

## **Abstracts for the Paleoanthropology Society Meeting**

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### **Taphonomy and zooarchaeology of the Die Kelders Cave 1 Middle Stone Age large mammal remains**

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Middle Stone Age (MSA) and Middle Paleolithic (MP) faunal assemblages have gained widespread attention due to their relevance to the debate over the modernity of hominid behavior during the MSA/MP. A recent critique of the scavenging argument for MSA/MP behavior drew on a summary presentation of the skeletal abundance and surface modification data from Die Kelders Cave 1 (DK1) Layer 10 (Marean, 1998). DK1 was excavated on two occasions: first in the 1970s and again in the 1990s. Both excavations were of high quality and produced large faunal assemblages with excellent contextual control. We have now completed the analysis of a substantially larger sample of fauna from Layers 10 through 13, and we present the results of that analysis here. Taphonomic analyses of the samples indicates that a substantial portion of the Size 1 bovids (grysbok) were not accumulated by people but rather by a large raptor, while virtually all Size 2 through 4 bovids were accumulated by people. Thus, while Size 1 mammals may dominate the species representation at DK1 and other MSA sites, the human component of the assemblage actually suggests that people focused on the large bovids. We have also developed new zooarchaeological methods that employ image analysis software (ArcView GIS) to quantify and analyze skeletal element abundance and surface modification, and completed a wide-ranging and carefully controlled experimental study of large mammal butchery in South Africa. This paper presents comparative analyses and results of the DK1 and experimental data sets utilizing the new image analysis techniques. Our results demonstrate that MSA hominids at DK1 were focusing on the Size 3 and 4 bovids, were transporting high utility skeletal elements back to the site, and were defleshing them in ways consistent with the modern experimental butchery study.

## The Palaeolithic occupations at Ortvale Klde and their bearing on the prehistory of Transcaucasia

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Transcaucasia represents a major temporal and geographic gap in our understanding of Archaic hominids. New research being conducted in the Georgian Republic is beginning to help alleviate this situation by shedding light on the Middle and Upper Palaeolithic occupation of this region. The rockshelter of Ortvale Klde, where the majority of this new research is centered, contains archaeological deposits that document the intensive use of the site by Middle and Upper Palaeolithic groups within a sub-Alpine, mountainous region. Palynological, mineralogical, and micromammalian data point to an initial occupation beginning with the main part of the last glaciation. These data also record three palaeoenvironmental shifts in and around the Chiatura region that are linked closely to the expansion and retraction of glaciers in the Great Caucasus to the north. Since Pleistocene climatic changes seem to have been less dramatic here than in more northern latitudes of Eurasia, many floral and faunal communities familiar to hominids persisted throughout much of this period. This pattern of relative environmental stability may be reflected archaeologically, with lithic assemblages remaining rather conservative in composition over many, many millennia. These data also demonstrate clear similarities in material culture between the inhabitants of Ortvale Klde and those groups occupying neighboring sites and regions. Preliminary zooarchaeological data indicate the intensive exploitation of *Capra caucasica* in all layers and the rare occurrence of carnivore remains. This pattern of faunal exploitation and site use has yet to be documented elsewhere in Transcaucasia. Finally, analysis of the stratigraphy and lithic assemblages suggest a sudden, late transition from the Middle to the Upper Palaeolithic. New study of these assemblages coupled with the chronometric dating of the site will provide a more complete picture of Archaic hominid lifeways in Transcaucasia and the timing and nature of their interactions with different hominid groups.

## **The Middle Palaeolithic site at Fuentes de San Cristóbal (Huesca, Spain)**

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The Middle Palaeolithic site at Fuentes de San Cristóbal is situated in the pre-Pyrenean mountains, in the northeast of Spain. The archaeological site is a rock-shelter discovered in 1998 and located in the Isábena river valley. The stratigraphic record is conserved in three karstic hollows which probably formed part of the same cavity. This succession is about 5 m thick and is composed of a slope-waste deposit sequence overlying an alluvial sequence; both contain archaeological layers. The site has yielded a large amount of archaeological remains and structures, including hearths. The upper succession of geological layers has been dated, with the youngest clear Middle Palaeolithic layer dated to  $36,000 \pm 1,900$  (OxA-8590). The aim of our fieldwork is to recover a wide range of data for reconstructing the behaviour of the late Middle Palaeolithic communities of the Iberian peninsula. Therefore, the dating of this site provides insights on the overlap of the Aurignacian and Mousterian cultures in the north of Spain.

## **Change in Middle Stone Age settlement patterns in the central Rift Valley, Kenya**

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In the central Rift Valley of Kenya, Middle Stone Age (MSA) sites with extremely high artifact densities are concentrated at an altitude of 2100-2200 m. Based on ethnographic analogy with local hunter-gatherers, Isaac proposed a model of MSA settlement preference for the forest/savanna ecotone. This ecotone is currently located at an elevation of 2300-2400 m. If this settlement preference model is correct, then the ecotone was lower, implying higher rainfall, during this part of the MSA. These sites may thus date to the last interglacial (oxygen isotope stage 5). The ecotonal settlement preference model has also been applied to the Holocene Later Stone Age (LSA). Archaeological and paleosol (fossil soil) stable carbon isotope evidence show that the ecotone and the focus of human settlement rose from 1940 to at least 2400 m between the early Holocene wet phase and the middle Holocene dry phase. During periods of decreased resource density and predictability the ecotonal settlement preference may have been abandoned, mobility and home range size increased, and regional intergroup interaction and exchange intensified. This change in socioterritorial organization should be reflected by a greater diversity of settlement locations and greater amounts of stone tool raw materials from distant sources. The evidence available for the MSA is consistent with this scenario: MSA sites located on the hypothesized paleoecotone at Prospect Farm have obsidian predominantly from sources within 30 km of the site. The late MSA site at Prolonged Drift is located on the floor of the central Rift, below the ecotone. It has obsidian predominantly from sources 40-50 km away, and only 5% comes from the closer sources that are abundant at Prospect Farm. Prolonged Drift does not appear to be part of the ecotonal settlement system. More research on environmental reconstruction, geochronology and obsidian source use is needed to determine if this difference in source use reflects a change in socioterritorial organization between glacial and interglacial environments.

## **A new functional interpretation of the Swartkrans early hominid bone tools**

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Ever since Dart identified bones from Makapansgat as tools, scientific consensus has fluctuated as to whether certain modified bones from early hominid sites should be interpreted as artefacts, or simply the result of non-human taphonomic processes. Brain and Shipman's analysis of 68 specimens from Swartkrans and Sterkfontein, and their interpretation of these as tools used for digging up tubers or working skins has provided new data in support of the anthropic hypothesis. This interpretation, however, was not validated by comparative analyses of wear patterns produced by natural processes, and alternative functional interpretations were not tested.

In this study, the results of a new archaeozoological, morphometric and microscopic analysis (optical microscopy, SEM, image analysis) of the Swartkrans and Sterkfontein material have been compared with those obtained from reference collections of bones modified by known natural agents, and from bone tools experimentally used in different activities, including Brain's experimental tools.

Our results confirm that many of the objects were tools used by early hominids. However, image analysis of the wear patterns contradict previous functional interpretations. The width, orientation and morphology of striations on experimental tools used to dig termite mounds are consistent with those found on the Swartkrans and Sterkfontein specimens, and different from those used by Brain and us in digging tubers and other activities. Termites provide a rich source of protein and fat, and are traditionally harvested after the rains as they vacate the colony. The use of bone tools implies that early hominids tapping this resource possessed the cognitive ability of developing a technique able to transcend the ecological constraints of seasonal availability. Moreover, breakage patterns reveal that in 96% of cases, the hominids used weathered long bone shaft fragments, suggesting that their gathering of bone blanks was not subsidiary to scavenging. Previously undescribed traces of shaping or re-sharpening through grinding have been identified, as well as sixteen new bone tools from Swartkrans.

## **Implications of dental morphology for population affinity among Late Pleistocene and recent humans**

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Decades of research have shown that comparative dental morphology is a useful method for determining population affinities among recent humans. Recent studies of Plio-Pleistocene hominids have shown that it is also a sensitive indicator of phylogeny. In comparison, systematic research on the dental morphology of Neandertals and other Late Pleistocene hominids is just beginning.

It is well documented that Neandertals exhibit unusual dental traits (e.g. taurodontism). Previous authors (Bailey and Turner, Irish, Stringer, Tyrell and Chamberlain) have confirmed that the overall dental pattern of Neandertals is also distinctive. Based on phenetic distance measures, outgroup analysis, and genetic affinity analysis, they have rejected the hypothesis of continuity between Neandertals and modern humans. With one exception (Bailey and Turner, 1999) these conclusions have been based on Krapina Neandertals and extant modern human populations.

The present study uses analyses of Mean Measure of Divergence (MMD) to assess the affinities of 11 populations representing early Anatomically Modern Humans, Upper Paleolithic Europeans, Recent modern humans and Neandertals.

The 17-trait MMD analysis demonstrates that, dentally, Neandertals are quite divergent from all modern humans. The results of cluster analyses based on MMD values suggest two major clusters: Neandertals and modern humans. The data also suggest two sub-clusters within the modern human cluster. One links Upper Paleolithic Europeans with recent North Africans and Europeans. The other links early Anatomically Modern Humans with Late Pleistocene Africans and recent Sub-Saharan Africans.

These results do not support either biological continuity or significant admixture between Neandertals and Upper Paleolithic Europeans. However, they do not disprove that some degree of admixture may have occurred. The results showing a close affinity between early Anatomically Modern Humans and Sub-Saharan Africans are consistent with the Recent African Origin model for modern human origins.

## The healthier choice: early colonizations of Eurasia

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This paper aims to present certain aspects of the dispersal phenomena of hominids migrating out of Africa, a series of episodic events that took place after a long *statis* in early human evolution.

The following traits were the most crucial for the success of the hominine Eurasian adaptations, and are, in fact, observed in the archaeological record at 1.7–1.5 Ma, which most researchers agree to have been the time of the first ‘*sorties*’ out of Africa:

- Steady and prolonged walking ability at normal pace, heat adaptation, reflected in the body shape and skull morphology of the early hominines (e.g., *H. ergaster*).
- A greater brain capacity than that of the contemporaneous Australopithecinae.
- A social structure different from that of the chimpanzee: more human-like, reflected in site patterning, the extensive exploitation of animal tissues, caring for a sick group member, etc.

The suite of archaeological sites and fossils from Eurasia pertaining to this period is discussed in the paper. The record is not continuous, and gaps in regional sequences are considered to indicate the extinction of particular hominid lineages, supporting the notion that, at least at the beginning, migrations were not incremental, nor always successful.

At the same time, the geographic distribution of sites in Africa dated to 1.8–1.0 Ma is rather limited, considering the surface area of the continent. Though climatic changes caused certain regions to open up or close down for human exploitation, it is assumed that population growth in the African ‘homeland’ was constrained not only by climatic conditions or predation, but in particular by endemic diseases, as is the case for the present day pongids.

The triggers for the movement out of Africa are poorly known. Proposed reasons are population increase—as for any successful species that expands beyond its original territory; a change in the species’ subsistence strategies (turning actively carnivorous); and climatic changes that severely reduced and modified the size of the exploitable territories.

The major climatic change at the Olduvai Subchron resulted in the desertification of numerous wet and lush environments. Yet the spread into new habitats in Eurasia, where hominines were previously unknown, meant that they escaped their many biological foes, first and foremost amongst them the zoonotic diseases, endemic to Africa, which to this day continue to decimate primate and other mammal populations.

## Some optical dating results from karstic cave sediments at Atapuerca, Spain

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Two “dolines” or infilled karstic caves (Gran Dolina and Galería) at Atapuerca in northern Spain have many hominid fossils and stone tools, with the deeper strata at Gran Dolina preserving the oldest (ca. >800 ka) such fossils in Europe. The younger strata at both sites have been difficult to date. We applied the daylight-sensitive, feldspar-specific infrared-stimulated-luminescence (IRSL) optical-dating method to sediment samples from both dolines, and to samples from the present-day surface soils on the surrounding limestone hill-slopes. During the Pleistocene, such surface material was the source of the strikingly dominant “entrada facies” in the dolines, created by slope-wash infilling of the caves.

An IRSL age = equivalent-dose ( $D_E$ , from IRSL measurements) / dose rate (from dosimetry data). We report  $D_E$  values for hill-slope samples and preliminary (dose-rate data are incomplete) age estimates for two samples from the Galería cave. Age estimates from additional samples from the two caves will be presented at the conference. Shallow-surface (1-3 cm depth) samples from four hill-slope sites yielded relatively small  $D_E$  values, corresponding to “parent” or surface-sediment ages of ~0.3 ka to ~1.5 ka. At a fifth surface site, parent ages ranged from ~1.3 ka (10-cm depth) to ~6.4 ka (40 cm). These results suggest that the IRSL “feldspar clock” is probably effectively zeroed in these cave sediments older than ~100 ka. Within Galería, a sample in the base of facies unit G3 gives an age estimate of  $180 \pm 30$  ( $1\sigma$ ) ka, and a sample about 1 m lower (in middle of unit G2) yields an estimate of  $190 \pm 30$  ka. Thus, the hill-slope results establish the feasibility of IRSL dating of these “entrada facies”, karstic deposits. The two results from Galería are stratigraphically reasonable. Further analyses and comparisons with independent methods are needed before accuracy of these IRSL ages can be more fully assessed.



## **Early *Homo sapiens sapiens* in the Swabian Jura and the origins of cultural modernity**

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Paleolithic research in the Swabian Jura goes back to the pioneering work of Oscar Fraas in the 1860s at the Schussenquelle and Hohlenstein. In subsequent decades Robert Rudolf Schmidt, Gustav Riek, Robert Wetzel and Joachim Hahn were central figures in the advancement of the Paleolithic research in the region. When examining the early Upper Paleolithic occurrences of the Swabian Jura, Schmidt's excavations at Sirgenstein, Riek's work at Vogelherd, Wetzel's digs at Hohlenstein, and Hahn's research at Geißenklösterle are of particular importance. These and other Aurignacian localities, as well as the early skeletal remains of modern humans from Vogelherd, provide key evidence for developing hypotheses for the appearance and spread of modern humans and the material manifestations of modern behavior. While we do not necessarily see a sharp break in the archaeological record of Europe between the Middle and Upper Paleolithic, the Aurignacian of the Swabian Jura provides remarkable evidence of cultural innovation including: numerous ivory statues, musical instruments, ornaments, and new organic and inorganic tools. Particular attention will be placed on the Aurignacian horizons at Geißenklösterle and their significance for documenting the advent of modern behavioral patterns. Additionally, this paper critically examines the timing and importance of the arrival of modern humans in the region. The rich archaeological data from the Swabian Jura lead us to formulate testable models for the appearance and spread of modern humans and fully modern behavior.

## The endocast of Sambungmachan 3 (SM-3): a new *Homo erectus* from Java

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The taxon *Homo erectus* occupies a considerable timeframe in hominid evolution. Accordingly, variations or changes in their paleoneurology may be of great value in interpreting brain evolution. Indonesian *H. erectus* is characterized by a long, low cranial vault, sloping forehead, and angled occipital region. These features are reflected on the endocasts, which range in size from 813cc to 1059cc. While we can witness the increase in brain volume in *H. erectus* over the course of a million years or more, there has been little evidence of the development of modern *Homo*-like traits in their endocasts. The endocast of a new calvaria discovered near Sambungmachan, Java, however, offers evidence suggesting the appearance of more modern characteristics in *H. erectus*.

A rhodorsil silicon rubber endocast was made from the Sambungmachan 3 calvaria (SM-3), and the base of the endocast was reconstructed so that an accurate endocranial volume could be obtained. Water displacement techniques yielded an average cranial capacity of 920cc. In addition, CT imaging was performed on SM-3 along with 4 other representative Indonesian and Chinese endocasts using helical fast tract scanning (mA = 140, kV = 170, 1 mm slice intervals), generating 2-D and 3-D reconstructions. Frontal, temporal, and parietal-occipital lobes were quantified using tracing techniques for each incremental slice based on neuroanatomical landmarks. Our preliminary comparative paleoneurological analyses shows that while SM-3 has a mosaic of features that are similar to both Indonesian and Chinese *H. erectus*, it also possesses significant apomorphic features. These include a greater degree of asymmetry characterized by a strong left-occipital, right-frontal petalial pattern; left-right volumetric asymmetry exhibited in the frontal and parieto-occipital lobes; and significant asymmetry in Broca's cap. Moreover, the frontal lobe offers a more shortened, rounded appearance in contrast to the flat, elongated appearance of other Indonesian fossils (e.g., Sangiran 17). Another apomorphic trait is exhibited in the transverse plane where the widest breadth of SM-3 occurs more superiorly than in other Indonesian *H. erectus*.

The endocast of SM-3 presents a unique morphology not seen previously in the fossil record. While the strong modern human characteristics in this endocast may not represent a particular ancestry, they do allow us to recognize a new dimension of the remarkable variation in Indonesian *Homo erectus*.

## **The beginnings of the Upper Paleolithic in Cantabria (Spain): levels 18B and 18C of the Cueva del Castillo**

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The Cueva del Castillo was first excavated by H. Obermaier between 1910 and 1914. The recent excavation of Castillo's level 18 has contributed to the more precise establishment of the beginnings of the Upper Paleolithic in the region. Several recent papers have challenged our proposition that a very early Aurignacian, such as that recovered from level 18, actually existed in Cantabria. In this paper we provide evidence confirming the integrity of the level and its archaeological attribution. The archaeological integrity of level 18 is demonstrated by the fact that it is separated from two other find-bearing strata -level 16 with Aurignacian materials above, and Mousterian level 20 below- by archaeologically sterile levels 17 and 19. Geologically, layer 18 is situated between two periods of rock fall. Chronologically, all of level 18 is attributed to 38,000 to 40,000 BP on the basis of AMS and ESR determinations from three different laboratories. The recent excavations have subdivided level 18. Lowermost level 18C has yielded nosed endscrapers, dihedral burins, Aurignacian blades, bladelets, and simple sidescrapers. In addition, decorated bones and a sagaie point have been found in 18C. Uppermost level 18B displays similar technological characteristics, though with finer-quality endscrapers and the presence of an atypical and isolated Chatelperronian point. Five operational chains have been identified; three for obtaining flakes and two for blades. In sum, the Middle Paleolithic "look" of the assemblage, combined with an Upper Paleolithic class of blades, leads us to propose that this is a transitional level. Faunal analyses from the recent excavations of level 18 demonstrate an emphasis on red deer. The population structure and reconstructed hunting patterns for the prey animals of 18C are very similar to those reconstructed for the Mousterian faunas, again corroborating the transitional nature of this Aurignacian level.

## **Inferring paleohabitats from the functional morphology of bovid postcrania**

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Representatives of the Bovidae are found in a diverse range of habitats and are relatively common in the fossil record, making them potentially informative regarding paleoenvironments. To this end, several researchers have identified morphological characters of bovid postcranial elements that appear to be correlated with habitat preference. This accords with the theoretical expectation that different bovid species will, to varying degrees, evince adaptations for moving across the particular substrate(s) they typically encounter. Metric characters of the femur and metapodial indicative of habitat preference have been developed and tested on extant bovid taxa by previous workers. Non-metric characters of the phalanges have been formally proposed, but not tested.

In this study, additional characters (both metric and non-metric) were developed for postcranial elements commonly preserved in the fossil record (tibia, distal humerus, astragalus, phalanges). Both these characters and those previously proposed were examined in a sample of modern African bovid specimens to evaluate whether they accurately indicate habitat preference. A number of previously suggested characters were found to not be indicative of habitat. Some characters, both from other studies and the present one, do appear to be correlated with habitat preference.

The results of this study expand the range of bovid elements that can be analyzed for morphological indications of habitat. This permits the application of these methods to fossil samples not previously suitable for such analysis. Considering multiple characters on different elements also results in more secure inferences of habitat preference. The advantages of a multi-element approach are illustrated using the example of the bovid sample from the Omo, Ethiopia.

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## **Chert procurement and the organization of lithic production in the Mousterian of Hayonim Cave (Israel)**

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The current excavations project at Hayonim Cave (Western Galilee, Israel), exposed a long Mousterian sequence, containing industries of "Tabun C-type" and in particular "Tabun D-type" (ca. 100 to 200 Ka). The rich and diverse assemblages of faunal and lithic remains allow us to draw a detailed picture of the techno-economic activities performed by Mousterian groups. Careful studies of lithic assemblages are employed as building blocks for reconstructing the patterns of human technological behavior and the range of daily activities. In this domain, the investigation of lithic raw materials exploited by prehistoric peoples provides the means to model mobility patterns, size of territories, intergroup contacts, and the like. In particular, the obtained information enables us to reveal the sets of behaviors embedded in techno-economic practices of procurement and subsistence. The reported research was designed for the study of the acquisition of lithic raw material used at Hayonim Cave during the Mousterian period. Chert artifacts recovered from layer F (ca. 220,000 Ka BP) were selected for this type of analysis. The presentation of the preliminary results already demonstrates three kinds of evidence: 1) the types of raw material present on the site; 2) the geographical distribution of the various sources of the siliceous rocks; 3) different states in which these raw materials were introduced into Hayonim Cave : i.e., complete nodules or as tested blocks, blanks, and curated tools. The field (geological survey) and laboratory (macroscopic and geochemical) observations indicate that most of the chert sources were located within a radius of 10 km around the site. Rare pieces originated from sources located 20-30 km away.

### Sambungmachan 3, a new *Homo erectus* from Java via New York City

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In the spring of 1999, a fossil hominin calvaria lacking most of its basicranium and face turned up at a natural history curio shop in New York City, where it was recognized as a probable specimen of *Homo erectus* by the owner, Henry Galiano. After discussion with several of the authors, it became clear that this was the same fossil which had been discovered in late 1997 by sand miners in the Solo riverbank and briefly described by Boedhihartono. Galiano then donated the calvaria to the Indonesian government as represented by T. Jacob, who now curates it. Prior to its return to Indonesia, we obtained CT and photographic images and made detailed comparisons with casts of other Asian and African hominins.

The calvaria was obtained near Poloyo, Sambungmachan district, Sragen county, in central Java, some 50 km N of the Sangiran Dome. Although it was previously termed Poloyo (PL)-1, it has now been officially catalogued as Sm 3.

Extocranial features of Sm 3 including frontal breadth, postorbital constriction, and conformation of the mastoid, supramastoid crests, and occipital torus suggest affinities to the geologically younger Ngandong specimens, but its estimated cranial capacity of 900+ ml is reminiscent of the older Sangiran hominins. Other features, such as high vertical forehead that rises quickly from the midline, non-barlike supraorbital torus that is midsagittally deficient and somewhat greater cranial breadth relative to length, are atypical among Asian *Homo erectus*.

Preliminary analyses of the arcs and chords of the frontal and occipital compared to other adult *H. erectus* and modern humans place Sm 3 within the variation range of *H. erectus*. Three dimensional morphometric analysis of the glabella to opisthion arc helps to clarify the evolutionary position of Sm 3 quantitatively.

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**A revised relative frequency of hominids from the Hanging Remnant of the Swartkrans Formation, South Africa, and its implications for re-interpreting the ecology and taphonomy of the Swartkrans hominids**

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Recent reanalysis of the entire faunal assemblage from the Hanging Remnant of Member 1 of the Swartkrans Formation has indicated that the relative frequency of hominids from this unit has been over-estimated. Previous reports on the Hanging Remnant have estimated that hominids represent as many as 20.3% of all macromammals. This high prevalence of hominids at Swartkrans has occasioned several potential taphonomic explanations.

All known macromammal fossils from all phases of excavation of the Hanging Remnant of Swartkrans were examined as a coherent unit. This included a large amount of previously undescribed fossil material that has now been attributed to this Member. Both cranio-dental and post-cranial material was used in this study. Dental material was assigned to discrete categories of development based on several criteria, including crown formation, root formation and dental attrition. Isolated teeth, by far the most common cranio-dental remains for all macromammals, were attributable to these categories, thus greatly increasing the sample size over previous studies. Specimen-by-specimen comparisons were then performed for each of the discrete categories of dental material to estimate numbers of individuals. Post-cranial material was identified to taxon wherever possible to complement or augment the numbers of macromammals estimated via cranio-dental material.

The results of this study indicate that the frequency of hominids relative to other macromammals was reduced significantly for the Hanging Remnant, thus obviating the need to invoke complex taphonomic or behavioral causes for a presumed high relative frequency of hominids in the assemblage. Specifically, the results of this study may eliminate the need to assign specialized predatory behaviors for large carnivores, and/or the need to refer to hominid cave habitation. The alteration of the relative frequencies of all macromammals may also have implications for ecological interpretations of the Swartkrans environment ca. 1.5-1.8 million years ago.

## **Reindeer exploitation at the Middle Palaeolithic site of Salzgitter-Lebenstedt, northern Germany**

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The Middle Palaeolithic site of Salzgitter-Lebenstedt was excavated in 1952. Salzgitter Lebenstedt is well known because of the presence of the northernmost Neanderthal remains, a exceptionally well preserved fauna associated with bifacially worked lithics and unique Middle Palaeolithic bone tools. These remains accumulated in an arctic setting in an earlier part of the last (Weichsel) Glacial (OIS 5-3). The fauna is dominated by adult reindeer (*Rangifer tarandus*). Analysis indicates autumn hunting of this species by Middle Palaeolithic hominids. During subsequent processing of the animal carcasses a selection against young and sub-adult animals occurred. Adults were clearly preferred and from their bones again, poorer marrow bones were neglected. This focus on primeness of resources has been documented in other domains of Neanderthal behaviour, but Salzgitter Lebenstedt is the best example yet known in terms of systematic and routinized processing of game.



## **Beeches Pit: archaeology of a Middle Pleistocene site in East Anglia, UK, 1996-1999 seasons**

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Beeches Pit in Suffolk, U.K., has been known as an artefact and faunal locality since the nineteenth century. Palaeoenvironmental studies have been carried out by a group of Quaternary Research Association for several years (Bridgland et al. 1995 in Proc.Geol.Assoc). We report here on archaeological excavations carried out by the Liverpool group. The site lies in forest to the NW of Bury St Edmunds, and preserves an interglacial sequence overlying glacial sediments. They represent the Anglian glaciation (isotope stage 12) and the following interglacial (isotope stage 11) on the basis of stratigraphy, environmental indicators and recent TL dating. Excavations have uncovered archaeological sequences in two areas of the NW part of the pit, where sections are of approximately 5 m height. Sediments in the eastern trench, AH, are stratigraphically older. Here an artefact horizon has been exposed across excavations of approximately 75 m<sup>2</sup>. It lies within interglacial tufaceous material overlying cold period sediments. In 1999 artefacts were discovered about 0.5 m under the principal artefact horizon, indicating multiple occupations, probably by the side of a pool. The great majority of finds (several thousand knapped pieces) come from a gently sloping horizon of up to 30 cm thickness. Within this about 100 refitting pieces have been found. The largest set of refitting pieces is of a biface roughout which was eventually abandoned probably because of a flaw.

The western area, AF, records a slightly later sequence within the same interglacial. Artefacts are stratified within clays overlying a channel bank of tufaceous clays. The site is notable for the variety of evidence of burning. Two localised burnt zones are under investigation. Burnt flints are common in the main excavations, but not in all areas. At higher levels in AF there is a widespread dark horizon which contains burnt material.

## **Hominid demography in the European Middle Pleistocene: models and trends**

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Mathematical modelling of Palaeolithic hominid populations remains a rarely visited research topic in European archaeology. Yet generalisations regarding global and continental population structures and trends form a significant element of current Palaeolithic archaeology, as they are linked with notions of hominid subsistence and survival in both the technological and social spheres. This paper presents a modelling approach by which demographic preconceptions may be tested rather than merely assumed.

Aspects of population and demography continue to be investigated, including home range size, social scales of hominid society, and group sizes, through the manipulation of body weight, brain size and raw material transfer data, and ethnographic analogy. These data can support models of population structures, but they stop short of estimating population sizes, the continuity of hominid occupations, and the resultant ebb and flow of Pleistocene populations in different regions of the Old World. This paper presents a methodology that was developed to address these questions of hominid demography in the Middle Pleistocene. The models reconstruct populations on the basis of their discarded lithic material, which in turn highlights issues ranging from selective sampling of the archaeological record to models of changing tool use within hominid social life.

This paper focuses upon two particular issues. Firstly, a comparison is drawn between glacio-fluvial and fluvial regional landscapes from southern England, respectively highlighting the impact of differential climatic conditions and geological processes upon hominid occupation and the formation and structure of the archaeological record. Secondly, an investigation of the impact upon the demographic models of changing assumptions, with particular reference to lithic tool 'life spans' and the changing "functions" of particular tool types (e.g. handaxes) within hominid societies. My research indicates both low population densities and a highly discontinuous hominid occupation in northwestern, coastal Europe (50°N), which contrasts markedly with published data on the East African situation.

## **Body techniques and lithic traditions among chimpanzees : Plio-Pleistocene implications**

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Because of their morphological and fonctionnal proximity, the tools made and used by primates - particularly chimpanzees (*Pan troglodytes*)- raise a number of questions about definitions and about the limits we can draw between the animal sphere and the human sphere. Tools are questioned today, as are the notions of culture or tradition, by ethologists and psychologists (i.e. Boesch & Tomasello, 1998; Whiten et al., 1999), but those scholars use definitions that are either too weak or overly specialised. Indeed, they rarely consider these phenomena as extensively as they are conceived and described for humans. This paper tries not to avoid the challenge of a comparison between the "cultural" behaviour of primates and humans, taking up the concept of "body techniques" as forged by Mauss at the beginning of this century and examining its implications in terms of tradition, objectification or technique. The argument developed here is based on ethological and archeo-ethological observations that I have been reporting since 1989 on the nut-cracking activities of West African chimpanzees (i.e. Joulian 1995, 1996, in press) and on ethological data published both on the voluntary transmission of techniques and on non instrumental traditions of these apes. I show in particular the intentional and collective character of the representations involved in this activity and raise the question of the simian meanings of techniques. To illustrate the analyses I will present here new field data on chimpanzee nut cracking behaviour in Ivory Coast, east of the Sassandra river. Indeed, until now, such activity was limited to west of that river (i.e. Boesch et al., 1994 ; Boesch & Tomasello, 1998) and the limit interpreted as a "cultural limit". My observations open the range of that behaviour and enable us to consider the variability and flexibility of gestures and tools. The ultimate goal is the understanding of Plio-Pleistocene tool traditions, from another hominoïd viewpoint.

## **Evolution of East African hominid communities and high resolution Pliocene climatic change in the central Kenyan Rift**

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Global climatic change during the Pliocene, recorded in deep-sea sediments, has been implicated in the evolution of East African ecosystems. Faunal turnover including the radiation of hominids between 3 and 2 Ma has been linked specifically to the onset of northern hemisphere glacial cycling. High latitude glacial episodes are presumed to have been manifested in low latitude East Africa by increased aridity, resulting in the replacement of forest environments by more open woodland and grassland habitats. However, empirical evidence documenting the response of local landscapes in the East African rift valley to global and regional climatic perturbations is scarce. Fossiliferous sediments of the 4.5 to 1.6 Ma Chemeron Formation exposed along an uplifted fault block (Tugen Hills) within the central Kenyan Rift Valley provides data relating to this issue.

In general, it is difficult to achieve the stratigraphic resolution or continuity in terrestrial rift valley depositional basins to recognize environmental shifts. In addition, tectonic pulses and volcanism, characteristic of active rifts, results in the alteration of sedimentary patterns that can mimic or obscure changes in lithofacies that could otherwise be attributed to local climate change. A section of the upper portion of the Chemeron Formation, exposed in the Barsemoi River drainage, includes a 2.66-2.56 Ma series of distinctive diatomite horizons indicating substantial lake systems, intercalated with fluvio-lacustrine and alluvial fan sediments. This section is interpreted to reflect a period of tectonic quiescence and as such, preserves a detailed record of climatic conditions within the axial portion of the rift during this interval. The diatomite units, up to 12m thick, document intermittent, significant lake systems within the axial rift. Based on a series of radiometric <sup>40</sup>Ar/<sup>39</sup>Ar SCLF dates and detailed paleomagnetic sampling from the sequence, the diatomite cycling correlates well with the 23 kyr precessional period suggesting that astronomical cycling exerts a significant influence on East African habitats and on fauna inhabiting the rift valley. This research provides evidence that the East African landscape does track global climatic change to an extent and that it is not unreasonable to assume that this region was experiencing the effects of high latitude glacial cycling.

Over 36 faunal localities including 3 hominid sites can be tied into the Barsemoi River section spanning 2.89 Ma to 2.43 Ma interval. We are currently investigating the potential impact of these environmental fluctuations on the fauna by detailed taxonomic assessments of fossil sites vertically through the succession as well as biogeochemical studies including oxygen and carbon isotopic analyses of herbivore enamel and diatoms.

## **Radiography of the Krapina hominid collection**

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The Husnjakovo rockshelter in the village of Krapina, 25 miles north of Zagreb, Croatia, has yielded the largest sample of Neandertal bones ever discovered. A recent radiographic study of these fossil specimens reveals that the majority of the bones are representative of osteologically healthy individuals. Exceptions include the occasional trauma as well as features associated with biomechanical wear resulting from strenuous physical activities and normal patterns of aging. These changes were manifested by, for example, osteoarthritis of the articular facet of the mandible, healed fractures, and spondylosis, ligament calcification and spinal stenosis of several vertebrae. There is one example of non-union or amputation of the ulna and a specimen showing a benign tumor of a rib. Long bones showed normal thick cortices and normal marrow spaces. There were no examples of congenital malformation syndromes, inflammatory arthritis or spondylitis, infections of bones or joints, mastoiditis, or metabolic or endocrine disorders.

This radiographic analysis of the 884 bones from the Krapina site provides support to the conclusions reached by Tillier's research on the growth and development of the immature fossil specimens from this site. This work revealed little evidence of growth disturbance and/or trauma. On the basis of these investigations, the Neandertal sample from the Krapina rock shelter appears to represent reasonably healthy and robust individuals.

## **Sterkfontein Oldowan and Early Acheulean: analytic and experimental results**

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The archaeological deposits at Sterkfontein have two well-provenanced stone tool collections: an Oldowan assemblage, ca. 2-1.7 Myr old, from Member 5 East, and an early Acheulean assemblage, ca. 1.7-1.4 Myr old, from Member 5 West. Being one of only four South African cave breccia sites which have yielded early stone tools, these assemblages provide important information on the earliest use of artefacts in southern Africa. Results of a technological and typological analysis of the artefacts are presented and compared to information from our programme of experimental replications. 126 cobbles in quartzite and quartz from gravels adjacent to the site were knapped to provide insights into the raw material properties, the relationship between cobble forms and core types, and the types and quantities of debitage produced when cores are fully reduced. The Oldowan assemblage is rich in flakes and debitage and has few cores, which contrasts with the Acheulean sample which is largely winnowed of debitage but has numerous cores and manuports providing good information on core reduction strategies. In both the archaeological and experimental collections, polyhedral cores dominate the core types (58%-63%), which is related to the blocky or polyhedral shape of the available cobbles. However, alternate flaking of cobbles is a prominent technique, and the most intensively reduced core types are both discoids and classic polyhedrons. In our experiments, core types often altered randomly during the flaking process, but just over two thirds of the cores achieved their final type mid-way through the reduction sequence. In general the cores from both archaeological samples have not been intensively reduced: a third of the Oldowan cores and 60% of the Acheulean cores still have some suitable angles for further flaking. 84% of the Oldowan (quartz-dominated) assemblage consists of small flaking debris less than 20 mm in maximum dimension, a proportion not unexpected for our vein quartz because of its friable nature and tendency to shatter. The experimental work provides quantitative corroboration, as we achieved means of 85% small flaking debris for quartz and 77.6% for quartzite.

## **New evidence for the possible use of controlled fire from ESA sites in the Olduvai and Turkana basins**

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Archaeological materials from sites in Africa, Asia and Europe indicate that early hominids had adopted the use of controlled fire by at least 0.5 Ma. Much of this evidence is in the form of individual artifacts exhibiting various traces of thermal alteration and features containing charcoal, heat-reddened patches of soil and charred bone. Far earlier potential evidence for the use of fire by ESA hominids has been noted at several sites in Kenya including FxJj20E from Koobi Fora and GnJi1/6E from Chesowanja, dating to about 1.6 and 1.4 Ma respectively.

During a recent examination of in-situ lithic artifacts from additional sites dating to at least 1.6 Ma in the Olduvai and Turkana basins, clear evidence for the exposure of some siliceous stone tools to intense heat was noted. These artifacts consist of flakes that exhibit pot-lid fractures, coloration and texture consistent with prolonged contact to temperatures in excess of 480 degrees fahrenheit. Such evidence strengthens earlier assertions regarding the use of fire by early hominids at sites such as FxJj20E and GnJi1/6E. In addition, these findings may indicate that this behavior originated earlier and was more widespread in the East African Plio-Pleistocene than previously thought.

## **The selection of lithic raw materials in the Lower Paleolithic site of Gran Dolina (Sierra de Atapuerca, Spain) and its technological implications**

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A behavioral relationship between the exploitation of lithic raw materials and the technological tradition was tested by the study of two different lithic assemblages from the Lower Paleolithic site of Gran Dolina (Sierra de Atapuerca, Burgos). The starting point of the study was the identification of the abundance and diversity of readily available raw materials in the immediate surroundings of the Sierra de Atapuerca sites. The results of a comparative study between two different archaeological levels, TD6 and TD10A, demonstrated that the lithic raw materials from the two levels, which are chronologically around 0.5 Myr apart, reflect subtle textural and morphological differences resulting from the different technological traditions represented in each level: TD6, containing a pre-Acheulean industry, exhibits a pattern of poorly-standardized raw material selection, while TD10A, represented by a Middle Palaeolithic industry, reveals a highly standardized pattern of raw material selection and optimization. Two main conclusions were drawn from this study: (1) a correspondence between economic behavior and certain aspects of the technological tradition is documented at Gran Dolina; and (2) given a lack of raw material constraint, other factors, such as cultural or biological considerations must be sought to explain the diachronic technological changes documented between TD6 and TD10A at Gran Dolina. Looking at patterns of raw material procurement from the perspective chosen in this study can elucidate some behavioral aspects of the technological systems represented by other Lower Paleolithic assemblages.



## **Excavations at the late Middle Pleistocene cave of Galeria Pesada: 1997/1999**

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In 1997, with NSF support, a cave gallery, completely sealed by entrance collapse, was exposed at Almonda in Portuguese Estremadura. Rather than the Middle Paleolithic as expected, the cave has, at least nine archaeological layers, all dating to the late Middle Pleistocene. The upper-most eight date to post-300,000 BP. Microfaunal assemblages and an extinct crow point to a Rissian age (OIS-6). While the lowest occupation, pre-dating ca. 300,000 is typically Iberian Acheulian, with crude quartzite bifaces and a hint of a proto-Levallois flake technology, the upper-most eight layers are quite different. Not only are they in situ, five are associated with rich faunal assemblages, from shrews to rhinos. The question of the relationship between the fauna (from rabbits up) and the hominids that left the artifacts will be discussed by Drs. Hockett and Brugal. This paper will discuss the dating of the cave, describe the basic stratigraphy of the cave deposits, the artifact distributions, and the technology and typology of the upper-most layers. Unexpectedly, while the assemblages have some affinities with Acheulian open-air sites, they also show marked differences in both technology and typology. Most striking is the expansion of bifacial reduction strategies to the production of small, usually unifacial tools, such as scrapers and knives. Many of the tools, in fact, would be more at home in the Micoquian of Central Europe than in Iberia. In addition, there appears to be little difference in how very distinct raw materials (quartz, quartzite, and flint) were used. The potential of this site to test a number of long held assumptions about Middle Pleistocene and, even later, adaptive patterns will be discussed.

## **Picking a Neanderthal's nose: gaining insight into the evolution of respiratory behaviors by examination of the nasal complex**

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The anatomy of the human upper respiratory tract (URT) has been shown to be a key determinant of our respiratory, digestive and vocalizing behaviors. Given the centrality of the region for normal physiologic activity, it has received considerable attention from paleoanthropologists, particularly as it relates to the origins of speech. While some components of the region, such as the tongue or larynx, have been the focus of attention others have not. A major part of the region, the “upper” upper respiratory tract - the nose and paranasal sinuses - has been of limited paleoanthropological focus due to a dearth of knowledge on the basic biology of these areas. The advent of new and potent methodologies in biomedical imaging (such as 3-D CT reconstructions or MRI scans), however, have enabled investigation of these anatomically hidden recesses in ways largely unimaginable even a few years ago. This study reports on our ongoing imaging and craniometric studies of monkeys, greater and lesser apes and humans, and on our examination of a number of later Pleistocene hominids. Our imaging analyses have shown the extensive inter-relationships of morpho-functional “nasal complex” pathways and how the morphologies of certain paranasal sinuses appear to reflect distinctive, species-level conditions. Our craniometric analyses on nasal aperture breadths have shown that this dimension appears greatest in “classic” Neanderthals when compared with other fossil hominids (e.g., Kabwe and Cro-Magnon) and with geographically distinct regional populations of modern humans (n=1,248). These observations taken together, suggest that some groups such as Neanderthals may have had a different anatomical template for this region than either living populations or their contemporaries. These differences may reflect both distinctive developmental growth trajectories and physiological capabilities. The fusion of both classic morphological examination and insights from imaging, are allowing us to “pick the nose” of our ancestors nasal complex and begin to understand the overall “bauplan” of the multi-dimensional URT mosaic.

## **Identifying the Acheulian to Middle Stone Age transition in the Kapthurin Formation, Baringo, Kenya**

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The subdivision of African prehistory into Earlier, Middle, and Later Stone Ages confounds temporal, technological, and typological issues. The Kapthurin Formation is a well calibrated fossiliferous Middle Pleistocene sequence in the Kenyan Rift Valley west of Lake Baringo, dated by K/Ar,  $^{40}\text{Ar}/^{39}\text{Ar}$ , and paleomagnetism to between c. 600 ka and c. 200 ka. It contains over 30 archaeological and paleontological sites, and highlights some of the practical and conceptual difficulties in clarifying the Acheulian to Middle Stone Age (MSA) transition. 1) Sites dating to between 600 ka and 280 ka, and containing an informal lithic artifact tradition in which bifaces are rare or absent, would be assigned to the MSA or perhaps the Oldowan if their ages were unknown. This industry is clearly contemporary with the Acheulian found both within the formation and elsewhere in East Africa. 2) Kapthurin Acheulian localities dating to the same time interval contain blade and Levallois elements usually considered characteristic of later periods. 3) In the Kapthurin MSA industry from higher in the sequence, points grade into small handaxes, and the two classes of artifacts cannot clearly be separated. 4) Finally, many sites lack handaxes or points altogether and cannot be assigned to either Acheulian or MSA on the basis of technology alone. It can be concluded that: 1) use of the African three-age system masks Middle Pleistocene hominid behavioral complexity; 2) assignment of undated knapping debris to the MSA has a high probability of error; and 3) the terms ESA, MSA, and LSA should be employed with extreme caution in the absence of independent chronology.

## **A forgotten Mousterian: the Asinipodian of Pech de l'Azé IV (Dordogne, France)**

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The site of Pech de l'Azé IV, excavated by F. Bordes from 1970 to 1977, contained a deep, rich sequence of Mousterian industries including several examples of Typical Mousterian and MTA-A and MTA-B at the top. Near the middle of the sequence is a series of industries sufficiently unusual that Bordes felt they merited their own name. He considered calling it Micromousterian but instead settled for Asinipodian; a Latin translation of the site name. These industries consist primarily of notched tools and simple scrapers, but there is also a very high percentage of truncated-faceted pieces, a high frequency of Kombewa cores and flakes, and many extremely small Levallois cores and flakes. While each of these elements is present throughout the Pech IV sequence, their combined effect in the Asinipodian gives it its distinctive character and seems to suggest a technology specifically geared towards the production of small flakes. This paper will present the results of analyses carried out on the full collection of this industry from Pech IV. These results suggest that, while it is probably not unique to this site, the Asinipodian does represent a significant industrial variant, with important implications for Mousterian variability on both a typological and technological level on the one hand, and hominid behavior on the other.

## **The Mousterian industry of Kebara and its place within the Middle Paleolithic of the Near East**

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The excavations at Kebara cave (Mt. Carmel, Israel) from 1982 to 1990 exposed a stratigraphic sequence which provides important information concerning the late Middle Paleolithic and early Upper Paleolithic of the Levant, dated by several techniques which provided a coherent set of readings spanning the time from ca. 60 to 28 Ka.

This large cave contains the evidence for relatively dense human occupations with numerous well preserved hearths and ash deposits throughout the entire Middle Paleolithic sequence. The lithic production took place inside the cave as attested by the proliferation of debris from knapping and rich assemblages of usable blanks, cores and some retouched items. In addition the large animal bone assemblages testify for continuous hunting (as documented by J.D. Speth) and exploitation of animal tissues also evidenced by cut marks. This type of activity left traces on the stone tools as recorded by S. Beyries and J. Shea.

Since the onset of the lithic analysis it was demonstrated that the Mousterian industry in Kebara is characterized by short Levallois blanks, often subtriangular, with a proliferation in certain levels of short Levallois points with a large base. Additional investigation clarified aspects of changes through the sequence such as the production of points (units X-IX) or special artifact types such as the technique of Nahr Ibrahim, side scrapers with inverse retouch that are more common in the lower layers. The latest Mousterian assemblage (Unit V) differs considerably from the earlier assemblages with its heavily retouched points.

The industry of Kebara is similar to the one of Tabun layer B, Tor Faraj and Umm el Tlel and to a lesser extent to Amud, thus justifying the identification in the Near East of a late Mousterian industry dominated by the production of short triangular Levallois blanks. Geographically, this industry is not limited ecologically to the coastal region of the Levant as it was found in the semi-arid areas of southern Jordan and the el-Kowm basin in Northeast Syria. In addition, it is associated with human fossils defined as the Western Asian Neandertals.

## Ancient foragers as early colonizers of tropical forests

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The initial human occupation of lowland tropical rainforests was thought to have occurred relatively late in human history. Indeed some scholars consider that foragers could only have colonized the forest in conjunction with horticulture. Stone artifacts from present-day lowland forest regions have been regarded as inconclusive, whether due to lack of provenience, to dating or stratigraphic uncertainty, or to lack of palaeoenvironmental evidence for the time depth of forest environments. The recent discovery of Middle and Later Stone Age sites in the Democratic Republic of Congo, Equatorial Guinea, and Cameroon, however, indicates that several regions of central Africa were inhabited by at least 40 Kyr ago. In particular, new results reported here from a 1998-99 program of survey and excavation in Equatorial Guinea and Cameroon parallel earlier findings from the Ituri forest region of D.R. Congo. New palaeoenvironmental evidence suggests that these prehistoric foragers inhabited tropical forest environments since the Upper Pleistocene at least. This brings up several theoretical issues of international transcendence: the ability of ancient *Homo sapiens* and predecessors to settle tropical forests, whether early humans embarked for rain forest regions during their Pleistocene global expansion, and whether tropical lowlands were a backwater stage for human development.

## **Behavioral ecological modeling and faunal resource use in the Middle and Later Stone Ages of southern Africa**

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Archaeological approaches to the origins of modern humans have recently focused on the attempt to identify the place and timing of the origins of modern human behavior. Researchers have focused on a variety of attributes including raw material use, evidence for symbolism, and faunal exploitation behavior. Prominent among these studies is Richard Klein's identification and interpretation of a pattern of change in the South African faunal record. During the Middle Stone Age (MSA), eland predominate over buffalo and bushpig, the few buffalo that are present are dominated by juveniles, and eland are well represented by prime age adults. Furthermore, fish and flying birds are rare in the MSA. These patterns change with the Later Stone Age (LSA), and Klein has argued that this change reflects improved hunting skills resulting from the advent of the modern human intellect. The authors of this paper contend that by examining the same faunal material from these sites in a theoretical framework derived from behavioral ecology, compelling alternative explanations can be developed. Specifically, we argue that the inclusion of dangerous prey such as buffalo and bushpig, and low-ranked prey such as fish and birds, represent an expansion of diet breadth. Such an expansion can result from labor intensification and/or prey depression coupled to population pressure. Explicit expectations for each hypothesis, that can be tested qualitatively and quantitatively, are developed and examined using existing data. In addition, relationship between the size of the faunal assemblages and the number of different taxa is examined. The authors conclude that the hypothesis that the MSA/LSA transition represents a marked shift in human intellectual capacity is not adequately supported, and our ecological alternative is more parsimonious.

## **Brush hut floors, hearths and flints: the Ohalo II case study (19 Ka, Jordan Valley, Israel)**

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The submerged site of Ohalo II is located at the shore of the Sea of Galilee, Jordan Valley, Israel. The camp is exposed in rare years of unusual low water levels at the lake. Due to excellent conditions of preservation *in-situ* features, organic material and a wide range of finds have been exposed and studied. All finds are radiometrically dated to 19,400 B.P. So far, the remains of several burnt huts with clearly visible brush walls (the oldest of their kind), hearths, a grave and other installations were excavated. The floors and hearths present a unique opportunity to analyze the daily “indoor” and “outdoor” activities at the camp.

The flint assemblage from all excavated units has been studied. In most huts / hearths, there are thousands of debitage pieces, as well as tens and even hundreds of retouched tools. A novel classification system for the flint microdebitage (smaller than 1 cm) has been developed and used here for the first time. The results of the pilot study were combined with the conventional analysis of the assemblage. At one hut, the distribution patterns of cores, tools, debitage and microdebitage on one floor reveal an interesting pattern. It seems that two or three artisans were sitting in a semi-circle near the entrance, and working flints together.

In terms of inter-locus comparisons, there is an astonishing resemblance between the frequencies of major categories in all huts and hearths. The results clearly indicate that flint knapping took place both in the huts and around outdoor hearths. Furthermore, the high resemblance of all samples suggests that only a small number of closely related knappers were working flint. Indeed, they were shaping cores and preparing tools at exactly the same way indoors and outdoors. The flint analysis results, as well as a variety of field observations and the study of animal bones distribution, indicate that floor cleaning or sweeping was uncommon here.



## **A critical look at the role of carnivory in early human evolution**

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Conventional wisdom continues to identify increased carnivory as the primary catalyst for the evolution of early African *Homo erectus* at ~1.7-1.8 Ma. This inference is supported by the demonstration that hominids were the primary agent responsible for the accumulation of large faunal assemblages, often containing the remains of many individuals of several ungulate taxa, at least some of which were processed with stone tools for meat and marrow, in sites of Plio-Pleistocene age. We agree that these assemblages were created mainly by hominids, but are skeptical of the idea that they show meat eating to have been an important element of early human subsistence. On the contrary, recent actualistic research on relevant assemblage formation processes, combined with reanalyses of ancient assemblages themselves, indicates that: 1) amounts of edible tissue obtained from large animal carcasses were often quite small, barely enough to meet the daily subsistence needs of one erectus-sized hominid per carcass, 2) all such tissue was probably consumed within a few hundred meters of its acquisition point, with no evidence of transport to "central places" for redistribution to conspecifics, 3) tissue acquisition rates were generally low, probably less than one "daily ration" every 7-10 days. A resource that feeds one individual in a sizable local group less than once a week is not enough to account for the changes in nutritional budget clearly indicated by erectus anatomy. Our skepticism about the evolutionary importance of Plio-Pleistocene hominid carnivory is further heightened by 4) recent reports indicating that meat eating at this scale may have been part of hominid subsistence by 2.2-2.6 Ma, far too early to be implicated in the evolution of *H. erectus*.

## **Behavioral diversity in the Wadi al-Hasa ca. 25,000 to 19,000 BP**

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Research in the Wadi al-Hasa documents an exceptional record of human adaptations associated with the lake/marsh context of Pleistocene Lake Hasa, which acted to ameliorate increasingly arid conditions that characterized the Levant at the onset of the Last Glacial Maximum. The Upper Paleolithic and the Epipaleolithic sites are relatively uncommon in having exceptional preservation of fauna in both open-air and rockshelter sites, as well as pollen and phytoliths, and materials for radiocarbon dating. The excellent potential for examining issues of chronological and functional variability is highlighted by the wealth of data available for sites in the period from about 25,000 to 19,000 bp, the interval which witnesses major changes in the local ecology of the eastern Hasa basin and which represents the lithic transition between the late Upper Paleolithic and the early Epipaleolithic. Four sites in the Wadi al-Hasa have been radiocarbon dated to this interval: Thalab al-Buhira, Ain al-Buhira, Yutil al-Hasa, and Tor Sageer.

Although chronological change over this 6,000 year radiocarbon period is expected, lithic assemblages from the four sites exhibit striking diversity. This is present even for those site components which can be considered relatively contemporary and is almost certainly tied in part to differences in specific activities, some of which appear to be related to faunal exploitation. These emphases are complicated by the type of site (base camps and specialized butchering locales), each of which resulted in different lithic configurations. It is especially intriguing to have lithic assemblages which lack microburin technique and emphasize Ouchtata microliths at virtually the same moment as assemblages which use microburin technique and emphasize forms such as curved backed, and backed and truncated bladelets. It is apparent that there is a significant overlap of what is conventionally defined as the late Upper Paleolithic and the early Epipaleolithic in the inland Levant.

## **Head burials from the Ofnet cave, southwest Germany: results of a reexamination**

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A reexamination of the skulls from the Ofnet cave in southwest Germany showed that these and similar deposits should be understood as the expression of a special burial custom rather than head hunting practices from the late mesolithic. In two pits of different sizes 34 heads were placed in the entrance area of the cave. The burial was carried out after the heads had been separated from the bodies with unretouched flint blades. This is shown by the discovery of cutmarks on some of the neck-vertebrae which could be verified by SEM analyses. The decapitation was carried out immediately after death. The articulation of the skulls together with the lower jaws and the vertebrae proves that the complete heads were buried. The presence of 34 heads which were placed in two different pits, the reduction of group sizes in the late mesolithic as well as the demographic structure makes it unlikely that this deposit was a single event. The site was used several times as a burial place. As grave goods perforated canines of red deer and shells, probably necklaces, were placed on or around the heads. Red ocre was found around the heads and in the filling of the pits. The reexamination of the traumatic lesions on the Ofnet skulls showed that at least only six individuals had died from fatal blows. These heads were deposited on the northwestern rim of the larger skull pit and could possibly represent a single event. The injuries were caused by a blunt, axeshaped object. Most of the injuries are located in the occipital area. The only exception are two male individuals with several traumatic lesions which occur also on the parietal and frontal areas.

The finds from the Ofnet cave show with examples from other sites in Southwest Germany the occurrence of interpersonal violence or warlike behaviour as well as a special burial custom during the late Mesolithic.

## **The recently excavated lithic and osseous assemblages from the Early Aurignacian site of Abri Castanet (Dordogne region, France)**

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The Early Aurignacian site of Abri Castanet was used in defining the classic Upper Paleolithic sequence in the Dordogne region of southwest France. Recent excavations have revealed a single archaeological level dated to ca. 35,000 B.P., making it one of the earliest dated Upper Paleolithic occupations in this region. Current study of the topography and stratigraphy of the site provides the context for ongoing analyses of the lithic and osseous assemblages. The site is located on the west-facing rocky terrace of a dry valley joining the Vézère River. The archaeological level is situated directly on bedrock and is capped by approximately 2 meters of primarily gravitational deposits. Both roof collapse and slope wash sealed the underlying Aurignacian level. We discuss the implications of the dynamic site formation processes in the excavated area. The primary post-depositional process that affected this portion of the site was water flow, obviating the possibility of fine-grained spatial analysis of the area. In combination, sedimentological and archaeological analyses indicate that the degree and nature of disturbance of most of the archaeological deposits is limited. Techno-economic interpretation of lithic and osseous assemblages clearly remains viable. While the recently excavated sector is undoubtedly the southern limit of the Early Aurignacian occupation of Castanet, even at this location there is clear evidence for production of carinate scrapers and their associated bladelets, as well as antler split based points. The near absence of burins and Dufour bladelets confirms deSonneville-Bordes' characterization of the lithic assemblage excavated from the site in the 1920's as a Castanet facies of the Early Aurignacian. Analysis of the osseous assemblage indicates differential use of this location in comparison with penecontemporaneous sites in the valley. Recognition of differential exploitation of local and non-local lithic materials offers insights into the techno-economic behavior and mobility of Early Aurignacian foragers.

## **Baboon bone mineral densities: implications for the taphonomy of primate skeletons in South African cave sites**

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C.K. Brain (e.g., 1981) documented a salient and interesting difference in relative skeletal part representation between primates and bovids of similar live body size recovered from the fossil cave site of Swartkrans (South Africa). Hominids and baboons are represented primarily by skull parts and a paucity of postcranial bones, while small and medium bovids are represented more evenly by all skeletal elements. Brain argued that the fossil bones from Swartkrans were primarily carnivore-collected, and postulated that the difference in element frequencies between primates and bovids is a manifestation of less durable primate postcranial skeletons relative to those of bovids when either are subjected to destructive processes such as carnivore feeding. Experiments by Brain and one of us (Pickering, in press), in which baboon and bovid carcasses were fed to large, African carnivores, lend support to Brain's hypothesis. Bovid postcranial elements survived carnivore feeding more frequently than those of primates. Here we supplement these observational data by presenting the first systematic, element-by-element comparison of baboon and bovid bone mineral density measurements obtained by photon absorptiometry. This quantitative analysis further supports Brain's original hypothesis that primate postcranial bones are more susceptible to density-mediated processes than those of comparably sized bovids. However, this finding does not, necessarily, support a carnivore-collecting hypothesis for the deposition of primate and bovid bones in Swartkrans.

## **The evolution of human pelvic morphology in the Pleistocene: the view from Jinniushan (Liaoning Province, China)**

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Analysis of the evolution of the human pelvis in the middle and late Pleistocene has generally focussed on the western part of the Old World and on a small sample of fossils that is overwhelmingly male. However, hypotheses to account for changes in pelvic morphology have often been based on obstetrical explanations and have frequently suggested that Neandertals were uniquely derived in their anatomy. Ironically, until recently there has been little opportunity to study pelvic sexual dimorphism in Pleistocene hominids or to examine pelvic morphology from regions of the world outside of Europe and the Levant.

The Jinniushan specimen from Liaoning Province in Northeastern China was discovered in 1984 in an isolated karst prominence in a fissure within a collapsed limestone cave. ESR and uranium series dating of animal teeth from the hominid-containing level yield a date of about 280,000 years ago, consistent with the associated fauna. The specimen is represented by a cranium and many bones of the postcranial skeleton including a complete innominate.

Comparison of the cranial morphology of the similarly-aged male specimen from Dali, China and analysis of the postcranial morphology suggests that the Jinniushan specimen is female. The individual was large in body size (consistent with its high latitude), and the morphology of the sciatic notch and medial pubic region are typically female. For those anatomical regions which can be compared, this specimen is extremely similar to the Arago XLIV innominate from southern France. In addition, it shares with Levantine and European Neandertal specimens, aspects of morphology which have long been thought to be uniquely derived in Neandertals. These observations suggest that those features are probably the primitive condition for humans rather than evidence of Neandertal phylogenetic or behavioral distinctiveness.

## **Paleolithic of Syrian desert-steppe and the site of Jerf al-Ajla**

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The Syrian Desert forms a large, central, and environmentally distinct zone in the arid interior of the Middle East. In the Pleistocene it offered opportunities as well as a challenges for Paleolithic inhabitants as it does today for prehistoric archaeologists working in the region. For the prehistorian the area remains largely unexplored and still less understood. For Paleolithic inhabitants the Syrian Desert provided abundant flint sources but only scattered surface water and limited subsistence opportunities. Research carried out in the past decade has confirmed the results of the first excavations in the area by Coon in 1955. He uncovered a sequence of Lower, Middle and Upper Paleolithic occupations in the cave of Jerf al-Ajla located near Palmyra. Subsequent investigations by Japanese, French, Swiss and Canadian teams have extended the Paleolithic sequence back in time as well as elaborating specific parts of the lithic sequence, particularly the Middle Paleolithic. This paper will briefly review these recent investigations: the sites and their Paleolithic content with an emphasis on recent work at Jerf al-Ajla. The paper will also describe key features of the Syrian Desert's environment and topography, the opportunities and challenges it held for the area's inhabitants, as a way of explaining why, despite the area's limitations, a number of localities experienced repeated Paleolithic occupations over tens of thousands of years.

## **Skinflint: a potential new method of dating Paleolithic flint tools**

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Many prehistoric artifacts, manufactured from siliceous rock (flint, chert, etc.), are less radioactive than the sediment from which they are excavated. Typically more than 2 mm of material has been removed from the surface of the object during manufacture. While the artifact lies buried in the sediment, a zone about 2 mm thick receives a dose of beta-particles from the surrounding sediment, while the interior of the artifact is self-shielded from these particles. Therefore, when analyzed by thermoluminescence or ESR, the outer "skin" of the flint artifact will display a larger accumulated dose of radiation than the interior of the artifact. It is possible to determine the time that has elapsed since the object was knapped and buried by measuring the difference in accumulated dose between the interior and exterior of the object. We have developed a simple procedure for measuring this dose difference, using ESR analyses. This method is best suited for dating artifacts at sites > 100 ka. No dosimetry of the site is required; it is only necessary to analyse the radioactivity of a sample of the sediment that enclosed the artifact. Examples of the application of this new method will be discussed.



## Using paleosol stable isotopes to reconstruct Olduvai basin landscapes

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Stable carbon and oxygen isotope values are used to reconstruct the vegetation context and local climatic conditions of the Olduvai paleolake basin during periods of soil carbonate formation in middle Bed I (MBI) and lowermost Bed II (LBII). Paleosol carbonates and groundwater limestones were collected in collaboration with the Olduvai Landscape Paleoanthropology Project directed by Drs. R. Blumenshine and F. Masao. Modern East African soil and plant community analogs are used to interpret the isotopic data. The interpretations are not necessarily the views of the project.

During MBI, soils developed on the interfluves and floodplain of a gently eastward sloping landsurface with streams draining from the Serengeti into the western side of the lake (G. Ashley pers. comm.). Paleosol carbon values (N=44) from 6 trenches excavated along a ~2 km stretch near Naisiusiu Hill indicate the western MBI area supported a local biomass of 40-55% C4 plants. The carbon values correspond to a mixed grassy woodland and wooded grassland habitat for local MBI hominids. LBII data (N=85) are from 26 trenches extending ~5 km east from a fluctuating lake margin to a volcanic debris fan, plus 3 trenches at Kelogi, and cover periods of soil formation within the ~50,000 years between Tuffs IF and IIA. The debris fan and Kelogi soils analyzed supported a 55-85% C4 plant biomass, a grassy woodland to wooded grassland habitat with minor open C4 grassland. Within the area near the lake, soils developed on lacustrine sediments may have supported a grassy woodland and wooded grassland mosaic with 40-80% C4 plants. This interpretation of paleovegetation in the LBII lake margin soils is contingent upon model conditions, which assume soil carbonates are formed in an open system equilibrated with a large reservoir of plant-derived CO<sub>2</sub>, and may be modified by future geological investigations. Oxygen values from the Beds I and II paleosol carbonates and from groundwater limestones (N=16) that formed in a discharge zone just east of the LBII lake indicate the lowland basin was cooler and moister than today's semi-arid climate. The Plio-Pleistocene soils also supported a higher proportion of woody C3 plants than present (0-15%) near Olduvai today.

These interim results and continuing analyses supported by the Boise Fund, Leakey Foundation, NSF SBR-9805846, Rutgers University, and Smithsonian Scholarly Studies Program.

## **Animal bones with intentional cut marks from the Middle Pleistocene site of Bilzingsleben, Germany**

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Human manipulations and cut marks on animal bones are principally well known from the last decade of research. On the other hand, documentation of prehistorical marks is presented mostly by a written description with only a few reference pictures from light- or electron-microscopy. When our project started to analyze cutting evidence with a *Laser Scanning Microscope*, there was more than one advantage:

1. It became possible to document profiles of cut marks on original specimens, without the danger of surface damage or loss of information caused by taking replicas.
2. It became possible to quantify profile information, such as the wall-angle of the mark, its width and depth. Quantified information will bring comparable evidence of anthropogenic cuts and provide for useful comparison with other archaeological sites. We look forward to finding characteristic cutting evidence based on the used edges of lithic tools.
3. We hope to bring new insight to the international discussion started in 1988 (*Rock Art Research Vol.5/2; 6/2*) concerning the postulated evidence for deliberate engravings on four animal bones from Bilzingsleben. To characterize the cuts in this quantitative way is not self-evident but can bring new arguments for the amazing regularity which we find not only macroscopically, but also microscopically.

During 30 years of field work, which has yielded tons of faunal remains, the Bilzingsleben team has uncovered many examples of functional cutmarks and bones which served as working surfaces. Ten years after the first international presentation of the four intentionally engraved objects there is still no indication that the characteristics of functional cut marks and these regular engravings overlap. These data strengthen our thesis that Bilzingsleben shows the clearest Middle Pleistocene evidence for deliberate activity in the context of early human culture.

## **Long gone or never was? Infrared and macroscopic data on bone diagenesis in Hayonim Cave (Israel)**

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Understanding variation in bone distributions caused by in situ diagenesis in archaeological sites requires that two conditions be distinguished: (1) bone mineral decomposition in place (leaching, recrystallization); and (2) "empty" areas where bones were never present. Stark differences in bone abundance are found among the excavation units in Hayonim Cave, a large Paleolithic site in Israel whose cultural deposits span 200,000+ to 11,000 years before present. Nearly identical spatial patterns are observed for wood ash residues and bone. Macroscopic study of bone fragmentation, tissue classes, and identifiability coupled with infrared (molecular) analysis of carbonate mineral composition of bones and sediments identify zones of rapid diagenesis and decomposition alongside areas that greatly favored the preservation of bone and ash. However, the few bones present in the bone-poor units are in consistently good condition, indicating that more recent material was introduced into older sedimentary layers via mechanical disturbance--small burrowing animals in our case. Stark contrasts in the preservation conditions among horizontal units are used to demonstrate that time-averaging effects from mechanical disturbance in Hayonim Cave were numerically unimportant. Our general findings support Karkanas et al.'s (1999) suggestion that bone and ash diagenesis in caves follow threshold-like rather than gradual transformations in geological time. The conditions of preservation depend on "stability fields" in sediments as determined by a combination of water percolation, pH and organic input, and parent geochemistry. Past and current preservation environments in sites can be inferred from molecular traces in sediments, long after the visually obvious signatures of bone and wood ash lenses have disappeared.

## Mapping the Upper Paleolithic of the Iberian Peninsula

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For the first time, a comprehensive database of the Upper Paleolithic sites of the Iberian Peninsula has been compiled, permitting the creation of maps of human settlement by major chrono-cultural periods. The product cross-cuts the linguistic, national and regional divisions which characterize this important (c.600,000 sq.km) sub-continental area--a potential bridge between Europe and Africa and a major refugium during glacial climatic crises. Among the principal immediate results of this mapping project are: 1.) Clear demonstration of the geographic restriction of early Upper Paleolithic (Chatelperronian & initial Aurignacian) settlement to only northernmost Spain, while Mousterian occupation (by Neandertals) continued for c.10 ka after 40 kya in the southern 3/4 of Spain & Portugal. 2.) Suggestion that human population levels were very low during EUP & Gravettian times. 3.) Confirmation of the explosive increase in sites (and arguably in human population density) during the Solutrean, not only in Cantabrian, but also in Mediterranean Spain, as well as in Portugal, coinciding with the human abandonment of NW Europe during the Last Glacial Maximum. 4.) Graphic proof of a dramatic recolonization of the interior uplands during the Magdalenian and Epipaleolithic, presumably as a consequence of/response to Tardiglacial climatic amelioration, and mirroring a trend throughout Europe at this time.

While presenting the distribution maps and suggesting possible causes for the apparent trends in human settlement, we will also discuss geomorphological & historical biases that may affect evenness of representation in the database. This database currently includes nearly 600 major site components, with high degrees of concordance in terms of the occupation histories of the four quadrants of the Peninsula (Vasco-Cantabria-Galicia-Navarra-Old Castile; Aragon-Catalonia-Valencia; Andalucia-Murcia-New Castile-Extremadura; Portugal), a fact which lends credibility to the preliminary results. These data, coupled with an extensive radiocarbon record, allow the calculation of relative changes in settlement density as measured by numbers of sites per millennium.

## **Fossil evidence for the evolution of tool behavior**

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Interest in the evolution of tool behavior has been rekindled by the discoveries of early hominid hand bones in South and East Africa. Debate centers on the question of who made the Oldowan tools. Different approaches to understanding the evolution of tool behavior have resulted in different opinions. Some investigators rely on replication studies (tool making by human subjects and unspontaneous tool making by extant primates) for the functional data in their functional morphological interpretations. Others have employed a more reductionist approach in their analyses. The latter group has weighted fossils more heavily in their work.

Those who have relied on replication studies in humans and apes have expanded greatly the categorization of grips and grip mechanics. The result is an expansion of Napier's distinction between "power" and "precision" grasping to a complex classification containing more than a dozen grips. The extension of Napier's classification ignores his caveat that the great multiplicity of prehensile activities of humans is influenced by the purposive action (function) as well as the size and shape of the tool.

Studies of hominid hand fossils and of the comparative, functional morphology of apes and humans indicate that the dichotomy of "power" and "precision" grasping is sufficient to address the question of who made the earliest (Oldowan) tools. A number of anatomical features of the thumb and fingers distinguish primitive (ape-like) from derived (human-like), power from precision, grasping. The hands of early hominids inferred by these methods to be those of "tool makers" are found in association with bone and stone tools.

## **Middle Palaeolithic patterns and Neanderthal behaviour in southern France: a regional, integrative and comparative approach**

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The archaeological record of the Neanderthals who lived in Mediterranean France has not generally formed part of the wider discussion concerning Neanderthals and their culture. Although much research has been carried out in this region, sites have largely been analysed separately, rather than examined comparatively or viewed as part of a region.

This paper is an attempt to fill that gap. The integration and analysis of lithic technology, lithic typology, as well as some faunal and raw material information from 75 Mousterian sites in Mediterranean France (ca.115 000 - 35 000 B.P.), revealed a number of interesting patterns. Certain lithic indices examined had exceptionally high values and some aspects showed high levels of spatial clustering. The analysis brings out the fact that there is a lot of heterogeneity within this region, with contrasts, for example, between the record east and west of the Rhône river. It is unlikely that this river was a physical barrier, but instead it may have acted, more interestingly, as a cultural boundary.

Contrasts were also found between the patterns from Mediterranean France and those of the classic region of southwestern France. Very significantly, one has to reassess the issue of Mousterian variability because the models discussed so far and constituting the Bordes-Binford-Mellars-Rolland-Dibble debate have been based on the presence of five main facies (with sub-types), one of which is absent from Mediterranean France (Mousterian of Acheulian Tradition) and another which is quite rare (Denticulate Mousterian).

A number of spatial and chronological patterns from Mediterranean France will be presented in an attempt to address issues such as the extent to which technology, typology and raw material are related, the extent to which different types of sites and different site-uses can be recognised in the landscape and the specific manifestations of the late Mousterian. All of these have important implications for the behaviour, adaptation and indeed cognition of Neanderthal populations in western Europe.

**Sand, slopewash, surfaces, and spatial organization:  
a high definition approach to a Gravettian campsite at Vale de Obidos, Portugal.**

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Discovered in 1996 following a forest fire and right of way clearance on the ridge separating the Rio Maior and Rio Jaleca valleys, the Gravettian occupation level at Vale de Obidos occurs in sands roughly 75 cm below the modern surface. Extensive area excavation data from the site are an ideal test of remote sensing methods, specifically soil resistivity measures, in Upper Paleolithic contexts. Modern pine root action and soil movement by plowing, construction, and tree throws successfully account for many low resistivity peaks, while Gravettian hearth areas were accurately predicted in two high resistivity zones of the site. Refitting and spatial analysis techniques detail the extent of vertical and horizontal movement of stone artifacts in the sandy soils. Locational patterning of lithic microdebitage (< 5 mm), contrasted by the distribution of equivalent sized, naturally occurring pebbles in the soil matrix, discerns various knapping and discard behaviors invisible at the macrodebitage level. Several function-specific activity areas are present at Vale de Obidos, such as a chert reduction area containing dozens of microgravettes, pointed backed bladelets, and associated cores/debitage and a discard zone for fire cracked rock. More importantly, these differentiated activity areas exhibit typological and technological differences previously assumed to be chronological in nature.

## **Evidence for juvenile mortality in Middle Paleolithic children from Central and Western Europe**

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The immature human remains from the Krapina rock shelter constitute the largest series from a single site in Central Europe (Gorjanovic-Kramberger 1906; Smith 1976; Radovic, et al. 1988) and are very informative in many respects. However, the fragmentary state of preservation of most of the remains, and the low possibilities of associating them based upon secondary morphological observations, limit the discussion of growth and development patterns within this Croatian sample. Considering these factors, the ways of assessing the alterations to the growth process in the Krapina immature sample and the question of the juvenile mortality within the overall sample are limited to the search for incidences of bone lesions and tooth enamel defects. Information gathered from the most complete skull specimens is re-examined in the light of data collected from other young Neandertal juveniles originating from neighboring areas and from Western Europe. The European fossil record appears to provide less evidence of growth disturbance and trauma related lesions than the early modern human children from the Middle East.



## **A technological analysis of the personal ornaments from the Châtelperronian and Aurignacian levels, Grotte du Renne, Arcy-sur-Cure (Yonne), France**

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In his excavations from the late 1940's through the early 1960's, André Leroi-Gourhan recovered from the Grotte du Renne at Arcy-sur-Cure a large sample of personal ornaments, including formed ivory and belemnite beads, pierced animal teeth and ivory rings and pendants. Although these have never been the subject of detailed scientific examination and publication, they have nonetheless been used as ammunition for debates surrounding Neandertal symbolic capacities and relationships between Cro-Magnon and Neandertal populations in the vicinity of 35,000 years ago. This rather imprudent use is ever more troublesome given limitations in the now 40+ year-old stratigraphic analysis at Arcy, combined with the fact that many of the ornaments come from talus deposits recognized even by Leroi-Gourhan as stratigraphically mixed.

The present paper, based on detailed microscopic and technological analysis of the Arcy ornaments, examines them against the backdrop of contemporaneous and more ancient collections of ornaments from early Aurignacian sites in Western and Central Europe. For the first time ever, they are presented with accompanying provenience data (or lack thereof) allowing comparisons between ornaments from Aurignacian level VII and ornaments from underlying Châtelperronian levels VIII, IX and X. This stratigraphic approach allows a measure of insight into the oft-raised possibility of Aurignacian/Chatelperronian stratigraphic mixture.

Recent suggestions that Châtelperronian techniques of ornament manufacture (notably drilling techniques) were distinctly different from those of the Early Aurignacian are shown to be false when large numbers of well provenienced, well dated Aurignacian and Châtelperronian ornaments are studied. Nonetheless, certain quantitative tendencies (e.g., species choice for animal teeth, preference for suspension by means of basal incisions around the circumference of the tooth root) of the Arcy Châtelperronian ornaments stand in some contrast to early Aurignacian ornamental assemblages.

The personal ornaments taken in isolation are not going to resolve in and of themselves questions about Neandertal symbolic activities. A complete analysis of the Grotte du Renne collections, accompanied by study of all maps and notebooks, and in conjunction with stratigraphic re-analysis, is mandatory to evaluate very real possibilities of stratigraphic mixture. It would not be at all surprising, in a cave excavation that occurred prior to the modern era of taphonomic, site formation, stratigraphic and sedimentological controls, there would be stratigraphic uncertainties. Under no circumstances can such mixtures if they exist, be attributed to incompetence or error on the part of the excavator(s).

Technological analyses can only point to convergences and divergences between collections currently attributed to different culture stratigraphic units. While there is currently great interest in jumping to larger questions concerning acculturation between Neandertals and Cro-Magnons, and Neandertal capacities for symbolic behavior, the Grotte du Renne at Arcy-sur-Cure cannot at present, and may never be able to, respond to such questions.

## **Experimental data on enamel deposition in sheep: implications for sampling strategies for stable isotope analyses**

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Dental enamel is an important proxy-record for the investigation of paleoenvironmental variability and especially useful for stable isotope analysis (SIA) because it is secreted in daily increments, records environmental information such as stable isotopic ratios (SIRs) during deposition, and is stable against post mortem diagenetic processes. However, inferring environmental information from enamel SIRs requires a better understanding of underlying causes for observed inter-tooth and intra-tooth isotopic variability. SIRs are biased by sampling strategies that do not control for the amount of incremental structures, i.e. time per unit sample. Controlling analytical time resolution is necessary to investigate short term environmental variability, and differs considerably between species and in different regions of the dentition. This study integrates experimental studies of enamel deposition in sheep with SIA of dental enamel carbonate to investigate how changes in oxygen SIR of drinking water are recorded during enamel mineralization. The goal is to develop optimal sampling strategies that control the temporal resolution of SIA. Sixteen adult sheep with growing third molars were raised under controlled conditions and their enamel and dentine growth marked with fluorescent dyes. Diet was identical between treatment groups with the exception of drinking water, which varied in oxygen SIR, both between sample groups and over the growth period. Histological analyses of third molars show the incorporation of fluorescent marker in the sheep teeth. Using fluorescing lines in dentine to register temporally homologous enamel regions improved estimates of enamel secretion rates. The enamel secretion rate increases from the enamel dentine junction towards the crown surface and decreases from cuspal to cervical. Histological data were used to devise a sampling strategy for enamel carbonate SIA that permits us to estimate the time represented per sample unit. This approach allows us to test and fine tune the temporal resolution of carbonate SIA in dental enamel.

## **Investigating the origins of modern human behaviour in southwestern Tanzania: a Middle or a Later Stone Age event?**

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Genetic and fossil evidence suggest that anatomically modern *Homo sapiens* evolved in Africa during the Middle Stone Age (MSA), sometime between 200,000 and 30,000 to 40,000 years ago. However, many archaeologists suggest that behavioural modernity, as measured by European Upper Palaeolithic innovations, only developed during the subsequent Later Stone Age (LSA), less than 30,000 to 40,000 years ago. Since few African sites contain a record of the MSA-LSA transition, it is hard to test the hypothesis of a radical transformation of technology and adaptation at this time.

This paper reports on results from test excavations at Idlu22 (33°12'E, 8°46'S), a collapsed volcanic rockshelter located east of the Songwe River in the Lake Rukwa Rift Valley of southwestern Tanzania. About 65,000 artifacts were recovered during excavations in 1995 and 1997, and a series of both typological and technological attributes were recorded for each. A continuous, extensive archaeological deposit was revealed which has both Pleistocene and Holocene components.

Sites like Idlu22 offer the potential to address the whole question of the onset of behavioural modernity. Instead of abrupt change, the lithic material excavated here shows a gradual transformation from a flake based LSA or LSA/MSA transitional industry to a bladelet and microlithic one, culminating with a Holocene LSA employing microburin production techniques. Added to regional information provided from surface MSA and LSA sites nearby, a picture of decreasing mobility and catchment area over time is developing. At no point can a sudden change from the MSA to the LSA be documented.

## The Mladeč males: Aurignacian crania from Moravia

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We present the results of systematic comparisons and analysis of the adult male crania from the Mladeč Caves in Moravia, Czech Republic, discovered between 1882 and 1922. Archaeological associations and the geological circumstances date these remains to the earlier Aurignacian of Central Europe. The Mladeč male crania show a mixture of features, some resembling Neandertals and others resembling more recent Late Pleistocene Europeans. From a systematic analysis of these features, a hypothesis of ancestry is evaluated for the sample, as this addresses issues of the fate of the European Neandertals and the origin of recent Europeans. We compare a battery of anatomical features and metric traits found in the Mladeč males with the males from two potentially ancestral samples, Skhul/Qafzeh and earlier European Neandertals. Most data were taken on the original specimens by the authors. Some features previously identified as Neandertal autapomorphies occur in the Mladeč males, indicating genetic contributions of Neandertals to these groups (a finding we reconcile with the mtDNA recovered from the Feldhofer cave Neandertal). Yet, our analyses suggest that Neandertals are unlikely to be the *unique* ancestors of these early Europeans. We show that it is not possible to exclude either the Skhul/Qafzeh or the European Neandertal samples from the ancestry of the Mladeč sample.

## **New paradigm and new chronology for *Homo sapiens* emergence: a cladistic point of view**

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In the past few years, new discoveries (Atapuerca, Dmanisi, Buia) and new reappraisals of the chronological pattern of human evolution during the Pleistocene in Asia and Africa (e.g., Modjokerto, Ngandong and Longgupo--but also in Europe) have suggested an earlier emergence of *Homo sapiens*. The new paradigm implies not only an earlier spread of *H. sapiens* into Europe but also a more recent date for the last occurrence of *H. erectus* in Asia. Is this new paradigm well founded, or should the definition of the species *H. erectus* and *H. sapiens* instead be reconsidered?

A numerical cladistic analysis was carried out, initially on 468 cranial features (123 morphological characters and 345 metrical data) and 67 OTUs. This showed that, when using ontogenetic information for coding, *Homo erectus* is a plesion close to the origin of *Homo sapiens*. Moreover, when the species *H. ergaster* and the grade *H. habilis* are taken into account, most of the Pleistocene human fossils from Africa, as well as Solo and Zhoukoudian, appear to be affiliated to *Homo sapiens*.

The result of this analysis can be read as indicating a radiation of *Homo* in East Africa. This proposal forms part of a synthesis which takes into account independent chronological and paleoenvironmental data.

## **Lagar Velho: the archaeology of an early Upper Paleolithic burial site**

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Lagar Velho is a rock-shelter in the Lapedo valley, central Portugal. Salvage excavations carried out in December 1998 and continued in July-August 1999 allowed the discovery of an EUP child burial dated to c. 25,000 BP. The upper 2.5 m of the site were bulldozed away in 1992 but an extensive remnant preserves a dense, charcoal-stained record of the last period of occupation, 22,000 to 20,000 years ago. The faunal assemblage is dominated by horse and rabbit and the lithic assemblages document both Proto-Solutrean and Middle Solutrean components. Current ground level corresponds to the deposits accumulated c. 25,000 years ago into which the burial of the Lagar Velho 1 child was excavated in the eastern part of the shelter. A charcoal lens immediately underlying the child's legs indicates that a ritual fire was lit before the deposition of the body. The child was in extended position, following the basal contour of the shallow pit where it was laid out, with the pelvic zone at lower elevation and the head and feet at a higher level. The feet were crossed and plantarflexed, suggesting that the body was wrapped up in a skin or textile blanket. The bones were extensively stained with red ochre in both their upper and lower surfaces. A pierced marine shell found near the neck and three pierced red deer canines found amongst a cluster of shattered skull fragments were the only artifacts recovered in the burial and suggest some kind of head dress. Testing of the deposits around the burial and immediately underlying it failed to produce any other evidence of human activity. In the central area of the shelter, testing documented human activity down to ca. 1 m below the burial level. These remains (heavily burnt deer bones) were recovered in fine alluvial deposits accumulated under very low energy conditions that seem to be ideal for the conservation of spatial features. Excavations are scheduled to proceed over the next few years in this shelter as well as in other cave and rock-shelter Paleolithic locations already identified in the valley.