The numerical composition of the vertebral column has generated newfound interest in recent years, particularly regarding its role in the evolution of hominoid primates, in large part due to the implications for hominin origins and the evolution of bipedalism. Recently, several different scenarios were proposed to describe the modal number of lumbar vertebrae possessed by the last common ancestor (LCA) of humans and chimpanzees. These include a "chimp-like" ("short-back") ancestry, a "*Proconsul*-like" ("long-back") ancestry, and a "human/gibbon-like" ancestry. Initial interpretations of *Ardipithecus ramidus* support the long-back scenario, although the ARA-VP-6/500 skeleton does not preserve sufficient remains to assess vertebral counts.

I test these competing hypotheses using a combined dataset of published vertebral formulae for both extant and extinct mammals, supplemented with my own data (total N~5,600 specimens). Modal ancestral vertebral formulae are reconstructed throughout mammalian evolution and the hominoid vertebral column is placed in this large phylogenetic framework. Results suggest that a 7-13-6-3 (cervical-thoracic-lumbar-sacral) vertebral formula evolved in the ancestor of therian mammals and persisted throughout mammalian evolution, including the LCA of catarrhines. The LCA of crown hominoids achieved a 7-13-5-4 formula through a caudally-directed homeotic shift at the lumbo-sacral border, a rare occurrence among mammals. The LCA of hominids experienced a subsequent shift at this border, rendering the vertebral formula 7-13-4-5, a "great-ape-like" pattern that persisted through to the hominin-panin LCA. Therefore, this study supports a short-back, "short-trunk" scenario of hominin ancestry. Implications for orthogrady, bipedalism, and hominin evolution are discussed.

This study was funded by the National Science Foundation, grant BSC-0925734.

Reproductive ecology, carious lesions, and selective mortality in late prehistoric west-central Illinois.

JEREMY J. WILSON. Department of Anthropology, Indiana University-Purdue University.

Recent research by John Lukacs and colleagues has highlighted the synergistic relationship between the reproductive ecology of women and the likelihood of poor dental health in prehistoric and contemporary populations. While these findings help to explain the prevalence and patterning of carious lesions in bioarchaeological samples, few scholars to date have effectively measured the biological cost of poor dental health and subsequent probability of entry into a death assemblage. Building upon the theoretical and methodological concerns formalized in the "Osteological Paradox" (Wood et al., 1992), results from a paleoepidemiological analysis of dental health for the late prehistoric period in west-central Illinois are presented. This includes a reexamination of the multicomponent Dickson Mounds skeletal sample using maximum likelihood methods of age estimation and hazard modeling to address the impact of selective mortality.

The co-variance of advanced carious lesions with age-at-death in females of reproductive age in all the time periods examined indicates that heterogeneity in frailty led to early entry into the death assemblages. Females with poor dental health had a significantly higher probability of death during their early reproductive years, while post-reproductive age females had considerably fewer carious lesions. By contrast, the relationship between carious lesions and age-at-death in males followed the attritional mortality profile with the probability of poor dental health increasing with age. These findings shed additional light on the relationship between fertility, subsistence, and well-being in traditional agricultural populations, while simultaneously challenging bioarchaeologists to employ analytical methods suitable for the right-censored data inherent to skeletal samples.

Components of this research were supported by grants from Wenner-Gren and the National Science Foundation.

Causes of intergroup aggression among chimpanzees at Gombe National Park, Tanzania.

MICHAEL L. WILSON[1,2], DEUS C. MJUNGU[3] and ANNE E. PUSEY[4]. [1]Department of Anthropology, University of Minnesota, [2]Department of Ecology, Evolution and Behavior, University of Minnesota, [3]Gombe Stream Research Centre, the Jane Goodall Institute - Tanzania, [4]Department of Evolutionary Anthropology, Duke University.

Since the first observations of intergroup killings among chimpanzees (*Pan troglodytes*) at Gombe National Park, Tanzania, anthropologists have used chimpanzee violence as a source of insights for explaining the origin and evolution of human warfare. Nonetheless, the causes of chimpanzee "warfare" remain only partly understood. Why, for example, are intergroup killings more common at some times and places than others? Debate continues over whether chimpanzee intergroup aggression depends mainly on the relative fighting power of neighboring groups, efforts to attract female immigrants, or competition for food resources. To better understand the relative importance of these factors, we analyzed 35 years of data from Gombe. We found considerable variation in the frequency and location of intergroup aggression. Direct physical contact occurred infrequently, but resulted in severe injuries, including at least 17 fatalities. Intergroup interactions were hostile throughout the study period but occurred most frequently during the destruction of the Kahama community in the 1970s, and the expansion of the Kasekela community in the 1990s and 2000s. The timing and location of patrols and intergroup encounters depended on the relative size of neighboring communities, and on the abundance and location of key food resources. In the past decade, Kasekela chimpanzees directed most of their territorial effort towards the food-rich north, but gained most of their female immigrants from the south, suggesting that competition for food, rather than females, is the more common motivator for intergroup aggression in this population.

This study was made possible by funding from National Science Foundation grant BSC-0648481 and the University of Minnesota.

Species differences in the rate of cognitive ontogeny among humans, chimpanzees, and bonobos.

VICTORIA WOBBER[1], ESTHER HERRMANN[2], BRIAN HARE[3], RICHARD WRANGHAM[1] and MICHAEL TOMASELLO[2]. [1]Department of Human Evolutionary Biology, Harvard University, [2]Department of Comparative and Developmental Psychology, Max Planck Institute for Evolutionary Anthropology, [3]Department of Evolutionary Anthropology and Center for Cognitive Neuroscience, Duke University.

Patterns of cranial development vary significantly between humans and our closest living relatives, chimpanzees (*Pan troglodytes*) and bonobos (*Pan paniscus*). Humans have been proposed to undergo a greater degree of cranial growth postnatally in comparison to the genus *Pan*, while in turn bonobos appear to exhibit delayed development in certain aspects of their crania relative to chimpanzees. Little data currently exists to test whether these changes in cranial ontogeny are associated with changes in behavioral or cognitive ontogeny. Here we compare the cognitive ontogeny of human infants (n = 48), chimpanzees (n = 138), and bonobos (n = 50), utilizing a battery of over 10 tasks examining a wide range of cognitive abilities. We test two hypotheses: 1) human cognitive development is accelerated relative to that of *Pan* in infancy and 2) bonobo cognitive development is delayed relative to that of chimpanzees. We found that human infants show accelerated cognitive development between 2 to 4 years of age, likely owing to an early emergence of social cognition abilities relative to *Pan* infants that allows for participation in human culture. We

also found that bonobos exhibited delayed cognitive development relative to chimpanzees, though only in physical cognition skills (those employed in foraging or reasoning about objects). These results suggest that differences in cranial ontogeny in hominoids are associated with significant differences in cognitive ontogeny. Further work should integrate studies of behavioral and physiological development as part of a larger evolutionary developmental approach to understanding human evolution.
This work was supported in part by a European Research Commission Advanced Grant Agreement 233297 and National Science Foundation grant NSF-BCS-08-27552-02 to B.H, and an L.S.B. Leakey Foundation Grant, NSF DDIG 0851291, and Wenner-Gren Foundation Grant to V.W.

Co-associations of subsistence strategy, non-specific infection, and congenital defects of the deciduous dentition in pre-Columbian Tennessee.

MARISSA C. WOJCINSKI. Department of Sociology and Anthropology, Illinois State University.

Defects of the deciduous dentition flag prenatal stress which may predispose children to postnatal chronic health problems. These chronic health problems may be skeletally manifested as periostitic or osteoporotic changes in the cranial and postcranial skeleton, and compromised growth of the long bones. The subadults which possessed deciduous dentition (skeletally <7 years of age) from 7 sites (N=386) from the agriculture-intensive late Mississippian (AD 1300-1550) period of East Tennessee were compared to the same skeletal age cohort from 5 sites (N=111) dated to the Late Archaic (3000-100 BC) period of west-central Tennessee. Despite the problems associated with the differential preservation of skeletal material, results indicate a higher frequency of chronic health problems in the maize-dependant Late Mississippian (32 indicative cases), with 13 of those individuals also demonstrating long bone involvement (13 indicative cases). The Late Archaic hunter-gatherers demonstrate a higher frequency of long bone involvement: 9 indicative cases out of 10 subadults with chronic conditions. When the co-association of chronic infection and dental defects was examined, results indicate that 28 (7%) Late Mississippian period subadults displayed gross enamel defects, 10 of which also demonstrate chronic infection. In contrast, the Late Archaic sample indicate a much lower frequency of dental defects (3%) with only 1 case co-associated with chronic stress. These results suggest that factors which contribute to this settlement and subsistence difference, which include fundamental community health differences linked to sedentism and population density, likely contributed to a higher co-association of non-specific infection and deciduous defects in the Late Mississippian.

Ontogeny of limb growth and locomotor behavior in *Lemur catta* and *Propithecus verreauxi*.

STEPHANIE A. WOLF[1], RICHARD R. LAWLER[2] and ROSHNA E. WUNDERLICH[1]. [1]Department of Biology, [2]Department of Anthropology, James Madison University.

Propithecus verreauxi and *Lemur catta* differ in adult locomotor behavior and morphology, especially in terms of specializations for hindlimb-dominant locomotion. However, little is known of the ontogenetic trajectories by which these adult forms are acquired. We examined changes in locomotor behavior and limb morphology from 0-2 years in *L. catta* and *P. verreauxi*. Limb segment lengths and body mass were recorded every two weeks (infants) or four weeks (yearlings) at the Duke Lemur Center (DLC). Locomotor data were collected on infants and yearlings of each species in free-ranging enclosures at the DLC using locomotor bout sampling. Bouts were classified as hindlimb, forelimb, or "all-limb" dominant locomotion. Positive allometric growth was observed in all limb segments (except *L. catta* radius) and was highest in femur length from 0-6 months in both species. No significant differences in allometric growth were found between species or age classes. *Propithecus* have significantly longer limb segment lengths than *L. catta* during infancy, and both species have relatively higher intermembral indices during 0-6 month versus 6-12 months of age. More hindlimb dominant locomotion was observed in *L. catta* infants than yearlings. No differences were observed in locomotor behaviors between *P. verreauxi* infants and yearlings. *L. catta* displayed higher frequencies of all-limb locomotion than *P. verreauxi* in all age classes. Growth trajectories were similar between species, yet initial limb segment lengths and locomotor behaviors differed between species across age classes. These data suggest that differences between species in adult body proportions may be established early in neonatal life.
This study was partially funded by Sigma Xi Grants-In-Aid of Research G2009151076.

Keeping their friends close? Contrasting models of social association in Hadza hunter-gatherers.

BRIAN M. WOOD[1], DAVID A. RAICHLEN[2], HERMAN PONTZER[3], JAMES H. JONES[1], AUDAX Z.P. MABULLA[4] and FRANK W. MARLOWE[5]. [1]Department of Anthropology, Stanford University, [2]School of Anthropology, University of Arizona, [3]Department of Anthropology, Hunter College, [4]Archaeology Unit, University of Dar Es Salaam, [5]Department of Anthropology, Durham University.

Because spatial proximity is necessary for most forms of social behavior, friendships and other "close" relationships are likely to be expressed in patterns of space use. While primatologists often explicitly model the social structure of a species or population in terms of space use, researchers studying human populations are much less likely to do so. Primatologists and other biologists often use observations of social interaction and grouping to create inductive models of social structure, from which individuals' preferred social partners can be inferred. In contrast, anthropologists and sociologists typically use interview data to create deductive models of social structure based on nominations of important social relationships, such as friendships. This paper will compare models of Hadza hunter-gatherer social structure derived from both methodologies: direct measures of social grouping as recorded by GPS devices worn by subjects, and the same subjects' nominations of who their friends were. 11 men and 14 women living in 2 Hadza camps in 2010 wore GPS devices daily for two weeks. We use measures of space use to model the strength of social association between individuals. The same subjects were asked to name who their closest friends in camp were. Both GPS data and interview responses reveal a strong preference for social association with same-sexed individuals. We examine the spatial correlates of strong and weak friendship ties, and test whether husbands and wives can be identified through patterns of spatial proximity.
This study was funded by NSF BCS 0850815.

Phylogenetic signals in the hominoid carpus.

STEVEN WORTHINGTON. Center for the Study of Human Origins, Department of Anthropology, New York University, and New York Consortium in Evolutionary Primatology (NYCEP).

The carpal skeleton has been an important region in studies of hominoid anatomy. It is the product of functional, developmental and phylogenetic processes and therefore many carpal traits would be expected to exhibit mixed 'signals'. The question asked in this study is: which carpal characters exhibit a high-level of phylogenetic structure?
Nineteen metric and seven categorical characters were collected from the capitate, hamate, lunate, triquetral, pisiform and scaphoid. Ten extant anthropoid taxa (n=253), including six hominoid species, were sampled. Individual