From Anthrosphere to Lithosphere (and back again): A Celebration of the Career and Research of Terry O’Connor

6th – 8th November 2015

University of York
FROM ANTHROSPHERE TO LITHOSPHERE (AND BACK AGAIN):

A CELEBRATION OF THE CAREER AND RESEARCH OF TERRY O’CONNOR

Lee G. Broderick
Clare Rainsford
Eva Fairnell
Carol Lang
Julie Bond
Matthew Collins

© 2015

Department of Archaeology
University of York
FROM ANTHROSPHERE TO LITHOSPHERE (AND BACK AGAIN):
A CELEBRATION OF THE CAREER AND RESEARCH OF TERRY O’CONNOR
IS GENEROUSLY SUPPORTED BY:

ZEISS

OLYMPUS®
Your Vision, Our Future

Association for Environmental Archaeology

OXBOW books

BAR
Since 1974

THE UNIVERSITY OF YORK
Get your radiocarbon results before your research fossilizes

• Results in as little as 2-3 days
• Queries answered within 24 hours
• Results available online

Beta Analytic
Radiocarbon Dating
Since 1979

Australia  Brazil  China  India  Japan  Korea  UK  USA
www.radiocarbon.com
# Contents

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conference Planner</td>
<td>1</td>
</tr>
<tr>
<td>Terry O’Connor and Environmental Archaeology</td>
<td>2–3</td>
</tr>
<tr>
<td>Map Showing York City Centre and Heslington West Campus</td>
<td>4</td>
</tr>
<tr>
<td>Map of Heslington West Campus</td>
<td>5</td>
</tr>
<tr>
<td>Using Social Media at the Conference</td>
<td>6</td>
</tr>
<tr>
<td>Make the Most of your Conference Registration</td>
<td>6</td>
</tr>
<tr>
<td>Timetable</td>
<td>7</td>
</tr>
<tr>
<td>Oral Presentations:</td>
<td></td>
</tr>
<tr>
<td>Taphonomic Processes – <em>chair: Lee G. Broderick</em></td>
<td>11–17</td>
</tr>
<tr>
<td>The Environmental Archaeology of Cave Sites – <em>chair: Sue Stallibrass</em></td>
<td>19–23</td>
</tr>
<tr>
<td>New Techniques to Answer Old Questions – <em>chair: Matthew Collins</em></td>
<td>25–41</td>
</tr>
<tr>
<td>Directions in Environmental Archaeology – <em>chair: Julie Bond</em></td>
<td>43–47</td>
</tr>
<tr>
<td>The Environmental Archaeology of Urban Sites – <em>chair: Clare Rainsford</em></td>
<td>49–55</td>
</tr>
<tr>
<td>Human–Animal / Animal–Human Relationships – <em>chair: Eva Fairnell</em></td>
<td>57–69</td>
</tr>
<tr>
<td>IGNITE papers – <em>chair: Carol Lang</em></td>
<td>71–77</td>
</tr>
<tr>
<td>Poster Presentations</td>
<td></td>
</tr>
<tr>
<td>Post-Script: Useful Advice for Newbie Zooarchaeologists</td>
<td>88–89</td>
</tr>
<tr>
<td>Additional Note Pages</td>
<td>90–94</td>
</tr>
<tr>
<td>FRIDAY</td>
<td>SATURDAY</td>
</tr>
<tr>
<td>----------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>9.00</td>
<td>coffee/registration</td>
</tr>
<tr>
<td>9.20</td>
<td></td>
</tr>
<tr>
<td>9.40</td>
<td>Taphonomic Processes and Assemblage Formation</td>
</tr>
<tr>
<td>10.00</td>
<td></td>
</tr>
<tr>
<td>10.20</td>
<td></td>
</tr>
<tr>
<td>10.40</td>
<td></td>
</tr>
<tr>
<td>11.00</td>
<td></td>
</tr>
<tr>
<td>11.40</td>
<td></td>
</tr>
<tr>
<td>12.00</td>
<td>The Environmental Archaeology of Cave Sites</td>
</tr>
<tr>
<td>12.20</td>
<td></td>
</tr>
<tr>
<td>12.40</td>
<td>New Techniques to Answer Old Questions</td>
</tr>
<tr>
<td>1.00</td>
<td>lunch</td>
</tr>
<tr>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>2.20</td>
<td></td>
</tr>
<tr>
<td>2.40</td>
<td>New Techniques to Answer Old Questions</td>
</tr>
<tr>
<td>3.00</td>
<td></td>
</tr>
<tr>
<td>3.20</td>
<td>coffee</td>
</tr>
<tr>
<td>4.00</td>
<td></td>
</tr>
<tr>
<td>4.20</td>
<td></td>
</tr>
<tr>
<td>4.40</td>
<td>New Techniques to Answer Old Questions</td>
</tr>
<tr>
<td>5.00</td>
<td>Registration</td>
</tr>
<tr>
<td>5.30</td>
<td></td>
</tr>
<tr>
<td>6.00</td>
<td>Keynote Presentation - Don Brothwell, Mark</td>
</tr>
<tr>
<td></td>
<td>Maltby, Naomi Sykes &amp; Lee G. Broderick</td>
</tr>
<tr>
<td>7.00</td>
<td>Reception</td>
</tr>
</tbody>
</table>
Terry O’Connor and Environmental Archaeology

Lee G. Broderick

It is only six years since the AEA last held their annual conference at York. That was a special occasion: with the organisation celebrating its 30th anniversary York was seen as the natural host. The university also hosted the conference in 1991 but its links go far deeper than that. Several of the founding members of the AEA were members of the Environmental Archaeology Unit (EAU) based in the Department of Biology at the University of York in the 1970’s and 1980’s. Indeed, it was that group who produced the association’s first journal – Ciraea – between 1984 and 1994, with Terry O’Connor acting as co-editor for several issues.

It is appropriate that a conference celebrating Terry’s career should be held in a city which has acted as his home, workplace and field of study. Terry retired from the University of York in early 2015 after 16 years in position, during which time he taught and supervised three of the conference committee members and at least nine other delegates, including his successor, David Orton. It says a great deal about the esteem in which Terry is held and about his influence within our discipline that York plays host to the conference for a third time (the first university to do so) so shortly after the second, in order to honour him. His publications dealing with the zooarchaeology of York (and, with his colleagues, the wider environmental archaeology of the city) remain benchmark studies within the field of urban environmental archaeology. More recent publications have continued to push boundaries, ranging from dietary isotopes on early Mediaeval pigs to using taphonomy to inform retention strategies. His association with the York Archaeological Trust is long-standing and included a stint as a Board Member and Trustee from 2005-2010.

Terry left the EAU to join the University of Bradford in 1990, where he was instrumental in establishing their archaeological science programme. In 1991 he returned to York to fulfil a similar role; on his Academia.edu profile he writes that ‘he is interested in the role of archaeology as a means of communicating the principles and excitement of science’. All of us would agree that he has demonstrated just that numerous times. It is perhaps in this light that it is best to view the two textbooks that have become essential reading for a generation of archaeology students – The Archaeology of Animal Bones and (with John Evans) Environmental Archaeology: Principles and Methods.

His passion for his subject has extended beyond the realms of enthusing others, however, and his career has been marked by a tendency to asking probing questions of himself and his colleagues as to the role of our discipline: ‘Economic Prehistory
or Environmental Archaeology?’, as he pointedly asked in the title of a 2001 paper. This concern over what environmental archaeology could, or should, be can perhaps be linked to an early concern with environmental archaeology being a part of archaeology – answering archaeological questions – and not an environmental curio. He specialised in ‘field archaeology and the study of animal remains’ while studying at UCL and his desire for environmental archaeology to be practised as field archaeology was particularly evident in The Analysis of Urban Animal Bone Assemblages: A Handbook for Archaeologists.

Terry remained at UCL to complete his PhD under the guidance of Don Brothwell, investigating morphometric variation in sheep bones. Both sheep bones and morphometrics were to continue to play large roles in his career – the latter combining with a domestic interest when he investigated osteological differences between domestic cats and the wild cat. His other interests outside archaeology have also continued to inform his academic career – his love of walking and wild places have, no doubt, had more than a little influence on his continuing interest in the archaeology of caves.

Whether in archaeospeleology, urban environments, the Post-Mediaeval or the Peri-Glacial, Britain or Africa, Terry has always shown an openness to new ideas. The huge variety of papers presented at this conference are testament to that and, truth be told, we (as organisers) were challenged to limit the themes to an amount appropriate for a two-day event. Contributing enormously to the development of taphonomic studies in zooarchaeology (see Biosphere to Lithosphere) he has also been involved in the adoption of new techniques such as isotopic analysis and aDNA studies in archaeology. It was with some glee that he approached the study of a prehistoric brain discovered on York’s new campus – research led by Sonia O’Connor.

Perhaps most importantly, Terry’s career is also a record of very many successful collaborations, good friendships and inspired students – far too many to mention individually. It is, however, very hard to talk about Terry without also mentioning Sonia. To amend a tired old cliché, alongside every successful man there is a successful woman, with whom Terry has worked, supported and been supported by throughout his career. We’d like to thank Sonia in particular for her support in organising this conference.

In a note of typical understatement taken from Terry’s staff page on the University of York website, Terry “retired early in 2015, but continues to work and publish in zooarchaeology.” Since retirement, Terry has published at least three papers, is the current President of ICAZ and remains as Professor Emeritus of Archaeological Science at the University of York. On behalf of the whole conference, we would like to wish him a long and productive retirement.
Using Social Media at the Conference

You can keep up to date with the latest conference news and interact with us directly by following our Twitter account, @AEA_2015, or by using the Twitter hashtag #aeayrk.

To help our presenters let you know whether or not they are happy for you to discuss their research on social media we have adopted a simple yes/no system. If a presenter displays the symbol on the left on their title slide or poster then they are happy for their work to be discussed online, if they display the symbol on the right then they are not. In either case, we hope you respect their wishes.

Please note that the use of either symbol should be taken to apply for all social media – not just Twitter.

Make the Most of your Conference Registration

Present your conference registration badge, or a copy of this programme, before 10\textsuperscript{th} November at any Yorkshire Archaeological Trust (YAT) attraction for a 25% discount on entry or at the Yorkshire Museum for discounted entry of £6.

\textbf{YAT attractions:} Jorvik Viking Centre, DIG: An Archaeological Adventure, Barley Hall, Richard III Experience, Henry VII Experience
## Timetable

<table>
<thead>
<tr>
<th>When</th>
<th>What</th>
<th>Where</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Friday</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.00pm</td>
<td><strong>Registration</strong></td>
<td>BS/104</td>
</tr>
<tr>
<td>6.00pm</td>
<td><strong>Keynote Presentation – Don Brothwell, Mark Maltby, Naomi Sykes &amp; Lee G. Broderick</strong></td>
<td>BS/005</td>
</tr>
<tr>
<td>7.00pm</td>
<td><strong>Drinks Reception</strong></td>
<td>BS/104</td>
</tr>
<tr>
<td><strong>Saturday</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.00am</td>
<td><strong>Tea &amp; Coffee/Registration</strong></td>
<td>BS/104</td>
</tr>
<tr>
<td>9.40am</td>
<td>Digestive Taphonomy in Archaeobotany: A Gnawing Problem – D. O’Meara</td>
<td>BS/005</td>
</tr>
<tr>
<td>10.00am</td>
<td>A Feast of Ducks? The Taphonomic History of Faunal Remains from Oakington Anglo-Saxon Cemetery – J. Notingham, <em>et al.</em></td>
<td>BS/005</td>
</tr>
<tr>
<td>10.20am</td>
<td>Profiling Taphonomic History Through Bone Fracture Analysis – E. Johnson, <em>et al.</em></td>
<td>BS/005</td>
</tr>
<tr>
<td>10.40am</td>
<td>What Doesn't Kill Me Makes Me Stronger. How to Turn the Taphonomic History of (Sub)Fossil Small Mammal Assemblages into Archaeozoologists Favour – B. Toskan</td>
<td>BS/005</td>
</tr>
<tr>
<td>11.00am</td>
<td><strong>Tea &amp; Coffee</strong></td>
<td>BS/104</td>
</tr>
<tr>
<td>11.40am</td>
<td>Reading the Bones: Multiple Interpretations of Human Activity in Doghole Cave, Cumbria – H. O’Regan, <em>et al.</em></td>
<td>BS/005</td>
</tr>
<tr>
<td>12.00pm</td>
<td>Reassessing the Irish Cave Fauna – R. Carden</td>
<td>BS/005</td>
</tr>
<tr>
<td>12.20pm</td>
<td>Faunal Contextualisation of Mixed Human and Animal Assemblages from the Yorkshire Dales – E. Keenan &amp; T. O’Connor</td>
<td>BS/005</td>
</tr>
<tr>
<td>12.40pm</td>
<td>Blood from a Stone: Petrosals and Ancient DNA – V. Mullin</td>
<td>BS/005</td>
</tr>
<tr>
<td>1.00pm</td>
<td><strong>Lunch</strong></td>
<td>BS/104</td>
</tr>
<tr>
<td>2.00pm</td>
<td>Reconstructing Past Herbivore Abundance using Dung Fungal Spores: A Taphonomic Approach – E. Van Asperen</td>
<td>BS/005</td>
</tr>
<tr>
<td>When?</td>
<td>What?</td>
<td>Where?</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>2.20pm</td>
<td>Using Biomolecules to Identify Ancient Remains of the Atlantic Gray Whale (<em>Eschrichtius robustus</em>)</td>
<td>BS/005</td>
</tr>
<tr>
<td></td>
<td>– C. Speller, <em>et al.</em></td>
<td></td>
</tr>
<tr>
<td>2.40pm</td>
<td>Site Ecology and Environment at the Bradford Kaims; Phytoliths and Thin-Sections as Indicators of Burnt Mount Depositional Sequences</td>
<td>BS/005</td>
</tr>
<tr>
<td></td>
<td>– T. Gardner</td>
<td></td>
</tr>
<tr>
<td>3.00pm</td>
<td>Sweet Chestnut (<em>Castanea sativa</em>) in Britain – Using New Techniques and Information to Test its Status as an ‘Archaeophyte’ of Roman Origin – R. Jarman, <em>et al.</em></td>
<td>BS/005</td>
</tr>
<tr>
<td>3.20pm</td>
<td><strong>Tea &amp; Coffee</strong></td>
<td>BS/104</td>
</tr>
<tr>
<td>4.00pm</td>
<td>Isotopic Landscapes: Faunal $\delta^{13}$C and $\delta^{15}$N Values from the Thames Valley – J. Hamilton, <em>et al.</em></td>
<td>BS/005</td>
</tr>
<tr>
<td>4.20pm</td>
<td>Using Modern Analogue Coleopteran (Beetle) Datasets to Quantify Landscape Cover and Human Activity – G. Hill, <em>et al.</em></td>
<td>BS/005</td>
</tr>
<tr>
<td>4.40pm</td>
<td>Developing Understanding of Ephemeral Mesolithic Sites through Geoarchaeological Techniques – C. Rowley, <em>et al.</em></td>
<td>BS/005</td>
</tr>
<tr>
<td>5.00pm</td>
<td>Exploring Extinction and Community Biodiversity using Niche Models – N.J. Whitehouse, <em>et al.</em></td>
<td>BS/005</td>
</tr>
<tr>
<td>5.30pm</td>
<td><strong>Association for Environmental Archaeology AGM</strong></td>
<td>BS/005</td>
</tr>
<tr>
<td>7.00pm</td>
<td><strong>Conference Dinner</strong></td>
<td>York</td>
</tr>
<tr>
<td></td>
<td><strong>York Brewery</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Sunday</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.00am</td>
<td><strong>Tea &amp; Coffee/Registration</strong></td>
<td>BS/104</td>
</tr>
<tr>
<td>9.40am</td>
<td>IGNITE papers</td>
<td>BS/005</td>
</tr>
<tr>
<td>10.05am</td>
<td>There’s More than One Way to Skin a Cat: Equifinality and Developer-Funded Archaeology – S. Richer, <em>et al.</em></td>
<td>BS/005</td>
</tr>
<tr>
<td>10.25am</td>
<td>The Debateable Territory where Geology and Archaeology Meet: Reassessing the Early Archaeobotanical Work of Clement Reid and Arthur Lyell in Silchester – L. Lodwick</td>
<td>BS/005</td>
</tr>
<tr>
<td>When</td>
<td>What</td>
<td>Where</td>
</tr>
<tr>
<td>----------</td>
<td>----------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>10.45am</td>
<td>From Coring Point to Landscape: Using Pollen Dispersal Modelling to Explore Hypotheses of Archaeological Landscape Organisation and Change – M.J. Bunting</td>
<td>BS/005</td>
</tr>
<tr>
<td>11.05am</td>
<td><strong>Tea &amp; Coffee</strong></td>
<td>BS/104</td>
</tr>
<tr>
<td>11.40am</td>
<td>The Archaeology of Excrement: The Passed and Present – A.K.G. Jones</td>
<td>BS/005</td>
</tr>
<tr>
<td>12.00pm</td>
<td>Urban Animals: People and Poultry in Later Post-Medieval Belfast – B.T. Fothergill</td>
<td>BS/005</td>
</tr>
<tr>
<td>12.20pm</td>
<td>The Blood of the Beasts: The Social Taphonomy of Cattle Bones in a Mediaeval City – L.G. Broderick</td>
<td>BS/005</td>
</tr>
<tr>
<td>12.40pm</td>
<td>Mediaeval Towns under the Microscope: Integrating Micromorphology, MicroXRF and Phytoliths – B. Wouters, <em>et al.</em></td>
<td>BS/005</td>
</tr>
<tr>
<td>1.00pm</td>
<td><strong>Lunch</strong></td>
<td>BS/104</td>
</tr>
<tr>
<td>1.00pm</td>
<td>AEA Committee Meeting</td>
<td>BS/007</td>
</tr>
<tr>
<td>2.00pm</td>
<td>Herd Demographics in Zooarchaeology: A Critical, Simulation-Based Assessment of the Viability of the Standard Mandibular Approach – D. Orton &amp; J. Wolfhagen</td>
<td>BS/005</td>
</tr>
<tr>
<td>2.20pm</td>
<td>Variations of <em>Apodemus</em> Mandibular Morphology During the Holocene: Functional Implications – E. Kerr, <em>et al.</em></td>
<td>BS/005</td>
</tr>
<tr>
<td>2.40pm</td>
<td>Super Furry Animals: Locating Foxes and Badgers in Anglo-Saxon Life – K. Poole</td>
<td>BS/005</td>
</tr>
<tr>
<td>3.00pm</td>
<td>Zooarchaeology of Emotion and Grief – J. Morris</td>
<td>BS/005</td>
</tr>
<tr>
<td>3.20pm</td>
<td><strong>Tea &amp; Coffee</strong></td>
<td>BS/104</td>
</tr>
<tr>
<td>4.00pm</td>
<td>Nest Egg: The Role of Eggs in Reconstructing Past Avian–Human Relationships – J. Best</td>
<td>BS/005</td>
</tr>
<tr>
<td>4.20pm</td>
<td>Diverse Ritual Practices in two Late Roman Landscapes, or Where’s My Cow? - C. Rainsford &amp; D. Roberts</td>
<td>BS/005</td>
</tr>
<tr>
<td>4.40pm</td>
<td>Human–Animal Relations in Iron Age Wessex: A Histological Study of Pit Deposits from the Danebury Environ, Hampshire, UK – R. Madgwick &amp; T. Booth</td>
<td>BS/005</td>
</tr>
</tbody>
</table>
Digestive Taphonomy in Archaeobotany: A Gnawing Problem

Don O’Meara
Durham University

The work of Professor Terry O’Connor was first encountered by me as an undergraduate student. His textbook *Environmental Archaeology* with John Evans, and his core text *The Archaeology of Animal Bones*, were the two key texts that influenced me (and no doubt many others) to become an environmental archaeologist. Other influences directed me towards archaeobotanical research and it is in this field this presentation is situated. Though my main area of research is in archaeobotany the emphasis Professor O’Connor gave to taphonomy had a lasting impact on my work. Perhaps slightly oddly it was his text *The Analysis of Urban Animal Bone Assemblages*, which formed the original methodological basis for my archaeobotanical study of Mediaeval cesspit remains. Specifically I was interested in the very different ways taphonomy is treated in zooarchaeology and archaeobotany. Because of the different origins of each field, digestive taphonomy has been a keystone of zooarchaeology research (including O’Connor’s own contribution on cat gnawing with Moran), whereas in archaeobotany it has rarely been examined via experimental research. This presentation presents the results of digestive taphonomy experiments on botanical material as part of a study to understand the formation of urban cesspit assemblages. Though this type of work demonstrates the different manner in which taphonomy has been approached by the two fields, it also demonstrates how archaeobotanical studies can learn from the manner in which zooarchaeology devotes such careful attention to taphonomic issues. It also raises questions about how archaeobotanical studies treat the ‘invisible’ botanical material: plants with a strong presence in the historical record but few or no archaeobotanical records. Though many environmental archaeologists will never have worked with Professor O’Connor, this presentation demonstrates that even outside the zooarchaeological field he has left a lasting impression on many environmental archaeologists.
A Feast of Ducks? The Taphonomic History of Faunal Remains from Oakington Anglo-Saxon Cemetery

James Nottingham, James Morris, Duncan Sayer
University of Central Lancashire

When we consider the animals present in mortuary rites of the early Anglo-Saxon period, the majority of archaeologists first think of horse burials associated with inhumations and cremations. However, other animal remains were also present in Early Anglo-Saxon burials. The example of an articulated cow at the early Anglo-Saxon cemetery at Oakington, Cambridgeshire, UK, demonstrates the variability observed in these deposits. Furthermore, animal burials are not the only pathway in which faunal remains appear in the archaeological record. Animal remains are often recovered from grave fills, sometimes as partially articulated bone groups, and frequently as individual elements. Often the faunal remains may be viewed as ‘offerings’, but the process of defining these grave goods can prove problematic, with residual animal bone being part of the sedimentary clast obscuring the picture. A key in analysing these bones is to identify the cultural and natural taphonomic transformations present in the assemblage.

Using a taphonomic model to consider pre and post-depositional histories, a faunal assemblage of 526 animal bones from the graves at the Anglo-Saxon cemetery of Oakington was analysed. Consideration of the faunal, taphonomic and associated archaeological information enabled purposeful and residual grave deposits to be identified. The project identified 18 elements forming placed deposits in graves, some of which were missed during excavation. These deposits vary from a duck’s wing to pigs’ trotters, many of which were present in infant graves. It also identified the varied taphonomic histories of the assemblage. Overall, this approach allows zooarchaeologists to shed light on the grey area surrounding purposefully placed deposits and further enables us to consider the nature of early Anglo-Saxon funerary activates.
Profiling Taphonomic History through Bone Fracture Analysis

Emily Johnson, Pip Parmenter, Alan Outram
University of Exeter

Taphonomy is an especially important consideration for all archaeologists interpreting material from archaeological sites. This paper presents a new method of assessing and displaying taphonomic history through detailed bone fracture analysis. Bone is a particularly useful material for taphonomic analysis as it is sensitive to when it was broken, depending on the degree of decomposition over time. The resulting Fracture History Profiles show the sequences of fracture and fragmentation that have affected a bone specimen from the death of the animal to recovery by archaeologists. The method firstly provides an assessment of the carcass processing traditions of past people, relating specifically to bone marrow and bone grease extraction. Secondly, by analysing post-depositional fracture in addition to bone modifications such as burning, gnawing and taphonomic agents, it is possible to reconstruct a comprehensive taphonomic history for each archaeological context. This has implications for other artefacts in the same context that have no equivalent diagnostic features, and is perhaps the most widely applicable use of Fracture History Profiles. This method will be demonstrated using case studies from the Linearbandkeramik and other Neolithic cultures.
What doesn’t Kill Me Makes Me Stronger: How to Turn the Taphonomic History of (Sub)Fossil Small Mammal Assemblages into Archaeozoologists’ Favour

Borut Toškan
Institute of Archaeology ZRC SAZU

Small mammals from archaeo(zoo)logical contexts are often seen as being very indicative of past habitats. Traditionally, the ecological tolerance of recent populations of various species is projected onto conspecific populations from past periods. Nevertheless, there are some pitfalls to the process that are to be considered, which are in great part linked to the neglection of the taphonomic history of the studied archaeozoological assemblage. If, however, taphonomic processes are properly understood, an even deeper insight into the past environments can be obtained relative to what would be expected from the interpretation of the ecological tolerance of individual small mammal taxa alone. This is shown in practice by presenting two case studies of micromammal remains originating from prehistoric pile-dwelling sites from Ljubljansko barje (Central Slovenia). In the case of Resnikov prekop (4,600 BC) the taphonomic analysis revealed that small mammal remains are clearly not coeval with large mammal bones found at the same location, which contributed to the discovery that some time in prehistory a watercourse traversed the site and washed away the settlement’s cultural layer. In the case of the assemblage from Stare gmajne (second half of the third millennium BC) the identification of the tawny owl (Strix aluco) as the principal agent of collection of the studied material allowed the distance between the village and the closest forest to be localised to less than 100 m, suggesting that fields and pastures must have been mostly located at some distance from the lake shore.
Doghole Cave has yielded the largest assemblage of Romano-British (RB) human remains (Minimum Number of Individuals = 28) from a cave in northern England. It has also yielded a Late Iron Age-Early RB horse burial and a number of neonatal pigs, cattle, sheep and humans, as well as many older individuals of these same taxa. Charcoal from the site has been identified as lime, birch, oak and hazel, and includes an RB charcoal-rich layer containing calcined sheep remains. The site is multi-period and it is likely, based on our radiocarbon dating results, that many of the adult animals date from the early Mediaeval period. What does it all mean? This paper will explore the many different hypotheses that we have considered to explain the species, age, and body part distribution of the remains within the cave, and discuss what this may tell us about both about cave taphonomy and about rural activity away from the military regions of Roman Britain. Our results also emphasise the importance of sieving when dealing with such deposits.
Reassessing the Irish Cave Fauna

Ruth Carden
National Museum of Ireland

From the 1850s to the mid-1930s, 34 cave sites in Ireland were extensively explored and excavated. The excavations were led by the leading scholars of that time (e.g. Adams, Plunkett, Ussher and Scharff). At least 11 of these caves have evidence of human remains and/or cultural use in conjunction with the presence of animal remains. It is estimated that more than 300,000 vertebrate bone fragments and artefacts were recovered from these cave sites, and the majority of this material is archived within the National Museum of Ireland (NMI) collections. The animal bones were identified post-excavation by NMI staff and other leading experts in Britain at that time and these original identifications and listings still influence contemporary histories of the vertebrate fauna of Ireland and indeed conservation policy in terms of priority of perceived native species.

The mid–1990s Irish Quaternary Fauna Project (IQFP) dated 64 bones from various caves, thereby establishing chronologies of the presence/absence of particular vertebrates and allowing better assessment of inferred environmental and ancient climatic changes. Subsequently, many scientific researchers have used the IQFP dated bones to extract ancient DNA (aDNA) to determine origins, colonisation events and species-specific relationships in phylogeography studies.

However, there are numerous species misidentifications of the bone fragments, as per original listings, as well as large volumes of identifiable fragments that were unidentified. Since animal bones are part of the palaeontological and archaeological records, it is vital that their identifications are correct. This research set out to critically re-examine the vertebrate cave assemblages and (re)identify and analyse all of the faunal remains, in conjunction with the potential reconstruction of contextual/other information based on the excavation notebooks. Results thus far indicate that these faunal records can still provide crucial and salient insights to our understanding of human presence and human–animal relationships.
The Yorkshire Dales contain many caves that house prehistoric anthropogenic material. Much of this material is osteological in nature, with both human and animal remains represented. Previous studies have focused on the human remains, with little attention paid to what rigorous study of the faunal material can reveal about prehistory in northern England. This study addresses this by considering the faunal material recovered from three cave sites in the Yorkshire Dales: Cave Ha 3, Thaw Head Cave, and Kinsey Cave. Materials from these three sites have been dated to the Neolithic, allowing insight to be gained about this comparatively understudied and poorly understood period in northern England. Results indicate shifts in cave use over time, including for shelter, burial, and carcass processing, as well as broader human–environmental interaction. There is room for great improvement of these conclusions by an expansion of this study to include a larger number of sites, and targeted dating of faunal materials to increase our understanding of what was happening when. Thus, this study may be viewed as a glimpse into the possibilities for improved understanding of the Neolithic within this region.
Blood from a Stone: Petrosals and Ancient DNA

Victoria Mullin
Trinity College Dublin

Over the past 30 years the field of ancient DNA (aDNA) has progressed from the amplification and sequencing of small fragments of DNA, to the sequencing of complete genomes. Along the way the field has aided in the taxonomic identification of archaeological specimens and shed light on the population histories of both extinct and extant species.

Prior to the latter half of the last decade, the aDNA field was dominated by mitochondrial studies, which, while informative, lacked the genetic power for in-depth population genetic analyses. In recent years technological advance, brought about by high throughput sequencing technologies, has meant that full genome DNA sequencing has become widely accessible to the scientific community. However, even with this access to relatively low-cost high-volume DNA sequencing, full ancient nuclear genomes can still prove elusive, mainly due to the low amount of high-quality DNA that is routinely extracted from archaeological remains. To increase the chances of extracting the quantities of DNA needed for genome-scale aDNA analysis, the targeting of certain dense skeletal elements, such as the shafts of long bones, metacarpals, metatarsals and teeth, has been common practice.

Due to its relative lack of use for species identification, the petrous portion of the temporal bone has, until recently, been overlooked by many as a resource for aDNA. With its name deriving from the latin for ‘stone like’, one of densest bones in the body is providing the field of aDNA with its very own ‘technological’ advance. As we gather an increasing collection of sequenced zooarchaeological petrosal bones, it is becoming clear that working with this bone element greatly increases the chances of retrieving the high quantities of good-quality DNA that will make the production of hundreds if not thousands of ancient genomes a reality.
Reconstructing Past Herbivore Abundance using Dung Fungal Spores: A Taphonomic Approach

Eline Van Asperen
Liverpool John Moores University

Although the study of animal bones can answer a wide range of archaeological and palaeoecological questions, it remains difficult to reconstruct past animal abundances. Recent decades have seen an increase in the use of spores of coprophilous (dung-inhabiting) fungi from sedimentary and archaeological sequences as a proxy for large herbivore abundance, in particular to answer questions regarding the human role in the Late Quaternary megaherbivore extinction and Mesolithic and Neolithic forest clearance and livestock impacts. Although this novel proxy has great potential for advancing our understanding of past herbivore populations, current research in this area is mostly qualitative and lacks a strong experimental basis. In particular, environmental and taphonomic factors influencing preservation and recovery of these spores are poorly understood.

I present the results from a study using pollen (Tauber) traps to assess the impact of environmental factors and animal densities on dung fungal spore representation. The traps were placed at 11 locations in Chillingham Wild Cattle Park, Northumberland, UK. The park is inhabited by a herd of ~100 wild cattle. The park is also frequented by fallow and roe deer, as well as badgers and a variety of smaller mammals. The pollen trap locations represent a range of moisture levels, habitats and animal densities. Sampling periods ran from October to March and from April to September. Soil and moss samples were also taken from the same locations. Spore influx (pollen traps) is compared with preservation and accumulation rate in the soil and moss samples, enabling an investigation of the impact of moisture levels, vegetation cover and herbivore presence on dung fungal spore abundance.
Whales are among the most threatened mammals, mainly as a result of relatively recent industrial overhunting. The impacts of pre-industrial whaling and the role of climate change have also been considered for the decline of certain species, particularly the Atlantic gray whale, thought to have gone extinct in the 18th century. Historical sources suggest that gray whales were caught in shallows and estuaries in the southern North Sea and English Channel from the 10th century - whale meat was certainly common and cheap in Mediaeval markets. Zooarchaeological data suggest that gray whales may once have even fed and calved in the Mediterranean along France’s southern coast. Documenting their former abundance and distribution, however, is hampered by the notorious difficulty in morphologically identifying cetacean bones to species. This project explored the use of biomolecular methods to validate the taxonomic identifications of 50+ putative palaeontological and archaeological gray whale remains. We applied a variety of methods, including collagen peptide mass fingerprinting (ZooMS), mitochondrial DNA (mtDNA) barcoding through targeted polymerase chain reaction (PCR), hybridisation capture of the mtDNA genome followed by high-throughput sequencing, as well as whole genome shotgun sequencing. In general, morphological misidentifications were common. No gray whale remains were identified among the putative archaeological samples from the Mediterranean, and some palaeontological identifications were also revised. ZooMS provided the most cost-effective, but least precise, approach for taxonomic identification. mtDNA barcoding was successful for the majority of the samples, though badly degraded remains did not yield DNA fragments of sufficient length for identification. Whole genome shotgun sequencing yielded few or no endogenous sequences, while hybridisation capture often provided complete or near complete coverage of the mtDNA genome. This project demonstrated the utility of molecular approaches for identifying cetacean remains, and the importance of accurate faunal identifications in reconstructing palaeoenvironments.
Site Ecology and Environment at the Bradford Kaims; Phytoliths and Thin-Sections as Indicators of Burnt Mound Depositional Sequences

Tom Gardner
University of Edinburgh

Burnt mounds, one of the most numerous and widespread prehistoric monuments in Britain, have now largely been dismissed as unintelligible and dull. This nihilistic appreciation of a deceptively complex monument type stems from the apparent homogeneity and sterility of the mound deposits, which indicate a uniformity of depositional type at the macro-scale. However, new scientific methods applied to these mounds have made it apparent that what is perceived as a boring deposit actually has a distinct and important series of depositional processes that have led to its accumulation, and post-depositional taphonomies that alter the perceptible record. Combined phytolith and thin-section sampling of burnt mound deposits in Northumberland have led to a number of interesting discoveries, including episodic deposition, concurrent variation in individual depositional events, and the appearance of some intriguing microcomponents within the mound strata.

Scientific approaches, when applied to old theories, can lead to new results. These support a reinterpretation of current typologies, distributions, and functions of burnt mound sites. Despite the complex depositional and post-depositional taphonomies that affect these sites, the data presented in this study has managed to distinguish between individual events of deposition, and episodic accumulations of material, within a conventional ‘burnt mound’. Although a pilot study, the presented data have indicated that a re-appraisal of burnt mound classifications is necessary, and also sheds some light upon depositional sequences and the fundamental processes that these ubiquitous prehistoric sites represent.

Other curiosities at the micro-scale include abundances of sponge spicules, diatoms, and dicot phytoliths, indicating that human–environment interactions utilised a diverse range of fuel types, resource uses and processing patterns. What we thought we knew about burnt mounds and their biographies is now being challenged, and rightly so, by environmental archaeology.
Sweet Chestnut (*Castanea sativa*) in Britain – Using New Techniques and Information to Test its Status as an ‘Archaeophyte’ of Roman Origin

Rob Jarman\(^1\), Frank M. Chambers\(^1\), Julia Webb\(^1\), Karen Russell\(^2\)

\(^1\) University of Gloucestershire, \(^2\) K Russell Consulting

In Britain, sweet chestnut has long been considered to be a Roman introduction, but only sparse definitive evidence for sweet chestnut has actually been found in Roman contexts, based on conventional pollen and macrophyte analysis, all of which could be derived from imported material.

A new search for evidence of sweet chestnut being cultivated in Britain for any period pre-Norman has been initiated, based on a regional study centred on the Forest of Dean in England. This search is for features that might be associated with a ‘chestnut landscape’, using evidence from the ‘living landscape’ as well as from the ‘archival landscape’. The ‘living chestnut-scape’ includes ancient chestnut trees and coppice stools, which can be dated and their origins mapped from analysis of their DNA and from dendroarchaeology; the ‘archival chestnut-scape’ includes place names, customs, written records and new analysis of palaeoenvironmental information.

New approaches in environmental archaeology, using genetics, dendroarchaeology, onomastics and palaeoenvironmental information, are being applied to new and historic data to uncover any ‘memory’ of chestnut as a food and material resource in Britain’s cultural heritage during the past 2000 or more years.

This research is designed to enable a review of the cultural significance of sweet chestnut in England – important given the threat from disease (chestnut blight) to the ancient chestnut trees and woods extant in Britain.
Isotopic Landscapes: Faunal $\delta^{13}C$ and $\delta^{15}N$ values from the Thames Valley

Julie Hamilton, Julia Lee-Thorp, Gary Lock, Robert E.M. Hedges
University of Oxford

Domestic animals were an integral part of the agricultural system introduced into Britain with the Neolithic, and their stable isotope ratios should reflect both their use of the environment they encountered and changes in that environment over time. $\delta^{13}C$ and $\delta^{15}N$ values were measured in over 2000 faunal samples from 23 sites in the Upper and Middle Thames Valley, UK, dating from the Neolithic to the Roman period. Variation in $\delta^{13}C$ and $\delta^{15}N$ values within and between species, sites, regions and periods was examined in unprecedented detail, and linked to variation in environmental factors, using linear mixed models. Underlying geology, forest clearance, and developing agricultural practices are all reflected in faunal isotope values in the Thames Valley. This work also provides an extensive body of data against which faunal isotope values from other sites can be compared and interpreted.

Changes in agricultural practice may be both cause and effect of environmental change, and looking at changes in domestic animal isotope ratios over time gives us insight into the interactions between people, their animals and their environment at site and landscape scales.
New Techniques

Using Modern Analogue Coleopteran (Beetle) Datasets to Quantify Landscape Cover and Human Activity

Geoff Hill¹, Nicola J. Whitehouse², Helen M. Roe¹, David N. Smith³, Ingelise Stuijts⁴,

¹. Queens University Belfast, 2. Plymouth University, 3. University of Birmingham, 4. The Discovery Programme

Over the past decade there has been considerable discussion concerning the use and viability of palaeoenvironmental proxies, particularly pollen, to reflect accurately the structure of vegetation in prehistoric environments. A key aim of environmental archaeology has been to portray landscape change correctly, not only in the landscape cover driven by herbivory that preceded the Neolithisation of the north-western European landscape (the so-called ‘Vera debate’, cf. Whitehouse & Smith, 2010), but also those subsequent, often dramatic, alterations shaped by the pressures of expanding human settlement.

We discuss a method that utilises a modern analogue technique (cf. Smith, et al. 2010) to reconstruct past land cover via a refined multi-tier functional group approach with Coleopteran datasets. Sub-fossil beetle assemblages from 19 digitally mapped modern sites with varying forest cover/openness, including dense forest, pasture woodland, open parkland and wetland areas from the UK and Estonia, have been sampled, identified and analysed for this study.

Results from the modern analogue datasets indicate that there is a strong relationship between primary functional group proportions and local (within 1000m) landscape vegetation type/cover. Among the sites analysed this is especially strong along a gradient of increasing forest cover. One of the further tiers incorporated in this method allows the assemblages to be scored according to the level of synanthropy it exhibits, permitting comparisons to be made with regard to the degree of human activity present in the surrounding environment. To assess the utility of this modern data for use within environmental archaeology, a range of comparative assemblages derived from archaeological investigation has been selected for presentation.


Developing Understanding of Ephemeral Mesolithic Sites through Geoarchaeological Techniques

Charlotte C.A. Rowley¹, Aimée Little¹, Shannon Croft¹, Emma Tong¹, Charles A.I. French², Chantal Conneller³, Barry Taylor⁴, Nicky Milner¹

4. University of Chester

The site of Flixton Island within the Vale of Pickering, Yorkshire, UK, was situated in the postglacial palaeolake that supported a number of Mesolithic settlements along its shore. At first glance, Flixton Island appears to be a typical, if substantial, Mesolithic lithic scatter found on the dryland of the island with no organic preservation directly associated with the lithics. In order to discover more about the activities that occurred on this site, a program of geochemical and micromorphological analysis has been implemented to complement the lithic analyses. High-resolution sampling combined with the application of a variety of analytical techniques for chemical characterisation of the soils is being conducted. By integrating these methods this research is overcoming the issue of intact organic artefacts as a means of developing our understanding of the behaviour of the site’s past inhabitants. This methodology holds potential for investigating equally ephemeral sites, with lithic scatters being the most common form of archaeological evidence that we have for this time period.
Exploring Extinction and Community Biodiversity using Niche Models

Nicola J. Whitehouse¹, Georgina Milne², Alison Cameron²
1. Plymouth University, 2. Queens University Belfast

The extinction of species and changing biodiversity of plant and animal communities has long been a preoccupation amongst palaeoecologists and environmental archaeologists studying the Quaternary record. In this paper, we explore new approaches developed in the biological sciences to study patterns of extinction within the fossil record, focusing on saproxylic beetle species. Saproxylic taxa are defined by their dependence upon either living trees, or the dead and dying wood of moribund trees for some part of their life cycle.

Environmental Niche Modelling (ENM) allows researchers to explore how species respond to climate change by building quantitative models linking species’ distributions to environmental variables. This allows us to assess how changes in environment may be driving ecological processes such as range shifts and extinctions. ENM is widely used by ecologists to assess the impact of future climate change on modern species; it can also be applied to past scenarios to address the same questions in the past and thus obtain greater insights on the longer term behaviour of species.

Here, we focus in particular on species that have become locally extinct during the Quaternary and discuss factors behind species decline. Using niche models, we examine whether niche breadth of selected Holocene taxa can explain species decline and eventual extirpation and their implications towards our understanding of the process of species extinctions. We hypothesise that niche traits influence extinction risk, whereby smaller range sizes (and consequently, niche breadths) are positively correlated with extinction risk, regardless of whether a species is a generalist or a specialist. We highlight the opportunities and challenges provided by the fossil biological proxy record to ask fundamental ecological questions around species migration, adaptation and extinction.
There's More than One Way to Skin a Cat: Equifinality and Developer-Funded Archaeology

Suzi Richer¹, Andrew James², Edward Blinkhorn³⁴, Victoria Bryant¹

Inspired by Terry’s teaching and a question he posed at the AEA Spring Conference 2015, this paper looks at equifinality in the everyday context of commercial archaeology. Equifinality, the idea that there are often different ways to arrive at the same answer, is intrinsic to archaeology, in particular to environmental archaeology and taphonomic studies. The question Terry posed – could perforated and strung shells be used as a something more practical, like an abacus, rather than being purely decorative – was a reminder that we need to constantly challenge our assumptions, or natural interpretations.

Using a range of environmental (and wider) archaeological case studies from the commercial sector, this paper will critically explore a number of questions. Are we offering alternative interpretations for our results? Where we are limiting our explanations – what is constraining us? And more importantly, what enables us to venture to offer different ideas? While there are inevitably considerable restraints (e.g. time, budgets) within the commercial sphere, we ultimately hope to illustrate that this is an area we perhaps need to be more aware of – our 'skinning techniques' have adapted to our restraints.
The Debateable Territory Where Geology and Archaeology Meet: Reassessing the Early Archaeobotanical Work of Clement Reid and Arthur Lyell at Silchester

Lisa Lodwick
University of Reading

A consideration of the practice of environmental archaeology as field archaeology requires an exploration of the emergence and development of the sub-disciplines over time. Archaeobotany is largely reliant on the sampling and processing of sediment during archaeological excavations, without which very few plant remains will be recovered by hand-collection. This paper will explore the development of these practices through an examination of the pioneering work of the palaeobotanist and geologist Clement Reid and the antiquarian Arthur Lyell at Silchester, 1899–1909, and evaluate it’s impact, or lack of, on the development of archaeobotany.

Reid and Lyell undertook an extensive study of waterlogged plant remains from Silchester, retrieved through a programme of sampling and sieving. This took place as an aspect of the Society of Antiquaries campaign of excavations at the Roman town, around 70 years before the wider adoption of these techniques and the ‘flotation revolution’. The first full examination of the collection of plant remains retrieved by them has revealed that they undertook a systematic and accurate archaeobotanical study. The majority of the plant remains identified have been confirmed, including numerous records of plant foods, and other archaeophytes. The study was, however, hindered by the lack of understanding of stratigraphy by the excavators, and very brief publication of the resultant data.

The dataset produced did remain important for the understanding of Holocene vegetation through the 20th century, and provided a key baseline against which archaeobotanical datasets produced in the 1970s could be compared with. Yet, the techniques they had developed did not become integrated into standard field archaeology practice, and the developing field of palaeoenvironmental research moved focus towards palynology. The wider background against which this study took place will be explored, and contrasted with that in which the field of archaeobotany ‘took-off’ in the 1970s.
Sediment cores provide reasonably continuous records of the inputs of many environmental proxies, including pollen, from the changing environment around a single coring point, providing the analyst with a spatially weighted average of what is happening in the wider landscape. However, human activity takes place within a structured landscape; for example, a landscape containing 20% tree cover might have several small woodlands with different compositions, a single block of woodland, or individual trees in wood–pasture scattered throughout an agricultural landscape, and these three options would support different patterns of human activity, provide different resources, and create different kinds of landscape experience that would then shape many facets of the lives and behaviours of the people living there.

Over the last 15 years, pollen analysts have been exploring the use of mathematical models of pollen dispersal and deposition as a means of generating spatially explicit, mapped landscape reconstructions from core records. As personal computers have become more powerful, opportunities to use these models have also expanded, and they are becoming a valuable tool in the environmental archaeologist’s arsenal. This presentation will outline some of the approaches being used, focusing on the Multiple Scenario Approach and a multiple hypothesis testing strategy using the HUMPOL and LandPolFlow software packages developed in Hull, and freely available to the community. Both methods lead to multiple possible landscape reconstructions, which can then be tested against archaeological evidence and other lines of palaeoecological evidence, such as mollusca, insects or vertebrates, or on-site ‘snap-shot’ assemblages.
The Archaeology of Excrement:  
The Passed and the Present

Andrew K.G. Jones  
University of York

This paper seeks to demonstrate the scientific importance of multidisciplinary environmental archaeological research by considering the recent history of a single piece of ancient mineralised excrement, the Lloyd’s Bank turd. This roughly 1000 year old coprolite, the best preserved human stool found so far in the British Isles, was excavated by the York Archaeological Trust in its first year of work: 1972. Myths and facts surrounding the discovery will be summarised, and the scientific analysis carried out by staff and placement students at the Environmental Archaeology Unit, University of York, will be outlined. The continuing significance of the find will be accessed.

Finally, the paper will reflect on how this object has been curated over the last 40 years. What was once a curious ‘environmental sample’ languishing in a reused tomato box in a leaking store inhabited by pigeons several years after its excavation, is now permanently on public display in a case of its own in the Jorvik Viking Centre in central York.
Live animals were a ubiquitous feature of post-Mediaeval urban communities and provided a variety of products (hides, meat, eggs, feathers and dung) to a broad cross-section of society. Poultry (and the ‘pin money’ from egg-selling) were accessible to many people, including those of modest means, and husbandry of these species was often specifically associated with women. A lack of attention to animal husbandry practices within cities, particularly in urban environments outside of London, is at odds with the quotidian presence and widespread nature of these activities. Furthermore, the agrarian historical literature has focused mainly upon rural environments and the wealthier classes of society. The faunal bone assemblage from St Anne’s Square, a 0.77 ha 17th–19th-century site in Belfast is one of only a few later post-Mediaeval assemblages from Northern Ireland that has been retained for study. I gathered zooarchaeological data from this assemblage in order to investigate human–animal relationships in an archivally documented post-Mediaeval working class neighbourhood. In order to contextualise these data, I accessed and investigated historical sources including maps, court records, probate inventories, news sheets and related resources held by the Public Record Office of Northern Ireland. By combining metrical and palaeopathological data obtained from the St Anne’s Square avian bone assemblage with these local documentary sources, I will discuss urban poultry-keeping practices, illuminate aspects of quotidian animal-human relationships and shed light upon the roles and management of poultry from the 18th to 19th century in Belfast and its environs.
The Blood of the Beasts: The Social Taphonomy of Cattle Bones in a Mediaeval City

Lee G. Broderick
University of York

The slaughter and butchering of animals in Mediaeval cities was a violent feature of everyday life, contrasting with but underpinning the more sedate pleasures and skills of food and craft. It has long been recognised that animal remains from urban sites can inform us of these activities in the past but identifying them has generally relied upon recognising distinct archaeological features and particular types of assemblages.

By adopting biographical theory, in particular chaîne opératoire, and incorporating it into taphonomic enquiry, it is possible to shed light on the complex network of social organisation and industrial activities that helped form an assemblage. Importantly, this means that pit and other deposits that are unrelated to any activity areas or buildings and that are poorly stratified or highly heterogeneous can be used to answer more questions than simple site-wide species or body-part proportional representation lists. This presentation revisits some of the Mediaeval assemblages from York in order to develop our understanding of life in the city through its zooarchaeology.
Micromorphology, the study of undisturbed soils and sediments under the microscope, is an effective method for the geoarchaeological research of complex sites. This talk presents an overview of how the technique can contribute to the study of (early) Mediaeval towns, demonstrated by several case studies from north-western Europe. The types of questions that can be tackled using this method range from the basic understanding of stratigraphy of both microstratified levels and thick homogeneous units such as ‘dark earths’, formation processes and environmental context to the identification of different activities.

A valuable approach to refine the results from micromorphological analysis even further is to complement this technique with micro X-ray fluorescence spectrometry (μXRF) and phytolith analysis. The systematic scanning of block samples with μXRF helps to understand specific issues that concern elemental composition of the samples, such as the identification of on-site metalworking, the identification of components and their provenance. Because the same polyester resin-impregnated blocks are used for the micromorphological thin sections as for the μXRF analysis, the results can be correlated and chemical elements pinpointed exactly. By combining both the visual and elemental data we can take our interpretations further: not only is it possible to identify objects and activities more precisely, one can also see and interpret them in relation to each other within their original stratigraphy. Phytolith analysis, the study of inorganic bodies of plant origin, provides information on the botanical component and its taphonomy, particularly in contexts where pollen and macrobotanical remains are poorly preserved.

The potential of this integrated approach is illustrated with examples from north-western town sites such as Kaupang (Norway), Haithabu (Germany), Antwerp (Belgium), Brussels (Belgium), and Lier (Belgium).
Herd Demographics in Zooarchaeology: A Critical, Simulation-Based Assessment of the Viability of the Standard Mandibular Approach

David Orton¹, Jesse Wolfhagen²
1. University of York, 2. Stony Brook University

Zooarchaeological age-at-death analyses are used to address a wide range of issues, from domestication through to trade and urban provisioning. In particular, however, they have been widely applied to understanding prehistoric herd management, typically by comparison with a range of published models representing idealised kill-off strategies.

Amongst numerous theoretical and technical problems with this approach, one of the most pervasive and yet poorly examined issues is that of sample size. Put simply, we have very little idea how large a sample is required in order consistently to discriminate between even idealised theoretical herding strategies.

Here, we test the effect of sample size on the ability to distinguish consistently between four popular mortality models under ideal conditions. We simulate death assemblages of varying sample size from several models developed by Payne, Redding, and Vigne & Helmer that have been widely used in the context of analysing prehistoric herding. By increasing sample size incrementally and repeating each simulation 2000 times at each increment, we visualise confidence intervals around each curve and demonstrate the extent of overlap at different sample sizes. Applying formal significance tests to each simulation run, we then plot the relationship between sample size and the rate of false negatives (type 2 errors).

The results demonstrate that many of the assemblages upon which interpretations have been based, and around which arguments have revolved, are not in fact sufficient to distinguish these models even under the most optimistic of assumptions.
Variation of *Apodemus* Mandibular Morphology During the Holocene: Functional Implications

Elizabeth Kerr¹, Anne Tresset¹, Anthony Herrel¹², Raphäel Cornette¹

¹. Museum National d’Histoire Naturelle, 2. Ghent University

Human activity has altered the ecology and landscape considerably in Western Europe during the Holocene, primarily through the introduction of agriculture. This has resulted in changes in biodiversity, yet there has been little investigation into possible concomitant evolutionary changes in native species. The wood mouse, *Apodemus sylvaticus*, was present in Western Europe prior to the introduction of agriculture, and due to its anthropogenic tendency has not declined dramatically and is currently a common species. Micro-mammal species, which have short generation periods, can evolve rapidly. The morphology of the mandible has also been shown to be highly evolutionarily responsive to functional demands associated with ecological changes, therefore providing a good model for investigating these patterns. A biomechanical model constructed using extant data is used to test the changes in mandibular shape of *Apodemus* from archaeological material across the Holocene in Western Europe, primarily France. We predict either a functional mandibular change, or non-functional changes reflecting random drift over time, or alternatively that the inherent versatility in *Apodemus* feeding biomechanics has allowed it to persist in a drastically altered ecology. These results will provide important data on the long-term human effects on the evolution of organisms in altered ecosystems. Functional changes in species may indicate shifts in ecological niche, and future studies may reveal how species interactions could therefore change over time. These perspectives could permit predictions on how human activity will continue to alter and affect micro-mammal phenotypes and ecological systems.
Super Furry Animals: Locating Foxes and Badgers in Anglo-Saxon Life

Kristopher Poole
University of Sheffield

Anglo-Saxon England had a diversity of wild animals, yet the majority of studies to date have tended to focus on a select group of species. These include those that are the most frequent in bone assemblages, such as red and roe deer, but also those that are rare in Anglo-Saxon period bone assemblages and subsequently became extinct in Britain, such as the wolf and beaver. As research has shown, the roles of these species in Anglo-Saxon England differed considerably, itself no surprise, given that the term ‘wild’ actually covers a wide range of species and diverse range of relationships (O’Connor 1997: 152). Yet human relationships with two of these species, the red fox (*Vulpes vulpes*) and the badger (*Meles meles*), have to date received relatively little attention in research. This lack of study is despite the fact that both would have been present across much of the British Isles throughout the 5th to 11th centuries. This paper utilises zooarchaeological data, documentary sources and place-name evidence to explore the roles of these animals and how they were perceived in this period. Despite their low zooarchaeological representation, the patterning of their remains on settlements indicates that they were engaged with (or not) differently between social levels. Moreover, place-name data demonstrate a keen awareness of the behaviour of both species and the close connection between humans, animals and local landscapes. The contrast between zooarchaeological and place-name data highlight the potential greater importance, in terms of daily experience, of these species when alive than dead. It also demonstrates the importance of adopting integrative approaches to studying human–animal relations in the past.
Zooarchaeology of Emotion and Grief

James Morris
University of Central Lancashire

The inside photograph at the beginning of Terry’s *The Archaeology of Animal Bones* book, shows an Anglo-Saxon horse burial under excavation. The caption suggests this deliberate burial shows what the horse meant to the people, but what did it mean? The meanings humans attach to animal burials is polythematic in nature and are much more complex than the simplistic ritual/waste dichotomies we often fall into. These kinds of deposits could also be an important component of social memory, with the actions forming part of a major event in people’s lives. As archaeologists we can investigate material aspects of such events, but a major factor we fail to consider is emotion. Many may view emotion as unrecoverable, not suitable for objective analysis, but there is a growing trend within archaeology to consider emotion, especially within prehistoric archaeology. As Peterson (2013) has rightly pointed out for funerary archaeology, whilst the processes are well understood, the emotional damage of grief and loss are often omitted.

Is it therefore possible to explore emotion, and in particular grief, from the zooarchaeological record? Humans grieve for animals; many modern day pets are subject to ceremonies we undertake on our own dead, highlighting the emotional connection many feel. But is this just part of our modern day mind-set? In exploring a zooarchaeology of emotion using animal burials, a possible approach is to consider points of contact between humans and the animal corpse. For example does the careful manipulation of a cat inside a tile cist at Silchester, or the placement of a dog inside an Iron Age pit, reflect emotion? Is it possible some of the animal burials we see were driven by emotion and mourning?

Eggs form an important part of avian–human interactions both today and in the past. They can be sourced from wild and domestic birds, but due to the creation of extended laying times in several domesticates, egg acquisition is frequently weighted towards poultry. Ducks, geese and other birds can all be kept for their eggs, but the chicken plays perhaps the most important role. As such, this work focuses on chickens but is contextualised within the wider body of archaeoornithological evidence. Such examination allows fuller understanding of past avian–human relationships in the context of diet, economy, society and (particularly for wild birds) the environmental and seasonal aspects of their relationship. This paper investigates egg use in the past by combining zooarchaeological and scientific analysis of physical eggshell remains from archaeological sites with evidence from documentary sources and material culture. Identification of eggshell to species via Zooarchaeology by Mass Spectrometry (ZooMS) and Scanning Electron Microscope (SEM), and the exploration of developmental stage via microscopy can be used to examine husbandry practices, fowling, and resource use in the past by informing on meat and egg production. Documentary sources include letters and orders (e.g. the Vindolanda tablets), and agricultural guides detailing husbandry and produce (such as Columella’s Res rustica). Using case studies from Roman and Medieval Britain, this paper demonstrates how multidisciplinary integration of eggshell analysis with other lines of evidence can offer new insights into avian–human relationships in the past.
Diverse Ritual Practices in Two Late Roman Landscapes, or, Where’s My Cow?

Clare Rainsford¹, David Roberts²
1. University of Bradford, 2. Historic England

Animals played a critical role in Romano-British ritual and religious practices, with distinctive assemblages of faunal remains found from burials, shrine and temple sites, as well as foundation deposits from settlements. However, there is considerable heterogeneity in these practices, reflecting diversity in belief and in broader animal–human relations. This paper will explore one example of this using evidence from recent excavations at two late Roman shrines in south-west Wiltshire.

Despite the two sites being in relatively close proximity and contemporary with each other, ritual activity in these places demonstrates startlingly contrasting characteristics, in terms of architecture, landscape and material culture. This is reflected and expressed in the zooarchaeological assemblages from these sites, which demonstrate different and distinctive ‘ritual’ features, from the sacrificing of lambs at one site to a near-complete absence of cattle at the other. Contextualisation within the broader suite of everyday animal–human–landscape interactions is key to understanding diverse expressions of belief, emotion, power and wealth that are evidenced in these ritual settings. This contribution will elucidate the roles of key species in the everyday landscape and in ritual practice at the two sites. This process of discussion will explore wider rural landscape practices including pastoralism, arable agriculture, animal husbandry and industry. A detailed and integrated diachronic approach has been taken in analysing these sites, and despite the late Roman date of these shrines, it can be suggested that the landscape roots of these practices extend into the earlier Roman period. Understanding the bioarchaeology of these ‘ritual’ sites in their wider context may provide a window onto long-term social practice in the landscape.
Human–Animal Relations in Iron Age Wessex: A Histological Study of Pit Deposits from the Danebury Environs, Hampshire, UK

Richard Madgwick¹, Tom Booth²
1. Cardiff University, 2. Natural History Museum

The recovery of unusual configurations of human and animal remains from atypical contexts is a persistent feature of the archaeological record in Iron Age Southern Britain. Human remains are often deposited on settlement sites as disarticulated fragments, articulated limbs or skeletons, frequently in storage pits or ditches. Faunal material is also regularly recovered from these features in configurations uncharacteristic of domestic refuse, including skulls, articulating limbs and complete skeletons. The practices responsible for these deposits have long been debated, with human remains variously interpreted as evidence for excarnation, exhumation, cannibalism, disturbance and curation. Faunal deposits have been explained as relating to sacrifice, feasting, diseased animals and fertility rituals. Research by J.D. Hill and J. Morris amongst others has shed considerable light on patterns of deposition. However, equifinality remains a substantial hurdle to interpretation, in many instances supporting data are lacking and reconstructing precise practices remains problematic.

This research explores the potential of using microscopic methods of taphonomic analysis in combination with macroscopic taphonomic indices for providing greater detail on the treatment of human and animal remains in Iron Age Wessex. The approach focuses on taphonomic modifications to bone microstructure (histology) that result from distinctive pathways in the depositional histories of osseous remains. This approach is tested on human and animal bones from two sites: Danebury and Suddern Farm, in Hampshire, central southern Britain. Results demonstrate that diverse modes of treatment were practised and that different configurations of remains were subject to prescribed, varied treatment, rather than resulting from different stages of the same process. These data provide new insights into human–animal relations and their treatment in death in Iron Age Southern Britain.
Environmental Archaeology at Pre-Urban (9th – 10th centuries AD) Antwerp: The Faunal and Archaeological Evidence

Eileen Reilly¹, Pam Crabtree², Tim Bellens³


Recent excavations at the Burcht Site in Antwerp, Belgium, have identified the earliest phases of Mediaeval settlement in the centre of the city. This presentation will bring together the evidence from archaeology, insect remains, and vertebrate faunal remains to examine the environment and economy of the pre-urban Mediaeval settlement in Antwerp’s early Mediaeval core.

Plant-Based Activity Areas at Songo Mnara, Tanzania: A Case Study at Macro and Micro Scales

Hayley McParland¹, Sarah Walshaw²

1. University of York, 2. Simon Fraser University

Archaeobotanical and phytolith analysis at the UNESCO World Heritage site of Songo Mnara, Tanzania, has contributed to our understanding of plant use within a Swahili stonetown. Integrated phytolith and archaeobotanical analyses from floor surfaces and discrete features revealed evidence of plant use within these structures, at micro and macro scales, providing complementary datasets to inform an in-depth interpretation of plant use within domestic structures.

Systematic high-resolution spatial sampling for phytoliths within stone structures with intact lime plaster floor surfaces, and daub structures with intact interior packed earth floor surfaces, provided a unique insight into the daily activities of the inhabitants or visitors occupying these structures. Inhabited for only a century, Songo Mnara provides an opportunity to examine spatial relationships between stone houses and wattle and daub structures from the 14th–15th centuries AD. The spatial approach was particularly effective, enabling the identification of plant-based activity areas within these structures, clearly defining interior and exterior activity areas through phytolith signatures. The analysis of charred plant remains provided direct evidence for the processing of plant based foods, demonstrating that African grains including sorghum and pearl millet, were prepared almost as frequently as Rice.

Archaeobotanical and phytolith research at Songo Mnara is part of a larger project, based at the University of York and Rice University, which applies an innovative multi-layer approach to permit a high resolution interpretation of interior and exterior space.
Testing the Potential of Geometric Morphometrics to Identify Pacific Salmon and Trout (*Oncorhynchus* spp.) Vertebrae to Species

*Edouard Masson-MacLean*

University of Aberdeen

Pacific salmon and trout (*Oncorhynchus* spp.) remains are commonly recovered in large numbers from archaeological sites from the North-East Pacific and Bering Sea coasts, with vertebrae by far the most frequent element usually represented. These remains have the potential to address a range of questions, not only for archaeology, but also for fisheries science. Typically these questions relate to human subsistence strategies, storage and site seasonality. In particular it is unclear how the different characteristics and behaviour of each *Oncorhynchus* species affected human populations. From an ecological perspective, research on past species distributions is an important element of conservation management and efforts to support and promote wild salmon recovery. However, the difficulty in identifying *Oncorhynchus* vertebrae to species has been an obstacle in addressing some of these research topics.

This ‘identification problem’ has led researchers to explore different techniques applied to *Oncorhynchus* vertebrae, including radiography, biometrics and DNA. Though DNA is currently the most reliable method, it is expensive to conduct on a large-scale with numerous samples and is, of course, destructive. Traditional biometrical approaches have been hailed as promising, but their accuracy has been proven problematic by DNA studies. On the other hand, they have the advantage of being non-destructive, cheap, fairly easy to replicate and applicable to a much larger number of specimens.

A recent biometrical study used length, height and the ratio of length to height to attempt to classify vertebrae using different statistical methods. As part of my PhD, I have developed a pilot study to take the biometrical method further. Here our objective is to test the potential of geometric morphometrics to identify *Oncorhynchus* vertebrae accurately to species, and the proposed presentation will present the project and preliminary results.
Caves represent an essential source of archaeological material, including human, cultural and biotic remains. Understanding the sedimentary and taphonomic processes involved in the accumulation of deposits is crucial for the correct interpretation of material from these complex environments. Shanidar Cave (Zagros Mountains, Kurdish Iraq) is one of the most interesting archaeological sites of the Near East due to the discovery, during the 1950s, of the first adult Neanderthal skeletons in Iraq, some of which were probably burials. Palynological analysis on the cave fill was undertaken by Arlette Leroi-Gourhan, but her early work is broadly considered controversial and requires further examination. This study presents the preliminary results of the analysis of superficial and stratigraphical samples collected at Shanidar Cave and other caves in the Zagros Mountains as part of a 5-year programme of landscape surveying and excavation in collaboration with University of Cambridge, Birbeck College London and Queen’s University Belfast. It represents an opportunity for experimental work to test the potential and the effectiveness of palynology in the reconstruction of palaeoenvironments and offers the possibility to add new and fundamental palynological data to the Near East database for a better understanding of vegetational and climatic histories. Ongoing analyses of superficial and stratigraphical samples from additional caves are used to evaluate the role of cave morphology and location in the transport and deposition of pollen and in the representativeness of the cave record. Results show that at present there is a reasonably close correspondence between assemblages accumulating within the external environs of the cave and the local vegetation and this may suggest that stratigraphic samples also reflect past local vegetation.

The Sheep Project: Comparison of Epiphyseal Fusion and Tooth Eruption and Wear in Sheep of Known Age, Sex, Breed and Husbandry

Polydora Baker¹, Fay Worley¹, Peter Popkin², Andy Hammon¹, Sebastian Payne³


Comparison of dental and skeletal maturity has been proposed as a means of interpreting marketing or procurement of meat, identifying the husbandry of animals,
for example the sex composition of flocks, and clarifying the role of different variables in tooth attrition, such as abrasion from soils. In this paper we present data from a population of 356 unimproved Shetland sheep of known breed, age, sex and husbandry, and discuss their potential for the interpretation of zooarchaeological assemblages. The population indicates that fusion is delayed in wethers relative to rams and most markedly to ewes (Popkin, et al. 2012), while tooth eruption and wear show little variation between sexes, confirming previous hypotheses that these data may allow distinction of sex (Worley, et al. in prep.). This paper develops the theme further, comparing data from additional reference skeletons from the UK (e.g. Moran and O’Connor 1994) and other geographical regions, to also examine whether breed, and species, impact relative skeletal and dental maturity. We consider implications for the interpretation of archaeological assemblages of fragmented bones and skeletons in the light of these results.


Burn Baby Burn; Sh*t Fuel Inferno: Ethnographic Fuel Use in the West Mongolian Altai

Danielle de Carle\textsuperscript{1}, William Linder\textsuperscript{2}, Jean-Luc Houle\textsuperscript{2}, Lee G. Broderick\textsuperscript{3}
1. University of Leicester, 2. Western Kentucky University, 3. zooarchaeology.co.uk

In 2014, alongside archaeological survey and excavations of Bronze/Iron Age remains in the high-altitude mountain valley of Tsaagan Asgaa, Bayan-Ölgii, Mongolia, particularly seeking traces of domestic habitation, a programme of ethnographic interviews was conducted with the current Kazakh residents of the valley and surrounding region. Those interviewed were mostly traditional transhumant pastoralist herders dependent on their close relationship with their flocks of sheep, goat, cows, yak, horses and even the odd Bactrian camel. One aspect addressed through interviews was the domestic use of fuel (dung, wood and other possibilities including bone and coal), its collection, preparation, storage and use. In a region with limited tree cover, strict national park rules, remote location and strong human–animal interdependence, dung, as a readily available, easily collected, secondary product was the most commonly used fuel for stoves. This was not always the whole story…

Where is the Donkey? – Rethinking the Presence of Non-caballine Domestic Equids in Roman Britain

Richard Chuang
University of Southampton

Both donkeys and mules were important means of animal labour in the Roman world. According to numerous accounts in historical records and artworks, both species were depicted as pack animals in various part of the Empire. However, none of these records is directly related to Roman Britain, even though it has been widely accepted that Romans were responsible for the introduction of donkeys and mules to Britain. While this assumption is likely to be true, the assumption that local breeding was established along with the initial introduction is rarely questioned. Does the introduction of a species, domesticated or not, also imply its local breeding? Even though there is no record of the earliest donkey breeding in the British Isles, Loudon (1825) argues that local breeding of donkeys did not take place in England until
some period after Henry VIII and that this can be attested by the work of Holinshed (1577), who states that there is no local production of either donkeys or mules during his time. Not only are these two species very rare in British archaeological faunal assemblages, the fact that the numbers of identified archaeological donkeys decreases through time and mules are only identified during the Roman period seems to disagree with the establishment of continuous local breeding of these species. While the morphological similarities between the skeletal remains of domestic equids and insufficient identification criteria are often blamed as the main cause for their low frequency in the archaeological record, the environmental and cultural–economic factors are seldom considered. This research examines the acquisition of equids in Roman Britain using isotopic analysis from five sites and hopes to rethink the question of local breeding of non-caballine equids in Roman Britain.

A Reconsideration of Calf Mortality in Mediaeval Emden, Germany

Louisa Gidney
Durham University

Terry and I first met as students at the Institute of Archaeology, where he was remarkably patient with a junior struggling to comprehend new concepts. Since then, Terry’s work has been a pleasure to read and a source of stimulation for new trains of thought. A throw away comment by Terry in a book review in Environmental Archaeology was the catalyst for the examination of the evidence for Mediaeval calf mortality presented in this poster.

Two excavations of 10th–16th century sites within the Mediaeval town of Emden, Germany, produced a collection of some 60 calf bones, categorised by Jessica Grimm as foetal according to published criteria.

The greatest length measurements of these bones, from which gestational age is estimated, are plotted against comparable data from known full-term stillborn Dexter calves, both normal and exhibiting chondrodysplasia. The two samples overlap, with the archaeological bones generally being longer than those of the Dexters.

The use of published criteria to estimate gestational age of archaeological finds needs to take into account the effect of maternal size on calf size. Both the modern normal Dexter cows and the Mediaeval cows from Emden appear to have been smaller than the modern breeds used to establish data on gestational age from foetal limb bone length.
Rather than a health problem causing premature births among the Mediaeval cows at Emden, the modern Dexter comparison suggests the consumption of veal from calves up to eight weeks old. This was a standard, documented strategy associated with Mediaeval and early post-Mediaeval milch cows. The survival of infant calf bones at Emden illuminates this aspect of Mediaeval urban cow-keeping.

States of Matter: The Differential Preservation Conditions and Resulting Challenges for Faunal Experts at Star Carr

Becky Knight⁴, Kirsty High⁴, Ian Panter², Kirsty Penkman¹, Terry O’Connor¹, Barry Taylor³, Chantal Conneller⁴, Nicky Milner¹

⁴. University of Manchester

Star Carr has become a world-renowned site for its unique artefacts and amazing preservation. However, recent excavations over the last 10 years have uncovered a range of deterioration states not previously encountered at the site. The project has published research into some of the possible reasons for the deterioration, however this paper will address some of the more specific effects on the bone and antler that are very dependent on their location within the site. Also to be discussed are the ways in which we have recovered the data from these assemblages despite some cases of fairly serious taphonomic degradation.

Three Excavations, Two Decades and a lot of Roman Animal Bone. Zooarchaeological Results of the Last Phase of Archaeological Research at the Vermeulenstraat in Tongeren (Belgium)

Emmy Nijssen
PCA Ltd.

The site of Vermeulenstraat, Belgium, has been permanently occupied since the arrival of the Romans in the first century BC. The site is located in the centre of the
town and has been investigated by archaeologists in several phases throughout the 1990’s and early 2000’s.

The last excavation dates from 2007 and it is this zooarchaeological material that will be investigated in this poster. This excavation revealed some of the later features of the site, which is of interest because not much is known about the late Roman phase (3rd-4th century) in Belgium. Naturally the excavations revealed a lot of the earlier site features as well. Therefore it was interesting to see, by looking at the zooarchaeological remains, whether there was a change in butchery, consumption and deposition patterns, throughout the Roman era.

The data on the main domesticated species (sheep/goat, cattle, pig, horse) from this site will be viewed both at micro and macro scales. Other sites in the region will be used as comparators, however, zooarchaeological analysis of the main domesticates is more productive if other domesticates and non-domesticates are taken into account as well. Therefore it is important to look at the relative frequency, distribution and degree of 'exotiness' of the assemblages across the different phases of the site.

Lo-Reningen, the Faunal Analysis of a (Early) Mediaeval Coastal Site. An Attempt to Integrate ‘Classic’ Zooarchaeology with Reality of Field Archaeology in Commercial Flemish Archaeology

Emmy Nijssen
PCA Ltd.

In spite of the perhaps bold title, in this poster presentation I will give a positive example of how environmental archaeology, in this case zooarchaeology, can be applied in a commercial environment in Belgium, where commercial archaeology is a relative new phenomenon.

The commercial units in Flanders region of Belgium are becoming increasingly aware that in-field collection/registration and post-excavation environmental analysis can yield interesting results that can contribute to a wider understanding of a site. This is of benefit to both the commercial unit who has responsibility for the site, as well as the archaeological community as a whole.

The rural site of Lo-Renningen serves as an example on how, with the aid of zooarchaeology, the hiatus in the knowledge of the (early) Mediaeval period in Belgium can be partially filled.

Due to the time-pressurised nature of commercial archaeology, researchers must be
aware of the pitfalls and how to avoid them for this type of analysis, both during the excavation as well as during the post-exavcation phase. Lo-Renningen has excellent preservation due to the clayey soil, in contrast to the often sandy soil in the rest of Flanders. This meant that the potential for recovering the full spectrum of animal species present at the site was high and various research questions could be addressed: What variety of species were present at the site? How and why were animals/(animal bones) acquired, used and deposited?

As well as the more economical and taphonomical approaches, it was possible to investigate whether there was a change in function of the site over time.

Phytoliths as Indicators of Late Quaternary Human Activities: A Record from FaHien Rockshelter (a Cave) in Sri Lanka

*Rathnasiri Premathilake*¹, Christopher Hunt²

¹. University of Kelaniya, 2. Liverpool John Moores University

Tropical environments are among the most challenging for human colonisation. Until recently, many anthropologists maintained that it was impossible for hunter-gatherers to live in rainforest environments if they could not exchange rainforest resources with agricultural populations. The history of human exploitation of rainforest environments is extremely sketchy and little evidence is available for South Asia. We demonstrate the very early occurrence of phytoliths of wild plant resources (e.g. banana and wild rice) at the longest archaeological sequence from FaHien Rockshelter site in Sri Lanka. The phytoliths records show that wild bananas and rice that probably occurred as a truly natural element in disturbed lowland rainforest and edge habitats, from which they colonise broken ground in Sri Lanka, were used as early as 38,000 BC. It is suggested that, in the remote past, prehistoric people were responsible for keeping the wild banana species (e.g. *Musa acuminata* and *Musa balbisiana*) and wild rice (e.g. *Oryza* spp.) with an expansion of the anthropogenic landscape. Phytoliths from domesticated bananas and rice, dated to middle-late Holocene, positively identified for the first time from an archaeological sequence in Sri Lanka is being debated. This discovery shows that the engagement of prehistoric cultures with the management of starchy staples in the rainforests of Asia has been underestimated and should be the focus for future research.
The nature of Anglo-Saxon fishing and fish consumption: a multi-disciplinary approach to the study of fish remains

Rebecca Reynolds
University of Nottingham

The taste for fish consumption during the Anglo-Saxon period has attracted much debate due to the importance fishing came to have in the high Mediaeval period. However, due to the fragile nature of fish remains and the associated complications with their analysis, the role fish played in Anglo-Saxon England is far from clear. The early Anglo-Saxon period is generally believed to be characterised as lacking in fish consumption, while the evidence for fishing picks up in the mid-Anglo-Saxon period, especially in the early urban centres. Most studies have taken an economic approach when analysing fish remains. The use of a multi-disciplinary approach combining zooarchaeology, human isotope data, place-names and material evidence has shown that the development of fishing is likely due to a change in perception of and relationship with watery environments. This is also closely related to the social development that occurs throughout the period. However, the picture is far from clear and many questions remain to be answered.

Of seals and men: liminal prey—hunter relationships in the Eastern Baltic Sea region in prehistory and history

Oula Seitsonen1, Sanna Seitsonen2, Lee G. Broderick3
1. University of Helsinki, 2. Independent Researcher, 3. zooarchaeology.co.uk

Seal hunting has been an important livelihood for the inhabitants of the Eastern Baltic Sea and Lake Ladoga, Europe’s largest lake, throughout millennia, based on zooarchaeological studies as well as historical and ethnographic data. Historical accounts document hunting methods that appear to have a long antiquity, such as hunting trips lasting several months on the sea ice. Sealing necessitates highly specialised knowledge of the prey’s movements and requires a high investment by the society. Early 20th century sealers were organised in secretive, esoteric sealing bands typically consisting of close kinsmen or neighbours. Membership of the bands
was controlled by a wealth of restrictions and rituals, and the bands developed their own enigmatic ‘ice language’ based on taboo words that the seals would not understand. In light of the rich folklore surrounding seal procurement in the early 20th century, sealing had a distinctive and resilient status and place in the cosmology of the societies participating in it: sealing has been deeply entwined with ritual, magic and superstition all over Fennoscandia. Sealing, as a way of life and a thing to do, seems to have been embedded into the very cultural core and worldview of the people. In particular, the so-called ‘charming hunting’, a peculiar and original prey luring method documented in the area, is thought-provoking: the hunter fundamentally transforms himself into a seal, originally also dressing in a seal skin, and replicates prey movements, sounds and general behaviour to lure seals on heat to approach him. By the early 20th century, this method was only used in Lake Ladoga but it might have been more widespread in the past. On a mental level this is an interesting undertaking, which evidences the intimate prey—hunter relationship and its cognitive reflections on the cosmology of the local hunter-fisher-cum-farmer population.

Thinking About Meat and Nutrient Storage in Prehistoric Contexts: The Case of Epipalaeolithic Kharaneh IV

Anna Spyrou
University College London

This paper considers a time period preceding the emergence of agriculture and domestication with a major focus on storage of animal meat and nutrients by mobile hunter-gatherers. While much is known today about the storage of plant resources, very little is known on the storage of meat and fat. This gap in research is primarily related to the difficulty of recognising storage in the archaeological record. Storage is more clearly recognisable in spatially constructed facilities (i.e., smokehouses) and features such as silos and granaries, however in prehistoric contexts such features are rarely preserved. Secondly, storage is mostly viewed as an early agricultural adaptation and appropriate attention is not paid to earlier phases including the Palaeolithic/Epipalaeolithic.

This paper proposes a new integrated approach for thinking about animal meat and nutrient storage in the archaeological record by combining multiple lines of evidence from zooarchaeological/taphonomic studies, spatial distribution of bone
fragments using computer techniques (GIS), information taken from ethnographic studies and a good knowledge of seasonality. The above approach has been applied and will be discussed for Kharaneh IV, an Epipalaeolithic ‘mega-site’ in the Eastern Jordanian desert (Azraq Basin). Kharaneh IV constitutes a good example where the likelihood of meat and nutrient preservation and storage are significantly high.

Teaching Taphonomy at the Faculty of Veterinary Medicine in Zagreb, Croatia

Tajana Trbojević Vukičević, Ivan Alić, Snježana Kužir
University of Zagreb

At the Faculty of Veterinary Medicine, University of Zagreb (Croatia), we teach taphonomy as a part of the elective subject archaeozoology. Veterinary medicine students discover that standard archaeozoological analysis (e.g. bone and taxon determination) is not easy as they thought, but thanks to a solid knowledge of domestic animals osteology, they do not have a problem working with bones. However, taphonomy is a rather new discipline for them.

Due to the impossibility of attending to excavations at archaeological sites, the basic taphonomic processes, factors and effects must be determined on the previously delivered samples. Usually, those samples contain remains of animal bones, teeth and horns from the waste pits, so the majority of taphonomic analysis refers to thanatic and perthotaxic processes. Considering the type of taphonomic factors, the most common are those incurred by direct action of humans. The method of butchery (primary, secondary and tertiary) is of special relevance. Namely, the veterinary students are familiar with the hygiene and technology of foodstuffs, as well as with the Croatian law related to methods of killing animals, so they can successfully compare the similarities and differences between recent and ancient ways of butchering.

Knowledge gathered from the field of taphonomy and archaeozoology allows students of veterinary medicine a better understanding of animal exploitation through ancient cultures and expands the area of their interest. At the same time, it amplifies the area of their future employment.
Animal Husbandry and Territory: An Overview of Herding Practices in the Western Mediterranean in the First Millennium BC through Relative Frequencies, Biometry and Strontium Isotopes from Cattle Teeth

Silvia Valenzuela-Lamas
University of Sheffield

The first millennium in Western Europe witnesses the development of metallurgy and an overall increase in social complexity, which is accompanied by the building of oppida and fortifications in most territories. In the Iron Age, other than the technology of iron itself, the archaeological record reveals the firsts evidences of wheeled pottery and rotatory querns, together with an expansion of cereal production. What happened to animal husbandry? What were the consequences of the use of iron tools in agriculture and demographic increase regarding animal production?

This work presents an up-to-date review of the relative frequencies of the main domesticates and cattle biometry from Southern England, Catalonia (North-Eastern Spain), Tunisia and Portugal, dating from the first millennium BC to the Roman period. The macro-regional and diachronic perspective reveals common trends after the introduction of metal technology in such different ecosystems as England, Catalonia and Tunisia, but also regional particularities, materialised in ancient Portugal by the absence of changes through time. The analysis of animal mobility by the means of strontium isotopes recovered from cattle teeth in England suggests that this is the key to understand – at least partially – these general trends.
Post-Script: Useful Advice for Newbie Zooarchaeologists

Terry O’Connor

These few handy tips do not appear in scholarly textbooks, nor are they likely to feature in any university course. They are not, in short, the sort of thing that experienced zooarchs ought to be telling the younger generation. However, in the course of several decades of pushing bones around a bench, a strange sort of cynical wisdom develops, knowledge of how things actually are, rather than how they ought to be in a well-ordered world. The aim of this short essay is to save you the bother of having to find this stuff out for yourself.

Identification

Any non-descript straight longbone shaft lacking its articular ends and about as thick as your finger or thumb will turn out to be a sheep-goat tibia shaft. The only exceptions are the 5% or fewer that are whatever other medium-sized artiodactyl is native to your study area (e.g. cervids, antelopes). Any such bone found with a cold-stage Pleistocene fauna will be an intrusive sheep, not the saiga antelope that you would like it to be.

Linnaeus was not a zooarchaeologist. Although Linnaean binomials should be used correctly and with care, other forms of taxa may be more expedient. Hence small ungulate, medium ungulate, big ungulate (smungs, mungs and bungs) and, for beginners faced with bird bones and inadequate reference material, nachos (not-a-chicken).

If a colleague asks for help identifying “A weird hook-shaped bone”, it will be an artiodactyl premaxilla.

Speaking of artiodactyls, there are almost no circumstances in which you need to differentiate between an anterior left 4th first phalanx and a posterior right 3rd first phalanx.

Rib fragments were invented to irritate zooarchs. Don’t let them get to you. Treat them with the contempt they deserve.

Get to know small rodent and amphibian bones. They give you a reason to sit quietly at a microscope, lost in thought or actually asleep, and nobody will disturb you for fear that you will ask their opinion of some obscure bit of anuran.
Reference Specimens

In any well-used reference collection, at least one disarticulated skeleton will have three femora.

When prepping bird carcasses, never pluck an owl. After an hour or so, you will have enough down feathers to stuff a king-sized duvet and will have lost the will to live. Owls consist almost entirely of downy feathers and eyeballs: do not mess with either.

Data Analysis and Recording

Pencil and paper records are fully compatible with all versions of Windows, OS, Linux and Android software.

Statistical techniques are like cars. There are far too many makes and models that all do the same job. If a technique is called something like ‘the Al-Khalili-Milligan-M-statistic’, the odds are that chi-squared will do the same job in half the time.

Avoid getting interested in tooth-marks. They are the gateway drug to a full-blown obsession with bone taphonomy from which you will never, ever escape.

When interpreting mortality profiles of domestic livestock, remember that in the real world, most animal husbandry decisions are the result of collective beliefs that have no basis in fact combined with individual cantankerousness. Optimal productivity is an occasional, and largely inadvertent, by-product.

If asked “What is the best way to measure cattle horncores?”, reply “That would be an ecumenical matter” and quickly change the subject.

Bone pathology is fascinating or baffling or both. If desperate for a diagnosis, emulate our human osteoarchaeology colleagues and make up a name such as “Richards’ Dysplasia” or “Marks-Spencer Syndrome”. It usually works.

Finally don’t forget to spend time watching live animals. You will subconsciously learn a lot about how they run, fly and feed. More importantly, it will get you out in the fresh air.

Reproduced from https://osteoconnor.wordpress.com/2015/07/13/useful-advice-for-newbie-zooarchaeologists/