

Ancient Human Occupation of Britain Conference

British Museum, April 8th - 10th 2010



Thursday 8th April

Chair: Name

10.00-10.20	Ian Candy	Sedimentology and Palaeoenvironments of the Wroxham Formation: The geological context of the earliest humans in Britain
10.20-10.40	Simon Parfitt, Simon Lewis & Nick Ashton	Where the wild things are. New evidence for early humans from East Anglia and the North Sea
10.40-11.00	Simon Lewis et al.	The Ancestral River Thames in Norfolk: palaeogeography and human presence
11.00-11.10	Questions	

Chair: Name

11.10-11.40 Coffee

11.40-12.00	Justin Dix and Fraser Sturt	Submerged Early Middle Pleistocene Palaeo-landscapes of the Thames Estuary
12.00-12.20	Mike Field	Recent work at Happisburgh Site 1
12.20-12.40	Richard Preece & Simon Parfitt	The age of the Middle Pleistocene succession in Norfolk and its relevance for Palaeolithic archaeology
12.40-1.00	Kirsty Penkman	Dating the early Palaeolithic: the new aminostratigraphy
1.00-1.10	Questions	

Chair: Name

1.10-2.10 Lunch

2.10-2.30	Andreu Ollé et al.	Experimental knapping and butchery: replicating Boxgrove
2.30-2.50	Laura Basell Tony Brown, Phil Toms, Chris Norman & Rob Hosfield	A mixed assemblage and fluvio-periglacial sedimentation at Doniford, North Somerset
2.50-3.10	Rob Hosfield & Nick Ashton	Mapping the human record in the British early Palaeolithic: evidence from the Solent River system
3.10-3.20	Questions	

3.20-3.50 Tea

Chair: Name

3.50-4.10	Kathy MacDonald	Environmental tolerances of the earliest occupants of Europe: a review of the Leiden workshop and implications for future research
4.10-4.30	Matt Pope	Human tool using behaviour and landscape use in Northern Europe MIS 13 – 3
4.30-4.50	Dave Horne, John Whittaker, Steve Brooks & Russell Coope	Hoxnian palaeotemperature estimates
4.50-5.00	Questions	

Friday 9th April

Chair: Name

10.00-10.20	Chris Stringer	Neanderthal origins and evolution
10.20-10.40	Beccy Scott	The early Middle Palaeolithic of north-west Europe
10.40-11.00	David Herisson & Jean-Luc Locht	Overview of the early Middle Palaeolithic site of Therdonne, northern France
11.00-11.10	Questions	

11.10-11.40 Coffee

Chair: Name

11.40-12.00	Jean-Luc Locht	The environment and chronostratigraphy of human occupation during the last glacial/interglacial cycle in north-west Europe
12.00-12.20	Pierre Antoine	Recent work at the MIS 5e site of Caours, northern France
12.20-12.40	Peter Hoare et al.	The origin, age and significance of the small interglacial basin at Wing, Rutland
12.40-12.50	Frank Wenban-Smith	Early Devensian (MIS 5) occupation at Dartford, southeast England
12.50-1.00	Questions	

1.00-2.00 Lunch

Chair: Name

2.00-2.20	Tom Higham & Roger Jacobi	Dating the Devensian
2.20-2.40	Danielle Schreve	Lateglacial environments: new evidence from Ebbor Gorge, Somerset
2.40-3.00	Mark Lewis	Palynology of hyaena coprolites from British Pleistocene sites
3.00-3.10	Questions	

3.10-3.40 Tea

Chair: Name

3.40-4.00	Richie Abel	Computed tomography of flint, fauna and flora: A beginners guide to the revolution
4.00-4.20	Silvia Bello	Testing evidence of nutritional cannibalism at Gough's Cave (Somerset, England, 14,700 cal BP).
4.20-4.40	Mark Ruddy	Time and place in fossil small mammal assemblages: a morphological perspective
4.40-4.50	Questions	

4.50-6.30 Wine reception

Public Day Conference

Saturday April 10th:

Chair: Name

10.00-11.00 Alice Roberts Notes from a small island

11.00-11.30 coffee

Chair: Name

11.30-12.30 Chris Stringer Early humans and the fossil record
12.30-1.30 Adrian Lister Of mammoths and men

1.30-2.30 Lunch

Chair: Name

2.30-3.30 Wil Roebroeks Ancient humans in Britain from a European perspective

3.30-4.00 Tea

Chair: Name

4.00-5.00 Phil Gibbard One million years of Britain's island heritage

Abstracts

Computed tomography of flint, fauna and flora: A beginners guide to the revolution.

Richard L. Abel

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The scientists taking part in the AHOB project are attempting to reconstruct the past lives of ancient humans. To achieve this objective the group has carried out qualitative and quantitative studies of human remains along with associated flint artefacts, fauna and flora. In 2009 AHOB approached the micro-computed tomography (CT) unit at the Natural History Museum to determine whether the technique might be useful. Micro-CT is a non-destructive radiographic imaging modality for producing 3D computer models of objects based on the density distribution of materials (or phases), as measured by x-ray transmission. The models can be rendered with lights, false colours and perspective to create “virtual” 3D specimens. The “virtual” specimens can be digitally manipulated and dissected on a computer to reveal internal structure and organization. The resolution of the data sets is typically between 5-125µm so the scans can be used to make detailed observations or collect accurate morphometric data.

Although micro-CT will never replace studies of real material virtual specimens will become increasingly useful in archaeology and palaeoanthropology. The presentation will demonstrate that micro-CT is a useful technique for visualising and measuring a wide variety of natural materials including rock, fossils, teeth, bones and shell. Virtual models of museum specimens, including flint artefacts, fauna and flora, will be used to explain how micro-CT will be useful for meeting some of the phase three AHOB project objectives.

Recent work at the MIS 5e site of Caours, northern France

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In 2002, new investigation lead on the tufa deposits of the River Somme basin have allowed the discovery of an exceptional Eemian tufa sequence at Caours including several *in situ* Palaeolithic levels (Antoine et al., 2006). The tufa formation, overlying a low terrace, is composed by incrusted vegetal remains and travertine concretions (stromatoliths) passing through typical fluvial tufa

faces with oncolithic sands and large scale cross beddings in the direction of the present day valley. The tufa sequence and the upper part of the underlying fluvial silts and marshy soil have provided an abundant malacological fauna that allowed to evidence the initial phases of the Eemian interglacial, followed by the climatic optimum. The lower part of the tufa includes two organic horizons that have provided numerous large mammals remains ($\pm 10\ 000$) and rodent contemporaneous of the interglacial optimum. Within the base of the sequence, several Palaeolithic layers have been discovered *in situ* in association with interglacial large mammal remains showing evidences of human operation (systematic breaking of long bones and cut marks). The archaeological levels discovered at Caours thus represent a unique example of Human occupation during the Last Interglacial optimum in Northern France and Europe. During the last archaeological campaigns (2006-2009) numerous new results have been produced by palaeoenvironmental, dating and archaeological approaches. The main points that will be developed in the presentation are the followings:

- Full transect (drilling) from the terrace to the present day valley showing for the first time a continuous record of the last two glacial interglacial cycles in the Somme terraces system.
- New dating results from U/Th (TIMS / stromatoliths) and TL from burned flints confirming the allocation of the archaeological layers to the Eemian optimum (5e) at 123 ± 3 ka (11 dates).
- First results from the petrographic analysis (thin sections from tufa samples)
- Confirmation of the occurrence of four distinct Palaeolithic levels separated by sterile deposits and evidencing of numerous connexions between the flint artefacts from distribution maps of the various levels.
- Discovery of concentrations of burned flints and bone fragments in level 4 (fire places)
- Differentiation between the faunal assemblages of the various layers. Confirmation that Caours corresponds to a full butchery site (numerous *in situ* percussion flakes from bones, selection of animals, systematic marrow extraction).

After five years of archaeological excavations Caours appears now as one of the most complete and well preserved Palaeolithic site in Europe for the Eemian optimum and allows to demonstrate that Neanderthal was fully adapted to forested and a temperate climate. New archaeological excavations and an approach for the preservation of the site are planned for 2010.

References:

- ANTOINE, P., LIMONDIN-LOZOUET, N., P. AUGUSTE, P., LOCHT, J.L., GHALEB, B., REYSS, J.L., ESCUDÉ, E., CARBONEL, P., MERCIER, N., BAHAIN, J.J., FALGUERES, C. & VOINCHET P. (2006) - Le tuf de Caours (Somme, Nord de la France): mise en évidence d'une séquence de tufs calcaires eemiens et d'un site paléolithique associé. Quaternaire, 17 (4), 281-320.
- DABKOWSKI, J., CHAUSSÉ, C., ANTOINE, P., LIMONDIN-LOZOUET, N., CARBONEL, P. Les microfaciès du tuf calcaire Eemien (MIS 5e) de Caours (Somme): Eléments d'analyse paléoécologique du dernier interglaciaire. Quaternaire (sous-presse).

Testing evidence of nutritional cannibalism at Gough's Cave (Somerset, England, 14,700 cal BP).

Silvia M. Bello

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Evidence of nutritional cannibalism is hard to demonstrate through osteological analyses, mainly because the presence of cut-marks on human remains can be associated to butchery activities (with possible consumption of the body), but also with other ritual practices (such as defleshing, without consumption of the body).

Human remains have been recovered at Gough's Cave (Somerset, England, ~ 14,700 cal BP), in association with a rich late Pleistocene fauna and Upper Palaeolithic artefacts. Several human and non-human remains showed modifications in the forms of cut-marks, percussion marks and breakages.

For the present study, a full re-assessment of the distribution, frequencies and micromorphological characteristics of modifications observed on human remains was carried out. The aim was to reconstruct the sequence of human carcasses reduction as evidenced by the osteological assemblage and to suggest plausible interpretations for such treatments. Particular attention was devoted to the treatment of cranial remains. Overall, the cranial elements were extensively cut-marked, poorly fragmented and lacking of burning damages. The similarities of modifications on human and animal remains at Gough's Cave seem to indicate similar butchering technique. The type and frequency of modification also point towards a functional exploitation of the body elements for nutritional purposes.

Sedimentology and palaeoenvironments of the Wroxham Formation: The geological context of the earliest humans in Britain

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The Quaternary shallow marine deposits of Eastern England (referred to as the 'Crag' sequence) contain an important record of changing climates and landscapes over the Late Pliocene through to early Middle Pleistocene. The youngest unit in the 'Crag' sequence is the Wroxham Formation, a series of shallow marine/tidal gravels, sands, silts and clays that reflect sediment accumulation during the Early and early Middle Pleistocene (Rose et al., 2001). During this period the major river systems of the region (the proto-Thames and Bytham) were supplying large amounts of coarse-grained sediment into the 'Crag' Basin (Rose et al., 2001). This unit is vital to our understanding of early human occupation in Britain as many important Early Palaeolithic sites occur in association with Wroxham Formation deposits. In many cases artefacts have been recovered either from deposits of the Wroxham Formation itself or from terrestrial deposits that are interbedded with these shallow marine sediments. In this presentation we discuss the stratigraphy and sedimentology of the Wroxham Formation with the aim of increasing our understanding of human occupation during this period. In particular this talk will focus on three main areas: firstly, the stratigraphy and palaeogeography of the Wroxham Formation and its relationship to tectonic processes and climate change; secondly, the palaeoclimatic record of the Wroxham Formation and

its significance to climate forcing during this period and finally, the evidence for early Human activity in Wroxham Formation sediments together with the relationship of the known archaeology to the reconstructed palaeogeography, landscape and palaeoclimate of the time.

References:

- Rose, J., Moorlock, B.S.P., Hamblin, R.J.O. 2001. Pre-Anglian fluvial and coastal deposits in Eastern England: lithostratigraphy and palaeoenvironments. *Quaternary International*, 79, 5-22.
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Experimental Investigations into Site Formation Processes and the Earlier Palaeolithic Record

Wei Chu

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This project explores the taphonomy of reworked stone tool assemblage formation of the Lower and Middle Palaeolithic periods in northern Europe. The approach taken here is experimental in both fluvial and terrestrial settings, studying the dispersal (transport, burial) and modification (breakage, abrasion) of replica lithic artifacts such as débitage scatters, cores, and core tools and bifaces. These are related to key variables including river types, channel morphology, sediment loads, and flow velocity, and bedrock types, vegetation types and slope morphology. Statistical modeling will be used to predict patterns in artifact representation and dispersal, and the time- and space-lags between artifact discard and assemblage formation.

The Palaeolithic archaeology of the Solent River as represented in the collections of John Bernard Calkin.

Robert J. Davis

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The Pleistocene gravels of the Solent River and its tributaries have produced a vast archaeological record that documents the Lower and Middle Palaeolithic occupation of southern Britain. The sequences of river terraces provide a relative chronological framework in which broad changes in lithic technology and the character of Palaeolithic occupation can be modelled. However the nature of secondary context archaeology and its recovery has created a number of biases that may skew the apparent spatial and temporal distribution of Palaeolithic occupation, including differential preservation of gravel bodies, the relative frequency of exposure of gravels through

quarrying and urban expansion, and the activities of antiquarian collectors. Further complications are presented by the uncertainty or absence of contextual information associated with some of the assemblages.

The current research has focused on the activities of a single collector, John Bernard Calkin, for whom the geographical and temporal boundaries of his work are known, and who also maintained detailed contextual records. His collections make up 25% of the total handaxe record for the Bournemouth area, one of the major concentrations of Palaeolithic findspots in the Solent, where terrace gravels preserve the evolving courses of the Solent River, the Stour, and their confluence. Terraces are numbered from 1 to 13, with 1 being the lowest and therefore the youngest. The differential exposure of gravels from each terrace as a result of quarrying and urban expansion are quantified for the period that Calkin was active to enable assessment of the variation in handaxe densities. Although far from clear, the combined handaxe, quarrying, urbanisation and abrasion data suggests earliest occupation in Terrace 12, with alternating low and high densities thereafter. Terrace 10 is likely to represent a peak in population, with Terrace 8 representing a decline. The low densities found in Terraces 9 and 11 may indicate terrace formation spanning periods when colonisation of Britain was more difficult, although in both cases the low densities may be a result of limited exposures. The increased frequency of very abraded material in the lower terraces suggests a greater contribution of material reworked from higher terraces, adding further support to the suggestion of decreasing population through time.

Terrace 12 is dominated by the assemblages recovered from the gravel pits at Corfe Mullen. The concentration of so many handaxes at a single location when there appears to be a general lack in the rest of the terrace suggests that it may be the location of substantial local human occupation. This is also supported by the significantly reduced number of abraded artefacts, suggesting that a large part of the assemblage has not travelled far. The Corfe Mullen handaxes display a typological and technological homogeneity that is entirely absent from assemblages in the other terraces, with notably less variation in handaxe form. It is unlikely that this is entirely due to reduced assemblage mixing, since the Corfe Mullen assemblages contain artefacts in a variety of conditions. Instead it is suggestive of an increase in the diversity of handaxe form through time.

AAR dating: *Into Africa 2*

Beatrice Demarchi, Mike Buckley, Molly Crisp, Enrico Cappellini & Kirsty Penkman

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The complete picture of early human evolution and dispersal cannot be understood without a robust and secure chronological framework. Amino acid geochronology is able to span the whole Quaternary and can be applied to a range of common materials which are directly related to the human occupation of an archaeological site.

Mollusc shells, for example, are frequently targeted as the substrate of choice: the exploitation of marine resources by early humans is considered to be one of the most important indicators of “modernity” in human behaviour. Fossil shells are also preserved in sediments which accumulated as a response to global climatic pulses, during the Pleistocene and beyond. In Africa, ostrich

eggshell (OES) is perhaps one of the most common biominerals found in archaeological contexts: early humans used them as water containers, as personal ornament and engraved them as a form of symbolic communication (Textier et al 2010). Therefore, amino acid geochronology has the potential to be widely applicable to the chronology of human evolution, as well as to the geological record.

However, for the use of amino acid racemisation (AAR) as a *reliable* dating tool, analysis of proteins from a closed system within fossils is vital. The intra-crystalline fraction within ostrich eggshell (Brooks et al 1990), and more recently from terrestrial molluscs (Penkman et al 2008), have been found to provide robust closed system protein, allowing significant increases in the resolution and reliability of AAR geochronology.

Our research has focused on building chronological frameworks for the dating of terrestrial and coastal archaeological and geological sites on a wide spatial and temporal scale. Beginning from the Lower Palaeolithic in Northern Europe (Parfitt et al 2005), we are making our way back into Africa: we crossed the Gibraltar Strait, where evidence for the Last Neanderthal occupation has been found, together with their exploitation of marine resources (Stringer et al 2008); we moved down to Morocco, to one of the earliest Aterian sites (Dar es Soltan I) (Barton et al 2009); we tested the environment of the Red Sea and the Bab el Mandab strait (Demarchi et al in review); we are now getting to South Africa, where some of the earliest evidence for modern human behaviour has been found (Marean et al 2007).

Overall, our work has confirmed the potential of the new developments in amino acid chronology for unravelling the complex interactions between early humans and climate occurring during the past. The method is now being extended to a range of different environments and substrates, including some of the earliest Modern Human sites in South Africa.

References:

- Barton RNE et al 2009 OSL dating of the Aterian levels at Dar es-Soltan I (Rabat, Morocco) and implications for the dispersal of modern *Homo sapiens*. *QSR* 28:1914-31
- Brooks, AS et al 1990 Dating Pleistocene archaeological sites by protein diagenesis in ostrich eggshell. *Science* 248, 60-64
- Demarchi et al AAR dating of shell middens: a mound of possibilities. *QI* in review
- Marean CW et al 2007 Early human use of marine resources and pigment in South Africa during the Middle Pleistocene. *Nature* 449:905-8
- Parfitt SA et al. 2005. The earliest humans in Northern Europe: artefacts from the Cromer Forest-bed Formation at Pakefield, Suffolk, UK. *Nature* 438:1008-12
- Penkman, KEH et al 2008 Closed-system behaviour of the intra-crystalline fraction of amino acids in mollusc shells. *Quaternary Geochronology* 3 (1-2), 2-25
- Stringer CB et al 2008 Neanderthal exploitation of marine mammals in Gibraltar. *PNAS* 105:14319-24
- Textier et al 2010 A Howiesons Poort tradition of engraving ostrich eggshell containers dated to 60,000 years ago at Diepkloof Rock Shelter, South Africa. *PNAS* in press

Submerged early Middle Pleistocene palaeo-landscapes of the Thames estuary

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A recent Government/Industry funded geological and heritage assessment project has identified an extensive, potentially early Middle Pleistocene, submerged palaeo-landscape in the Outer Thames Estuary. The combined interpretation of bathymetry and sub-bottom data, and a full review of the extant geological and archaeological record, identified c. 3,000 km² of exceptionally preserved palaeo-landscape, interpreted, on a relative stratigraphic basis, as dating from between 600 – 720 kaBP. This landscape is spatially bracketed by the key internationally significant sites of Clacton (to the south) and Pakefield (to the north), a coastline which has produced evidence for the earliest occupation of the British Isles at c. 600 – 700 kaBP. The exceptional level of preservation of this landscape holds great potential for enhancing both our understanding of the earliest occupation of the British Isles and the broader geological changes which have occurred during multiple episodes of sea level transgression and regression. This paper will describe the nature of this palaeo-landscape; the relative chrono-stratigraphical arguments for hypothesising such early dates; and finally ongoing work to establish true chronological constraints on this land surface through a current industry funded exercise.

On the Origins of British Hyaenas

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The spotted hyaena *Crocuta crocuta* persisted in the British Isles until ~25,000 BP according to available 14C dates, and it is usually assumed that they became locally extinct during the Last Glacial Maximum and failed to return with mammoth steppe faunas when conditions finally ameliorated. Other extinctions which occurred broadly around the same time frame include the Neanderthals. Key Devensian palaeontological sites for hyaena include Creswell Crags (Derbs/Notts) and Kents Cavern, Devon.

Crocuta crocuta arose during the Middle Pleistocene and the time to the most recent common ancestor of the spotted hyaena mitochondrial DNA (mtDNA) sequences has been estimated at 3.48 myr BP. The spotted hyaena migrated out of Africa three times, of which only two reached Europe; the first at 1.3 myr BP and the second at 360 kyr BP, both of which led to the mtDNA genetic clades B and A respectively. Both of these clades have been found among Upper Pleistocene *Crocuta crocuta* on mainland Europe although the continental source for British hyaenas is currently unknown.

Our aim here is to reconstruct the origin of British *Crocuta crocuta* populations through mitochondrial DNA analysis of dated samples taken from Creswell Crags and Kents Cavern. A further ramification follows: if the Neanderthals and spotted hyaenas were contemporary in the tundras of Devensian Britain, the evolutionary history of the two could be interlinked and the population demographics of hyaenas could be of importance to our understanding of Neanderthal extinction.

Hominid Landscape Use: Resources, rocks and real estate

Helen Drinkall

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At the turn of the 19th century Sir John Evans was astonished to find palaeoliths present on chalk, far removed from the traditional river valleys. A hundred years later upland sites are still considered a questionable resource, but could these actually represent key locales in hominins exploitation of the landscape? The oft described monotonous character of the Lower Palaeolithic may result from a single facet of behaviour represented by these lowland, riverine sites. The hypothesis proposes that landscape character and available resources determined the types of activities and artefactual signatures left behind. Therefore approaches focusing on sites in comparable settings may not be representative of the full spectrum of wider landscape choices. It may be the case, as Roberts has suggested for Boxgrove, that the upland sites represent our hitherto missing camps, situated in elevated positions away from the lowland hunting grounds. The research aims to investigate behavioural choices through artefactual analysis of datasets from selected lowland and upland sites, combined with environmental evidence and a GIS approach. This poster presents one aspect of this research, highlighting the importance of the upland record and investigating landscape use via sites from the Chilterns and the North Downs of Kent.

Surface Tomography and Metrology in the Quest to Understand Prehistoric Man

Adrian Evans

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The work illustrates a newly developed method of using laser scanning confocal microscopy (LSCM) to characterise the texture of worn surfaces on stone tools to infer function. It details 1) how the method works; 2) a comparison of the imaging capabilities of LSCM to standard microscopy and scanning electron microscopy; and 3) shows how the use of LSCM with texture analysis methods can successfully differentiate wear produced from using stone tools to work a range of different materials. Application of this technique to prehistoric material should allow us to understand how stone tools were used with a much higher accuracy and consistency than current methods and thus open the door for a better understanding of site function and organisation.

Preliminary results from a recent excavation at the Happisburgh 1 site.

Mike Field

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A fluvial channel deposit (part of the Cromer Forest-bed Formation) occurs below the modern beach to the south of Happisburgh, Norfolk. In places the channel is overlain by the Happisburgh Till (the lowest member of the Happisburgh Formation). This locality has been called Happisburgh 1.

The discovery of a handaxe in the channel deposits in 2000 prompted a British Museum (BM) team to undertake a small excavation in 2004. The BM excavation recovered a small worked flint assemblage. Analysis of sediment samples suggested cooler conditions at the time of deposition than today. Cut marks on bone indicated butchery had taken place and the presence of *Arvicola* pointed to an age of between 500 to 600,000 years old.

In 2009 a team from Leiden University dug at the Happisburgh 1 site in collaboration with members of the AHOB project. The aim was to expand what was known about the geography of the channel deposits and the stratigraphy at the site, recover more artefacts, and undertake a palaeoenvironmental investigation (with a palaeobotanical bias). Preliminary results from the excavation and laboratory analyses are presented.

The Happisburgh Till / channel contact is probably an unconformity and is positioned just above sea-level. Directly below this contact a laterally discontinuous dark brown silt horizon exists which in places contains many wood fragments. Underlying the dark brown silt and till is a grey sand and silt horizon. In the upper part of the grey sand and silt sequences of fining upwards sediments are present. These may indicate deposition during flood events. After deposition these sediments were distorted possibly by the overlying ice. Approximately 1.3 m below sea-level a yellow orange coarse sand with clasts occurs and this may represent the bottom of the channel.

Despite an intensive sieving operation few vertebrate remains were recovered. However, the sediments yielded plant macrofossils and microfossils (pollen and spores). Initial results show that the grey sand and silts were deposited under brackish conditions because taxa such as *Salicornia* and *Chenopodiaceae* are well represented as well as Foraminifera. Palynological data show a coniferous forest consisting of *Pinus*, *Picea* and some *Abies*. *Carpinus* is recorded and traces of other thermophilous tree taxa are also present (*Quercus*, *Ulmus*, *Corylus*). Exotic taxa represented include *Azolla filiculoides* and the extinct ancestor of the Kiwi fruit *Actinidia faveolata*. The palynological assemblage from the dark brown silt with wood fragments also shows that a *Pinus* and *Picea* coniferous forest prevailed at the time of deposition. However, the plant macrofossil assemblages from this horizon indicate deposition under freshwater conditions with aquatics such as *Callitrichie*, *Lemna*, and *Stratiotes aloides* represented.

The top part of the grey sand and silt horizon yielded a relatively large number of unprepared core technology artefacts (thin flakes and multi-platform cores). Based on the refitting of some of the very well preserved flakes it is probable that the assemblage is in primary context.

The preliminary results suggest hominin activity at the margins of an estuary probably towards the end of an interglacial stage. The BM excavation concluded that deposition took place at the end of the Cromerian Complex, but the *Actinidia faveolata* find makes an age determination difficult because this taxon has only previously been recorded from Early Pleistocene deposits in the SE Netherlands.

Work on the Happisburgh 1 site is ongoing and another field season is planned in 2010.

Dating the Devensian

Tom Higham¹ and Roger Jacobi†

¹ Oxford Radiocarbon Accelerator Unit, University of Oxford, Dyson Perrins Building, South Parks Road, Oxford OX1 3QY, UK

A reliable radiocarbon chronology is crucial in order to develop a proper understanding of the Middle and Upper Palaeolithic of the British Isles. We have worked over the last 10 years to improve the application of radiocarbon to the period, by redating material previously dated which we suspected to be problematic using improved methods of dating. At the Oxford Radiocarbon Accelerator Unit (ORAU) we have developed aspects of our pre-treatment chemistry, particularly the purification of bone collagen using ultrafiltration. When comparing the ultrafiltered results with previously determined samples of the same bone from our laboratory, and other laboratories, the results in many cases are quite different. When ultrafiltration is used, the dates are often older, and we consider, more accurate due to increasingly effective contaminant removal.

In this talk details of further methodological improvements will be described, and some aspects of the emerging chronology for some of the key sites in the British Isles and continental Europe will be outlined. This will include the dates and modelling of the Middle to Upper Palaeolithic levels at Kent's Cavern, Torquay, in which the important human maxilla is located, and the dating of the leaf-points discovered in 2000 at the site of Grange Farm, Glaston (Rutland) and therefore part of the wider Lincombian-Ranisian-Jerzmanowician techno-complex.

Palaeolithic Archaeology of the Solent River: Human Occupation in its Stratigraphic Context

Marcus Hatch

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The Solent River was the largest river of southern England during the Quaternary Period and a major gateway for early human populations entering Britain. Abundant early Palaeolithic artefacts, notably handaxes, are found in the gravel terraces that the river left behind. The archaeology of the Solent River region, comparable in importance to the River Thames, could shed light on issues such as the first appearance of hominins in Britain, technological change and innovation, and population change as Britain became an island. The main aim of the project is to improve understanding of the nature and dating of this immense archaeological resource.

My research will focus on the development of the Solent River system and its contained archaeology through the investigation of terrace sediments. Existing modelling of the Solent

terrace stratigraphy will be critiqued via a comprehensive review of the region's borehole record and new data collection. Correlation issues relating to terrace deposits in different parts of the system will be addressed, with fieldwork at key sites enabling a re-assessment of current interpretations of the region's stratigraphic record. The use of optically stimulated luminescence (OSL) dating on key gravel aggradations will establish a chronology for the terrace sequences. The project's development of a new Solent River chrono-stratigraphic framework will significantly improve the potential to understand changes in the archaeological record of the Solent region.

Overview of the early Middle Palaeolithic site of Therdonne, northern France

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At the end of MIS 7, between 170-190 ky BP (TL determination: 178 +/- 11 ky BP), hominins settled at the foot of the tertiary hillside at Therdonne (Oise, France). Located only four kilometers from the later Middle Palaeolithic site of Beauvais "La Justice", the site of Therdonne offers the same advantages in terms of location. The excavation began in 1999, and revealed an exceptionally well-preserved archaeological layer (N3). This communication is intended to present an overview of the N3 occupation. The context of the discovery and the excavation will be presented, as well as the chronostratigraphic framework of the site, and the first results from analysis of the lithic industries and hearths. The evidence from the site is placed within the context of early Middle Palaeolithic sites, which are, as yet, poorly dated. The N3 occupation therefore represents a rare example of a well-dated Saalian occurrence from Northern France.

The origin, age and significance of the interglacial basin at Wing, Rutland

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An earlier study at Wing identified a small, closed, bedrock basin, roughly circular in plan, locally steep-sided and believed to result from glacial erosion. Infilling of the basin was said to have begun in Ipswichian Ip IIb and to have ended during the early Devensian (Hall 1980). Wing is significant, therefore, in providing one of very few records of the second part of this interglacial. It was cored again in September 2009 in the course of a wide-ranging evaluation of MIS 7 and 5e sites in Britain (Lewis *et al.*, forthcoming). We report here on preliminary results from the examination of these deposits.

The recovery of beetles, ostracods, chironomids and fish remains from the sedimentary infill, though few in number and fragmentary, represents a marked increase in the range of material reported by Hall (1980). The beetles indicate that the local ecology was predominantly that of a swamp with shallow ponds amongst reed beds; open habitats, some dry, others moist, lay nearby. A temperate climate is recorded by the beetles in the older sediments. There are few sites against which to compare this fauna; contrasts with the earlier part of the classical Ipswichian interglacial may reflect different parts of the same stage. The beetles indicate a subsequent rapid deterioration to tundra conditions.

The geometry of the basin, and its regional setting, suggest that it developed by cambering, gulling, sagging and bulging of ‘competent’ and ‘incompetent’ beds in the subjacent Jurassic succession. Initiation of the basin post-dates the most recent glaciation of the district and, since the early part of the interglacial is missing, may have begun part way through the warm stage.

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Hoxnian palaeotemperature estimates

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The Stratotype Hoxnian Interglacial lake sediments at Hoxne (Strata D, E and F), correlated with Marine Isotope Substage 11c, are overlain by a cold-climate interval represented by the so-called “Arctic Bed” (Stratum C; correlated with MIS 11b), followed by a cold-temperate interstadial

interval (Stratum B, fluvial deposits) correlated with MIS 11a. The lacustrine interglacial deposits (Strata E and F) are capped by a peat (Stratum D) representing a drying-up of the lake and the encroachment of terrestrial vegetation; reworked sediment and organic material in the overlying deposits indicate a hiatus between Stratum D and the return to lacustrine deposition in Stratum C. Archaeological evidence of human occupation is confined to the post-Stratum C fluvial sediments (Strata B1 and B2) and the overlying alluvial silts (Strata A1 and A2). New palaeotemperature estimates based on three invertebrate groups (beetles, chironomids and ostracods) confirm that Stratum C was a cold interval sandwiched between warm intervals and indicate an earlier cold episode in Stratum F, suggesting that lake deposition may have begun towards the end of the MIS12 (Anglian) late-glacial interval. In Stratum F, wide ranges of possible January temperatures indicated separately by beetles and ostracods only overlap in the narrow range -10 to -9°C, demonstrating the facility of the multi-proxy approach for greater precision; a July range of +10 to +12 °C indicated by beetles falls within a much wider range obtained from ostracods. No beetle palaeotemperature estimates could be obtained from Stratum E but chironomid results for July (+17 to +21°C) fall within wider ranges indicated by ostracods, consistent with a full interglacial climate slightly warmer than that of today. Stratum D January and July estimates (beetles only) suggest slightly cooler interglacial climate similar to today. In Stratum C, beetle, chironomid and ostracod estimates are all consistent with summer temperatures substantially colder than today; however, the beetles indicate that July temperatures did not exceed 11 °C, while the chironomids give minimum values at least a degree higher, a discrepancy that might be at least partly due to lack of exact equivalence in sampling. Similar discrepancies between beetle and ostracod estimates at some levels may also be explainable by reworking of certain ostracod taxa from exposed marginal deposits of the larger, interglacial lake into the smaller Stratum C lake. According to the beetles, January temperatures did not rise above -10 °C; the corresponding ostracod data, while very wide-ranging, are not inconsistent with this and hint at a more complex structure in the Stratum C climate record: a more stable early phase followed by an interval of greater fluctuations and colder winter extremes. A combination of ostracod palaeoecology and oxygen stable-isotope analyses of ostracod shells suggests (tentatively) colder conditions in the upper part of Stratum C, possibly accompanied by a change in effective moisture. In Stratum B only relatively broad-ranging ostracod-based estimates have been obtained, which nevertheless indicate at least a slight warming compared to Stratum C and are consistent with the climatic amelioration suggested by mammalian and fish fauna. These results demonstrate the potential value of the multi-proxy approach but also highlight the need for rigorous comparative testing of the methods and more precisely coordinated sampling.

Mapping the human record in the British early Palaeolithic: evidence from the Solent River system

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The lithic record from the Solent River and its tributaries is re-examined in the light of recent interpretations about the changing demography of Britain during the Lower and early Middle Palaeolithic (Ashton & Lewis 2002). Existing models of the terrace stratigraphies for the Solent River and its tributary streams are briefly reviewed and the corresponding archaeological record (specifically handaxes) for each terrace is assessed to provide first appearance estimates and models for the changes in human occupation through time. The Bournemouth area is presented as a short case study examining the effects of quarrying and urbanisation on collection histories and on the biases it introduces to the archaeological record. In addition, the effects of reworking of artefacts from higher into lower terraces are assessed, and shown to be a significant problem in the Solent River system.

Although there is very little absolute dating available for the Solent area, a cautious interpretation of the results from these analyses would suggest a pre-Marine Isotope Stage (MIS) 12 date for the first appearance of humans, a peak in population between MIS 12 and 10, and a decline in population during MIS 9 and 8. This record is comparable to the earlier part of the Middle Thames record as modelled by Ashton & Lewis (2002). Owing to poor contextual data and small sample sizes, it is not clear when Levallois technology was introduced in the Solent. The latter part of the record is therefore contrasted to that from the Thames Valley, and also considered with reference to other handaxe-dominated MIS 9/8/7 sites from the west of England (Broom and Harnham). It is suggested that changes and regional variations in the palaeogeography of Britain might have contributed to differences in the archaeological records from the Solent and Thames regions, and reference is made to the progressive impact of uplift/subsidence in the southern North Sea Basin and the English Channel upon land connections to the continent over the course of the Middle Pleistocene.

«Tranchet Blow» technique, and *curation* of hand axes during the Lower Palaeolithic: New observations from Boxgrove – Q1B site.

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In our poster, we question the relevance of the ‘tranchet blow’ as a specialized re-sharpening technique of the acheulean hand axes from Boxgrove – Q1B site (500 Kyrs BP). For some decades, an increasing effort has been done to explain the specific role possibly played by hand axes in the subsistence of the first hominids that colonized northern Europe. It is supposed hand axes provided some advantages compared to more simple implements as flake tools. Among other hypothesis, a very popular one is that hand axes were long lasting tools, used by hominids in their moves and intensively re-sharpened. As an extension of this theory, it has also been suggested that hand axes discard at different stage of their exhaustion could explain the important variability in their size and shape. Since size and overall shape of hand axes are also too obviously related to variations in initial blanks properties, these attributes are not sufficient to validate the ‘reduction hypothesis’. It comes to the conclusion that biface re-sharpening is more likely to be demonstrated by other kind of evidences, like specific knapping procedures. Following

observations done by Cornford at La-Cotte-de-Saint-Brelade, ‘tranchet blow’ technique tends to establish itself in prehistorian common knowledge as a ‘specialized re-sharpening technique’. Nevertheless, too few studies have tempted to replace this technique in the reduction sequences of acheulean handaxes. These sequences are deduced from the overlapping of flake removals. Such study has been carried out by us on Boxgrove hand axes. Tranchet blow was very frequently done at the tip of these hand axes, creating a transverse cutting edge. The key concern was to verify if the technique occurred at the moment expected for a re-sharpening : at the very-end of the reduction. However, our observations allow us to maintain that it was often followed by extensive reduction led by more ‘conventional’ retouch on the lateral margins and sometimes even at the butt of the hand axe. Economical and typological implications of these results are discussed.

Dans notre poster, nous nous interrogeons sur la pertinence de la technique du ‘coup de tranchet’ en tant que technique spécialisée de raffûtage des bifaces acheuléens de Boxgrove (500 Kans av. le présent). Depuis plusieurs décennies, un effort constant a été fourni pour expliquer le rôle particulier ayant pu être joué par les bifaces dans la subsistance des premiers hominidés qui ont colonisé le Nord de l’Europe. On suppose en particulier que les bifaces présentaient quelques avantages comparé aux outils plus simples comme les outils sur éclat. Une hypothèse populaire considère que les bifaces étaient des outils à usage prolongé, utilisés par les hominidés lors de leur déplacement et intensément raffûtés. En complément de cette théorie, il a été proposé que l’abandon de ces bifaces à différents stades de leur exhaustion puisse expliquer l’importante variabilité de leurs formes et de leurs dimensions. Dans la mesure où la forme et la dimension des bifaces sont également trop clairement conditionnées par la forme et la taille du bloc de départ, ces attributs ne sont pas suffisants pour valider l’hypothèse du raffûtage. Cela conduit à la conclusion que le raffûtage doit être démontré au travers d’autres indices, comme des techniques de taille spécifiques. Suite aux travaux de Cornford à la Cotte-St-Brelade, la technique du ‘coup de tranchet’ tend à s’imposer dans l’opinion général des préhistoriens comme une technique spécialisée de raffûtage. Cependant trop peu d’études ont tenté de replacer cette technique dans les séquences de façonnage des bifaces acheuléen. Ces séquences sont déduites du recouplement des négatifs d’enlèvements entre eux. Une étude de ce type a été entreprise par nous sur les bifaces de Boxgrove. Les coups de tranchets ont été très souvent pratiqués sur la pointe de ces bifaces créant un tranchant transversal. La question centrale était de vérifier si cette technique intervenait au moment attendu pour un raffûtage : à la toute fin du façonnage. Nos observations nous autorisent toutefois à affirmer qu’elle est souvent suivie par une réduction importante conduite par le biais d’une retouche plus conventionnelle, à partir des longs cotés et parfois même de la base. Les implications typologiques et économiques de ces résultats sont discutées.

Palynology of hyaena coprolites from British Pleistocene sites

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Spotted hyaena (*Crocuta crocuta*) coprolites from four British Pleistocene sites were analyzed for pollen content. At the two open sites the palynology was compared to that of the surrounding sediments. The results provide palynological data, supported by other lines of evidence, enabling some reconstruction of environments as well as providing insights into the taphonomic complexities of incorporation of pollen into coprolites. Pollen presence and preservation appear to be closely related to mammalian behaviour and post-depositional processes. Age does not seem to be a significant factor as samples from two of these sites are amongst the earliest known from the Pleistocene to provide viable pollen counts.

The Ancestral River Thames in Norfolk: palaeogeography and human presence

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The Early and early Middle Pleistocene landscape of eastern England, in particular the course of major rivers prior to the Anglian (MIS 12) glaciation, remains the subject of much debate. Following the recognition of extensive spreads of sands and gravels of Thames origin in East Anglia (the Kesgrave sands and gravels) it was suggested that the earliest route for the pre-diversion River Thames was northeastwards from the Vale of St Albans through Hertfordshire, Suffolk and into Norfolk. More recent reconstructions have proposed a more southerly route for the River Thames that did not extend into Norfolk. One of the key pieces of evidence in this debate is the occurrence of a distinctive suite of erratic lithologies that can be attributed to a Thames origin. This suite includes Lower Greensand chert from the Weald, Hertfordshire ‘Puddingstone’ and acid igneous lithologies which are widely held to have their ultimate source in the Palaeozoic rocks of north Wales. Recent field work at Happisburgh, in northeast Norfolk, has revealed a sequence of fluvial and estuarine deposits, including gravelly units. Clast lithological analysis and inspection of a large number of ‘over-sized’ clasts retained from field sieving of several tonnes of these gravels have enabled a suite of erratic lithologies to be identified which are compatible with that from the pre-diversion River Thames. This necessitates a re-evaluation of the palaeogeography of the River Thames during the Early and early Middle Pleistocene and, in turn, has implications for the reconstruction of the landscape that was occupied by the earliest human occupants of Britain.

Environmental tolerances of the earliest occupants of Europe: a review of the Leiden workshop and implications for future research

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Given the relatively extreme climate influenced by location at high northern latitudes and proximity to the Atlantic Ocean, the north-west region of Europe provides an interesting case study for hominin colonization and environmental tolerance. The discoveries from the Cromer Forest-bed Formation have demonstrated that hominins were present in this region surprisingly early, and opened our eyes to what may be found elsewhere in Europe. In addition, the chronology and environments of hominin occupation are known in increasing detail particularly in the UK for the period after c. 600,000 years ago. A workshop held in Leiden in May 2009 focused on the chronology and environments of the late Early and early Middle Pleistocene period, and aimed to address the implications of the chronological and environmental evidence for hominin environmental tolerance and colonization of northern Europe.

The workshop raised many interesting ideas and questions which merit further investigation. Here I will outline and develop points from the workshop relating specifically to the archaeological record, which address three key research questions. First, given the surprisingly early discoveries in East Anglia, should we expect to find equally early sites elsewhere in northern Europe? Which deposits would be worth surveying with this in mind? Secondly, was early colonization successful, leading to continuous occupation? Third, in what environmental conditions did hominins live in NW Europe in the early Middle Pleistocene, and what does this imply in terms of hominin behaviour? Based on this review, I will highlight problems and prospects for future research on hominin colonization and environmental tolerance in NW Europe.

Experimental knapping and butchery: replicating Boxgrove

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This paper presents the ongoing results of a research project devoted to the analysis of some basic processes in the subsistence strategies of early Middle Pleistocene hominins. Experimentation is utilised as a common procedure to gain competence and direct experience in activities regularly practised during the Palaeolithic: namely, knapping and butchery. The dual purposes of the research were to provide a better understanding of the excavated archaeological record and to validate or reject hypotheses resulting from the study of these excavated assemblages. Specifically, the project team carried out the experimental reproduction of a series of large flint cutting tools or handaxes, based on examples recovered from the Acheulean site of Boxgrove in

West Sussex, UK. The tools were then subsequently used in a series of monitored and recorded butchery experiments; the resulting traces of the butchery on both the lithics and the bones have been described, quantified and studied.

The replication of lithic artefacts and specifically handaxes and cleavers, has been traditionally used to aid interpretation of the archaeological record in terms of technology and typology. The first studies carried out by the authors focussed on the applicability of recording the controlled replication of these large and relatively complex tools, followed by experiments with variables such as the type of hammer utilised and the status of the primary raw material to be knapped. The experiments focused on the reduction process and sequence required to produce Boxgrove-type handaxes, using the procedures elucidated from the archaeological record; the raw materials used were flint nodules eroding out of mass movement Chalk gravels at the site. The final goal of the experiments was to correctly weight the variables required to produce the handaxes; these included the dimensions and shape of the original nodule, the type of hammer used and the reduction strategy employed by the knappers. The experimental knapping by a team with varying degrees of experience in handaxe manufacture proved invaluable in gaining insights into the Acheulean *chaînes opératoires*.

The second part of the analysis was to ascertain the use or uses of the tools by their original creators. Although the function of large cutting tools is a recurrent topic in the study of Acheulean lithic assemblage, in fact little specific work has been done on functional analyses. Those that have been undertaken have been from the perspective of evaluation of tool effectiveness, simple technological experiments, and comparative ethnological studies. Direct approaches to the study of function such as use-wear analysis and residue studies have only been patchily applied to handaxes.

The few use-wear studies available point to butchery being the main function of this class of artefacts; this point has been attested to both by work at Boxgrove and some other European sites. This project aims to greatly increase the quantity of experimental data especially butchery specific use-wear traces, which might then be utilised to further support the butchery hypothesis. It is also proposed to utilise the experimental butchery programme to examine the applicability of combining zooarchaeological and use-wear analyses to discern the different stages of the butchery process such as skinning, evisceration, dismemberment and defleshing, and to link these to data generated from the archaeological record.

Dating the early Palaeolithic: the new aminostratigraphy

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Accurate dating greatly improves our understanding of past climate cycles, as well as their impact on the environment occupied by early humans. The isolation of intra-crystalline protein has proved critical to the application of amino acid geochronology, enabling clear identification of compromised samples and a robust method able to discriminate individual interglacial events over the last 2 million years. The combination of three new approaches (closed system, multiple amino acids and Free & Total fractions) into a measure of the overall extent of Intra-crystalline protein decomposition (IcPD) has allowed new insights into the applicability and reliability of amino acid geochronology and the improved levels of temporal resolution. The aminostratigraphic framework has been extended from the UK into continental Europe and from the terrestrial to the marine environments. The results of this extension are presented, with significance for our understanding of both human occupation and resource exploitation.

Human tool using behaviour and landscape use in Northern Europe MIS 13 – 3

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Neanderthal behaviour and anatomy are often generalised as adaptations to climatic and environmental conditions at northern latitudes. However, a close reading of the archaeological record from MIS 13 indicates that Homo Heidelbergensis, widely accepted as ancestral to European Neanderthals, were able to exploit cool climates and boreal/temperate forest conditions. The evidence suggests that archaic Homo Sapiens in Europe had therefore already developed effective adaptive responses to allow established colonisation of Northern Europe during the Early Middle Pleistocene. Additionally there is little direct evidence to suggest an extension of adaptive range for early Neanderthal populations in Britain beyond that of earlier Heidelbergensis groups. Where then does this leave our understanding of Neanderthal anatomy and behaviour, often characterised as cold climate adaptations? An alternative perspective is suggested which sees Neanderthalisation as trajectory towards adaptation towards hunting in seasonal temperate to boreal climates, a process initiated in the Early Middle Pleistocene. Thus, by MIS 7 features consistent with acquisition of a specialised intercept/ambush predator niche can be seen in the archaeological record. It is this specialisation which gives rise to the distinctive and recognisably Neanderthal character of Early Middle Palaeolithic populations in Europe. The nature and degree of such specialisation might also be important contributors to Neanderthal extinction in MIS3.

Biostratigraphic and aminostratigraphic constraints on the Middle Pleistocene glacial succession in north Norfolk and its relevance for Palaeolithic archaeology

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Considerable debate surrounds the age of the Middle Pleistocene glacial succession in East Anglia following some recent stratigraphical re-interpretations (e.g. Lee et al., 2004). Resolution of the stratigraphy here is important since it not only concerns the glacial history of the region but also has a bearing on our understanding of the earliest human occupation of NW Europe at sites like Pakefield and the first appearance of hand-axe industries in this region. The orthodox consensus that all the tills were emplaced during the Anglian (MIS 12) has recently been challenged by a view assigning each major till to a different glacial stage, before, during and after MIS 12. Between Trimingham and Sidestrand on the north Norfolk coast, datable organic sediments occur immediately below and above the glacial succession. The oldest glacial deposit (Happisburgh Till) directly overlies the 'Sidestrand *Unio*-Bed' of the Cromer Forest-bed Formation. Dating of these sediments therefore has a bearing on the maximum age of the glacial sequence. The palaeobotany and faunal assemblages recovered from the Sidestrand *Unio*-Bed indicate accumulation in a fluvial environment in a fully temperate climate with regional deciduous woodland. There are indications from the ostracods for weakly brackish conditions. Significant differences are apparent between the Sidestrand assemblages and those from West Runton, the type site of the Cromerian Stage. These differences do not result from contrasting facies or taphonomy but reflect warmer palaeotemperatures at Sidestrand and a much younger age. This conclusion is suggested by the higher proportion of thermophiles at Sidestrand and the occurrence of a water vole with unrooted molars (*Arvicola*) rather than its ancestor *Mimomys savini* with rooted molars. Amino acid racemization data also indicate that Sidestrand is significantly younger than West Runton. These data further highlight the stratigraphical complexity of the 'Cromerian Complex' and support the conventional view that the Happisburgh Till was emplaced during the Anglian rather than the recently advanced view that it dates from MIS 16. Moreover, new evidence from the Trimingham lake bed (Sidestrand Cliff Formation) above the youngest glacial outwash sediments (Briton's Lane Formation) indicates that they also accumulated during a Middle Pleistocene interglacial, probably MIS 11. All of this evidence is consistent with a short chronology placing the glacial deposits within MIS 12, rather than invoking multiple episodes of glaciation envisaged in the 'new glacial stratigraphy' during MIS 16, 12, 10 and 6. The pre-glacial provenance of a hand-axe found at Sidestrand in 1922 remains uncertain but hand-axes from beneath the Happisburgh till are now known from two sites at Happisburgh itself. The Happisburgh till overlies the archaeological horizon at Happisburgh 1 with a fresh hand-axe and *Arvicola*. Our reinterpretation of the age of the glacial succession now removes the need to invoke an anomalously early pre-MIS 16 hand-axe industry in Norfolk.

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Time and place in fossil small mammal assemblages: a morphological perspective

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What does a fossil assemblage represent? Can it be thought of as a ‘snapshot’ in time and space—equivalent to a local biological population of today—or is it something more complex, containing individuals that lived tens of thousands of years and hundreds of kilometres apart? Such questions are often challenging to answer because of difficulties assessing and teasing apart the factors that influence time-averaging and spatial resolution in a fossil assemblage, and in many palaeontological studies taphonomy is only briefly referred to, or may even go unmentioned. However, consideration of this issue is a vital precursor to any investigation that uses data from the fossil record, and is especially significant in studies of Late Pleistocene fauna, where individual taxa may only make fleeting appearances in an assemblage (e.g., *Homo sapiens*) and where much faunal-turnover occurs cryptically; only being recognisable through aDNA analysis. Given that large-scale radiocarbon dating programmes can be impractical and are limited to the last 50 kBP, how else may the temporal and spatial extent of an assemblage be evaluated?

This paper employs a large dataset of European water vole tooth shapes from the Middle Pleistocene to the Recent to examine morphological variation in fossil assemblages from different taphonomic contexts: fluvial, lacustrine, marine-marginal, aeolian, archaeological, and cave settings. It is hypothesised that morphological variation is related to taphonomy, in that the greater the amount of time-averaging and spatial mixing present, the greater will be the amount morphological variation in the assemblage. This standpoint is tested empirically and through statistical modelling in order to assess the morphometric fingerprint of taphonomic mixing in the fossil record.¹

The Lateglacial in Somerset: new information from Gully Cave, Ebbor Gorge

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Since 2006, new excavations at Gully Cave in Ebbor Gorge have revealed an important series of fossiliferous deposits that provide high-resolution information on the palaeoecology and biostratigraphy of the Lateglacial interstadial in the UK. The sediments consist of a thin flowstone and tufaceous deposits, underlain by a red breccia that is the source of an extraordinarily rich and diverse vertebrate assemblage (large and small mammals, abundant birds, rare herpetofauna and fish), together with a more limited molluscan assemblage. The paper presents a preliminary palaeoecological reconstruction of the immediate area, together with some comments on the

taphonomic origins of the remains, the inferred age of the assemblage and its implications for our wider understanding of terminal Pleistocene climate change and human occupation in Britain.

The early Middle Palaeolithic of north-west Europe

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Early Middle Palaeolithic Britain was the northwesternmost edge of the known world. The early Middle Palaeolithic (MIS8-7-6) is somewhat unstable in climatic terms, especially when contrast with other glacial-interglacial cycles. During this interval, the plains of northwest Europe witnessed periodic and repeated episodes human extinction and recolonisation (Hublin and Roebroeks 2009), a pattern which is especially visible in Britain. In this paper, we examine similarities and differences between the early Middle Palaeolithic records of Britain and northwest Europe, in order to explore particular factors which have may have impacted upon early Neanderthal survivorship and colonisation. In particular, we consider whether the northwest European record as whole reflects a human preference for particular types of habitat, whether preference for particular environments had an impact upon recolonisation by human groups, and how humans acted within such contexts. The effect of palaeographic changes upon colonisation of the British margin is also considered, in particular the variable effect of the channel as a semi-permeable obstacle to human movement.

References:

Hublin, J-J, Roebroeks W. 2009. Ebb and flow or regional extinctions? On the character of Neandertal occupation of northern environments. *Comptes Rendus Palevol* 8:503-509.

Investigating the synchronicity of the late-glacial climate warming and the Magdalenian re-colonization of the British Isles

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As climate deteriorated towards the Last Glacial Maximum (LGM) the distribution of Upper Palaeolithic human groups contracted southwards, essentially emptying northwest Europe and the British Isles. The timing of the re-colonization of northwest Europe after the LGM has been the

focus of much research. Some researchers have suggested that the re-colonization occurred prior to the late-glacial abrupt climate warming. Thus non-climatic factors, most probably social developments, enabled humans to adapt better to the prevailing cold conditions, and hence to re-migrate into the region prior to any significant improvement in climate. Other researchers have suggested, however, that the rapid climate warming observed in the Greenland ice-cores (Greenland interstadial-1e) and the re-colonization of northwest Europe occurred synchronously and that the abrupt climate change triggered an equally abrupt and widespread response in human development at that time.

New radiocarbon dates suggest that the re-colonization was broadly contemporaneous with the late-glacial abrupt climate warming. However due to the imprecision in radiocarbon calibration models as a result of the radiocarbon plateau it is impossible to tell from radiocarbon dates alone whether or not the re-colonization of the British Isles occurred synchronously with the rapid climate warming that is observed in the Greenland ice-cores.

As correlating the radiocarbon dates from archaeological material to the Greenland ice-core record is problematic it is necessary to develop palaeoclimatic reconstructions that are not only local to the archaeological sites in the British Isles, but are directly linked to the period of human activity. Through oxygen isotope analysis of animal skeletal remains that have been humanly modified and thus are directly linked to human activity, we are reconstructing the climatic conditions during the Magdalenian occupation. We believe this approach will allow us to establish whether the Upper Palaeolithic re-colonization of the British Isles preceded, occurred synchronously with or succeeded the late-glacial rapid climate warming.

Neanderthal origins and evolution

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Most researchers recognise the existence of a Neanderthal lineage in western Eurasia, based on both morphological and genetic data, and most now use the 1864 species name *Homo neanderthalensis* for it. However, there is much less agreement over other issues concerning the Neanderthals. While their evolution during the later Middle Pleistocene is often seen as gradual and accretional, the time and mode of origin from the inferred ancestral species *Homo heidelbergensis* is less clear. The large skeletal sample from the Sima de los Huesos Atapuerca is usually assigned to *H. heidelbergensis* and yet its morphology is clearly Neanderthal-like, and its age has recently been pushed back by uranium-series dating of a Sima flowstone to ~600ka. This would clearly imply Neanderthal origins must lie beyond this date, although this implication is in conflict with other morphological data, and with genetic estimates for the timing of the Neanderthal-modern split. However, in my opinion, there are several unresolved issues concerning the stratigraphy and taphonomy of the Sima, which means that the material may not all be dated by the flowstone in question. In addition, the morphology of the Sima sample warrants its classification as *Homo neanderthalensis* rather than *Homo heidelbergensis*.

Seabed Prehistory: Investigating palaeo-landsurfaces associated with the discovery of Palaeolithic artefacts, North Sea.

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In February 2008, 75 Palaeolithic artefacts, including hand axes, flakes and cores, and a series of bones (including woolly mammoth, bison, and reindeer) were discovered in stockpiles of gravel at the SBV Flushing Wharf, near Antwerp. The artefacts were recovered from a discrete area of dredging Area 240, situated approximately 11 km off the coast of Great Yarmouth.

The discovery showed that archaeological material of great significance can be present in deposits targeted for marine aggregate extraction. However, archaeologists have only limited capacity to identify and localise such deposits in the marine environment. This paper presents the latest results of an ongoing project that targets these deposits using geophysical, geotechnical and seabed sampling methodologies.

Acquisition, processing and interpretation of sub-bottom profiler (boomer, chirp, pinger and parametric sonar), multibeam echosounder data and vibrocore logs reveal a complex history of erosion and deposition within the dredging area, dominated by two channel features. A buried channel feature, with an extensive floodplain, possibly cut during the Anglian Glaciation is observed. Channel infill sediments are indicative of a changing flow regime with periods of high-energy and low-energy sediment deposition. The artefacts were recovered to the south of the area, within the floodplain of the buried channel. A shallow meandering channel infilled with peats and organic sediments, possibly deposited as late as the Mesolithic (c. 10,000 – 7,500 BP) is also observed within the area.

Based on these results, a series of transects were selected and the capability of established seabed sampling methods (video, beam trawl and clamshell grab sampling) to enable observations of artefacts, palaeo-environmental material, and their spatial distributions was assessed.

Fifteen flint flakes, the by-products of flint tool manufacture, and ten pieces of bone (including terrestrial mammal bone) were recovered during the sampling survey. Two of the flakes were broken mid-sections of tertiary flakes which are characteristic of hand axe thinning flakes. These finds and those previously recovered indicate that the area is significant in terms of its artefact content. Further work including palaeoenvironmental sampling, assessment, dating and analysis within the area are anticipated for 2010.

The results of the project not only provide geological and environmental context in relation to the Palaeolithic finds recovered from the area, but also help improve the future management of the potential effects of aggregate dredging on the marine historic environment.

Fossil bears from Britain and their closest relatives: a 3D geometric morphometrical approach to functional morphology

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There are eight living species of Ursidae in the world today. In the Pleistocene of Europe, however, there were also the now extinct cave bear (*Ursus spelaeus*) and its probable precursor (*U. deningeri*). Their closest extant relatives are all members of the genus *Ursus* (*U. arctos*, *U. americanus*, *U. maritimus* and *U. thibetanus*) and are omnivorous, with the exception of *U. maritimus*, which is a pure carnivore. The aim of this study is to interpret the masticatory adaptations of fossil bear populations in reference to extant species, and to infer aspects of their dietary habits from this.

To test for functional similarities between the masticatory apparatus of fossil and extant bears a number of landmarks on the mandible has been digitised in three dimensions (3D). As the mandible is part of the masticatory system, it is expected to hold information about diet. Landmarks for 3D digitisation of the mandible have been chosen to reflect functional shape. In addition to masseteric fossa length, which is an estimator of the size of the deep masseter and of the moment arm of that portion of the masseter, and is often used in traditional morphometric studies, 3D analysis of the mandible also provides information on the position of the masseteric fossa. Specimens of *U. deningeri* (from Bacton and Tautavel), fossil *U. arctos* (from Grays Thurrock, Manea Fen and several continental European localities), *U. spelaeus* (all from continental Europe) and their four closest extant relatives have been digitised with a Microscribe G2 digitiser. Subsequently, Procrustes superimposition, regression of the Procrustes coordinates onto centroid size, and Principal Component Analyses (PCA) on the regression residuals have been conducted.

As *U. deningeri* is the most likely ancestor to *U. spelaeus*, and the latter is larger than the former, the expected trend in size is that older specimens of *U. deningeri* are smaller than younger ones. Furthermore, Bergmann's rule suggests that animals from colder areas (often associated with higher latitudes) should be larger than animals from warmer areas. The mandibles of *U. deningeri* from Bacton (OIS 9, South Britain) are significantly smaller than those from Tautavel (OIS 11-13, South France) ($\alpha=0.01$), which does not fit theoretical expectations. At present it is unknown whether Britain was an island or a peninsula during OIS 9. The smaller size of *U. deningeri* from Bacton in comparison with Tautavel could be an indication that Britain was an island during OIS 9 and that island dwarfing has taken place to a limited degree. Additionally, it is possible to distinguish between *U. deningeri* from Tautavel and Bacton on several PCs indicating that these populations may have adapted to different circumstances.

No significant size differences are observed between different populations of *U. arctos*, or any significant shape differences. This is likely due to the smaller sample sizes involved, because the overall pattern observed is very similar to that of *U. deningeri*.

The results will be discussed in a functional morphological and evolutionary context.

Early Devensian (MIS 5) occupation at Dartford, southeast England

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A deeply buried horizon containing mint condition flint debitage was discovered in 2006 during major roadworks reconfiguring the junction of the M25 motorway with the A2. Recently received OSL dating results place this horizon in the period MIS 5d-5c, early in the UK Devensian glaciation. The paper will present details of the artefacts, their context and the dates, and briefly explore how this apparent occupation fits in with the wider pattern of Neanderthal settlement in the UK and northwest Europe in the later Pleistocene.

The MIS3 Neanderthal re-occupation of Britain: late Middle Palaeolithic technological organisation and landscape use.

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Research on the British Mousterian over the last 30 years has generally focused on fitting assemblages into prevailing typological categories. Advances in the precision of chronometric frameworks have resulted in the recognition of a long hiatus in human occupation, between MIS 6 and MIS 3. Our understanding of this re-occupation (at least 55 kyr BP until around 40 kyr BP) has been relatively poor due to a combination of early excavations leading to loss of contextual information, and a lack of chronological constraints on sites. However developments in dating and lithic methodologies, alongside the recent discovery and excavation of Lynford Quarry, make a re-analysis of the British Mousterian now possible.

A holistic methodology using metrical data, raw material type, and techno-typology enables a *chaîne opératoire* approach focusing on the spatio-temporal location of stages of production, use and discard. These data permit analysis and interpretation to move between two scales: individual site examination concentrating on situational responses, and inter-site comparisons investigating technological organisation within the landscape. Results indicate that Neanderthals were consistently making knowledgeable choices in their utilization of raw materials, as part of a discoidal-based technological system focused on flexibility, reliability and maintainability, as a response to the challenges of an extremely mobile, high-risk lifestyle, where resources could be unpredictable.

Assessment of climate shifts during Oxygen Isotope Stage 3 based on stable light isotopes in horse and woolly rhinoceros teeth.

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The characteristic fauna of the Pin Hole mammal assemblage zone, which includes mammoth, horse and woolly rhinoceros, appears to be fairly homogenous during Oxygen isotope Stage 3 (ca. 60 to 30 Ka), in spite of the rapid, high amplitude climate shifts observed in continuous archives such as the Greenland ice cores. This is the period in which Late Middle Palaeolithic humans reappeared in Britain after a long absence of over 100 000 years, during an early phase of OIS 3 (ca. 55 ka) when glacial conditions relaxed. In general, the responses of terrestrial biomes to the extreme climate shifts observed in the high resolution archives are poorly understood. Oxygen and carbon stable isotopes of tooth enamel, and nitrogen and carbon of dentine from Woolly Rhinoceros (*Coelodonta antiquitatis*) and Horse (*Equus ferus*) were analysed to document and explore shifts in temperature, precipitation and vegetation during this period. The results from Pin Hole (Creswell Crags, Derbyshire) and Picken's Hole (Crompton Bishop, Somerset) suggest that conditions during OIS 3 were not homogenous during this period. The results from Rhinoceros Hole (Wookey, Somerset) are more tightly clustered and may suggest a shorter period of deposition. In all sites, the $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ data for *Coelodonta antiquitatis* tend to be offset from those of *Equus ferus*. Radiocarbon dates, currently in process, will help elucidate the chronology of these patterns of change.