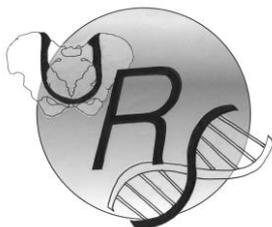


COMMITTEE ON DIVERSITY



UNDERGRADUATE RESEARCH SYMPOSIUM

**AAPA 87TH ANNUAL MEETING
6-8 PM, WEDNESDAY APRIL 11TH, 2018**

GRADUATE MENTORS

Katie Allen, University at Buffalo--SUNY	Jessica Joganic, Washington University of St Louis
Eduardo Amorim, Stony Brook University	Rachel Kalisher, Brown University
Kersten Bergstrom, Texas A&M University	Brittany Kenyon, University at Buffalo--SUNY
Lucy Bowland, UC Denver	Myra Laird, New York University
Eve Boyle, George Washington University	Steven Lautzenheiser, University of Washington ♦
Colin Brand, University of Oregon	Katie Lee, University of Illinois
Melissa Clark, Ohio State University ♦	Ingrid Lundeed, University of Texas at Austin ♦
Mary Beth Cole, Ohio State University	Diana Messer, Mercyhurst University
Ashley Dafoe, Mississippi State ♦	Abi Nishimura, Stony Brook University
Noah Dunham, Ohio State University	Rachel Perash, Independent Archaeologist ♦
Sara Getz, Penn State	Kristen Ramirez, City University of New York ♦
Carmen Hove, UC Santa Barbara ♦	Michael Rivera, University of Cambridge
Chu Hsiao, University of Florida	Michala Stock, University of Florida
Mareike Janiak, Rutgers University	

Organized by Cara Wall-Scheffler

Program by Marcie Myers

♦ Previous USR participant now serving as a graduate student mentor

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Poster Titles and Authors

1. **Precision in 3D prints: The case of MH1 (*Australopithecus sediba*).** *LAUREN HAMMOND, KERSTEN BERGSTROM, ROBERT Z. SELDEN, JR. and DARRYL DE RUITER.
2. **Bipedal vs terrestrial signals in the *Australopithecus afarensis* fourth metatarsal.** *ALISHA ANAYA, BIREN A. PATEL, CALEY M. ORR and SERGIO ALMÉCIGA.
3. **Bearing the burden: Trauma during agricultural intensification in pre-contact Ohio.** *SKYLER JACKIM, *DEVON REICH, MELISSA CLARK and EMMA LAGAN.
4. **Planting Perthes: Agriculture & mechanical loading in a pre-contact female.** *DEVON REICH, *SKYLER JACKIM, MELISSA CLARK and EMMA LAGAN.
5. **Using transition analysis to examine age at death in Tombos.** *ISABELLE ORTT, MICHELE BUZON and KAITLYN SANDERS.
6. **Preliminary analysis of temporal changes in cremation practices in Early Bronze Age Arabia using the distal humerus.** *ANTONIA CARTER, *JORDAN TEMPLES, LESLEY A. GREGORICKA and JAIME M. ULLINGER.
7. **Use of dermestid beetles in cleaning osteological specimens: Best practices.** *LYDIA M. HAAKE and CLAIRE E. TERHUNE.
8. **Assessing interobserver replicability in the scoring of enthesal markings through 3D technology.** *KYLE MCLAUGHLIN and KRISTINA SHULER.
9. **A comparative study of medieval population mortality profiles as an indicator of life history for rural and urban lifeways.** *EMMA BERTHIAUME and BRIGITTE HOLT.
10. **Preparation of human remains: An examination of cut marks and burning on human bone at sites with evidence of cannibalism in the prehistoric southwestern United States.** *JOSEPH H. REYNOLDS.
11. **§A new method for soft tissue removal for osteological analysis and preservation.** *JOSHUA SCHOFIELD.
12. **§Neurological deficiencies due to antemortem cranial trauma in the Chanka polity of Andean Peru (1000-1400 CE).** *SKYLER J. KEITER and DANIELLE KURIN.
13. **The effect of lifestyle on fecal calprotectin levels of the indigenous Shuar of Ecuadorian Amazonia.** *ALI BEDBURY, TARA CEPON ROBINS and JOSH SNODGRASS.
14. **Predictors of infant hair cortisol concentrations in The Gambia.** *GABRIELLA B. MAYNE and ROBIN M. BERNSTEIN.
15. **Investigating the health effects of the nutrition transition among the Tsimané of Lowland Bolivia.** *JENNAH THOMPSON-VASQUEZ and WILLIAM LEONARD.

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Poster Titles and Authors

16. **Identifying the unidentifiable: Using isotopic analysis to develop biological histories in forensic cases from Flagstaff, Arizona.** *TAYLOR LAMBRIGGER and CORINA KELLNER.
17. **Anthropometric measures of growth among Hadza children and juveniles, bush and village populations compared.** *ELLE R. FORD, TREVOR R. POLLOM, CHAD L. CROSS, DANIEL C. BENYSHEK and ALYSSA N. CRITENDEN.
18. **Risk of Lyme disease in the Southern Tier of New York: Spatial variability of ticks, *B. burgdorferi* prevalence and human risk in residential areas.** *CHELSEA CLARK, *MATTHEW GOLDMAN, *BRYAN LEVINE, *ANDREW WAGNER, RUWANSHA GALAGEDARA, RITA SPATHIS, AMANDA ROOME and RALPH GARRUTO.
19. **Prevalence of *B. burgdorferi* in *Peromyscus leucopus* and *Ixodes scapularis* in the Upper Susquehanna River Basin.** *KRISTINA OPALECKY, *COLIN PRITCHARD, *ANULI KHAIRATKAR, *ALLYANA GALLO, *DANIEL DEL VALLE, *GABRIELLE CELESTIN and MICHEL SHAMOON-POUR.
20. **Dental wear of the late Bronze Age populations in northern China: A paleodietary analysis and its implications on subsistence in three steppe sites.** *KAYLA DOMINGUEZ and JACQUELINE T. ENG.
21. **Indications of interglobular dentin in Ya'amun, Jordan.** *DYLAN ROBERTS and TERESA WILSON.
22. **Asymmetry of the dental arcade in six populations from the Indian Sub-Continent.** *AIMEE L HERUBIN, JEANNE MCLAUGHLIN and FRANCES J. WHITE.
23. **On the cusp of industry: A look at the quality of dental health in 19th century Saint Louis, Missouri.** *KATHLEEN RICE and *SHAWN EDGHILL.
24. **Dental microwear textures of Norse and Thule individuals from Greenland.** *NASEER NASEEM, LUCAS DELEZENE and PETER UNGAR.
25. **Differences in diet and dental health in the Atacama Oases of Northern Chile.** *BRONTE CUNNINGHAM and MARK HUBBE.
26. **§Dental caries and oral health in the initial contact period Guale, St. Catherines Island, Georgia.** *KENDRA S. WEINRICH, CLARK SPENCER LARSEN, BARBARA J. BETZ and LEIGH A. OLDERSHAW.
27. **§Sex differences in oral health at the Greek Colony of Himera.** *ERIKA B DANELLA, *CHELSEA BATCHELDER, BRITNEY KYLE, LAURIE J REITSEMA, STEFANO VASSALLO and PIER FRANCESCO FABBRI.

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Poster Titles and Authors

28. §Quantifying sexual dimorphism in the geometry of modern human canines. *GRACE V. CALHOUN, DEBBIE GUATELLI-STEINBERG and MARK HUBBE.
29. §Biological and cultural influences on caries prevalence between sexes among worldwide skeletal series. *JULIANNE R. STAMER, KATHRYN MARKLEIN and MARK HUBBE.
30. Evolutionary significance of human female longevity and the modern grandmother identity. *SOFIYA SHREYER and ELLEN INGMANSON.
31. §Maternal motives behind elective cesarean sections in the US. *EMALINE REYES, KAREN ROSENBERG and WENDA TREVATHAN.
32. Perpetual care in Harris County historic segregated cemeteries: A quantitative assessment. *KARA MURPHY.
33. §Taking rests changes the heart rates and core temperature of women and men during canoeing. *AZARIEA BONNER-HARRIS and CARA WALL-SCHEFFLER.
34. §The use of resting breaks changes blood perfusion during paddling bouts. *HAYLEY CHEYNEY KANE and CARA WALL-SCHEFFLER.
35. §Baby carrying positions change walking speed. *OLUWADAMILOLA SOSANYA and CARA WALL-SCHEFFLER.
36. Ground Reaction Forces: Does turning matter? *MIGUEL OCHOA, STEVEN G. LAUTZENHEISER and PATRICIA A. KRAMER.
37. Influence of resting metabolic rate on weight gain among Chicago area residents. *KAYLIN DONG, *JENNAH THOMPSON-VASQUEZ, STEPHANIE LEVY and WILLIAM LEONARD.
38. The functional and evolutionary genomics of sexual dimorphism in *Homo sapiens*. *AUDREY ARNER and GEORGE PERRY.
39. Influence of familial ancestry on self-reported “color” in Brazil. *TODDOSSA COLEMAN, LAUREL PEARSON, RINALDO W. PEREIRA and MARK D. SHRIVER.
40. Origin stories: Personal genomics, transnational adoption, and the adoptee identity narrative. *KIT MITCHELL.
41. Population genetics of the north and central highlands of West New Guinea: A mitochondrial perspective. *CALEB ALMETER, *EMILY JELEN, *AMELIA GUYON, *SIMONE HERNANDEZ, *PAOLA VELAZQUEZ, *SEAN VELAZQUEZ and MICHEL SHAMOON-POUR.

**AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018**

Poster Titles and Authors

42. **Mitochondrial diversity in northern and western Iranians.** *HEATHER GOELLER, *KATIA BROCK, *EDGAR ARIAS, *OLUWAFUNMBI ADEJOLA and MICHEL SHAMOON-POUR.
43. **Mitochondrial diversity in the south coast of West New Guinea.** *MAURICIO MONTES, *NATHANIEL BENJAMIN, *MAITAL CITRON, *CHRISTOPHER FUGINA, *MOLLY MORAN, *CORINNA RONEN, *NOAH SALAZAR and MICHEL SHAMOON-POUR.
44. **Investigating the relationship between diet and molar wear in cercopithecoid primates.** *ANNA WISNIEWSKI and SIOBHÁN B. COOKE.
45. **Anterior dental microwear in four sympatric Sumatran primates.** *SARA JEFFRESS, LUCAS K. DELEZENE, J. MICHAEL PLAVCAN, MARK F. TEAFORD and PETER S. UNGAR.
46. **Dental emergence in living wild chimpanzees (*Pan troglodytes schweinfurthii*) from Gombe National Park, Tanzania.** *LAUREN J SUTHERLAND, MATTHEW R. HEINTZ, CARSON M. MURRAY, ANNE E. PUSEY, KARA K. WALKER, KAITLIN R. WELLENS and SHANNON C. MCFARLIN.
47. **Genetic diversity and relatedness of *Eulemur rubriventer* in Ranomafana National Park.** *AMANDA PUTTIZA, RAQUEL L. LOPEZ, SANTIAGO CASSALETTI, APARNA CHANDRASHEKAR, AMANDA MANCINI, STACEY TOCET, LAUREN O. DIAKIWI, KATIE AMATO and ANDREA BADEN.
48. **Convergent bursts of amylase copy number.** *KIRSTEN DEAN, PETAR PAJIC, STEFAN RUHL and OMER GOKCUMEN.
49. **§Quantifying free simple sugars in orangutan foods using spectrophotometry: Implications for orangutan feeding ecology.** *NATALIE ROBINSON, *LEXI LANG, ERIN KANE and CHERYL KNOTT.
50. **§Effects of environment and relatedness on the gut microbiome of Ugandan red colobus monkeys.** *TABOR WHITNEY, MARIA J. RUIZ-LOPEZ, DIANA M. CHRISTIE, COLIN A. CHAPMAN, TONY L. GOLDBERG and NELSON TING.
51. **Dominance hierarchies are not linear in semi-free ranging Black and White Ruffed Lemurs (*Varecia variegata*).** *INDIA J. BROCK, *NORA W. SAWYER, COLIN M. BRAND and FRANCES J. WHITE.
52. **Blue sexual skin color and male sociosexual behaviors among South African vervet monkeys (*Ch. a. pygerythrus*).** *ABIGAIL RIGGLE, JENNIFER DANZY CRAMER, J. PAUL GROBLER and TRUDY R. TURNER.

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Poster Titles and Authors

53. **Effects of habitat difference on group cohesion and social behavior in Golden Crowned Sifakas (*Propithecus tattersalli*).** *ZOE BERISS and MEREDITH SEMEL.
54. **§Using tools promotes persistent foraging behavior in Tufted Capuchin Monkeys (*Sapajus libidinosus*).** *BRENDAN HARRIS, *MACKENZIE R. PRYOR, CAROLINE E. JONES and DOROTHY M. FRAGASZY.
55. **Correlations between olfactory turbinal surface area and olfactory bulb volume among extant euarchontans.** *JESSICA JOHNSON, *ELISE HARAIS and INGRID K LUNDEEN.
56. **§Circumorbital rim variation in Western red colobus (*Ptilocolobus badius badius*) and its potential role as a sexually selected trait.** *LUKE FANNIN and SCOTT MCGRAW.
57. **§Effect of enclosure type on locomotion and spatial use in captive Sifakas (*Propithecus coquereli*).** *DANIELLE RAE ORLANDI, MARK MCGOWAN, ANTHONY TONGEN and ROSHNA WUNDERLICH.
58. **Howler monkey tree use and activity budgets based on tree diameter (DBH).** *JOSEPH EDWARD CASTILLO.

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

Population genetics of the north and central highlands of West New Guinea: A mitochondrial perspective.

*CALEB ALMETER, *EMILY JELEN, *AMELIA GUYON, *SIMONE HERNANDEZ, *PAOLA VELAZQUEZ, *SEAN VELAZQUEZ and MICHEL SHAMOON-POUR. SUNY Binghamton.

Background: The island of New Guinea is crucial to understanding human migration into Oceania. New Guinea was first settled 60,000-40,000 kya by peoples featuring mitochondrial haplogroups P and Q - either together in one, or two separate migrations. The genetics of New Guinea populations underwent major changes due to the later Austronesian migrations, yet no mitochondrial evidence of the Austronesian migration has been found in West New Guinea (WNG). **Methods:** Mitochondrial HVS-1 sequence data were obtained through PCR and Sanger sequencing using 111 blood serum samples from the Binghamton University Biospecimen Archive facility, collected between 1960 and 1990 from the north and central highlands of West New Guinea. Bayesian analysis was performed using BEAST2, and Arlequin was utilized to compute *F_{st}* values between the studied population and various reference populations. Median-Joining Network analysis was performed for the lineages of the most common haplogroup (Q1). **Results:** All studied samples belonged to non-Austronesian haplogroups (P, Q, M73'79, and M79). Bayesian analysis yielded similar coalescent estimates for haplogroups P and Q, suggesting that they arrived in New Guinea by one single migratory event. *F_{st}* values suggest limited gene flow between WNG and surrounding populations, including Papua New Guineans. According

to network analysis, WNG has the greatest diversity of Q1 (87 haplotypes) among studied populations, pointing to the old age, and perhaps origin of this clade in WNG. **Conclusion:** While previous genetic studies have been a major source of information on early peopling of the Pacific, little research has focused on WNG. The results of this research support the 'one migration' theory into the New Guinea island, and provides further evidence for a lack of Austronesian admixture in WNG.

Funding: This project was supported in part by grants to Binghamton University from Howard Hughes Medical Institute (HHMI) through the Precollege and Undergraduate Science Education Program, from New York State Regional Economic Development Council, and from SUNY Investment Performance program.

Bipedal vs terrestrial signals in the *Australopithecus afarensis* fourth metatarsal.

*ALISHA ANAYA, BIREN A. PATEL, CALEY M. ORR and SERGIO ALMÉCÍJA. The George Washington University.

Background: *Australopithecus afarensis* is a ~3-4 million-years-old hominin whose mosaic morphology causes continuous debates. While the morphology of the pedal phalanges are relatively long and curved, resembling African apes, and are seen as arboreal locomotor adaptations, its ankle bones and metatarsals are human-like, suggesting striding bipedalism. In 2000, a complete *A. afarensis* fourth metatarsal (AL-333-160) was recovered in Hadar, Ethiopia. This metatarsal presented distinctive modern human features (e.g., torsion, base morphology) supporting the hypothesis that *A. afarensis* exhibited modern human foot

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

arches and accordingly was a committed terrestrial biped by 3.2 Ma (Ward et al., 2011 Science). **Methods:** Building on Ward et al.'s study with a larger and more diverse comparative sample, we measured torsion [T], proximal articular surface dorsoplantar-mediolateral ratio [DM], plantar-diaphysis angle [PDA], plantar-base angle [PBA], base-diaphysis angle [BDA], proximal contour ratio [PCR], and lateral cuneiform articular facet presence [CAF], to assess if humans differ from other anthropoids, and if *A. afarensis* is human-like. **Results:** While humans overall differ from non-human hominoids, they overlap in some variables (PBA, BDA, PCR). In general, AL-333-160 is closest to modern humans, but also with other taxa in all variables. Overall shape variation was summarized with a principal component analysis (PCA) in which PC1 (46.42%) separates most non-human hominoids from humans and cercopithecids (which largely overlap along PC2), and AL-333-160 falls within the overlapping morphospace region of humans and cercopithecids. **Conclusion:** These results suggest that some functional variables traditionally linked to bipedalism could instead represent general terrestrial locomotion.

Funding: National Science Foundation [BCS-1316947, BCS-1317047, BCS-1539741], Wenner-Gren Foundation, Leakey Foundation, the Generalitat de Catalunya (CERCA Programme) and MINECO/FEDER EU (CGL2017-82654-P).

The functional and evolutionary genomics of sexual dimorphism in *Homo sapiens*.
*AUDREY ARNER and GEORGE PERRY.
The Pennsylvania State University.

Background: Genome wide association studies (GWAS) can be used to identify genetic loci associated with phenotypic variation within a population. These loci can then be studied with population genetic analyses to indirectly test hypotheses about the evolutionary history of the trait. **Methods:** We are applying this two-part approach to study the recent evolutionary history of human body size and shape sexual dimorphism. A recent GWAS identified a total of seven single nucleotide polymorphisms (SNPs) that were associated with sexual dimorphism for height, weight, BMI, waist circumference, hip circumference, and waist-to-hip ratio in Europeans, using a series of filters and a stringent 5% false discovery rate (FDR). In order to study the evolutionary history of these polygenic traits with the singleton density score (SDS) approach, an expanded set of loci are necessary. Therefore, we re-analyzed the original dataset with slightly less stringent cutoffs (e.g. 10% FDR). Prior to performing our evolutionary analysis, we wanted to confirm the biological plausibility of this larger set of sexual dimorphism-associated SNPs, given the relaxed statistical cutoff used. **Results:** Therefore, we are currently testing whether our updated set of candidate SNPs are significantly more likely (compared to SNPs associated with body shape phenotypes but not differentially between men and women) to be located in or nearby the binding sites of the 242 transcription factors and 705 downstream receptors for steroid hormones known to influence sexual differentiation (progesterones, androgens, and estrogens). Our next step will then be to use the SDS statistic to test whether the sexual dimorphism-associated genetic loci have been affected by positive selection in

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

recent human evolution and if so, in which aggregate direction for each trait. **Conclusion:** While some anthropologists have hypothesized that following the transition to agriculture there has been selection for reduced dimorphism due to a more equal division of labor, change in technology, and/or nutritional changes, any recent changes in the degree of sexual dimorphism could alternatively simply reflect genetic drift. This project will identify genetic loci which differentially influence male and female body size and shape, then explore the relationship between biological and cultural evolution in the context of the shift from hunting and gathering to agriculture by examining the recent evolutionary histories of these loci.

The effect of lifestyle on fecal calprotectin levels of the indigenous Shuar of Ecuadorian Amazonia. *ALI BEDBURY, TARA CEPON ROBINS and JOSH SNODGRASS. University of Oregon.

Background: Fecal calprotectin levels are a measure of gastrointestinal inflammation which can be caused by inflammatory bowel disease, cystic fibrosis, cancer, and several other inflammatory diseases. **Methods:** The samples were collected on-site and then sent back to the University of Oregon for analysis. Fecal calprotectin levels were measured using an ELISA assay machine. **Results:** From the FC levels, 30% had mild inflammation and 6% had elevated inflammation. The remaining 63% had no inflammation of the gastrointestinal system. Further analysis will be conducted on the correlation between composite lifestyle scores and FC levels. **Conclusion:** Due to the range of market integration, from rainforest to city and the spectrum in between,

studying the Shuar offers a unique window into the long-term effects of lifestyle changes on a variety of factors including gastrointestinal inflammation.

Funding: Funding was provided by the University of Oregon Health Education Research Award and Tara Cepon Robins, PhD an Assistant Professor in the Department of Anthropology at University of Colorado.

Effects of habitat difference on group cohesion and social behavior in Golden Crowned Sifakas (*Propithecus tattersalli*). *ZOE BERISS and MEREDITH SEMEL. Macalester College.

Background: With a restricted habitat in northern Madagascar, the golden crowned sifaka (*Propithecus tattersalli*) stands as one of the more representative, yet critically endangered animals of the region. This study, completed in two distinct forest types, sought to analyze the possible correlation between group cohesion and social behaviors between habitat types in this species. **Methods:** Two separate forest types were analyzed to obtain the data used in this study; a dry forest and a rainforest. In each forest, a troop of sifakas was chosen over the course of 1-2 days, then followed and observed for the following 5-6 days. The groups were followed for approximately 12 hours each day, in which all daily activities were monitored. Group scan data would be taken down every 15 minutes, including each individual's behavior, nearest neighbor distance, and the overall group spread. **Results:** The study found that the troop of sifakas in the Antsahabe rainforest participated in significantly more social behavior, and had higher group cohesion, whereas the troop in the Bekaraoka dry forest

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

demonstrated lower instances of social behavior, and lower group cohesion. Statistically, the results showed that the Anstahabe group spent 27% more time, on average, participating in social grooming than the Bekaraoka group, and had a lower average group spread of 10.8m, compared to 15.6m for the Bekaraoka group. **Conclusion:** A greater understanding of how forest fragmentation and habitat affects the social behavior of non-human primates can aid anthropological understanding of primate behavior, as well as how it has influenced the evolution of our social behaviors.

Funding: My research was aided in part by my study abroad program, SIT: Madagascar: Biodiversity and Natural Resource Management.

A comparative study of medieval population mortality profiles as an indicator of life history for rural and urban lifeways. *EMMA BERTHIAUME and BRIGITTE HOLT. University of Massachusetts Amherst.

Background: Environment and life conditions are two of the most critical factors in determining how healthy a population is likely to be. For instance, it would be expected that a population living in a more rural area with better access to food, water, and clean air would have a lower risk of mortality than a population living in an urban area. For this study, a mortality profile was reconstructed for the Medieval rural Italian town of Noli through the analysis of skeletal remains and this profile was then compared to data from a contemporary Medieval urban London population (kindly provided by S. DeWitte). **Methods:** For Noli, the adults were aged using transition analysis and the subadults

were aged using a combination of epiphyseal fusion, dental eruption, and long bone length. A Kaplan-Meier survivorship analysis was used to compare the mortality profiles of these two populations and to test the hypothesis that the Noli population would have had a lower mortality rate than the London population due to their rural environment and lifestyle. **Results:** Surprisingly, the results showed that subadults (0-20) had a significantly higher mortality rate in Noli than in London and that there was no statistically significant difference in mortality for the adults. These results show that the differences in environment between Medieval London and Noli did not meaningfully impact the health of the adults of these populations. The elevated Noli subadult mortality, however, suggests that Noli children were undergoing some kind of critical stress that was not impacting the London children. **Conclusion:** This research is relevant to anthropology because it is a study of the impact of human environments on the lives and health of a past population.

Funding: I was granted \$1000 by the University of Massachusetts Amherst Commonwealth Honors College to get 3 skeletal samples carbon dated.

Taking rests changes the heart rates and core temperature of women and men during canoeing. *AZARIEA BONNER-HARRIS and CARA WALL-SCHEFFLER. Seattle Pacific University.

Background: Other studies have noted that taking rests at regular intervals may decrease heat load and/or increase metabolic recovery. Therefore, taking rests may allow humans to do more work than they would be

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

able to without regular breaks. **Methods:** We had college aged men and women (N=16) canoe in a lake around a set point for 6- or 12-minute bouts. The times rowing were interspersed with both long and short rests (either 6- or 12-minutes). Core temperature was recorded immediately at the beginning and end of each rest, while heart rate was recorded continuously. Data for the participants were compiled into a spreadsheet and analyzed. **Results:** It was observed that when long rests preceded short bouts, heart rate was significantly lower ($p=0.038$). Women displayed sensitivity to rest, as their heart rates and core temperature were close to resting during long rests ($p=0.011$ for HR and $p=0.127$ for core temperature). Men's core temperature and heart rate increased regardless of rest length and their heart rates were significantly different than women ($p=0.017$). There was no statistical evidence to support a difference between men and women for core temperature ($p=0.451$), most likely do to the large variation in core temperatures. **Conclusion:** This research is relevant to anthropology because the differences in the physical reaction of men and women's bodies to conducting and maintaining work may be connected to ancestral roles for foraging.

Dominance hierarchies are not linear in semi-free ranging Black and White Ruffed Lemurs (*Varecia variegata*). *INDIA J. BROCK, *NORA W. SAWYER, COLIN M. BRAND and FRANCES J. WHITE. University of Oregon.

Background: Dominance rank and the linearity of social hierarchies have important consequences for social behavior in many species, including many primates. Of

particular interest are lemurs, which are the only taxonomic primate group that exhibits female feeding priority and social dominance in multiple genera, including *Varecia*. Previous research has revealed significantly linear dominance hierarchies in some female dominant species (*Lemur catta*) but not others (*Propithecus verreauxi*). **Methods:** Here, we investigate the dominance linearity of another female dominant lemur species: the black and white ruffed lemur. We predicted the dominance hierarchy to be significantly linear both before and after rank changes. We collected behavioral data on semi-free ranging ruffed lemurs (N=8) housed at the Duke Primate Center. We used all-occurrence sampling to record interactions between individuals between Sep 1991 and Mar 1993. We constructed dominance matrices using decided interactions and split the data into one of three time periods based on the eviction of a dominant female. We calculated the dominance linearity (h') for each time period. **Results:** Contrary to our prediction, we found no significance difference in linearity across any of the time periods: Pre-Event ($h'=0.37$, ns), Event ($h'=0.33$, ns) Post-Event ($h'=0.33$, ns). This study demonstrates that ruffed lemurs exhibit a more shallow hierarchy more similar to *P. verreauxi* than to *L. catta*. **Conclusion:** Dominance rank and the linearity of social hierarchies have important consequences for social behavior in many species, including many primates.

Quantifying sexual dimorphism in the geometry of modern human canines. *GRACE V. CALHOUN, DEBBIE GUATELLI-STEINBERG and MARK HUBBE. The Ohio State University.

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

Background: While there have been many studies that quantify sexual dimorphism in the size of modern human canines, the degree of sexual dimorphism in their shape is not clear. Over human evolutionary history, the shoulders of the canine tooth have migrated closer to the tip of the crown, making the canine tooth more rounded and less acute. We sought to explore if and to what extent modern human male and female canines differ this way in their shape; particularly, whether males have a more pointed canine shape than females. **Methods:** 204 unworn or minimally worn canines (112 males, 92 females) were measured from dental casts of Gullah individuals. Angles at the canine cusp tip were calculated from crown measurements using the Law of Cosines, and then compared between sexes. To scale these differences to crown size, we calculated ratios between crown angle and crown height, and between mesial and distal occlusal edge lengths to crown height. **Results:** T-tests show that females have on average slightly more rounded canines (by about 10 degrees) in all four tooth types ($p < 0.001$ for URC, ULC, and LRC; $p = 0.003$ for LLC). Crown angle to crown height ratios were larger for females than for males ($p < .001$); mesial edge length to crown height ratios were larger for males than for females ($p < .001$); and, distal edge length to crown height ratios were larger for males than for females ($p = 0.015$). **Conclusion:** These results suggest that the canine tooth, which is the most sexually dimorphic tooth in the dental arcade in terms of size, also exhibits sexual dimorphism in terms of shape. Future work will include the construction of a statistical probability function that can be used to predict the sex associated with any canine

tooth, given its crown dimensions and cusp angle.

Preliminary analysis of temporal changes in cremation practices in Early Bronze Age Arabia using the distal humerus.

*ANTONIA CARTER, *JORDAN TEMPLES, LESLEY A. GREGORICKA and JAIME M. ULLINGER. University of South Alabama.

Background: Umm an-Nar (2700-2000 BC) mortuary practices involving inhumation and secondary processing in the Early Bronze Age of southeastern Arabia varied despite regional uniformity in tomb construction. At the site of Shimal (UAE), two large Umm an-Nar tombs – Unar 1 (2400-2200 BC) and Unar 2 (2300-2100 BC) – contained the commingled remains of hundreds of individuals. Archaeologists hypothesized that bodies were inhumed and left to decompose on lower tomb levels before being removed, cremated, and re-deposited on upper levels within the same structure. **Methods:** To evaluate the degree of decomposition prior to cremation, as well as how practices of inhumation and cremation may have differed temporally, bone color from articular and non-articular areas of the distal humerus was assessed using a Munsell Color Chart. Bone undergoes documented changes in color with heat, and if soft tissue was still present, color was expected to differ between articular and non-articular surfaces. **Results:** Results indicated no significant differences in bone color between sides, nor between articular and non-articular surfaces, confirming hypotheses that cremation occurred after soft tissue decomposition. However, the popularity of cremation increased considerably over time. While burning was evident among some Unar 1

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

bones, the majority remained unburned; conversely, by Unar 2, the majority of bones were calcined, indicative of temperatures over 800°C. **Conclusion:** These findings suggest a shift in mortuary preferences towards enhanced body processing techniques prior to final deposition, and provide insight not just into intra-site changes in funerary practices but that also may be reflective of broader social change among Bronze Age communities.

Howler monkey tree use and activity budgets based on tree diameter (DBH).

*JOSEPH EDWARD CASTILLO. Texas A&M University.

Background: Tropical rainforest habitats in the New World, which are primary home ranges for multiple primate species, continue to be endangered by anthropogenic disturbances such as mass agriculture which continues to occur in primary habitat ranges. Activity budgets can be useful in obtaining behavioral data to understand how non-human primates are able to cope with anthropogenically disturbed habitats. **Methods:** In the Summer of 2017, from July 22nd to August 12th, 33.5 hours of data was collected on a population of mantled howler monkeys (*Allouata palliata*) in a small rainforest patch in NE Costa Rica using focal animal point sampling. DBH measurements of trees which were rested or fed in by individuals were also taken. Individuals were separated into 3 categories: Male, Female, and Juvenile. The class of the nearest individual to the focal individual was recorded along with behaviors in 2-minute intervals. **Results:** This preliminary study found that male mantled howler monkeys preferred to rest in larger trees than females, however females tended to feed in the same

size trees as the males. This may be a result of parental care, as females spent more time near juveniles, who tended to be more active while spending more time in smaller trees. **Conclusion:** Mantled howler monkeys, which are widespread throughout Central America, provide a useful study sample due to their ease of observability. As a sexually dimorphic species, research on this species may also inform ideas about sexually distinct behaviors in non-human primates, especially if these behaviors are possibly affected by the surrounding environment.

The use of resting breaks changes blood perfusion during paddling bouts.

*HAYLEY CHEYNEY KANE and CARA WALL-SCHEFFLER. Seattle Pacific University.

Background: The body uses blood perfusion (BP) to reduce heat load: as core body temperature increases, vasodilation allows blood to leave the core and flow along the body's periphery, allowing the blood to cool near the body's skin/surface. In this study we looked at the patterns in blood perfusion between bouts of paddling of different time increments. **Methods:** We measured the changes in blood perfusion on individuals (N=16) while paddling on an outdoor lake for either 6-minute or 12-minute increments. Measurements were taken before and after the bouts began. **Results:** We found that tissues that are metabolically active during paddling, such as the biceps and the palm, also show increased BP when the paddling length is kept constant but the rest increases ($p=0.128$, $p=0.064$ respectively). Thus, using resting bouts of 12 minutes does allow humans to cool down metabolically active tissue. **Conclusion:** This is relevant to anthropology because it shows a connection

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

between heat load and humans' ability to do work.

Risk of Lyme disease in the Southern Tier of New York: Spatial variability of ticks, *B. burgdorferi* prevalence and human risk in residential areas. *CHELSEA CLARK, *MATTHEW GOLDMAN, *BRYAN LEVINE, *ANDREW WAGNER, RUWANSHA GALAGEDARA, RITA SPATHIS, AMANDA ROOME and RALPH GARRUTO. SUNY Binghamton University.

Background: Lyme disease is the most prevalent tick-borne disease in the United States, affecting an estimated 300,000 people annually. It is spread to humans through the bite of an *Ixodes scapularis* tick infected with *Borrelia burgdorferi*, the causative agent of Lyme, and can significantly impair the quality of life of those infected. **Methods:** This study seeks to determine the density and infectivity of nymphal ticks throughout neighborhoods, along with human risk factors associated with Lyme infection in urban and peri-urban residential areas in the Southern Tier region of New York, now endemic for Lyme disease. Ticks were collected from May-September 2017 using a 1m² corduroy cloth dragged along the perimeter of houses and yards, around the base of trees, low lying vegetation, and 5m transects of the lawn. **Results:** All specimens were processed in the molecular laboratory by extracting and amplifying DNA to determine the density of infected nymphs, an ecological risk to humans. An area of 46,791m² was dragged on 97 neighborhood properties, with 72 nymphal ticks collected. Yard perimeters contained 44.4% of nymphs, while 40.3% were found in vegetation, 9.7% in lawns, and 5.5% around the house. Overall tick density was 1.54/1000m², with

significantly more ticks found on properties bordering woods (33.3%) than not (6.1%) (p=0.00). Laboratory work indicates nymphal infectivity to be 33.33%. **Conclusion:** This research takes a biomedical approach to anthropology to understand the behavioral and ecological risk factors for humans contracting Lyme disease in urban and peri-urban environments of New York. An anthropological perspective was chosen to not only understand the biological agent, but also the human behavioral risk factors associated with varying neighborhood settings.

Funding: Research was supported in part by Binghamton University's Undergraduate Awards for Research and Creative Work and Southern Tier Lyme Support, Inc.

Influence of familial ancestry on self-reported "color" in Brazil. *TODDOSSA COLEMAN, LAUREL PEARSON, RINALDO W. PEREIRA and MARK D. SHRIVER. The Pennsylvania State University.

Background: We are studying Brazilians biological and physical characteristics by investigating their ancestry and how they self-report. **Methods:** We examined a set of participants (N=309) recruited in Brasilia, Brazil who provided "color" designations for themselves, their parents, and grandparents. **Results:** For study participants reporting their "color" as preta, all but two had at least one parent that they reported as preta. It appears that both phenotype and known parental ancestry influence how our study subjects chose to self-report "color". **Conclusion:** Our study supports the complex nature of "color" in Brazil.

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

Differences in diet and dental health in the Atacama Oases of Northern Chile.

*BRONTE CUNNINGHAM and MARK HUBBE. Ohio State University.

Background: The Atacama oases, in Northern Chile, have been occupied by agropastoralist societies from 2500 BP until the arrival of the Spaniards in the 16th century. Between 400 and 1000 AD, the oases were under the influence of the Tiwanaku State, which exerted political and economic influence in much of the South-Central Andes. Several studies have explored the impact that Tiwanaku had on the Atacameño life-style. **Methods:** The present study complements this research line by analyzing aspects of oral health from four archaeological sites from the Atacama oases: Coyo 3, Quitor 6, Solcor 3 Non-Elite, and Solcor 3 Elite. The prevalence of dental caries, abscesses, antemortem tooth loss, and average tooth wear were calculated separately for males and females, and total for different parts of the dental arcade (anterior, posterior, superior, inferior, right, and left), to test if there are significant differences in oral health, and therefore in dietary practices, between the sites. Prevalence differences were tested using Chi-Square test and Analysis of Variance. **Results:** The results show significant difference in total presence of dental pathological conditions throughout the entire dental arcade between males and females at all sites, suggesting differential access to food between the sexes. In addition, all sites had significant differences between the posterior and anterior sections of the dental arcade and two sites, Coyo 3 and Quitor 6, had significant differences between the superior and inferior sections of the dental arcade. **Conclusion:** These results

suggest that the populations represented in these sites had significantly different diets and/or food preparation habits.

Sex differences in oral health at the Greek Colony of Himera. *ERIKA B DANELLA, *CHELSEA BATCHELDER, BRITNEY KYLE, LAURIE J REITSEMA, STEFANO VASSALLO and PIER FRANCESCO FABBRI. Quinnipiac University, University of Northern Colorado.

Background: In the archaeological record, females tend to have worse oral health than males due to differences in diet, resource availability, and/or social position; there are also possible biological factors that negatively influence female oral health. This study examines potential inequality between males and females at the Ancient Greek colony of Himera. **Methods:** To assess oral health, prevalence of caries in 239 individuals (152 males and 87 females), and abscesses and ante-mortem tooth loss (AML) in 227 individuals (147 males and 80 females) from Himera were calculated (sex determined following the Global History of Health Protocol). A total of 5384 teeth were examined for evidence of caries and 4305 tooth positions were evaluated for evidence of AML and abscesses. Additionally, stable carbon and nitrogen isotope analysis revealed dietary patterns in the individuals. **Results:** Chi-square and Fisher exact analyses demonstrate that male and female individuals at Himera had an equal chance of developing at least one oral pathology, but females were more severely affected by dental caries and abscesses. Preliminary carbon and nitrogen isotope analysis indicate that males and females at Himera were eating similar types of foods in relatively equal quantities. **Conclusion:** Therefore,

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

differences in female oral health at Himera are possibly due to biological factors, such as early dental eruption or cariogenic saliva related to female hormones. In the future, we plan to examine other skeletal stress indicators, in addition to indicators of diet, in order to better characterizing potential gender-based inequality in Ancient Greece.

Funding: This research was funded by National Science Foundation Research Experience for Undergraduates award numbers 1560227 and 1560158, the University of Georgia, and the University of Northern Colorado.

Convergent bursts of amylase copy number.
*KIRSTEN DEAN, PETAR PAJIC, STEFAN RUHL and OMER GOKCUMEN. University at Buffalo.

Background: Amylase gene, which encodes the starch-digesting enzyme in the pancreas and in saliva, has been extensively studied within the context of recent adaptive human evolution. Specifically, the copy number of this gene has been shown to adaptively increase in relation to starch consumption in the human lineage. **Methods:** We have now expanded this notion and conducted a comprehensive digital PCR-based study of copy number variation of dozens of nonhuman primates as well as nonprimate mammals. **Results:** We found that increase in gene duplication has happened independently in at least 7 lineages. Our results suggest extremely high mutation rates and adaptive retention of copy number of amylase genes among mammalian species. **Conclusion:** Our results have implications to understand the evolution of functional sequences in primates. In addition, we argue that the general dietary trends shaped by

humans may have impacted the adaptive landscape on commensal species.

Dental wear of the late Bronze Age populations in northern China: A paleodietary analysis and its implications on subsistence in three steppe sites.
*KAYLA DOMINGUEZ and JACQUELINE T. ENG. Western Michigan University.

Background: The late Bronze Age (c. 1000-600 BCE) represented a transitional period in northern China, as social complexity increased and interactions among regional populations became more common. This transition encompassed the expansion of mobile herding, and intensification of land use, and shifts in local economies, that ultimately, lead to greater variation in subsistence strategies. Such subsistence variation may be expected to have impacted rates and severity of dental wear patterns, due to changes in diet. **Methods:** Dental wear was analyzed in individuals from three different sites across northern China, Jinggouzi (n=63), Tianshan Beilu (n=71), and Yanghai (n=73). The goal of this investigation was to assess potential impacts of differences in diet and/or subsistence practices between the sites. **Results:** Direct comparisons of the teeth combining left and right side data revealed significant differences among all maxillary [F(2, 233)=42.72, p<.00001] and mandibular [F(2, 261)=35.93, p<.00001] molars. Further analysis concentrating on first molar (M1) data revealed a lack of significant differences between left and right sides [t(155)=0.0426, p=0.9661 for the maxilla, t(176)=0.6501, p=0.5165 for the mandible]. The remaining tests focused on left mandibular M1 data. No significant differences were found among the sexes [t(92)=0.8522, p=0.3963] or across the sites

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

[$F(2, 91)=2.47, p=0.0906$], yet significant differences were found among the age groups [$F(2, 85)=10.70, p=.000071$]. However, this could possibly represent a skewing in results due to unequal sample sizes. **Conclusion:** Overall, these preliminary findings suggest that while the sites may have been ecologically different, diet and subsistence patterns were relatively similar. Analysis of intra and inter-site variations, as well as differences between the tooth position, age, and sex will be further investigated.

Funding: Funding for Jacqueline T. Eng; Fulbright-Hays Doctoral Dissertation Abroad program & University of California Pacific Rim Award.

Influence of resting metabolic rate on weight gain among Chicago area residents. *KAYLIN DONG, *JENNAH THOMPSON-VASQUEZ, STEPHANIE LEVY and WILLIAM LEONARD. Northwestern University.

Background: As the prevalence of obesity continues to increase in the United States, so does the demand to understand the mechanisms behind weight gain. Weight gain is ultimately the result of an energy imbalance, whereby caloric/energy consumption exceeds energy expenditure. While much obesity research focuses on changes in dietary intake, less attention has been paid to how variation in energy expenditure shapes risks for overweight and obesity. **Methods:** This study addresses this gap by examining how variation in baseline resting metabolic rate (RMR) influences changes in body weight, composition, and metabolic health over the ensuing year. Thirty-five young, Chicago-area adults (26

women, 9 men) between 18 and 39 years old were recruited in the summer of 2016 and were measured again during the summer of 2017. Resting metabolic rate was measured at baseline using indirect calorimetry. Anthropometric measurements and blood samples were collected at baseline and one year later. **Results:** Female participants with lower RMRs showed greater weight and fat gains, and poorer plasma triglyceride levels than those with higher RMRs. Among male participants, variation in RMR did not significantly predict change in weight, fatness or metabolic health, owing partly to the small sample size. **Conclusion:** These results suggest that variation in metabolism has significant influence on the likelihood that women increased weight, particularly body fat.

Funding: Northwestern University; Leakey Foundation; NSF DDRIG-1455804.

Circumorbital rim variation in Western red colobus (*Ptilocolobus badius badius*) and its potential role as a sexually selected trait. *LUKE FANNIN and SCOTT MCGRAW. The Ohio State University.

Background: Inflation of the bones forming the orbital rim is a characteristic feature of red colobus crania (Genus: *Ptilocolobus*). Previous work has demonstrated that variation in this region of the primate face is unrelated to masticatory forces, and while several authors have invoked size or sexual selection as potential explanatory factors, few have tested whether sex differences can explain the feature's variance in a single species. In this study we investigate patterns of circumorbital swelling variation in West African red colobus (*Ptilocolobus badius badius*), testing the hypotheses that

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

differences in the extent of rim development are sex, age, and/or size dependent. **Methods:** A sample of 77 crania from Tai Forest, Côte de l'Ivoire was used to collect 11 measurements, including 3 measures of circumorbital development. Adult age was assessed using a tripartite scheme of dental wear: low, moderate, and heavy. **Results:** Paired t-tests revealed that males possess both absolutely and relatively larger measures of circumorbital ridging than do females. One-way ANOVAs revealed no significant association between dental wear and extent of ridging. Log-transformed bivariate regressions revealed that facial size is a moderate predictor of orbital rim development; however, the extent of ridging in males is generally larger than expectations based on facial size alone, while females have smaller measures than expected. **Conclusion:** We conclude that circumorbital ridging in *P. badius badius* is a sexually dimorphic trait unrelated to size or age effects. We posit that its variation is explicable via sexual selection, a hypothesis testable with data on female choice and paternity skew.

Anthropometric measures of growth among Hadza children and juveniles, bush and village populations compared. *ELLE R. FORD, TREVOR R. POLLOM, CHAD L. CROSS, DANIEL C. BENYSHEK and ALYSSA N. CRITTENDEN. University of Nevada, Las Vegas.

Background: Anthropologists and human biologists have long used anthropometric measurements as macro-level indicators of child health. Here, we contribute to this literature and report data on basic anthropometric measurements among Hadza children and juveniles (n= 213; age 1-

18 years), including height, weight, and body mass index. **Methods:** We evaluated children's nutritional status using WHO standards [weight-for-age (WAZ), height-for-age (HAZ), and weight-for-height (WHZ)]. We compared data from two time points, 2005 and 2017, and then compared those living in the bush with those living closer to villages. Temporal and geographic comparisons allowed us to estimate the effects that varying degrees of market integration and consumption of maize have on growth trajectories. **Results:** Our results suggest that in 2005, individuals eating a mixed diet (including wild foods and domesticated grains) exhibited less stunting and wasting than those consuming an entirely bush diet (composed of wild foraged foods). In 2017, there are no differences based on geographic location and bush and village dwelling individuals exhibit overall less stunting and wasting than in 2005. **Conclusion:** These data indicate that the current mixed subsistence strategy employed by the Hadza (primarily wild foraged foods supplemented with maize) has acted to redress growth faltering. These data on early nutrition transition will be critical in addressing the prevention of potential future dietary challenges that the Hadza will face as the micronutrient rich wild foods that they are currently consuming become less available and maize consumption increases.

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Mitochondrial diversity in northern and western Iranians. *HEATHER GOELLER, *KATIA BROCK, *EDGAR ARIAS,

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

*OLUWAFUNMBI ADEJOLA and MICHEL SHAMOON-POUR. Binghamton University.

Background: Located at the crossroads of the Old World, Iran has a diverse population comprising numerous ethnolinguistic groups, as well as millenia-old communities of several religious minority populations. A study of the mitochondrial (mtDNA) diversity among Iranians helps give a better understanding of the past migratory events which have shaped the inter-population dynamics in the Near East. **Methods:** 96 Iranian samples were selected from a collection stored at the Binghamton University Biospecimen Archive Facility. The samples were extracted using QIAmp QIAGEN protocol. HVS-I region of mtDNA was amplified and subsequently sequenced using ABI3730XL. Data analysis was performed using an array of software including Haplogrep, Mitomaster, MEGA7, Sequencher and Arlequin. **Results:** Results showed a high diversity of haplogroups represented in all studied towns and villages, yet certain trends in haplogroup frequencies were observed with respect to geographic and ethnolinguistic patterns. While a vast majority of lineages belonged to West Eurasian clades, a few individuals represented Asian (D) and sub-Saharan African (L3) haplogroups. **Conclusion:** This research provides insight to the great diversity of maternal lineages in the understudied regions of Iran. The populations represented in this study live in a territory that overlaps with the routes of prehistoric and historic migrations between Anatolia, South Caucasus, Mesopotamia, and Iran.

Funding: This project was supported in part by grants to Binghamton University from Howard

Hughes Medical Institute (HHMI) through the Precollege and Undergraduate Science Education Program, from New York State Regional Economic Development Council, and from SUNY Investment & Performance program.

Use of dermestid beetles in cleaning osteological specimens: Best practices.

*LYDIA M. HAAKE and CLAIRE E. TERHUNE. University of Arkansas.

Background: Multiple methods for using dermestid beetles to process animal remains have produced similar results with regards to soft tissue removal. The goal of this research was to compare these procedures to determine which practice(s) are most efficient at cleaning specimens with the most well-preserved articulation. **Methods:** Previously identified factors related to cleaning efficiency and articulation include specimen moisture level (fresh or dehydrated), specimen elevation (elevated or unelevated), and lighting (natural, full light, or full darkness). These factors were systematically tested on over 30 mouse (*Mus musculus*) carcasses via randomized trials over six weeks. Complete cleaning was identified as the point when there were no longer beetles, larvae, or visible pupa within each specimen's cranium. Daily check-ins were used to monitor specimen progress and temperature and humidity levels were recorded for the duration of the experiment. **Results:** We observed that the most important factor for cleaning efficiency was the specimen remaining unelevated, while the greatest factor in preserving articulation was the lighting remaining natural or dark, with dark specimens taking the least time to be completely cleaned with the most complete articulation. **Conclusion:** This experiment allowed the compilation of best

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

practices for dermestid cleaning and enables labs to select techniques based on individual needs such as speed and articulation. By identifying these best practices, this research benefits labs, museums and private collections that wish to utilize dermestid beetles to process osteological specimens for teaching or research.

Funding: State Undergraduate Research Fellowship (SURF Grant), Arkansas Department of Higher Education.

Precision in 3D prints: The case of MH1 (*Australopithecus sediba*). *LAUREN HAMMOND, KERSTEN BERGSTROM, ROBERT Z. SELDEN, JR. and DARRYL DE RUITER. Texas A&M University.

Background: The use of three-dimensional (3D) printed models of hominin fossils is becoming more common in biological anthropology, due in part to their low production cost. Digital meshes are also more accessible than casts, further increasing the reach and impact of specimens. An inherent trust in scanning protocols and printers underlies the utilization of prints, though scanner type, processing techniques, environmental variables, and proprietary algorithms used by 3D printers also influence the way that 3D prints convey the topology of the original scan. The type specimen of *Australopithecus sediba* (MH 1) is used to highlight these issues. **Methods:** In this study we assess the precision of five different brands of 3D printers, and subsequently the repeatability and reliability of a single printer. The original scan data are compared to the printed/scanned (measured) data in Geomagic Control X using a 3D comparison to identify global deviations, a 2D comparison to identify deviations for specific

curves used in geometric morphometric (GM) analyses, and a suite of comparison points to compare deviations of specific locations on the mesh surface. **Results:** Results demonstrate broad similarities between prints, however, variability is detected on a smaller scale using a 0.1mm tolerance. This project quantitatively demonstrates which 3D printer produces models most closely resembling original specimens – based upon currently-deployed settings and environmental configurations – and repeatable replication of models from a single printer. **Conclusion:** Through critical assessment, this project makes clear the implications and risks associated with the reuse of archived 3D meshes in research, teaching, and museum-based endeavors.

Funding: Texas A&M Department of Anthropology's Undergraduate Student Research Award (\$750).

Using tools promotes persistent foraging behavior in Tufted Capuchin Monkeys (*Sapajus libidinosus*). *BRENDAN HARRIS, *MACKENZIE R. PRYOR, CAROLINE E. JONES and DOROTHY M. FRAGASZY. University of Georgia.

Background: Due to the lack of a baseline measurement, or even a definition of persistence, persistence has rarely been studied as a feature of animal behavior. The goal of this research is to examine persistence as it applies to tool-use in a group of wild tufted capuchin monkeys at Fazenda Boa Vista, Brazil. **Methods:** A total of 24 extractive foraging bouts by 12 monkeys were video recorded from May to July 2015. Duration and behavioral variation were compared in tool versus non-tool foraging bouts, and percussive versus non-percussive

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

foraging bouts. **Results:** The monkeys spent, on average, 50% more time per bout foraging when the bout required a tool (87 sec vs 58 sec, paired t test, $p < .05$). They also spent, on average, 167% more time foraging when the bout was percussive (88 sec vs 33 sec, paired t-test, $p < .05$). **Conclusion:** Our results support the hypothesis that working with a tool results in significantly more persistent foraging behavior. Development of selective persistence may have contributed to the appearance of tool-use in diverse primate lineages.

Funding: Center for Undergraduate Research Opportunities (CURO).

Asymmetry of the dental arcade in six populations from the Indian Sub-Continent. *AIMEE L HERUBIN, JEANNE MCLAUGHLIN and FRANCES J. WHITE. University of Oregon.

Background: Deviations from symmetry that arise during development are defined as fluctuating asymmetry (FA). Greater asymmetry is often related to differences in genetic and environmental factors experienced during development with males showing more asymmetry than females. We hypothesized that men and women would have differing degrees of asymmetry as well as individuals in different castes. **Methods:** We measured samples from the John R. Lukacs Dental Cast Collection at the University of Oregon. Our sample consisted of 177 paired mandibles and maxillae (57 females, 120 males). Individuals were from one of six social castes. Permanent dentition was measured in a three-dimensional plane at the cervix between the first incisors and on the distal surface of premolars and molars. 13 landmarks were digitized using a

microscribe-3DX© following the protocol of Frost et al (2003). Dental FA was measured by calculating the Procrustes' distance between each individual and its mirror image. We compared mean asymmetry by sex and caste using a two-way ANOVA. **Results:** We found significant differences in both the maxilla and mandible FA between castes ($F=51.28$, $DF=5$, $p<0.0001$ and $F=19.40$, $DF=5$, $p<0.0001$, respectively) but not between sexes with no significant interaction term. Our hypothesis that there would be a difference in asymmetry between sexes was not supported, however, our hypothesis that there would be differences in levels of asymmetry between castes was supported. This suggests that there may be genetic or environmental factors influencing dental arcade development differently in different castes. **Conclusion:** Our project furthers our knowledge of biological variation between social groups in a region of the Indian Sub-Continent.

Bearing the burden: Trauma during agricultural intensification in pre-contact Ohio. *SKYLER JACKIM, *DEVON REICH, MELISSA CLARK and EMMA LAGAN. The Ohio State University.

Background: This study examines how pathological conditions present in the skeletal remains of an Indigenous American from 17th century southern Ohio are related to the changing societal demands brought on by an increase in agriculture practices as shown through paleoethnobotany studies. The subject of this study is a middle-aged male with multiple vertebral lesions, ulnar and radial deformations, and bilateral periosteal reactions on the tibial diaphyses. Initial assessments suggested changes to the distal ulnae and radius were consistent with

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

rickets, a nutritional deficiency caused by lack of vitamin D which, when present in infants, softens bones leading to bending in the arms and legs **Methods:** These indicators included widespread bilateral periosteal reactions on the tibial diaphyses, lesions on multiple vertebral bodies, osteophytosis along the anterior and superior of the L-2 vertebrae, and gross deformation of the distal left radius combined with bilateral lateral bowing of the distal ulnar diaphysis. **Results:** While rickets was originally thought to have changed the ulnae and radius, a closer examination suggested Colles' fractures due to lack of evidence of rickets in the legs. Meanwhile, the osteophytosis of the vertebral margins and the lesions on the vertebral body are consistent with slipped discs between T-12 and T-11 and L-2 and L-1, while the other vertebral lesions are consistent with intervertebral disc disease. **Conclusion:** These injuries were likely caused by an increased vulnerability due to rudimentary lithic tools found in the 17th century, making these conditions consistent with the intensification of agriculture rather than violence or disease as originally thought.

Anterior dental microwear in four sympatric Sumatran primates. *SARA JEFFRESS, LUCAS K. DELEZENE, J. MICHAEL PLAVCAN, MARK F. TEAFORD and PETER S. UNGAR. University of Arkansas.

Background: In Sumatra, sympatric catarrhine primates differ in the manner and extent to which they use their anterior teeth in food acquisition and processing; and these feeding behaviors are related to niche partitioning. For example, the arboreal and frugivorous apes, *Hylobates* and *Pongo*,

differ in anterior tooth use. *Pongo* feeds lower in the canopy and exhibits a higher level of anterior tooth (e.g., nipping and stripping leaves and fruits), whereas *Hylobates* feeds high in the canopy and often places smaller food items on in the mouth without anterior tooth use. *Presbytis*, primarily folivorous, relies on its incisors to manipulate leaves and hard fruit husks in the lower canopy, while *Macaca* enjoys a diversified diet, including insects, on or near the ground with varying degrees and types of incisal preparation. To investigate the relationship between tooth use and dental wear, microwear textures were analyzed for the anterior teeth of four genera of Sumatra primate for which field observations of anterior tooth use are available. **Methods:** Using a white light confocal microscope, ten ISO-25178 texture attributes that reflect microwear feature size (*Sz*, *Sv*, *S5v*, *Sda*, *Sdv*, *Vvv*), anisotropy (*Str*), surface roughness (*Sa*), surface complexity (*Sdr*), and feature density (*Ssk*) were recorded. Microwear was recorded from the center of the incisal edge of the labial surface of high-resolution epoxy casts of maxillary central incisors of adult wild-collected Sumatran specimens of *Pongo abelii* (*n* = 31), *Hylobates lar/agilis* (*n* = 36), *Presbytis melalophos/thomasi* (*n* = 39), and *Macaca fascicularis* (*n* = 20). **Results:** In line with previous feature-based studies, there is strong overlap among the four genera in microwear attributes. *Pongo* is observed to have smaller feature sizes (*Sda*, *Sdv*, and *Sz*) than either *Hylobates* or *Presbytis*, while *Hylobates* exhibits the largest features. *Presbytis* exhibits less surface roughness (*Sa*) than that of *Macaca*, while also having the least complex surfaces (*Sdr*). No observable differences among taxa were found for anisotropy. **Conclusion:** These findings

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

align with reported field observations of tooth use and feeding height in the canopy and illustrate the potential for using microwear texture analysis to infer patterns of anterior tooth use in extinct primates.

Funding: The Leakey Foundation.

Correlations between olfactory turbinal surface area and olfactory bulb volume among extant euarchontans. *JESSICA JOHNSON, *ELISE HARAIS and INGRID K LUNDEEN. The University of Texas at Austin.

Background: Among extant Primates, some clades are characterized by reduced olfactory systems relative to the primitive euarchontan condition. Fossils lack the tissue and olfactory epithelium used to represent much of the olfactory system, making it difficult to determine the timing of this reduction within Primates. Much of the understanding of the olfactory system reduction comes from studies focusing on olfactory fossa volume, a proxy for olfactory bulb volume. In contrast, olfactory turbinals, which in vivo are covered in olfactory epithelium, are rarely used to infer olfactory sensitivity. Here, we rely on recent increases in data resolution and availability to quantify and compare olfactory bulb volume with olfactory turbinal surface area to evaluate the potential of the latter as a proxy for olfactory sensitivity. **Methods:** High-resolution CT scan data representing each major euarchontan clade including Primates (n=28), Scandentia (n=3), and Dermoptera (n=1) were downloaded from Morphosource. Olfactory bulb volume, total brain volume, and olfactory turbinal surface area were segmented and quantified, in Avizo 8.1. To look at the relationship between variables, Phylogenetically

Generalized Least Squares regressions were conducted in R statistical software. **Results:** Our results show a statistically significant linear relationship between olfactory turbinal surface area, and both relative and absolute olfactory bulb size (P<0.05). **Conclusion:** Here, we establish the relationship between olfactory bulb volume and olfactory turbinal surface area, facilitating the use of olfactory turbinal surface area as a proxy for olfactory sensitivity in extant and extinct euarchontans.

Neurological deficiencies due to antemortem cranial trauma in the Chanka polity of Andean Peru (1000-1400 CE). *SKYLER J. KEITER and DANIELLE KURIN. University of Massachusetts Amherst, University of California, Santa Barbara.

Background: This study examines the antemortem cranial trauma found on skeletal samples from seven Late Intermediate Period sites in the province of Andahuaylas, Peru. **Methods:** 124 crania were assessed for age, sex, and presence of trauma. Crania were also measured to determine the degree of cranial modification present and its effect on the size and location of lobes of the brain. Crania showing trauma were further assessed for type of trauma, lethality, location, and evidence of healing. Location of trauma was correspondingly mapped onto images of the brain to determine possible impacts on neurological function present in the population. **Results:** Results showed that half of the entire sample displayed evidence of cranial trauma and there was no significant statistical difference in trauma rates between males and females. Blunt-force trauma to the frontal and parietal bones were the most common forms of injury,

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

corresponding to deficiencies in concentration, judgement making, voluntary muscle movement, eye movement, and language comprehension. **Conclusion:** This study combines inquiry methods from forensic anthropology, psychology, and neurology to determine what neurological problems were common among this group. This is done by mapping the injuries onto images of the brain to determine what lobes were affected and looking at recent medical and psychological literature to determine the issues specific to that area of the brain. This is a novel approach that has not been applied previously to a non-living population. Because this is a new method of data inquiry, it comes with many challenges (such as a lack of comparative literature). However, in the future, it will be a viable process for physical anthropologists interested in studying neurological function in past populations with a known history of violence and head trauma.

Funding: University of Massachusetts Amherst, Department of Anthropology.

Identifying the unidentifiable: Using isotopic analysis to develop biological histories in forensic cases from Flagstaff, Arizona. *TAYLOR LAMBRIGGER and CORINA KELLNER. Northern Arizona University.

Background: Stable isotope analysis was successfully used in a modern forensics context in the identification of a mutilated murder victim in 2005 in Dublin, Ireland, and this technique in forensic anthropology is quickly growing. This study is the first to use stable isotope analysis of bone and teeth from unidentified victims from Coconino County in northern Arizona to augment the

burgeoning forensic isoscape for the United States. **Methods:** We obtained unidentified human remains from the Coconino County Medical Examiner's Office for processing in the Paleodiet Lab at Northern Arizona University (NAU). Carbonate from bone and teeth were analyzed at the Colorado Plateau Stable Isotope Laboratory at NAU for carbon and oxygen values. **Results:** Overall, oxygen values between tooth and bone from these unpaired individuals are not significant ($t = -0.13$, $df = 5.40$, $p = 0.90$), while the carbon values are significant ($t = 2.72$, $df = 5.81$, $p = 0.04$), suggesting the possible incorporation of more C3 foods in adulthood in comparison with childhood and adolescence. However, one individual with paired tooth and bone exhibits no significant shift in carbon values and a more negative oxygen value than other individuals in this preliminary data set, implying a stable diet over the lifecourse and a different locality for this individual. **Conclusion:** This successful preliminary analysis of isotopic values from unidentified human remains in a forensic context is the first of its kind in northern Arizona and has contributed important data to the United States isoscape to further the use of this methodology in forensic anthropology. We will continue this research with forthcoming bone collagen data and strontium isotope analysis for a clearer picture of diet and geolocation, with the aim of narrowing down the possible identities of these individuals.

Funding: My research has been funded by the Hooper Undergraduate Research Award at Northern Arizona University.

Predictors of infant hair cortisol concentrations in The Gambia. *GABRIELLA B. MAYNE and ROBIN M.

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

BERNSTEIN. University of Colorado, Boulder.

Background: Worldwide, growth stunting affects over 150 million children under five and is associated with high rates of morbidity and mortality. Previous research has shown that growth stunting persists despite nutrition-centered interventions, highlighting the need for investigation into other pathways and mechanisms mediating stunting. **Methods:** Measuring hair cortisol concentrations (HCC) provides a relatively non-invasive method for gaining insight into stress responses and hypothalamic-pituitary-adrenal (HPA) axis activity over an extended period of time, with potential relevance for understanding underlying causes of growth stunting, or the efficacy of interventions. Here, we test different predictors of HCC variation in infants in rural West Kiang, The Gambia (N=38). Two hair samples were collected from each infant, first at one week of life and then again between six months and 1.5 years (76 hair samples total). HCC were determined using an enzyme-linked immunosorbent assay developed for use in saliva and validated for use in hair. Two models were constructed to determine significant predictors of HCC – both overall HCC and change in HCC over time. **Results:** Mean HCC for the group is 62.49 pg/mg (median 44.86, range 7.14 - 185.86). Results indicate mother's socio-economic status (overall HCC and delta HCC $p < 0.0001$), infant village of residence (overall HCC $p = 0.0001$, delta HCC $p < 0.0001$) and maternal weight gain in the third trimester (overall HCC $p = 0.0035$) are significant predictors of HCC. **Conclusion:** Identification of variables that significantly predict variation in HCC can offer insight into important factors that may contribute to issues of growth stunting,

and through which stunting may be ameliorated.

Funding: Funded by the Bill and Melinda Gates Foundation (OPP1066932).

Assessing interobserver replicability in the scoring of enthesal markings through 3D technology. *KYLE MCLAUGHLIN and KRISTINA SHULER. Auburn University.

Background: This research assesses replicability in the scoring of entheses using standard visual methods on dry bone, 3D-scans, and 3D-prints from the appendicular skeleton. **Methods:** 42 entheses (subscapularis, pectoralis major, extensor carpi radialis longus, quadriceps femoris, and soleus) from the Newton Plantation osteological series were scored from seven bones that were used to create three identical scoring sets: dry bones and corresponding 3D-scans and 3D-replicas. NextEngine© scans (29K resolution) were printed via Makerbot Replicator©. Entheses were then scored independently by two observers of varying experience levels using standards developed by Hawkey and Merbs (1995) and Villotte (2006). **Results:** Percent agreement (57%) was identical for dry bones and 3D-scans with attachment sites combined. 3D-prints had slightly lower agreement between observers (54%). Agreement between scorers ranged from 50%-65% across attachments. The highest agreement was seen in soleus and lowest in quadriceps femoris. Overall, agreement was low for both the Hawkey and Merbs (55%) and Villotte (57%) methods as previously reported (Davis et al. 2013). **Conclusion:** In sum, this preliminary study does not suggest a major difference using entheses from real bone, versus 3D technology to assess, or between observers,

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

though the results continue to suggest the need for refined scoring methods.

Funding: Auburn University Undergraduate Research Fellowship Program Grant of \$4500.

Origin stories: Personal genomics, transnational adoption, and the adoptee identity narrative. *KIT MITCHELL. Wellesley College.

Background: Personal genomics testing companies advertise ancestry and disease risk assessment services based on population-level genomics research on human migration and human variation. My research explores how adults adopted from China have incorporated personal genomics testing into their search for information, birth family in China, and sense of national identity. **Methods:** I have used primarily ethnographic methods in this research, including semi-structured interviews with adopted adults and immersion in social media communities devoted to birth parent search, personal genomics companies, and genealogy enthusiasts. **Results:** Adoptive parents are interested in using personal genomics testing to gain medical and ancestral information about their children. Their faith in the empirical validity of consumer genomics tests stands in opposition to the conclusions made in the literature, which suggests that population genomics cannot assess ancestry at the individual level. In contrast, adoptees' primarily use testing to find cousins through family linkage in the company databases. However, rather than completely eclipsing more laborious methods of search for birth family, personal genomics is considered an additional avenue to reach birth relatives. **Conclusion:** This research explores how new

biotechnologies change the nature of kinship structures, national identity, and sense of cultural belonging. Furthermore, it develops a case study for the impact of population genomics on the Western (and particularly American) attitudes towards science and empiricism.

Funding: Provost's Multicultural Research Grant, Wellesley College.

Mitochondrial diversity in the south coast of West New Guinea. *MAURICIO MONTES, *NATHANIEL BENJAMIN, *MAITAL CITRON, *CHRISTOPHER FUGINA, *MOLLY MORAN, *CORINNA RONEN, *NOAH SALAZAR and MICHEL SHAMOON-POUR. Binghamton University.

Background: Early migrations and the isolation of the people of New Guinea have fostered genetic and linguistic diversity on the island which provides insight into the peopling of the Pacific region. It is believed that first people entered New Guinea ~60 thousand years ago (kya) introducing haplogroups M, P, and Q. **Methods:** This study identified the mitochondrial lineages of 96 serum samples from Binghamton University Bioarchive representing the populations of the south coast of West New Guinea (WNG). DNA was extracted from the samples, PCR of the HVS-1 region was conducted, and gel electrophoresis was used to analyze the DNA products from PCR. **Results:** Results supports two early migrations resulting in first peopling of the south coast of WNG, and suggest that the out-of-Taiwan Austronesian migration never reached this region. The discovery of new M73 haplotypes informed the phylogeny of this rare haplogroups. Network analysis also suggests the WNG P3 lineages are ancestral

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

to Aboriginal Australian lineages, suggesting migration of P3 from WNG to Australia. **Conclusion:** The results of this study elucidate the genetics of the isolated people of the south coast of WNG, which until early 20th century, had little contact with outside world. The results have important implications for the first peopling of the island of New Guinea, as well as the migratory events between New Guinea and Australia.

Funding: This project was supported in part by grants to Binghamton University from Howard Hughes Medical Institute (HHMI) through the Precollege and Undergraduate Science Education Program, from New York State Regional Economic Development Council, and from SUNY Investment & Performance program.

Perpetual care in Harris County historic segregated cemeteries: A quantitative assessment. *KARA MURPHY. Beloit College.

Background: Cemeteries are valuable sources of cultural and demographic information when conducting skeletal analysis. Historic African American cemeteries have a long history of erasure and neglect due to lack of constant maintenance (perpetual care), despite being important cultural touchstones and valuable avenues for individual and community identification. **Methods:** To measure this phenomenon, a photographic survey was conducted to compare African American and Anglo American cemeteries in Harris Co., Texas from Summer 2016 to Fall 2017. The alternative hypothesis was that there will be a statistically significant difference in damage and perpetual care between African American and Anglo American cemeteries. A

chi-square analysis comparing gravestone damage, legibility, and overgrowth was conducted between the two groups to measure the disparity in damage and perpetual care. **Results:** Upon analysis, the difference in presence of overgrowth and damage of gravestones were statistically significant. Legibility differences, however, were not statistically significant. Historic problems concerning access to cemeteries, the geographic differences in the cemetery locations, and legal issues that challenged cemetery legitimacy are possible contributing causes for the disparity in the level of perpetual care. **Conclusion:** Statistical cemetery analysis allows physical anthropologists to better holistically understand societies by using difference in cemetery care to understand both status and demographics before excavation and skeletal analysis. It is the context in which skeletal remains are found that build appropriate life narratives; consequently, understanding how those contexts can be lost is an imperative.

Dental microwear textures of Norse and Thule individuals from Greenland. *NASEER NASEEM, LUCAS DELEZENE and PETER UNGAR. University of Arkansas.

Background: There has been considerable research recently on why Norse settlers disappeared from Greenland by the 15th century while the Thule continued to inhabit the island. Viking sagas and archaeological evidence of pastures and attempts at farming indicate that the Norse diet differed somewhat from that of the Thule, a diet known to be based on maritime hunting specifically, and hunting and gathering in general. A dental microwear texture analysis of Norse and Thule samples was conducted

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

to assess possible differences in diet that might help explain the differences in success of occupation of Greenland. **Methods:** Data were collected from high-resolution epoxy replicas, specifically facet 9 of M2, for Norse (n=17) and Thule (n=29). Using scanning white light confocal microscopy, surface textures were characterized using 38 conventional ISO-25178 parameters. A MANOVA on rank-transformed data was used to compare central tendencies between the groups. A second MANOVA on ranked Levene-transformed ISO data was used to compare sample dispersions. **Results:** The Norse and Thule samples did not differ significantly in dental microwear textures, in either central tendencies or dispersion of values. This implies that, if the groups did differ in diet, those differences were too slight, or there was too much overlap, to detect it in their microwear textures. **Conclusion:** Historical documents suggest cultural differences in diets between the Thule and Norse and studies of hunter-gatherer populations (including those from the high arctic) do show differences in microwear related to food preferences; therefore, the lack of distinction between the Greenland groups suggests differences in the material properties of diets were likely subtle. These results may have implications for the theory that the Norse were unable to adapt to a diet optimal for Greenland.

Ground Reaction Forces: Does turning matter? *MIGUEL OCHOA, STEVEN G. LAUTZENHEISER and PATRICIA A. KRAMER. University of Washington Bothell.

Background: Directional changes when walking are often overlooked when investigating the body's response to locomotive forces, despite the commonality

of directional changes. **Methods:** Kistler force plates were used to collect kinetic data from 13 individuals. Data was collected when participants walked under two conditions: walking in a straight line, and walking with a 90 degree turn. Maximum ground reaction forces in the X, Y, and Z directions and midstance ground reaction forces were calculated. **Results:** Forces associated with turning were compared with straight line forces. Results show higher turning forces, with all p values of <0.001. This indicates that ground reaction forces are higher when individuals make directional changes. **Conclusion:** Hominin lower limb morphology could be adapted to different force profiles than have been typically considered.

Prevalence of *B. burgdorferi* in *Peromyscus leucopus* and *Ixodes scapularis* in the Upper Susquehanna River Basin. *KRISTINA OPALECKY, *COLIN PRITCHARD, *ANULI KHAIRATKAR, *ALLYANA GALLO, *DANIEL DEL VALLE, *GABRIELLE CELESTIN and MICHEL SHAMOON-POUR. Binghamton University.

Background: Lyme disease is the fastest growing human infectious disease in the Northeast region of the United States. The bacterial agent of Lyme disease, *Borrelia burgdorferi*, is transmitted to humans by the blacklegged tick, *Ixodes scapularis*. The white-footed mice, *Peromyscus leucopus*, is the principal host for infected blacklegged ticks and the primary reservoir of *B. burgdorferi*. Large populations of both white-footed mice and blacklegged ticks reside in the Upper Susquehanna River Basin, making it a relevant area for study. This study aims to improve our understanding of the risk of Lyme disease in

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

the Upper Susquehanna River Basin, a region of New York state adjacent to counties with the highest prevalence of Lyme disease in the United States. **Methods:** DNA was extracted from blacklegged ticks and white-footed mice collected from New York State counties; Broome, Chenango, Tioga, and Tompkins. The samples were then tested for the presence of *B. burgdorferi* using quantitative PCR (qPCR). **Results:** The overall prevalence of *B. burgdorferi* in blacklegged ticks and white-footed mice across the counties was determined to be 47% and 37%, respectively. While there was a high frequency of infection in ticks and mice populations from all counties, Tompkins county had the highest frequency of infection (63% and 53%). Using Spearman's Rank, no significant correlation of infection between vector and reservoir was found. **Conclusion:** A full understanding of the multiple factors contributing to the rapid spread of Lyme disease in the United States requires an anthropological approach. These factors include the development of fragmented built environments (suburbs), activities that put humans at risk of exposure to ticks, and the prevalence of reservoir (mice) in a region.

Funding: This project was supported in part by grants to Binghamton University from Howard Hughes Medical Institute (HHMI) through the Precollege and Undergraduate Science Education Program, from New York State Regional Economic Development Council, and from SUNY Investment & Performance program.

Effect of enclosure type on locomotion and spatial use in captive Sifakas (*Propithecus coquereli*). *DANIELLE RAE ORLANDI, MARK MCGOWAN, ANTHONY TONGEN and ROSHNA WUNDERLICH. James Madison University.

Background: The assessment of physical activity in captive primates is important to health and husbandry decisions and to the interpretation of experimental studies. The purpose of this experiment was to assess differences in locomotor activity, energy expenditure, and spatial use during locomotion in sifakas in caged enclosures (CGEs) and natural habitat enclosures (NHEs) at the Duke Lemur Center (DLC). **Methods:** Using a datalogger inertial sensor attached to 7 sifakas, we collected three-dimensional acceleration and barometric pressure (related to height) for a total of 101 hours in CGEs (528.5-843.5 ft² x 10 ft), and 195 hours in NHEs (1.5-14 acres) at the DLC. We used continuous focal animal sampling to ground-truth the acceleration data. We compared the number of leaps, ODBA, activity and rest time, and barometric pressure between enclosure types. **Results:** Sifakas in NHEs did not differ in spatial use ($p = 0$) but did leap less ($p = 0.002$), were less active ($p = 0.02$), rested more ($p = 0.02$), and exhibited lower ODBA ($p = 0.01$) than those in CGEs. **Conclusion:** The assessment of activity in captive environments is essential to animal health, animal husbandry decisions, and the interpretation of experimental studies performed in these environments. We have presented a tool for assessing locomotor behavior, energy expenditure, and spatial use that can be used to quantify these aspects of physical activity in both captive and wild primates.

Funding: Sigma Xi Grant-in-Aid of Research, Molly H. Glander Student Research Grant from Duke Lemur Center, and National Science Foundation 0960417.

Using transition analysis to examine age at death in Tombos. *ISABELLE ORTT,

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

MICHELE BUZON and KAITLYN SANDERS. Purdue University.

Background: Traditional methods of age estimation based on skeletal evidence assign all older aged individuals to the broad category of 50+ years of age. To more accurately determine the age of individuals belonging to this group, we utilized transition analysis to examine an archaeological collection of individuals excavated from Tombos, Sudan, an Ancient Nubian settlement occupied from the New Kingdom through the Napatan period.

Methods: Based on the age-related characteristics of each element, we scored the crania, auricular surfaces, and pubic symphyses according to the methods outlined by Boldsen et al. to estimate age in individuals who appeared 50+ years using traditional methods. Thirty well-preserved individuals from the collection are included in this study. These data, along with sex estimates, were analyzed using the transition analysis program ADBOU to generate a 95% CI age range and maximum likelihood age estimate for each individual. **Results:** Calculated ages vary, with 70% of individuals displaying characteristics consistent with an age of 50 or greater. Of these 21 older individuals, 10% were aged 50-59, 24% fall within the age category 60-69, 38% likely died between age 70 and 79, and 29% had an age at death exceeding 80 years.

Conclusion: This study demonstrates that transition analysis can reveal considerable variation in samples of advanced age. Such an analysis not only provides more accurate estimations of life expectancy in Ancient Nubia, but also presents an opportunity to consider the Osteological Paradox of health in populations who live to advanced age but display few pathological lesions.

Funding: This project is associated with the Purdue University Margo Katherine Wilke Undergraduate Research Internship.

Genetic diversity and relatedness of *Eulemur rubriventer* in Ranomafana National Park. *AMANDA PUTTIZA, RAQUEL L. LOPEZ, SANTIAGO CASSALETT, APARNA CHANDRASHEKAR, AMANDA MANCINI, STACEY TOCET, LAUREN O. DIAKIW, KATIE AMATO and ANDREA BADEN. Hunter College.

Background: *Eulemur rubriventer* is endemic to the tropical rainforests of Madagascar. These lemurs are highly frugivorous, remain in fixed territories, and live in relatively stable, small monogamous family units. For our study, we looked at the genetic diversity of 31 individuals part of 11 groups with overlapping territories at Vatovaya, Ranomafana National Park.

Methods: DNA was extracted from these fecal samples collected in the field using QIAamp DNA Stool Mini Kits; 10 microsatellites were targeted as genetic markers during PCR. These amplified regions were sequenced and analyzed using GeneMarker and population genetic calculations were carried out using GenA1Ex and GeneDivo. **Results:** A total of 43 alleles were identified for the 10 markers, with an average of 4.3 alleles per loci. All 10 loci were found to be polymorphic with 3-7 alleles. The Queller-Goodnight estimator was used to calculate the average r -value of -0.042, indicating that relatedness between selected pairs was on average less than what is expected between two random individuals. Group average F_{st} value was 0.086, which supports free interbreeding among nearby groups. The results support a high amount of

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

genetic diversity in Vatovaya, with high allelic diversity and high observed heterozygosity.

Conclusion: This population genetic study focuses on a small sample of an endangered primate population found in a harsh, volatile environment. The results from this study help establish genetic diversity on a small, reliable scale and also help researchers further understand the group dynamics of red-bellied lemurs.

Planting Perthes: Agriculture & mechanical loading in a pre-contact female. *DEVON REICH, *SKYLER JACKIM, MELISSA CLARK and EMMA LAGAN. The Ohio State University.

Background: Seventeenth century pre-contact Ohio witnessed the intensification of agriculture and dietary transition to less nutritious foods. Meanwhile, fairly rudimentary tools, such as hatchets and shovels made from stone and animal bone, increased individuals' vulnerability to workload-related injuries. One such Native American population found at the Grantham cemetery site in Northeastern Ohio along the southern shore of Lake Erie, dated circa 1650 AD, had nearly transitioned fully to sedentism. The purpose of this study was to diagnose a pathological condition of the right femoral epiphysis exhibited in an individual and interpret this condition within the context of agricultural intensification in pre-historic Ohio. **Methods:** Sex was assessed according to Buikstra & Ubelaker 1944, and the auricular surfaces of the ilium and pubic symphseal surfaces were examined to estimate age. Stature was estimated according to Scullin et al., 1990. The individual was estimated to be a middle-aged female with a height ranging between 142.9 cm (4'8") and 151.6 cm (5'0") with

noted femoral asymmetry. **Results:** The right femur showed a shortened femoral neck, "mushrooming" of the femoral head, and a necrotic lesion on the epiphysis. The maximum width of the left femoral head was 8.8 mm greater than that of the right. These are indicative of Legg-Calvé-Perthes disease, unique in both females and non-European populations. Perthes disease occurs as the result of an occluded blood supply to the femoral head, resulting in avascular necrosis of the bone and eventual fracture. An immature skeleton would likely be unable to bear the loads applied to it, thus susceptible to occlusion of the blood supply and trauma. **Conclusion:** The transition to agriculture characteristic of this individual's population resulted in both less nutritious diets, a leading cause of skeletal immaturity, and increased work load. Perthes is also consistent with other observations that support heavy agricultural work loads such as increased robusticity and joint damage. The northern latitude of the Grantham population and climate served as higher risk factors for this individual.

Maternal motives behind elective cesarean sections in the US. *EMALINE REYES, KAREN ROSENBERG and WENDA TREVATHAN. University of Delaware.

Background: As a result of our evolutionary history (adaptation to bipedalism and encephalization) birth can be especially difficult for humans. Trevathan has argued that because of the complicated and relatively risky way humans give birth, humans benefit from assistants providing both logistical and emotional support. The extreme version of this intervention is cesarean sections; surgical deliveries of infants. Cesarean sections are important life-

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

saving procedures, however they have risks (and other costs) of their own. This is why the WHO recommends a target cesarean section rate of 15% of all births. In recent years, the US has a rate of 33% and some other developed countries are even higher. One reason for this growing rate is elective cesarean sections. Our hypothesis is that women who are more likely to elect cesarean section for non-medical reasons do so at least in part because of neglected fears and anxieties. **Methods:** Using an online survey and in-person interviews, our study investigated women's birth preferences and attitudes towards birth. Both the survey and interview process used a snowball sampling strategy. Our sample was young, American women who have not previously given birth but who may in the near future (N = 333). Some of the questions we asked were "what is your preferred mode of birth?" and "do you have any fear concerning birth?" These questions were multiple choice, select all that apply, and open-ended. **Results:** Women in our sample who leaned towards cesarean section were more likely to be extremely fearful of birth (55%) than those leaning towards vaginal delivery (21%). 72% of the cesarean section group confirmed (when asked) that fear is what influenced their birth preference, 14% said their fear had no influence, while in the vaginal birth group 19% said fear influenced their birth preference and 55% said it did not. **Conclusion:** In our sample, women likely to elect cesarean sections in the absence of medical necessity are motivated at least in part by fear. They report more extreme fear than the group anticipating non-surgical delivery and it is more likely that this fear influences their birth decision. This study provides a better understanding as to why

women actively elect cesarean sections and offers productive low-tech and inexpensive ways to address their fears.

Funding: My research was funded by both the Summer Scholars program and the Senior Thesis Winter Session Scholars Award at the University of Delaware.

Preparation of human remains: An examination of cut marks and burning on human bone at sites with evidence of cannibalism in the prehistoric southwestern United States. *JOSEPH H. REYNOLDS. Metropolitan State University of Denver.

Background: This study examines data collected by Turner and Turner (1999) from their book, *Man Corn Cannibalism and Violence in the Prehistoric American Southwest*. Cut marks and burning were identified on human remains at Pueblo II (A.D. 950-1150) and Pueblo III (A.D. 1150-1300) sites and were determined by Turner and Turner (1999) to demonstrate evidence of cannibalism. Therefore, this study focuses on the frequency of these two variables in Pueblo II and Pueblo III samples, with the hypothesis that if cannibalism was a standardized practice then there will be no difference in the frequency of cut marks or burning per skeletal element or between sites. **Methods:** A Cochran-Mantel-Haenszel (CMH) test was used to analyze the frequencies of cut marks (n=111) and burning (n=103) on 5 skeletal elements occurring across Pueblo II (n=5), Pueblo III (n=3), and Pueblo II-III (n=3) sites. **Results:** Results of the CMH test indicate that there is no significant difference when considering cut marks per skeletal element ($p=0.3667$), and cut marks across sites ($p=0.218$).

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

However, there is a significant difference in burning per element ($p=0.03371$), and burning across or between sites ($p=0.04286$). **Conclusion:** The results do not support the hypothesis of a standardized treatment of human remains for the purpose of cannibalism at these sites. The frequency of cut marks and burns may differ due to variation in the preparation of human remains for the purpose of cannibalism between Pueblo II and III cultural periods. Other explanations for these results will be explored in the poster.

On the cusp of industry: A look at the quality of dental health in 19th century Saint Louis, Missouri. *KATHLEEN RICE and *SHAWN EDGHILL. University of Missouri- Saint Louis.

Background: This undergraduate thesis takes a look at the teeth of settlers in the early decades of Saint Louis's inclusion to the United States, approximately 1790-1850. The data considered comes from human remains excavated from the now defunct Second Catholic Cemetery, an urban graveyard that was discovered during development in 1990. **Methods:** We evaluate the quality of dental health by comparing scores of carious lesions, tooth wear, and periodontal disease both within the population reviewed as well as against comparable populations from the same time period. The variables recorded to assess the oral health of the population replicate the data collection codebook of The Global Health Project **Results:** We compared the SCC population by age and sex. Within the results, we found osteological evidence exhibiting abnormally poor dental health in both females and elderly populations due to high rates of caries. **Conclusion:** The research addresses the issue of transition of

diet at a time of rapid urbanization from the late 18th century to mid 19th century Saint Louis.

Blue sexual skin color and male sociosexual behaviors among South African vervet monkeys (*Ch. a. pygerythrus*). *ABIGAIL RIGGLE, JENNIFER DANZY CRAMER, J.PAUL GROBLER and TRUDY R. TURNER. University of Texas at Austin, American Public University (APU).

Background: Blue scrotal color of male vervet monkeys is used as sociosexual signal used for communication within and between the sexes. Captive work in *Ch. a. sabaues* examining female preference for male color suggests that while female vervets do not preferentially mate with males based on color alone, they do observe differences in natural and experimentally altered male color; for wild vervets, especially the most colorful subspecies, *Ch. a. pygerythrus*, if and how male color relates to their affiliative or sexual relationships with females is unclear. **Methods:** We studied sub-adult and adult male *Ch. a. pygerythrus* living in two troops at the Soetdoring Nature Reserve in South Africa. We examined the relationship between scrotal color and sexual behavior. Digital photography was used as an objective measure of scrotal color. Focal data were collected to measure sexual behavior. **Results:** We predicted darker and bluer males would have higher rates of mating, higher rates of female hindquarter inspection, and lower rates of mount refusals. Contrary to our predictions, male color was not related to mating rate ($r=.54$, $p=.13$). There was a positive trend with darker and bluer males having higher rates of mating but this result was not significant with small power size and only four of nine

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

males observed mating. Male color was also not related to rate of female hindquarter inspection ($r=.31$, $p=.42$) or the rate of mounts refused by females ($p=-.26$, $p=.49$). **Conclusion:** This research articulates the theoretical framework that is present in a generalized comparison of human reproduction as opposed to that of non-human primates. Vervet males live in multimale groups and females have concealed ovulation and estrus. Understanding male color helps us better understand how females choose their mates and how males use visual cues to communicate to one another and to females.

Funding: This research was supported in part by NIH R01RR016300.

Indications of interglobular dentin in Ya'amun, Jordan. *DYLAN ROBERTS and TERESA WILSON. Louisiana State University.

Background: Vitamin D is a cholesterol hormone that facilitates the transport of calcium and phosphorous absorbed in the gut outside the intestinal cells into the blood for circulation. Once in circulation, the ions are used in numerous reactions throughout the body. Insufficient consumption/production of Vitamin D can result in decreased renal reabsorption of inorganic minerals. This causes hypophosphatemia and hypocalcemia. These adverse conditions can lead to Interglobular dentin (IGD). IGD is the disturbance of dentin mineralization during Dentinogenesis. IGD is characterized by globular, under-mineralized regions in the matrix of the tooth. **Methods:** In this study, samples were taken from Ya'amun, Jordan to characterize the degrees of IGD from the Bronze to the Byzantine Period. After

obtaining the teeth, a random sample of 415 mandibular canines was chosen. The teeth were submerged in an epoxy resin and thin sliced by a slow speed saw. The thin sections of the tooth were then adhered to a microscopic slide and observed by a compound light microscope at 100x magnification. Observations were made in the presence or absence of interglobular dentin in the population. IGD severity was also recorded by a personal classification system ranging 1-4 depending on severity. **Results:** Of the 415 teeth observed, 132 were observed to have some level (1-4) of interglobular dentin. Of these 132, 49.24% had Level 1 severity, 23.50% had Level 2 severity, 19.70% had Level 3 severity, and 7.60% were found to have Level 4 IGD. The sample of Level 4 IGD were found to share some major characteristics. 90% of Level 4 IGD were found to be from Ya'amun in the Roman era. **Conclusion:** This helps indicate the living conditions based on information for the region during that time period. Conclusions can be drawn that Ya'amun experienced a Vitamin D deficiency in the region during the Roman era.

Quantifying free simple sugars in orangutan foods using spectrophotometry: Implications for orangutan feeding ecology. *NATALIE ROBINSON, *LEXI LANG, ERIN KANE and CHERYL KNOTT. Boston University.

Background: Orangutans (*Pongo pygmaeus wurmbii*) in Gunung Palung National Park, West Kalimantan, Indonesia experience significant seasonal and annual fluctuations in the availability of their preferred food, ripe fruit, and increase their consumption of continuously available fallback foods (bark, pith, and leaves) when ripe fruit is less

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

readily available. Free simple sugars (FSS) provide orangutans with readily-metabolizable energy and are presumed to be in lower concentrations in fallback foods.

Methods: We examine FSS concentrations in a variety of orangutan foods (n=54) to better understand orangutan foraging and nutritional ecology, and the nutritional content of fallback foods. We analyzed FSS concentrations using a modified phenol-sulfuric acid method, and tested sample absorbency using a spectrophotometer at 490 nm. We analyzed 54 samples from 48 species, examining six plant parts: bark, flowers, leaves, pulp, seeds, and skin/pulp. **Results:** Although preliminary results indicated no statistically significant differences in sugar content across the six food categories ($F(5,47)=1.78$, $p=0.14$), we did find that preferred foods (fruit pulp and seeds) had an average sugar concentration that was significantly higher (4.7%) than fallback foods (leaves and bark) ($t=2.355$, $p=0.04$). Therefore, as predicted, we find that orangutans' preferred foods have higher concentrations of FSS. **Conclusion:** Our results support the claim that fallback foods are less nutritious than preferred foods, as they contained lower concentrations of calorically-dense FSS. Obtaining adequate caloric and nutritional intake is crucial for orangutan reproduction and development, and thus this study provides new insight into what drives orangutan dietary choices.

Funding: National Science Foundation (BCS-1638823, BCS-0936199, 9414388), National Geographic Society, US Fish and Wildlife (F15AP00812, F12AP00369, 98210-8-G661), Leakey Foundation, Disney Wildlife Conservation Fund, Wenner-Gren Foundation, Nacey-Maggioccalda Foundation.

A new method for soft tissue removal for osteological analysis and preservation.

*JOSHUA SCHOFIELD. Metropolitan State University.

Background: Soft tissue removal is a necessary and time consuming step for osteological analyses and curation. Powdered Brewery Wash (PBW) (Five Star Chemicals, Commerce City, Colorado), a buffered alkaline detergent, is known in the brewing industry for its ability to quickly break down lipoproteins that are a byproduct of the fermentation process. This pilot study illustrates that PBW is efficient for the removal of soft tissues, while leaving the bone undamaged. **Methods:** A solution of PBW and water was tested with pig (*Sus scrofa*) ribs, which were allowed to soak for four hours in a warm-water bath (~ 95°F). The PBW solution was compared to an enzymatic detergent solution and a water control. **Results:** The ribs treated with the PBW solution took the least amount of time to finish manually cleaning compared to the enzymatic detergent and water (mean time of 53.5 seconds, 132 seconds, and 237.5 seconds, respectively). Four trials were conducted with the three treatments. A Kruskal-Wallis test comparing the treatments was significant ($p=0.0280$). **Conclusion:** Based on the results of this analysis PBW shows potential as an agent to aid in soft tissue maceration. Future plans for this project include running more trials as well as testing effectiveness of the PBW solution on other skeletal elements and varying taphonomic conditions. This pilot study shows that PBW as a macerating agent is a promising method.

Evolutionary significance of human female longevity and the modern grandmother identity. *SOFIYA SHREYER and ELLEN

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

INGMANSON. Bridgewater State University.

Background: Unlike animals which reproduce until the end of their lives, aging women redirect their energy from childbirth to intergenerational child care, which likely facilitated the evolution of the unusually extended human female longevity. Multigenerational demographic research has shown that in post-industrial societies, postmenopausal mothers contribute to the reproductive fitness of their children by decreasing infant mortality, and allowing them to begin having children earlier and more successfully. **Methods:** To explore the contemporary variation in grandmothers' intergenerational reproductive strategies, a mix-method study was conducted composed of a narrative literature review as well as fifteen in-depth interviews with grandmothers (6), mothers (4), and grandchildren(5) in southern Massachusetts. The interviews ranged from 26 minutes to 95 minutes, and were held with populations between the ages of 18 and 78. The interviews were recorded with the interviewee's permission, transcribed and coded for relevant themes. **Results:** The interviews brought to light a few strategies that grandmothers in southern Massachusetts use to increase the reproductive fitness of their children and grandchildren. Grandmothers, especially maternal grandmothers, took part in intensive one-on-one activities with their grandchildren (such as reading, long walks, storytelling) that the parents had little time to partake in. These mind-molding activities could have a positive effect on the cognitive function of grandchildren. Grandmothers were also extremely willing to take on the role of a step-in caregiver or second parent if something happened to the child's parent/s.

Grandmothers were helpful to their daughters through pregnancy and child rearing, providing assistance and advice (especially with breastfeeding and sick children). **Conclusion:** The evolutionary, economic, and cross-cultural impacts of grandmothers are growing areas of research within anthropology, as scholars have found that grandmaternal caretaking decreases infant mortality, boosts children's health, increases their children's reproductive fitness, and may influence high sociality and emotional responses in human babies. My research aims to elucidate on proximal mechanisms of grandmothers' reproductive strategies and explore the variation in their caretaking behaviors.

Funding: This research was funded by Bridgewater State University's Adrian Tinsley Program Undergraduate Research Grant.

Baby carrying positions change walking speed. *OLUWADAMILOLA SOSANYA and CARA WALL-SCHEFFLER. Seattle Pacific University, University of Washington.

Background: Methods of infant carrying vary among different cultural groups, and potentially even within a group based on what other tasks the carrier is trying to accomplish. Here we investigate how the position of babies and toddlers influences aspects of the walkers' gait. **Methods:** Kinematic measures and walking speed of adult male and female participants (n=6) were collected along a forested trail in the Pacific Northwest. Participants, while carrying their own infants (≤ 2 years), were asked to walk along a designated trail under three loaded conditions—front, back, and side—as well as without their infant in an unloaded control. Kinematic measurements,

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

including stride length, were taken over a pre-measured portion of the route that included both flat and inclined terrain. Speed was collected across the entire path, as well as for the portions of the terrain where kinematics were monitored. **Results:** Unsurprisingly, inclined terrain significantly reduced stride length ($p=0.022$), though interestingly, the babies' different positions did not initiate deviations from this general pattern. Baby carrying position did significantly change overall walking speed ($p=0.031$), in that front and side loading significantly slowed walking speed, whereas back carrying allowed participants to walk at speeds indistinguishable from their unloaded walking speed. Back carrying seemed particularly helpful in maintaining walking speed on the inclines, whereas on the level, back carrying decreased walking speed in a similar way to the other carrying conditions. This interaction did not quite reach significance ($p=0.09$) but deserves further attention. **Conclusion:** Studies on load carrying and gait can provide support in understanding the various patterns of baby carrying observed among different people groups and their given environments. This may also illuminate differences in preferred carrying choice between men and women.

Biological and cultural influences on caries prevalence between sexes among worldwide skeletal series. *JULIANNE R. STAMER, KATHRYN MARKLEIN and MARK HUBBE. The Ohio State University.

Background: The global transition from hunter-gatherer to agricultural subsistence captures a profound biocultural transition in human history, resulting in significant changes to different aspects of human life-style, including the increased susceptibility

to different pathological lesions, like dental caries. On a global scale, skeletal series show higher prevalence of caries in females than males. Biological (dental morphology, oral fauna, age, and sex) and cultural (diet, social/socioeconomic factors, technology, personal preference) variation have been argued to be responsible for this difference. However, the importance of these factors on caries prevalence between sexes is unknown. **Methods:** Here, we analyze the impact and importance of biological and cultural factors on caries prevalence by sex. Data on caries (prevalence by teeth and individuals) from 69 skeletal series from 55 sites published in *International Journal of Osteoarchaeology*, *Backbone of History*, *Current Anthropology*, and *American Journal of Physical Anthropology* were collected ($N=4,374$ individuals) and compared between sexes. **Results:** Caries frequencies for males were plotted against the frequencies for females, and their relationship was analyzed through linear regression and ANOVA tests. The results show a strong association between sex and carious lesions ($R^2=0.187$, $p=0.015$), with females showing 5.6% higher prevalence of caries than males, on average. **Conclusion:** However, this relationship explains a low proportion of the variance in the dataset, suggesting that the variation in caries prevalence is not due to intrinsic sexual differences. These results support the idea that caries has a complex etiology, and that differences between sexes cannot be easily attributed to either biological or cultural factors.

Dental emergence in living wild chimpanzees (*Pan troglodytes schweinfurthii*) from Gombe National Park, Tanzania. *LAUREN J SUTHERLAND,

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

MATTHEW R. HEINTZ, CARSON M. MURRAY, ANNE E. PUSEY, KARA K. WALKER, KAITLIN R. WELLENS and SHANNON C. MCFARLIN. The George Washington University.

Background: Dental emergence is hypothesized to correlate with life history events in comparative contexts, and is frequently used as a proxy for biological age in living and fossil populations. Current knowledge of dental emergence in living chimpanzees is largely derived from captive samples and the Kanyawara community of wild eastern chimpanzees (*Pan troglodytes schweinfurthii*) in Kibale National Park, Uganda (Smith and Boesch 2011; Smith et al. 2013; Machanda et al. 2015). Variation in tooth eruption timing between wild chimpanzee populations is poorly understood, but critical for understanding the scope and sources of variation in this species. **Methods:** We characterized dental emergence in a second population of wild known age chimpanzees at Gombe National Park, Tanzania (N=18, age 0.59-9.75) using video footage taken over a five-year period. By extracting stills, we assessed the presence and eruption stage of different tooth positions within individuals. **Results:** All individuals 0.59 years or older had at least partially erupted deciduous dentitions. The youngest age of first molar emergence reported here is 2.65 years old and overlaps with a previous report for Kanyawara chimpanzees. The youngest age of emergence for the permanent maxillary first incisor and canine—5.6 and 8.2 years, respectively—are earlier than in the Kanyawara community, but within the range of captive chimpanzees. **Conclusion:** By expanding the known sample, a more accurate picture of variation in chimpanzee

dental emergence is elucidated. As more data accumulates, future studies should investigate how differences in dental development between and within wild populations may be due to factors such as ecology and maternal condition.

Funding: I was awarded the Sigelman Undergraduate Research Enhancement (SURE) Award from The George Washington University to pursue my research, a total sum of \$500.

Investigating the health effects of the nutrition transition among the Tsimané of Lowland Bolivia. *JENNAH THOMPSON-VASQUEZ and WILLIAM LEONARD. Northwestern University.

Background: The nutrition transition is a broad change in patterns of dietary consumption and energy expenditure that is occurring in developing countries around the world (Popkin, 1994). The indigenous Tsimané of the Beni department of lowland Bolivia are experiencing the early stages of this transition. **Methods:** Information on demographics, anthropometry, horticulture, use of natural resources, income, social behavior, perceived health, and substance use were collected between 2002-2010. For the purpose of understanding how modernization and access to market goods and economy, anthropometric measurements collected from TAPS, including weight, BMI, body fatness, and measures of cholesterol, will be juxtaposed to United States 5th and 50th centiles. Data was taken from adults ranging from ages of 18 to 75 and older were used in these comparisons and averages from the 5th and 50th centiles and TAPS data were created in order to view the associations between the Tsimané and the United States. **Results:** Between 2002 and

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

2010, the prevalence of overweight and obesity increased by more than 50% in Tsimané' adults (from 20% to 32%; $P < 0.001$). Other measures of metabolic health (e.g., plasma glucose, HDL cholesterol) also appear to be declining. These results highlight the rapid increase in a metabolic health problems among acculturating Tsimané. **Conclusion:** The significance of this research lies in the exploration of underrepresented communities and observing how urbanization and entering the market economy can change lifestyles and dietary patterns.

Dental caries and oral health in the initial contact period Guale, St. Catherines Island, Georgia. *KENDRA S. WEINRICH, CLARK SPENCER LARSEN, BARBARA J. BETZ and LEIGH A. OLDERSHAW. Beloit College.

Background: Dental caries is an infectious disease process involving focal demineralization of dental hard tissues from acid byproducts of oral bacterial fermentation of dietary carbohydrates. Carious lesions provide a record of diet and oral health outcomes in a wide range of populations globally. **Methods:** Analysis of a skeletal series from the 16th century Fallen Tree site, St. Catherines Island, Georgia, provides the opportunity to document oral health during initial European contact well preceding intensive contact decades later during the 17th century mission period. We test the hypothesis that oral health declined in the Fallen Tree community preceding the establishment of the Spanish mission (Santa Catalina de Guale, ca. AD 1600-1680). **Results:** Statistical treatment of dental caries data for 38 individuals from the prehistoric preagricultural period (PP), 20 individuals from the prehistoric agricultural period (PA),

and 49 individuals from the initial contact period Fallen Tree site (IC) revealed dramatic and significant increases in prevalence of carious teeth for PP, 1% ($n=462$); PA, 7% ($n=228$); IC, 18% ($n=965$); and of carious individuals for PP, 8% ($n=38$); PA, 30% ($n=20$); IC, 68% ($n=47$) ($p \leq 0.05$; chi-square). **Conclusion:** These findings reveal a clear pattern of increase in maize consumption and associated oral health decline occurring decades prior to the intensification of contact between Guale and Europeans and the accompanying dramatic social, health, diet, economic, and behavioral changes during the mission period in the 17th century.

Funding: Funding support by the Summer Research Opportunities Program at The Ohio State University, the St. Catherines Island Foundation, and the National Science Foundation.

Effects of environment and relatedness on the gut microbiome of Ugandan red colobus monkeys. *TABOR WHITNEY, MARIA J. RUIZ-LOPEZ, DIANA M. CHRISTIE, COLIN A. CHAPMAN, TONY L. GOLDBERG and NELSON TING. University of Oregon.

Background: The gut microbiome consists of microbial communities that reside in the gastro-intestinal tract of living organisms. Variation in this system has been linked to health outcomes in human and animal models by affecting digestion, immune system development, and pathogen invasion. However, we still lack a complete understanding of the factors that shape gut microbiome variation, particularly in wild primates. **Methods:** The central aim of this research is to further test how forest fragmentation is associated with gut

AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Abstracts

microbial diversity in the Ugandan red colobus monkey. We sequenced the 16S rRNA hypervariable V-4 region to characterize the gut microbiome from 106 genotyped individuals across eight social groups inhabiting different forest types within Kibale National Park and its surrounding area. **Results:** We compared alpha diversity in the gut microbiome of individuals inhabiting fragmented versus continuous forest and did not find a simple relationship between gut microbial diversity and forest fragmentation. While individuals residing in some fragments had lower gut microbiome alpha diversity, those residing in well-protected fragments retained gut microbial diversity levels comparable to residents of continuous forest. Furthermore, we discovered numerous highly related red colobus monkey dyads between forests, which allowed us to assess the affects of genetic relatedness on gut microbial similarity. We found that environment plays a larger role than genetic relatedness in shaping the gut microbiome. Our research thus reinforces the role that environment plays in shaping within-species gut microbial variation with potential implications for the conservation of threatened populations in fragmented landscapes. **Conclusion:** This research question is strongly associated with primate conservation and how anthropogenic stresses are playing a direct role in shaping the monkey's gut microbiome. My research is a primatology focus and assesses the potential consequences a degraded environment can play in the red colobus health and survivability.

Funding: The Peter O'Day Fellowship Summer 2017 provided funds to help me carry out an

independent research project that was the main topic of this AAPA submission.

Investigating the relationship between diet and molar wear in cercopithecoid primates.
*ANNA WISNIEWSKI and SIOBHÁN B. COOKE. Johns Hopkins University.

Background: Members of the primate family Cercopithecidae utilize a range of dietary niches, with frugivorous and folivorous specialists both well-represented in the group. There are well-established differences in molar morphology between frugivorous and folivorous species; for example, frugivores tend to have shorter shearing crests and folivores tend to have larger teeth overall. These features allow folivorous primates to better break down leaves during mastication. **Methods:** To assess if there is a correlation between diet and molar wear patterns in cercopithecoid primates, we chose the frugivorous *Macaca fascicularis* and the folivorous *Nasalis larvatus* as representative species. Epoxy casts of museum specimens were coated and scanned using a R4X white light scanner (GoMeasure3D) to generate 3D models of the lower molar row. Molars were categorized into one of four categories of wear using an established wear stage model. The molars were then assessed for their degree of dental relief through the wear sequence using relief index – a ratio of three-dimensional crown surface area to two-dimensional planar surface area. Surface area measures were taken using Geomagic Studio. **Results:** Preliminary results indicate that in the unworn stage *N. larvatus* has a greater degree of dental relief than the frugivorous *M. fascicularis*. This trend is continued through the wear sequence. **Conclusion:** These data indicate that dental functional differences

**AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018**

Abstracts

between folivores and frugivores are maintained even during dental wear. The maintenance of functional dentition over the course of an animal's lifetime is a fitness advantage, and thus has evolutionary implications.

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**AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018**

Author Index

Ω denotes IDEAS Scholar. # denotes COD Undergraduate Symposium Travel Award recipient. Poster number shown in brackets []. Abstract page number shown in parentheses (). Email address is for corresponding author.

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AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018

Author Index

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**AAPA COMMITTEE ON DIVERSITY
UNDERGRADUATE RESEARCH SYMPOSIUM
6-8 pm, Wednesday April 11th, 2018**

Author Index

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