

Friday and Saturday
November 9-10, 2018
Texas State University
San Marcos, TX



Primate Behavior
Socioecology



Forensics
Human Variation



Paleoanthropology
Paleoprimatology

TABA Texas Association of Biological Anthropologists

Annual Meeting 2018

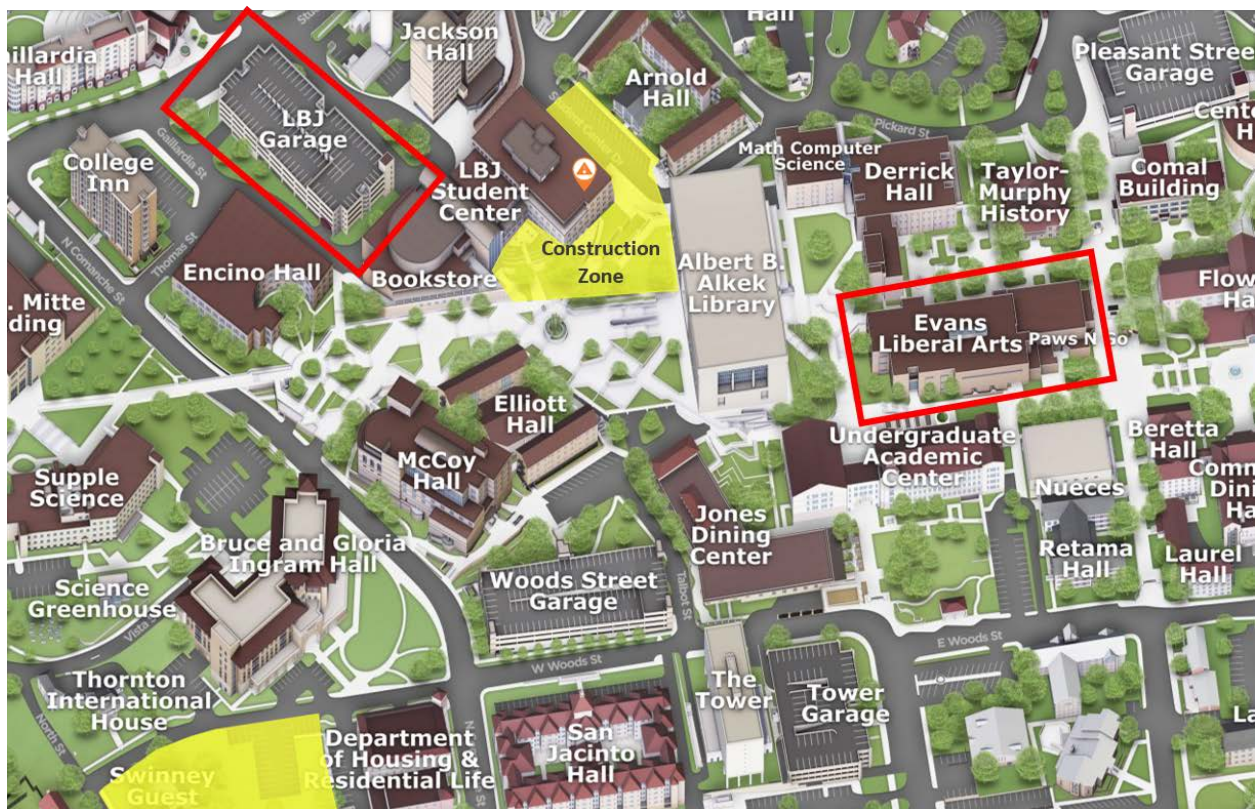


CONFERENCE LOCATION & PARKING

Friday: The keynote address, opening reception, and undergraduate poster session will be held at the Grady Early Forensic Anthropology Laboratory (Grady Early Building, 1921 Old Ranch Road 12, San Marcos, TX 78666). Free parking is available at the building, with additional parking available next door at The Dive Shop parking lot after 5 pm.

Saturday: Conference presentations will be held on the main campus of Texas State University in the Evans Liberal Arts (ELA) Building. Podium presentations will be held in ELA 114, with posters in the large adjacent walkway. Visitor parking is available nearby at the LBJ Student Center Garage (Gaillardia St, San Marcos, TX 78666) and various surface lots. Parking Services does not enforce “No Permit” violations on Visitor/Guest vehicles from 5 p.m. Fridays through 7 p.m. Sundays.

Additional TXSU parking information: <https://www.parking.txstate.edu/visitors.html>
Interactive TXSU campus map: <https://map.concept3d.com/?id=308#!ct/18453>



SCHEDULE OF EVENTS

Friday, November 9, 2018

Grady Early Building, 1921 Old Ranch Road 12

- 5:00-6:00 Registration
- 6:00-7:00 Keynote Address: Dr. Kate Spradley, Department of Anthropology, Texas State University. *The Humanitarian and Human Rights Crisis in South Texas: Anthropological Application.*
- 7:00-9:00 Undergraduate Poster Session and Opening Reception

Saturday, November 10, 2018

Evan Liberal Arts Building, Room 114

- 8:30 - 9:00 Registration & Poster Set-up
- 9:00-9:15 Welcome Remarks
- 9:15-10:30 Podium Presentations (Session I)
- 10:30-11:00 Coffee Break
- 11:00-12:15 Poster Presentations (Session II)
- 12:15-1:15 Lunch Break
- 1:15-2:00 Business Meeting and Election of Officers
- 2:00-3:15 Podium Presentations (Session III)
- 3:15-3:45 Coffee Break
- 3:45-5:15 Poster Presentations (Session IV)
- 5:15-5:30 Closing Remarks and Awards
- 6:00-8:00 Social Gathering (AquaBrew, 150 S. LBJ Drive)

KEYNOTE ADDRESS

Friday, November 9, 2018

6:00 PM

THE HUMANITARIAN AND HUMAN RIGHTS CRISIS IN SOUTH TEXAS:
ANTHROPOLOGICAL APPLICATION

Kate Spradley, Department of Anthropology, Texas State University

Dr. Kate Spradley, Professor at Texas State University, is the founder and director of Operation Identification (OpID) established in 2013. OpID provides humanitarian assistance to families of the missing and human rights assistance to migrants that die crossing the Texas/Mexico Border. The mission of OpID is to facilitate identifications and repatriations through community outreach, forensic anthropological analysis, and collaboration with governmental and non-governmental organizations. Dr. Spradley will discuss the applied anthropological aspects of OpID as well as research derived from studying migration from Latin America from a skeletal biology perspective.

More information on Dr. Spradley's work can be found at:

<https://www.txstate.edu/anthropology/people/faculty/spradley.html>

UNDERGRADUATE POSTER SESSION

Friday, November 9, 2018

7:00 PM

- 1. Interobserver reliability of ectocranial suture obliteration assessment in determining age of death.** LAUREN SIDES, ALEXANDRIA ASSENHEIMER, KATIE M. BINETTI
- 2. Comparing age-at-death profiles from cemeteries on Sint Eustatius, Dutch Caribbean.** JAMES R. TICHY
- 3. Mortuary patterns of an 18th century cemetery on Sint Eustatius.** KIMBERLY WILE
- 4. Virtual dissection of complex muscles with DiceCT.** RICHARD SAAVEDRA, RACHEL A. MENEGAZ
- 5. Assessing ecogeographic variation in superior ethmoidal breadth as a proxy for internal airway dimensions.** CECELIA M. SCHAEFER, SCOTT D. MADDUX

PODIUM & POSTER PRESENTATIONS

Saturday, November 10, 2018

SESSION I: PRIMATE EVOLUTION AND BEHAVIOR

Contributed Podium Presentations

- 9:15 **A wider binocular field improves leaping precision: Implications for primate origins.** ADDISON KEMP
- 9:30 **Behavioral flexibility in black-and-white colobus monkeys.** EVA WIKBERG, PASCALE SICOTTE
- 9:45 **What are the roles of vision, olfaction, and touch in fruit evaluation? A comparison of sensory foraging behavior in three sympatric platyrrhines.** CARRIE VEILLEUX, CHIHIRO HIRAMATSU, SHASTA WEBB, FILIPPO AURELI, COLLEEN M. SCHAFFNER, SHOJI KAWAMURA, AMANDA D. MELIN
- 10:00 **Participation in intergroup encounters in Verreaux's Sifaka are influenced by maternal energetic stress.** REBECCA J. LEWIS, SAMANTHA HILTY, SIERRA E. BARNETT
- 10:15 **Social relationships and survival in female baboons: which aspects of social bonds matter most?** FERNANDO A. CAMPOS, ELIZABETH A. ARCHIE, SUSAN C. ALBERTS

SESSION II: PALEOANTHROPOLOGY, BIOARCHAEOLOGY, AND HUMAN VARIATION

Contributed Poster Presentations

11:00 - 11:30 Individual presentations (5 minutes each)

11:30 - 12:15 Authors present for questions

- 1. Contesting Middle Pleistocene hominin occupation of the Americas: Site formation and taphonomic processes at the Cerutti Mastodon Site, southern California.** JOSEPH FERRARO, KATIE BINETTI, LOGAN WIEST, DON ESKER, LORI BAKER, STEVEN FORMAN

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2. **Preliminary analysis of fossil avifaunal humeri from Swartkrans.** REAGAN VAN COUTREN, THOMAS A. STIDHAM, TIMOTHY L. CAMPBELL
3. **Stable isotopic analyses from dental and bone tissues from two individuals buried at the Pozo Izquierdo Necropolis, Gran Canaria Island, Spain.** PALOMA CUELLO DEL POZO, HACOMAR BABÓN GARCÍA, ALMUDENA GARCÍA-RUBIO, PEDRO SOSA
4. **Variation in the trabecular structure of the 4th lumbar vertebra between obese and non-obese individuals.** DEVORA S. GLEIBER, DEBORAH L. CUNNINGHAM, DANIEL J. WESCOTT
5. **The interaction of climatic and energetic factors on human nasal morphology.** ALEXA P. KELLY, SCOTT D. MADDUX
6. **Climatic adaptation and human inferior nasal turbinate morphology.** TARA N. MARKS, SCOTT D. MADDUX, LAUREN N. BUTARIC, ROBERT G. FRANCISCUS

SESSION III: HUMAN EVOLUTION AND BONE BIOLOGY

Contributed Podium Presentations

- 2:00 **The effect of mobility impairment on femoral trabecular and cortical bone structure.** DEVORA S. GLEIBER, DANIEL J. WESCOTT
- 2:15 **The application of consolidation materials to burned bone: A comparative approach.** COURTNEY C SIEGERT, MICHELLE D HAMILTON, ELIZABETH ERHART, JOANNE DEVLIN
- 2:30 **Structural and mechanistic analogies in primatology: Different implications for evolutionary reconstructions of human behavior.** CODY J. MOSER
- 2:45 **Zygomaticoalveolar crest curvature in recent and fossil *Homo*: Implications for Neandertal facial biomechanics.** SCOTT D. MADDUX
- 3:00 **Virtual restoration of a Paleoindian skull (~10,000 BP) from central Texas using high-resolution X-ray CT.** CHRISTOPHER DAVIS, ANTONIO PROFICO, JOHN KAPPELMAN

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SESSION IV: PRIMATE BIOLOGY, ECOLOGY, AND EVOLUTION

Contributed Poster Presentations

3:45 - 4:30 Individual presentations (5 minutes each)

4:30 - 5:15 Authors present for questions

1. **Reproductive biology of chimpanzees (*Pan troglodytes verus*) in a West African savanna-woodland.** JILL PRUETZ, SARAH JO NEAL WEBB
2. **A comparison of intestinal parasite infections and activity budgets in 3 forest-housed vs. enclosure-housed lemur species (*Lemur catta*, *Varecia rubra*, and *Eulemur mongoz*) - preliminary results.** ANGELA ACHORN
3. **Intersexual power dynamics in lemurs: “Female dominance” or “female leverage”?** RACHEL VOYT, KATHRYN M. ORTIZ, AARON A. SANDEL, REBECCA J. LEWIS
4. **Intermediate forest recovery patterns following Cyclone Fanele in Kirindy Mitea National Park, Madagascar.** DOMENIC ROMANELLO, REBECCA J. LEWIS
5. **Bamboo-related adaptations in *Hapalemur's* hindlimb musculature.** HOLDEN W. HEMINGWAY, MAGDALENA N. MUCHLINSKI
6. **The evolution of body size in Strepsirrhine primates.** ANNA PENNA, LUCA POZZI
7. **Early Bird: A new Middle Eocene vertebrate fossil locality from the Canoe Formation of Southwest Texas.** CHRIS KIRK, INGRID LUNDEEN, SEBASTIAN EGBERTS
8. **Investigating dietary niche partitioning in the earliest North American Euprimates *Teilhardina* and *Tetonius* (Anaptomorphinae), and *Cantius* (Notharctinae) using dental topographic analysis.** BENJAMIN RODWELL
9. **Contextualizing the mammalian fauna of the Fantasia locality on Carter Mountain, Wyoming.** INGRID K. LUNDEEN

SOCIAL GATHERING

Saturday, November 10, 2018

At 6:00 pm, we will gather at AquaBrew, where we have reserved space for TABA participants and guests in the Beer Garden. AquaBrew is located at 150 S. LBJ Dr, San Marcos, TX 78666, and walking distance (0.5 miles) from TXSU. Food and drink are available for purchase.

www.aqua-brew.com

ABSTRACTS

(in alphabetical order by first author)

A comparison of intestinal parasite infections and activity budgets in 3 forest-housed vs. enclosure-housed lemur species (*Lemur catta*, *Varecia rubra*, and *Eulemur mongoz*) – Preliminary results

ANGELA ACHORN¹

¹Anthropology, Texas A&M University.

The primary goal of this study was to assess how range size affects intestinal parasite infections in three lemur species. Continual use of an area by hosts could lead to increased concentration of feces, and therefore increased exposure to infectious parasite eggs. Thus, hosts with smaller ranges are expected to encounter fewer parasite species, but a greater number of each since the eggs are concentrated in a smaller area. In contrast, hosts with larger ranges are expected to encounter a greater number of parasite species, but fewer of each since the eggs are distributed over a larger area^{1,2}. I predicted that enclosure-housed lemurs would exhibit decreased parasite richness but increased parasite intensity since they spend more time in a smaller area. I also predicted that forest-housed lemurs would exhibit increased parasite richness but decreased parasite intensity since they have access to a larger area. A secondary goal was to assess how parasite infections affect active versus inactive behaviors. I predicted that individuals with more parasite infections would spend less time engaging in active behaviors. To test these three predictions, individuals were each observed for a total of 24 hours (four 6-hour observation sessions on separate days). Behaviors were recorded using instantaneous scan sampling with 5-minute intervals^{3,4}. A minimum of 5 fecal samples (mean=11, range=5-22) were collected per individual. Samples were obtained on different days throughout June/July to account for variation in the number of detectable parasite eggs at a given time. A total of six parasite genera were identified. Preliminary results support the prediction that more heavily parasitized individuals spend less time engaging in active behaviors. However, due to the extremely low

parasite prevalence among all of the lemurs, it was not possible to determine if parasite richness and intensity were significantly influenced by range size.

¹Freeland 1976; ²Nunn et al. 2003; ³Altmann 1974; ⁴Martin & Bateson 1984

Thank you to the Lemur Conservation Foundation's reserve in Myakka City, FL, for hosting this pilot study, and to the Department of Anthropology at Texas A&M University for the financial support.

Social relationships and survival in female baboons: which aspects of social bonds matter most?

FERNANDO A. CAMPOS¹, ELIZABETH A. ARCHIE², SUSAN C. ALBERTS³

¹Department of Anthropology, University of Texas at San Antonio; ²Department of Biological Sciences, University of Notre Dame; ³Department of Biology and Department of Evolutionary Anthropology, Duke University.

There is abundant evidence that people with stronger or more supportive social relationships have longer lifespans. This link between relationships and lifespan cuts across geographic lines, gender, socioeconomic status, and causes of mortality, and the magnitude of the effect on survival is comparable to that of cigarette smoking. Recent studies have revealed remarkably similar patterns in a variety of nonhuman primates and other social mammals. This suggests that the links between social relationships and survival may be evolutionarily conserved, but the mechanisms that underlie these links remain an important gap in knowledge. Here, we use fine-grained longitudinal data on social relationships and lifespan of 276 adult female baboons (*Papio cynocephalus*) (N = 2,037 female-years) to examine whether structural (e.g., number of grooming bonds) or functional (e.g., relationship quality) aspects are better predictors of female survival. Using time-varying Cox proportional hazards models, and controlling for the social status, group size, and observer effort, we find that greater relationship quality with partners of both sexes, larger numbers of partners of both sexes, and higher interaction frequency with male partners all significantly predict longer lifespan ($p < 0.01$). The best single predictor is number of grooming partners. Greater numbers of weak bonds (below 50th percentile of bond strength distribution), strong bonds (between 50th and 90th percentiles) and very strong bonds (above 90th percentile) all independently enhance female survival. The overall best model includes number of partners of both sexes and relationship quality with both sexes, all of which have independent, significant effects on survival ($\Delta AICc = 30$ compared to next-best model). These findings advance our understanding of how social relationships affect survival throughout the aging process of female baboons, and they inform debate about whether structural or functional aspects of social bonds are better predictors of fitness.

This research was funded by the National Institutes of Health, the National Science Foundation, the Leakey Foundation, and the Max Planck Institute for Demographic Research.

Stable isotopic analyses from dental and bone tissues from two individuals buried at the Pozo Izquierdo Necropolis, Gran Canaria Island, Spain.

PALOMA CUELLO DEL POZO¹, HACOMAR BABÓN GARCÍA², ALMUDENA GARCÍA-RUBIO³, PEDRO SOSA²

¹Department of Anthropology, Texas A&M University; ²Arqueología D3; ³Aranzadi Scientific Society.

This study presents stable isotopic results obtained from dental and bone apatite from one male and one female buried at the Pozo Izquierdo Necropolis, Gran Canaria Island, Spain. These remains were recovered during salvage excavations due to rising sea levels by Arqueología D3 and the Aranzadi Scientific Society. In order to gain a better understanding of the life history of these two individuals, the Department of Anthropology at Texas A&M University entered into collaboration with these organizations with the purpose of examining the stable isotopes of nitrogen ($\delta^{15}\text{N}$), carbon ($\delta^{13}\text{C}$), oxygen ($\delta^{18}\text{O}$) and strontium ($^{87}\text{Sr}/^{86}\text{Sr}$) as a means to assess past dietary habits and mobility patterns of the two individuals. Isotopic research has been widely used in archaeology to understand food intake and provenance of human populations across the globe. While investigations in the Canary Islands have been interested on these subjects, to date, no studies on provenance have been accomplished through chromatographic techniques. Here we present the first data of $^{87}\text{Sr}/^{86}\text{Sr}$ ratios obtained from human remains from the archipelago. Additionally, $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ data are also presented in the form of a linear mixing model originally created by Krueger and Sullivan (1984), and recently updated by Kellner and Schoeninger (2007), and Froehle et al. (2012). The analysis of ancient diets among Canary aboriginals often focuses on signals obtained from collagen, however, Schoeninger and colleagues have shown the importance of obtaining ratios from both collagen and apatite material. In light of this, we adopt the more holistic approach to investigate the diets of pre-Hispanic Canary islanders and use for the first time this linear mixing model as a reference and incorporate our data with those from collagen tissues previously obtained during the carbon 14 dating of the skeletal remains.

Krueger, H.W., and Sullivan, C.H. (1984). Models for Carbon Isotope Fractionation Between Diet and Bone. *Stable Isotopes in Nutrition*. Chapter 14, pp 205–220.

Kellner, M.C. and Schoeninger, M.J. (2007). A simple carbon isotope model for reconstructing prehistoric human diet. *American Journal of Physical Anthropology*. 133 (4), 1112-1127

Froehle, A.W.; Kellner, C.M.; Schoeninger, M.J. (2012). Multivariate Carbon and Nitrogen Stable Isotope Model for the Reconstruction of Prehistoric Human Diet. *American Journal of Physical Anthropology*, 147:352–369.

Virtual restoration of a Paleoindian skull (~10,000 BP) from central Texas using high-resolution X-ray CT

CHRISTOPHER DAVIS¹, ANTONIO PROFICO², JOHN KAPPELMAN¹

¹Anthropology, University of Texas at Austin; ²Environmental Biology, Sapienza Universita di Roma.

A common way to address issues concerning the ancestry and paleobiology of the earliest Americans, often called Paleoindians, is through analyses of craniofacial morphology (CFM). Previous CFM studies have identified trends among Paleoindian crania which suggest a generalized Asian ancestry, but a specific Asian sub-region for the ancestral population(s) has not been consistently identified. CFM studies have also documented seemingly distinct morphological patterns between Paleoindian crania from the late Pleistocene/early Holocene and those of later Holocene populations from the Americas, but it remains unclear whether these patterns reflect rapid population differentiation following a single migration into the Americas, or at least two separate migration events involving biologically and morphologically distinct groups. Resolving these issues is complicated in part by a lack of well-preserved crania of sufficient antiquity in the Americas, and North America in particular. As it happens, the Wilson-Leonard 2 (WL-2) Paleoindian skeleton from central Texas includes a largely complete skull for which a full set of craniometric data are not yet reported, because the skull is crushed and preserved in a manner that precludes physical reconstruction. We undertook a comprehensive digital restoration of the WL-2 skull using high-resolution X-ray CT data and geometric morphometric techniques. The new restoration offers an opportunity to more thoroughly assess cranial form in this individual and for the first time to include her in quantitative comparative analyses with other late Pleistocene/early Holocene crania from the Americas and more recent populations worldwide. Results verify that, like many Paleoindians, WL-2 has a long, narrow cranium and a short, prognathic face. Statistical analyses indicate that she is morphologically most similar to Paleoindians from Santana do Riacho and Sumiduro in Brazil, and recent populations from China, the Americas, and eastern Europe. Implications for Paleoindian ancestry and competing models of the peopling of the Americas are discussed.

Contesting Middle Pleistocene hominin occupation of the Americas: Site formation and taphonomic processes at the Cerutti Mastodon Site, southern California

JOSEPH FERRARO¹, KATIE BINETTI¹, LOGAN WIEST², DON ESKER², LORI BAKER¹, STEVEN FORMAN²

¹Anthropology, Baylor University; ²Geosciences, Baylor University.

Hominin biogeography and the peopling of far northeast Asia and the Americas are topics of ongoing scientific interest and debate. In a recent Nature paper, Holen et al. (2017) add to these discussions with their report of a 130,000-year-old archaeological site in southern California, USA. The Cerutti Mastodon (CM) site includes the remains of a single mastodon (*Mammut*

americanum), spatially-associated stone cobbles, and associated lithic debris. From damage observed on the bones and stones, as well as the spatial relationships among them, Holen et al. infer prehistoric hominin involvement in site formation. If correct, this finding would rewrite much of what we know about Middle Pleistocene hominin paleobiology, biogeography, and archaeology. It would also radically change the date for the initial peopling of the Americas, pushing it back more than 110,000 years from current consensus, as well as require an archaic hominin presence in the Americas. We contend, however, that features of the CM record that Holen et al. use to infer the archaeological nature of the site are more parsimoniously explained as being the product of common geological and taphonomic processes, and that these neither specifically indicate nor require prehistoric hominin involvement. We present evidence from other proboscidean death assemblages, both modern and ancient, that similarly call into question the archaeological nature of the CM site. While further investigations may yet identify unambiguous evidence of hominins in California 130,000-years-ago, we urge caution in interpreting the CM record.

Holen, S. R. et al. A 130,000-year-old archaeological site in southern California, USA. *Nature* 544, 479-483 (2017).

Variation in the trabecular structure of the 4th lumbar vertebra between obese and non-obese individuals

DEVORA S. GLEIBER¹, DEBORAH L. CUNNINGHAM¹, DANIEL J. WESCOTT¹

¹Anthropology, Texas State University.

Obesity adds a biomechanical burden to the human body that should be reflected in the trabecular structure of the lumbar vertebrae. We conducted an assessment of the differences in trabecular architecture of the 4th lumbar vertebra in obese and non-obese individuals. High-resolution computed tomography was used to scan the 4th lumbar vertebra of ten obese and ten non-obese, age-matched females and males. A cubic volume of interest (VOI) was extracted from the center of the each vertebral body, and bone volume fraction, connectivity density, degree of anisotropy, and trabecular thickness and spacing were calculated for each VOI. Two-tailed t-tests show that obese females have less trabecular spacing than normal BMI females, while connectivity density, a proxy for trabecular number, is significantly greater in obese females. Both of these properties are nearly significant in males. Additionally, there is a nearly significant difference in bone volume fraction in both males and females, with obese individuals having a greater amount of bone in the VOI. Trabecular thickness and anisotropy are not significantly different for either sex. The results suggest that the biomechanical burden of obesity is reflected in the trabecular structure of the lumbar vertebral body. The differences between obese and non-obese individuals are more pronounced in females and are due to the addition of trabeculae in obese individuals rather than an increase in the trabecular thickness. This study contributes to our understanding of how obesity affects the skeleton, and more broadly how bone reacts to mechanical usage.

This research is supported in part through instrumentation funded by the National Science Foundation under Grant NSF:MRI 133804.

The effect of mobility impairment on femoral trabecular and cortical bone structure

DEVORA S. GLEIBER¹, DANIEL J. WESCOTT¹

¹Anthropology, Texas State University.

Reduced mobility or long-term immobility results in diminished muscular stress and normal weight bearing on the lower limb bones. Since mechanical usage influences trabecular architecture and cortical density, reduced ambulatory ability should be reflected in the trabecular structure and cortical area of the proximal femur. In this study, the proximal femur of mobility-impaired and normal mobility individuals was assessed for differences in trabecular architecture and cortical area. High-resolution computed tomography was used to scan the femora of twenty-eight mobility-impaired and twenty-eight age, sex, and BMI (when possible) matched normal mobility individuals. A cubic volume of interest (VOI) was extracted from the center of each femoral head and bone volume fraction, connectivity density, degree of anisotropy, and trabecular thickness and separation were calculated for each VOI. Kruskal-Wallis tests show that mobility-impaired individuals have significantly less bone volume fraction and trabecular thickness and greater trabecular spacing than normal mobility individuals. Connectivity density and degree of anisotropy show no significant difference between mobility impaired and normal mobility individuals. This indicates that mobility impairment is causing bone to be lost from each trabecular strut, losing thickness, rather than by entire trabeculae being resorbed. Additionally, cross-sectional slices of the cortical bone at the midpoint of the femoral neck, subtrochanteric, and midshaft of the femur show that mobility-impaired individuals have less cortical area in all directions than do normal mobility individuals. The results of this study suggest that the lack of biomechanical burden on mobility-impaired individual femora is reflected in their trabecular structure and cortical bone. This has implications for identifying mobility impairment in the forensic and archaeological context, as well as for comparison with studies using bone microstructure to analyze mobility and subsistence patterns over time.

This research is supported in part through instrumentation funded by the National Science Foundation under Grant NSF:MRI 133804.

Bamboo-related adaptations in *Hapalemur's* hindlimb musculature

HOLDEN W. HEMINGWAY¹, MAGDALENA N. MUCHLINSKI¹

¹Center for Anatomical Sciences, University of North Texas Health Science Center.

Hapalemur sps. and *Prolemur simus* (bamboo lemurs) stand out among the relatively homogeneous lemurids because they are bamboo feeders and vertical clingers and leapers. Their unique diet presents challenges, like its verticality, toughness, and toxicity. Researchers have

identified skeletal traits that may be adaptive for bamboo feeding. Bamboo lemurs present with an “intermediate” hindlimb morphology that does not mirror their congeners, the lemurids, and does not match adaptations seen in either larger- or small-bodied vertical clingers and leapers. To better understand this intermediate morphology, we examine variation in regional muscle mass and muscle fiber composition in *Haplemur griseus* and other Malagasy, mainland African, Asian prosimians, and a tree shrew (N = 8, n = 22). Muscle masses (g) were collected from fresh cadaveric specimens and muscle biopsies were histologically sectioned and muscle composition collected (immunohistochemistry). Results indicate that *Haplemur* has relatively more sural muscle mass than the other mammals sampled. When the fiber profiles of primary foot plantar flexors were evaluated, the soleus muscle of *H. griseus* displayed a higher amount of type II (fast) fibers than any other species. These findings indicate that although *H. griseus* shares some generalized lemurid morphology, its diet of bamboo may have pushed this generalized lemurid to adapt the unique vertical substrate. We suspect that based on the diameter of the bamboo stalk and the bamboo lemurs body size, bamboo lemurs may be leaping in a unique fashion that does not easily fit with small-bodied “foot-powered” leapers or large-bodied “hip-powered” leapers.

The interaction of climatic and energetic factors on human nasal morphology

ALEXA P. KELLY¹, SCOTT D. MADDUX¹

¹Center for Anatomical Sciences, University of North Texas Health Science Center.

While a narrower nose enhances inspiratory air-conditioning in cold-dry climates, such environments are also metabolically expensive, requiring greater oxygen intake than tropical environments. Accordingly, it has previously been hypothesized that volumetric restriction of oxygen intake due to nasal narrowing may necessitate an increase in nasal height to meet energetic demands. To test this, we employed 17 linear measurements from the nasal skeleton of modern humans from 10 climatically diverse geographic areas (Arctic Circle, Europe, Iran, Australia, North Africa, Khoisan, South African Bantu, East Africa, West Africa, Papua New Guinea). Femoral head diameter (FHD) was further employed as a proxy for body size and metabolic requirements. In conjunction with climatic data, these morphological data were employed in multivariate analyses to examine the relationship between nasal dimensions, climate, and metabolic demand. Our results indicate that most breadth measurements of the nasal aperture and internal cavity are significantly correlated with climate (all r-values=0.64–0.81, p-values<0.045), but not FHD. Conversely, height and length measurements of the aperture and cavity were found to be more strongly correlated with FHD (r-values=0.53–0.68, p-values<0.047) compared to climate. Further, overall nasal passage area was found to be positively associated with FHD (r=0.54, p=0.039), while nasal passage shape retained a significant relationship with climate (r=0.76, p=0.001) with relatively tall/narrow airways associated with colder-drier environments. Collectively, these results support the assertion that airway height represents a compensatory mechanism for ensuring a metabolically sufficient intake of oxygen. Additional studies employing more direct measures of metabolic demands are accordingly warranted.

A wider binocular field improves leaping precision: Implications for primate origins

ADDISON KEMP¹

¹Anthropology, University of Texas at Austin

The Grasp-Leaping Hypothesis proposes that diagnostic crown primate traits, including a large field of binocular vision, evolved to facilitate a locomotor pattern characterized by powerful jumps between supports that are grasped precisely upon landing. This hypothesis suggests that a wide binocular field evolved to provide the improved depth perception necessary for early primates to accurately judge the distance to the next substrate. The ability of the Grasp-Leaping Hypothesis to explain the evolution of a wide binocular field was evaluated experimentally by testing the underlying assumption that a wider binocular field improves leaping performance. The correlation between leaping performance and binocular field size was tested in *Cheirogaleus medius*, a small-bodied (~ 180 g) nocturnal strepsirrhine. Five individuals were filmed leaping between thin (0.75cm) vertical supports under normal (n=60 leaps) and reduced binocular field (n=60 leaps) conditions. Binocular field restriction was achieved using a head-mounted blinder that blocks the medial visual field of one eye. Generalized linear mixed effects models were used to evaluate the effect of visual condition and individual on five performance variables. While the reduced binocular condition did not cause a significant increase in the frequency of catastrophic landings, it did cause significant increases ($p < 0.001$) in the frequency of adverse landings, the number of grasp adjustments required between leaps and the speed at which the animals leapt. These results indicate that a wide binocular field improves the precision with which animals can execute leaps between narrow branches and suggest that grasp-leaping behavior may have contributed to selective pressures favoring the evolution of forward facing eyes in the earliest primates.

Early Bird: A new Middle Eocene vertebrate fossil locality from the Canoe Formation of Southwest Texas

CHRIS KIRK¹, INGRID LUNDEEN¹, SEBASTIAN EGBERTS²

¹Anthropology, University of Texas at Austin; ²Bio-Medical Sciences, Philadelphia College of Osteopathic Medicine.

The Canoe Formation is a middle Eocene sequence of sedimentary and igneous rocks exposed in the Tornillo Basin of southwest Texas. The most extensive outcrops of the formation occur in the Tornillo Flat area of Big Bend National Park. The Big Yellow Sandstone Member forms the base of the Canoe Formation and unconformably overlies the early Eocene (Wasatchian) Hannold Hill Formation. The remainder of the Canoe Formation is composed of >250 m of mudstones and sandstones with intercalated basalt flows. Here we report the discovery of a new vertebrate fossil locality, Early Bird (TMM 44063), in a mudstone unit overlying the Big Yellow Sandstone Member. The vertebrate fauna recovered from Early Bird consists primarily of turtles, crocodylians, squamates, and isolated teeth of small- to medium-sized mammals, including

chiropterans, marsupials, "insectivores", plesiadapiforms, hyopsodontids, equoids, tapiroids, carnivorans, mesonychids, and rodents. This faunal assemblage is noteworthy in three main respects. First, Early Bird provides the most extensive record of mammals from a single locality in the Canoe Formation. Indeed, mammalian species richness at Early Bird exceeds that of all other Canoe Formation fossil localities combined. Second, Early Bird documents the first plesiadapiforms known from the Canoe Formation, including a diverse array of both large and small microsyopids. Third, the lower Canoe Formation has been variously interpreted as late Bridgerian (Br3) or early Uintan (Ui1) in age. The mammalian fauna recovered thus far from Early Bird is conspicuous in its lack of characteristic Uintan taxa, increasing the probability that the lower part of the Canoe Formation is late Bridgerian. If so, Early Bird would represent one of the lowest latitude Bridgerian sites in North America, along with Br2 localities in the Delmar Formation of southern California and Br3 localities in the Hart Mine Formation of central New Mexico.

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Participation in intergroup encounters in Verreaux's Sifaka are influenced by maternal energetic stress

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Resource availability determines group size and space use, partially mediated via between-group competition. Larger groups have larger and/or better home ranges because of their numerical advantage. The numerical superiority hypothesis, however, has received mixed support, perhaps due to the collective action problem and/or sex differences in strategies and payoffs. Previous studies have found that Verreaux's sifaka (*Propithecus verreauxi*) exhibit no sex differences nor an effect of numerical advantage during intergroup encounters (IGEs), despite a post-encounter reduction in space use for the losing group. Using demographic, ecological, and behavioral data collected on 5 social groups of Verreaux's sifaka in Kirindy Mitea National Park, we tested this pattern with 150 encounters and a 10-year dataset. Yearly home ranges averaged 16±4 ha with 4.8% overlap and hardly varied despite drastic changes in group size and cyclone-related habitat alteration. Consequently, group size did not significantly predict winning IGEs and larger groups had fewer participating individuals. The only significant predictor of a successful group supplant was whether a female chased a member of the other group. Neither sex exhibited patterns expected if infanticide is the main force behind male and female intergroup behaviors. Females exhibited significant effects of reproductive and ecological season on participation. They were significantly more likely to participate in IGEs during the season of infant dependency and less during the season of food abundance. Male participation was not predicted by reproductive season. Importantly, male sifakas are the same size or smaller than females. Thus, male participation in IGEs may not be as effective as female participation. Our results suggest that the

story of IGEs in sifakas centers around the females. Females are actively defending the limited critical resources during the period of infant dependency.

Contextualizing the mammalian fauna of the Fantasia locality on Carter Mountain, Wyoming

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Fantasia is a high-elevation (3140 m) Bridgerian fossil locality located on the north face of Carter Mountain in northwestern Wyoming. Carter Mountain, found on the western edge of the Bighorn Basin is found within the Absaroka Volcanic Province (AVP), a major eruptive zone during the Eocene. Fantasia preserves a fauna that lived when the Thorofare Volcanic group became active, marked by the ~48 Ma Blue Point ash bed that overlies the site. Fantasia was collected in the 1970s by J. Eaton, yielding a sample of 446 vertebrate fossils. This assemblage is of particular interest because Fantasia is found at a higher modern elevation than better-known basin center Bridgerian sites in the greater Green River Basin and the Bighorn Basin. The timing of eruptive events in the AVP, as well as ongoing oxygen isotope paleoaltimetry studies, suggest that this site documents a faunal community that lived at a relatively high elevation, not significantly altered by local Laramide uplift. Modern biogeographic patterns suggest that high elevations should document substantially different faunas than lowland basins and sampling such sites should provide new insight into regional diversity patterns. Here I report the results of renewed collecting at Fantasia in 2017, which more than doubled the number of fossil specimens known from the site. Microvertebrate fauna are common at this site and erode out and accumulate along a broad deflation surface. The most common taxa in the sample reported here are rodents (36%), euarchontans (28%), including particularly abundant *Microsyops* species, *Hyopsodus* (7%), and *Orohippus* (6%). Increased sampling of high-elevation sites such as Fantasia provides an opportunity to critically examine sampling biases favoring lowland depositional environments in the North American Eocene. The degree to which this bias has impacted our understanding of faunal community change over time is explored here in light of new data from Fantasia.

Zygomatocoalveolar crest curvature in recent and fossil *Homo*: Implications for Neandertal facial biomechanics

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Curvature of the zygomatocoalveolar (ZMA) crest is widely discussed in phylogenetic and biomechanical assessments of craniofacial morphology related to modern human and Neandertal evolution. However, the complex curvilinear morphology of the ZMA crest has proven difficult to accurately quantify with traditional methods, significantly impeding previous attempts at evaluation. In this study, nine semilandmarks derived from a ridge curve between zygomaxillaire

and the alveolar border were employed to accurately measure ZMA crest curvature in a large sample of fossil *Homo* ($n = 71$) and recent humans ($n = 303$). A principal components analysis following Procrustes superposition of all semilandmark configurations reveals that PC1 accounts for 57.6% of the total variance and contrasts the degree of curvature along the entire length of the crest (i.e., straight vs. parabolic), while PC2 (18%) contrasts curvature along the lateral ZMA crest related to the medial or lateral positioning of a malar tubercle. Interestingly, PC1 was found to be significantly correlated with facial size both inter- and intraspecifically in *Homo*, indicating that larger faced individuals predictably exhibit straighter ZMA crests, while smaller faced specimens exhibit more arched ZMA crests. Moreover, while contrasted at each end of the size spectrum, ZMA crest curvature actually arrays along a continuous gradient of facial size, and is thus not truly dichotomized into the "arched" versus "straight" polarities often described in the paleoanthropological literature. Finally, biomechanical modeling of the ZMA crest as a curved beam suggests the straighter ZMA crests of Neandertals may simply represent a compensatory mechanism for resisting stresses in a large, prognathic face, rather than conferring an actual mechanical advantage.

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Climatic adaptation and human inferior nasal turbinate morphology

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The nasal turbinates, three pairs of scroll-shaped bones that project from the nasal wall, directly influence the overall size, shape, and surface area of the mucosa-lined nasal passages. Accordingly, variation in turbinate morphology may substantially impact heat and moisture exchange within the nasal cavity. Yet, unlike the encapsulating walls of the nasal cavity, ecogeographic variation in turbinate morphology has not been established in humans. This study investigated population variation in inferior nasal turbinate morphology, employing linear measurements of inferior turbinate length, height, and breadth, as well as common meatus, inferior meatus, and overall nasal passage dimensions. These measurements were collected from CT-scans of crania from two mixed-sex human samples from Equatorial Africa ($n=35$) and the Arctic Circle ($n=35$). MANOVA results revealed significant morphological differences between regional samples ($F=3.95$, $p<0.0001$), with no significant sexual dimorphism ($F=1.74$, $p=0.06$), nor interaction effect of sex on regional differences ($F=0.53$, $p=0.94$). Specifically, individuals from the Arctic Circle were characterized by significantly taller ($p=0.009$) and broader ($p=0.015$) inferior turbinates compared to equatorial Africans. Further, although the Arctic sample was found to possess slightly narrower nasal passages, the greater breadths of their inferior turbinate resulted in substantially narrower common meatus dimensions ($p<0.0001$). Similarly, while the Arctic sample actually exhibited significantly taller nasal passages ($p=0.0008$), greater inferior

turbinate heights also resulted in narrower inferior airway dimensions ($p=0.0007$). ANCOVA results confirm that, compared to equatorial Africans, individuals from the Arctic Circle possess significantly narrower common meatuses ($p<0.0001$) for a given nasal passage breadth, and significantly narrower inferior airways ($p<0.0001$) for a given nasal passage height. To our knowledge, this study is the first to document such ecogeographic variation in nasal turbinate morphology among humans, and suggests that turbinate morphology likely augments other aspects of nasal cavity anatomy which modulate respiratory heat and moisture exchange.

Structural and mechanistic analogies in primatology: Different implications for evolutionary reconstructions of human behavior

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The use of analogues for evolutionary reconstructions of human behaviors is one of the cornerstones of anthropological primatology, as well as in Binford's middle-range theory. Although sometimes dismissed as a form of evolutionary storytelling, the existence of analogues may be indicative of natural pattern recognition between human and non-human primate behaviors. Despite the concept of analogy being relatively straightforward, scholars have differed in their interpretations of what the best analogies are. I argue that there are two types of analogies which yield different interpretations for relations between humans and non-human primates: namely those using a structural approach for their interpretations and those of a more mechanistic nature. Applying both approaches to discussions of songs in gibbons and hunting in chimpanzees, I will attempt to expand on the nature of these separate methodologies to help develop a further metaunderstanding of our approaches in analogical thinking.

The evolution of body size in Strepsirrhine primates

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Body size is a critical life history trait. It affects locomotion, climate adaptation, metabolism, social structure, and behavior in primates, therefore playing a central role in primate origins and diversification theory. Nocturnal Strepsirrhine (lemurs, lorises, and galagos) species are often used as a proxy to the ancestral primate due to their small bodies and other "primitive" traits. On the other hand, it has been suggested that nocturnal lemurs and galagos experienced independent events of body size reduction, perhaps as a further adaptation for life in unpredictable environments. The average body mass among living Strepsirrhines ranges from ~30g (mouse lemurs) to ~7kg (indri), while recently extinct lemurs weighed ~160kg (sloth lemurs), substantially increasing the variation in the clade. Nevertheless, investigations of body size never accounted for the giant subfossil lemurs, nor the middle-sized lorisiforms (Galagidae and Lorisidae) fossil record. Here we integrate data from 17 fossil and 105 living species in a comprehensive phylogenetic context to investigate the trends of body size evolution in a

macroevolutionary scale. We performed body mass ancestral state reconstruction in two contrasting scenarios, one including and the other excluding extinct species. We argue that the exclusion of fossils hampers the interpretation of body size evolution, particularly in more inclusive nodes and within clades with more extinct representatives. Our results recovered smaller estimates for the root of Strepsirrhines, and supported the hypothesis of convergent dwarfism between members of Cheirogaleidae and Galagidae families, which have experienced at least four major events of drastic reduction of body size (~50%).

Reproductive biology of chimpanzees (*Pan troglodytes verus*) in a West African savanna-woodland

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There is a large amount of extant data regarding estrus, cycling, and birthing patterns in wild chimpanzees. However, much of the data is limited to wild chimpanzees living in forested habitats (e.g., Gombe, Mahale, Tai, Kibale). Little data exist regarding reproductive parameters in chimpanzees living in a savanna-mosaic environment. Apes at Fongoli, Senegal differ in several respects from their forest-living counterparts, including behavioral responses that allow them to live in such an open, dry, and hot environment. Therefore, the current study aimed to provide empirical data regarding savanna chimpanzee estrus, cycling, swelling, and birthing patterns using data collected from nine free-ranging wild female chimpanzees at Fongoli over a 10-year period. Results showed no evidence of seasonality in estrus or cycling patterns, including no differences between rainy and dry seasons in mean swelling scores (mean dry = 0.84, SE = 0.11; mean rainy = M = 0.95, SE = 0.09), number of estrous females (mean dry = 5.27, SE = 0.38, Mdn = 5; mean rainy = 5.27, SE = 1.84, Mdn = 6), or proportion of births (dry = .38; rainy = .62, $p = 0.58$). This contrasts with findings from wild chimpanzees at other study sites in Africa showing seasonality in cycling and swelling. Fongoli females also exhibited a trend toward shorter interbirth intervals (Fongoli mdn = 48 mos; forested mdn = 70.75 mos, $z = -1.82$, $p = 0.069$). These data suggest that, like the behavioral adjustments exhibited by chimpanzees in response to savanna-living, there may be similar differences in reproductive parameters that characterize Fongoli chimpanzees in contrast to chimpanzees living in more forested environments.

Investigating dietary niche partitioning in the earliest North American Euprimates *Teilhardina* and *Tetonius* (Anaptomorphinae), and *Cantius* (Notharctinae) using dental topographic analysis

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Dental Topographic Analysis (DTA) provides a method for quantifying aspects of the gross morphology of teeth that correspond with functional processing of foods. In extant primates and other mammals these measures are accurate in distinguishing individual taxa based on primary dietary components. In this study, DTA is applied to examine niche partitioning among three contemporary genera belonging to two subfamilies of the earliest known North American euprimates (*Teilhardina* and *Tetonius*, Anaptomorphinae; *Cantius*, Notharctinae). Using a Nanovea high resolution white-light confocal profilometer, 3-D models of the lower second molars of *Teilhardina*, *Tetonius*, and *Cantius* were generated and analyzed using three dental topographic metrics: Dirichlet Normal Energy (DNE), Orientation Patch Count Rotated (OPCR), and Relief Index (RFI). DNE is a measure of curvature across the tooth surface, OPCR measures the relative complexity of the occlusal surface, and RFI provides a measure of the relative amount of topographic relief or relative amount of food processing surface of a tooth. Body mass estimates and shearing ratios were also calculated. A Kruskal-Wallis test with *post hoc* Mann-Whitney pairwise comparisons, principal coordinate analysis, and linear discriminant analysis were conducted between taxa. Results indicate that the adapoid *Cantius* occupied separate dietary niche space from the Omomyoids *Teilhardina* and *Tetonius*, supporting early ecological divergence of North American euprimates.

Intermediate forest recovery patterns following Cyclone Fanele in Kirindy Mitea National Park, Madagascar

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While anthropogenic climate change has led to more powerful storms and longer periods of drought, very little information is available regarding the impact of climate change on tropical dry forest structure and arboreal fauna. We examined the intermediate effects of damage to the tropical dry forest of Kirindy Mitea National Park by Cyclone Fanele, which made landfall in western Madagascar with sustained winds of 185 km/h and gusts up to 260 km/h in January 2009. In the dry seasons of 2009 and 2018, all trees of diameter at breast height (DBH) ≥ 5 in nine 25 x 25m plots were measured and assessed for mortality, trunk damage, and limb damage. Tree DBH was a better predictor of tree mortality and damage than tree height, although the inclusion of height improved most statistical models. Tree mortality increased from 9% shortly after the cyclone to 20% in 2018. Stem density decreased by 21% from estimated pre-cyclone values (pre-cyclone: 2420 ± 1039 stems/ha; 2018: 1995 ± 765 stems/ha) but the proportion of understory trees increased by 15%. While our results may indicate regrowth, the forest structure has not recovered since Cyclone Fanele. Additionally, drought has likely exacerbated damages. Arboreal fauna, such as primates, living in cyclone-prone tropical dry forests must cope with significant tree mortality, major trunk and limb damage, and decreased availability of canopy and emergent trees. These changes to forest structure may challenge arboreal fauna via (1) a decrease in sleep site availability, (2) a higher availability of foraging material closer to the ground, and (3) an increase in exposure to predation. Cyclone damage to tropical dry forests requires long-term recovery, but as the effects of climate change intensify the recovery period

may be significantly lengthened. Future research should address survival mechanisms of arboreal fauna to altered forest stratification.

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Virtual dissection of complex muscles with DiceCT

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Computed tomography (CT) scanning is commonly used in biomedical research to image the skeleton. However, the boundaries of soft tissues such as muscle and cartilage are not well defined in CT scans. Here we demonstrate how diffusible iodine-based contrast-enhanced computed tomography (diceCT) can be used to visualize soft tissues and measure muscle volumes more accurately than in traditional dissection methods, particularly in small rodent species. The goal of this project is to assess changes in the growth trajectories of masticatory musculature due to variation in the biomechanical properties of diet. Male Sprague-Dawley rats were raised from weaning to adulthood (12 weeks), and randomly separated into four hard and/or soft dietary treatment groups. Post-sacrifice, cranial tissues were fixed in 4% PFM for 36 hours and stored in 70% EA at 4°C. Specimens were stained in 11.25% Lugol's solution (I2KI) for 48 hours and imaged in a Skyscan 1172 micro-CT scanner (0.018 mm³ voxels). Masticatory muscles were manually segmented every 10 slices using the Segment Editor module in 3D Slicer. The "Fill Between Slices" function was used to generate complete volumes which were measured by the Volumetric Statistics module. Preliminary results suggest that, contrary to our expectations, animals raised on soft diets have larger temporalis and superficial masseter muscles. DiceCT is a promising method for soft tissue analysis that complements CT analyses of bone. Volumetric and geometric data can be obtained for small and/or complex musculature where limitations exist for traditional dissection methods.

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Assessing ecogeographic variation in superior ethmoidal breadth as a proxy for internal airway dimensions

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Superior Ethmoidal Breadth (SEB = the maximum breadth between the left and right frontoethmoidal sutures) is widely employed as a proxy for internal nasal airway dimensions.

SEB is also commonly argued to evince climatic adaption in modern humans, as populations living in cold-dry environments predictably exhibit narrower SEB dimensions than those inhabiting tropical environments. However, as SEB anatomically spans both the upper nasal airways (i.e., common and superior meatuses) and the ethmoid air cells, the accuracy of SEB as a proxy for airway dimensions remains questionable. Here, we assess the relationship between SEB and internal nasal cavity dimensions using measurements collected on CT scans from a mixed-sex sample of modern human crania (n=46) from West Africa, Europe, and the Arctic Circle. Our results indicate that the position of SEB is typically superior to the roof of the internal nasal cavity, and thus above the actual airways. However, linear regression demonstrates that SEB is highly correlated with bi-ethmoidal breadth taken at the appropriate level of the airways ($r=0.94$, $p<0.0001$). Kruskal-Wallis ANOVA results indicate, that in addition to significant differences in SEB ($p=0.0007$), regional differences also exist for common ($p=0.018$) and superior ($p=0.046$) meatus breadths, but not ethmoid air cell breadth ($p=0.21$). Moreover, our results indicate a positive scaling relationship between SEB and internal airway dimensions, such that West Africans with wider SEB values exhibit disproportionately wider common and superior meatuses compared to Europeans and Arctic Circle natives. Cumulatively, these results support use of SEB as proxy for upper nasal airway breadth.

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Interobserver reliability of ectocranial suture obliteration assessment in determining age of death

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Assessing the extent of cranial suture obliteration is a methodology used in both forensic and archaeological contexts to determine age at death for human skeletal specimens. As humans mature, the cranial bones meet and interfinger forming the cranial sutures as they fuse together. Then, as a general trend that extends from maturation to senescence, the sutures become less visible as individuals age; a process known as “obliteration”. Meindl and Lovejoy (1985) first generated a systematic method of post-mortem age estimation by visually assessing the extent of cranial suture obliteration in skeletal specimens of known demographics. Their visual assessments were then converted into numeric scores (0-3) that represented four progressive stages of obliteration. Since its introduction this method has been widely used by skeletal analysts in both forensic and bioarchaeological contexts. However, due to the inherent subjectivity involved in converting a continuous characteristic into a categorical variable, it is possible that this method may be imprecisely applied, particularly by inexperienced analysts. The objective of this study is to determine how reliably this method can be employed by observers of varying levels of experience in skeletal analysis. We recruited study participants from Human Osteology and Forensic Anthropology courses at Baylor University in the Spring and Fall semesters of 2018. Each observer conducted ectocranial suture obliteration assessments using the

Meindl and Lovejoy (1985) method for six cranial specimens. The observer assessments were compared to determine whether the variance exhibited between analysts is of statistical significance. The results of this study should inform forensic and bioarchaeological investigators about the reliability of interobserver application of the Meindl and Lovejoy (1985) method for age assessment.

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The application of consolidation materials to burned bone: A comparative approach

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Fire-altered bone presents a unique challenge owing to its inherent friability. The Bridgeville Fatal Fire Recovery Protocols¹, were developed to maximize recovery and mitigate fragmentation; however, they do not address methods that could reduce fragmentation due to repeated handling. A possible solution is the standardized use of consolidation materials during recovery efforts. The objectives of this project are to quantitatively and qualitatively elaborate on previous research^{2,3} by comparing four consolidants' ability to increase the strength and toughness of thermally-altered bone, and recommend a consolidant for usage on burned bone. The sample population consisted of domestic pig (*Sus scrofa domesticus*) femora (n = 58) and skulls (n = 5), subdivided into five groups, including a control group. An open fire cell was constructed and subsequently lit on fire then allowed to extinguish naturally with bone samples placed on the structure floor. Consolidant materials were prepared at a 10% concentration and applied to all visible surfaces of the bone samples for a total of four applications. Variables investigated in this research include ease of solution preparation and application, dry time, changes to the appearance of the bone surface, mode of deformation during a loading event, as well as ultimate strength and toughness of the sample after consolidation. Mode of deformation was assessed through load-displacement curves produced by a nanoindenter. Drop weight impact testing and exposure to forced vibration were used to assess strength and toughness. Results indicate that all four materials increase the strength and toughness of burned bone compared to the control sample. Although Acryloid™ B-72 was not ultimately as strong as Rhoplex™ B-60A or Butvar® B-98, the quicker dry time and the lack of alteration to the bone's appearance make Acryloid™ B-72 the most suitable choice for regular use.

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Comparing age-at-death profiles from cemeteries on Sint Eustatius, Dutch Caribbean

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On the Caribbean island of Sint Eustatius (Statia), there are several cemeteries dating from the 18th and 19th centuries, primarily utilized during a time of colonization and trade by the European colonial powers, Netherlands, Great Britain and France. Cemeteries with gravestones denoting the names and ages of those buried are all associated with the European inhabitants, while an unmarked cemetery dating to the 18th century investigated during 2018 likely contains the burials of enslaved Africans from a nearby plantation. This project investigates whether differences in social status and ancestry between individuals interred in these cemeteries is reflected in the respective age-at-death profiles. Furthermore, data from a contemporaneous plantation cemetery for enslaved Africans on Barbados is used to expand the comparison to a different cultural context. Comparing the resultant graphs and trends for the ages-at-death across the cemeteries, it appears that there are not significant differences across the cemeteries on Statia and Barbados.

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Preliminary analysis of fossil avifaunal humeri from Swartkrans

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In this study, we present preliminary results from an analysis of avifaunal remains recovered from the hominin-bearing site of Swartkrans, South Africa. The specimens represent part of the SKX microfaunal assemblage, a collection of fossils excavated between 1979-1986 from Members 1-3 of the cave site. These deposits are Early to Middle Pleistocene in age and date to ~2.0, 1.65-1.07, and 1.04-0.62 Ma respectively. To date, relatively little has been published on the birds from Swartkrans, although seven orders and 11 families have previously been identified from these deposits (Watson 1991, 1993). In this preliminary analysis, we examined 71 nearly complete to complete bird humeri from the SKX collection. Identifications are based on overall

gross morphology and the presence of synapomorphies indicating phylogenetic placement. In total, specimens from six orders and four families have been identified with the majority of specimens (n=54) attributed to the most diverse avian clade, Passeriformes (song birds). Nineteen specimens from three families, however, represent new records for the site. Newly identified families include the Psittacidae (parrots, NISP=10), Hirundinidae (swallows and martins, NISP=8), and Turnicidae (buttonquails, NISP=1). These preliminary results demonstrate that a greater diversity of birds was present at Swartkrans than has previously been recognized. Moreover, these birds point to a past diversity of habitats around the cave including wet grasses and forests or woodlands.

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What are the roles of vision, olfaction, and touch in fruit evaluation? A comparison of sensory foraging behavior in three sympatric platyrrhines

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Because sensory adaptations are often associated with foraging, variation in sensory function between sympatric species can influence niche partitioning. However, little work has explored sensory variation in wild sympatric primates foraging on the same foods. Here, we used behavioral data from three sympatric platyrrhines (*Ateles geoffroyi*, *Alouatta palliata*, *Cebus capucinus*) in the dry forest of Sector Santa Rosa, Costa Rica, that differ in diet, locomotion, and sensory function. We calculated how often visual inspection, smell, and touch were used during feeding bouts to evaluate fruits from six shared plant species (1283 bouts). Using generalized linear mixed models, we found differences among platyrrhines in the use of all three senses. Platyrrhine species significantly influenced variation in visual inspection (LRT, $p=0.017$), smell ($p=0.007$), and touch ($p<0.0001$). When evaluating the same fruits, *Cebus* and *Alouatta* used vision more than *Ateles*, *Ateles* used smell more than *Cebus* and *Alouatta*, and all three differed in the use of touch (*Cebus*>*Ateles*>*Alouatta*). We also found an effect of color vision phenotype

on the use of smell when combining all three species ($p=0.002$), suggesting that dichromats use olfaction more often than trichromats. Intraspecific analyses of the polymorphic species revealed that color vision phenotype influenced smell use in *Cebus* but not *Ateles*. Our results suggest that even when feeding on the same fruit species, sympatric primates differ in how they use their senses for fruit selection. Olfaction may be particularly important for *Ateles* when evaluating fruits to compensate for reduced manual dexterity due to derived adaptations for suspensory locomotion.

Intersexual power dynamics in lemurs: “Female dominance” or “female leverage”?

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Intersexual power in lemur societies is often characterized as female-biased. However, the expression of female power over males varies among lemur species. Much of this variation depends on the primary source of female power, which may be based upon “dominance” or “leverage”. Here, dominance-based power depends upon fighting ability and occurs when traits such as body size have a significant influence on social relationships. In contrast, leverage-based power depends upon resources that cannot be taken by force and occurs when the potential for mating opportunities or other sources of leverage have a significant influence on social relationships. We sought to determine the primary base of female power in Verreaux’s sifaka (*Propithecus verreauxi*) by analyzing the effects of reproductive maturity and body mass on intersexual conflict outcomes. Data on four social groups at the Ankoatsifaka Research Station in Kirindy Mitea National Park were collected from 2007 to 2015 and included 483 decided agonistic encounters for which both behavioral and morphometric data were available. Overall, female power among was expressed unambiguously, with >99% of conflicts decided in favor of adult females. Generalized linear mixed models showed that female reproductive maturity had a significant influence on conflict outcome, but body mass did not. Social structures in Verreaux’s sifaka are thus characterized by female leverage and not female dominance. Future studies should seek to examine this classification in additional lemur species to determine whether this pattern is applicable to the entire lemur taxon.

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Behavioral flexibility in black-and-white colobus monkeys

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Behavioral flexibility is an important means to adjust to rapidly changing environments, particularly for long-lived animals like primates. The aim of this study was to quantify the variation in social behaviors among female white-thighed black-and-white colobus monkeys (*Colobus vellerosus*) at Boabeng-Fiema, Ghana. At the beginning of the project, females were described as egalitarian lacking strong dominance hierarchies and spending a small percentage of their time grooming and being aggressive. Since then, the population has increased due to a shrinking forest size and extirpation of predators. Here, we present a year of behavioral data from 62 females in 8 groups collected almost 10 years later. Females in most groups formed linear dominance hierarchies (linearity index 0.6-1, $p < 0.05$) although the rate of within-group agonism varied considerably between females (0-0.3 interactions/focal hour). All but one group showed differentiated grooming relationships ($z: -2 - -7$, $p < 0.05$). There was also a large range of variation in female participation in between-group encounters, possibly linked to habitat type. We only observed within-group coalitionary support in the two study groups with a high proportion of female kin. Our analyses suggest that female aggression during between-group encounters and female agonism within groups have increased over time ($p < 0.05$), which may be linked to increased competition for access to food. An important avenue for future research is to assess the health and fitness implications of these different behavioral strategies.

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Mortuary patterns of an 18th century cemetery on Sint Eustatius

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Little is known about the mortuary patterns of enslaved and freed Africans during the 18th to early 19th century on the Dutch Caribbean island of Sint Eustatius. Excavation and analysis of burials from a small 18th century cemetery provides information about the lives of the interred individuals, who are likely of African ancestry. Mortuary patterns can help assess health, status, and societal norms of these people. This study uses data from the burial excavations and analysis of the recovered human remains and artifacts to explore mortuary patterns in the cemetery. The study also includes information comparing the Sint Eustatius cemetery data with other contemporary Caribbean and non-Caribbean cemeteries. These comparisons will effectively show variation in daily life, status and societal norms for individuals of African ancestry who lived under different 18th century European colonial powers.

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