

burials were made before 1350. This means that around 40% of all burials of adults in the city of Odense between the 1270s and 1350 were made in the cemetery of the leprosarium. Based on an epidemiological analysis, virtually all the skeletons came from people who suffered from leprosy; based on a pathological analysis more than half of the skeletons came from people with leprosy.

Consequently, more than 20 % of the people of Odense died with leprosy between 1270 and 1350. This means that leprosy was an extremely common disease and that the epidemiological estimate of the frequency of leprosy are much more accurate than those based on pure pathological analyses.

Funded by the EU program Interreg 4A.

Identity marker or medicinal treatment? An exploration of the practice and purpose of dental ablation in ancient Nubia

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Dental ablation, as both a social and physical experience, is performed for many reasons. This practice has a long history in Sudan, though its implementation and significance appear to vary through time. Ablation is portrayed as a male rite of passage in Neolithic Sudan and in ethnographic and clinical literature; however, this pattern is not found in Meroitic (c. 350 BC-AD 350) to Christian (c. AD 550-1400) period samples. In this study, 409 Meroitic individuals from the Second Cataract Semna South site were examined using a previously developed system for the differential diagnosis of ablation. Thirty (7.3%) individuals, 17 of 164 (10.3%) males and 13 of 168 (7.7%) females, show dental ablation. Of these, 18 of 30 (60%) exhibit ablation of one to four mandibular incisors and 14 of 30 (40%) exhibit ablation of both mandibular and maxillary incisors. A previous study of 96 late Meroitic through Christian period individuals from the Fourth Cataract Ginefab School site revealed similar frequencies of mandibular ablation. Chi-Squared Tests confirmed there is no statistically significant sex bias in instance or pattern of ablation in either sample.

The social correlates of ablation are often prioritized in study, resulting in neglect of consideration of biological implications. These results suggest ablation may have been a form of medicinal practice in this period, possibly in prevention and treatment of febrile illness and lockjaw. This study demonstrates that both the social and biological significance of ablation should be investigated as temporally fluid, elucidating the evolving function of cultural practices.

Ancient DNA from Early to Mid-Holocene Burials in Northwestern Argentina: Implications for understanding the colonization and early populations of South America

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Archaeological evidence demonstrates that humans have been living in South America since the late Pleistocene. However, relatively little is known about the genetic diversity present in early hunter-gatherer populations on this continent, and few studies have examined ancient DNA from Pleistocene or early to mid-Holocene human remains from South America. Many questions therefore remain about the early populations of this continent and the routes of migration that were used by some of the earliest settlers.

In this study, we extracted DNA from the remains of 13 individuals unearthed at early and mid-Holocene archaeological sites in northwestern Argentina. The remains come from four locations in the Antofagasta de la Sierra region, in the southern Argentine Puna, and they date between ca. 9500-3330 cal BP. We identified mitochondrial DNA (mtDNA) haplogroups based on coding-region SNPs, and sequenced 372 base pairs of the first hypervariable region of the mtDNA to confirm haplogroup assignments and define mtDNA haplotypes. All results were confirmed through multiple independent DNA extractions and PCR amplifications. We compared the genetic lineages in these individuals with those in other ancient and contemporary populations from the Americas to help elucidate the genetic affinities between the prehistoric inhabitants of the Puna and peoples in other regions. We found that one of the most common mtDNA lineages in these ancient Argentinians was haplogroup D4h3a, which is rare in indigenous Americans today but most common along the Pacific coast. Our results shed light on the early populations and routes of migration in South America.

Anti-predator vocalization usage in the male ring-tailed lemur (*Lemur catta*)

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The ring-tailed lemur (*Lemur catta*) is a group-living strepsirrhine primate endemic to Madagascar that faces considerable predation pressure from aerial and terrestrial predators. This species engages in mobbing and vigilance behavior in response to predators, and has referential alarm vocalizations. Although *L. catta* is female-dominant, males may also engage in anti-predator behavior. This study tests two hypotheses for male anti-predator vocalization behavior on wild *L. catta* at Beza Mahafaly Special Reserve in Madagascar. To test the predator confusion hypothesis, we collected focal data on males, and predicted that when a male made an alarm call, one or more group members would also make the same vocalization. To test the mobbing hypothesis, we

played wolf (*Canis lupus*) howls and control playbacks to five *L. catta* groups, and predicted that lemurs would make alarm calls following wolf playbacks, but not following controls. We found support for both hypotheses. When a male *L. catta* made an anti-predator call, one or more group members made the same vocalization more often than expected by chance (binomial tests: $p < 0.05$). Males as well as females from all five *L. catta* groups made alarm calls following wolf howls, but not following control playbacks (Wilcoxon: $p < 0.05$). Some groups responded more strongly to playbacks, which may reflect differential predation pressures. Our results show that *L. catta* males participate in group-level anti-predator vocalization usage. Although females are known to hold the primary role in group defense, *L. catta* males also participate in behavior that may confuse or drive away predators.

Research funding provided by the Natural Sciences and Engineering Research Council of Canada, American Museum of Natural History, St. Catherines Island Foundation, and National Science Foundation BCS 0922465.

Growing up gibbon

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A sample of 45 (23 female, 22 male) immature, wild collected white-handed gibbons (*Hylobates lar*) were assessed for body mass, trunk height, limb lengths, bone fusions and cranial capacities and compared with 92 adults (42 female, 50 male) wild-collected during the A.P.E. 1937 expedition. Schultz's 1944 monograph highlights age changes in this population, but new dental aging techniques and long term behavioral research allow a reassessment of anatomical growth within a chronological and behavioral framework. The immatures were categorized into 4 age classes by molar eruption sequences and proximal humeral fusion. Results highlight individual features by age class: age class 1 infants (~4-21 months) have intermembral indices of 127.2, close to the adult averages of 130.8; by the end of age class 2 (before M2 eruption), individuals reach about 50% of adult body mass and over 75% trunk height. By age class 4 (M3 eruption, ~6.1 yrs), sub-adult gibbons have all of their permanent teeth; body growth is incomplete and sex differences appear. Sub-adult males are significantly different from adult males at 90% their trunk height and average 88.6% the body mass of adults. Sub-adult females are 97% the trunk height of adults and 93.1% adult body mass, not significantly different than adults. The extended juvenility up to 10.0 yrs of wild female gibbons suggests that they may spend almost 4 years as sub-adults before reproducing.

Implications of vertebral degenerative disease and vertebral ligamentous ossification in native populations of the Lower Tennessee River Valley

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Cervical vertebrae are an effective data source for understanding physical activities of a populace due to the osteological reactivity of nuchal muscle use to extensive weight and pressure. Differentiation in the distribution of osteophytosis (OPL), osteoarthritis (OA), and ossification of the ligamentum flavum (OLF) along the cervical vertebrae may indicate particular load-bearing stresses and/or behavioral differences between subsistence strategies.

A collection of 287 pre-Columbian Native American individuals (N = 854 vertebrae) was analyzed for presence and severity of OPL, OA and OLF. The sample consists of remains from six archaeological sites located in the lower Tennessee River Valley: three sites (Cherry, Eva and Kays Landing) from the Archaic period (~2500-1000 BC) that reflect an intensive hunter-gatherer subsistence strategy; and three sites (Link, Slayden and Thompson Village) from the Mississippian period (~AD 1000-1200) that reflect an agriculturalist subsistence economy. Multivariate statistical analysis was employed to compare the 167 individuals viable for OPL analysis and 103 individuals viable for OLF analysis to determine frequency and distribution. Granted that degenerative changes are ultimately phenomena related to age and body size and are etiologically multifactorial, the results of this study, in conjunction with previous paleopathological studies of the rotator cuff, suggest a strong patterned co-association between reactive changes on the cervical spine and particular repetitive load-bearing movements (e.g., head balancing, forehead and chest level tump line use, weight bearing by the arms) and subsistence economy.

The standard Procrustes analyses may be inappropriate for applications to variation at large geometric scale

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For phylogenies varying greatly at the largest geometric scales, the geometric morphometric (GMM) shape coordinates produced by the conventional "generalized" Procrustes analysis (GPA) may be less appropriate than a different set of Procrustes shape coordinates taking phylogeny into account much more explicitly. Howells, Oxnard, and others have argued that any concordance between shape similarity and phylogeny should concern only aspects of shape that are uninformative about functional morphology; but large-scale shape features of animals often have obvious functional implications. For the mammals as a clade, Marcus et al. (2000) claimed that the standard GMM coordinates of skull form over 53 mammal genera conveyed hardly any information about phylogeny. We reanalyzed the midline forms of a slightly larger sample of their specimens, covering a considerable diversity of 13-gons, not by GPA but by a substantially different algorithm that takes into account not only the now-conventional phylogenetic correlations but also empirical anisotropies of the shape coordinates, the a-priori curvatures of Kendall shape space, and the Oxnard-Howells concern. Using one good contemporary phylogeny we find a substantial phylogenetic

signal within an arguably nonfunctional subspace of midline skull shape over these mammals. The new method is based on shape distances, Brownian models over divergence time, and the approximation of functional indices by linearized shape factors. Reanalyses along these lines might constructively reopen the old argument about the role of quantitative morphology in systematics studies. For studies of clades showing substantial variation at the largest geometric scales, biometric progress may depend on replacing GPA.

Support: NSF grant DEB-1019583 to FLB and Joe Felsenstein, UW, who has argued with me extensively about many aspects of this theme; data courtesy of Erika Hingst-Zaher.

Ecological correlates of diet and social structure in the greater bamboo lemur (*Prolemur simus*)

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It has been argued that the unpredictable climate of Madagascar and high energetic cost of reproduction have favored female dominance in the Malagasy lemurs; however, this strategy varies in effectiveness depending on the distribution and seasonality of a species' preferred food source. Bamboo lemurs are unique among primates in their ability to detoxify large quantities of cyanide while consuming their primary food, the Madagascar giant bamboo (*Cathariostachys madagascariensis*). This adaptation has allowed for the utilization of an abundant resource with little competition among sympatric species.

In this study, we explore the rates of intersexual competition found in the greater bamboo lemur (*Prolemur simus*). We hypothesized that the lack of interspecific feeding competition, in addition to a male size advantage, has led to a deviation in the pattern of female dominance found in the majority of lemurs. Data were obtained from June to August 2013 at Kianjavato Ahmanson Field Station in southeastern Madagascar. More than 160 focal hours were collected from 14 adults in three groups (N=5 males; N=9 females). During 2-hour focals we recorded behaviors using instantaneous scan samples at 5-minute intervals. Agonistic and affiliative interactions were recorded *ad libitum*, but were only included in analyses if they pertained to focal individuals. Over the 10-week study, 51 intersexual agonistic interactions were observed. All but one were initiated by males and resulted in female displacement. While more long-term data are needed to account for seasonality, this preliminary study has highlighted key differences in the social organization of the greater bamboo lemur.

Data collection funded by Dr. and Mrs. Carl A. Bunde Graduate Research Grant, Department of Zoology at University of Wisconsin-Madison, Omaha's Henry Doorly Zoo and Aquarium, and the Madagascar Biodiversity Partnership.

Urinary oxytocin, sociosexual behavior, and grooming in bonobos (*Pan paniscus*): Preliminary analyses

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Oxytocin is a hormone known to regulate the social memory and reward systems of the brain in several species of mammals, including primates. Recent research suggests that this hormonal system may be the underlying mechanism that facilitates cooperation and social bonding in unrelated individuals. Bonobos represent an ideal species to study this mechanism because, although bonobos are male-philopatric, females form strong and cooperative non-kin social bonds and frequently engage in sociosexual behavior as a mechanism to diffuse tension and facilitate cooperation, particularly during feeding. This study presents preliminary data on mean urinary oxytocin and social behavior in the Columbus Zoo bonobo colony (N=16 individuals). We collected observations of all social behaviors including grooming and sociosexual behavior. Urine was collected from each individual and assayed for oxytocin using a commercially available enzyme immunoassay kit. We found that mean urinary oxytocin and rank were positively correlated for females ($r=0.952$; $p<0.05$) but not for males ($p=0.14$). We also found a positive correlation between mean oxytocin and grooming bouts (N=71) with unrelated individuals ($r=0.705$; $p<0.05$). We found that sociosexual behavior predominantly occurred between unrelated individuals and that adolescents engaged in significantly more sociosexual behavior than did the adults (ANOVA: $F=13.309$; $df=1,4$; $p<0.05$). In addition, mean oxytocin was significantly higher among adolescents (N=4, age range = 7-12 years) than among adults (ANOVA: $F=8.725$; $df=1,5$; $p<0.05$). These results support the hypothesis that oxytocin regulates the maintenance of social bond formation in unrelated individuals and may play a role in the facilitation of sociosexual behavior in bonobos.

Support: Nacey Maggioncalda Foundation; University of Oregon.

Intra-annual variation in lemur hunting on the Masoala Peninsula of Madagascar

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Recent evidence has shown that lemurs and other mammals are (and have been) widely hunted for food throughout Madagascar. This study examines the seasonal variation in mammal hunting on the Masoala Peninsula of Madagascar, an area of heightened biodiversity and endemism. From July 2011 to June 2012 a focal hunter was shadowed daily and an individual from 100% of a focal village's households was interviewed about seasonal wildlife consumption. These data revealed specific intra-annual patterns in trapping efforts and wildlife consumption. While lemurs and bushpigs were predominately targeted during the cool, wet austral winter, carnivorans were