, Cambridge)**
Archaeological wood analysis – more than dendrochronology and palaeo-environment reconstruction

15.45–15.55 **Andy Fairbairn (UQ)**
Disentangling plant economies and landscape change in Anatolia from the Epipalaeolithic to Post-Medieval Periods

16.00–16.10 **Alison Crowther (UQ, MPI-SHH)**
Comoros Origins Project: People, plants and their transoceanic connections

16.15–16.25 **Steve Goldstein (MPI-SHH)**
Max Planck Institute excavation projects in eastern and southern Africa

16.30–16.40 **Charlie Le Moyne (UQ)**
Bad breath and poor dental hygiene: A direct method for tracing plant use throughout the prehistory of Sub-Saharan Africa

16.45–17.00 **Jeremy Farr (UQ, UCL)**
Kawa Archaeobotany Project: New results on early agriculture in Sudan

17.00–17.30 ***Discussion 2***

18.30–18.30 ***Dinner: Zur Noll, Oberlauengasse 19, 07743 Jena***

Abstracts (in order of presentation)

Hominins on the move: An assessment of anthropogenic shaping of environments in the Palaeolithic

Michael Petraglia
Department of Archaeology, Max Planck Institute for the Science of Human History

Hominin dispersals in the Pliocene and Pleistocene have led to repeated range expansions of multiple human species, some with significant niche constructing behaviours. There is little doubt that humans have dramatically transformed global ecosystems since the adoption of agriculture by many societies in the Holocene. Beyond megafaunal extinctions, however, little attention has been paid to how pre-Holocene societies and our earlier hominin ancestors may have modified ecosystems as a consequence of subsistence-related activities and other pursuits. Evidence is reviewed here to demonstrate that the subsistence activities of hominins did in fact have an effect on local and regional environments as humans expanded their niches and territorial ranges in the Pliocene and Pleistocene. Evidence for the transformation of local ecologies in the Upper Palaeolithic of Europe is particularly convincing. Hominins also shaped their habitats through the use of fire and through the procurement and quarrying of raw materials for stone tool manufacture. Anthropogenic transformation of the natural world would appear to have begun in the Pliocene and Pleistocene, albeit on a different scale than in later periods.

Hunter-gatherers mobility and technological organizations

Andrea Picin
Department of Archaeology, Max Plank Institute for the Science of Human History, and Bereich für Ur- und Frühgeschichtliche Archäologie, Friedrich Schiller Universität Jena

Climatic fluctuations and seasonal environmental variations imposed significant restrictions on the subsistence strategies of prehistoric hunter-gatherers who do not produced food and, consequently, moved on the landscape in relation to the changes in the spatial and temporal distribution of resources. Frequent seasonal movements from different habitats was a typical strategy in foragers groups but little is known about its development and evolution during the Palaeolithic. Ethnographic studies on mobility patterns in modern hunter-gatherers reported the use of different strategies on the base of productivity of the ecosystems, settlement dynamics and population density. Generally, in territories with relative scarce biotic resources hunter-gatherers tends to move frequently whereas in plentiful environments they are less mobile and tend to camp near ecotones where resources from several habitats can be gathered at the same time. Thus far, research on the understanding of how prehistoric foragers moved on landscape are provided by the matching the raw materials with the geologic sources but this information offers only a rough indicator of the range of provisioning, rather than the type of mobility, because the raw material could have been acquired through residential or logistical movements. The application of a high-resolution approach discriminating the different patterns of lithic

artefacts transport and disentangling the settlement palimpsests is critical for understanding the behavioural trajectories of the human species on the management of the territory.

The FINDER project: Identifying Palaeolithic hominin remains in Northern Asia using ZooMS

Sam Brown
Department of Archaeology, Max Planck Institute for the Science of Human History

The identification of human remains is one of the most significant hurdles to those studying the Palaeolithic. Human remains are a rare discovery in the archaeological record, particularly at Palaeolithic sites where very specific conditions are required to preserve bone over tens of thousands, if not hundreds of thousands of years. Conversely, advancements in biomolecular techniques means that we now know more than ever before about when and where ancient hominins were moving, their dietary behaviour, and the genetic links between them. Without their physical remains however these investigations are severely hampered. Using Zooarchaeology by Mass Spectrometry (ZooMS), FINDER aims to address this problem by targeting assemblages of fragmented and morphologically unidentifiable bone from key Middle and Upper Palaeolithic sites in order to identify the hominin remains amongst them. Specifically, this research will look at sites within Northern Asia where Denisovans are believed to have been present in the hopes of expanding the physical remains known to them, a single distal phalanx bone and three teeth. Once hominin remains have been identified this project will then begin investigating them further using a range of techniques including stable isotopes, radiocarbon dating, and DNA analysis.

Developed methods, new lands: Macro GIS approaches to the Palaeolithic of the Inner Asian Mountains

Nils Vanwezer
Department of Archaeology, Max Planck Institute for the Science of Human History

Although GIS methods have existed for several decades, the recent advances in computational power has broadened not just the possibilities of using GIS methodology, but also, it's accessibility. Despite this, GIS methods have seen very little use in the Palaeolithic in comparison to later period. Especially on large macro-scales. This is notably evident in Inner Asia. Using published sites, GIS analysis can be easily done across gigantic regions to look at broad patterns in settlements, surface assemblages, climate, migration routes, etc. In addition, this initial analysis can assist archaeological prospection, by using the discovered patterns to assess areas with higher probabilities of finds. A preliminary “work in progress” display of these methods in Mongolia and Uzbekistan will be explained and discussed.

Prospects and challenges of northern Australian zooarchaeology

Tiina Manne[1] and Phoebe Heddell-Stevens[1,2]
1. School of Social Science, The University of Queensland
2. Institute of Archaeology, University College London

Zooarchaeological research in the northern Australia offers exciting prospects of revealing new dimensions of prehistoric human behaviour in these environmentally diverse areas. However, current research is limited by a range of issues, including incomplete taxonomic and distributional knowledge of most groups of vertebrates, limited information on the behavioural ecology of many species, and for all but a few regions, little knowledge of Quaternary environmental history. More practical issues derive from the aggressive chemical environment in many sites and low sedimentation rates in others, both factors leading to highly fragmented assemblages, with the key taphonomic processes often not well understood. Access to inclusive reference collections also inhibits our capacity to analyse these assemblages. Here we explore the prospects and challenges of carrying out zooarchaeological research in the north and in the process, highlight exciting potential areas of research.

In Times of Change: Some Case Studies on Late Pleistocene to Mid-Holocene Human-Animal Interactions in South and Southeast Asia

Noel Amano
Department of Archaeology, Max Planck Institute for the Science of Human History

I will present results of ongoing analyses of faunal remains from sites in Sri Lanka, Indonesia and the Philippines. These sites have deposits dating from before the Last Glacial Maximum until the Mid-Holocene, a period of dramatic climatic changes. In Sri Lanka, the results suggest specialized, heavy exploitation of small-bodied rainforest-adapted taxa during the past 35 thousand years. This is in contrast to the patterns observe in Southeast Asian sites where there is specialized hunting of large, grassland-adapted ungulates during the Late Pleistocene and a dramatic shift to hunting arboreal-semi arboreal taxa during the Holocene. Ongoing analyses also include dental wear and enamel isotope analyses for paleoenvironmental reconstruction. Together, the results aim to provide unique insights on hunting strategies of prehistoric foraging communities and the environment they encountered in South/Southeast Asia during a key period in human history.

The Orangutan: From the Pleistocene to Modern Conservation

Courtney Culley
School of Social Science, The University of Queensland

19 megafauna genera became extinct during the Pleistocene in Southeast Asia. The nature of these extinction events has been heavily debated concerning the role of humans, climate change or a combination of both. Although it is important to understand the causes of

extinction events, extinctions research can also inform the conservation of contemporary biodiversity. There are roughly 568 mammal species in Southeast Asia today that are threatened with extinction due to habitat destruction and hunting. By exploring the nature of Pleistocene mammal extinctions, conservation palaeobiologists can develop more robust and targeted plans to safeguard Southeast Asia's threatened fauna. In this study, ecological variables of extinct fossil mammals, including body mass, dietary preference, habitat preference and locomotor adaptation are compared to living species to make inferences about modern conservation issues, namely the orangutan. The results show a contrast between the ecology of extinct species due to climatic factors and contemporary species threatened by human impacts.

Using proteomics to uncover ancient diet and economy

Shevan Wilkin
Department of Archaeology, Max Planck Institute for the Science of Human History

Archaeological proteins can tell us a lot about ancient diet and economy, which can be especially helpful in situations where little to know material culture is preserved. Proteins are regularly extracted from dental calculus, ceramic residues, and mummified human tissue, all of which can help identify foods consumed during life, and the species of plants and animals exploited. Here we detail a new study that has identified evidence for various species specific milk peptides in dental calculus, stressing the importance of dairy in ancient Mongolian subsistence strategies.

Stable isotope analysis at the MPI-SHH

Patrick Roberts
Department of Archaeology, Max Planck Institute for the Science of Human History

The Department of Archaeology's stable isotope research group is committed to applying stable isotope methods within multidisciplinary research programmes that are focused on human palaeoclimates, palaeoenvironments, palaeodiets and palaeomobility. Here, I review the equipment we have available for the bulk stable isotope analysis of organic and inorganic remains and the compound specific isotope analysis of leaf wax biomarkers in sediments, pottery lipid residues, and amino acids in bone collagen. I outline some of our current main applications of these techniques, with a particular focus on building 'on-site' records of human palaeodiet, palaeoecology, and landscape interactions in the tropics of Africa, South Asia, Southeast Asia, and Melanesia. This is bridging traditional gaps between natural and anthropogenic terrestrial palaeoenvironmental records and enabling more detailed comparison and understanding of humans within their global, regional, and local environments.

New species, new environments: Using stable isotope analysis to document animal mobility and distributions in the past

Anneke Janzen
Department of Archaeology, Max Plank Institute for the Science of Human History

The use of multiple stable isotopes a powerful tool to document mobility of both people and animals. The ecological and geological diversity of eastern Africa allows us to assess movements of individuals across the landscape. Intra-tooth sequential sampling of tooth enamel presents an isotopic record of diet during tooth formation, and with detailed isotopic baseline data, seasonal mobility of herded livestock and migratory wild species can be tracked. Such analyses have revealed dynamic histories of species distributions and the evolution of herding practices in eastern Africa. Stable isotope analysis thus has great potential for examining the introduction and evolution of pastoralism across Africa.

Plant food use at Madjedbebe: Using archaeobotanical and isotopic methods to understand the adaptation of early modern humans to new environments in Sahul

Anna Florin
School of Social Science, The University of Queensland

This presentation will discuss my PhD research at Madjedbebe, a 65,000 year old rockshelter in western Arnhem Land (northern Australia). My research at the site focuses on the charred plant macrofossils recovered through bulk-sediment flotation from two one-metre-squared trenches and all adjacent excavated features. The assemblage, which spans the 65,000-year sequence of occupation at the rockshelter, allows insights into diet, landscape use and past climate. In order to explore these areas of interest, my PhD research has focused on the identification of tropical plant macrofossils, especially underground storage organs, and the stable carbon isotopic analysis of *Pandanus* sp. drupes to create a proxy for past rainfall. This presentation will focus on my progress so far with these two scientific techniques.

Sharing the Umu: Commensal diet and human niche construction in Polynesia

Jillian Swift
Department of Archaeology, Max Planck Institute for the Science of Human History

Commensal animals live in close association with human populations, though unlike domestic species are generally not under direct human management. As such, isotopic reconstructions of commensal diet can provide information on resource flows at the nexus of societies and ecosystems. Stable carbon and nitrogen isotope analysis of Pacific rat (*Rattus exulans*) remains recovered from Polynesian archaeological sites reveal significant and lasting transformations to island nutrient pathways after human arrival. Changes in rat diet can be traced back to local- and global-scale processes including human land use and site activities, resource intensification, and faunal community restructuring. This novel quantitative method for examining the deep-time impacts of human niche construction

activities on anthropogenic food webs can be compared with modern ecological datasets and extended to other regions and taxa.

Presenting IsoMemo: a global initiative for the centralization of isotope and radiocarbon data

Ricardo Fernandes
Department of Archaeology, Max Planck Institute for the Science of Human History, and McDonald Institute for Archaeological Research, University of Cambridge

IsoMemo (http://www.isomemo.com) is a Big Data initiative bringing together isotopic and radiocarbon data from various research fields including archaeology. This global initiative includes several partners including AustArch, a radiocarbon database for Australia, and the New Zealand Radiocarbon Database. The goals of IsoMemo are to establish common data standards, sharing and centralizing data, creating tools such as user-friendly graphical interfaces for simple upload and download of data, and building interdisciplinary projects. Currently under development is the IsoMemo R package which will include Bayesian analysis capabilities. In this paper, several examples will be presented to illustrate the archaeological potential of IsoMemo. This will include mapping the chronological spread of technological and cultural developments and past trends in human diet and mobility.

The role of archaeobotany in climate change studies

Ustunkaya M. Cemre
School of Social Science, The University of Queensland, and
The McDonald Institute, University of Cambridge

Archaeobotanical studies have been primarily used to answer questions related to the origins of agriculture, subsistence strategies of ancient populations, and environmental change in the past. The coupling of standardised archaeobotanical analyses with stable isotope analyses will make it possible to look into past climate patterns by providing a climate proxy directly linked to human activity. I will talk about my research in Turkey where I have been investigating if changing climate patterns played a role in the destabilisation of the Hittite Empire during the Late Bronze Age period through use of combined archaeobotanical techniques, stable isotope analysis and grain weight analysis. I will also talk about my current research in India as part of the TwoRains Project where I am investigating the impact of the changing Indian monsoon in the Early Bronze Age.

Archaeological wood analysis – more than dendrochronology and palaeo-environment reconstruction

Wright Nathan J.
School of Social Science, The University of Queensland, and
The McDonald Institute, University of Cambridge

The study of archaeological wood (anthracology) - whether it be charred, waterlogged or mineralised – can yield a comprehensive archive of the environmental conditions ancient societies encountered and interacted with. However, over the last 100 years, despite the maturing of anthracology as a science, it has been primarily used for palaeo-environment reconstruction and dendrochonological analyses. These analyses are increasingly being used to inform us of more substantive archaeological questions relating to woodland management and resource use as well as being used to address key palaeo-climate questions via stable isotope applications. I will show some of the new and exciting uses for anthracology via a brief overview of the state of the art and a discussion of some case studies from my own work in Turkey and Malta.

Disentangling plant economies and landscape change in Anatolia from the Epipalaeolithic to Post-Medieval Periods

Andrew Fairbairn
School of Social Science, The University of Queensland

Anatolia is increasingly recognised as being a significant region for understanding the human past and is shaking off its status as 'the bit in the middle' between Europe and the Near East. Rather than simply being a corridor between two major cultural regions, Anatolia's complex topography, high montane centre and environmental gradients has led to the development of a complex history all of its own. Archaeoboanical research in Anatolia has been patchy, providing a varied view of those pasts. My research over 19 years has aimed to develop and understanding on the diversity of landscape and economic change in Central Anatolia, including in the Epipalaeolithic to Neolithic of the Konya Plain, and from the EBA to Ottoman period of the central plateau at sites between Ankara and Kayseri. In this talk, I will summarise some of the results of that work and point out the many areas ripe for future projects.

Comoros Origins Project: People, plants and their transoceanic connections

Alison Crowther
School of Social Science, The University of Queensland, and
Department of Archaeology, Max Planck Institute for the Science of Human History

The Comoros Origins Project seeks to understand who the first Comorians were, and how pre-modern trade and migration helped shape the archipelago’s unique cultural and biological diversity. First colonised by humans around the 8th century CE, this small chain of

stepping stone islands is a critical geographical link between mainland East Africa (occupied in the first millennium largely by Bantu-speaking farmers) and the 'island continent' of Madagascar (populated today by people who speak Austronesian languages derived from island Southeast Asia). Genetic studies indicate that both African and Asian populations contributed to the modern Comorian gene pool, and recent archaeological and ancient DNA findings by our team suggest that the Comoros may have been settled by Austronesian-speaking peoples prior to the settlement of Madagascar. Early sites are also rich in imported ceramics and other exotic goods, particularly from the Middle East, indicating the importance of long-distance trade in the archipelago's settlement history. Using new multi-disciplinary archaeological science approaches, the project aims to define how and when admixture occurred between Asian, African and Middle Eastern populations in the Comoros; the social, cultural and economic contexts in which these processes occurred; and the broader role played by the Comoros in the westward Austronesian expansion.

Max Planck Institute excavation projects in eastern and southern Africa

Steve Goldstein
Department of Archaeology, Max Planck Institute for the Science of Human History

The spread of food production in sub-Saharan Africa occurred against the back drop of major demographic and climatic change over the last 5,000 years. Herding preceded farming in many regions, however lifeways based on plant agriculture, mobile pastoralism, and fishing-hunting-gathering developed complex systems of co-reliance and interaction. Systems of interaction spanned this cultural and economic diversity to facilitate the movement of various crop plants and domesticated into new environments. Few archaeological excavations have investigated these issues in recent decades, and even fewer of these have had the resources to carry out high resolution recovery and lab analyses. Two new Max Planck Institute excavations projects have been launched to address this issue, focusing on the transition to the early Iron Age and the arrival of domesticated plants and animals at field sites in southwestern Kenya, and in Zambia. These projects are providing a wealth of datasets with great potential for elaborating chronological, economic, demographic, and environmental questions about transitions to food production in the African interior. This paper outlines ongoing excavations, highlighting opportunities for research collaborations.

Bad breath and poor dental hygiene: A direct method for tracing plant use throughout the prehistory of Sub-Saharan Africa

Charles Le Moyne
School of Social Science, The University of Queensland

As a primary source of carbohydrates, plants play a particularly important role in human history. Changes and variation in the use of plant resources reflect the adaptability of subsistence economies and strategies. However, the intricacies of plant use in Sub-Saharan African cuisines throughout pre-history remain an enigma, as the dynamic depositional environments of equatorial Africa bias archaeobotanical assemblages in sediments and residues. This talk will discuss the results of my previous research on plant use at the major

East African coastal trading site of Unguja Ukuu (c. 600 – 1000 A.D.), and will contextualize this within my ongoing research using dental calculus as a direct proxy of ancient diet in Sub-Saharan Africa.

Kawa Archaeobotany Project: New results on early agriculture in Sudan

Jeremy Farr
School of Social Science, The University of Queensland, and
Institute of Archaeology, University College London

Ancient Nubia was the link between sub-Saharan Africa and the Levant, yet, until fairly recently, there has been an absence of archaeobotanical data to investigate topics such as agricultural practices, diet, economics, and trade and exchange with other regions. In this presentation, I will discuss my ongoing work on the archaeobotanical analysis of samples taken from the excavations at Kawa, led by Derrick Welsby in 1998, 2000, and 2001 (part of a wide-ranging programme of field work coordinated by the British Museum and Sudan's National Corporation for Antiquities and Museums). An early analysis of 24 samples by Dorian Fuller in 2004 provided macro-botanical evidence of cereals such as barley; emmer wheat; wild millet (akin to *Setaria sphacelata*); and intriguingly, sorghum. The samples also contain macro-botanical evidence of lentils and fruits including doum palm, figs, dates, and grape. I will discuss how my findings so far compare to this initial analysis and to the significant archaeobotanical project led by Phillipa Ryan, further north at Amara West. I will also touch upon the debate on the domestication of sorghum and its presence in Nubia during the early Kushite period pre-400 BCE.