

The background features a collage of archaeological artifacts and a map of Europe. In the top left, there are several stone tools, including a flint arrowhead and a handaxe. A map of Europe is overlaid in the center, with a yellow dot on the Iberian Peninsula. In the bottom right, there are two large, dark, irregularly shaped stones, possibly flint nodules or cores. The text is overlaid on this collage.

1st Workshop of AHOB3: Ancient Human Occupation of Britain

Dispersal of Early Humans:
Adaptations, frontiers and new territories



Edited by
Chris Stringer, Nick Ashton and
Silvia Bello

AHOB, London
May 19-20th, 2011

First Workshop of AHOB3
(Ancient Human Occupation of Britain)

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adaptations, frontiers and new territories

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its generous support of the projects*

1st AHOB3 Workshop

Queen Mary University of London, Geography Room 126

May 19-20th, 2011

Thursday 19th May

Session 1: *The earliest occupation of Europe*

Chair: Adrian Lister

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|--------------|---|---------------------------|
| 10:00 | A reinvestigation of the Chapel Hill sands, Norwich, Norfolk | Simon Lewis <i>et al.</i> |
| 10:20 | Coleoptera from the Bytham palaeoriver channels at Brooksby, Leicestershire | Russell Coope |
| 10:40 | Chronology, sedimentology and palaeo-environments of the Crag Basin: significance to the landscapes and timing of early human occupation | Ian Candy <i>et al.</i> |
| 11:00 | A new biostratigraphy for the Early Pleistocene of the North Sea Basin | David Mayhew |
| 11:20 | <i>Discussion</i> | |
| 11:30 | <i>Coffee</i> | |
| 11:50 | The stratigraphic context of the Palaeolithic sites at Happisburgh | Simon Lewis |
| 12:00 | Recent excavations at Happisburgh Site 1 | Mike Field |
| 12:20 | Flint artefacts from Happisburgh 1 | Monika Knul |
| 12:40 | Savin's collection of Pleistocene mammals from East Anglia: implications for archaeology and the age of the East Anglian pre-glacial sequence | Simon Parfitt |
| 13:00 | <i>Discussion</i> | |
| 13:10 | Lunch | |

Chair: Mark White

- 14:00** Climate structure and duration of MIS 11 in Britain: preliminary results from Marks Tey, Essex Adrian Palmer *et al.*
- 14:20** Evolutionary trends at the Early and Middle Pleistocene technological record from Sierra de Atapuerca (Burgos, Spain) Andreu Ollé *et al.*
- 14:40** From Atapuerca to Europe Marina Mosquera *et al.*
- 15:00** Sorting the muddle in the middle: how many early human species in Europe? Chris Stringer
- 15:20** Pioneering populations: adaptations to northern environments during the Early and early Middle Pleistocene Nick Ashton
- 15:40** ***Discussion***
- 15:50** **Tea break**

Chair: Simon Lewis

- 16:10** Optically stimulated luminescence dating of river gravels in the Solent river system: progress to date, challenges and future directions Becky Briant *et al.*
- 16:30** Recent fieldwork in the Warsash (Southampton) area: a report on the terrace stratigraphy alongside new optically stimulated luminescence dating Marcus Hatch
- 16:50** The Palaeolithic archaeology of the Solent River as represented by the Bournemouth record Rob Davis
- 17:10** ***Discussion***

17:30 Refreshments and Workshop Dinner

Friday 20th May

Session 2: *The Middle Palaeolithic revolution*

Chair: Nick Ashton

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|--------------|---|----------------------------|
| 10:00 | The Quaternary archaeology and environments of Jersey | Matt Pope |
| 10:10 | La Cotte and the Quaternary history of Jersey: peninsularity and isolation | Martin Bates <i>et al.</i> |
| 10:30 | Home and away? Reanalysing the lithic material from the bone heaps at La Cotte | Beccy Scott |
| 10:50 | Ecological change at the subspecific level and its implications for humans in MIS 3 | John Stewart |
| 11:10 | <i>Discussion</i> | |
| 11:20 | <i>Coffee</i> | |

Session 3: *The emergence of modern humans*

Chair: Chris Stringer

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|--------------|---|--------------------------------|
| 11:40 | The Kent's Cavern 4 maxilla: an update on research progress | Tim Compton <i>et al.</i> |
| 12:00 | The context of Middle Palaeolithic, Early Upper Palaeolithic and Mesolithic artefacts from Beedings, near Pulborough, West Sussex | Matt Pope <i>et al.</i> |
| 12:20 | The Early Upper Palaeolithic site of Ffynnon Beuno | Rob Dinnis & Chantal Conneller |
| 12:40 | Trou du Renard and ongoing work on the Aurignacian of the far north | Rob Dinnis & Damian Flas |
| 13:00 | <i>Discussion</i> | |
| 13:10 | <i>Lunch</i> | |

Session 4: *New technique of analyses*

Chair: Richard Preece

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|--------------|--------------------------------------|----------------------|
| 14:10 | Amino acid dating: the power and the | Kirsty Penkman & Bea |
|--------------|--------------------------------------|----------------------|

- pitfalls
- 14:30** Re-inventing ancient (human?) DNA?
The impact of next generation
sequencing on ancient DNA research
- 15:00** Palynology of hyaena (*Crocuta crocuta*)
coprolites from the bone bed at Victoria
Cave, North Yorkshire
- 15:10** CT reaches flakes other imaging
techniques cannot reach
- 15.30** *Discussion*
- 15:40** **Tea break**

Session 5: The end of the last glaciation

Chair: Ian Candy

- 16:00** Reconstructing rapid climate change in
the British Isles at the end of the
Pleistocene through hydrogen and
oxygen isotope analysis of terrestrial
fauna
- 16:10** Recent excavations at Ebbor Gorge
- 16:30** Magdalenian bone and antler artefacts:
a re-discovery within the Natural
History Museum collections
- 16:50** Earliest directly dated human skull-
cups
- 17:00** *Discussion*
- 17:10** **Meeting close**

Abstracts

As these abstracts may contain unpublished data,
please check with the authors before quoting

CT reaches flakes other imaging techniques cannot reach

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Archaeologists often find lithic assemblages with missing flakes. New high resolution micro-computed tomographic (CT) scanners might provide a solution to this problem. Scanners produce 3D computerised ('virtual') models of objects based on density distribution and could be a cost effective method for studying and sharing lithic artefacts. Importantly, it is possible to visualise the key features of percussion that distinguish intentionally made flakes from natural breakage. Since the data are 3D it is possible to recreate missing flakes (or parts thereof) from refitted groups by visualising void spaces. Hence it is possible to obtain a better understanding of the knapping process and obtain a glimpse of the flakes that were actually used as tools.

Pioneering populations: adaptations to northern environments during the Early and early Middle Pleistocene

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Recent work at Pakefield (Parfitt *et al.*, 2005) and Happisburgh (Parfitt *et al.*, 2010) have not only pushed back the timing of the earliest human colonisation of northern Europe, but also shown that early humans were capable of living in a range of different environments. This is particularly apparent at Happisburgh Site 3 where at over 800,000 years ago humans were associated with an open river valley, surrounded by coniferous-dominated forest with winters cooler than East Anglia today. How humans adapted to these colder conditions from the warmer environments of southern Europe has been the subject of much speculation. Three main adaptive strategies have been suggested, namely: the earlier development of technologies such as fire, shelter or clothing; seasonal migration; or, physical adaptation. Each of these of these adaptive strategies is discussed and of how we might investigate these aspects further. It is suggested early humans may have already been physically adapted to cope with winter cold and that it was the shortened growing season that may have been the main barrier to occupying northern latitudes. It is also suggested that the earliest occupation was by pioneering populations of possibly *Homo antecessor* who ultimately failed to colonise the north. Instead, the first sustained colonisation may have been by *H. heidelbergensis* with a range of new technologies.

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La Cotte and the Quaternary history of Jersey: peninsularity and isolation

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Investigations at the site of La Cotte de Saint Brelade in the summer of 2010 were undertaken in order to ascertain the nature of surviving sediments at the site. In particular section cleaning and recording was undertaken that demonstrated:

1. Intact sediments of later Pleistocene date were present.
2. These sediments contained archaeological material.
3. Correlations could be made with sequences previously recorded at the site.
4. New work could potentially be undertaken at the site.

Today La Cotte occupies a coastal setting and its formation and development is certainly a product of coastal erosion however, for much of its existence the cave would have been a considerable distance from the contemporary coast. The same is true for the larger landscape of Jersey when lowered sea levels repeatedly made the island part of the larger continental landmass. This broader context to the site and its contained archaeology is also being addressed and this includes a survey of local coastal geological sequences that contain important palaeoclimatic data as well as sediments suitable for dating. However, it is possibly the seabed that contains the most significant record of past landscape change and a part of the project is now being developed within the marine context around Jersey and will be the focus of fieldwork in summer 2011.

Extant bathymetric data from the seabed, when combined with bedrock geology, provides a basis for predicting those parts of the seabed where sea cliffs and caves might potentially exist. Coupled with regional and global sea level curves those parts of the landscape in which contemporary occupation to that at La Cotte can be targeted for survey. These predictions will be tested in summer 2011 when two survey vessels and an ROV will be taken to Jersey to begin the investigation of the seabed. This survey is also linked to the investigation of a series of marine vibrocores between Grouville, Jersey, and St-Germain-sur-Ay, France that were collected by the Jersey Electrical Company. They have been assessed for contained palaeoenvironmental material. Both Pleistocene and Holocene sediments have been identified in these cores and a comprehensive record of sea level change and transgression is recorded in the cores that document the isolation of Jersey in the earlier Holocene. A terrestrial landsurface (associated with terrestrial molluscs and small mammal remains) has also been identified in some locations.

Earliest directly dated human skull-cups

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The use of human braincases as drinking cups and containers has extensive historic and ethnographic documentation but archaeological examples are extremely rare. So far, the earliest known evidence for skull-cup preparation is from the Upper Palaeolithic Magdalenian culture (~15-12,000 yr BP, 17) in Europe. Nine cranial remains from the site of Le Placard Cave (Charente, France) have been interpreted as skull-cups. All show signs of defleshing, breakage by percussion, and careful 'retouching' of the broken borders. Human remains from Isturitz (Gironde, France) are dominated by cranial elements, most of which have been cut-marked and some modified by percussion to make skull-cups.

Three skull-cups have been identified amongst the human bones from Gough's Cave (Somerset, England). New ultrafiltered radiocarbon determinations provide direct dates of about 14,700 cal BP, making these the oldest directly dated skull-cups and the only examples known from the British Isles.



Optically stimulated luminescence dating of river gravels in the Solent river system: progress to date, challenges and future directions

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Recent developments in optically-stimulated luminescence (OSL) dating have meant that this technique can be applied to river terrace sequences spanning multiple glacial-interglacial cycles with a good chance of obtaining robust age estimates. This is crucial in providing a context for archaeological assemblages whose ages previously had to be estimated by correlation with other sequences. Recent dating work in the main Solent / Test both west and east of Southampton Water (Bates *et al.*, 2004, 2007; Bates and Briant, 2009; Bates *et al.*, 2010; Briant *et al.*, 2006; Schwenninger *et al.*, 2006, 2007) and of Stour terraces near Corfe Mullen (Hosfield *et al.*, in preparation; McNabb *et al.*, submitted) represents significant progress in the application of this technique to archaeologically-significant river terrace deposits. This work suggests that robust dates can be obtained from locations where multiple samples can be taken, to an age limit of approximately 300,000 years ago.

Significant challenges in dating this type of sediment still remain in two areas, both of which are observed in the Solent. The first is scatter: different samples from the same stratigraphic unit can yield very different results, meaning that single dates from a location are hard to interpret. This is problematic because many of these deposits can only be accessed through test-pitting, which usually exposes less suitable material for dating within each stratigraphic unit. The requirement for multiple samples from a unit also has cost implications. The second challenge is that of saturation, which can be the factor causing scatter in some older samples. This occurs where all the available 'traps' within a quartz sand grain are full and determines the dateable age limit for a sample. This is problematic because the earliest artefacts and some of the archaeologically-important sites such as Corfe Mullen are in higher, older terraces where samples may be saturated.

Many new developments in OSL dating are ongoing, some of which may be able to address these problems. These will be discussed.

Chronology, sedimentology and palaeoenvironments of the Crag Basin: significance to the landscapes and timing of early human occupation

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The Crag Basin is a westerly continuation of the southern North Sea that extended across the eastern parts of Norfolk, Suffolk and Essex during the Early and early Middle Pleistocene. The sequence of the Crag Basin comprises shallow marine sediments inter-bedded with cold-climate sediments, such as ice-wedge casts and periglacial river gravels, and temperate-climate terrestrial sediments. The sediments of the Crag Basin, therefore, contain deposits of the Cromer-Forest Bed and the Bytham river both of which have yielded "early" archaeology. This presentation will summarise work that has been carried out on coastal exposures of the Crag Basin. This work has involved the analysis of 75 coastal sections from Weybourne through to Dunwich and the sampling of these sections for palaeomagnetic dating, micromorphology, clast lithology and heavy mineral analysis. In the course of this work over 1000 samples have been taken for palaeomagnetic dating.

This presentation will review the results of this work and summarise the main findings. In particular the presentation will focus on 1) the palaeomagnetic results which allow deposits to be divided into older and younger sediments groups; 2) the record of changing sea levels that the Crag Basin contains and its relationship to long term climatic trends; and 3) the changing palaeogeography of the region. In particular the presentation will focus on the sites which have yielded reversed magnetic data and they fall into two categories: 1) Early Pleistocene sites that have reversed magnetism because they are pre-Brunhes in age; and 2) Middle Pleistocene sediments that have reversed magnetism because they were deposited during magnetic excursions during the Brunhes chron. The results of this combined sedimentological and chronological survey have implications for the timing of the first arrival of humans into Britain and the age of the earliest Acheulian sites. The major landscape and climate changes, that are the background context to these different phases of human occupation, are also discussed.

The Kent's Cavern 4 maxilla: an update on research progress

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The Kent's Cavern 4 right maxilla (KC4) was excavated in 1927, and described by Keith, who diagnosed it as an Upper Palaeolithic modern human. In 1988 it was directly dated by accelerator mass spectrometry (AMS), giving a radiocarbon age of 30,900 ± 900 BP. In the last ten years the stratigraphic, chronological and archaeological context of the specimen has been re-investigated, suggesting a greater antiquity for it, and further study of the fossil showed that it had been wrongly reconstructed. A new reconstruction of the specimen has been made and subjected to detailed study regarding its modern human or Neanderthal affinities. Further direct dating and an ancient DNA investigation proved unsuccessful, but Bayesian analysis of a series of ultrafiltered dates on an ordered stratigraphic sequence of associated fauna places KC4 at 44180–41530 (95.4% prob.) cal BP. It is thus a crucial specimen in terms of the initial Upper Palaeolithic and the potential overlap of the last Neanderthals and the earliest modern humans in western Europe.

The new reconstruction of the Kent's Cavern maxilla by Chris Collins, Palaeontology Conservation Unit, NHM



Coleoptera from the Bytham palaeoriver channels at Brooksby, Leicestershire

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The pre-Anglian Palaeolithic site at Brooksby, Leicestershire, in the ancient channel of the Bytham Palaeoriver, is of pivotal importance because it links the well known East Anglian sites with the less familiar ones in the English Midlands. It is situated downstream from Waverley Wood, Warwickshire, where several superimposed channel fills were associated with numerous hand axes of various degrees of sophistication. At both Brooksby and Waverley Wood, most of the implements were recovered from the reject heaps of cobbles discarded by the gravel company and therefore without precise stratigraphical context. However one pebble flake in mint condition was obtained *in situ* from the deposit in the lowest channel at Waverley Wood.

Coleopteran assemblages from organic sediments within the channels at both sites have enabled a detailed ecological picture to be reconstructed. At Waverley Wood the Coleoptera provide evidence of severe climatic changes; a period of gradual cooling leading from temperate conditions at the start to ones of arctic/continentality which was then followed, after a minor sedimentary break, by a return to temperate conditions once again. But it is not clear with which of these climatic episodes the bulk of the lithic industry was associated. Unfortunately it is not now possible to recover more data from Waverley Wood as the deposits have been completely worked out and the quarry "restored". At Brooksby on the other hand, extraction has only just begun and will continue for many years providing a second chance to record the geology, archaeology and palaeontology of this important site and possibly to resolve some of the outstanding problems raised by the Waverley Wood investigations.

In 1999 exploratory boreholes carried out by the British Geological Survey to assess the potential of the Brooksby area for sand and gravel, encountered channel deposits near to the base of the Quaternary sequence in a stratigraphical context very similar to that at Waverley Wood. Some of the borehole samples included organic sediments which yielded sparse coleopteran remains. Although these faunas were small, there were enough species present ($n=17$) to make Mutual Climatic Range (MCR) estimates of the palaeotemperatures. These were similar to those in central England at the present day. With the commencement of sand and gravel extraction at Brooksby, a channel with organic sediments was exposed near the base of the pit and three samples of this deposit were analysed for Coleoptera. It was expected that these would augment the meagre results obtained from the reconnaissance boreholes. The coleopteran faunas from these samples were completely different from this expectation. They included species which today have

exclusively arctic and Siberian geographical ranges and one species that is now found only in Mongolia. These assemblages indicate an open, rather barren landscape with sparse vegetation and a climate of arctic severity. The sedimentological consequences of this thermal regime are considerable. For instance, any precipitation during the winter months would have accumulated as snow, causing widespread flooding at the time of the spring thaw. With the annual repetition of freezing and thawing, any superficial sediments would have become readily mobilised and easily transported by the enhanced energetic flow of rivers and streams incorporating in their sediment load many of the stone implements. Some of the implements lying on the land surface would have been glazed by blown sand, a feature seen in several of the Waverley Wood hand axes. In the light of the marked difference between the two channels so far known from Brooksby, it would be useful to examine the detailed relationship (if any?) of the implements and these channels, including others that may yet be discovered, and thus to explore the precise environment under which Lower Palaeolithic humans lived in Britain at this time.

The Palaeolithic archaeology of the Solent River as represented by the Bournemouth record

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The fluvial deposits of the Solent River and its tributaries have produced a vast Palaeolithic record that rivals the Thames with regards to quantity of material; however it has received comparatively little attention. Uncertainty over the correlations between the various sections of terrace stratigraphy that are preserved across the region and the difficulties faced in dating them have prevented the Solent's archaeology from playing a full part in our understanding of the British Palaeolithic. In recent years a small number of studies have begun to address this, in particular exploring demographic (Ashton & Hosfield, 2010) and typological (Bates *et al.*, 2004) change through time. Building on this earlier work, this paper presents an updated view of the distribution of Palaeolithic material across the Bournemouth terrace sequence based on lithic analysis coupled with the study of associated contextual information and historic maps. Using terrace stratigraphy as a chronological framework, and employing the dating scheme provided by Westaway *et al.* (2006), the revised database is examined to identify the first appearance of key technological innovations and to investigate patterns of typological and technological change through time. Although the research discussed here is ongoing, the results are cautiously interpreted to suggest that the earliest secure evidence of Acheulean technology occurs in the Setley Plain Gravel, dated to MIS 13. Abraded Levallois flakes first appear in the Taddiford Farm Gravel, dated here to MIS 9, and continue to appear at low density in subsequent terraces. This suggests that whilst there is an early development of prepared-core technology, it plays a minor role in a technological repertoire which continues to focus on biface production. Typological and technological analysis of the handaxe assemblage identifies a great deal of intra-terrace with little inter-terrace variation, with little evidence for temporal patterns in raw material use or reduction intensity. However there is indication of a typological distinction between the Setley Plain Gravel assemblage and the other terrace assemblages. The dominance of ovate handaxe forms in the Setley Plain Gravel can be partly explained by raw material constraints, but there is an indication that other factors may be at play. Additionally, twisted-ovates and Ficrons are absent from the Setley Plain Gravel assemblage, appearing consistently in small numbers in subsequent terraces, adding further to the body of evidence that suggests these types have temporal significance.

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Magdalenian bone and antler artefacts: a re-discovery within the Natural History Museum collections

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In 1881, the Natural History Museum (NHM) became independent from the British Museum. When the collections were split between these two institutions, the NHM kept what were then thought to be unmodified faunal remains. However, a pilot survey of the Upper Palaeolithic faunal collections at the NHM revealed the existence of over 200 humanly modified specimens.

In this talk we will present the preliminary results of our survey and describe two of the most significant specimens: an engraved antler and a flint-knapping hammer.

Most of the specimens were waste from the production of finished artefacts. The bones and antler of four different species of mammals (reindeer, red deer, horse and bear) have been modified; over 160 reindeer antlers show evidence (splinter removal) associated with the first stage of barbed point manufacture.

An antler of reindeer, from the Magdalenian site of Neschers (France), is engraved with a horse's head. This historically important specimen published by Marcellin Boule in 1906, was subsequently lost and re-discovered in July 2010. Found in circa 1840 by l'Abbé Croizet who excavated at Neschers in the early 19th century, this specimen is thought to be one of the earliest artefacts found in France bearing a clearly identifiable artistic representation. While the specimen is mentioned and/or figured in 38 references, it does not appear to have been studied or published in great detail to date.

The flint-knapping hammer, possibly from the Magdalenian level of the site of Laugerie Haute (France), was made from an antler of red deer. This is an extremely rare find with few comparable known examples from the Palaeolithic.

The Early Upper Palaeolithic site of Ffynnon Beuno

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The beginning of the Upper Palaeolithic in Britain is documented by two archaeological complexes: the Lincombian-Ranisian-Jerzmanowician (LRJ), believed by most to have been made by late Neanderthals, and the modern human Aurignacian. Only three sites have provided evidence for both of these complexes: Kent's Cavern, Paviland, and the less well known Ffynnon Beuno Cave in north Wales. Ffynnon Beuno and neighbouring Cae Gwyn Cave were excavated in the 1880s by Henry Hicks (1886), whose research was driven by geological and chronological questions of human occupation and the 'ice age'. As for many cave sites excavated during this period current research is hindered by a lack of ancillary information accompanying the faunal and lithic material recovered.

An overview of what is known about Ffynnon Beuno and neighbouring Cae Gwyn Cave is given, including results of preliminary analysis of the meagre lithic assemblage from the site. This lithic assemblage is important due to its position on the north-western periphery of the known ranges of both the LRJ and the Aurignacian. However, it is readily apparent that the extant lithic collection is highly selected, and is inconsistent with the few details of the discovery of stone tools provided by Hicks. Drawing any firm conclusions from a study of the lithic material is therefore difficult. One important observation can be made: that late Neanderthals and early modern humans were not doing anything 'different' or 'special' at the site when compared to sites farther south. The LRJ point from Ffynnon Beuno would not be out of place in the collection from Beedings in south-eastern England (Jacobi, 2007), and the Aurignacian material is strikingly similar to that from the Belgian site of Maisières Canal (Flas *et al.*, 2006).

A project reassessing old collections from Ffynnon Beuno and Cae Gwyn is now underway, and it is hoped that more work at Ffynnon Beuno will help to contextualise these important collections.

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Trou du Renard and ongoing work on the Aurignacian of the far north

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The Aurignacian is generally agreed to be the first Europe-wide archaeological expression of modern human occupation, and is therefore key to understanding the demise of Neanderthals and roots of our own species. When compared to neighbouring regions to the south, the Aurignacian of the far north of Europe remains poorly understood. To a large extent this is due to stratigraphic problems associated with the antiquity of excavations at major sites, most notably the famous Belgian site of Spy Cave.

New research on lithic collections from Britain and from Belgium has allowed material to be viewed from a new perspective, and a more detailed history of Aurignacian occupation of the regions can now be proposed (e.g. Dinnis 2008, 2009; Flas *et al.*, in press). By focussing on smaller and homogeneous assemblages, the extent of technological variation within discrete chrono-cultural phases of the Aurignacian can be isolated. Armed with the technological understanding this brings, larger and potentially mixed Aurignacian assemblages can reasonably be separated out into different “types”, broadly corresponding to different occupation events. The advent of Aurignacian occupation of the far north, and changes in occupation through time, can now be described in greater detail than was previously possible. An overview of this work is given here.

In addition, some new observations from the (very) recently re-examined assemblage from Trou du Renard, Belgium are presented. This small cave assemblage may have particular significance for understanding the British Aurignacian.

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The ongoing excavations at the Happisburgh 1 site

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A fluvial deposit (part of the Cromer Forest-bed Formation) occurs below the modern beach between Happisburgh and Cart Gap in Norfolk, UK. 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 an AHOB team to undertake an excavation in 2004. The result was the recovery of a small worked flint assemblage. Beetle remains 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 and 600 ka.

In 2009 a team from Leiden University began to dig at the Happisburgh 1 site in collaboration with AHOB project members. The aims were to expand what was known about the geography of the channel deposits and the stratigraphy at the site, examine the sedimentological setting; undertake a palaeomagnetic study; recover more artefacts; and undertake a palaeoenvironmental investigation (with a palaeobotanical bias). Preliminary results from the excavations and laboratory analyses are presented.

Work on the Happisburgh 1 site is ongoing and another field season is planned for the summer of 2011.

Recent fieldwork in the Warsash (Southampton) area: a report on the terrace stratigraphy alongside new optically stimulated luminescence dating

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The Solent River formed the largest fluvial system of southern England during the Quaternary Period and presented a major gateway for early hominin populations entering Britain. While the archaeology of the region is comparable in importance to that of the Thames system, this resource is currently poorly understood in terms of stratigraphic context and chronology. There are issues regarding correlation between the main Solent and its tributaries, alongside conflicting models of the terrace stratigraphy of the Solent River itself. There also remain uncertainties in dating many elements of the Solent system. This research project is focused on the development of the Solent River system through the investigation of its terrace sediments. The main aim is to improve contextual understanding of the rich archaeological resource of the Solent by developing a new stratigraphic and chronological framework of the region.

Current interpretations of the stratigraphic record of the Warsash area and how it relates to the wider fluvial terrace sequence of the River Test are re-examined after recent fieldwork. In autumn 2010 sections were opened in two former gravel quarries at Warsash in an attempt to i) record the stratigraphy of the fluvial deposits and establish bedrock height OD in the area, ii) locate sediments suitable for optically stimulated luminescence (OSL) dating and iii) locate the so-called 'blue clay' deposit which was reported by Burkitt *et al.* (1939) to overlie Levallois artefacts that are found in the Warsash area. Results of the fieldwork will be presented alongside a re-assessment of the terrace stratigraphy of the wider River Test valley, as revealed by a study of the borehole records of the region. It is also hoped that new age estimates for Terrace 3 at Warsash will be presented, obtained by the application of OSL on quartz from fluvial sands located during fieldwork.

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Re-inventing ancient (human?) DNA? The impact of next generation sequencing on ancient DNA research

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The analysis of ancient DNA has made great progress during the last few years. While the analyses of faunal ancient DNA is almost routine these days, studying ancient DNA from human fossils remains arguable the most controversial field of research within ancient DNA. However, this has not kept researchers from attempting it, nor has it journals from publishing the results, although these were mostly either ignored or heavily criticised by a substantial and influential part of the ancient DNA community. During the last few years, this situation has changed completely, mostly because of the introduction of new analysis techniques, prime among them next generation sequencing approaches. In my talk I will discuss, how – if at all indeed – next generation sequencing changes ancient DNA research with an emphasis on the impact on the analysis of human fossils, but including the possibilities offered by ancient DNA analyses of faunal remains both in their own rights and with regard to a better understanding of human history. I will discuss the prospects, limitations and problems of whole genome shotgun analyses and investigate which alternatives exist to this approach. As such, I will contrast the good old PCR amplification with comparatively recent DNA hybridization capture approaches for targeting specific DNA segments. Finally, I will conclude with some suggestions which question about human history could be studied either if reliable human ancient DNA sequences could be obtained routinely and on a large scale or by inference from data obtained from other species.

Flint artefacts from Happisburgh 1

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The Lower Palaeolithic site Happisburgh 1 (Norfolk, UK) yielded three archaeological assemblages. A study of the flint artefacts has been made in order to study the similarities and differences between the three assemblages, which were obtained in three different sampling events.

The 'London 1' assemblage (excavated by the AHOB team in 2004) has been recovered from fluvial organic loams of a river channel, following the discovery of an ovate hand axe at the site. Their mint state of preservation and the presence of the artefacts <10 mm suggests minimal fluvial transport and a primary archaeological context. The 'Leiden 1' assemblage has been excavated from fluvial grey sands of the very same river channel (layer underneath the organic loam). The five refits of a core reduction sequence from a single small pit and other characteristics testify to the *in situ* preservation of knapping events at the site. The third assemblage (Norwich 1), is a collection of surface finds made on the beach by various amateurs, kept at the Norwich Castle Museum. This assemblage includes the ovate hand axe. Most of the artefacts have been recovered directly from the organic loam. The artefacts are quite large which can be attributed to recovery methods.

While there are minor differences between the flint assemblages, the similarities are striking. Early hominins used an *ad hoc* approach for creating flint artefacts by hard hammer percussion. There is no sign of core platform preparation or a specific focus on obtaining certain flake shapes. Larger flakes were selected for the production of simple tools. Tools were also made from natural pieces of flint with natural fissures, indicating the scarcity of good quality raw material in the vicinity.

Palynology of hyaena (*Crocuta crocuta*) coprolites from the bone bed at Victoria Cave, North Yorkshire

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Victoria Cave, near Settle, North Yorkshire, contains one of the longest Quaternary cave sequences in Britain. There are TIMS*-dated calcites (speleothem) formed during interglacials from before MIS 13 through to MIS 5, with glacial clay rhythmites deposited during MIS 12, 10, 6 and 2. The faunal record includes a Last Interglacial bone bed with remains of a number of large mammal taxa including straight-tusked elephant, mammoth, narrow-nosed rhinoceros and hippopotamus, many with [TIMS-dated] calcite formed around them. There are also bone remains and a number of coprolites of spotted hyaena; a significant proportion of the mammal bones exhibit evidence of carnivore gnawing and chewing, probably by *Crocuta*. The bone bed was partly overlain by calcite, TIMS dated to late MIS 5e.

The taphonomic problems of pollen analysis of cave sediments are well-documented and therefore, as a continuation of previous work undertaken at other British Pleistocene sites, pollen preparations of four hyaena coprolites from the bone bed were analysed. Although pollen taphonomy of coprolites has its own problems, the results suggest an open grassland environment locally, as would be expected at an upland locality, but with additional evidence of deciduous and coniferous woodland and alder carr nearby, possibly at lower elevation in the valley areas. Although the rate of accumulation and time range of the bone bed is currently unknowable, the presence of *Carpinus* pollen suggests that the coprolites were deposited during a later part of MIS 5e, possibly early in the late-temperate pollen zone Ip III. Further work to extract pollen from speleothem associated with mammal fossils is planned in the near future.

* TIMS = Thermal ionisation mass spectrometry: uranium/thorium

The stratigraphic context of the Palaeolithic sites at Happisburgh

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This short contribution will review the inventory of stratigraphic information concerning the Pleistocene sediments that lie beneath the modern beach at Happisburgh. The stratigraphy of the sediments beneath the tills of the Happisburgh Formation (which are exposed in the cliffs) over this c. 1 km stretch of coastline can be constructed using data from the current work at HSB3, the AHOB 2004 excavations at HSB1 and HSB2, the on-going University of Leiden excavations at HSB1 and the previous work of West (1980). Together these data can be used to establish the stratigraphy and, in particular, assess the relationship between the archaeological sites at HSB3 and HSB1. The Hill House Formation; consisting of laminated sands and silts and gravels, is thought to extend laterally for some 700 m, though the south easterly extent has not yet been firmly established. The organic deposits at HSB1 occupy a channel-like depression, which deepens to the southeast. Further investigations aimed at clarifying the relationship between these sequences is a priority for this year's fieldwork.

A reinvestigation of the Chapel Hill sands, Norwich, Norfolk

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Over the last ten years or so there has been a debate about the age and correlation of the Middle Pleistocene tills in East Anglia. Crucial to this debate is the occurrence of sediments between tills of the Happisburgh and Lowestoft formations that have been interpreted as those of an interglacial, high sea level. Evidence for this was identified at a number of sites including Pakefield, Suffolk and Chapel Hill, Norfolk. At the latter site, Read *et al.* (2007) recognised a new stratigraphic unit, the Chapel Hill sands, which lies at c. 30m OD between the Happisburgh and Lowestoft tills. The sands were interpreted as marine in origin on the basis of their sedimentology and a limited foraminiferal assemblage. An early Middle Pleistocene interglacial age (MIS 13 or 15) was proposed for the Chapel Hill sands and an MIS 16 age suggested for the Happisburgh Formation (Read *et al.*, 2007).

In the light of this age controversy and the implications for neotectonic movements, the site was reinvestigated in 2009-10. The main objectives were to reassess the stratigraphy and to collect material for micropalaeontological analysis. Three boreholes were drilled using a Cobra percussion auger fitted with a window sampling chamber. This revealed the geometry and thickness of the Chapel Hill sands and provided samples for initial micropalaeontological assessment. It became evident that a more complete understanding of the site could be achieved only by opening fresh faces. Four test pits were dug with a mechanical excavator. Detailed section descriptions were recorded, palaeocurrent measurements were made on the sands and about 30 samples were collected for micropalaeontological and sedimentological work. In addition four samples were taken for OSL dating.

Seven samples from GTP 4 were processed and preliminary results of the micropalaeontological analyses indicate that the Chapel Hill sands are rich in very well preserved calcareous ostracods and foraminifera derived overwhelmingly from the local Upper Chalk bedrock. The exceedingly rare Quaternary foraminifera indicate cold conditions. It has not been possible to replicate the autochthonous assemblages representing temperate marine conditions reported by Read *et al.* (2007). Our findings appear to indicate that the Chapel Hill sands represent glacial outwash rather than marine sediments. If this is indeed the case, it is unnecessary to invoke tectonic uplift of the area to the south of Norwich following the deposition of the Chapel Hill sands and the Happisburgh and Lowestoft glaciations may better fit a 'short (MIS 12) chronology'. Further field work is planned to assess the lateral variability of the sands at Chapel Hill and to undertake OSL dating of the sediments.

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A new biostratigraphy for the Early Pleistocene of the North Sea Basin

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The biostratigraphic system for the Pliocene and early Pleistocene proposed by Tesakov (2004) for southeast Europe has been tested and found to apply to western Europe, including the North Sea Basin. The new scheme (table 1) recognises for the Gelasian stage (2.58–1.80 Ma) five biozones based on arvicolid species present and their evolutionary level measured by heights of enamel free areas in the molar teeth in several lineages of vole. The three earliest biozones cover the period of deposition of the 'Weybourne' and Norwich Crag, and, possibly, part of the underlying Red Crag. The 'Weybourne Crag' (currently included in the Wroxham Crag Formation) arvicolids fall within biozone MNR1. The Norwich Crag arvicolids fall within biozone MNR2 with two distinct levels. The later level, dating from the end of biozone MNR2, includes the arvicolids from deposits exposed on the Suffolk coast near Southwold, including Easton Barents. These underlie the type deposits of the Barentian Stage. The earlier arvicolid assemblages date from the beginning of biozone MNR2 (or just possibly the end of biozone MNR3) and come from deposits including the type Bramertonian (Norfolk), as well as deposits at and near the surface in the area of Sizewell (Suffolk) currently considered part of the Chillesford Sand Member of the Norwich Crag Formation. The new assignment to biozones uses the evolution of the water vole *Mimomys praepliocaenicus* and its descendant *M. pliocaenicus*, based on statistically supported evidence of crown height increase. On the basis of palaeomagnetic calibration in southeast Europe (table 1), the three levels of the UK sequence correspond to absolute age limits of 2.1–2.25 Ma ('Weybourne Crag'), 2.25–2.35 Ma (later Norwich Crag) and 2.35–2.45 Ma (earlier Norwich Crag). Tesakov already noted in his biostratigraphy the position of the Dutch localities Tegelen (channel filling, type of 'Tiglian C5' of the pollen sequence, = MNR1) and the lowest part of the Zuurland borehole faunas (here as: Zuurland 91–101 m, uppermost MNR2). These correlations are confirmed by new results from the Moriaanshoofd borehole sunk in 2008, where the basal unit corresponds to Zuurland 91–101 m and to the uppermost Norwich Crag. At Easton Wood, near Southwold, an assemblage of similar age has been recovered with the earliest UK occurrence of *Mimomys tigliensis*, and a new species of vole closely related (ancestral?) to *Mimomys hordijki* from the Netherlands. The new biostratigraphy for the North Sea Basin area has a potential resolution believed to be of the order of ± 80 ka (= 2 x 40 ka cycles). The accuracy may be greater after calibration by new palaeomagnetic results, and the application of the principles of sequence stratigraphy and allostratigraphy to the analysis UK crag deposits. In the Netherlands, work on boreholes recognises successive cycles, believed climate based, in the Gelasian. Current work is aimed at correlating these cycles across the North Sea, using the new arvicolid biostratigraphy, thus also relating continental and marine deposits.

From Atapuerca to Europe

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The Sierra de Atapuerca sites (Spain) provide excellent information both in quality and quantity, and also they surely represent the longest European chronological sequence from the late Early Pleistocene to the late Middle Pleistocene. Considering these facts, here we aim:

- 1) To characterize the technological features of some key European sites according to the significant factors observed to be maintained or change through the Atapuerca sequence (see Ollé *et al.*, this volume);
- 2) To evaluate whether the European technological evolution during Early and Middle Pleistocene times matches with that of Atapuerca.
- 3) To take into consideration some population inferences derived from the Atapuerca record, and extrapolate them into the European context.

Our conclusions suggest that the earliest peopling of Western Europe occurred before 1 My with a quite homogeneous Mode 1 technology (Fuente Nueva and Barranco León, and TE9, and TD3-4 in Spain, Pont-de-Lavaud in France, Monte Poggiolo in Italy, etc.). The sudden presence and good representation of European sites of this time may suggest that the first peopling may not have occurred much earlier. That is, the fact does not seem to be due to methodological or taphonomical questions. The origin of this early peopling is under debate (Carbonell *et al.*, 2010), whether African (Bermúdez de Castro *et al.*, 1997) or Asian, although researchers currently support the latter origin for *H. antecessor* (Bermúdez de Castro *et al.*, 2010). In this case, its Mode 1 technology may also have the same origin.

Around 800 ky the European technological framework is limited to a few assemblages, all derived from the early European Mode 1. These are the late Mode 1 assemblages of TD6 (Spain), and Pakefield and Happisburgh (England). Some younger sites are those of La Noira (France) and Notarchiricco (Italy), dating to 680 and 640 ky, respectively, interestingly both having Acheulean technology. Besides them, only two sites are closer to these dates: Isernia La Pineta (Italy) and Bilzingsleben (Germany), c. 650-600 ky or even younger in the case of the latter. Both localities are supposedly Late Mode 1 technology, but the strong conditioning of the raw material in the former, and the presence of large bone tools, although unifacially flaked in the latter, make this assumption doubtful.

Interestingly, at Atapuerca we have a gap between 800 ky and 500 ky, that is, between the Late Mode 1 and the first Mode 2 represented there (Plain Acheulean). Besides technology, this gap also concerns hominins, since before 800 ky the

hominin represented is *H. antecessor*, and after 500 ky the hominin represented is *H. heidelbergensis*.

Therefore if we extrapolate this gap from Atapuerca to Europe, some points appear to be considered. First, that *H. antecessor* who initially peopled Europe might have become extinct at around 800 ky. Before this date there are several sites in this subcontinent, but very few between 800 and 500 ky. Actually, only two sites may be considered as Mode 1 sites (Bilzingsleben and Isernia la Pineta), and the technological attribution of both are doubtful.

Secondly, that before 650 ky some new but light hominin waves may be coming into Europe with new Acheulean technology. These new peopling events may possibly be related to the Gesher-Benot-Ya'aqov Acheulean tradition, closer in time to our earliest Acheulean sites, instead of that from Ubeidiya, which occurred at 1.4 My and making it difficult to explain such a huge delay. These population waves did not reach most of the continent at this time, when the late Mode 1 (TD6, Pakefield and Happisburgh?) had disappeared, as well as any evidence of human occupation until (thirdly) the arrival of the 500 ky-old Plain Acheulean groups. Between 500 ky and 300 ky this Plain Acheulean appeared in several European sites, and *H. heidelbergensis*, whatever its origin, was strongly associated to this new technology in this subcontinent.

Fourthly, and very important, if the Late Mode 1 eventually disappeared at around 800 ky or even 650 ky (in the doubtful case of Isernia and Bilzingsleben as heirs of Pakefield, Happisburgh and TD6), then the later Clactonian sites of northern Europe cannot come from this legacy, but from the Acheulean one, being therefore a variant.

Finally, our data support the idea that the Plain and Late Acheulean may have technically evolved into the Mousterian of the European Mode 3.

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Evolutionary trends at the Early and Middle Pleistocene technological record from Sierra de Atapuerca (Burgos, Spain)

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The Sierra de Atapuerca sites offer a chronological sequence that allows the study of the evolution of technology during the Early and the Middle Pleistocene at a local scale. Here we present updated information of the lithic assemblages recovered at the different levels of the sites of Sima del Elefante, Gran Dolina, Galería and Sima de los Huesos. Also, other archaeological and environmental data will be compared with the technical features in order to understand the peopling that took place at Atapuerca during Pleistocene times.

The first peopling of Atapuerca occurred at 1.2 My, represented at TE9 and TD3–4 by *Homo antecessor* with a Mode 1 technology that is very immediate and simple although both assemblages yielded few artifacts. Subsistence strategies were also opportunistic, focused on exploiting carcasses that fell into the karstic cavities.

Around 800 ky there is a second cultural phase represented at TD6, and characterized by new subsistence and technological strategies, although still belonging to Mode 1 and represented by *H. antecessor*. At TD6 the lithic assemblage is rich and diversified, although it may be the result of technological evolution from the oldest assemblages. Intensive occupations with well organized subsistence strategies have been documented, as well as the earliest trace of cannibalism in prehistory.

After a hiatus of approximately 300 ky without hominin traces, the occupations of Galería and TD10 correspond to a third cultural phase, ranging between 500–250 ky, represented by a Mode 2 technology associated with systematic and directional carcass processing, including hunting events at TD10. This time there is a replacement of *H. antecessor* by *H. heidelbergensis*, which is probably not a coincidence.

Finally, TD10.1 may represent the transition to Mode 3, which evolved at Atapuerca as a local evolution of Mode 2 assemblages.

After studying the assemblages, several technological features have been observed to be maintained or change through the Atapuerca sequence. The main trends of those considered to have an evolutionary significance are:

- 1) Raw materials selection. Use of local varieties of rocks, used simultaneously only from the late Lower Pleistocene onwards. Progressive increase of selection of the most workable varieties through the Middle Pleistocene.
- 2) Production sequences. There is a coexistence of knapping methods (unipolar, multipolar orthogonal, multidirecional, bipolar and centropolarized), with a clear increase in abundance of centripetal strategies, in flake predetermination and in standardisation, which lead, in the end, to Levallois-like techniques.
- 3) Chopper and chopping-tools are very scarce, slightly shaped, and so, without any special significance.
- 4) Small tools on flakes appeared only at the end of the Lower Pleistocene, and increased in number, complexity and standardisation through the Middle Pleistocene.
- 5) Large cutting tools (on flakes or cobbles) appear c. 500 ka ago. At Gran Dolina TD10 they progressively decreased in number, in standardisation and intensity of shaping.

Climate structure and duration of MIS 11 in Britain: preliminary results from Marks Tey, Essex

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MIS 11 is an important climatic interval for understanding early hominin occupation in Britain. As well as containing important fossil sites, such as Swanscombe, this interglacial contains evidence for archaeological complexity through the presence of different lithic industries, e.g. the Clactonian and Achuelian. Although it has been suggested that MIS 11 was a particularly long interglacial, characterised by stable climates there are few detailed terrestrial sequences to support this. The lake basin at Marks Tey represents one of the most important MIS 11 sites in Europe and one of the longest Quaternary sediments sequences in the UK. Its' significance reflects the fact that through much of the Marks Tey record the sediments are annually laminated, or varved, and the potential exists to generate an annually-resolved chronology for this important time interval. Furthermore, as well as containing a range of biological proxies the Marks Tey varves contain a summer lamination of authigenic carbonate that can be used as the basis for $\delta^{18}\text{O}$ analysis which can provide information on changing summer temperatures.

This presentation will aim to summarise preliminary results obtained from a new Marks Tey core taken in December 2010 adjacent to the deep core (GG) of Turner (1970). The stratigraphy of the new core will be summarised and compared to that of earlier studies (i.e. Turner, 1970). In particular the varve sedimentology of the early to middle Hoxnian sediments will be described and discussed. A strategy for future research objectives will then be outlined, these include; 1) confirmation of varve micro-facies, 2) development of an annually resolved varve chronology for Ho I to the middle of Ho III, 3) an oxygen isotopic record of overall climate structure and evidence for abrupt climate events, 4) quantification of duration of events and rates of change and 5) a detailed analysis of the non-arboreal pollen phase.

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Savin's collection of Pleistocene mammals from East Anglia: implications for archaeology and the age of the East Anglian pre-glacial sequence

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During the Early and early Middle Pleistocene, the East Anglian Crag Basin accumulated substantial sediment bodies, deposited mainly in fluvial and near-shore marine environments. This sequence spans a critical period of climatic, environmental and faunal change, when the dominant periodicity switched from ~41-kyr to ~100-kyr. The sediments are famous for their abundant and diverse fossils. These include many climatically sensitive taxa which record fluctuations between warm interglacials and periods of arctic severity, culminating in the first expansion of glaciers into lowland Britain, during Marine Isotope Stage 12.

Until recently, these pre-glacial sediments were thought to be devoid of Palaeolithic artefacts, but within the last decade, artefacts and humanly modified bones have been found at Pakefield (Suffolk) and at five coastal sites between Happisburgh and Ostend (Norfolk). Although the dating of these sites may be contentious, they offer a unique opportunity to assess the influence of climate on human range expansions and contractions, as well as the behaviours and technologies that facilitated human adaptation to novel habitats in northern climates.

In this talk, I will discuss the potential and pitfalls of interpreting historical fossil vertebrate collections, focussing on the internationally important A.C. Savin collection in The Natural History Museum. This is the single largest collection of fossil bones from the 'Forest Bed' and 'Craggs', which was amassed by the well-known Norfolk geologist and collector Alfred Collison Savin (?1861–1948), from the cliffs and intertidal zone in Norfolk and Suffolk. The potential of such collections is highlighted by the recent discovery of humanly modified early Middle Pleistocene bones from three different localities at Happisburgh. Pitfalls include problems of provenance and authenticity. Although outright forgeries are rare, many of the fossils in Savin's collection were purchased from a network of contacts that included longshoremen, fishermen and beachcombers, as well as officers of the Geological Survey and clergymen, not all of whom were entirely trustworthy or honest.

Specimens from Savin's collection serve as the holotypes for several species of mammal. Those named in his honour include the ancestral water vole *Mimomys savini*, an antelope *Caprovis savinii*, giant deer *Megaloceros savini*, the shrew *Sorex savini* and a primitive 'cave' bear *Ursus savini*. The latter species is unusually common at Bacton (Norfolk), where it dominates the collection. Taphonomy and mortality patterns are consistent with the bears having died during hibernation, possibly in dens in a river bank.

Integrating old collections with recent fieldwork is throwing new light on the age of critical horizons, most notably at East Runton. Here, Savin collected small mammals from a 'gravel pan' at the foot of the cliff. This deposit was relocated in 2005 and has yielded further small mammal material, as well as *Bithynia* opercula. Dating evidence suggests a late Early Pleistocene age for these deposits, strengthening the view that the East Anglian sequence is more complete than formerly believed.

Amino acid dating: the potential and the pitfalls

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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. However, it's not like waving a magic wand — there are still several important factors that need to be taken into account (species effects, the importance of the calcium carbonate matrix, the responses to temperature) — and it is clear that we need to interpret the data in light of these considerations. In this paper we will present some of our data from a wide range of samples that highlight these issues, and discuss the ramifications.

The Quaternary archaeology and environments of Jersey

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In 2010 a new multidisciplinary field project was established bringing together specialists from a number of British Institutions. Its primary aim was to undertake a survey of Pleistocene and Early Holocene find-spots on the Island of Jersey in order to characterise the context of finds, determine their likely age, behavioural significance and whether they indicated preserved fine-grained archaeological sites. In addition the project undertook renewed field investigations at the Middle Palaeolithic site of La Cotte de St Brelade in order to establish both the nature and condition of surviving deposits at the site and to begin to provide new supporting contextual evidence for on-going reassessment of the archive (see Scott *et al.*, this volume). In the first season of fieldwork three main sites were investigated: surface scatters of Middle Mesolithic flintwork at Canal Du Squez, a plough-soil scatter of Late Upper Palaeolithic flintwork at Les Varines and deposits previously regarded as backfill at la Cotte. At all three sites primary context archaeology was encountered as part of preserved intact quaternary sediment horizons. Follow-up fieldwork planned for this summer aims to further determine the age and nature of the surviving La Cotte sequence as well as recover the threatened LUP site at Les Varines. In addition, other surface find spots will be investigated. By improving our knowledge of the occupation history of the island we can better understand biotidal processes in the southern, continental part of the English Channel region. This will provide not only a occupation history against which to benchmark the British sequence but also as a bridge towards fuller integration with continental sequences.

The context of Middle Palaeolithic, Early Upper Palaeolithic and Mesolithic artefacts from Beedings, near Pulborough, West Sussex

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This paper is dedicated to the memory of Roger Jacobi and Con Ainsworth

The collection of flintwork from the site of Beedings, West Sussex contains by far the largest number of stone tools from the earliest Upper Palaeolithic of Britain, and is one of the two largest assemblages of its type in Europe. Despite its obvious importance, analysis of the archaeological collection from Beedings has been hindered by several factors resulting from the antiquity of its excavation. The result of new work at the site, this paper presents the first formal account of the context within which this exceptional collection of lithic material was found. During fieldwork undertaken between 2007 and 2008 in a field immediately adjacent to 'Beedings' — an early 20th century house and site of the original finds — further Upper Palaeolithic material was recovered. This material was located within a series of fissures situated across the surface of the hill upon which the house stands. Here we provide an account of these excavations, a technological overview of the flint assemblage, which also includes Middle Palaeolithic and Mesolithic artefacts, and the results of taphonomic analyses. The results of OSL analysis accord with an Early Upper Palaeolithic age for the majority of the old lithic collection from the site. Our taphonomic analysis suggests a mechanism for site formation and accounts for the exceptional preservation of early prehistoric archaeology from a high topographic position in the Wealden landscape. In light of these results, the 'Sackung' hypothesis of site capture originally proposed by Simon Collcutt for Beedings is upheld and further discussed. Wider implications for the preservation of open air Palaeolithic sites are also considered.

Home and away? Re-analysing the lithic material from the bone heaps at La Cotte

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One could be forgiven for supposing two things about La Cotte de St. Brelade; first, that the only Neanderthal behaviours recorded there relate to mammoth hunting and butchery, and secondly, that the site has been in any way “finished”. Most of the archaeological horizons have been interpreted as reflecting use of the site as a “home base” (Callow 1986), but two particular levels (3 and 6) are dominated by material resulting from the butchery of mammoth and woolly rhino carcasses, swiftly sealed by loess. It is these bone heaps which are often viewed as reflecting the “whole story” of La Cotte.

The bones within these piles are stacked roughly according to element, with some remaining vertically placed against the pile. This is suggested to reflect human processing of several individuals at once and the mortality profiles are argued to reflect a living herd, driven off the headland above by Neanderthal hunters (Scott 1986). The restricted faunas from these levels, and the loess within which they are preserved, reflect cold and open conditions. However, the lithic material from these levels has never been published, although preliminary cataloguing was undertaken. These levels record Neanderthal presence in the channel region at the beginning of MIS 6, before abandonment/extinction of the whole northwest European plain during fully glacial conditions. The character of this presence, and changes in behaviour as the environment and landscape changed, is critically important for an understanding of climatic and behavioural boundaries to early Neanderthal occupation. In this paper we present the preliminary results of a new analysis of the lithic material from the bone heaps, looking from the material discarded at the site itself to the broader use of the surrounding landscapes of the channel river valley.

Reconstructing rapid climate change in the British Isles at the end of the Pleistocene through hydrogen and oxygen isotope analysis of terrestrial fauna

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High resolution records of rapid climate change at the end of the last glacial (Greenland interstadial 1e to 1a and Greenland stadial 1) are available from ice and ocean cores. The extent to which these climate records reflect past climate on land in areas such as the British Isles is unclear as land ecosystems and climates exhibit greater spatial and temporal heterogeneity.

A small amount of data from fossilised insects suggest that the rapid warming in the British Isles may pre-date that seen in the ice-core records (Walker *et al* 1993, Walker *et al* 2003). This suggests that major climate changes during the Late Glacial could have been time transgressive across Europe, and between Europe and Greenland. Thus there is a need to develop further continental palaeoclimate records. We aim to establish an independent terrestrial palaeoclimatic framework for the British Isles for the Pleistocene-Holocene transition using hydrogen and oxygen isotope analysis of terrestrial fauna.

We measured oxygen isotopes in tooth enamel and hydrogen isotopes in bone and dentine collagen from horses recovered from localities in the British Isles. Preliminary results mimic the climate variations observed in the Greenland ice-cores. As all specimens were recovered from archaeological sites, the results of this preliminary study provide both a record of palaeoclimate in the British Isles at the end of the Pleistocene and a climatic framework in which the recolonization of the British Isles by humans can be considered.

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Ecological change at the subspecific level and its implications for humans in MIS 3

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The local extinction of Neanderthals, and subsequently of modern humans, in Belgium took place towards the end of MIS 3 against a backdrop of ecological change. The data on faunal turnover for the region suggests that processes taking place affected many organisms albeit in particular ways. This paper examines the evidence for ecological change at a subspecies level and discusses the implications for the human populations.

Sorting the muddle in the middle: how many early human species in Europe?

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The early human occupants of Europe are well-characterised from their archaeology, but considerable debate surrounds who these people were, and how they relate to later human populations. In this talk I will present my current views about the status of *Homo antecessor*, *Homo heidelbergensis* and *Homo neanderthalensis*. *Homo antecessor* was probably a European derivative of Asian *Homo erectus*, which may have gone extinct. *Homo heidelbergensis* was a widespread species which apparently gave rise to at least three descendent populations: *Homo sapiens* in Africa, *Homo neanderthalensis* in western Eurasia, and the 'Denisovans' in eastern Eurasia. The Atapuerca Sima de los Huesos sample should be assigned to *Homo neanderthalensis* rather than *Homo heidelbergensis*. Nevertheless, there is growing evidence for an overlap of *Homo heidelbergensis* and its putative descendants in the later Middle Pleistocene. Together with recent indications of late Pleistocene archaic-modern gene flow, these issues highlight the complexity of any taxonomic framework for these populations.



