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Determining early hominid habitats in the Middle Awash Valley, Ethiopia, using paleosol stable isotopes

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The rich hominid fossil record in the Middle Awash region of the Afar Rift of Ethiopia spans the Late Miocene to Pleistocene. Associated fossils and sediments can be used to investigate fundamental questions about the environmental contexts of early hominids. Paleosol (fossil soil) carbonate and organic matter carbon isotope ratios provide direct, quantitative evidence for floral microhabitat composition, specifically the proportions of trees to grasses. Pedogenic carbonate oxygen isotope ratios are influenced by several factors, including temperature, humidity, evapotranspiration, elevation, proximity to oceans, and global ice volume (Cerling 1984). Paleosol carbonates were analyzed from twelve localities associated with early hominid fossil horizons along the western margin and rift floor of the Middle Awash. Samples from Late Miocene sites (5.8-5.2 Myr) associated with *Ardipithecus ramidus kadabba* (Haile-Selassie 2001) have the lowest $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values, reflecting grassy woodland to closed woodland habitats (WoldeGabriel *et al.* 2001). Woodland habitats persisted until at least 3.8 Myr. Samples from Late Pliocene sites (2.5 Myr) associated with *Australopithecus garhi* (de Heinzelin *et al.* 1999) have intermediate values, reflecting a mosaic of grassy woodland and wooded grassland microhabitats. Early Pleistocene sites associated with *Homo erectus* (1.0 Myr) (Asfaw *et al.* 2002), and late Pleistocene sites associated with an advanced Acheulean industry (0.3 Myr) (Schick and Clark 2000) have the highest carbon and oxygen isotope ratios, reflecting predominantly lightly wooded to open dry grasslands.

Oxygen isotope ratios increase by approximately 18‰ from the Late Miocene to the Pleistocene, reflecting local increases in temperature, decreases in humidity and increased global ice volumes. The high magnitude of this shift suggests decreased elevation, caused by subsidence of the Afar Rift Valley, contributed to the high rate of increase in $\delta^{18}\text{O}$ values through time.

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An assessment of patterns of geographic variation in the frontal bone morphology of Middle Pleistocene *Homo*

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This study examines the predictions embodied in competing models of the evolutionary history of Middle Pleistocene *Homo* through a detailed analysis of geographical variation in frontal bone morphology. Evidence that geographically proximate populations are morphologically more similar and those further apart are more dissimilar would lend support to a clinal model of variation. A significant correlation between lower morphological and geographic distance classes but not among higher ones would suggest that isolation-by-distance and multiple dispersals are likely sources of craniofacial variation among these populations. A final alternative hypothesis sees variation as the product of cladogenesis and thus significant at the species level, whereby no geographic patterning in the distribution of morphological features would be observed.

Six sagittal, parasagittal and coronal outlines of the frontal bone were collected on forty-five Early, Middle and Late Pleistocene fossils. These outlines were quantified using Elliptical Fourier Analysis. The amplitude measurements were reduced using principal components analysis and a Euclidean distance matrix was calculated. A geographic distance matrix was then constructed using pairwise sets of fossils. These matrices were compared using Mantel's test to determine if morphological distance was significantly correlated with geographic distance. A second analysis on the original principal components scores, using Moran's spatially autocorrelated *I* statistic, was used to determine if these variables at various geographic locations were significantly different, and what the pattern of those differences was. This analysis indicates that there is no significant correlation between the degree of morphological differentiation and the geographic distance of these fossils, thus failing to support a model of clinal patterning in the observed variability. However, morphological differences are consistently smaller between specimens within the same or neighboring regions. Thus, an explanation proposing a high degree of cladogenesis among these fossils is also not supported. These results suggest that isolation-by-distance is a likely source of craniofacial variation among Middle Pleistocene *Homo*. This would be consistent with a scenario proposing low population densities and multidirectional dispersal patterns among the groups of this time period.

Environmental context and taphonomy of the A.L. 333 Locality, Hadar, Ethiopia

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The A.L. 333 locality in the Denen Dora Member of the Hadar Formation is one of the most enigmatic concentrations of early hominid remains ever found. As of 2002, 257 specimens representing at least 17 individuals have been recovered, and excavation and surface screening indicate that most if not all are derived from a single stratum within a restricted area of outcrop. In 2001-02, microstratigraphic study of well-exposed strata surrounding the site revealed that the bone concentration was preserved in the uppermost fill of a channel system, which has been traced across an area of paleolandscape approximately 2.0 by 0.8 km. When active, the channel was up to 3m deep, 40m wide and flowed north, with smaller and shallower tributaries feeding in from the south and southwest. At the time of burial of the hominids, the abandoned channel formed a shallow swale that carried only low-energy, silt-bearing flow during flood events. The hominid-bearing zone at the excavation site is heavily bioturbated with carbonate nodules and root casts, indicating pedogenesis associated with the channel fill silts. Other faunal remains from the excavations include only fragments of rodent, amphibian, snake, fish, bird, mollusk, eggshells, and a few crocodile and large mammal teeth. Throughout the area examined, the channel has relatively few fossils, highlighting the uniqueness of the hominid concentration. Overall sedimentary context, skeletal part preservation, and lack of abrasion on the remains as well as their degree of spatial and stratigraphic concentration all indicate that the hominids died where they were buried in a slight depression formed by an abandoned channel. Bone modification features suggest that scavenging and weathering affected some remains prior to final burial. The evidence argues against death caused by an unusual flood or mining and leaves open the possibility of predation or another cause of sudden mass mortality.

Two steps away from the end of the world: the Upper Paleolithic site of Vale Boi, southwestern Portugal

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The site of Vale Boi is located 2 km from the modern Atlantic shoreline, on the southwestern tip of Europe. The long cultural sequence preserved at Vale Boi begins in the late Middle Paleolithic, and nearly all of the Upper Paleolithic is represented. It is a rich site marked by good faunal preservation, with thousands of bones and shells, several bone tools, and some perforated shell and tooth ornaments. Also, it is represented a very diverse lithic assemblage. This paper will focus on two aspects. The first concerns evidence of resource intensification as seen through bone grease rendering (in the Gravettian deposits) and overall changes in prey diversity. The second aspect is related to the interregional connections between Algarve and other areas in the Iberian Peninsula implied by the presence of raw material coming from the Rio Maior area, near 500 Km to the North of Vale Boi, as well as by typological and technological traits resembling those from the Spanish Levante, some 500 Km to the East.

Phylogenetic significance of endocranial features and the problem of variation: A CT-based study

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Over many decades and especially since computed tomography has entered paleoanthropology, numerous endocranial features have been suggested to be of phylogenetic relevance for human evolution. These include e.g. the positions of the cribriform plate and the pituitary fossa, the inclination of the anterior cranial fossa and the crista galli, the orientation of the posterior petrous surface, the occurrence of an arcuate eminence, etc. In the course of our virtual study of the endocranial morphology of the matrix-filled archaic *Homo sapiens* cranium from Eliye Springs, Kenya, we examined a large number of such features in order to determine where this hominid exhibits ancestral or more derived modern conditions. In addition to the Eliye Springs specimen, a small sample of final Pleistocene/early Holocene crania from Tanzania was also scanned and 3D reconstructed using the VOXEL MAN program. Even this limited number of specimens revealed the great variation that exists for many features, often clouding their phylogenetic significance. Moreover, it became evident that clear, reproducible definitions are needed for many traits, when they are assessed by virtual tools. Earlier endocranial descriptions mainly based on fragmentary specimens need to be re-assessed in the light of the current methodological possibilities. Finally, larger recent and fossil samples have to be examined to provide an increasingly better basis for analysing the phylogenetic relevance of most endocranial features.

Quantifying Oldowan Lithic Reduction Sequences: Theoretical and Methodological Considerations

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The wealth of recent research in the Oldowan continues to expand our understanding of tool using hominid behaviors. New data suggest that the behavior of Oldowan hominids may be more diverse than previously indicated. Studies of artifact manufacture, use, and transport have the advantage of interpreting behavioral patterns from one of the largest body of data on early hominid behavior: stone tools. Models developed in the 1980s to understand processes of stone tool production (reduction sequences) provide a basis for comparing patterns of artifact use, transport, and discard across archaeological locales. Results derived from a recent analysis of reduction sequences at Olduvai Gorge by Kimura (2002) suggest regional and temporal variability within the Oldowan. This variability is explained as evolutionary changes within the Oldowan focused on increased intensity of artifact transport through time. This increase in artifact transport is seen as a corollary to increases in hominid ranging patterns through time.

However, investigating the manufacture and transport of stone tools in the Oldowan may be more complicated than previously thought. Models of Oldowan artifact use and transport are based on reduction sequences that may be influenced by size-related factors. Here we report on experimental and comparative archaeological evidence that begins to address the influence of cobble size on patterns of artifact manufacture and reduction in the Oldowan. This analysis suggests that existing reduction sequences are limited in their ability to elucidate patterns of transport and discard in Oldowan assemblages. Inferences about Oldowan behavior based on current models of artifact reduction and discard may thus be questionable. Replicative experimental data are used to improve upon previous models of reduction sequences in the Oldowan. Using multivariate techniques, a continuum-based size-independent model is developed for understanding Oldowan artifact reduction and transport. This model is then tested against data from refitted Oldowan artifact sets from the Koobi Fora Formation in northern Kenya.

Sahelanthropus tchadensis (Late Miocene of Chad), the earliest hominid

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The new Chadian hominid *Sahelanthropus tchadensis* Brunet *et al.*, 2002, nicknamed Toumaï, recovered by the M.P.F.T. from the Late Miocene of Toros-Menalla (Djura desert) is associated with a fauna (42 species) of which the mammalian component (24 species) indicates a biochronological age close to 7 million years.

The fauna comprises aquatic (fish, turtles, crocodiles) and amphibious (anthracotheriids, hippopotamids) vertebrates, but also species inhabiting gallery forest (monkeys), wooded savanna (proboscideans, giraffids, suids, etc) and grassland (bovids, tridactyl equids). Sedimentological data (Aeolian sandstones, periacustrine sandstones, diatomites) are in agreement with this mosaic of environments, indicating a vegetated periacustrine belt between lake and desert.

The new hominid displays a unique combination of primitive and derived characters that clearly shows that it is not related to chimpanzees or gorillas, but rather suggests that it is an ancestor of later hominids, and probably temporally close to the common ancestor of chimpanzees and humans.

The geographic location of Toumaï, 2500 km west of the Rift Valley, along with its great antiquity, suggest an early (at least by 6 to 7 million years ago) widespread hominid distribution (Sahel and East Africa), and a somewhat earlier chimpanzee-human divergence (at least 7 million years ago) than previously indicated by many molecular studies.

Is old age really old? An analysis of longevity in the hominid fossil record

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Over the last decade the evolution of hominid longevity has become the focal point of the “new” grandmother hypothesis, where an increase in longevity is seen to be adaptive, leading to the inclusive fitness of grandmothers who invest in their reproductive age daughters and their offspring. It has been suggested that increased hominid longevity may be associated with the increased encephalization, secondary altriciality and prolonged offspring dependence that emerged in members of the genus *Homo* in the early Pleistocene. However, no fossil evidence bearing on changes in life span has been introduced to support this model.

Accepting the premise that changes in longevity have occurred over the course of human evolution, we use a resampling approach to examine the nature of that change, with particular interest in whether

there is a pattern of gradual change, or if there is a significant increase in longevity with the emergence of *Homo erectus*. Our sample consists of ages at death derived from the literature and includes over 150 specimens ranging from the late Miocene to the Upper Pleistocene. These were plotted against time using a resampling method that avoids the problems of time dependence and the interpretation of slope that are inherent in linear regressions. To avoid error introduced by dates, we considered the data in 100,000 and 50,000 year intervals and focused on increments of change (D) between individual observations in adjacent intervals. Random resampling with replacement was done an equal number of times for each increment generating a distribution for each resampling run as well as a total distribution of D. These distributions suggest no significant change in longevity with the emergence of *Homo erectus*; rather, such change occurs later in human evolution.

What's in a name? An empirical review of the compositional integrity of the eurasian Aurignacian

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At the SAA meetings last year, we asserted that the basic analytical units used in Upper Paleolithic archaeological research are (1) 'accidents of history', created by French prehistorians between c. 1880 and c. 1940 in order to solve chronological problems, (2) that they are based ultimately on typological systematics and have become essentialized by subsequent workers, (3) that they have no compositional integrity across space and time, (4) are defined differently by different workers, and (5) that there is no consensus about what they mean or represent behaviorally. Here we put empirical 'teeth' into these assertions in respect of the most visible of them - the Aurignacian - taken by many to mark the appearance of modern humans in western Eurasia.

For the Aurignacian to have heuristic validity, it must share a number of defining characteristics that co-occur systematically across time and space. To test its compositional integrity, we examine data from Aurignacian layers in Kebara, Hayonim, Warwasi, Bacho Kiro, Siuren-I, Geissenklosterle, Trou Magrite, Abri Pataud, La Ferrassie, La Vache, Fumane, Riparo Mochi, Castelcivita, El Castillo, and Cueva Morin. All sites are compared to one another on the basis of (1) relative frequencies of endscrapers, burins, and Dufour bladelets; (2) aspects of technology based on the prevalence of blades and bladelets, tool:core ratios, and debitage characteristics; and (3) observations about bone technology, art, and personal ornaments. Classical indicators of the French Aurignacian are reviewed and are used as a yardstick to contextualize data from other regions, allowing for quantitative assessment of whether or not the Aurignacian can be considered a single, coherent archaeological 'entity', and thus its heuristic utility as an analytical device.

Relating vegetation structure to hominid plant resource availability based on an actualistic study in modern East African savannas

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Although paleoenvironmental reconstructions have become key components of human evolution research, we lack an actualistic basis for translating those reconstructions to terms of hominid resource availability. For example, the paleoenvironments of African early hominid sites are reconstructed using categories like grassland, bushland, and forest, but there is no basis for predicting the classes of plant food items available in each category, nor can one predict the ecological and physiological strategies required by hominids to utilize particular resources in those habitats.

In order to address this gap in paleoanthropological knowledge, I conducted a study of modern vegetation in northern Tanzania that was aimed at predicting plant food availability across the Plio-Pleistocene Olduvai landscape. In modern vegetation plots I assessed the relationships between structurally defined habitat types (woodland, grassland, etc.), geomorphologically-defined landscape units, and plant food abundance.

The distribution of vegetation structural types across semi-arid savannas depended not on rainfall, but on the redistribution of groundwater. In summary, forests contained trees with edible fruits, bushland had trees with edible seeds/pods and shrubs with edible fruits, bush grassland and grassland provided edible herbs only during the wet season, and wetlands had edible underground parts: rhizomes, stem bases, and bulbs.

Only at the relatively fine spatial scale of the landscape facet (a "local habitat" with homogeneous ecology) are vegetation structure and plant food availability predictable.

Areas larger than a facet contained a mosaic of habitat types, and plant foods differed across the mosaic.

The time scale at which vegetation structure changes depends on the landscape unit. Interfluvies in the Serengeti Woodlands fluctuate from grassland to woodland over centuries, but

riverine forests, wetlands at permanent springheads, and edaphic grasslands such as the Serengeti Plains remain in place for tens of thousands of years.

Middle Paleolithic human teeth digested by carnivores (Les Pradelles, Marillac-le-Franc, France)

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Human remains are uncommon in Upper Pleistocene sites. Each fossil find, therefore, represents a discovery of importance. Even with incomplete fossil fragments, which cannot be utilized for comparative studies, other data can be obtained: extraction of genetic material, trace chemical analysis, etc.

In carnivore dens, fragmentary human remains which exhibit traces of carnivore activity are sometimes found. These modifications alter the morphology of hard tissue fragments and makes anatomical and taxonomic determinations difficult.

This paper describes a specific kind of carnivore modification to hard tissues: the partial digestion and regurgitation of teeth. Examples of this activity have been identified, for the first time, on human teeth discovered at the Les Pradelles Mousterian site.

Traces left by gastric juice action on the surface of bones have been described in the literature. They include loss of bone mineral through acidic action and destruction of the organic portion by means of enzyme activity. Hyenas are often responsible for large accumulations of these sorts of modified fragments. Bones are not the only faunal elements they routinely chew and swallow: horns, hoofs and teeth are also consumed. Indeed, bovid and equid dental remains with traces of digestion are frequently found in modern hyena dens. Because of their high mineral content, teeth are better able than are bones to resist the action of the digestive process. However, teeth are degraded by gastric activity, with modifications to their morphology resulting in spatial thinning, more strongly marked on the root than on the crown and an opening of the apical extremity. These traits are often employed to distinguish deciduous from permanent teeth as well as in the identification of ungulate and human incisors. In this fashion, regurgitated human incisors could be mistaken for ungulate anterior teeth.

Human teeth modified by carnivore digestive action have been identified initially at the Les Pradelles site. But, it is possible that other examples of regurgitated human teeth could be present in the faunal collections from other sites, especially early hominid cave sites from South Africa, but identified as deciduous ungulate teeth.

The Oldest Cutmarked Bones: Pliocene Hominid Faunal Exploitation at Bouri, Ethiopia

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Hominid acquisition and consumption of large mammals has been suggested as a driving force of encephalization, increased social organization, and even migration out of Africa. The evaluation of these hypotheses requires analysis of the physical evidence for such exploitation. We report here the analysis of the hominid-induced modifications to the faunal remains from vertebrate paleontology locality 12 on the Bouri peninsula (BOU-VP-12) in the Middle Awash study area of Ethiopia.

The deposits at BOU-VP-12 are assigned to the Hata formation and dated to 2.5 million years ago by single-grain ⁴⁰Ar/³⁹Ar dating, a result confirmed by paleomagnetic and biochronological analysis. These deposits have yielded the type cranium of *Australopithecus garhi*, as well as hominid postcranial remains. Initial reconstructions suggest that the paleoenvironment of BOU-VP-12 was the broad, featureless margin of a shallow freshwater lake. Rare, isolated, widely scattered cores and flakes of Mode I technology apparently eroded from Hata beds have been encountered, but no surface concentrations or in situ Mode I artifacts have been located.

A portion of the faunal remains from BOU-VP-12 bear clear signs of hominid-induced modification, especially cutmarks produced by stone tools. This is the earliest known evidence of such behavior. These fossils, which are primarily from excavated in situ contexts, provide information about the acquisition and processing of various animals by Pliocene hominids. These data allow us to test hypotheses regarding early hominid tool use, diet, behavior, and evolution.

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Recent Excavations at the Mousterian Site of Pech de l'Azé IV

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F. Bordes excavated Pech IV from 1970 to 1977 and found over 100,000 artifacts from a deep and varied sequence of Mousterian industries. His findings, however, were not fully published. In 1999, we finished a four year project to re-inventory and publish the existing collections, and last summer we

finished three years of excavation at the site. These excavations were focused on the following goals: 1) collect new dating samples to establish the site's chronology, 2) excavate controlled artifact samples to assess the degree of collection bias in the existing collections, 3) complete geological descriptions of the sediments, and 4) assess and begin to unravel the site formation processes. While the analyses are still ongoing, some of the significant results to date are reported on here. First, Pech IV was almost certainly a cave much like Pech I and even Pech II, rather than the rockshelter that Bordes had suggested, and much of the deposits, particularly in the upper layers, have yet to be uncovered. Second, the deposits are largely intact with minimal post-depositional movement. Third, due to ideal burial conditions that yielded very minor uranium uptake into teeth, electron spin resonance (ESR) ages on five enamels recovered from MTA levels yielded statistically indistinguishable mean early uptake (EU) and linear uptake (LU) ages of 50 +/- 3 and 52 +/- 5 ka. Fourth, significant burning is evident in the basal layers with horizontal variability that includes some intact burned features, as well as more human-modified areas. Fifth, Pech IV has produced 25 pieces of manganese 16 of which show traces of utilization. Sixth, the industries are indeed highly variable and include an industry apparently deliberately geared towards the production of small flakes using a variety of technologies. One more field season is currently planned for Pech IV to further investigate the burned features.

Cutmarked Bones from Late Pliocene Archaeological Sites at Gona, Afar, Ethiopia: Implications for the Function of the World's Oldest Stone Tools

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Newly discovered archaeological sites at Gona (Ethiopia) preserve both stone tools and faunal remains. These sites have also yielded the largest sample of cutmarked bones known from the time interval 2.6 – 2.3 million years ago (Ma). Most of the cutmarks on the Gona fauna possess obvious macroscopic (e.g., deep V-shaped cross-sections) and microscopic (e.g., internal microstriations, Herzinian cones, shoulder effects) features that allow us to identify them confidently as instances of stone tool-imparted damage caused by hominid butchery. In addition, the anatomical placement of the cutmarks on several of the recovered bone specimens suggests that Gona hominids eviscerated carcasses and defleshed fully muscled upper and intermediate limb bones of ungulates—activities which further suggest hominids gained early access to large mammal carcasses. These observations support the hypothesis that the earliest stone artifacts functioned primarily as butchery tools and also imply that hunting and/or aggressive scavenging of large ungulate carcasses may have been part of the behavioral repertoire of hominids by c. 2.6 – 2.5 Ma, although a larger sample of cutmarked bone specimens is necessary to support the latter inference.

Our field permit was issued by the Authority for Research and Conservation of Cultural Heritage (ARCCH) of the Ministry of Youth, Culture and Sports Affairs of Ethiopia. The project was organized from the CRAFT Research Center, Indiana University, and the overall contributions made to the project by Kathy Schick and Nicholas Toth (Co-Directors, CRAFT) and the Friends of CRAFT are very much appreciated. Research grants were provided by the L.S.B. Leakey Foundation, the National Geographic Society, the Wenner-Gren Foundation and the National Science foundation. M.D-R.'s travel to Ethiopia was supported by Complutense University.

Interim Report on the Geology of the Dmanisi Site, Republic of Georgia

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During the 2000-2002 seasons at Dmanisi, geologic studies centered on the stratigraphy, site formation processes and basin-wide geologic context of this important Plio-Pleistocene locality in the Georgian Caucasus Mountains. In Block 2, numerous hominin fossils, artifacts and vertebrate remains were recovered. The fossil-bearing sediments overlie the topographically lowest surface thus far exposed of the Masavera Basalt (1.85 Ma, normal polarity). Stratum A volcaniclastics (normal polarity) overlying the basalt, exhibit the same lithologic and pedogenic features seen in other exposures, and also have a very abrupt erosional contact with the superjacent Stratum B (reverse polarity) deposits. The greatest concentration of hominin and other fossils in this area occur in a well-defined, elongated cavity which follows the dip of the basalt surface towards the valley axis, and is joined to the A-B erosional paleosurface by a distinct collapse feature, quite similar to those associated with piping in present day semi-arid settings. Stratum B1a ashes cover the paleosurface and infill fractures and the collapse feature. Lithic artifacts and manuports are concentrated in lower Stratum B. Testing west (upslope) from Block 2, revealed thick sections of Stratum B, with superposed concentrations of artifacts and highly fragmented faunal remains that appear to register occupation surfaces of repeated occupations. These overlie eroded Stratum A deposits having numerous complete bones, including a hominin phalange. We have now exposed in trenches ca. 25 m of lacustrine sediments, rich in plant macrofossils and faunal remains, that fill the lake basin formed when the Masavera lava dammed the Pinazouri river immediately below the Dmanisi site. Correlations with the site deposits will be established by absolute dating and detailed paleomagnetic studies of the lacustrine sections. About 20 km west of Dmanisi, we have discovered a new thick section of ashes between the Masavera Basalt and the Zemo Orzmani Basalt (1.76 Ma, reverse polarity) which provides an excellent opportunity to firmly bracket the age of the Dmanisi occupations and hominin fossils.

Anghilak cave, Uzbekistan: documenting Neandertal occupation at the peripheryM. Glantz¹, and R. Suleymanov²¹ *Department of Anthropology, Colorado State University, Fort Collins, CO 80523 U.S.A.*mglantz@lamar.colostate.edu² *Department of Archaeology, National University of the Republic of Uzbekistan*

In 1938, Okladnikov excavated the site of Teshik-Tash in the Baisun region of Uzbekistan and found a complete cranium of a Neandertal child. This discovery anchored the eastern boundary of the Neandertal range in Uzbekistan and linked the manufacture of Mousterian assemblages from the region to this hominid group. Although Uzbekistan has a relatively rich record of Paleolithic occupation, previous excavations have not benefited from contemporary archaeological methods and many well-known sites such as Teshik-Tash have been emptied of deposits, making reanalysis impossible. Moreover, the collapse of the Soviet Union brought Paleolithic research to a halt in most of the Central Asian Republics. The purpose of this paper is to present preliminary results from test excavations of a new Mousterian cave site in the Kashkadariya region of southeastern Uzbekistan. Anghilak cave represents the first new discovery of this type in the country in over sixty years. Located in the foothills of the southern face of the Zerafshan mountain range, Anghilak (39° 17'07.4"N, 66° 41'13.1"E, 796 m.) is a relatively small east-facing cave formed from a vertical karst. In 2002, two test units were excavated to a depth of 1.45 m. and yielded 485 pieces of chipped stone and over 2200 animal bones. A typological inventory reflects the Middle Paleolithic character of the lithic assemblage. Over 50% of the faunal material is tortoise and the remainder appears to be sheep and goat with a high frequency of green breakage patterns. Questions concerning the Central Asian Middle Paleolithic, the geographic distribution of the Neandertals and their possible interactions with modern humans in this region of the Old World as well as the origins of the Upper Paleolithic in Uzbekistan will be discussed in the context of Anghilak cave and the new insights that analysis of its material provides.

A Late Miocene Hominid from the Middle Awash, Ethiopia, and Its Relationship with Contemporary Hominoid Taxa

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The number of late Miocene hominoid taxa dated to between 5 Ma and 7 Ma has substantially increased in the last couple of years. The discovery of *Orrorin tugenensis* from the Tugen Hills of Kenya marked the first hominoid from ca. 6 Ma. This was followed by the discovery of *Ardipithecus ramidus kadabba* from the Middle Awash of Ethiopia, which extended the early hominid record to ca. 5.8 Ma. The most recent discovery of *Sahelanthropus tchadensis* from Chad in Central Africa further extended the record of early hominids back to between 6 Ma and 7 Ma.

Phylogenetic relationships among these late Miocene hominoids are currently far from being clearly understood. Although this is largely due to the paucity of the available fossil record from the latest Miocene period, the variability of analytical methods used by various researchers has further complicated understanding of phylogenetic relationships among early hominoids. Critical observation of the fossil evidence is what yields the most accurate information on such relationships. Now, the additional recovery of fossil specimens of *Ardipithecus ramidus kadabba* has shed additional light on the phylogenetic relationships between *O. tugenensis*, *A. r. kadabba*, and *S. tchadensis*.

Paleoclimate during early modern human occupation at Qafzeh, Israel: the stable isotope dataK. A. Hallin¹, M. J. Schoeninger² and H. P. Schwarcz³¹ *Department of Anthropology, University of Wisconsin, Madison, WI 53706, U.S.A.*krishallin@hotmail.com² *Department of Anthropology, University of California at San Diego, La Jolla, CA 92023, U.S.A.*mjschoen@weber.ucsd.edu³ *School of Geography and Geology, McMaster University, Hamilton, ON L8S 4M1 Canada*schwarcz@mcmaster.ca

Much debate in paleoanthropology has focused on the complex pattern of human evolution in Israel during the Late Pleistocene under the premise that climate change was the primary determinant for observed changes in human activity. One of the paramount questions is whether Neandertal and early modern human occupations, in Israel, alternated as environmental conditions fluctuated. Bar-Yosef proposes that early modern humans occupied Israel during a warm, dry period of the Emian interglacial, Oxygen Isotope Stage 5 (OIS 5), approximately 110 ka. Neandertals, on the other hand, entered the region approximately 70-40 ka as a result of European climate degeneration at the onset of the Wurm glaciation (OIS 4).

We tested Bar-Yosef's hypothesis through stable oxygen and carbon isotope analyses of fossil herbivore enamel carbonate from the early modern human site, Qafzeh (~92-115 Ky.), Lower Galilee, to reconstruct paleoclimatic conditions during the Late Pleistocene. A baseline comparative sample, established from the teeth of modern analogues across Israel, represent present climatic conditions--a long, dry summer and a rainy winter.

Through zoning profiles and information on eruption and mineralization patterns for modern analogues, seasonal patterns in the $\delta^{18}\text{O}$ of rainfall were determined. Data obtained from Qafzeh, layer XXI, show a trend in $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ that is similar to the modern proxy data. That is, drier conditions with rainfall occurring only in the winter. In contrast to present conditions, however, $\delta^{13}\text{C}$ values demonstrate the presence of mixed C_3/C_4 vegetation indicating a drier and more open environment near the cave. A previous study of the Neandertal site, Amud, demonstrates that Neandertals lived under

wetter conditions with more closed woodland (Hallin et al., 2002). It appears thus far that early modern humans (Qafzeh XXI) and Neandertals (Amud) lived under different climatic conditions during the late Pleistocene. Supported by the Wenner-Gren Foundation (to K.A.H.).

Preliminary taphonomic analysis of hominin remains from A.L. 333, Hadar Formation, Ethiopia

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The A.L. 333 locality, Hadar, Ethiopia, occurs stratigraphically in the Hadar Formation between the 3.22 myr TT4 tuff and the 3.18 myr KHT tuff. Among Pliocene open air sites, this site is unusual in preserving multiple individuals of *Australopithecus afarensis*. Our study is designed to assemble taphonomic and geological evidence to test alternative hypotheses concerning the genesis of the hominin assemblage. Initial discovery, survey and excavation (1975-77) recovered over two hundred specimens, including 19 *in situ*. Dental estimates placed the minimum number of individuals (MNI) at nine adults and four juveniles (White and Johanson 1989). Renewed fieldwork in the 1990s increased the number of hominin specimens to 257. New MNI estimates for the A.L. 333 hominin assemblage are based on a reassessment of all specimens collected between 1975 and 2001. The updated estimate derived from cranial and dental material, which comprises 40% of the sample, identifies at least 17 individuals; nine adult, three adolescent and five juveniles, with the youngest represented by an unworn deciduous incisor. Preserved postcranial remains are primarily fore- and hindlimb elements, with bones from the axial skeleton being proportionately underrepresented. We conservatively sorted most postcranial specimens into groups that represent separate individuals (MNI) based on appraisal of non-overlapping elements, similar age, size and state of preservation. There are several examples of convincing antimeres, as well as articulating and conjoining elements. The MNI based on this conservative assessment of postcrania is sixteen, including juveniles and adults. With further study of age, size, preservation, and taphonomy, these may reasonably be grouped with individuals identified on the basis of cranial/gnathic remains. The assemblage as a whole contains small and large individuals among both adults and adolescents. Preliminary estimates based on hominoid data in McHenry (1992) indicate that the range of adult body mass is 38-57 kg.

New chrono-cultural data on the Cro-Magnon and Combe-Capelle human remains (Dordogne, France): consequences for the biocultural origins of modern humans in Europe

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The question of the age of the Cro-Magnon and Combe-Capelle human fossils is clearly of considerable importance. Hominid specimens from both sites have played a critical role in the development of current perspectives on modern human origins in Western Europe.

The Cro-Magnon skeletal remains, discovered in 1868 near les Eyzies-de-Tayac by workmen and excavated by L. Lartet are routinely attributed to the Aurignacian culture. An AMS C14 date (27 680 ± 270 BP, Beta — 157439) of a shell associated with the human remains as well as cultural indications, demonstrates that these specimens postdate 28000 BP. The Cro-Magnon burials should not be attributed to the earliest Aurignacian, but rather to the Gravettian.

The Combe-Capelle skeleton was discovered by O. Hauser at the beginning of the twentieth century. According to him, the burial occurred at the interface between a Mousterian and an early Aurignacian (i.e. Châtelperronian) level. The supposedly Châtelperronian age of the skeleton (and the very authenticity of the skeleton itself), and its morphology, have long been the subject of debate. As the remains had until recently been thought to have been lost or destroyed during the last war, it was impossible to check the original data.

In 1990, the Combe-Capelle remains were rediscovered by A. Hoffmann and D. Wegner at the Museum für Vorurnd Frühgeschichte, Staatliche Museen zu Berlin(RFA). The morphological study of the Combe-Capelle skull, the analyses of associated shell ornaments and of available archives provide some new insight into the probable age of this specimen. This new analysis has quite important implications for our understanding of cultural and biological processes at the beginning of the Upper Paleolithic in Europe.

Early Dates for the European Upper Paleolithic from Kostenki (Russia)

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During 2002, field research continued at Kostenki on the west bank of the Don River near the city of Voronezh in Russia. New excavations were conducted in the lower occupation levels at Kostenki 12

(Layers III and IV) and Kostenki 14 (Layer IVb). These levels are found stratigraphically beneath a horizon of volcanic ash dating between 35,000 and 40,000 years BP. They contain artifacts and vertebrate remains in layers of silt that seem to have been deposited by a complex interplay of slope and low-energy stream processes. A series of five luminescence (IRSL) dates on these sediments at Kostenki 12 yielded estimates between 43,470 and 51,060 years ago. Buried soils are present at both localities and some of them are associated with occupation levels.

The lowest occupation level at Kostenki 14 (Layer IVb) contains prismatic blade cores, end-scrapers, burins, and bifaces, along with tools of bone, antler, and ivory (e.g., points). Other artifacts include a perforated shell (imported from a remote source) and carved ivory fragment that appears to represent the head of a figurine. An isolated tooth recovered from this level in 2001 has been assigned to modern humans. A broadly correlative level at Kostenki 12 (Layer III) contains an assemblage of bifacial points, end-scrapers, and side-scrapers that lacks non-lithic tools, ornaments, and art objects (assigned to the *Streletskaia kul'tura*). In 2002, a large bone bed comprising fragmented remains of reindeer and horse was uncovered in Layer III. The underlying level (Layer IV) may contain an assemblage similar to that of Layer IVb at Kostenki 14, but the sample size is small.

The new discoveries at Kostenki indicate that an Upper Paleolithic industry—most probably created by modern humans—was present as early as ca. 45,000 years BP on the central East European Plain. This suggests that modern humans may have initially occupied some of the coldest and driest areas of mid-latitude Europe during the earlier Middle Pleniglacial. It is unclear if Neanderthals were also present in the region at this time, although they might have produced the assemblage from Layer III at Kostenki 12.

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New evidence of the Middle- Upper Paleolithic transition from Riparo Bombrini (Grimaldi, Italy)

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The site of Riparo Bombrini (Grimaldi, Liguria, Italy) belongs to a complex of caves and rock shelters that has produced some of the earliest and most complete early Upper Paleolithic human skeletons in Europe. In 1976, Giuseppe Vicino exposed rich early Aurignacian and late Mousterian deposits. The Aurignacian assemblage includes numerous “Dufour” bladelets, bone points, decorated bone, perforated shells, ochre, and an isolated human deciduous tooth. The basal Aurignacian at nearby Riparo Mochi has been dated at 35,7 ky. Given the resemblance in assemblage composition and depositional history between the two sites, Riparo Bombrini may have one of the earliest Aurignacian deposits associated with anatomically modern human remains in Europe. In July 2002, a team from Duke University, University of Pisa and the Soprintendenza Archeologica della Liguria reopened excavation of Bombrini with the specific goal in mind to clarify the nature of the Mousterian-Aurignacian transition in northern Italy. Several questions framed the project: 1) Is the Mousterian-Aurignacian transition in northern Italy an abrupt event? 2) What is the timing of this transition (was there an overlap between Mousterian and Aurignacian)? 3) Are there distinct differences between two time periods in provisioning and use of raw material?

Preliminary analysis point to marked differences in raw material utilization between Mousterian and Aurignacian assemblages. With a few exceptions, Mousterian industry was made of low quality local material, while the flint used to make Aurignacian tools generally came from sources located as far as 200 kilometers away. There seems to have been no overlap between the makers of the Mousterian and Aurignacian. The two assemblages are markedly distinct and separated by a semi-sterile layer, confirming the pattern suggested by other sites in northern Italy that Aurignacian groups either replaced local Mousterian populations or perhaps moved into areas that had been vacated by the latter.

Laetoli paleoecology reconsidered: The isotopic evidence

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Sediments exposed at the site of Laetoli in northern Tanzania have yielded an extensive assemblage of Pliocene vertebrates, including early hominins. While traditionally interpreted as a grassland or savanna habitat, with patches of acacia woodland, accumulating faunal evidence suggests a more complex scenario with a greater representation of woodland and bushland ecosystems in the Laetoli Beds (4.3-3.5 Ma), transitioning to semi-arid bushland/grassland communities in the Upper Ndolanya Beds (2.6-2.7 Ma). To establish corroborating evidence, over 250 samples of fossil mammal tooth enamel, struthionid eggshells, invertebrates, and paleosol organic residues and carbonates from the Laetoli and Ndolanya Beds were analyzed isotopically to constrain aspects of vegetation and climate at Laetoli during the Pliocene. Collectively, the data indicate environmental variability within the temporal range represented by the Laetoli Beds, but consistently suggest woodland components regionally if not locally. Isotopic profiles of multiple enamel samples of 15 herbivore taxa collected from horizons throughout the upper and lower Laetoli Beds reflect diverse dietary strategies including obligate browsers, obligate grazers, and mixed C₃/C₄ feeders. While an isotopic shift in two vertebrate taxa between the Upper Laetoli and Upper Ndolanya Beds indicates an increasing reliance on C₄ graze, there is no obvious overall dietary change reflecting significant habitat modification or trends in the succession.

Within the interpretive limitations associated with small analytical data sets, habitat reconstructions at Laetoli based on isotopic enamel signatures cannot be differentiated from those documented at other early hominin sites, including Tabarin, Olduvai Bed I and Lothagam, as well as for modern East African ecosystems, such as at Amboseli. Within the stratigraphic resolution of sampling, isotopic signatures of the Laetoli material indicate that the fossil hominins potentially had access to a mosaic of habitats ranging from grasslands to woodlands in the Laetoli region at ~5-2.5 Ma.

The early human remains from Niah Cave's West Mouth (Sarawak, Malaysia)

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One of the most significant sites producing early modern humans in island Southeast Asia is that of Niah Cave's West Mouth in northern Borneo (Sarawak, Malaysia). In 1958 a human cranium was discovered there, *in situ*, associated with a radiocarbon date on charcoal from a neighboring unit yielding an age of ca. 40 ka. Associated post-cranial material was mentioned in passing, however, attention focused on the "Deep Skull" and its early date for modern humans in Southeast Asia. Since that time, Niah Cave is no longer considered the earliest site in the region—sites in Australia date to at least 55 ka. However, its equatorial setting on the Sundaland subcontinent has important implications towards inferring the prehistoric lifeways of early modern humans in a tropical forest setting.

Recently, new finds of human skeletal material directly associated with the "Deep Skull" were re-discovered at the Sarawak Museum and at The Natural History Museum (London). This material consists of (1) additional skull fragments not included in the original reconstruction by Brothwell (1960), and (2) a 90% complete adult left femur. Given the paucity of late Pleistocene human skeletal material from Southeast Asia, these new finds are significant, especially so considering the different interpretations the "Deep Skull" has received over the years. This paper reviews these interpretations with respect to the age/sex of the "Deep Skull" and associated remains and their morphological affinities. Analyses by Brothwell and Birdsell are reviewed and new interpretations are offered. Geological context and age of the early human remains in light of recent fieldwork with the Niah Cave Project is discussed.

Is the variation in cranial capacity of the Dmanisi sample too high to be from one species?

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The three early Homo crania discovered in Dmanisi contribute to the important question in paleoanthropology: is the variation in a fossil sample from a single species or multiple species? I test the null hypothesis that the degree of variation in the cranial capacity of the Dmanisi sample is within the expected range of a single species variation. Using a method based on a data resampling approach, I ask the likelihood that sexual dimorphism or intrasexual individual variation can explain the observed variation in the Dmanisi fossil sample. Statistical significance of the variation in the Dmanisi sample is examined using distributions generated from resampling data sets consisting of single species. Results indicate that the largest difference between two of the Dmanisi cranial capacities is well within the range of variation from male-female pairs of comparative species of modern humans, chimpanzees, and gorillas. Furthermore, results do not completely reject the hypothesis of intrasexual individual variation. The observed value from the Dmanisi sample can easily be observed in male populations of gorillas and chimpanzees. However, it is not likely to observe such difference from modern men nor from any female population of the three species compared. The results of this paper are consistent with the one by the original researchers of the Dmanisi sample, that they belong to a single species.

New Catarrhine Fossils from the Lower Miocene of Uganda, with Implications for the Ape-Monkey Split

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The Napak (~19 Ma) and Moroto (>20.6 Ma) fossil localities in northeast Uganda comprise some of the oldest Miocene sites in Africa. Among the fauna from these sites are several catarrhine taxa, including the earliest records of the superfamilies Cercopithecoidea (*Victoriapithecus*, Napak) and, arguably, Hominoidea (*Morotopithecus*, Moroto), as well as more primitive catarrhines (e.g. *Limnopithecus*, *Dendropithecus* and *Micropithecus*, Napak and Moroto). During June, 2002, field

efforts resulted in the recovery of several new catarrhine specimens. An adult maxilla and facial fragments, as well as a juvenile mandible attributable to *Micropithecus* were collected from the Napak IX locality. From the Moroto II locality, part of the spinous process, neural arch and transverse process of a lumbar vertebra of *Morotopithecus* (perhaps from the same individual (i.e. UMP 67-28) found in the 1960's), and a fragment of a cercopithecoid maxilla (dP4M1) were collected.

Since the Moroto localities seem to predate the Napak ones, the new cercopithecoid specimen is now the oldest of its kind. Molecular estimates have put the cercopithecoid-hominoid divergence in the range of 20-25 Ma, and the recent finds provide additional evidence that it occurred before 20.6 Ma, although how much before is debatable. In addition, co-occurrence at Moroto II shows that some of the earliest apes and monkeys lived in relatively close spatial proximity, although the niches they occupied may have been quite different. Future research will attempt to elaborate on paleoenvironmental reconstructions of the Napak and Moroto localities so that we may better understand the ecological context that immediately succeeded the divergence of the two modern catarrhine groups. Research was funded by the L.S.B. Leakey Foundation and the N.S.F. (BCS-0215877).

Vertebrae and Language Ability in Early Hominids

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It has been suggested that the size of thoracic vertebral foramina in WT-15000 reflects the degree of neurological control of the intercostal muscles, providing insight into Nariokotome's motor capabilities for spoken language. This is due to the putative relationship between the intercostals and fine-tuned breath control utilized during speech. However, while intercostal muscles act to brace the ribcage during strenuous activities, analysis of spinal cord injury patients shows that their function in precision breathing and speech production is negligible. By contrast, the diaphragm is almost exclusively responsible for breath management during speech. Cervical vertebrae may be more useful in the study of language evolution, as the phrenic nerve serving the diaphragm exits cervical vertebral elements. Moreover, a reassessment of salient vertebral morphometric features is presented here in apes, modern humans, and early hominids. It is suggested that WT-15,000 vertebral elements are highly anomalous, as size-corrected values lie below ape values, while the contemporaneous fossil specimen ER-164 is well within modern values.

Evaluating the structure-function relationship of the apical tuft of the hominid distal phalanx

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The enlarged apical tuft of the distal phalanx is a unique structure found almost exclusively in hominids. It is commonly considered to be a reliable marker of enhanced grip. Among hominids, Neandertals consistently show some of the largest apical tufts relative to their distal phalanx length. Musgrave (1971) suggested that instead of the manual hypothesis, the enlarged tufts in Neandertals might be indicative of an increased vascular supply to the distal finger, which would prove adaptive in their cold environment. Neither idea, however, has been formally tested thus far.

In an attempt to do so, morphometric as well as micro-CT (mCT) imaging studies were done on specimens of modern human distal phalanges with a focus on comparing measurements from populations of cold or warm adapted modern humans. Ipiutak Indians from Alaska represents the recent human cold adapted population (n = 31). Aborigines from Africa (n = 11) and Native Americans from the Southwestern U.S. (n = 48) account for the warm adapted group. mCT analysis was performed on a subset of 12 bones.

Surprisingly, the warm adapted humans had a higher ratio of apical tuft to maximum proximal breadth than the cold adapted group ($p < 0.01$). This was supported by preliminary mCT results in that the warm adapted samples had an overall greater bone volume fraction, trabecular number and thickness, and reduced trabecular spacing. In relation to the apical width to maximum proximal breadth ratio, positive correlations were found with bone volume fraction ($r^2 = 0.35$; $p < 0.05$) and trabecular thickness ($r^2 = 0.32$; $p = 0.052$), and a negative correlation with the structural model index ($r^2 = 0.31$; $p = 0.059$). Taken together, these results indicate a need to reevaluate the cold adaptation hypothesis of distal phalangeal expansion, while lending credence to the mechanical hypothesis.

The Art of Taphonomy and the Taphonomy of Art: An analysis of Molodova I, Level IV: Putative Symbolic Evidence

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During the 1950's-1980's excavators recovered two to three thousand faunal remains from Level IV of Molodova I, an open-air Middle Paleolithic site in the Ukraine. This site has been described by some researchers as a possible source of evidence for early symbolizing behavior. Drawing on experimental data the authors examined 300 unpublished mammoth bone objects from this layer that were identified by Ukrainian researchers as exhibiting possible engravings. These purportedly grooved and incised objects include two anthropomorphic figures.

The mammoth bone objects were analyzed initially by optical microscopy to establish whether the observed modifications were the result of anthropogenic or natural causes. While our analysis is on-

going, using patina, the position of rootmarks relative to cutmarks, the presence or absence of striations as well as other indicators preliminary results of this study suggest that the engravings and other modifications are best explained by carnivore activity, blood vessel markings and post-depositional trauma incurred during excavation including human trampling and deliberate engraving to record provenience.

While we have determined there is no evidence of symbolic activity at Molodova I, the database we have created, with its systematic recording of traces left by taphonomic agents on faunal remains, is providing a better understanding of the overall site taphonomy. This is exceedingly important because this site is well known for its striking evidence of habitation structures. While MP cave sites and rockshelters are relatively common, open-air sites are exceedingly rare. Large horizontal excavations at Molodova I have revealed the remnants of several large tent rings up to 8 meters in diameter comprised mainly of mammoth bones. Inside these rings are dense scatters of lithics, faunal remains and ash scatters/hearths. Recreating the depositional history and related taphonomic processes of this site is one key to understanding long term use of the site as well as area specific activities.

New archaeological and fossil hominid evidence from the Late Pleistocene of Greece

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Although Greece has long been proposed as a main corridor of dispersal from Africa through the Middle East into Europe for both archaic and anatomically modern humans, the Greek paleolithic and fossil records remain unexplored. Lakonis, a Middle-Upper Paleolithic site on the eastern coast of the Mani peninsula, southern Peloponnese, provides much-needed evidence for the Late Pleistocene of Greece.

Lakonis consists of a cave and several collapsed karstic formations along the present seashore. The main site, area A, in the easternmost sector, preserves a 7-meter thick sequence of brecciated sediments interspersed with travertine formations. Preliminary survey was conducted in 1997-1998 and excavation has been carried out from 1999-present. The earliest occupation of the site is placed at 94,240 ±14,710 using U-series dating of the basal travertine. The upper sediments are dated to between 24 - 44 ka (¹⁴C AMS, ESR). Lakonis preserves an extraordinarily rich lithic and faunal record. The density of lithic artifacts larger than 2cm is estimated at >4000 /m³. Most artifacts are manufactured on raw materials locally available in primary and secondary sources. The assemblages from the lower units are characterized by the use of Levallois technology with an emphasis on the recurrent laminar variety. In the upper units, dated between 44-38 ka, the technological and morphological characters of the lithic industries suggest the existence of the "transition" to the Upper Paleolithic. The fauna is dominated by cervids, particularly fallow deer; *Sus*, *Bos* and a rhinocerotid have also been recovered. Carnivores are very rare.

During the 2002 field season a hominid lower molar was excavated from the upper sediments, containing the transitional assemblages and provisionally dated to <40 ka. This is the first documented Late Pleistocene human specimen from Greece. Preliminary assessment of crown dimensions and non-metric traits, such as taurodontism, suggest Neanderthal affinities.

This research was supported by the Greek Ministry of Culture, the Wenner-Gren Foundation, Leakey Foundation and the Institute for Aegean Prehistory.

The Faunal Context of the "Little Foot" *Australopithecus* Skull and Skeleton (Stw 573) from Sterkfontein Member 2 (South Africa)

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We describe the reconstructed paleoenvironmental and taphonomic contexts of a partial hominid skeleton from Sterkfontein Member 2 (Stw 573), in presenting the results of our analyses of the mammalian faunal assemblage associated stratigraphically with the hominid. We infer that the Member 2 paleohabitat was typified by rolling, rock-littered and scrub-covered hills (indicated by the abundant *Felis caracal* and cercopithecoid fossils recovered and the identified presence of the extinct *Caprinae Makapania broomii*). In addition, it is likely that the valley bottom probably retained standing water year-round, and supported a spatially restricted riverine forest, fringed by limited grassland, a setting suitable for the well-represented ambush predator *Panthera pardus* and indicated by the presence of Bovini in the Member 2 assemblage. The assemblage is dominated by cercopithecoids (*Parapapio* and *Papio*) and felids (*P. pardus*, *P. leo*, *F. caracal* and Felidae indet.), in terms of number of identified specimens, minimum number of elements and minimum number of individuals. In addition, the assemblage is characterized by a number of partial skeletons and/or antimeric sets of bones across all taxonomic groups. There is scant evidence of carnivore chewing in the assemblage. These observations, in addition to other taphonomic evidence, suggest that the remains of many animals recovered in Member 2 are from individuals which entered the cave on their own—whether accidentally by falling through avens connecting the cave to the ground surface above (i.e., deathtrap scenario) or by intentional entry—and were then unable to escape, rather than primarily through systematic collection by a biotic, bone-

accumulating agent. Finally, the reconstructed paleoenvironmental and taphonomic settings of Sterkfontein Member 2 are compared to penecontemporaneous sites in eastern and north-central Africa.

Heterogeneity in large-mammal paleocommunities and hominin activities in the southern Kenya rift valley during the mid-Pleistocene (1.2-0.4 Ma)

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A well-calibrated mammalian fossil sequence from the southern Kenya rift provides a biotic context for behavioral and biogeographic change in human evolution 1.2 to 0.4 million years ago. Excavation of more than 120 fossil samples at three time intervals in the Olorgesailie basin offers the spatial and temporal control needed to determine mid-Pleistocene species associations. The new data set confirms an earlier suggestion of an unusual sequence of large mammal dominance (*Equus* at 990 ka; *Theropithecus* and *Equus* at 900 ka; *Kolpochoerus* and *Hippopotamus* at 650 ka) at Olorgesailie prior to the formation of bovid-dominated communities consisting of extant species in East Africa. Based on spatially widespread excavations in Olorgesailie Member 1 (990 ka) and Member 7 (900 ka), the pattern of species dominance shifted over time from spatially homogeneous to highly variant, similar to a change during this same time period from spatially homogeneous to highly patchy artifact distributions. This local increase in spatial patchiness in both the archeological and faunal records, and long-term variation in the dominant mammalian taxa over time, appear to exemplify the rich environmental heterogeneity in which human adaptability evolved from the mid- to late Pleistocene. (Research supported by NSF grant BCS 0218511, the Smithsonian's Human Origins Program, and the National Museums of Kenya.)

Stone Age Archaeological Survey in the Busidima region, Ethiopia

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We report on the 2000 and 2002 field seasons undertaken to investigate the Pleistocene prehistory of the Busidima region in Ethiopia. This presentation focuses on the many surface finds identified over the course of the two seasons, and on broad patterns that are already apparent in the distribution of archaeological material. We present evidence that suggests that the area was occupied starting early in the Early Stone Age (ESA) and that this occupation continued throughout the Middle Stone Age (MSA); at present, there is no substantial evidence of a Late Stone Age occupation.

We focus our discussion on the plentiful surface finds in the area and discuss in detail several localities. We first present two Acheulean localities that yielded substantial amounts of bifaces, and investigate the technological and economic patterns that characterize them. We subsequently detail the techno-typological characteristics of three MSA open-air localities that yielded flake-based industries. Each MSA site is also analyzed in terms of the raw-material exploitation strategy that characterizes its assemblage, suggesting that very distinctive kinds of activities were carried out at distinct points on the Pleistocene landscape. A preliminary overview of a fourth MSA locality that combines archaeological and fossil remains is also presented in order to contextualize and highlight a salient pattern of the Busidima area, namely the very rare co-occurrence of both faunal remains and stone tools at a given location. Lastly, the distribution of faunal remains is also investigated geographically in an attempt to reconstruct the paleoenvironment of the region.

Use of African bovid forelimb morphology in determining habitat cover at Makapansgat Limeworks, South Africa

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Bovid postcranial remains are found at all African hominin fossil sites. These remains, however, have been historically useful for studies of hominin subsistence rather than for taxonomic or environmental information. Several previous studies have shown that bovid femora and metapodials are useful for identifying habitat cover in which bovids exist. As running style varies based on habitat cover, behavioral variation is thus reflected in morphology. Elements of the forelimb such as the distal humerus and proximal radius have high bone density and are therefore more abundant at some fossil localities than other elements. This study examines the use of these forelimb elements in determining habitat cover. This may have important applications for the reconstruction of hominin habitats, as reconstructions often describe woodland or bushland habitats without additional information on the amount of cover.

Six species of African bovids were analyzed; 3 are typically found in grassland and 3 inhabit forests. Nine features of the distal humerus and four of the proximal radius were measured. ANOVA was used to determine which characters were significantly different between habitats. These significant factors were then analyzed by principle components. Five measures of the humerus and two of the radius clearly distinguish between open and closed cover taxa.

Fossil humeri and radii from Makapansgat Limeworks were compared to the extant data.

Approximately 50 elements from size class II bovids were analyzed. Of 22 humeri, all but 2 group with the closed cover extant bovids. Similar results were obtained for fossil radii. These results are in concordance with reconstructions of this *A. africanus* site, where the reconstructed habitat includes more closed habitats such as riparian woodland and forest.

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Preliminary dental microwear analysis and dietary reconstruction of Makapansgat bovids

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An understanding of the community paleoecology of early hominin sites is critical to putting our predecessors into environmental context. Much work has already been accomplished on the faunas of sites such as the Pliocene site of Makapansgat using isotopic and ecomorphological analyses. Here we add to this body of knowledge with preliminary data on dental microwear. Three bovid taxa from Makapansgat Limeworks Cave deposits, *Makapania broomi*, *Parmularius braini*, and *Aepyceros* sp., are compared with microwear of extant *Connochaetes taurinus* (grazer) and *Tragelaphus scriptus* (browser). High-resolution epoxy replicas were prepared from polyvinylsiloxane impressions taken from original specimens. Lower m1-2 buccal enamel bands were imaged at a resolution of 0.3 microns using a white light confocal microscope and resulting photomicrographs were analyzed using Microware software. *Tragelaphus scriptus* surfaces are dominated by fine striations and pits, with enamel prism exposure common. In contrast, *C. taurinus* surfaces are dominated by large, deep striations with high orientation homogeneity. Considering that fossil sample sizes are small thus far (n = 4-5 per taxon), some preliminary results are of interest. *Aepyceros* exhibits marked heterogeneity with specimens alternatively resembling both *T. scriptus* and *C. taurinus*. Less variability in microwear patterning is seen in specimens of *M. broomi* and *P. braini*, and are both dominated by thinner striations with more orientation homogeneity. These results are consistent with isotope and ecomorphology data suggesting mixed-feeding for *Aepyceros*. However, *M. broomi* and *P. braini* microwear patterning is unlike that of these extant taxa, and will require a larger baseline series of living bovids to interpret. These results demonstrate that fossil bovids at Makapansgat preserve distinctive antemortem microwear patterning, and that comparisons between microwear, ecomorphology and isotopic evidence will offer a more complete picture of the environmental context in which *Australopithecus africanus* and other faunas at the site lived. Supported by NSF BCS-0104260.

Recent archaeological discoveries from Gona, Afar, Ethiopia

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Previous archaeological investigations of the Late Pliocene deposits of the Kada Gona drainage in the Afar, Ethiopia have yielded the oldest known archaeological sites dated to ~2.5 million years (Ma) (Semaw, 2000; Semaw et al., 1997). The latest field investigations (1999-2001) of the deposits exposed to the south/southwest in the Ounda Gona area have produced additional new archaeological sites that are contemporary with those earlier identified in the Kada Gona and dated to 2.5 Ma. Systematic excavations of the new sites have revealed Oldowan stone artifacts and associated fossilized fauna that may have been incorporated in the diet of the first toolmakers. The two sites were securely dated between 2.6-2.5 Ma based on a combination of Ar/Ar and paleomagnetic profiles, also reinforcing the radiometric dates for the artifacts recovered earlier from Kada Gona. The Ounda Gona artifacts were made of trachyte, rhyolite and fine raw materials such as chert. The archaeological evidence indicates that the hominids ~2.6 Ma were sophisticated stone knappers and selected for raw materials with good flaking quality. Results of our recent investigations of the Gona deposits offer new insights on the beginnings of early hominid use of flaked stones and their functions.

Dating the East African LSA: ESR age for the Naisiusiu Beds, Olduvai Gorge

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The Lower Beds at Olduvai Gorge are well known for their content of early hominid fossils and Oldowan stone tools, and their ages have been established by $^{39}\text{Ar}/^{40}\text{Ar}$ method and paleomagnetic stratigraphy. Ages are generally less certain for the upper deposits at Olduvai Gorge because of the scarcity of datable tuffs. The youngest archaeologically significant site at Olduvai is the type section of the Naisiusiu beds. Excavated by the Leakeys in the 1960's and 1970's, these beds contain microlithic tools suggestive of the LSA. Previous efforts to date the site are inconclusive, with C-14 dates of 17,000-17,550 (Hay, 1976) and >42,000 BP (Manega, 1993). The tuff bed in the zone with artifacts is reworked material and therefore not datable by $^{39}\text{Ar}/^{40}\text{Ar}$, so some other dating method was needed. In the summer of 2001, five equid teeth were collected from the type Naisiusiu site. Another tooth had been previously collected. ESR ages have been determined for four of these teeth and, assuming linear uranium uptake, cluster around 60 ± 10 ka. These dates are considerably older than previous estimates and suggest an early MSA/LSA transition in East Africa.

New Chemical Evidence of Australopithecine Diets

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Over the past decade, stable isotope studies have demonstrated that South African australopithecines ingested significant quantities of C_4 resources. As these resources are not consumed to a significant extent by *Pan*, *Gorilla*, or *Pongo*, this suggests a considerable broadening of the ancestral C_3 resource base by australopithecines. Unfortunately, however, stable carbon isotopes alone do not allow us to distinguish between the consumption of a variety of C_4 foods (tropical grasses, sedges, or animals eating these foods). Nonetheless, other lines of evidence have recently pointed to termites and sedges as possible C_4 sources. The purpose of this paper is three-fold. Firstly, we present data from new stable isotope analyses of 19 australopithecines, effectively doubling the published sample size. Secondly, we present the first Sr/Ca data for *A. africanus* and its associated fauna. Lastly, we discuss the possibility of termite- and sedge-consuming hominids in light of new data on the isotopic and elemental compositions of these foods in Kruger National Park, South Africa.

Red deer hunting by Middle and Upper Paleolithic hominids from western Europe

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Fossil hominid morphology, archaeology, and genetics indicate that in Europe 30,000-40,000 years ago, anatomically modern humans and their Upper Paleolithic industries replaced Neandertals and their Middle Paleolithic tools. Neandertals had thrived for hundreds of thousands of years, so why were they replaced? One possibility is that modern humans were able to extract more resources from the environment. I tested this explanation by assessing variation present in ancient hunting practices and by investigating the relationship between Late Pleistocene hominids, tool industries, and hunting. I examined the hunting of one species, red deer (*Cervus elaphus*), through time and across space using prey age-at-death as an indicator of hunting strategy. Using data collected on fossil samples from France and northern Spain, I reconstructed age distributions using three methods: histograms, boxplots of median crown heights, and modified triangular plots, and two tooth combinations: dp4/p4 and dp4/m1. Two samples served as comparative baselines: a sample of *C. elaphus* killed by modern hunters in western Montana and a sample of *C. elaphus* hunted by wolves reintroduced into Yellowstone National Park, Wyoming. The mortality distributions of these two modern samples differ dramatically; the wolf-kill sample contains more juvenile and old individuals, while the hunter-kill sample has more young adults. My results show that Neandertals and modern humans did not differ significantly in their ability to hunt prime-age red deer. None of the mortality distributions from the archaeological samples resemble the distribution constructed from the wolf-kill sample. Nevertheless, the samples included in this study show a shift in prey age-at-death during the Middle Paleolithic approximately 50,000 years ago. Young adult prey are more abundant in recent assemblages than in more ancient assemblages. Over 25 archaeological samples from western Europe contribute to these conclusions, making this study the most comprehensive study of Pleistocene hunting to date.

Preliminary results on subsistence and technology of the initial Upper Paleolithic and Ahmariyan at Üçağızlı Cave (Hatay, Turkey)

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Üçağızlı Cave on the Hatay (Mediterranean) coast of Turkey preserves a technological and faunal sequence spanning the Initial Upper Paleolithic (>41,000 radiocarbon years BP) through Ahmariyan (ca., 30,000 years BP), along with an early Epipaleolithic component (Kuhn et al. 1999; 2001). Excellent preservation at the site provides a unique perspective on foraging and technology in the Levantine early Upper Paleolithic, otherwise known almost exclusively from stone tools. Nine major cultural layers have been identified. Formal bone tools and marine shell ornaments occur throughout the sequence. The diverse contents of the cultural deposits indicate use of the site as a residential camp throughout its occupation history; there are large quantities of stone tools, ornaments, bone and antler implements,

cobble grinding stones and anvils, food debris in the forms of broken bones and shell, hearths and ash dumps, and, in an upper Ahmari layer, a large rock alignment. The shelter's position adjacent to the mouth of a high-walled, narrow valley would have presented considerable advantages for hunting roe deer, fallow deer, wild goat, and other ungulates. Throughout the sequence there was heavy emphasis on scraping tools, scraping and defleshing of prey, "through-bone" methods of carcass dismemberment, and extensive use of fire, possibly for smoking meat. These patterns, along with the predominance of large and medium game among the fauna, indicate a continuous focus on ungulate hunting and processing at this locality, irrespective of culture complex. Increases in dietary breadth are evidenced with time, independent of climate-induced shifts in prey species representation. The changes in diet breadth may also be associated with more increasingly prolonged occupations of the site.

Stone tools and the brain: the neural substrates of Mode I knapping skill as revealed by Positron Emission Tomography (PET)

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Attempts to understand the implications of early stone tools with respect to hominid psychological and brain evolution have long suffered from a scarcity of hard evidence regarding the actual neural substrates of stone toolmaking skill. Functional brain imaging studies using Positron Emission Tomography (PET) are now beginning to readdress this problem by providing a new avenue of experimental inquiry for human origins researchers. The research presented here follows a previously published pilot study (Stout *et al.* 2000; *JAS* 27: 1215-1223) in using PET to identify the regions of the brain that display increased activity during Mode I (Oldowan-style) flake production. Six subjects with no prior knapping experience were imaged under three different experimental conditions: (1) a control condition consisting of simple percussion without flake removal, (2) "novice" knapping, and (3) "experienced" knapping following four hours of practice. Significant knapping-related activations were observed in (1) the primary sensorimotor cortices surrounding the central sulcus, (2) the premotor cortex of the frontal lobe, (3) the polymodal association cortices of the superior parietal lobule, (4) the visual cortices of the occipital lobe, and (5) the cerebellum. These activations reveal the relatively intense visuomotor demands of stone knapping and highlight those regions of the brain that would have been the most likely targets of selection on knapping skill. The pattern of activations observed during experienced knapping is qualitatively similar to that seen in novice knapping, but of lesser intensity. This reflects the increased stability and efficiency of performance that comes with experience. Available evidence does not indicate the recruitment of prefrontal planning and problem solving regions during Mode I flaking, nor show any clear overlap between toolmaking and language processing networks. Results from this PET research have major implications for numerous hypotheses concerning the cognitive and evolutionary implications of early stone tools.

Taphonomic versus ecological factors in the rarity of fossil hominins at Laetoli, Tanzania

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Australopithecus afarensis is a remarkably rare component of the Laetoli fauna, representing less than 0.2% of the mammalian specimens collected. It is important to determine whether this rarity is a reflection of their original representation in the fauna, because this would have implications for understanding their habitat preference and niche specialization. Clues to answering this question come from a closer examination of the hominin remains themselves. The Laetoli sample, compared with that from Hadar, is much more fragmentary, and consists almost exclusively of cranio-dental specimens. A similar pattern is found in cercopithecids, in which postcranials comprise only 8% of specimens. Since the Laetoli fossils are part of a subaerially deposited attritional assemblage with evidence of carnivore activity, the rarity and composition of the hominin remains might be explained as a consequence of carnivore ravaging. To test this hypothesis, we collected data on the representation of cranio-dental and postcranial specimens assigned to seven size classes of ruminants at Laetoli. Ruminants were selected because they are the best represented taxon (53% of all mammal specimens) with a broad range of body sizes (~5-1000 kg). The results show that medium-sized bovids (~25-250 kg) have a much higher proportion of cranio-dental remains relative to postcranials than do small and large-size ruminants. This may be explained as a consequence of more intensive carnivore ravaging of medium-sized bovid carcasses. Larger ruminants, with their more robust skeletal elements, are less likely to be entirely destroyed by carnivore activity, while smaller bovids are more likely to be buried by periodic volcanic ashfalls and so avoid detection by scavenging carnivores. The inferred body size of *A. afarensis* would make it particularly susceptible to destruction by carnivores, and this may be a significant factor in accounting for their low representation in the fauna, and the rarity of their postcranials.

Intraspecific variation of enamel thickness in humans and modern apes, and its significance to the interpretation of fossil hominids

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Enamel thickness has been a feature of some importance in hominoid paleobiology and systematics. A significant amount of research on molar enamel thickness was generated from interest in

Ramapithecus. More recently, the Mio-Pliocene hominids or hominid candidates, *Ardipithecus*, *Orrorin*, and *Sahelanthropus*, have been discussed with reference to enamel thickness. L. Martin was the first to define and quantify "overall" enamel thickness of a molar by use of an "average" thickness value. This was done by sectioning a tooth through the two mesial cusps, and by dividing the cross-section area of enamel by the length of the enamel-dentine junction (EDJ). Others suggested that enamel thickness varies within a section, and interpreted

such patterns with regards to function. A small number of fossil hominoid (including hominid) molars have been evaluated by sectioning, by measuring natural fracture planes, or by ct scanning, although medical scanners do not necessarily provide the required resolution. Our own studies of enamel thickness were initiated from the necessity to adequately interpret thickness as inferred from the available natural sections, such as those of *Ardipithecus*. We focus on two methodological aspects. First, we developed methodologies by which we obtain high resolution 3-dimensional surface representation of both outer enamel surface and the EDJ. This enables quantification and evaluation of "overall" thicknesses based on accurate estimates of enamel tissue volume. A comprehensive examination of within-tooth variation of thickness also becomes possible, and measurements taken on natural sections can be interpreted within such larger framework of reference. Second, we attempt to gauge variation from sufficiently large sample sets for at least some of the modern comparative material, such as with humans. In this presentation, we summarize some of our results on intraspecific variation in enamel thickness, and discuss their implications to the interpretation of the Mio-Pliocene hominids.

Interim Report on Continuing Excavations and Taphonomy at the Dmanisi Site, Republic of Georgia

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In 2002 the Dmanisi research team continued its excavations in "Area 2" and in "M6" recovering some 600 new fossil specimens, and more Oldowan tools. We report here on taphonomic observations of the vertebrates made during 2001 and 2002 as well as preliminary analyses of ages of death (mortality profiles) of the vertebrates from the site as a whole. Taphonomic analysis is mid-way, excavations are ongoing (and therefore samples will get larger) but some interesting patterns are already emerging. Although the time period over which the assemblages were deposited is believed to be extremely short, there does appear to be spatial heterogeneity between microstratigraphic features and levels at the site. M6 has great potential as the most *in situ* archaeological layer discovered so far. More broken bones, specifically long bone shaft fragments, broken while fresh, were discovered during 2002 than in 2001. Analysis of notch shape (breadth/depth) on bone fragments indicates the central tendencies are most similar to those made by carnivores (with lower ratios) rather than by hammerstones (which have higher ratios) in actualistic studies published by Capaldo and Blumenshine. However, the variation at Dmanisi is much higher than in actualistic studies, and it seems that more than one process created notches at Dmanisi, and that hominins broke open some bones with hammerstones. Although there are few scores made by teeth or tools at the site, there is some evidence of both carnivore and hominin food processing. The ongoing study of tooth eruption and wear to form mortality profiles of the carnivores and herbivores, along with abundances of carnivore specimens, and other taphonomic observations, does not so far implicate denning behavior of *Canis*, *Ursus*, or *Pachycrocuta* as the primary cause of bone accumulation.

Elephant Biostratigraphy and Human Evolution in the African Fossil Record

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Species and subspecies within the African *Elephas* have been important faunal markers for biostratigraphic correlation of African paleontological localities. Specimens of elephants are common in faunal assemblages associated with humans in early hominid sites. In addition, the division of the intermediate member of this lineage, *Elephas recki*, into five time-successive subspecies; *Elephas recki brumpti*, *Elephas recki shungurensis*, *Elephas recki atavus*, *Elephas recki ileretensis* and *Elephas recki recki*, with each species and/or subspecies evolving directly into the next with no overlap in time. The association of elephant and hominid specimens, combined with proposed tight temporal framework of the *Elephas recki* lineage, illustrates the utility of this particular large mammal for biochronology. Results from comparison of dental variability in *Elephas recki* to both extant elephant species as well as other African and Eurasian fossil elephants indicate that the variation in the sample of specimens currently attributed to *Elephas recki* exceeds that of many other species. There is great variation at the subspecies level as well. Consolidation of the published records of *Elephas recki* subspecies indicate that the ranges for all five subspecies overlap, and are not separated in time as previously proposed. The significant degree of temporal overlap, combined with the wide range in morphological variation suggests that this is not a single species, and a preliminary proposal for taxonomic revision is discussed. The utility of *Elephas recki* as a biochron must be reevaluated in the overall context of Plio-Pleistocene elephant evolution in Africa.

New Research on the Early Upper Paleolithic of Central Europe: the Re-excavation of Brno-Bohunice

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This paper presents the preliminary results of the August, 2002, re-excavation of Brno-Bohunice, the type-site for the Early Upper Paleolithic industry, the Bohunician. Conducted as a collaboration between the University of Minnesota and the Institute of Archaeology, Brno, Czech Republic, this project was designed 1) to resolve the potential bias of the original amateur-collected assemblage by procuring a new sample with modern artifact recovery protocols; 2) to evaluate the apparent industrial heterogeneity between the original type-site collection and the well-excavated Bohunician assemblages from Stránská skála; and 3) to test Oliva's hypothesis about the acculturation between the contemporaneous industries of the Szeletian & Bohunician. This paper presents our initial test of Oliva's hypothesis that the Bohunician did not produce bifacial foliate points but acquired them in trade from Szeletian flintknappers. As the Szeletian has been argued to be the handiwork of Neanderthals whereas the Bohunician has been demonstrated to be intrusive to the region (and thus potentially the handiwork of anatomically modern humans), this issue is of great relevance to the current debate over the Neanderthal acculturation hypothesis. As the new excavation recovered numerous bifacial thinning flakes and foliate points within the cultural horizon of a classically Bohunician assemblage, the traded-point hypothesis appears to be falsified. The new data from Brno-Bohunice, however, does raise other important issues about the relationship between the Szeletian and Bohunician archaeological entities as material culture traditions or landscape variants.

An early modern human from southeastern Europe

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It is frequently assumed that southeastern Europe would have been the primary dispersal route for early modern humans during the Late Pleistocene Interpleniglacial, but documentation of this has been limited by presence of only fragmentary and/or poorly dated human remains from this region and time period. The 2002 discovery of a largely complete early modern human mandible in the Peștera cu Oase, in southwestern Romania, therefore contributes toward our knowledge of the establishment of an early modern human biology within Europe. It was found in a karstic system associated with extinct Pleistocene fauna and dates to the early Upper Paleolithic. The mandible lacks only the antemolar dentition and one posterior ramal margin. It presents one derived feature of early modern humans relative to Neandertals, a prominent *tuber symphyseos*, plus a suite of features which occur in higher frequencies among European early modern humans, including symphyseal orientation, mental foramen position, retromolar space absence, and mandibular notch shape. However, it also exhibits unilateral mandibular foramen lingular bridging and progressively larger distal molars, and the ramus is exceptionally wide for its mandibular length. In the last feature, it has its closest morphological affinities to some Middle Pleistocene humans and Nazlet Khater 1.

Technological change across the Acheulian-Middle Stone Age transition of the Kapthurin Formation, Kenya

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The Middle Pleistocene African archaeological record is marked by the disappearance of the Acheulian and its replacement by diverse Middle Stone Age (MSA) industries. This is an important technological shift, and part of an increasingly complex hominid behavioral pattern inferred from MSA sites. Understanding the processes behind the end of the Acheulian is important, as the advent of the MSA may be coincident with a hominid speciation event leading to the appearance of our own species.

The Kapthurin Formation, Kenya preserves one of the few dated sequences spanning the Acheulian-MSA transition. Sites occur within and beneath the Bedded Tuff Member (K4), which records a period of intermittent volcanism, the latest phases of which are dated by ⁴⁰Ar/³⁹Ar to >235 ka. High-resolution field mapping and geochemical characterization of the Bedded Tuff has permitted the stratigraphic ordering of associated archaeological assemblages. Acheulian and MSA sites, some containing blades and handaxes on Levallois flakes, are inter-stratified, demonstrating a complex, non-linear transition. Current research applies these tephrostratigraphic data to locate sites in poorly represented time intervals, and uses tuffs as isochronic horizons to document paleolandscape variability.

Recent excavation at Koimilot (GnJh-74) targeted stratified artifact occurrences within upper portions of K4. Koimilot, attributed to the MSA, is the youngest site yet known from the Kapthurin Formation and exhibits technological features not seen at other, older sites. Fluvio-lacustrine sediments and fossil reeds preserved within tuff suggest a setting near the shoreline of a fluctuating freshwater lake. The artifact assemblage from the stratigraphically lower Locus 1 is in fine-grained overbank deposits, exhibits little post-depositional disturbance, and is characterized by centripetally flaked preferential and recurrent Levallois cores. Locus 2 artifacts occur within an ephemeral channel, but preserve an industry with large (~10 cm) Levallois points and elongated flakes. These show the diversity of technological approaches used by hominids at even the earliest MSA sites.

Viruses and Human Evolution

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Molecular phylogenies of human and animal viruses suggest that hominids have been affected by viruses throughout their evolutionary history. Some viruses show evidence of ancient intimate relationship and cospeciation with hominids, while others were acquired from other species, including African primates at various points during hominid evolution, and domesticated animals and rodents since

the Neolithic. This paper discusses some of the effects these viruses may have had on human evolution.

Given the longstanding interaction between humans and viruses, a coevolutionary relationship is likely. As important causes of morbidity and mortality, viruses can act as agents of selection and mediate competition among sympatric populations and species. Viral selection for specific resistance polymorphisms appears unlikely, but in conjunction with other parasites viruses have undoubtedly contributed to selection pressure maintaining MHC (HLA) diversity and a strong immune response. They probably also contributed to the loss in our lineage of the sialic acid N-glycolylneuraminic acid (Neu5Gc), a cell surface binding site for a number of pathogens. Zoonotic viruses could have affected the outcome of competition among Pliocene hominids, while viruses carried by anatomically modern humans and other animals migrating out of Africa may have contributed to declines in non-African populations such as Neandertals.

In addition, the ability of many viruses to integrate into or recombine with host DNA gives these "molecular genetic parasites" opportunities to directly affect host genomes. Endogenous retroviral insertions since the divergence between humans and chimpanzees may have influenced hominid evolution through changes in gene expression and development.

Discovery of Photo Negatives of Destroyed Upper Palaeolithic Fossil Material from Předmostí (Czech Republic)

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Discovery of fossils hominids from the end of the 19th and beginning of the 20th century from the Moravian site Předmostí which contains the remains of 29 subjects of different ages and sex are among the most important Gravettian findings in Central Europe. Dating of different Předmostí sites vary between 25 – 27 kys BP (Svoboda, 2001). In the past, the morphology of these skeletons was classified as a transitory state between Neanderthals and anatomically modern humans. Though the taphonomic aspects of the Předmostí collective grave have been recently discussed the fossil material was nearly completely destroyed at the end of the Second World War. Scholars were left only with a two-volume publication *Homo predmostensis* by J. Matiegka published in 1934 and 1938 which is not available at present.

During the reconstruction of the university department where J. Matiegka (*1862 - †1941) worked, an extensive photographic archive of materials dating from this time was found, unfortunately without documentation. In this collection we found among others also glass negatives of photographs which beyond doubt were part of the mentioned publication. In the first step of analysis of this material we identified some 220 photographs of the cranial and postcranial skeleton as well as casts of endocrania of the majority of individuals from Předmostí. Preliminary analyses show that not only negatives of already published photographs were saved but also some unknown and unpublished negatives. Preservation and digitalization of original negatives of high professional quality will make it possible, as compared with the original photographs, to visualize more anatomical details for further investigations of the morphology of these lost fossil skeletons. It is possible that further analysis of the photographic evidence will reveal new details about the Předmostí fossils. The preservation of these documents of scientific and historical value will facilitate new publications and will provide valuable information on Předmostí fossils hominids remains for the future.

Diaphyseal and articular proportions in the limbs of *Australopithecus afarensis*

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Long bone articular dimensions and diaphyseal robusticity, governed by genetic and epigenetic factors, have been shown to vary with locomotor mode in primates (Ruff 2002). *Australopithecus afarensis* was habitually bipedal, and is considered partly arboreal by some. If below-branch arboreality like that of extant great apes was a significant part of its locomotion, we might expect to see this reflected in joint size and relative bone strength in the upper limb.

Diaphyseal cross-sectional dimensions of all possible *A. afarensis* specimens were recorded from photographs of natural breaks, and linear articular dimensions were measured on the fossils. These data were compared with those from extant catarrhines. Because of the fragmentary nature of the fossils and availability of comparative data, we considered sections only of the proximal humerus and midshaft of the radius, ulna and tibia, and articular dimension of the distal humerus and proximal radius, ulna and tibia.

Humans have broader tibial plateaus and more robust tibial diaphyses relative to their humeral, radial, and ulnar articular widths and diaphyses than non-human catarrhines. *A. afarensis* shared this distinctly human pattern. The hominin pattern is clearly different from that of apes, in particular orangutans, which have the largest upper limb joints and strongest upper limbs. Humeral diaphyseal strength of *A. afarensis*, however, is greater relative to its articular dimensions than that of apes and humans, but smaller than monkeys, which have relatively small upper limb joints compared to hominoids. In addition, radial and ulnar proportions differ among *A. afarensis*, chimpanzees and gorillas, suggesting independent specialization of forelimb functional morphology among extant hominoids. Thus, *A. afarensis* does not closely resemble extant apes in any of its articular to diaphyseal proportions, but

instead has a generally human-like pattern of joint size and bone strength, except that its humeral diaphysis is stronger relative to articular size.

Human-tooth ornaments from the French early Aurignacian : implications for early Upper Paleolithic treatment of the dead

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The richness and diversity of personal ornaments in the southern French early Aurignacian is now well documented. These are generally manufactured of marine shells, animal teeth, soft stone and, especially, mammoth-ivory. In addition however, early twentieth century excavations provided two examples of pierced human teeth, one from La Combe (Dordogne) and the other from Tart (Haute-Garonne). New, high-quality excavations at Brassempouy (Landes) and Isturitz (Pyrénées-Atlantique) have now revealed several well-provenienced

human teeth transformed into personal ornaments. This corpus of human-tooth ornaments is analyzed with particular attention to the anatomical position of the teeth chosen, the techniques by which they were transformed and stigmata on the teeth themselves indicating probable flesh removal. With the recent re-dating of the human remains from Cro-Magnon, there are no known burials of Aurignacian age. Suggesting that Aurignacian treatment of the dead did not involve interment. Aurignacian human remains are generally sparse and highly fragmented. This fact, combined with the frequency of human-tooth ornaments implies alternative but equally complex mortuary practices.

Early Hominids: Diversity or Distortion?

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Paleoanthropology has readily adopted "diversity" systematics over the last ten years, partly because of new fossils and perhaps partly as an expression of modern academic culture. Hominid phylogenies now regularly recognize up to 20 species. To evaluate the biological significance of these taxonomic claims it is essential to consider normal ontogenetic, sexual, geographic, idiosyncratic, and temporal variation within biological species lineages. "*Kenyanthropus platyops*" has been interpreted as evidence of an early diet-driven adaptive radiation in the hominid clade. Does the putatively "new" morphology of this taxon lie outside the expected range of phenotypic variation of the well-documented *A. anamensis* to *A. afarensis* species lineage? This paper will examine that issue from two perspectives. First, the features purported to differentiate the taxa are examined in light of comparative data from extant hominoid taxa. Second, a new form of distortion, Expanding Matrix Distortion (EMD), is defined and evaluated in light of historical considerations and a recent assessment of a series of Oligocene oreodont crania from the University of California Museum of Paleontology. Expanding matrix distortion is shown to have systematically altered the morphology of the holotype specimen of "*Kenyanthropus platyops*." Because the only known cranium of "*K. platyops*" suffers Stage 4 EMD, additional fossil evidence from 3.5 Myr horizons in the Turkana basin will be required to establish whether this represents a valid taxon, or simply a Kenyan variant of the *A. anamensis* to *A. afarensis* lineage.

Refining character sets for hominin phylogenetic analysis

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Recent work by Collard and Wood (2000) has brought into question the use of cranial and dental data for phylogenetic analysis of fossil hominins. In order to test the reliability of craniodental data, Collard and Wood compared molecular-based phylogenies of extant hominoids and papionins to ones based on metric and discrete craniodental characters like those typically used to infer hominin phylogenetic relationships. Their analysis revealed contradictions between the two sets of phylogenies, thus leading them to conclude that craniodental data are unreliable and should not be the sole basis of hominin phylogenetic hypotheses. While we agree that cranial and dental homoplasies are common and can lead to incorrect phylogenies, we believe that categorizing all craniodental data as unreliable is ill-advised. Many cranial and dental characters accurately reflect phylogenetic relationships, although determining which do so is difficult to assess. A technique similar to the one used by Collard and Wood could be employed to identify characters or types of characters that regularly produce misleading phylogenetic signals. By mapping craniodental characters onto a known phylogeny of a closely related extant group such as the hominoids, homologous and homoplastic characters can be recognized. Omitting characters that regularly appear as homoplasies from future analyses should allow better phylogenies to be generated from the limited data that is typically available among fossil samples. We applied this technique to the qualitative data used by Collard and Wood and discuss here the possibility of refining such a character set for phylogenetic analysis of fossil hominins.

