Paleolithic Foragers of the Hrazdan Gorge, Armenia

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For more than a century numerous archaeological sites attributed to the Middle Paleolithic have been investigated in the Southern Caucasus, but to date few have been excavated, analyzed, or dated using modern techniques. Thus only a handful of sites provide the contextual data necessary to address evolutionary questions regarding regional hominin adaptations and life-ways. This talk will consider current archaeological research in the Southern Caucasus, specifically that being conducted in the Republic of Armenia. While the relative frequency of well-studied Middle Paleolithic sites in the Southern Caucasus is low, those considered in this talk, Nor Geghi 1 (late Middle Pleistocene) and Lusakert Cave 1 (Upper Pleistocene), span a variety of environmental, temporal, and cultural contexts that provide fragmentary glimpses into what were complex and evolving patterns of subsistence, settlement, and mobility over the last ~200,000 years. While a sample of two sites is too small to attempt a serious reconstruction of Middle Paleolithic life-ways across such a vast and environmentally diverse region, the sites discussed here provide initial glimpses into the technological, economic, and social behaviors of perhaps the earliest, and certainly the latest Middle Paleolithic hominins in the Southern Caucasus.

On the Use of Hearths as a Tool for Reconstructing Middle Paleolithic Spatial Organization

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Based on ethnographic and archaeological research, hearths have long been seen as a kind of anchor around which spatial organization and behavioral activities of modern and past hunter-gatherer communities are organized. In trying to reconstruct behavioral patterns, however, archaeologists face several issues, including the intrinsic spatially and temporally patchy nature of the archaeological record and the degree of analytical resolution that can be achieved. These issues make it difficult, if not impossible, to document the degree of association and contemporaneity among hearth features and the surrounding artifactual assemblages. In addition, post-depositional processes can significantly affect the preservation of hearth contents and associated assemblages. In this paper, we present our experience investigating a series of extremely well-preserved hearths in the Middle Paleolithic site of Roc de Marsal (France), to which a variety of field excavation methodologies and laboratory techniques were applied, such as soil micromorphology and GIS techniques. Our results show that the traditional excavation method of "décapage"—that is, exposing features and archaeological materials over a theoretical penecontemporaneous—is inappropriate for accessing any type of potential spatial organization, and in many cases it can lead to false impressions, simply because a reliance on macroscopic field observations alone is insufficient to document the complexity of the archaeological record. At Roc de Marsal, for example, a superimposition of several hearths was observed at the microscopic level, but was virtually undetectable in the field. Thus, in spite of the fact that the hearths in the lower layers of the site are extremely well-preserved, the problem of how to separate distinct occupational events around them remains. The present paper aims to highlight the complexity of studying hearth related features and the necessity of developing more in-depth levels of analysis to address questions about prehistoric spatial patterning related to past human behaviors.

Obsidian Source Survey and Late Quaternary Artifact Sourcing in Kenya: Implications for Early Modern Human Behavior

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Merrick and Brown's pioneering research (1984–1994) identified 30 obsidian chemical source groups by XRF and electron microprobe, and previously published analyses. In 2008–2011, we resampled many previously known sources and collected new sources in Kenya for Neutron Activation, XRF, and Electron Microprobe analysis. The survey area spanned the entire Rift Valley, from the Tanzanian

  ISSN 1545-0031
doi:10.4207/PA.2012.ABS10

to the Ethiopian borders. Among the 414 samples collected from 157 geographically discrete localities we identified 16 new chemical source groups. Most source areas in the Eastern Province where sources were previously reported have not yet been resurveyed. Obsidian artifacts were analyzed from six Middle Stone Age and three early Later Stone Age assemblages in the central Rift Valley ranging in age from 240 to 16 ka in four archaeological sites. The earliest of five MSA assemblages at Marmonet Drift (244 ka) is made almost entirely (97%) of glass from unidentified sources. Two assemblages >100 ka that likely date to the penultimate glacial (MIS-6) have a much higher diversity of sources and the highest average site-to-source distances compared to two assemblages dating to the last interglacial (MIS-5). The highest site-to-source distances occur during the last glacial (MIS-3, 34 ka) at Deighton's Cliff, which is the type-site for the MSA/LSA transition. These data provide insights into changes in the scale of mobility and interaction during the last two glacial-interglacial stages.

Acknowledgements: Support was provided by grants from NSF and the University of Illinois Research Board.

Preliminary Mapping of Paleolithic Entities in China

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China is a geopolitical unit that encompasses different types of landscapes traditionally subdivided into several altitudinal regions. The diversity is better expressed in the vegetation, the roles of the summer and winter monsoons, but mainly by its complex Quaternary history. The basic subdivision of the Paleolithic record follows the Pleistocene chronological units, namely Lower, Middle and Upper Pleistocene. Within the sequence of the latter the Upper Paleolithic is identified in the North by the presence of blades and microblade industries, and a few bone and antler tools and body ornaments. In addition, in the south, fresh water shell tools and pottery appear earlier than in the North but the lithics remain the same cobble-tools as in earlier periods of this region. With these limitations in mind, the current presentation is a preliminary effort to delineate the large-scale geographic distributions of Paleolithic entities based on published reports and personal observations. Thus elements considered as "cultural markers" in western Eurasia are borrowed for constructing the Chinese Paleolithic entities. For example, the presence of handaxes as markers of the Acheulian beyond the "Movius line" is considered, or retouched side scrapers and points of Upper Pleistocene age are seen as markers of the Middle Paleolithic. Similarly the presence of Levallois technique also is taken into account. Truly Upper Paleolithic blade industries are present in the northern part of the country, as well as blade/bladelet assemblages in the central plains. "Microblade industries," characterized by several knapping techniques aimed to obtain fine, often not retouched bladelets, demonstrate a distribution beginning in the north and expanding during the Terminal Pleistocene southward. While detailed aDNA information is still scanty, the overall genetic data recently published supports some contentions for population expansions and the effects of inward and outward migrations.

The Impact of Attritional Mortality versus Mass Death Events on the Skeletal Record of East African Mammals

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Interpretations of hominin-bone and hominin-animal interactions depend on understanding taphonomic variation in naturally accumulated (i.e., non-hominin affected) bone assemblages. The vertebrate fossil record consists of remains representing attritional deaths from predation or disease to large die-offs caused by floods or drought. How animals die and the effectiveness of post-mortem recycling processes have important effects on skeletal completeness, bone damage, and the probability that remains of any given species will survive to become fossils. In theory, the fossil record could be biased toward preservation of species that died during unusual events, if these result in more complete bones and skeletons than occur in attritional accumulations. The partial collapse of an herbivore community in Amboseli National Park, Kenya, provided an opportunity to compare the taphonomy of catastrophic mortality with the attritional skeletal record previously documented in this ecosystem. The 2009 mass mortality occurred during a severe drought and totaled over 12,000 individuals, mainly grazers. The number of dead far exceeded the initial recycling capacity of local scavengers (primarily spotted hyena). Animals died from starvation rather than thirst, and drought death carcasses were widely distributed rather than clustered around water sources. Taphonomic surveys documented skeletal remains on 20 established transects and comparisons with previous data show how the mass mortality event differs from more normal times of attritional accumulation. Skeletons are more complete and scavenger impact is low, with characteristic patterns of damage to particular skeletal parts. Grazing herbivores are more abundant in the assemblage, and dentitions show extreme wear in both adults and juveniles. These features provide potentially useful taphonomic indicators for recognizing input from unusual mortality events in the fossil record.

Acknowledgements: We sincerly thank David Maitumo, Kennedy Sakimba, and Fred Lala for help with the 2010 field work and also gratefully acknowledge the hospitality of the directors and staff of Amboseli Baboon Camp and Elephant Camp. The Kenya Wildlife Service and the National Museums of Kenya have provided long-term institutional support for the Amboseli bone studies, and grants from the National Geographic Society have been essential to the long-term success of this project.

Earliest Evidence for Non-Dietary Anterior Tooth Use Behaviors in *Homo*

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The practice of non-dietary anterior tooth use behaviors, or use of the anterior dentition as a tool, clamp, or third hand, is most often associated with Neandertal dietary and subsistence strategies; however, the antiquity of these behaviors has yet to be examined. Evidence for these activities do not appear in non-human apes or in Australopithecines. Here we present the earliest evidence of these activities from the Early Pleistocene site of 'Ubeidiya, Israel, using both microwear texture and plant phytolith analyses. A high-resolution cast of UB 335, an I2 dated ca. 1.2 Ma and assigned to *Homo erectus/ergaster*, was scanned for antemortem microwear using a white-light confocal profiler. Four adjacent scans, totaling a work envelope of 204x276µm, were taken on the labial surface, closest to the incisal edge. The scans were uploaded into Toothfrax and SFrax SSFA software for surface texture characterization, and the resulting data were compared to an extensive modern human collection. The microwear textures of UB 335 were characterized by extremely low anisotropy and low-to-moderate textural fill volume. The dental calculus of UB 335 was examined for plant microremains and several phytoliths were recovered. These do not match phytoliths from known edible plants, but they are similar to those recovered from sediments from other Near Eastern sites. The microwear texture results indicate that UB 335 was participating in non-dietary anterior tooth use behaviors that required a low-to-moderate anterior loading regime. The most similar modern human analog is that of the Coast Tsimshian of Prince Rupert Harbour who used their anterior dentition in softening plant fibers. Moreover, the plant phytolith evidence suggests that UB 335 was using and/or processing plant resources. Taken together, these data support the antiquity of non-dietary anterior tooth use behaviors in early *Homo*, and provide a unique view of Early Pleistocene non-dietary behavior strategies.

Acknowledgements: This microwear portion of this research was funded by the NSF DDIG program (BCS-0925818) and the Irene Levy Sala CARE Foundation. The phytolith analysis was supported by the Max Planck Society. We thank Peter Ungar for his assistance with this project. We thank Rivka Rabinovich (National Natural History Collections, The Hebrew University of Jerusalem) for her assistance in help with access to the collections and Hagar Leschner (The Herbarium of The Hebrew University of Jerusalem), Yuval Sapir, and Mimi Ron (Tel Aviv University Botanical Garden) for help in collection of plant specimens.

The Caldas da Rainha Geosol: A Geoarchaeological Marker Horizon for the Pleistocene-Holocene Transition in Central Portugal

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A prominent paleosol marks the Pleistocene-Holocene transition in sandy deposits of the Estremadura region in central Portugal. We refer to this soil as the "Caldas da Rainha Geosol" to emphasize its role in establishing a chronology of paleoenvironmental change for the coastal zone surrounding the Caldas da Rainha diapiric valley. In most places this acidic forest soil qualifies as a Spodosol (orthod or humod) according to USDA Soil Taxonomy. We have described more than 30 profiles in aeolian, fluvial, colluvial, and littoral parent materials, many of which are associated with Middle and Upper Paleolithic archaeological sites. Relative to the modern surface, the soil is variably preserved in buried, relict, eroded, and welded phases. The geosol has been a valuable tool for archaeological survey in the region because it distinguishes older (Pleistocene/Paleolithic) dune and floodplain surfaces from younger (Holocene/Neolithic) surfaces. Luminescence ages on the sandy parent materials of the geosol vary between 11–210 ka, but the degree of horizon development does not appear to be related to the age of the parent material. Thus the period of pedogenesis most likely postdates 11 ka. Burial of the paleosol by late Holocene dunes demonstrates that the soil was already established by the mid-Holocene. We believe the paleosol formed in minimally-weathered parent materials of diverse ages at the beginning of the Holocene. This model is consistent with other paleoenvironmental evidence that suggests widespread landscape instability associated with climate fluctuations of the late Pleistocene, followed by forest expansion and pedogenesis during the early Holocene. This study establishes the geosol as a valuable stratigraphic marker horizon for use in future geomorphological, archaeological, and paleobotanical studies in central Portugal.

Tracing the Earliest Evidence of Fire: The Microstratigraphic Record in the Early Acheulean at Wonderwerk Cave, South Africa

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Controlled use of fire is a major turning point in hominin evolution that provided fundamental means of adaptation and social aggregation (Wrangham 2009). While extensive deposits of ash, charcoal, and burnt lithics from sites dating to the last 400 ka are well documented (Roebroeks and Villa 2011), efforts to pinpoint the initial appearance of fire in archaeological contexts remain inconclusive. In fact, the evidence for fire from earlier contexts such as Gadeb, Koobi Fora, Chesowanja, and Swartkrans is ephemeral and subject to alternative interpretations due to the lack of micro-contextualization within sedimentary sequences. Here we present the results from integrated micromorphology and FTIR microspectroscopy analysis, together with data on burnt bone and lithics, which clearly show the presence of combusted plants and bone fragments lying on several occupational surfaces of the Early Acheulean deposits, at Wonderwerk Cave in South Africa. This layer, Stratum 10, is characterized by hand axes without invasive retouch and is currently dated to the Jaramillo normal subchron (1.07–0.99 Ma) by the combination of cosmogenic isotopes dates and paleomagnetic ages (Chazan et al. 2008; Matmon et al. in press). The presence of lithics, burnt bone, and ashed plant material, indicates a strong association of this hominin occupation with fire during the Early Acheulean. Our results, although preliminary, are among the first and oldest direct evidence of fire related to early hominins.

Acknowledgements: This research is funded by grants from the Canadian Social Sciences and Humanities Research Council, the Wenner Gren Foundation, and the National Science Foundation (Grants #0917739 and #0551927).

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The End of the Middle Paleolithic and the Emergence of Anatomically Modern Humans in Southwestern Iberia

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Recently, several researchers (e.g., Aubry et al. 2011; Zilhão et al. 2010) have argued that in Portugal there is a clear hiatus between the late Middle Paleolithic (Mousterian) and the beginning of the Upper Paleolithic (Aurignacian) and the respective associated hominids, Neanderthals and Anatomically Modern Humans. New data on lithic typology and technology from a group of sites and new absolute dates from Foz do Enxarrique (Beira Alta), Picareiro (Estremadura), and Vale Boi (Algarve) located in central and southern Portugal suggest otherwise (Bicho et al. 2011; Haws in press). In fact, there is evidence for a chronological continuum between Middle and Upper Paleolithic. Also, these data suggest that there was no Aurignacian occupation in Southwestern Iberia (Bicho 2005) and that the first Upper Paleolithic in Portugal was an early Gravettian phase dated to c. 33,000 cal BP (c. 28,000 RCYR BP) clearly related to the beginning of the H3 event.

Acknowledgements: We would like to acknowledge the following insitutions for the funding of the various projects: Fundação para a Ciência e Tecnologia (Portugal), National Geographic Society (USA), National Science Foundation (USA), and Wenner-Gren Foundation (USA).

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New ESR Ages for the Early Stone Age Deposits and an Early Lechwe (*Kobus leche*) Find at Groot Kloof (Northern Cape Province, South Africa)

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Groot Kloof comprises many karstic deposits, with tufa, archaeological artifacts, and fossiliferous sediment rimming the Ghaap Plateau, South Africa. From $^{230}Th/^{234}U$ dates for the Groot Kloof D (GKD) tufa, Phase 1 probably predates 500 ka, while Phase 2 dates to 389±12 ka, Phase 3, 221±6 ka, Phase 4, 96–127±2 ka, and later phases < 11 ka, correlating with MIS 11, 7, 5, and 1 respectively. ^{14}C indicates that several phases date to < 50 ka. ESR dates for a tooth from the upper GKD deposit averaged 306±11 ka, and may relate to surface deposits containing small 'Fauresmith style' handaxes. The lower GKD deposits have yielded large unifacial flakes resembling Acheulean flakes, but no handaxes. Four independent ESR dates on a lechwe (*Kobus leche*) tooth from the lower GKD deposits dated at 1.05–0.80 Ma. The lower GKD deposits have a normal magnetic polarity, and given the ESR data, correlate with the Jaramillo Sub-Chron, narrowing the age range to 1.05–0.99 Ma. Thus, Groot Kloof may well contain stratified deposits covering the time since ~1 Ma. Previously, Gladysvale Cave External Deposits had yielded the oldest confirmed lechwe, dated to 780–560 ka. Recently *Kobus* cf. *leche* was tentatively identified from Swartkrans Member 3, dating to 1.0–0.6 Ma, and possibly a single tooth from Member 2 at 1.4–1.0 Ma. These new age estimates for the lower GKD units make the deposit's fauna contemporary with fauna recovered from Buffalo Cave (1.07–0.78 Ma) and Cornelia-Uitzoek (1.07–0.99 Ma), which lack lechwe. Since the lechwe is adapted to wetter environments, like the modern Okavango Delta and Bangweulu Swamps, a more restricted range for its preferred environment within South Africa may explain its absence from other deposits during the early Quaternary.

Projectiles and Hafted Weapons at the Early Middle Stone Age Site of Keraswanin, (GnJh-78), Kapthurin Formation, Kenya

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Points define the Middle Stone Age (MSA) and represent an important technological innovation (Clark 1988). Most aspects of modern human behavior, including symbolic expression, first occur in a MSA context (Henshilwood and Marean 2003; McBrearty and Brooks 2000). MSA artifacts are also associated with early *Homo sapiens* fossils at several sites, suggesting that this technology was made and used by the earliest members of our species (McBrearty and Brooks 2000). Still, the precise function of MSA points and the timing of their appearance are debated (Brooks et al. 2006; Shea 2006; Sisk and Shea 2011; Villa 2009). We present here 41 points made on obsidian and basalt recovered from the surface and *in situ* at the site of Keraswanin (GnJh-78), Kapthurin Formation, Kenya. A date of 235–285 ka on the Keraswanin tuff overlying the *in situ* artifacts is derived from glass tephra correlation using comparative microprobe geochemistry with a preexisting dated and geochemically described Kapthurin Formation tephra dataset (Deino and McBrearty 2002; Tryon and McBrearty 2002; 2006). Two bifacial foliate points made on obsidian were recovered *in situ* within or below the dated tuff unit. Their weight, tip cross sectional area, and perimeter dimensions fit those of archaeological and ethnographically known projectile armatures from the late Pleistocene and Holocene (Brooks et al. 2006; Hughes 1998; Sisk and Shea 2011). Keraswanin Levallois points (n=39) show basal preparation and thinning for hafting, as well as step and hinge fractures and breaks. Twenty-one of 39 Levallois points (53%) show ventral flaking of the distal tip, indicating damage during use (cf. Villa 2009). The Keraswanin points represent a diverse weapon system that includes hafted and dedicated projectile weaponry. The early date of the site demonstrates that hafted projectile points were in use in East Africa before 235 ka.

Acknowledgements: We would like to thank Dr. Christian Tryon for petrographic input; Matt Sisk and Bev Schmidt for total station/computer assistance; Bonface, Matthew, Kenyanze, Dan, Muinde, Julius, Simeon, "Brown", Wambua, Museoka, Gideon, Gichuru, and all of our other Kenyan colleagues, and National Museums of Kenya for permits and facilities. Research supported by National Science Foundation funding to McBrearty (BCS 0917965) and by University of Connecticut departmental funding to all authors.

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Human Adaptations and Paleoecology during the Middle and Late Pleistocene in the Modder River Valley, South Africa

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Stone Age archaeologists rarely investigate open sites in the South African interior plains, but in this expansive region during the Middle and Late Pleistocene the potential record of human adaptation is great. Here we report on new analysis and dating of Early Stone Age, Middle Stone Age (MSA), and Later Stone Age (LSA) occupations at Erfkroon and other sites in the western Free State's Modder River Valley. Four terraces have been identified along a 120km valley stretch. The oldest terrace, dating to the Middle Pleistocene, has fossilized faunal remains and occasional artifacts including a Victoria West Core. Numerous MSA and LSA occurrences are found in two Late Pleistocene terraces that span the period from at least 120 ka to 10 ka. Two distinct pre-Howiesons Poort MSA assemblages have been identified along with Late and Terminal MSA occupations, plus Early LSA and Robberg locales. Lithic analysis and replication experiments demonstrate a shift from MSA prepared point production to the Early LSA use of bipolar reduction techniques and grinding stones. Our ethnobotanical study of local Southern Sotho peoples helps identify potential Pleistocene plant foods. Faunal remains occur throughout the terrace deposits. Partially articulated *Equus capensis*, *Megalotragus priscus*, and *Damaliscus niro* skeletons were recovered in a lower unit of a Late Pleistocene terrace, while in an upper unit of the same terrace human processed remains of plains game, such as *Connochaetes gnou*, *Megalotragus priscus*, *Equus capensis*, and *Phacochoerus* sp., are abundant. Stable isotope and phytolith results indicate widespread C_4 plant environments except for a brief period in the Late Pleistocene when there is a marked shift to C_3 plant communities including C_3 grasses. These results provide new information on the evolution of the grassland biome, the duel nature of wetland and open plains Florisian faunal species, and modern human adaptations in the interior grassveld.

Analysis of the Laetoli Trackway for Locomotion Characteristics and Evidence of Group Movement

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This presentation provides comparison of early hominin locomotion to that of modern humans by examining the map of a five-meter section of the Laetoli trackway from Tanzania, Africa (Leakey and Harris 1987). The intent is to determine characteristics of locomotion and group movement in these individuals, assumed to be a species of *Australopithecus*. Parameters of gait, body orientation, and stature were interpreted from the Laetoli trackway by three modern day trackers. A recreation of the trackway was then produced by surrogates of similar stature. Results suggest the hominins crossed the landscape together, and that a minimum of four individuals can be identified in the trackway. The results also suggest the westernmost individual was a pregnant female. Two central questions of the present analysis are: Why do members of a species intentionally step in each other's footsteps as they travel (direct register walking) and how might changes in female anatomy during pregnancy affect gait characteristics? Further research consisted of an extended literature search to document human and non-human occurrences of direct register walking and an analysis of the gait of pregnant human females, including the gait characteristics of straddle and pitch. The literature search revealed four major categories of human direct register walking: ritual, warfare, imitation, and play (Martin 2011; Savory 2011; Tobin 1958). There has also been anecdotal evidence for direct register walking in great apes and baboons (Root 2011; Sapolsky 2011). Recent analysis of the gait of one AMH pregnant female has shown a tendency toward increased pitch and negative straddle, similar to the westernmost Laetoli individual. Additional subjects are being sought. This current analysis strongly suggests the presence of four individuals, including a pregnant female, and leads to questions regarding the intentionality and purpose of direct register walking.

Acknowledgements: Diana Repp, PhD, Lea Mason-Kohlmeyer, MA, David Raichlen, PhD, Donald Johanson, PhD, Robert Sapolsky, PhD, Elizabeth Marshall Thomas, Allan Root, Alan Savory, and James A. Martin.

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A Reconstruction of the Habitat Mosaic Associated with "*Australopithecus robustus*"

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This study better resolves the environmental mosaic that is typically reconstructed for the *A. robustus*-bearing faunal assemblages of South Africa and evaluates whether *A. robustus* were habitat specialists or habitat generalists by testing whether they are associated with numerous different reconstructed habitats, or if they can be associated with a single, more homogeneous habitat type. Determining the habitat preferences of *A. robustus* holds important implications for understanding the behavior of these hominins and, potentially, for understanding whether their ultimate extinction might have been climatically influenced, as fluctuations in the environments associated with the robust australopiths provide direct evidence about the responses of hominins to environmental change. To achieve this, a 2-dimensionsal morphometric tool was developed for accurately identifying the abundant bovid teeth that are found in direct association with the hominins using Elliptical Fourier Function Analysis. More accurate taxonomic identifications facilitate more precise estimates of the relative abundance of ecologically sensitive bovids, allowing for finer resolution when segmenting the various components of the reconstructed habitat mosaics. The fossil bovids from Cooper's D and Swartkrans HR, LB, M2, and M3 were identified and their relative abundances were compared across the assemblages over time in order to define the environmental mosaic and to determine if environmental heterogeneity existed across the assemblages. The relative abundances of the bovid fossil assemblages and *A. robustus* were compared to assess the habitat preferences of these hominins. *A. robustus* were not consistently associated with a particular habitat type suggesting that perhaps they were habitat generalists, capable of surviving in multiple types of habitats.

Modeling the Scavenging Landscape: Using Carcass Utilization to Interpret Zooarchaeological Assemblages

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Carrion consumption was most likely a key ecological process employed by early hominids, as it is today among recent carnivores, and human foragers. Current research has suggested that carrion use is a stabilizing force in food webs, especially when there is environmental stress on animals. If carrion presence and availability is considered as a feeding ecocenter, the potential to understand carcass utilization on the landscape is great. The ecocenter concept, put forth by Craighead et al. (1995), indicates that these concentrated food resources are highly nutritional, not energy costly, and have a predictable/learnable presence on the landscape. Given those criteria, three feeding ecocenters exist for predators to acquire scavenged food stuffs: predator-hunted fauna, environmental mortality of fauna, and human-hunted fauna. This poster presents a model that applies the feeding ecocenter concept to zooarchaeological assemblages by recording and analyzing carcass utilization as presented by Haynes (1982). The scavenging ecocenter model can be employed to approximate the degree of stress in paleoenvironments affecting fossil carnivores and hominids, thus augmenting paleoecological interpretations.

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Wild Chimpanzee (*Pan troglodytes*) and Pleistocene Hominin Raw Material Preference Ccompared: Evidence from Archaeological Data and Natural Experiments

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The archaeology of non-human primates seeks the origins of technology and, at Bossou, Guinea, studies the stone technology of wild chimpanzees. Field experiments combined with archaeological methods elucidated a variety of contexts of chimpanzee tool-use, from raw material selection to the description of nut-cracking sites. Hominins have been known to selectively transport tools for over 2 million years. The ability for hominins to recognize the material properties of stone has been highlighted in the study of the earliest stone tools (Braun et al. 2009; Harmand 2008; Stout et al. 2005). We have shown previously that weight, size, and types of raw material are important variables for chimpanzee stone tool use (Carvalho et al. 2008, 2009). In order to further access if quality and availability of raw material may be ecological constraints to technological development in both human and non-human tool use, we carried out field experiments introducing novel raw materials to wild chimpanzees (flint and basalt) in a variety of shapes and sizes. Chimpanzees preferred to use the basalt tools, both as hammers and anvils, over locally available materials. The basalt exhibited performance char-

acteristics that surpassed local materials. No basalt tools showed signs of fracture after 47 experimental sessions; use wear traces were minimal on anvils. Hammers did show prominent battering. Data suggests that chimpanzees may be able to 1) discriminate among-different rock types; and, 2) select tools based on rock properties (i.e., elasticity, durability, handling ergonomics, task efficiency). Our study suggests that quality of locally available raw material (soft rocks that do not fracture conchoidally) may be an important variable to explain the absence of more complex stone tool use among chimpanzees. However, ongoing experiments are accessing the extent to which these apes are able to discriminate mechanical properties of stones, in comparison to hominin preferences.

A Recently Excavated Aurignacian Fire Feature at Abri Castanet, France

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Abri Castanet, a collapsed rockshelter in the Dordogne region of Southwestern France, contains a single (~30cm thick) archaeological layer dating to the Aurignacian (~32,500 bp) resting on bedrock and sealed by the collapse of the shelter roof. Excavations in the south sector of the site (2005–2010) have revealed a large multi-component fire structure. This structure is made up of three distinctive sub-features, all within a 2 m^2 area. Two of these features are within intentionally constructed hollows in the bedrock. The largest also contains a semi-circular arrangement of plaquettes derived from the limestone bedrock, potentially for protection or heat banking. Each of the three sub-features yielded a different archaeological signature, with varying densities of artifacts, burnt bone, and other residues, potentially indicating task differentiation. The fire structure has undergone extensive post-depositional processes, including washing and freeze-thaw. These processes enlarged its footprint as well as moved burned material vertically through the profile. In addition, micromorphology has shown a particularly high degree of trampling indicating that human traffic also played a role in post-depositional modification. In this presentation, we will discuss how the fire feature was excavated, what it can tell us about post-depositional processes of the site itself, and, finally, what the organization of this structure might tell us about Aurignacian fire use both generally and within the Castel-Merle Vallon.

Human Subsistence Behavior during the Howieson's Poort: New Data from Sibudu Cave (KwaZulu-Natal, South Africa)

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The Howieson's Poort (HP; ~65–60 ka) continues to be a source of interest to scholars interested in human behavioral evolution during the Later Pleistocene. This is in large part because the HP preserves evidence for innovative technologies (including finely made bone points and geometric backed tools) and for symbolically mediated behavior (engraved ostrich eggshell) (Texier et al. 2010; Wadley 2008). The HP is also of interest because the disappearance of the innovative behaviors associated with this phase is not well understood. Despite the attention the HP has received in the literature, we still know remarkably little about subsistence behavior during this period. I previously reported on the initial faunal sample from the HP deposits from Sibudu, excavated from a 1x2m trial trench (Clark et al. 2008). Here, I present data on the complete HP faunal assemblage excavated under the direction of Lyn Wadley, recovered from a 2x3m unit. The assemblage comprises several hundred thousand fragments, of which ~6,000 were identifiable macromammalian remains. The available evidence is consistent with humans being the primary contributors to the assemblage, although the presence of digested bones suggests a low degree of carnivore input, as well. There are marked changes in the fauna over the course of the HP, the most notable being a steady decline in the representation of small ungulates. I will discuss potential reasons for this variation, some of which may be linked to changes in the local environment. Finally, while it has been suggested that the diverse small game assemblage in the HP may have been taken using traps or snares (Wadley 2010), evidence for direct human interaction with this component of the assemblage is lacking. While the use of remote capture technologies cannot be absolutely ruled out, solid evidence for the use of such technologies remains absent.

Acknowledgements: Funding for this research was provided by a number of sources, including the Leakey Foundation, the Palaeontological Scientific Trust, the National Science Foundation, and various units at the University of Michigan. A National Research Foundation grant to Lyn Wadley also provided partial support.

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What is in a Name? Providing an Identity to the "Pre-Still Bay" and "Post-Howiesons Poort"

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In recent decades much research on the South African Middle Stone Age has focused on assemblages from the Still Bay (SB) and Howiesons Poort (HP). This has led to a strong emphasis on these periods and cultural groups at the expense of the research on human groups living before and after the Still Bay and Howiesons Poort. With work on both the eastern and western coast of South Africa, we are working to give the cultural developments in the period prior to the SB and following the HP a stronger identity within the MSA. Our results from excavations at Sibudu and Elands Bay Cave address these issues. We argue that all periods of the MSA are of inherently equal importance for understanding the course of human evolution in Africa. Here we present detailed results from the cultural sequence from Sibudu to highlight the importance of what has often been referred to as "Pre-Still Bay" and "Post-Howiesons Poort." This sequence refutes the notion that the earlier and later phases of the MSA are somehow less interesting and unique than the SB and HP. Rather than referring to these periods in respect to what they are not, we recommend developing a nomenclature that gives these periods an identity of their own.

Acknowledgements: We thank the Heidelberg Academy of Sciences, the Tübingen Senckenberg Center for Human Evolution and Paleoecology, and the Deutsch Forschungsgemeinschaft.

Man as Sign: Testing Models of Cognitive and Behavioral Modernity Using Semiotic Theory

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Defining the nature and origin of modern human cognition has become one of the most important and seemingly intractable problems in paleoanthropology. Widespread acceptance of Upper Paleolithic symbolic expression and technological innovation as the first fully modern human behavior has been eroded by a number of "precocious" remains from Africa. The discovery of engraved ochers, beads, and bone tools dating to the Middle Stone Age has prompted many workers to reconsider the evolutionary trajectory of complex human behaviors and the cognitive capacities that support them. The result is a spate of models that argue cognitive and behavioral modernity either emerged sporadically, beginning *at least* 80,000 years ago, or arose abruptly from genetic or demographic shifts approximately 35,000 years ago. Several models also identify cognitive processes that engender artifact production and use. They consistently point to flexible and shared attention, advanced theory of mind, advanced working memory, and/or extra-somatic symboling as primary entailments of behavioral modernity. Yet none of the approaches has established deductive protocols for identifying cognitive processes in the archaeological record. Claims that any artifact evidences a specific capacity are then largely inferential and cannot conclusively support evolutionary models of when, where, and how modernity arose. This paper uses semiotic theory to model the evolution of symboling capacities in the human lineage, and in conjunction with Information Exchange Theory, identifies the material correlates of extra-somatic expression during the Middle to Late Pleistocene. By isolating different types of symboling, providing examples from Africa and Eurasia, and specifying deductive protocols, the paper outlines an empirical testing program for defining the evolution of cognitive and behavioral modernity in *Homo sapiens*. Ultimately, the discussion highlights the potential contributions of semiotic theory for better understanding cognitive development in all hominin taxa.

Born to be Wide: The Evolutionary Significance of Covariation among Measures of Body Breadth in Modern Humans

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Paleoanthropological dogma holds that the wide bodies of Neandertals, characterized by voluminous, barrel-shaped chests, platymeric femora, and medio-laterally elongated (i.e., platypelloid) pelves, are a derived condition that arose due to thermoregulatory needs and/or insufficient cultural buffering in cold climates, bioenergetic concerns, or heightened activity levels (Churchill 2008; Holliday 1997; Weinstein 2008). However, recent research suggests a similar morphological configuration in Early and Middle Pleistocene *Homo erectus* and *H. antecessor* (Arsuaga et al. 1999; Simpson et al. 2008). Furthermore, a similar body plan can still be found in modern populations, not all of whom are necessarily "hyper cold-adapted" or subject to abnormally high levels of activity. This study proposes that many of the features previously posited as derived in Neandertals are primitive retentions which can be traced through the hominin lineage from at least the Early Pleistocene (and likely earlier) up through today. Multivariate methods are used to investigate the relationship between morphological characters of the femur, pelvis, and trunk, in a sample of European and Native American modern humans (n=35). Statistically significant covariation among these traits indicates that they are part of a morphological suite of characters, each of which is functionally related to all of the others. The results of this study suggest that the wide bodies of Neandertals are, in fact, a primitive retention and not a direct consequence of their environment. As such, the suitability of this body type for colder climates, high activity levels, and the like, represent a fortuitous exaptation rather than a direct adaptation per se.

Acknowledgements: I would like to thank Ann Magennis from Colorado State University and Rick Weathermon from the University of Wyoming for allowing me access to their collections of skeletal material.

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Recent Experiments in Flake Production

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Much of what we currently know about stone tool production process comes from knapping experiments. Through replicating tool forms found in the archaeological record, replicative studies have proposed various attributes to be critical in controlling flake formation and blank design. Yet, exactly how these variables affect flake formation has rarely been tested under strictly controlled environments. In this paper we describe a new experimental design that allows the testing of many attributes in a more objective and controlled fashion, utilizing materials and methods that closely mimic actual flake production but, at the same time, still allow for strict controls on isolating the effects of one variable at a time. The results of several of these experiments will be summarized, focusing particularly on those that can both be tested against the archaeological record and which are the most relevant for current interpretations of prehistoric assemblages. Among these are the role of core morphology in determining flake shape, the effects of different hammers (both in terms of material and shape) on producing particular flake characteristics, and how the use of different strategies can affect the efficiency (in terms of maximizing the potential of raw material resources) of the knapping process. Attention will also be given to the divergence of the results of our controlled experiments from those that have been proposed on the basis of replicative experiments, which in many cases is significant.

Patterns of Raw-Material Procurement and Exploitation in the Caucasian Middle Paleolithic

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This paper presents results of a comparative study of Neanderthal raw material procurement patterns in the Northern and Southern Caucasus. In the former, the Eastern Micoquian was present during almost the entire Middle Paleolithic (from 75 to 40 ka) and was closely linked to industries of Central and Eastern Europe. On the contrary, the industries of the Southern Caucasus are more closely related to the Middle Paleolithic of the Levant and Zagros. The authors obtained petrography data and carried out research on several lithic collections from Middle Paleolithic sites in the Northern Caucasus. These materials come from two cave sites (Mezmaiskaya and Matuzka), two open-air sites (Baranaha-4 and Besleneevskaya), and one workshop (Hadjoh-2). Raw material sources were studied during field surveys conducted in 2007–2011. Our research so far shows that Neanderthals preferentially exploited local (0–5km) raw-material sources, but in addition, they actively used high-quality flints and other rocks transported into the sites from more distant sources (30km and more), mostly as retouched tools or flakes. Also, raw materials from even more distant sources (up to 200–300km) have been found. For example, flints from the Eastern coast of the Sea of Azov, where other Eastern Micoqian sites are known (examples include the open-air sites of Rojok and Nosovo), were found in Mezmaiskaya Cave (approximately 300km way). In addition, obsidian found in the Middle Paleolithic layers at Mezmaiskaya originated from sources located near the village of Zayukovo in the North-Central Caucasus (approximately 200km distant). This research allows us to define three zones of raw material procurement and different strategies of raw material use. In this paper, we compare our original data with those available from published reports on the South Caucasian sites. Our research shows similar patterns of raw material procurement and exploitation in both of these two different cultural entities.

Acknowledgements: This project was sponsored by the National Geographic Foundation (Young Explorers Grant #8300-07) and the University of Pennsylvania Museum Summer Field Research Grant (2011). We thank Drs. L. Golovanova and V. Doronichev for the opportunity to study lithic collections from Mezmaiskaya Cave, Matuzka Cave, and the Baranaha-4 and Besleneevskaya open-air sites, as well as N. Leonova, E. Vinogradova, J. Tchistyakova, and A. Blajko for rock samples from some other sites and raw material sources. E. Doronicheva thanks Prof. V. Beliayeva and Prof. H. Dibble for advising the research.

An Academic Knapping Community: Placing Experimental Knapping in its Social Context

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Cognition and learning are important topics for research addressing the technological development of hominins. Skill, expertise, and learning in stone knapping have been investigated in an individual learner context (Bril et al. 2005; 2010). The theory of situated cognition suggests that the human mind does not only reside within the body, but encompasses material, environmental, and social aspects of the world (Clark 1997; Hutchins, 1995). Lave and Wenger (1991) emphasized the importance of social context and community in human cognition, particularly through the phenomenon of legitimate peripheral participation: individuals as legitimate members of a community with many fluid relationships that aid their development of skills. This suggests that human learning never occurs in isolation from its social context. It is critical to include both individual and social perspectives in the analysis of learning in experimental knapping. A multidisciplinary approach including experimental archaeology, situated cognition, and social learning provides interesting avenues for the investigation of the development of knapping skills. My research addresses the potential relationships between technical knapping gestures and social interactions. I organized a participant community of academic stone knappers who engaged in group knapping learning sessions. The video footage was divided into segments that corresponded to each knapping sequence executed by each individual. These segments served as a framework from which to sample and conduct analysis of specific, technical gestures. Social interactions were observed, and the effects of these interactions on individuals' technical gestures were evaluated. I hope to demonstrate how the concepts of 'legitimate peripheral participation' (Lave and Wenger 1991) and 'joint attention' (Tomasello 1999) are useful for analyses of knapping skills development that seek to address both the individual and the social context of learning. Experimental knapping studies that address social context may inform theories of the evolution of hominin social cognition.

Acknowledgements: I would like to acknowledge the support and guidance that my supervisor, Michael Chazan, has provided me throughout the development of this project. Also, thank you to my colleagues who participated in this study; your time, effort, and patience were greatly appreciated.

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Why Levallois? An Experimental and Morphometric Approach to 'Standardization' and 'Predetermination' in the Middle Paleolithic

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Middle Paleolithic 'Levallois' products have caused considerable debate regarding issues of technological predetermination and hominin cognition. Central to this controversy is the extent of 'predetermination' and 'standardization' in so-called 'preferential Levallois flakes' (PLFs). Here, we sidestep the problems associated with arbitrarily assigning archaeological flakes to different categories by using an experimentally replicated dataset (n=642 flakes). We firstly demonstrate (quantitatively) that our experimental cores replicate genuine archaeological Levallois examples accurately. Thereafter, using 15 size-adjusted flake variables and multivariate statistics, we tested whether putative PLFs possess particular attributes that identify them as a group more consistently than the debitage flakes produced during their manufacture. We also compared the degree of relative standardization in PLFs. In addition, we examined whether the particular PLF attributes identified during our analyses can be related to current knowledge regarding flake functionality and utility.Our analyses show that PLFs possess specific properties that unite them robustly as a statistical 'category' of flake.The properties that do so relate most strongly and most consistently to flake thicknesses across their surface area. This suggests that the 'volumetric' construction of Levallois cores leads to the production of flakes ('PLFs') that are standardized in such a manner that they may be considered 'predetermined' with regard to a specific set of properties that distinguishes them from a majority of other flakes. Importantly, these particular attributes can be linked to factors that, based on current knowledge, are desirable features in flake tools (including reduction of torque, durability, and capacity for retouch). As such, our results support the hypothesis that the lengthy, multi-phase, and hierarchically organized process of Levallois reduction was a deliberate, engineered strategy orientated toward specific goals. In turn, our results support suggestions that Levallois products required particular cognitive capacities of their manufacturers, in particular, a capacity for long-term working memory.

Evidence for Non-Foraging Sexual Division of Labor in Neandertals from the El Sidrón Site (Asturias, Spain).

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There is archaeological evidence of social networks in Neandertals, even if, as some researchers proposed, networks that were simpler than the ones developed by anatomically modern humans (Harvati 2010; Hockett and Haws 2005; Kuhn and Stiner 2006). One relevant feature of social networks is the sexual division of labor. Zooarchaeological data and the study of Neandertal lower limb bones cortical thickness, support the presence of sexual division of labor in this species, but contrary to anatomically modern humans only in foraging activities (Kuhn and Stiner 2006; Ruff 1987; Villotte et al. 2011). In this study we want to search for skeletal evidence of this division of work in other activities than the provisioning of food. We analyzed the non-masticatory dental wear (cultural striations and chipping enamel) on the anterior dentition of the six Neandertal adult individuals (three females and three males, Lalueza-Fox et al. 2011) from the El Sidrón site. Cultural striations length in females was found statistically significantly (ANOVA test analysis) longer than in males. This means differences between males and females in the non-masticatory activities performed (e.g., using the mouth as a third hand while preparing skins or cutting meat). Our data increase the range of sexual division of labor development in Neandertals, suggesting that this population could have more complex social networks than previously considered. Our results also improve, with respect to the division of labor, the record of data recompiled directly from Neandertal remains. These results make us wonder about the social specificity of *Homo neanderthalensis*. Research will go on.

Acknowledgements: The authors are grateful to the PaleoAnthropology Group of the MNCN for comments and suggestions, and also to the El Sidrón Cave excavation team. A.E. is beneficiary of a predoctoral research grant (FPI; BES-2010-033914) from the Spanish Ministry of Science and Innovation (Project CGL2009-09013).

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How Many Different Ways do You have to Change a Bone into a Tool?

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The bone industry is one of several types of evidence of Upper Paleolithic hunter-gatherer activity, being composed of a wide variety of objects used in many daily actions. Thus, it is an important part of the material culture of prehistoric populations. During the Portuguese Upper Paleolithic, antler availability may have been dependent on both hunting activities and seasons, since red deer do not have antlers all year round and antler quality varies throughout its development. As to the bone, its cortical tissue, which is most of the bone, was the most exploited material by prehistoric humans in the manufacture of their equipment for hunting and fishing. They would take the fractured bone after collecting the bone marrow, reorienting the flaking until the desired tool was made. The focus of this paper is to examine the methods and debitage schemes used to transform bone material in tools and weaponry, through the technological analysis of the bone artifacts from the Upper Paleolithic site of Vale Boi, located near Cape Saint Vincent, Southwestern Algarve, Portugal.

Acknowledgements: To Fundação para a Ciência e a Tecnologia.

Early and Middle Pleistocene Paleoanthropological Discoveries in the Chalbi Basin, Northern Kenya

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The Chalbi Basin of northern Kenya preserves a long succession of laterally-extensive but little-explored fossiliferous sediments dating to the Early and Middle Pleistocene. Located to the southeast of Lake Turkana, the Chalbi Basin offers paleobiologists and geoscientists a relatively rare opportunity to assess a wide variety of biological and geological responses to paleoclimatic, paleoenvironmental, and

geomorphological factors across a range of spatial and temporal scales. In the summers of 2009–2011, our team conducted a series of brief expeditions to the previously-described ~2.2 million-year-old fossil locality of 'Marsabit Road.' Surface surveys and a small excavation yielded an abundant and speciose collection of ~700 fossil specimens. Finds include an intact hominin MC3, as well as the remains of 30+ species of primates, carnivores, bovids, equids, suids, camelids, and hippos, among others. We also recorded several promising surface scatters of Mode 1 lithic technology. In regards to paleoenvironmental context, the fauna strongly and concordantly suggest the presence of an edaphic grassland directly abutting the Chalbi watercourse, giving way to secondary grasslands and lightly wooded/bushy upland settings. A limited survey of the surrounding region resulted in the discovery of several additional paleontological and archaeological localities. One of these ('Farre') possesses a dense surface scatter of several hundred spatially-associated lithic artifacts and fossils. Diagnostic lithics include a large cutting tool, smaller bifacially-flaked pointed forms, and simple cores and flakes. At the assemblage level these finds are indicative of the ESA-MSA transition. The associated faunal record (*Eurygnathohippus*, *Metridiochoerus*), however, indicates a date in excess of ~700 ka, seemingly suggesting a greater antiquity for some 'transitional' lithic technologies. To date, our project has surveyed <5% of the Chalbi Basin. Ongoing and future research will undoubtedly improve our understanding of past conditions in the Chalbi, as well as serve as valuable data for comparative/synthetic paleobiological and geological studies.

New Evidence for the Spatial-Temporal Record of Occupations at Dmanisi in the Georgian Caucasus

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New excavations have significantly expanded the temporal and spatial range of occupations at Dmanisi in the Republic of Georgia. Separated by 220 meters, the M5 and M9 Units each preserve 6.5 meters of stratified deposits, containing superposed assemblages of faunas and artifacts. These document numerous serial occupations of the site, before, during, and after accumulation of the numerous hominin fossils recovered from Stratum B1 in the main excavations situated between M5 and M9. Absolute ages and paleomagnetics date Dmanisi's occupations from ca. 1.85 Ma to ca. 1.76 Ma. Continuing excavations in the M5 block have recovered abundant faunas, with differential associations of artifacts, and with spatial-stratigraphic differences in evidence for carnivore activity. Marked differences in lithic raw material selection as well as reduction intensity are evident between early (Stratum A) and late (Stratum B) occupations. These new findings suggest that Dmanisi may have served as a "home base," frequented by a well-established regional population. The expanded spatial-stratigraphic data base is being studied with respect to intra- and inter-occupation variability in subsistence and technology, as well as patterns of human-carnivore interactions.

Acknowledgements: This research is supported by the National Science Foundation, Grant No. BCS-1025245.

Reconstructing Late Pleistocene Site Formation Processes Using Multi-Proxy Datasets and Novel, Empirical 3D GIS Models at Site PP5-6, Pinnacle Point, South Africa

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Caves and rock shelters around the world often act as natural sediment traps, helping to preserve fragile archaeological and sedimentological records. Along the south coast of South Africa, numerous sea caves have preserved invaluable records that have figured prominently in our understanding of modern human evolution. However, caves and rockshelters also often have very complex stratigraphic records due to diagenic and anthropogenic influences that are limited to their confined spaces. Understanding the sedimentology at these sites is thus no less important than studying the paleoanthropology because it establishes the processes that have influenced the development of the archaeological records, which informs the context of past human activities. Stratigraphy is most commonly analyzed today using combinations of on-site observations, sample collection, and extra-field analysis that are often mapped onto 2D plan and profile drawings. In some cases, artifacts are also plotted onto these maps. But, 2D analyses are unable to recognize the complex spatial irregularities that characterize cave and rockshelter stratigraphy, and may even introduce artificial patterning within datasets. 3D visualization presents a much more comprehensive analytic environment. Here, we present the results of a comprehensive stratigraphic analysis of site PP5-6 on South Africa's south coast using 3D GIS models. After five years of excavations at PP5-6, numerous studies have been used to create a detailed history of site formation processes. Over 156,000 total station plotted finds, integrated with geometrically-rectified section photography in a novel 3D GIS model, allows unprecedented recognition of fine vertical and lateral patterning. When micromorphology and OSL age estimates are also integrated into this 3D model we create an invaluable and independent test of our preexisting stratigraphic models. We argue that 3D models of archaeological materials are thus an invaluable— but still underutilized— empirical dataset to study stratigraphy at archaeological sites.

Preliminary Spatial Density Analysis in the Upper Paleolithic Rockshelter of Vale Boi (Southern Portugal)

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The usefulness of spatial density analyses across an archaeological site has been solidly demonstrated by several studies over the last decade. The main advantages of these approaches are on identifying clusters and data anomalies, defining potential activity areas, shifts in space occupancy over time, and helping in the identification of post-depositional disturbances. Due to its unique state of excellent deposit preservation and to the high resolution methods used for data acquisition and processing, the Paleolithic site of Vale Boi, in Southwestern Iberia, is an optimal resource for the application of spatial density analysis techniques. Vale Boi is a multi-component site with a fairly complete Upper Paleolithic record, spread over two open-air loci and a rockshelter area. The latter corresponds, in fact, to a collapsed shelter, most likely in front of a completely filled up cave. The collapse took place at the end of the Last Glacial Maximum and sealed a series of late Solutrean horizons. Despite the identification of three geological distinct layers, forming a c. 1.2m thick deposit, the vertical distribution of the Solutrean materials is almost constant throughout the sequence, making difficult the identification of the original occupational horizons. This poster focuses on the successful use of geospatial analysis tools, such as Kernel Density Estimation and Average Nearest Neighbor statistics, in the recognition of distinct Solutrean horizons in the Vale Boi rockshelter, based on the identification of independent horizontal clusters.

Land, Sea and Ice: Linking Local Sedimentary Records of Environmental Change from Paleolithic Archaeological Sites in Portugal to Regional and Global Paleoclimatic Records from Deep-Sea and Ice Cores

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Macro-scale records from deep-sea and ice cores may provide high-resolution temporal evidence for paleoclimatic and paleoenvironmental change during the Late Pleistocene but only coarse-scale spatial evidence for reconstructing local and regional paleoenvironments. On land, many of the best records are caves and/or rockshelters because they act as traps for the preservation of sediments, artifacts, bones, and botanical remains. Unfortunately, post-depositional processes such as pedogenesis, mixing due to animal burrowing, and human modification often plague these records. In addition, time-averaging caused by slow sedimentation rates and a lack of temporal resolution due to error ranges from radiometric dating remain persistent problems that often preclude fine-scale understanding of diachronic changes in the archaeological and associated paleoenvironmental record. As a result, archaeological sites rarely provide high-resolution paleoclimatic or paleoenvironmental data. In central and southern Portugal, a few caves and rockshelters preserve intact sedimentary records of environmental change during MIS 2 and 3. Here we report magnetic susceptibility analyses of Gruta Nova de Columbeira, Lapa do Picareiro, Vale Boi, Lapa do Suão, and Lapa dos Coelhos, to understand paleoclimatic conditions during the formation of the sedimentary sequences of each site and link them with global signatures from the deep-sea cores off Portugal and Greenland ice cores. The land, sea, and ice correlations show that local environmental responses to larger climatic processes are preserved in at least three of these sites, Picareiro, Vale Boi, and Suão. The sediments record the general trends of MIS 2 climatic fluctuations including H1, the LGM, H2, and several D-O events. The magnetic susceptibility results also enable a better understanding of the associated archaeofaunal records and regional Paleolithic archaeology.

Acknowledgements: Funding for the research was provided by the National Science Foundation Archaeology Program, (BCS-0715279 and BCS-1118155 to Haws, BCS-1118183 to Benedetti), the Wenner-Gren Foundation for Anthropological Research (Haws and Bicho), and the Archaeological Institute of America (Haws).

Preliminary Faunal Analysis of the Donggutuo Site, Nihewan Basin, China

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Donggutuo is a 1.1 million year old archaeological site in the Nihewan Basin of China, located approximately 100 miles west of Beijing. This site was previously excavated by the Nihewan Research Team (consisting of Desmond Clark, Nick Toth, Kathy Schick, Wei Qi, and Xie Fei) in 1991 and 1992. A team from the Institute of Vertebrate Paleontology and Paleoanthropology conducted a subsequent field season in 2000–2001. Although these faunal specimens were examined on-site at the time of excavation, there has been no formal analysis to date. Stone tools at this and many other Nihewan Basin sites attest to the presence of *Homo erectus* in this area, but as of yet there have been no *H. erectus* specimens found in the basin. This preliminary faunal analysis is found to establish a direct connection between these stone tools made by early hominids and the accumulated fauna. The current analysis consists of 2,188 specimens (>2cm) from all three recorded field seasons. Surface damage indicates carnivore involvement in the accumulation of this site, but there is an indication of hominid involvement as well in the form of both cutmarks and hammerstone percussion marks. Additionally, in an effort

to add to paleoenvironmental reconstructions of the Nihewan Basin, specimens were identified to taxa when possible. A majority of the specimens were unidentifiable (19.97%) or unidentifiable long bone fragments (38.48%), but an analysis of the identifiable specimens indicates a high frequency of Equidae in addition to Rhinocerotidae, Elephantidae, and Bovidae. The high proportion of Equidae indicates a generally open environment during the time of deposition while *H. erectus* was moving into this new geographic area.

Acknowledgements: Thank you to Nick Toth, Kathy Schick, and the Stone Age Institute for the opportunity and funding to travel to Beijing and conduct this research, and thanks to the Department of Anthropology at IU for summer research funding. Additional thanks to the IVPP, Wei Qi, Pei Shuwen, Tong Haowen, Gao Xing, and Guan Ying for all of their help and hospitality during my stay in Beijing and the Nihewan Basin.

New Dates Confirm a 1.1 Million Year Long Life History for Coastal Sea Caves at Pinnacle Point, S. Africa: A Presentation of the Geology, Geochronology, Paleontology, and Archaeology

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South African coastal caves preserve temporally long and rich paleoanthropological sequences crucial to human origins research, but to date they have not been shown to hold sediments dating to the Acheulian. This has been hypothesized to result from short cave life histories, high sea levels washing out sediments, and lack of interest from Acheulian hominins. We investigate these hypotheses through a combined petrographic, palaeomagnetic, thermally transferred optically stimulated luminescence (TT-OSL), and uranium-lead (U-Pb) analysis of a series of deposits preserved in a set of caves at Pinnacle Point. Our results show that the caves were formed over a million years ago, far earlier than previously thought. The oldest deposits are a series of raised beaches that date to the unusually long Marine Isotope Stage 31 (MIS 31). At PP13G the lowest of these beaches is capped by a flowstone dated to between 1.11 and 0.96 Ma. The PP13G flowstone records a normal magnetic polarity and at Opera House Cave the reversal at the end of the Jaramillo Normal Polarity Sub-Chron (~1.07–0.99 Ma). After ~ 1 Ma a series of caves (PP13B, PP5-6, PP9, Crevice Cave, Opera House Cave, Staircase Cave) at Pinnacle Point record evidence for a one million year long sporadic deposition of raised beaches, speleothem formation, fossil accumulations, and human habitation. The heights and form of the PP caves ARE typical for caves across the South African coast, and thus it is likely that many of these caveS share this ancient origin. Despite their age, the caves have yet to reveal evidence for Acheulian occupation, which is abundant on the surrounding landscape. The age of the coastal caves shows their potential for providing a much longer archaeological and fossil record than previously imagined, and eliminates one hypothesis for the lack of Acheulian occupation of South African coastal caves.

The Search for the Proto-Aurignacian in Eastern Europe

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The Proto-Aurignacian is an early Upper Paleolithic industry best known from Italy, where it has been found beneath the CI Y5 tephra at several localities, and thus dates to more than 40,000 cal BP. Many assemblages are dominated by backed bladelets and points, and also contain other typical Upper Paleolithic forms, including non-stone artifacts and ornaments. Although not associated with diagnostic human skeletal remains, Proto-Aurignacian artifacts are assumed to have been made by modern humans. The Proto-Aurignacian has yet to be widely recognized east of the Carpathians, but new discoveries and improved site chronologies reveal that this industry, or something very similar to it, is present in the northern Caucasus and on the central plain. An assemblage containing backed bladelets and points recovered from Layer 1C at Mezmaiskaya Cave (northern Caucasus) recently has been attributed by Golovanova et al. to the Ahmarian of the Levant, which is often regarded as the likely source of the Proto-Aurignacian. At Kostenki-Borshchevo on the central plain (Middle Don River), assemblages buried below the CI Y5 tephra lie in the same stratigraphic context as the Proto-Aurignacian of Italy. Some of these assemblages contain diagnostic elements of the Proto-Aurignacian, while others do not; the latter may be plausibly attributed to sampling and site-function differences. At least two other localities contain assemblages with diagnostic Proto-Aurignacian types that currently are thought to be less than 40,000 cal BP. They include Mira, Layer II-2 on the Lower Dnepr River and Buran-Kaya III in Crimea. The East European sites provide new insights to one of the earliest movements of modern humans into northern Eurasia (during GI 11–10?), documenting eyed needles (Mezmaiskaya Cave), use of rotary drills (Kostenki 17), possible figurative art (Kostenki 14), and both the harvesting of small mammals (Kostenki 14) and groups of reindeer and horse (Kostenki 12).

A 'Black Hole' in Southeast Asian *Homo erectus* Biogeography

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The discovery of >100 *Homo erectus* fossils in eastern Java establishes the species' presence in the central Sunda volcanic archipelago (SVA) during the Early-Middle Pleistocene. The SVA population probably ranged eastward for 1000km to Flores, given million-year-old artifacts there, and westward through Java. Nonetheless, a 'black hole' exists in our biogeographic knowledge of *Homo erectus*, because no fossils are known for >2000 km north of Java across the forests and seas of Southeast Asia (SEA). A potential reason for missing onshore records is suggested by taphonomic patterns in Java. Here the *Homo erectus* finds were individuals who died in river drainages of local stratovolcanoes, where pulses of volcaniclastic sediment preserved the bones of the humans and thousands of animals. Nearby non-volcanic uplands, beyond the pulses' reach but also likely inhabited, have produced no *Homo erectus* fossils, even where expected in caves. Taphonomic loss akin to that in the uplands plausibly affected the entire no-find region, because volcanism was rare throughout. Disparate biogeographic alternatives remain for the 'black hole.' Conceivably, SVA *Homo erectus* was isolated biogeographically from mainland Eurasia after initial dispersal; more probably, in part because other taxa from the Java hominin-fossil beds evince faunal exchange, *Homo erectus* continued to inhabit the 'black hole' region. Although the population here was perhaps always sparse and transient, it might have become the largest one in Afro-Eurasia, when lowered sea level transformed the Sunda continental shelf into immense fluvio-coastal lowlands with varied landforms and vegetation. Either the river valleys of Java's stratovolcanoes produced an optimal *Homo erectus* habitat befitting a narrow species niche, or were among many SEA paleoenvironments suitable to the species, reflective of great niche breadth. The anatomical features that characterize Java *Homo erectus* either developed locally or reflect different SEA settings and circumstances, where fossil records are lacking.

Analysis of Dorsal Scars in 3D on Middle Paleolithic Debitage

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Flake scar directionality in lithic studies has been analyzed to determine how cores are rotated during their reduction and the production of chipped stone flakes. Past studies have used two-dimensional directional data to infer the type of reduction technology as well as how the treatment of cores may change throughout reduction. In order to assess the directionality of flake scars in a more robust manner this study treats the directionality of scars in three dimensions. This method allows for flake scar directionality to be assessed as a continuous, rather than a categorical, variable. Approximately 400 total flakes from Tabun Types C and D from Jelinek's excavations of the Middle Paleolithic site of Tabun, Israel, housed at the University of Arizona, were scanned using a NextEngine Desktop 3D Scanner. These artifacts were supplemented and compared with experimentally produced flake assemblages of several different methods of reduction (bifacial,levallois, blade core, discoidal). Individual flake models from these scans were produced using the Rapidform XOR/XOV software suite. Like Clarkson, Vinicius, and Lahr's (2006) work on cores, 3D vector data were taken for readable scars over 0.5cm on flakes. While Clarkson et al. treated this directionality as a single variable, this study characterizes separately rotational (strike or azimuth) from convexity (dip or incline/decline) data. This is done with the aid of geology-based software and visualization methods (stereonets) used in the study of paleomagnetic directional data. These data allow for the comparison of assemblage level variability in directionality and incline/decline between different types of core reduction as well as through time for the Tabun Types C and D assemblages.

Acknowledgements: Steve Kuhn, Mary Stiner, Vance Holliday for access to the Tabun collections at the University of Arizona and use of their lab, University of Minnesota GRPP funding, Evolutionary Anthropology Labs for use of the NextEngine scanners and Rapidform software.

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The Faunal Remains from Bundu Farm and Pniel 6, Northern Cape, South Africa

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Open-air fossil sites dating from the latter phase of the Early Stone Age and the early phase of the Middle Stone Age in southern Africa are often located along riverbanks, floodplains, pan margins, and in spring deposits. Here we describe the faunal remains from two such locations in the Northern Cape, South Africa, associated with possible Early Stone Age/Middle Stone Age hominin occupations: Bundu Farm (pan margin) and Pniel 6 (riverine). The faunas represent grassland environments with nearby woodlands surrounding seasonal bodies of water. These water features were likely focal points on the landscape, drawing in a variety of ungulate prey and both hominin and non-hominin predators. Despite the presence of sizeable lithic assemblages at both sites, there are no taphonomic patterns in the faunal accumulations to suggest large-scale hominin involvement. Prey mortality patterns, skeletal element representation, and limb bone portions differ little from expected patterns of natural deaths or carnivore predation. However, several burned bones at

Bundu Farm and a few impact notches on limb shafts at Pniel 6 may indicate hominin scavenging. As sites from similar settings, such as Florisbad, do show selectivity in hominin hunting practices, evidence from open-air sites as a whole suggests considerable variability in subsistence behaviors at these open-air locations during the transition from the Early Stone Age to the Middle Stone Age in southern Africa.

Acknowledgements: We thank David Morris at the McGregor Museum, Kimberley, South Africa, Philip Kiberd, and John McNabb for access to the Bundu Farm and Pniel 6 collections. This research was funded by the University of Nevada-Reno, Graduate Student Association.

Dealul Guran: Age and Description of a New Lower Paleolithic Locality in the Southeastern European Loess-Karst Steppe

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Eastern Europe holds a geographically important position as a potential crossroads for hominin migration. However, the quality and quantity of data from the Balkans and the eastern European steppe has thus far been insufficient to reliably evaluate dispersal models for the Middle Pleistocene. We present here new data from the site of Dealul Guran in southeastern Romania, discovered in 2010 during a systematic survey of the loess-karst landscape of the Lower Danube Basin (LoDanS Project). Hominin occupation of the site, preserved at three levels, was dated using luminescence techniques (OSL, IRSL, and post-IR IRSL). The lower two archaeological units of the site yield ages most likely corresponding to marine isotope stage (MIS) 11, and therefore establish Dealul Guran as one of the oldest securely-dated Lower Paleolithic sites in eastern Europe. The upper archaeological layers date to MIS 3 and 2, providing evidence for more recent hominin presence in the region, the earlier part of which corresponds to the time-window relevant to the modern human migration into Europe. The earliest occupation phase confirms the Middle Pleistocene antiquity of hominin settlement of the eastern European loess steppe, a period characterized by increasingly open steppic environments in the region, and experiencing relatively milder climates than areas further north and west within Europe. We discuss the role of southeastern Europe in Middle Pleistocene hominin dispersals, and hypothesize that the particularly thick and widespread loess cover throughout this region may have contributed to the relative paucity of known Lower Paleolithic archaeological sites.

Acknowledgements: This study was funded by the Max-Planck-Institute for Evolutionary Anthropology (MPI-EVA), overseen by Prof. J.-J. Hublin and Dr. S. McPherron. The work was carried out in concordance with Romanian law and within the terms of the permit no. 1/2011, granted by the Ministry of Culture of Romania to a collaborative team headed by Dr. V. Zirra and representing the Institute of Archaeology "Vasile Pârvan" and the Institute of Speleology "Emil Racoviță" of the Romanian Academy of Sciences, along with the German partners, MPI-EVA and the Römisch-Germanisches Zentralmuseum Mainz (RGZM-Monrepos). Thanks to Prof. A. Barnea (University of Bucharest) and Mariana Petrut (National History Museum, Adamclisi) for logistical help. Thanks to G. Heinz (Fachhochschule Mainz/RGZM) for assistance with the total station and to Dr. S. McPherron (MPI-EVA) for help with the rest of the equipment. Thanks to S. Albert for assistance with OSL sample preparation. Fieldwork assistance was provided by N. Schlösser and K. Weber, along with students from the Prehistory Program at the University of Mainz.

New Excavations of a Late Pleistocene Bonebed and Associated MSA Artifacts, Rusinga Island, Kenya

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Middle Stone Age (MSA) artifacts within the Pleistocene (>38 ka) Wasiriya Beds on Rusinga Island (Lake Victoria, Kenya) are contemporaneous with lithologies and fossil fauna indicating localized riverine and spring-side environments within an expansive arid grassland. Despite their important implications for interpreting hominin evolution, MSA hominin behaviors in arid settings remain relatively poorly understood. New excavations at the Wakondo Bovid Hill site in the Wasiriya Beds yielded a dense accumulation of bovid skeletal remains and MSA artifacts within an ancient channel deposit. The bonebed is represented by a single taxon, the extinct alcelaphine *Rusingoryx atopocranion*. High frequencies of juveniles with deciduous teeth in similar stages of wear and prime age adults are consistent with mass death of a single herd. Multiple associated artifacts (including large retouched blades >7cm) and a previously recovered cut-marked specimen implicate humans in the taphonomic history of the bonebed. Geological and taphonomic evidence suggests that the dense accumulation of *Rusingoryx* remains are the result of: 1) a mass drowning event, perhaps during seasonal migrations, that was subsequently scavenged, or 2) a hunted assemblage where humans took advantage of herd vulnerability during river crossing. Neither has been previously documented in the African Stone Age record, although there are parallels with other probable MSA mass kill assemblages (e.g., eland at Klasies River Mouth and an extinct alcelaphine at Lukenya Hill). In addition to the behavioral implications of the Bovid Hill site, several complete *Rusingoryx* crania display morphological characters unparalleled in the bovid fossil record. Most notably, *Rusingoryx* crania are characterized by extreme doming of the nasal bones, forming a massive nasal cavity that projects dorsally ~10–15cm above and between the orbits. Hunting or scavenging of *Rusingoryx* in mass quantities may represent

innovative and flexible behaviors in a hyper-arid environment.

Acknowledgements: This work was funded by National Science Foundation (BCS-1013199, BCS-1013108), Leakey Foundation, National Geographic Society, University Research Challenge Fund grant from New York University, and Block Grants from the University of Minnesota Anthropology Department.

New Insights into Technological Variability in the Earliest Middle Stone Age from Keraswanin, Kenya

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In the African Middle Pleistocene, the appearance of the Middle Stone Age (MSA) is marked by a technological turnover in which Acheulian hand held tools are replaced by hafted points, often made using prepared core techniques. Although prepared core technology appears in the Acheulian, several have argued that smaller core size and a greater diversity of core preparation techniques distinguishes the use of prepared core technology in the MSA from its Acheulian precursors (Tryon et al. 2005 and citations therein). Here we describe a diverse assemblage from the site of Keraswanin (GnJh-78), Kenya, dating to >235 Ka. A total of 29 cores was recovered from surface and *in situ* contexts, including 10 Levallois, 6 radial, 3 blade, and 6 assorted single and multi-platform cores. The Levallois cores show a range of preparation techniques including preferential, centripetal, bi-directional, and pointed flake preparation, and were recovered in association with typologically MSA Levallois, unifacial, and bifacial points. Although made on the same fine grained phonolite, the Keraswanin cores are smaller and considerably more diverse in their preparation than the larger Levallois boulder cores found in association with typologically Acheulian tools tool kits in the Kapthurin Formation (McBrearty et al. 1996; Tryon et al. 2005). The core diversity found in association with typologically MSA points at Keraswanin demonstrates that a significant technological change in the way hominins made stone tools accompanied the shift from handaxes to points at the Acheulian to MSA transition. These findings confirm the MSA attribution of sites with diverse prepared core techniques but that lack diagnostic formal tools such as points (see Tryon 2006). It also suggests that characterizing technological change at the Acheulian to MSA transition requires as thorough an understanding of the dynamics of flake production as is usually given the formal tool types typically used to characterize these time periods.

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Middle Stone Age Land Use and Technology along the Shinfa River in NW Ethiopia

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Controlled excavations and surveys along the upper reaches of the Blue Nile tributaries on the lowland slope of Ethiopia's northwestern plateau provide new information about Middle Stone Age (MSA) humans living in the Horn of Africa. These river systems are somewhat unique in that they arise in the highlands with flows concentrated in only a few months of the year. Landuse patterns included exploitation of resources that may correlate with wet and dry seasons as indicated by spatial patterns in stone raw material sources. The streamside occupations dated circa 100 ka (preliminary ESR ages) were likely dry season encampments tethered to widely spaced river waterholes which provided access to both aggregated terrestrial and aquatic resources and served to increase subsistence resource predictability. Seasonal use of the streamside localities took advantage of nearby gravel bars as prime sources of both coarse-grained (mostly basalt) and fine-grained (chert, chalcedony, quartz crystal, etc.) raw materials for tool stones. Upland tool stone resources including basalt flows also were exploited but with less certainty as to season. Variation in regional spatial patterns of artifact size, raw material selection, and production technology further suggest that late MSA technology may have been responsive to seasonal local conditions and adaptive constraints. Levallois core reduction produced flakes, points, and prismatic blades, while the recycling of extractive tools resulted in mostly maintenance items such as wedges. Tool function identified by microscopic use-wear analysis documents a wide array of large, coarse-grained cutting/processing tools similar to Sangoan industries plus smaller fine-grained tools used as butchering knives, burins, and, most conspicuously, projectile points that fall within the size range of modern

arrowheads. This seasonal pattern appears to have been a key component of landscape use by early Anatomically Modern Humans.

Acknowledgements: Supported by NSF 0921009. Thanks to the ARCCH, the University of Texas, and our friends at Shinfa.

The Paleolithic Settlement of Central Anatolia: Recent Results from Göllüdağ

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Anatolia (Asian Turkey) is often assumed to be a bridge between continents, channeling movements of hominin populations between Africa (via western Asia) and Europe. However, comparatively little is known about the archaeological record corresponding to hypothetical dispersal events. The Göllüdağ region, known for its broad exposures of Pleistocene volcanics and abundant obsidian outcrops, is an ideal location to search for Paleolithic sites in good geological context. Four seasons of systematic survey around the Göllüdağ volcanic complex have revealed a rich record of open-air Paleolithic localities. Analysis of the survey database in its geomorphological context is currently underway. Salient findings to date include: 1) clear differences in the distributions of Lower and Middle Paleolithic artifacts; 2) a very rich Mousterian record, exhibiting a high level of technological diversity within assemblages, but low diversity between assemblages; and, 3), a marked scarcity of Upper and Epi-Paleolithic remains. The second and third observations in particular have potential relevance to questions of hominin dispersals across central Anatolia during the Pleistocene.

Further Significance of the Earliest Acheulian from Kokiselei, Kenya

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Acheulian stone tools are often considered to represent the first significant milestone for material culture evolution that followed the Oldowan. In the northwest part of the Turkana basin (Kenya), archaeological, stratigraphic, and geochronological data from the Kokiselei site complex can be used to demonstrate that the Acheulian may not have evolved linearly from the Oldowan amid anagenic-like circumstances. Oldowan and Acheulean stone-tool making coexisted not only within the same paleoenvironmental context but also through the period when *Homo erectus* first appears in the basin's geological record. However, there is a paucity and restricted geographic distribution for early Acheulian sites that date to the same time as early *H. erectus* sites, whereas Oldowan sites are comparatively ubiquitous spatially and temporally. This may indicate that localized fringe populations at Turkana utilized the earliest Acheulian and/or that the Oldowan was more adaptive in this setting. In fact, when the East African Paleolithic record is examined, it can be shown that the Acheulian is a nominal component through the interval of about 2.0–1.5 Ma, possibly suggesting a gradual diffusion or independent origins geographically for this stone-tool technology. A similar sparseness for the Acheulian is well documented for the earliest Paleolithic records from Eurasia. Considering the difficulties in linking stone-tool types and hominid species proprietarily, the Oldowan artifacts from Dmanisi, Georgia, might be interpreted as either the archeological remains of a *H. erectus* group that journeyed from Africa yet lacked the early Acheulian being made in Kenya at roughly the same time, or the behavioral residues of a different hominid. This last supposition raises the prospect that another stone-tool-using species (such as *Homo habilis*) could have been the first to disperse from Africa.

Acknowledgements: We thank the office of the President of Kenya and the National Museums of Kenya for permission to conduct this research, TOTAL Kenya for logistical support, and the WTAP team. Funding was provided by the French Ministry of Foreign Affairs and the National Science Foundation (BCS 02-18511 to C.S.F.). Lamont-Doherty Earth Observatory is acknowledged for ongoing support to the Paleomagnetics Laboratory.

Chronology of the Beginning of the *Homo sapiens sapiens* Epoch on the Russian Plain

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The problem of chronology of the beginning of the *Homo sapiens sapiens* epoch on the Russian Plain could be based on the information from the Kostenki region in the basin of the Don river because it is the center of the concentration of the oldest European Upper Paleolithic sites with anthropological remains of *Homo sapiens sapiens* (Anikovich 2005; Hoffecker et al. 2007; Sinitsyn 2002). The aim of the present report is to analyze the different dates (OSL, ^{14}C calibrated, ^{14}C uncalibrated, tephrochronological, and palaeomagnetic) of the Kostenki Paleolithic layers. This is done from the point of view of the chronology of rapid global climatic oscillations, during which

the most ancient Upper Paleolithic cultures existed at Kostenki. The stadials and interstadials of the Kostenki region are registered in several standard pollen diagrams (Kostenki 12: Levkovskaya et al. 2005 and others). They are correlated with well dated rapid global climatic oscillations of European pollen standards (Monticchio in Italy with 16 horizons of tephra, as well as standards from Greece, from Rugen in the Baltic, etc.), and with isotope glacial scale GISP2, Villars cave, and some marine scales. The GISP2 scale is dated by glacial varvochronology until 37,000 BP and the Villars scale by counting stalagmite layers. The research shows the excellent correlation of the chronology of different paleoenvironmental events, OSL, and uncalibrated ^{14}C dates. The oldest Paleolithic layers with OSL dates in the range of 50,120–43,470 years correlate with the Glinde+Moershoofd interstadials (51,000–43,000 years) and with GISP2 oscillation 14 (51,000–48, 000 years).

Late Pleistocene Human Occupation of Northwest Africa: A Crosscheck of Chronology and Climate Change in Morocco

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Regular Middle Paleolithic inventories as well as Middle Paleolithic inventories of Aterian type have a long chronology in Morocco going back to MIS 6 and are interstratified in some sites. Their potential for detecting chrono-cultural patterns is low. The transition from the Middle to Upper Paleolithic, here termed Early Upper Paleolithic—at between 30 to 20 ka—remains a most enigmatic era. Scarce data from this period requires careful and fundamental reconsidering of human presence. By integrating environmental data in the reconstruction of population dynamics, clear correlations become obvious. High resolution data are lacking before 20 ka, and at some sites this period is characterized by the occurrence of sterile layers between Middle Paleolithic deposits, possibly indicative of a very low presence of humans in Morocco. After Heinrich Event 1, there is an enormous increase of data due to the prominent Late Iberomaurusian deposits that contrast strongly with the foregoing accumulations in terms of sedimentological features, fauna, and artifact composition. The Younger Dryas again shows a remarkable decline of data marking the end of the Paleolithic. Environmental improvements in the Holocene are associated with an extensive Epipaleolithic occupation. Therefore, the late glacial cultural sequence of Morocco is a good test case for analyzing the interrelationship of culture and climate change.

Assessment of the Cortex Ratio Model with an Epipaleolithic Assemblage from Jordan

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Intensity in cortex reduction and the transport of artifacts have been long discussed in archaeological assemblages. The cortex model proposed by Dibble et al. (2005) provided a successful geometric method to quantify the expected and observed amount of cortex in a particular assemblage. The ratio of observed to expected can highly suggest, or not suggest, the likelihood that flakes and other lithic materials were selected for transport to and from a site. A collection of lithics, stored at the University of Pennsylvania Museum, from the Early Epipaleolithic occupation (Area C) at the site of Yutil al- Hasa (WHS 784) in Jordan, excavated by Deborah Olszewski in 1984, 1997, and 2010, was selected. This research resulted in an assessment of the applicability of this model to an Epipaleolithic assemblage, with the cortex model used to quantify the cortex ratio for the Area C occupation at Yutl Al-Hasa. The Area C occupation, known as the Nebekian, was a temporary occupation during the Epipaleolithic. Other lines of evidence such as the characteristics of the Epipaleolithic and the deposition of lithics in the assemblage support this study.

Acknowledgements: Dr. Harold Dibble and Dr. Deborah Olszewski, University of Pennsylvania.

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High-Resolution Landscape Reconstruction of the FLK *Zinjanthropus* Site, Olduvai Gorge, Using Plant Biomarker and Phytolith Evidence

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The FLK *Zinjanthropus* (Zinj) archaeological site at Olduvai Gorge plays a central role in understanding the origins of hominin behavior because of its unusual high-density co-occurrence of fossilized bones and Oldowan stone tools. Many models of early human behavior utilize the environmental context, yet reconstructions remain highly controversial for FLK Zinj and the surrounding landscape. We use molecular and stable isotope signatures of organic matter in 53 paleosol sediments in conjunction with phytoliths to shed new light on hominin landscapes at Olduvai Gorge. Paleosol sediments recovered from FLK Zinj (Level 22) and 18 lateral facies equivalents from

the surrounding 1,000m^2 consist of smectitic clays that were deposited during episodic flooding over the lake margin landscape (~1.839 Ma). Carbon-isotope ratios $\delta^{13}C$) of bulk organic matter vary from -18.6‰ to -27.1‰ while plant biomarker $\delta^{13}C$ vary between -19.4‰ and -33.1‰. Hominin remains, stone tools, and cut-marked bones show highest concentrations in sediments with more negative $\delta^{13}C$ values and are associated with phytoliths from woody dicots or palms. Conversely, positive $\delta^{13}C$ values are associated with grass phytoliths and non-woody plant tissue (lignin) signatures. Samples from near to a freshwater tufa mound show intermediate $\delta^{13}C$ values and relatively high concentrations of sedge biomarkers (5-n-alkylresorcinols). We interpret our results as evidence of a spatially varied (patchy) landscape ranging from closed woodlands to wetlands. Densest archaeological accumulations occur near FLK Zinj, and negative $\delta^{13}C$ values and woody dicot phytoliths at this site suggest a woodland patch or thicket. A nearby tufa deposit and sedge biomarkers suggest the occurrence of a perennial freshwater source. These two landscape patches contrast with proxy evidence for extensive grassland occurrence in this basin. We conclude that hominins selected this site for carcass transport and processing because it afforded shelter and potable water in an otherwise harsh environment.

The Next Revolution that Wasn't: Aggregation, Symbolism and Social Interaction at Early and Middle Epipaleolithic Kharaneh IV, Eastern Jordan

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Kharaneh IV is an Epipaleolithic site located in the Azraq Basin of eastern Jordan. It was occupied between 19,800 and 18,600 years ago and, in these thousand or so years, multi-season, prolonged, and repeated habitation of the site created a 2m mound of extraordinarily dense archaeological deposits, making it one of the largest Paleolithic sites in southwest Asia. In addition to the well-preserved, rich, high-resolution stratified deposits, the site contains some of the region's earliest evidence for hut structures, widespread on-site caching, carvings in stone and bone, intensive exploitation of gazelle including evidence for possible feasting and meat storage, and long-distance trade in marine shells extending to the Mediterranean and Red Seas, as well as the Indian Ocean. Four years of work have produced a wealth of data on on-site activities and the timing and duration of occupation, providing fresh insights into the nature of the transition from hunting and gathering to agriculture in southwest Asia. Here we present Kharaneh IV as a hunter-gatherer aggregation site hinting at sedentism and settlement, elaborate art and decoration, economic intensification, and long-distance exchange networks, almost 6,000 years earlier than the well-known pre-farming Natufian period.

Paleoeconomy of the Late Mousterian and Aurignacian Levels at Salitrena Pecina, Central Serbia

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Between 40 and 28 ka, relevant shifts in human biology and cultural technocomplexes occurred in Europe as a result of the arrival and rapid dispersal of *Homo sapiens* throughout the continent. This occupation has recently been shown to have happened approximately 5,000 years earlier than previously thought (Benazzi et al. 2011; Higham et al. 2011), which in turn means that *Homo sapiens* may have coexisted with late Neanderthals for a longer period of time. The role that isolated areas, located far from the main communication pathways, would have played as ecological refugia for archaic populations is well-known for this period. This is the case for the south of the Balkan Peninsula, a region that was probably the destination of Neanderthals' withdrawal during the advance of *Homo sapiens* through the Danube corridor (Mihailović et al. 2010). Unfortunately, Paleolithic research in this area until now has been quite limited. This scenario is changing with the study of Salitrena Pecina (central Serbia) presented here, as it is the only Serbian site to the south of the Danube where a stable and continuous sequence of the Middle to Upper Paleolithic transition has been recorded. Modern excavations carried out since 2004 have revealed a rich deposit of stone tools and faunal remains dated to the late Mousterian (~37 ka) and Aurignacian (~31 ka) periods. The archaeozoological and taphonomical analysis of the faunal assemblage has revealed interesting patterns in terms of subsistence and human mobility, with implications for continuity and discontinuity between periods.

Acknowledgements: This work is part of the research undertaken by Ana B. Marín-Arroyo, funded by the McDonald Institute for Archaeological Research, a British Academy Postdoctoral Fellowship, and a British Academy Small Grant at the Leverhulme Centre for Human Evolutionary Studies, University of Cambridge.

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The Vicentine Points from the Early Gravettian of Vale Boi (Portugal): Technological and Use-Wear Analysis

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The emergence of the first Upper Paleolithic in Southwestern Iberia has been recently associated with the Gravettian, c. 33 ky cal BP. One of the most important sets of evidence is from the archaeological site of Vale Boi, with the only long Gravettian sequence in SW Iberia. The Early Gravettian layers (33 ky cal BP) found in two different areas of the site have a series of double-backed bipointed bladelets, with no other parallel in Iberia—the Vincentine Points (named after the St. Vicent Cape, located nearby). Our analysis recognized mastic on their proximal end and impact fractures on the distal one, suggesting that they were hafted and used as projectiles. Due to the long sequence of well-dated archaeological layers and sites, we propose that the Vicentine Points represent the only reliable diagnostic tools for the earliest presence of Anatomically Modern Humans in SW Iberia.

Acknowledgements: Research funding is from FCT (Fundação para a Ciência e Tecnologia, Portugal) (Grant PTDC/HAH/64184/2006), the National Geographic Society, the Archaeological Institute of America, and Wenner Gren Foundation.

An Organizational Approach to Acheulean Handaxe Technology from the African Middle Pleistocene

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Handaxes have long held the attention of Paleolithic archaeologists because of their striking formal characteristics and the distinctive patterning associated with Acheulean archaeological sites. As such, they have been used as a source of evidence concerning a wide range of phenomena, including early hominin subsistence activities, knapping skills, cognitive capabilities, and social structures. Such studies have often focused on describing and quantifying patterns of handaxe size and shape in order to address issues such as symmetry, thinning, and shape redundancy. This paper argues that, while such studies of handaxe formal characteristics have contributed a great deal, patterning in terms of assemblage composition holds many complementary insights. This study examines Acheulean assemblages from the Middle Pleistocene raised beaches of the Namib Desert coast of Namibia excavated by Corvinus (1983), as well as contrasting data from Olorgesailie, Kenya (Isaac 1977). These data demonstrate significant variability in the composition of Acheulean lithic assemblages in terms of the frequencies of handaxes, as well as other forms of debitage with direct implications for the technological activities conducted by early hominins at these sites. As with earlier research, this study finds a contrast between sites with very high and low frequencies of handaxes. However, a more detailed technological analysis of the Namib assemblages demonstrates that sites with low frequencies of handaxes tend to have high frequencies of early-stage core reduction and bifacial thinning debris. In contrast, sites with high frequencies of handaxes have little other debitage but high frequencies of retouched tools. Based on these findings, this paper proposes a model in which handaxes were: 1) roughed out at locations of raw material availability, 2) transported and used at various activity areas, as well as serving as a source of flakes during processes of reduction; and, 3) were discarded at locations distant from raw material sources.

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Evolving Tephra Compositions over Time at Olduvai Gorge: Implications for a Changing Volcanic Source

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Changes in composition, grain size, and thickness of Olduvai Gorge tephra over time must track changes in volcanic sources in the nearby Ngorongoro Volcanic Highlands (NVH). The thick, relatively coarse-grained tephra of Bed I, which are used to constrain the relative stratigraphic positions of the classic Bed I paleoanthropological sites, come from nearby sources—Ngorongoro (Lower Bed I rhyolites) and Olmoti (upper Bed I trachytes: McHenry et al. 2008) volcanoes. The proximity of these volcanoes (~20km to the mouth of Olduvai Gorge) and inferred east to west paleowinds (similar to those today: Hay 1976) would have provided a direct path for volcanic ash. Tuff IF, marking the boundary between Beds I and II, is a "surge" deposit (Stollhofen et al. 2008), deposited in part by a superheated, ash-laden gas cloud from Olmoti. Deposits such as this and the Ngorongoro-derived Naabi Ignimbrite (base of Bed I) could not have originated from more distal sources. Olduvai Bed II tephra are less continuous, more contaminated, and typically finer grained. With the possible exception of Tuff IID, none show evidence of surge or other near-source depositional features. The mineralogy changes abruptly between Beds I and II, where Ngorongoro rhyolites and Olmoti trachytes were replaced by nephelinites from a more distant but still unidentified source. Bed II tephra are thus more difficult to characterize, correlate, and date. Potential

sources include Elanairobi (Embagai, NE of Olmoti), Olsirwa, and Loolmalasin (E of Olmoti), but none has been characterized or dated with enough certainty to test this, though nephelinites have been described (Dawson 2008; Hay 1976; Mollel 2007). Further work in the NVH is required to better constrain the ages and compositions of these potential source volcanoes, which could help constrain the tephrostratigraphic record (and ages) of Olduvai Bed II tephra and contribute to a regional tephrostratigraphic framework.

Acknowledgements: Funding for this project was provided by NSF (award BCS-0852292), the L.S.B. Leakey Foundation, and the UW Milwaukee Research Growth Initiative. Permission to conduct research at Olduvai was provided by the Tanzania Commission for Science and Technology (COSTECH) and Tanzania Antiquities Department.

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The Post-MIS 5a Middle Paleolithic Occupations and Micromorphology of Combustion Features in Üçağızlı II, Hatay, Turkey

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Üçağızlı II is a collapsed Middle Paleolithic coastal cave located in the Hatay Province of Turkey, several hundred meters northeast of the well-studied Upper Paleolithic site of Üçağızlı I. Test excavations in 2005 and 2007 revealed a roughly two-meter sequence of anthropogenic deposits containing variably-cemented combustion features, well-preserved faunal remains, and stone tools. The faunal assemblage is dominated by medium and large ungulates although remains of shellfish are present throughout. The stone tools were produced using a range of Levallois reduction strategies. Uranium-series dating of carbonate flowstones capping a beach deposit that underlies the archaeological sequence place the earliest preserved occupations after MIS 5a, with occupations of the western, eroded portion of the site continuing at least through MIS 3. Micromorphological analyses of the sediments and intact combustion features revealed: 1) a strong anthropogenic contribution to sedimentation, irrespective of the density of artifacts and bones, 2) a decrease in the abundance of charcoal between the lower and upper layers of the sequence, 3) that stacked, unprepared ashy combustion features were situated beneath the highest point of the cave ceiling, 4) that burning activities alternated with other types of refuse disposal; and, 5) that post-depositional insect and rodent bioturbation negatively impacted the preservation of combustion features in the eastern portion of the trench. Comparison of combustion features with those present in the nearby site of Üçağızlı I suggests that pyrotechnologies at both sites were similar with unprepared substrates and burning yielding abundant ashes with respect to charcoal, but that a narrower range of combustion-related behaviors is present within the Middle Paleolithic site.

New Data on Neandertal Pelvic Morphology: The Case of Regourdou 1

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The Neandertal pelvis has been broadly studied during the 20th century and its main characteristics are well known. A long and thin pubis, and a deep subacetabular sulcus associated with modern like sacrum and ilium are usually considered as specific to this population. But, beside this homogeneity, an important variability of size and shape still exists. How can we describe, more globally, the morphology of the Neandertal pelvic belt? The recent discovery of a new Neandertal pelvis, Regourdou 1, offers an opportunity to discuss these characters (Meyer et al. 2011). Associated with the individual Regourdou 1, a young adult dated from OIS4, the well preserved ilium and ischium fragments match the sacrum and form a relatively complete pelvis, which we can add to the Neandertal pelvis inventory. A comparison of visual and linear traits between Regourdou 1 and several Mousterian (Tabun C1, Kebara 2, Feldhofer 1, Krapina 207 and 209, La Ferrassie 1) or modern (historical French population) pelves is proposed. The usual measurements from Martin (Brauer 1988) are complemented by new ones, defined to reflect Regourdou 1's state of preservation. Our analysis shows that the morphology of the Regourdou 1 pelvis is typical of late Neandertals while our metric data point out that it is within their variability. Regourdou 1 presents characteristics which have already been described, e.g., on Kebara 2 and Feldhofer 1. This allows us to define new specific traits on the Neandertal pelvis. This study opens up new prospects for the study of Neandertal pelvic morphology and its homogeneity and variability in a broad spatio-temporal context. It could also contribute new data on the functional analysis of this morphology. Indeed, as numerous functional interpretations have been proposed, the recent discussion about the Tabun obstetrical analysis shows how this part of Neandertal biology is still unknown and controversial.

Acknowledgements: The authors would like to thank the Musée de l'Homme, in Paris, for help during the study of La Chapelle-aux-Saints and La Ferrassie 1 and 2. We

also would like to thank Mrs Véronique Merlin-Anglade, curator of the Musée d'Art et d'Archéologie du Périgord, in Périgueux, who graciously loaned us the rest of the Regourdou 1 pelvis.

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Middle Stone Age Plant Bedding and Settlement Patterns at Sibudu, South Africa

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Sibudu, a rock shelter located in KwaZulu-Natal, South Africa, contains one of the most complete later Middle Stone Age sequences in southern Africa (including pre-Stillbay, Stillbay, Howiesons Poort, and post-Howiesons Poort assemblages), and numerous examples of early behavioral innovations, including bone points and perforated shell beads, >1,000km away from better-known examples on the southern coast. Recent geoarchaeological and archaeobotanical investigations from the rock shelter suggest that Middle Stone Age occupants regularly constructed and maintained floor preparations, or "bedding," out of sedges and other monocotyledonous plants starting ca. 77 ka. The oldest bedding at the site was topped with a thin layer of leaves from *Cryptocarya woodii* (River Wild-quince), which contain insecticidal and larvicidal compounds. The selection of these leaves for bedding construction suggests that the inhabitants of Sibudu had an intimate knowledge of the plants around the shelter and were aware of their possible medicinal properties. After ca. 73 ka all of the plant bedding appears to have been burnt, likely as a form of site maintenance to rid the bedding of pests and to prepare the site for future occupation. After ca. 58 ka, the construction and burning of bedding, along with the occurrence of other site maintenance practices (such as hearth rake-out), intensifies. This intensification also corresponds with an increase in density of lithic artifacts and an increase in anthropogenic sedimentation rates, implying a change in the settlement strategies and possibly the domestic organization of the occupants of Sibudu after ca. 58 ka. These behavioral changes may also coincide with broader demographic shifts within and out of Africa between ca. 77 and 58 ka.

Ostrich Eggshell Beads from Mlambalasi, Tanzania, and Their Application to Modern Human Origins Research

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Objects of personal adornment are among the earliest signs of modern human behavior. The first standardized ornamental artifacts in Africa appear in the form of ostrich eggshell (OES) beads. Their use can be traced to at least 50,000 years ago, and they are present at many archaeological sites from the later Middle Stone Age to historic times. OES beads have great potential to yield important information about the development and spread of early modern humans; as non-utilitarian artifacts, they are well suited to reveal regional and temporal styles. Previous studies of variability have focused on the hunting/herding threshold in southern Africa, and demonstrated a steady change in external bead diameter over time. My research involves the analysis of the OES beads from Later Stone Age and Iron Age deposits at the Mlambalasi rock shelter in Tanzania. My findings indicate that this trend of diameter change is also present in East Africa, and extends well into the Later Stone Age. This poster presents my results alongside comparable data from sub-Saharan Africa, and suggests how OES bead analysis can contribute to the study of modern human origins.

Acknowledgements: This research was funded by a SSHRC Standard Research Grant awarded to Dr. Pamela Willoughby. Many thanks to Dr. Willoughby, SSHRC, the University of Alberta, and the Iringa Region Archaeological Project team.

Natufian Cave Alteration: Bedrock Modification at Raqefet Cave, Mt. Carmel, Israel

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The Natufian culture (15,000–11,500 cal BP) developed in the Levantine Near East, just before the establishment of the first Neolithic villages. It is renowned for its burial customs, 'art' manifestations and semi-sedentary settlement pattern. Its innovations include the intensive use of stone for construction, and the production and utilization of a wide variety of stone implements. Of particular interest are the bedrock features hewn into cave floors and terraces and rock exposures in open-air sites. Raqefet Cave (Mt. Carmel, Israel) presents a rich assemblage of ca. 100 mortars, cupmarks, tiny holes, and other features carved into the cave floor and terrace ledges. So far, 31 human burials have been discovered in the cave, and some are closely associated with bedrock features. We suggest that these features and others throughout the cave are associated with ritual activities that were intertwined with the inhumations and memorial rights of the dead. Some of these features were found with objects buried in them, one had an incised pattern inside the shaft, and yet others

were very narrow and deep suggesting that food or mineral preparation in them was unlikely. Another form of stone modification is cave floor leveling, noted mainly near the burials. There are also cases of modified steep irregular bedrock exposures. One example is a large protuberance from the bedrock floor, around which several intact human burials were located. Flake scars indicate stone-carving was carried out, probably by chiseling. The hewing of bedrock mortars/cupmarks is well known for the Natufians. Leveling floor areas and modeling steep rocky exposures are not reported, and if our identifications of chisel marks are correct, this is also a new discovery. The combined evidence indicates that the Natufians chose the cave for specific activities, and then modified several parts of it in order to fit their burial and social needs.

Introducing CODI (the Comprehensive Olduvai Database Initiative): An Electronic Repository of Information about Fossils from Olduvai Gorge

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Olduvai Gorge was first brought to the attention of paleoanthropologists in 1913 and has since provided tremendous insight into the last two million years of vertebrate evolution in East Africa, especially elucidating human evolution. Thousands of important fossils have been recovered from this area over the almost 100 years of field work. However, due to the long history and multiple investigators, no comprehensive database of these fossils yet exists and the material is scattered across numerous museums and personal collections. With funding from the National Science Foundation (grant number BCS 1025263), we are implementing the Comprehensive Olduvai Database Initiative with the goal of creating an electronic repository of information about fossils that have been recovered from Olduvai and where they are currently housed. As of January 2012, 20 monographs and other scientific publications dating from 1934–1990 have been entered into the database, capturing all of the Olduvai fossils published under the project leadership of M.D. and L.S.B. Leakey (approximately 3,700 specimens). We are now starting the second phase of the project, which is to incorporate fossil material recovered by currently active projects and to identify as-yet unpublished material. Here we will introduce the audience to this on-line database and request assistance recovering information about fossil material from Olduvai Gorge, calling for the scientific community at-large to work collaboratively to record this information before it is lost to the passage of time.

Preliminary Taphonomic and Technological Analysis of Two Middle Stone Age (MSA) Open-Air Lithic Assemblages at Vleesbaai, Western Cape, South Africa

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Here we present preliminary taphonomic and technological analyses of two MSA lithic assemblages from exposed ancient land-surfaces suggestive of intact paleosols at Vleesbaai, South Africa. Open-air MSA contexts in southern Africa have received relatively little research attention compared to cave/rock-shelters. MSA caves/shelters provide a glimpse of MSA behavior at discrete locations often along the coast. However, most subsistence and social interaction likely occurred on the landscape. We have a very limited understanding of these activities at present, making studies of open-air sites crucial to understanding developments in modern human behavioral complexity. The two assemblages reported on here, preliminary called Area A and Area B, both tentatively date to ~60 ka based on preliminary OSL dating on underlying sediments at the Area A location, and by MSA artifact typology, represented by a single, possible Howiesons Poort backed piece, at the Area B location. Total-station piece plotting of artifact orientation/dip, artifact size distributions, and the exposed surface side-up of artifacts, suggest that both lithic assemblages have undergone limited post-depositional disturbance. Technological analyses indicates a reliance on secondary cobble sources in the Area A assemblage, and is suggestive of early stage lithic reduction, evidenced by large tested cobbles with few removals, and a high percentage of dorsal cortex. The Area B assemblage is relatively more reliant on primary outcrop raw materials, has higher artifact density, and is suggestive of relatively later stage lithic reduction based on a higher frequency of dorsal flake scars and less dorsal cortex. We explore comparisons between these open-air assemblages and other southern coast MSA cave contexts at PP13B, Cape St. Blaize, and Klasies River. The two Vleesbaai assemblages expand the range of MSA behavioral variation to areas outside of cave contexts, and expand the range of behavioral variation observed in open-air contexts along the southern coast of South Africa.

Acknowledgements: The majority of this research was funded by the National Science Foundation (USA; grants # BCS-9912465, BCS-0130713, and BCS-0524087 to Curtis Marean), as well as funding from the Huxleys, the Hyde Family Trust Foundation, the Institute for Human Origins, and Arizona State University.

Nira Nascente, a Late Pleistocene Site in Southwest Iberia

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SW Iberia is a diverse geologic region where all Paleolithic populations extensively used chert, quartz, and quartzite. This may explain why none of the Middle Paleolithic sites from the region fit with the traditional French Mousterian. Recently, a new coastal site, Mira Nascente, dated to 40–42 ka, was found with an assemblage dominated by good quality flint. New lithic analyses include technological and typological studies, use wear, and refitting. Preliminary results indicate that the flint is not local. Refitting and use-wear indicate that the site is highly preserved despite the absence of faunal remains. Lithic analyses show the presence of a Levallois technology and a low frequency of retouched tools, similar to other Middle Paleolithic sites in this region. The assemblage does not fit into any Bordian Mousterian facies. Based on this fact, it might be possible that SW Iberian Neanderthals had a low-curated technology, which probably represents by itself an independent Mousterian regional facies.

Taphonomic Comparison of Modern East African Owl Pellets and the Kanapoi Fossil Micromammal Assemblage

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Micromammals have long been recognized for their value in the reconstruction of hominin paleoenvironments, but they are relatively understudied in East Africa in comparison to large mammals. When concentrations of micromammal fossils are recovered, avian predators usually are invoked as the accumulating agent, even though other taphonomic processes—alluvial processes, catastrophic events, mammalian predation, etc.—also could play a role in concentrating small bones and teeth. This actualistic study tests the avian predator hypothesis by focusing on the taphonomy of micromammal assemblages. We compare a sample of East African micromammal fauna collected from modern owl roost localities to a fossil micromammal assemblage from East Africa hypothesized to have been accumulated by avian predators. The extant micromammal samples were collected from five roost localities to the east of Lake Turkana in northern Kenya and nine roost localities from the Serengeti in northern Tanzania, while the fossil assemblage is from Kanapoi in northwestern Kenya. Minimum number of individuals along with skeletal element and portion representation are compared between the modern and fossil localities to determine the degree of similarity between modern owl-accumulated and fossil micromammal assemblages from East Africa. The findings of this pilot study can be used in conjunction with other taphonomic signatures (i.e., surface etching, degree of rounding/abrasion, mortality, and age profiles, etc.) to improve interpretations of the biological and geological processes that formed micromammal assemblages in the fossil record and increase understanding of taphonomic processes that may bias reconstructions of hominin paleoecology.

Differences in Raw Material Management by Neanderthals and Modern Humans in SW Iberia

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From an anthropological perspective, the origins of modern human behavior (MHB) have been one of the most interesting research topics in prehistory. Most of the European recent studies on this theme have focused on dietary (e.g., the exploitation of marine resources) and symbolic (e.g., body ornaments) traits as the key differentiating elements. In SW Iberia, the emergence of MHB is associated with the Middle (MP) to Upper Paleolithic (UP) transition, which is marked by significant changes in the technological systems and an apparent continuity in raw material choices. In fact, new data on lithic assemblages from this region revealed that both Neanderthal and Modern Humans used several raw materials even when good quality flint was available at less than 5km. This is a completely different scenario from that of regions located further east, where flint tends to comprise more than 80% of the UP assemblages. Nevertheless, our studies indicate a marked difference between the way that Iberian Neanderthals and Modern Humans exploited the available raw materials. While Neanderthals used flint, quartzite, and quartz to produce the same tools, Modern Humans used flint to produce tools

with long sharp edges for hunting activities, quartzite for domestic tasks, and quartz for both, depending on its quality. This suggests that differentiated usage of raw materials distinguishes the UP from the MP in Europe, and this distinction was not previously recognized because the European regions with longer research traditions are flint rich and assemblages are dominated by this raw material. We hypothesize that this distinction in raw material use may signal a more flexible and creative approach to technology on the part of modern humans.

The Emergence of Levallois Technology in the Western Mediterranean

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The introduction of Levallois method in Europe was an asynchronous event of reorganization of the local core technology. Although the chronologies of this new knapping method are well established in Northern Europe, a certain disagreement exists in the literature regarding the Mediterranean territories. Some authors argued that Levallois technology was developed in southern Europe at about 300 ka (Fontana et al. 2010; Palma di Cesnola 1996) or even earlier (Santonja and Peréz González 2006; Walker et al. 2006). The absence in some sites of secure chronological dates induced others to propose a younger age (Mussi 2002) for the Italian Peninsula. Another source of discrepancy is related to the attribution to an early Levallois production of some lithic series in which the presumed Levallois blanks might be interpreted as by-products of other knapping strategies. The state of uncertainty about the analyses of some collections limited the inclusion of the western Mediterranean from the debate over the emergence of Levallois in Europe. In this research the lithic assemblages of Unit VIII and Unit VII of San Bernardino Cave (Italy) are presented. These assemblages are dated with ESR and U/Th methods respectively to MIS 7a and the beginning of MIS 6. The technological analyses detected the appearance and the development of Levallois method. These results add new data to the understanding of the dynamics of the origin of this technology in the late Middle Pleistocene.

Acknowledgements: This research was supported by the Fuhlrott Research Fellowship of the Neanderthal Museum Foundation in cooperation with the Neanderthaler-Gesellschaft (A.P.).

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An Open-Access, Collaborative Online Database of Romanian Middle Paleolithic Finds

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Romania is a very promising yet poorly understood area in terms of Middle Paleolithic research. Despite a series of recent publications (e.g., Cârciumaru and Anghelinu 2000; Cârciumaru et al. 2002; Horvath 2009; Riel-Salvatore et al. 2008), relatively little information is available on the region, especially to Anglophone scholars. In order to promote research and facilitate access to data, I have created a comprehensive, open-access, collaborative online database of Romanian Middle Paleolithic finds, scheduled to go live in April 2012. This poster will demonstrate the utility of the database and describe its functionality. The database contains information compiled from over 200 Romanian publications, first hand observations, and conversations with several leading twentieth century Romanian researchers (e.g., Marin Cârciumaru, Maria Bitiri, Elena Terzea, and Vasile Boroneanț). For each systematically excavated Middle Paleolithic site published in Romanian sources to date, the database contains coordinates, available absolute dates, quantitative data on the recovered faunal and lithic material, paleoenvironmental information, a bibliography with English summaries of the most relevant publications, an overview of the history of research, and a critical summary of the available data.

Acknowledgements: This research was supported by the Social Sciences and Humanities Research Council of Canada.

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Assemblages' Size Dependence, "SHE" Analysis, and Lithic Variation in Paleolithic Assemblages

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Lithic assemblages recovered from the Central-Eastern European Paleolithic record during more than 150 years of research have been published in varying degrees of detail and classified according to French Paleolithic systematics, aiming mostly toward assigning these assemblages to different techno-complexes and/or facies of the Middle (MP) and Early Upper Paleolithic (EUP). Based on a combination of typological features, raw material, and regional peculiarities, the lithic assemblages from the region have been used to define different late MP and EUP "type" industries as expressions of activity or cultural identity. Yet assemblages are also a product of formation processes; they accumulated over varying time spans, with various artifact combinations and discard rates, and represent therefore the context of complex relationships, as opposed to essentialist view of static types (Schiffer 1987; Shott 1998, 2010). Recently, application of "SHE" analyses (joint study of assemblage richness, heterogeneity, and evenness) (Buzas and Hayek 1998, 2005; Hayek and Buzas 1997) to lithic assemblages has shown that it would not be productive to attribute assemblage variation to activity sets, cultural facies, or other essential types (Shott 2008, 2010). In my study I will apply "SHE" analysis to several Paleolithic assemblages from Romania, to document lithic assemblages' size dependence variation, and to evaluate the reality of assemblages (i.e., lithics in this case) as exemplars of ideal "types."

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Building a Sequence: Elands Bay Cave in the MSA of Southern Africa

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The timing of cultural evolution in the southern African Middle Stone Age is based on a few remarkable sequences that define the technological phases and successions of the region. These sequences often give prominence to the recent part of the MSA (the Still Bay, the Howiesons Poort, and the "post-Howiesons Poort"), while little attention is paid to its earlier phases. This Early MSA is poorly defined and is often described as a period of stasis and homogeneity. However, the archaeological record of southern Africa reflects a more complex picture. While absolute dating is essential, technological studies are central for establishing the chrono-cultural changes that characterize this MSA. With the goal of discussing the nature of the Early MSA in southern Africa, we recently began reanalysis of and fieldwork on the MSA from Elands Bay Cave (EBC), one of the key sites used by T. Volman to define the MSA 1 (1984). This paper reports the main results of our research at EBC and provides a closer look at the important sequence of lithic technology documented at the site. Comparisons with the neighboring site of Diepkloof Rock Shelter and other southern African sites lead us to discuss the timing of innovations and cultural changes in southern Africa and the ways our models distort our interpretations of the cultural variability during the MSA.

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Neanderthal Plant Food Consumption and Environmental Use at Sima de las Palomas, Southeastern Iberia

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The disappearance of the Neanderthal populations of Western Eurasia following the arrival of Modern Humans is poorly understood. Some models suggest that the Neanderthal's narrower diet may have been a competitive disadvantage that was a factor in their demise (Stiner and Kuhn 2009). Until recently there has been limited data available on Neanderthal dietary breadth, particularly about plant foods. The Neanderthals from southern Europe are less widely-understood than their more northern counterparts, though there is evidence that they persisted late in this area (Zilhão 2006) and likely had access to a wider spectrum of dietary resources (Hardy 2010; El Zaatari 2011). However, the vegetal component of diet in the Paleolithic of the Western Mediterranean is almost entirely unknown.

We analysed the plant microremains (phytoliths and starch grains) preserved in dental calculus and on stone tools in order to assess the vegetal component of the diet at Sima de las Palomas in southeastern Iberia. This site is known for its Neanderthal population with an unusual combination of derived and archaic features, some of which may be adaptations to local environments (Walker et al. 2008; 2011b, c, d, e). The 24 teeth and 8 tools in our study date to between 60,000 and 40,000 calendar years before present (Walker et al. 2011a). Our results provide the first direct evidence of plant consumption within a range of niches in Middle Paleolithic of the Western Mediterranean, which may influence our understanding of the behavioral variation among Neanderthal groups.

Acknowledgements: This project was funded by the Max Planck Society.

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Habitat Preference(s) of Early Pleistocene Tool Users

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Cerling et al. (2011) demonstrated that over the last 6 million years less than 40% tree cover was consistently present at East African hominin sites, which suggests grassland environments were a significant part of the hominin ecological niche. Preservational biases potentially confound differentiation of primary depositional environments of skeletal and dental elements representing habitat preference(s) in life from secondary deposition in non-preferred environments. For example, in many of the Plio-Pleistocene Turkana Basin paleolandscapes, past and present hydrological systems have reworked and redeposited fossil material some distance from its original source. Few fossil finds provide indisputable evidence for little to no reworking (e.g., KNM-WT 15000, KNM-ER 1808). Lithic assemblages are susceptible to similar hydrological redeposition; however, numerous archaeological sites in the Turkana Basin have been demonstrated by lithic refitting to be in primary contexts (e.g., Kokiselei; FxJj50). In an effort to resolve habitat preference(s) of early hominins, we compared the $\delta^{13}C$ values of paleosols from archaeological and paleontological sites in a primary context to those of reworked sites at Turkana and to the East African $\delta^{13}C$ baseline established by Cerling et al. (2011) during the early Pleistocene. We found that there are discernible differences between the groupings, which may indicate that tool-using hominins preferred wooded areas within the savanna grassland ecosystem.

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Quantifying Symmetry in the Middle Stone Age: A Morphometric Analysis of Projectile Points from Botswana and Ethiopia

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Symmetry is generally regarded as an important feature of projectile armatures, contributing both to formal patterning of these lithic artifacts and their aerodynamic quality. Metric studies of symmetry, however, are problematic. Several studies using digital morphometric methods analyzed symmetry, particularly of Acheulean bifaces (Lycett 2008) and Paleoindian projectile points (Buchanan 2005). Here we used digital imaging and statistical software to analyze the symmetry of Middle Stone Age (MSA) projectile points from Bo-

tswana and Ethiopia. Retouched MSA points were digitized using a Nikon D70 and Adobe PhotoShop CS5. We analyzed points using FlipTest, a statistical program which examines the digital image and outputs an Index of Asymmetry (IA). The IA first calculates the pixel area of an artifact and then superimposes the left half of the image onto the right side. The area of overlap is divided by the overall area to produce the IA value. Thus, more symmetrical artifacts exhibit an IA value closer to zero. To test whether the hafted portion was contributing disproportionally to the IA, we analyzed whole point versus distal portion symmetry. Finally, we compared IA values with metric measurements describing the extension of the left and right sides respectively from the line bisecting the tip. Preliminary results confirm that symmetry played a significant role in MSA point manufacture, especially if the hafted portion is excluded. We suggest that digital morphometric analysis is a useful technique for the study of MSA technology.

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Does it Matter Who Made the Uluzzian?

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Recent work by Benazzi et al. (2011) suggests that the Uluzzian of Grotta del Cavallo (Puglia, Italy) was made by anatomically modern humans, in contrast to the prior view that it had been the handiwork of Neandertals. Here, we highlight some features of the record that indicate that the question may not be satisfactorily resolved. We focus on issues about the size and composition of the comparative samples used in their study that indicate that the within-sample variation may have been unintentionally depressed. This suggests that a larger Neandertal sample, with less bias toward older material, as well as a larger Upper Paleolithic modern sample, that is less biased toward younger specimens, might show greater overlap than assumed, thus clouding the taxonomic identity of the Cavallo teeth. While this does not directly contradict the results of Benazzi et al.'s innovative analysis, it suggests that caution is still warranted when discussing the authorship of the Uluzzian and other 'transitional' technocomplexes. Drawing on the archaeological evidence, we also discuss to what extent it matters to know the authorship of these industries when assessing how 'modern' they are, and how preconceptions about authorship only complicate research. Given that the majority of the available evidence is archaeological, we argue that the behavioral record itself needs to be given its proper place in such discussions. As concerns the Uluzzian, its 'modern' features appear clear but they remain distinct from those of the proto-Aurignacian which succeeds it. We conclude with a discussion of how this shifts how paleoanthropologists should approach the Middle-Upper Paleolithic in Italy and more broadly at a continental level.

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An Analysis of the Applicability of the 2D:4D Ratio in Sexing Positive Handprints in Rock Art

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Handprints are a common element of world rock art, sometimes numbering in the hundreds at Pleistocene cave sites and rock shelters. At present, handprints provide the most conclusive means of determining the sex of prehistoric artists and thus sexing handprints allows archaeologists to trace whether male and female, adult and child participation in image making changed over space and time. Researchers have applied the 2D:4D (second to fourth digit) ratio to sex the negative handprints found in archaeological contexts but there has been little discussion regarding the potential problems of using this technique such as population variation, topography, and the significant overlap between males on the lower end of the scale and females at the higher end; nor has the 2D:4D ratio been attempted on positive handprints. To that end, I examined the use of the 2D:4D ratio on a modern sample of positive handprints in order to determine its applicability in relation to these contentious issues. The results of my analysis strongly suggest that the 2D:4D ratio is not a reliable method for sexing positive handprints as the paint responds to pressure points; the palmar proximal crease is often not visible and the paint can spread altering the length of the digits prior to measurement. As an alternative, I present the results of a preliminary study of a new method; a 1D:2D ratio which relies on the angle produced by the thumb and the index finger. This method is significant because the angle created by these digits remains constant regardless of the paint, overcoming at least one of the issues of the 2D:4D ratio. Since no one method of measurement is infallible, it follows that the greater the number of methods used when analyzing handprints, the higher the chance of accurately determining sex.

Acknowledgements: I would like to thank my Graduate Supervisor Dr. April Nowell for all of her help and support.

Isotopic Evidence for Dietary Adaptations in the Middle and Upper Paleolithic of Eastern Iberia

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Isotopic analysis carried out on Neanderthals from cold environments indicates that in all cases Neanderthals were top-level carnivores and obtained mainly all dietary protein from large herbivores. In contrast, isotopic evidence from European Upper Paleolithic modern humans reflects a wider range of dietary protein resources, including evidence of partial marine and freshwater consumption. We report here on the direct isotopic evidence for Neanderthal and Paleolithic modern human diets in Eastern Iberia from Cova Negra, Abric del Salt, Cova del Parpalló, and Cueva de Nerja. Our results confirm that the top-predator model is also applicable to Neanderthals that lived in more temperate southern areas, although not as rigidly as seen in northern Neanderthals, and that Paleolithic modern humans from the Mediterranean are definitely intensively exploiting and consuming marine resources. A clear isotopic dietary shift is hence described for Eastern Iberia between the Middle and Upper Paleolithic.

Acknowledgements: The Spanish Government (Programa Becas FPU) and the Max-Planck Society (Prof. Jean-Jacques Hublin and Dr. Amanda Henry) for funding.

What's the Difference? Variability among Solutrean "Parpalló points" from Iberia

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Studies on metric variability among stemmed and winged points, so-called "Parpalló points," indicated a difference in size between points from Central Portugal (Estremadura) and those from Southern and Eastern Iberia. To substantiate this observation—that is interpreted as a hint for territorial differentiation during the Upper Solutrean—the present study, based on an enlarged sample of points and variables, focuses on two main aspects, firstly on the identification of significant (functional and stylistic) characteristics of the points, and, secondly, on the application of statistical methods to test the variability between sites/regions. The results presented indicate that besides statistically significant differences in metrics (only hampered by the small sample available from Central Portugal), we are also facing regional variability, which is best explained by stylistic rather than functional differences.

Diets of Early Hominins: Alternative Hypotheses for the Isotope Data

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Stable carbon isotope ratios in tooth enamel of early hominins from five sites across Africa suggest they fed on some amount of C_4-based foods. Estimates fall between 30% and 50% C_4-based foods for *Australopithecus africanus*, *Paranthropus*, and early *Homo* sp. and close to 80% for *Australopithecus boisei* (Lee-Thorp and Sponheimer 2006; van der Merwe et al. 2008). The percentage of C_4-based foods is calculated by comparing the hominin data with endpoints defined by data from fossil browsers (C_3) and grazers (C_4). The stable carbon isotope ratios in diet can also be estimated using the offset between the ratio in diet and tooth enamel. Our group's meta-analysis of data from laboratory animals with digestive physiologies similar to our own shows an offset around 10‰. The value is 14‰ in large bodied experimental (Passey et al. 2005) and free-ranging East Africa fauna (Cerling et al. 2003) that rely on extensive fermentation for energy extraction. Using 14‰, most diets of early hominins would be 100% C_3-based foods with the exception of *Australopithecus boisei*. Our new analysis of free-ranging fauna and the earlier meta-analysis also imply differences in offsets when feeding on C_3- versus C_4-based diets. We propose that early *Homo* sp. ate some C_4-based foods assuming digestive physiologies similar to our own, *Australopithecus boisei* relied largely on C_4-based foods irrespective of digestive physiology, and the other early hominins, employing extensive fermentation, ate a largely C_3-based diet.

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Dating of Submerged Landscapes by Electron Spin Resonance

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In the Early and Mid-Pleistocene, the Thames River in Great Britain drained much of East Anglia and emptied into the North Sea near Swanscombe in Kent. At some point, presumably as a result of one or more glaciations, the course of the river moved south to its present location. This region and period have produced the earliest archaeological evidence for the occupation of the British Isles (Parfitt et al. 2010). Mapping of the English Channel revealed c. 15,000km^2 of paleolandscapes, including well-defined traces of the original river course. Recently electron spin resonance (ESR) dating has been extended to quartz grains, where the age obtained represents the last exposure of the sample to light (Rink et al. 2007). The age range extends into the millions of years. Rink's initial testing of the technique focused on beach sands. Here we are extracting samples from core material, which originated in fluvial and coastal settings but is currently submerged beneath 30–50m of water and buried at a depth of several meters beneath the surface. While a number of cores from the paleolandscape were obtained, this presentation focuses on one. Foraminiferal analysis, amino acid racemization, and ESR all suggest an early Pleistocene age. Although this particular core may predate the postulated hominin settlement, the results encourage us to look at other cores for a more detailed picture of the later Pleistocene.

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Microwear Analysis of Kenyan Middle Stone Age Obsidian Artifacts from Marmonet Drift (GtJi15): A Functional Evaluation

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Traditional lithic microwear studies use light microscopy to determine chert and flint artifact functions. Applying this technique to obsidian is problematic because light reflects off its naturally glassy surface hindering observation of microwear features such as flake scars, edge rounding, striations, and polishes. Because it is too reflective for light microscopy, obsidian requires a unique analytical method for microwear analysis. Scanning electron microscopy (SEM) negates light reflection and permits clear, high magnification images of microwear features on obsidian artifacts. I will present the results of a microscopic use-wear study on obsidian artifacts from the Middle Stone Age site of Marmonet Drift (GtJi15) in central Kenya. The project involved recording microscopic use-wear traces on obsidian artifacts with an SEM in order to infer artifact functions, specifically kinematic use-actions and worked materials. Thirty-five artifacts were observed and, based upon previous analyses of experimental and blind test artifacts, the visible wear patterns suggest sawing, slicing, and scraping on soft and hard materials, including wood, bone, and hide. The sample included small retouch flakes, biface trimming flakes, scraper fragments, and a unifacial point. The retouch and trimming flakes typically retain microwear evidence on the dorsal proximal area of the tool (near the platform), suggesting that the use occurred before removal from the larger tool's edge during a longer sequence of tool use and rejuvenation. The analytical technique of microwear allows researchers to investigate relationships among artifact morphology, function, and reduction sequences. Understanding these relationships is crucial to our comprehension of Stone Age technological organization in order to better understand strategic decisions Paleolithic humans made regarding tool use.

Ornaments as Artifacts and Reflections of Site Function at the Early Upper Paleolithic Site of Üçağızlı Cave I (Hatay Province, Turkey)

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More than 2,000 mollusk shell ornaments were collected from the excavations of Üçağızlı Cave I in southern Turkey, which preserves a rich, multi-layered record of early Upper Paleolithic activities spanning 41–29 ka (uncalibrated radiocarbon years, Kuhn et al. 2009). Most recent literature on very early shell beads has focused on demonstrating their antiquity and association with humans. This study considers the contexts of ornament use in relation to site function and the diversity of human activities by examining how the ornaments were made and used as well as the contexts of their disposal and loss. A range of evidence testifies to high activity diversity on site. People carried finished artifacts to this seasonal residential hub and usually stay long enough to produce more. The input rates for shell beads, bones, and stone tools parallel one another through time, indicating overall consistency in the roles of these artifacts in human activities at the site. Üçağızlı Cave I was situated near a rich source of marine shells. Not surprisingly, evidence of manufac-

turing errors is widespread, and unused shells and "eccentric" forms are common in some cases. In addition to unaltered shells and manufacture rejects, ornament assemblages from all layers include specimens that were moderately or heavily used. These artifacts display localized fine polishes that indicate that the shells arrived on site affixed to human bodies or organic artifacts. The small basket forms of the genus *Nassarius* and close cousins were a great favorite in earliest ornament assemblages in Africa and Eurasia. This is the most important form in the earliest Upper Paleolithic of Üçağızlı I as well. However, taxonomic diversity in the shell ornament assemblages increases steadily with time at this site. Some of this variation may reflect local changes in coastline habitat structures, but human-imposed biases are apparent with respect to the range of erratic forms.

Secondary Human Burial of Magdalenian Age in El Miron Cave (Ramales, Cantabria, Spain): A Preliminary Presentation

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During 2010–2011 excavations in El Miron, a partial human skeleton was uncovered in Magdalenian archeological context in the narrow space between a large decorated block and the rear of the cave vestibule. The remains consist of a nearly complete mandible with worn teeth including the right and left P4-M3 series, loose lower and upper incisors, a tibia shaft, clavicle, parts of a scapula and pelvis, patella, several ribs and vertebrae, and numerous hand and foot bones. The bones are stained with red ocher, as is the sediment matrix and the side of the block adjacent to the remains. Some of the bones seem to have been placed directly atop a bedrock ledge and the rest were in a small pit dug into an archeological level banked up against the ledge, all within an area of ca.1square meter. The burial was covered by four rocks, in turn overlain by a hearth layer AMS-dated on charcoal to 15,120 uncal BP. Animal bones from the burial layer are dated to 15,740 BP. Although analyses are only beginning, it appears that the burial is of a single, small adult. Hitherto only the tibia shows signs of carnivore modification. There is evidence of possible infection on the mandible. The associated cultural remains include abundant unretouched flint bladelets, as well as classic Lower Cantabrian Magdalenian tool types (e.g., backed bladelets, nucleiform scrapers, antler points). Unambiguous grave goods seem absent. The individual was interred soon after the large block fell atop a 16,000-year-old Lower Magdalenian level. The block's outer face (oriented toward the cave mouth) was engraved with numerous lines shortly thereafter—perhaps contemporaneously with the burial and the painting of the inner face of the block. This is the first Magdalenian burial to be found in Iberia and suggests highly ritualized deposition during a very intensive occupation of El Miron, characterized by works of portable art, hearths, tool manufacture, and abundant red deer, ibex, and salmon remains.

Acknowledgements: Thanks to the Government of Cantabria for permits and funding, the L.S.B.Leaky Foundation, and the UNM Foundation Fund for Stone Age Research (Jean and Ray Auel, principal donors) for funding the 2010–2011 seasons.

Late Juvenile, Early Adult Cranial Growth in *Pan*

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Some of the most prominent specimens in the hominin fossil record are either late juvenile or early adult individuals (M2s but not M3s in occlusion; unfused spheno-occipital synchondrosis). Examples include type specimens (MH1, OH5, and OH7), as well as well-preserved skulls (KNM-WT-15000 and D2700). Such specimens are frequently considered in studies assessing taxonomy or phylogeny, with the explicit or implicit assumption that at this stage of development various relevant characters are already fully adult in morphology. However, little is known about this later phase of growth and development in hominid taxa, with a marked absence of comprehensive quantitative studies specifically mapping morphological change from late juveniles into adulthood. Here we present a quantitative analysis of shape changes during late stages of cranial ontogeny in a sample of 41 wild chimpanzees. Cranial morphology was quantified using 152 3D landmarks and 38 semilandmarks on curves. Data were collected in a virtual environment, from high-resolution CT-scans. Changes in size and shape were analyzed using geometric morphometric techniques. Data were converted to shape variables using Procrustes superimposition and visualized using principal component analysis in Mathematica and the EVAN toolbox. Multivariate regressions of shape on centroid size were used to assess ontogenetic allometry; comparisons of mean shapes computed for dental age groups further illustrate the shape changes in late juveniles. The results show that after the eruption of M2 the chimpanzee cranium shows little change in overall size and shape, but localized events can be discerned, mostly associated with ongoing expansion of the frontal and temporal bones, as well as development of the masticatory musculature. These findings are in agreement with observations in previous studies (Krogman 1931). The developmental models obtained for the extant taxa provide a framework for interpreting subadult fossils, and will make it possible to predict their adult cranial morphology.

Acknowledgements: We thank Christophe Boesch and Jean-Jacques Hublin for access to the CT-scans of the Tai chimpanzee skeletal collection housed at the MPI-EVA.

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The Oldowan and *Homo habilis* at Swartkrans

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Excavations from 2005–2009 in the oldest deposits at Swartkrans, the Member 1 Lower Bank, resulted in the recovery of >1,000 stone artifacts. Previous excavations by C.K. Brain yielded 298 stone artifacts, but the absence of Large Cutting Tools and flakes >10cm in size (diagnostic of the Acheulean) left the assemblage unresolved as to industry. The situation was further complicated by the faunal age estimate for Member 1 (1.7 or 1.8 Ma) which is close to the date for the earliest appearance of the Acheulean in Africa at 1.7 Ma. Our analysis of the expanded artifact sample for the Lower Bank, together with forthcoming dates which indicate that the deposit is substantially older than 1.7 Ma, now leads to the conclusion that the industry is Oldowan. The reduction methods, raw material exploitation, and size profile of the assemblage all compare well with the Oldowan at Sterkfontein in South Africa and Oldowan sites in East Africa. A crushed cranium of a hominid child from Member 1, SK 27, was classed by Broom (1949) and Broom and Robinson (1952) as *Paranthropus*. However, Clarke (1977) demonstrated that it was in fact the cranium of an early *Homo*, with some similarities to the *H. habilis* cranium KNM-ER 1470. Following our technological re-assessment of the archaeology, Clarke has re-examined SK 27 and now concludes it is *H. habilis* (Clarke in prep.), as it compares very well with the OH 65 *H. habilis* specimen from Olduvai. We thus argue that the Lower Bank of Member 1 contains an Oldowan assemblage >1.7 Ma and that *H. habilis* is present in Member 1 of the Swartkrans Formation.

Acknowledgements: The Swartkrans Paleoanthropology Research Project (SPRP) is supported by grants to: T.R. Pickering from the National Science Foundation (USA), the L.S.B. Leakey Foundation, the Palaeontological Scientific Trust (PAST), and the Vilas Associates Program (University of Wisconsin-Madison); to Morris Sutton from the National Research Foundation (NRF, South Africa) and PAST; and to Kathleen Kuman from PAST and the NRF. We thank the following individuals and institutions (in alphabetical order) for their assistance with our project: the Brain/Newman/Watson family; Laurent Bruxelles; Anna Craven-Sutton; John Cruise; Hendrick Dingiswayo; the Institute for Human Evolution, University of the Witwatersrand; Barry Jacoby; Lazarus Kgali; Isaac Makhele; Nkwane Molefe; Abel Molepolle; Stephen Motsumi; Andrew Phaswana; the T.R. Pickering family; Stephany Potze; Dusty van Rooyen; the School of Geography, Archaeology and Environmental Studies, University of the Witwatersrand; Lucas Sekowe; Solomon Seshoene; Francis Thackeray; the Transvaal Museum.

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Fossil Hair Identification in *Parahyaena brunnea* Coprolites from Middle Pleistocene Deposits at Gladysvale Cave, South Africa

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The field of paleoanthropology appreciates the insights that ancient mammalian hair can provide into a site's function, the nature of the paleoenvironment, species evolution, and the inter-relationship between people and animals in the past. This research focuses on scale pattern and cross sectional morphology of hair to identify fossil hairs from *Parahyaena brunnea* (brown hyaena) coprolites, from Gladysvale cave, South Africa, using scanning electron microscopy. The coprolites are part of a brown hyaena latrine preserved in calcified cave sediment dated to the Middle Pleistocene (257–195 ka). Following the recent discovery of possible human hair in a single coprolite, the purpose of this project is to identify fossil hairs in an enlarged sample of coprolites from the same deposit. A 75cm block of the calcified latrine, containing twelve coprolites, was removed for laboratory analysis. Forty-eight fossil hairs were extracted using fine tweezers and a binocular microscope, and were examined using scanning electron microscopy. Hair identification was based on consultation of standard guides to hair identification and comparison with my own collection of samples of previously undocumented guard hairs, from 15 taxa of indigenous southern African mammals. Samples were taken from the back of pelts curated at the Johannesburg Zoo and Ditsong National Museum of Natural History in Pretoria. Based on the fossil hairs identified here, this research has established that between 257 and 195 ka, brown hyaenas shared the Sterkfontein Valley with warthog, impala, zebra, kudu, black wildebeest, and, interestingly, with humans. These animals are associated with savanna grasslands, much like the Highveld environment of today. These findings provide a new source of information, besides faunal remains, on the local Middle Pleistocene fossil mammal community, and insight into the environment in which archaic and modern humans in the interior of the African subcontinent lived.

Acknowledgements: I am very grateful to all my project sponsors, namely the Palaeontology Scientific Trust (PAST), South African National Research Foundation (NRF) through a grantholder-linked bursary to Lucinda Backwell, and a Postgraduate Merit Award from the University of the Witwatersrand. Dr. Lucinda Backwell and Professor Lee Berger deserve many thanks for guiding me throughout this research, in particular Lucinda for her exceptional motivation, patience, and inspirational criticism. I am most grateful to Professor Michael Witcomb for his invaluable technical assistance during scanning electron microscope analysis of hair samples. Dr. Theresa Kearney and the Ditsong National Museum (formerly Transvaal Museum), and Mrs. Louise Matschke and the Johannesburg Zoo are also thanked for providing me with modern comparative hairs for my investigation.

Reassessment of the Formation and Significance of the Mwanganda's Village 'Elephant Butchery Site,' Karonga District, Northern Malawi

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Mwanganda's Village, a site in the Karonga District of northern Malawi, is one of three formally published Middle Stone Age (MSA) sites from Malawi and one of only a handful from central Africa. It was originally excavated by Clark and Haynes (1970) with later geoarchaeological work done by Kaufulu (1990). Its current significance is based on two commonly-cited claims: 1) It is a MSA occurrence with Sangoan stone tool technology; and, 2) It is an early proboscidean butchery locality. These factors make Mwanganda's Village an important reference point for MSA research, but there are several reported aspects of the site that require revision and/or updating. Three seasons of fieldwork in the Karonga District under the Malawi Earlier-Middle Stone Age Project (MEMSAP) have included new excavations, dating, lithic, and faunal analysis at Mwanganda's Village. This has resulted in a much firmer understanding of the depositional chronology of the site. The original 'elephant butchery site' is embedded within a larger terrace sequence, and initial U/Th ages confirm at least a Middle Pleistocene age for the locality. However, there is no confirmed behavioral association between the recovered artifacts and fossil fauna. On a higher terrace ca 60m to the southeast an intact terminal MSA lithic assemblage dating between ~ 22 and 42 ka was recovered over a meter below the present surface. This suggests that the true significance of the site may lie in its contributions to understanding the later rather than the earlier end of the MSA, or in its potential to inform about both at the same locality.

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Femoral Anteversion and Incomplete Femora: A Geometric Morphometric Investigation

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Obtaining an accurate measure of femoral anteversion has long been a topic of interest in clinical and anthropological research. Several publications provide informed accounts of variation between recent human populations as well as patterned behaviors influencing the expression of femoral anteversion (Angel 1952; Eckhoff et al. 1994; Kate 1976; LeVeau and Bernhardt 1984; Young 2004). Unfortunately, little of the available data has been applied to the hominin fossil record. Much of this derives from the fact that complete femora are rare in the fossil record due to preservational issues. In addition, traditional methods of measuring anteversion require the preservation of anatomical features not related to the torsion present in the diaphysis. Therefore, obtaining femoral anteversion data is often restricted to specimens of near perfect preservation. The research addressed in the current study, examines the utility of obtaining anteversion data from incomplete femora using geometric morphometrics. The use of 3D morphometric landmark and semi-landmark data enabled the author to quantify the amount of a femur required to obtain a reliable anteversion measurement. Comparison between anteversion measurements collected using traditional methods and measurements collected using 3D coordinate data was made possible using standard multivariate methods.

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Dual Inheritance Modeling and the Middle to Upper Paleolithic "Transitional" Technocomplexes: The Implications of the Szeletian and Bohunician of the Central Europe

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It is a propitious time to highlight the dual role of cultural and biological transmission among Pleistocene hominins in understanding the nature of the Middle to Upper Paleolithic "transitional" technocomplexes in Europe. Recent studies necessitate the reevaluation of extant hypotheses for interaction between Neanderthals and modern humans, including the modern human association with the Uluzzian in Italy (Benazzi et al. 2011), the technological comparisons drawn by Roussel (2011) between the Châtelperronian at Quinçay and the Protoaurignacian of southern France, the re-dating of worked bone from the Châtelperronian at Grotte du Renne (France) (Higham et al. 2010), and Nigst's (2009) re-dating of the Early Aurignacian in Layer AH3 at Willendorf II (Austria). Most significant, however, is Green et al.'s (2010) conclusions concerning the 1–4% contribution of Neanderthal genetic sequences into living Eurasians. The present paper reports on a reanalysis of the "transitional" technocomplexes of the Middle Danube region, specifically the Szeletian and the Bohunician, according to the expectations of dual inheritance modeling as applied to Pleistocene lithic assemblages (Tostevin 2012). The analysis is conducted using Tostevin's data from the Micoquian of Kůlna Cave Layer 7a, the Bohunician assemblages from Stránská skála, and Brno-Bohunice (Czech Republic), and Nigst's (2009) data from the Aurignacian of Willendorf II Layer AH3 and the Szeletian of Layer AH2. Multiple hypotheses involving combinations of cultural and biological transmission between known assemblages are evaluated through the three-assemblage comparison approach of Tostevin (2007), which produces a quantitative measure of the goodness of fit between the archaeological record and model predictions for the directionality of cultural transmission of technological learning sets. The paper concludes by using the Middle Danubian Szeletian and Bohunician to problematize the current treatment of the Châtelperronian, Uluzzian, and other "transitional" technocomplexes in the arguments over the dispersal of modern humans into Europe.

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Analyzing Fertility and Attraction in the Paleolithic: The Venus Figurines

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Over the past century, countless hypotheses have attempted to explain one of the least understood artifacts, the "Venus figurines." The problem with most of these hypotheses is that they are not testable. The current authors investigated a hypothesis first suggested, but not thoroughly researched, by R. Dale Guthrie involving the Waist-to-Hip Ratio. The Waist-to-Hip Ratio is a measurement that determines fertility, beauty, and health in modern human females; women with a ratio of a .7 are considered attractive cross culturally. Guthrie argued that the figurines share a low average Waist-to-Hip Ratio of .655, indicating that Paleolithic males preferred curvier women than do modern males. Our research has sought to determine two things: whether the statuettes are representative of Paleo-erotica based on the presence of a low average Waist-to-Hip Ratio, and whether the results are homogeneous across each region (Central Europe, Western Europe, The Russian Plains, and Siberia). Our mean was 1.049 and was significantly different than Guthrie's ($t=13.21$, $p<0.0001$). We also found that there are differences in mean Waist-to-Hip Ratios among the four sites sampled, with Central Europe, Siberia, and Western Europe being similar to each other and the Russian Plains being different. Therefore, we have determined that while some of the statuettes may have served as Paleo-erotica, it seems unlikely that they all did. While one statuette may represent Paleo-erotica, another may have represented an ancestor or depicted pregnancy. It is important to understand the context of each statuette instead of searching for a single unifying hypothesis.

Acknowledgements: Allison Tripp would like to thank Leiden University Funds, Dr. Wil Roebroeks, Dr. Kathy MacDonald, Svetlana Demeshchenko, Dr. Gennady Khlopachev, Dr. Sergey Vasil'ev, Dr. Sabine Gaudzinski, and Dr. Olaf Jöris.

The Discovery of New, Intact, Middle and Upper Paleolithic Deposits at La Ferrassie

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For almost a century the site of La Ferrassie has played an important role in research into at least two major aspects of Middle Paleolithic behavior—the question of Neandertal mortuary behavior and as the eponymous site of the Ferrassie Mousterian industry. The Upper Paleolithic component of La Ferrassie also has contributed significantly to subsequent descriptions and definitions of Upper Paleolithic stone tool systematics (Chatelperronian and Aurignacian). The original, and by far the most extensive, excavations at the site were conducted by Capitan and Peyrony's work in the early part of the 20th century. This was followed by more limited excavations by Delporte from 1968 to 1973, along with some geoarchaeological studies, which focused almost exclusively on the eastern part of the site. New research by the present team took place in 2010–2011 and has demonstrated the presence of previously unknown deposits in the extreme western area of the site, which is immediately adjacent to the original locations of where the Neandertal skeletons La Ferrassie 1 and 2 were originally found. At the base, these deposits contain several Middle Paleolithic levels. Although the current assemblages are small, it is clear that one of these levels includes bifaces (most likely representing the Mousterian of Acheulian Tradition) and that this level is overlain by another that appears to be the classic Ferrassie Mousterian. Some limited, but very rich, Upper Paleolithic deposits are preserved in this part of the site that have yielded an assemblage not inconsistent with an Aurignacian designation. So, the configuration of the preserved deposits presupposes that Chatelperronian and perhaps Proto-Aurignacian are also present. This poster will present the new findings and results that are currently available as well as the larger goals of continued excavation at the site. These goals include: 1) analyzing site formation processes, particularly with a goal of 2) documenting the sedimentary context of the La Ferrassie 1 and 2 skeletons, 3) providing dates for the remaining sequence, including providing at least a maximum age for the La Ferrassie 1 and 2 skeletons, 4) re-assessing the Ferrassie type industry, 5) assessing the bifacial industry situated stratigraphically below the Ferrassie industry; and, 6) examining the early Upper Paleolithic industries.

Functional Analysis of ~500 ka Lithic Points from Kathu Pan 1, South Africa

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It is frequently suggested that MSA points were hafted and used as spear tips, but so far only a limited number of use wear and residue analyses of MSA points support this view. There have been no functional studies of points securely dated to >250 ka. However, the manufacture and use of lithic-tipped hunting weapons, which changes the efficiency of prey acquisition and foraging, has important implications for hominin evolution. At Kathu Pan 1 (KP1), South Africa, points were recovered from sediments dated by OSL to 464±47 and combined U-series/ESR to 542+140/-107. Based on the co-occurrence of blades, points, and handaxes, the assemblage has been attributed to the 'Fauresmith' industry, variably designated as early MSA, late Earlier Stone Age, or 'transitional.' Here we report results from a functional analysis of 210 points and point fragments from KP1 and replication experiments using hafted points and a calibrated crossbow. Edge damage was identified with 10–50x magnification, and systematically mapped using GIS software. Three hypotheses for edge damage formation on KP1 points were evaluated: use as armature tips, use as cutting tools, and post-depositional processes. Multiple lines of evidence support the hypothesis that KP1 points were used as spear tips. Edge damage distribution on ventral lateral margins is inconsistent with a distribution resulting solely from post-depositional processes. Damage on KP1 points increases significantly at the tip, and the left and right sides have equivalent distributions, consistent with experimental spear points but inconsistent with cutting tools and taphonomic patterning. 'Diagnostic impact fractures,' proximal modification, and point morphometrics provide additional supporting evidence for the spear tip hypothesis. This study documents the earliest evidence for hafted hunting weapons.

MSA Lithic Assemblages from Hoedjiespunt 1 and the Evolution of Coastal Adaptations in the Western Cape of Southern Africa

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The earliest systematic exploitation of shellfish by *Homo sapiens* in the Middle Stone Age (MSA) has been the focus of recent research. New excavations at the MSA open-air shell midden Hoedjiespunt 1 (HDP1) on the West Coast of South Africa shed light on the evolution of these coastal adaptations. HDP1 dates to the last interglacial and consists of three occupation phases, each containing abundant lithic artifacts, shellfish, terrestrial fauna, ostrich eggshell, and ground ocher. The site provides an excellent case study to analyze behavioral adaptations linked to early exploitation of marine resources. We reconstructed activity patterns through an in-depth study of the lithic assemblages combining analyses of the reduction sequences, artifact attributes, and quartz fracturing. These methods allow insights into raw material procurement, lithic reduction sequences, site use, mobility patterns, and foster comparison with other MSA coastal sites. The basic features of the assemblages remain constant throughout the sequence. Quartz dominates silcrete and other raw materials by almost four to one. Flakes produced by various non-systematic core reduction strategies are the dominant blank type (>90%). Denticulates represent the most frequent tool form. The assemblages show complete, bipolar, and hard hammer reduction sequences for the locally available quartz, but highly truncated reduction sequences with many isolated end-products for silcrete, a material with a minimum transport distance of 10–30km. This pattern suggests "provisioning of individual" and anticipated coastal settlement shifts for shellfish exploitation. The simultaneous occurrence of flexible raw material use, anticipated long-distance transport, systematic gathering of shellfish, and pigment use is probably the most important behavioral observation at the site. While the HDP1 lithic assemblages show a distinctive signal, the results enhance comparisons with early MSA coastal sites such as Ysterfontein and Pinnacle Point. In summary, HDP1 adds new facets to our knowledge about early coastal adaptations of *Homo sapiens*.

Acknowledgements: We thank Heritage Western Cape for permission to excavate and Captain Peter Stowe, Harbor Master at Transnet National Ports Authority of Saldanha Bay, for access to the site. Judy Sealy and Louisa Hutten of the Department of Archaeology at University of Cape Town (UCT) arranged work space and equipment. Katherine Kyriacou provided data on shellfish, and Cuan Hahndiek photographed lithic artifacts and ocher. Students and staff from UCT and Tübingen volunteered on the excavation. Colleagues of the Zamani Project, including Heinz Ruther, Roshan Bhurtha, and Ralph Schroeder of Geomatics at UCT, conducted photogrammetric studies and generated base maps of the Hoedjiespunt Peninsula. Guillaume Porraz of the Centre National de Recherche Scientifique (CNRS-UMR 7041-ArScAn) allowed access to the Diepkloof Rockshelter Silcrete Database. John Rodgers, David Reid, and Chris Harris of the Department of Geology at UCT shared their local expertise identifying lithic raw materials. Frank Brodbeck of the University of Tübingen illustrated the lithic artifacts. The Heidelberg Academy of Sciences and Humanities and the Senckenberg Center for Human Evolution and Quaternary Ecology funded the project.

Dating the Earliest Microblade Industries in Northern China

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The well-known distribution of microlithic industries in northeast Asia, the Japanese archipelago, and northwest America is a subject that attracts attention today due to the genetic hypotheses concerning the dispersals of modern humans into East Asia and beyond. The Loess Plateau in North China is one of the key areas for the study of microblade assemblages. Current suggestions view the Upper Paleolithic of the Altai Mountains as the source of the knapping techniques for the production of narrow, thin bladelets, detached by direct or pressure percussion. A series of traditional Upper Paleolithic blade-dominated assemblages in the Altai date to 38,000–30,000 cal BP, but similar industries were found in northeast China. Therefore, without debating the location where direct percussion of prismatic blade cores changed into or was replaced by special prepared microlithic cores such as 'wedge shaped,' "pencil-shaped,' and others, the dating of the earliest microblade assemblages may shed light on the time when their makers occupied the loess-covered region of north China. Many of the microblade sites in China are known from surface collections. However, several sites, either excavated in the past or recently, produced radiocarbon dates. When calibrated, the dates indicate that the first manifestations of microblades should be attributed to the conditions of the late MIS3 (ca. 29,000–25,000 cal BP), several millennia before the impact of the cold and dry conditions of the LGM (24,000–18,000 cal BP). Among the earliest dates are those obtained from Longwangchan (Shaanxi), and Xiachuan and Sizitan (Shanxi). Later, during the LGM, the harsh environmental conditions forced many of these foragers to move further south. A few sites of the post-LGM assemblages through the early Holocene in Shanxi, Hebei, Gansu, and other provinces, illustrate the continuity and distribution of the microblade tradition in north China.

Cores-on-Flakes and Worked Flakes in an Early Pleistocene Context: New Evidence from the Oldowan-like Site of Bizat Ruhama, Israel

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The lithic industries assigned to the Mode 1 techno-complex are characterized by simple reduction sequences consisting of two stages, raw material acquisition followed by detachment of the flakes. Unmodified sharp-edged flakes produced at the end of this reduction

sequence are currently interpreted as the major goal of the Mode 1 lithic production systems. Only rarely do Mode 1 industries show evidence for post-detachment treatment of the flakes. Retouched flakes were reported in low quantities from several sites, while flakes used as cores are extremely rare. The lithic assemblage of Bizat Ruhama, an Oldowan-like site in Israel, provides novel evidence for post-detachment flaking, breakage, and modification of the flakes in the Early Pleistocene. The site of Bizat Ruhama, currently dated to the Matuyama paleomagnetic chron (1.96–0.78 Ma), is one of the earliest and best preserved Mode 1 occurrences in Eurasia. The excavations at the site have yielded several lithic assemblages (ca. 2,000 artifacts) composed mostly of cores and debitage products. The raw materials used at the site were small rounded pebbles from which flakes were detached by a number of simple methods with frequent use of bipolar technique. About half of the flakes produced during core reduction were further flaked, broken, or notched. The selected flakes were either used as cores for removal of a few flakes struck by free-hand techniques, or were knapped against an anvil. In both cases, the probable goal of the knapping was to produce small, thin flakes. Flake knapping was probably a response to the raw material constraints in the area. The intensive use of flakes for further knapping at Bizat Ruhama offers a new look into the complexity of Mode 1 lithic production systems and the flexibility and adaptive skills of Early Pleistocene hominins.

Acknowledgements: The Bizat Ruhama excavations were supported by LSB Leakey Foundation.

The Effect of Ochers on the Material Properties of Resin Hafting Adhesives

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Ochers are a group of ferruginous minerals united by their ability to produce strongly colored streaks suitable for use as pigment. The presence of red and yellow ochers, composed of the minerals hematite α-Fe^2O^3) and goethite α-FeOOH) often in combination with clay minerals or quartz, have been widely reported from Middle Stone Age (MSA) excavations and are frequently interpreted as a proxy for symbolism. A human preference for red ochers has been repeatedly noted by both archaeologists and ethnographers. Residue analysis of lithics from Sibudu Cave, South Africa, dating to 26– 60 ka, and subsequent experimental studies of plant resin glues have suggested that MSA people used ocher to improve the adhesives used in compound tool production. Here we report a new study quantitatively comparing the material properties of multiple adhesives formulated from *Acacia senegal* resin and five different ochers or a non-ferrous control. We specifically address whether the patterns of color represented in MSA ocher assemblages can be explained through a utilitarian hafting adhesive interpretation. Using acacia resin, distilled water, five ochers, and silicon dioxide sand, we formulated six adhesive recipes and used these to replicate hafted projectile armatures in a standardized manner. Each sample was subjected to a modified lap shear test to determine the relative efficacy of the adhesive formulas. Additional samples were subjected to: 1) standard lap shear tests to calculate each formula's work of adhesion; and, 2) indentation testing in order to determine Young's Modulus. Our results indicate that while the addition of ochers or quartz sand does improve acacia resin adhesives, there is no significant functional reason for red ocher specifically to be preferentially used in hafting glues. This suggests that the selective acquisition of red ochers by MSA humans was mediated primarily by visual properties, supporting a material symbolism interpretation of ocher use.

Acknowledgements: This project would not have been possible without: Burl Bowman (Hoover Color Corporation) who graciously continues to supply samples of red and yellow ocher, Dr. Peter Lucas (Kuwait University) whose material science advice has proven invaluable, and Dr. Paul Constantino (Marshall University) who offered his help before we even had a real project. Dr. Catherine Forster (GWU), Scott Anderson (GWU), Jeff Speakman, Nicole Little (Smithsonian Museum Conservation Institute), and Kevin Verhulst (University of Iowa) all supported last year's preliminary investigation. Thank you all. This project was supported by the NSF-IGERT DGE-0801634.