Program

Fourth Annual Meeting of the
Southwestern Association of Biological Anthropologists,
Arizona State University

November 4-5, 2016
SOUTHWESTERN ASSOCIATION OF BIOLOGICAL ANTHROPOLOGISTS

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Acknowledgments

The organizing committee thanks ASU’s School of Human Evolution and Social Change, the Institute of Human Origins, Julie Russ and Lindsay Mullen for financial and logistical support. We thank Brent Adrian of Midwestern University for providing artwork for our organization’s logo.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule</td>
<td>4</td>
</tr>
<tr>
<td>Map</td>
<td>5</td>
</tr>
<tr>
<td>November 4th Program Schedule</td>
<td>6</td>
</tr>
<tr>
<td>November 5th Program At A Glance</td>
<td>7</td>
</tr>
<tr>
<td>November 5th Program in detail</td>
<td>8</td>
</tr>
<tr>
<td>Abstracts</td>
<td>13</td>
</tr>
</tbody>
</table>
## SWABA CONFERENCE 2016: SCHEDULE OF EVENTS

### Friday, November 4

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>5:00 – 7:00</td>
<td>Welcome reception and registration</td>
<td>West Hall 135 &amp; Garden</td>
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<tr>
<td>7:00 – 8:30</td>
<td>Plenary talk (Dr. Brian Villmoare)</td>
<td>Social Sciences 105</td>
</tr>
<tr>
<td>8:30</td>
<td>Dinner (on own, see below)</td>
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### Saturday, November 5

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<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>8:15 – 9:00</td>
<td>Coffee</td>
<td>Social Sciences Atrium</td>
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<tr>
<td>9:00 – 10:30</td>
<td>Primate behavior/genetics</td>
<td>Social Sciences 105</td>
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<tr>
<td>10:30 – 10:45</td>
<td>Break</td>
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<tr>
<td>10:45 – 12:00</td>
<td>Human genetics/behavior</td>
<td>Social Sciences 105</td>
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<tr>
<td>12:00 – 2:00</td>
<td>Poster session / lunch</td>
<td>Social Sciences Atrium</td>
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<tr>
<td>2:00 – 3:30</td>
<td>Life history/paleoecology</td>
<td>Social Sciences 105</td>
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<tr>
<td>3:30 – 3:45</td>
<td>Break</td>
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<tr>
<td>3:45 – 5:00</td>
<td>Morphology/biomechanics</td>
<td>Social Sciences 105</td>
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<tr>
<td>5:00 – 5:15</td>
<td>Business meeting</td>
<td>Social Sciences 105</td>
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<tr>
<td>5:15</td>
<td>Student prizes</td>
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<tr>
<td>6:00</td>
<td>Dinner (on own, see below)</td>
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**Welcome Reception and Registration** – The welcome reception will be held in the West Hall 135 and ‘Secret Garden’ (see map on following page). We will have a registration desk to accept conference fees by **cash only** ($40 /$30/$20 for faculty/postdocs/students). Beer, wine, and hors d’oeuvres will be served.

**Plenary** – The plenary talk will be held in Social Sciences, room 105 (see map on following page)

**Conference** – Saturday’s podium talks will be held in Social Sciences 105, and the poster session will be held in the atrium of the Social Sciences Building. A catered lunch will be provided.

**Dinner on Saturday Night** – Given the growing popularity of SWABA, we are unable to reserve a venue for a group dinner after the program on Saturday. We will provide a number of suggestions at the business meeting.
Apache Boulevard and Rural Road parking structures - $3/hr on Friday, free on Saturday
Program Schedule, Friday, November 4th

Welcome reception and registration
5:00 – 7:00 pm West Hall 135

We will serve wine, beer, and Hors d’oeuvres in West Hall 135 and the “Secret Garden”

Plenary Talk – Early Homo at Ledi-Geraru: taxonomic and adaptive inferences for human evolution at 2.8 MA

7:00 – 8:30 pm Social Sciences 105

Dr. Brian Villmoare, Department of Anthropology, University of Nevada, Las Vegas

In 2013, a hominin mandible was discovered in the Ledi-Geraru Research Project area, Afar, Ethiopia, which dates to roughly 2.8 million years ago. Based on a variety of anatomical specifics it was attributed to the genus Homo, and is presently the earliest securely-dated specimen of our genus. Here I discuss the history of the exploration of the Ledi-Geraru region, the goals of the research, and the circumstances of the discovery. Additionally, I explain how we made the inference that this specimen should be attributed to the genus Homo, other candidates that have been proposed, and some modest controversy over the taxonomic allocation. Finally, I review the evidence that the anatomical changes seen with the appearance of Homo is associated with the environment during the transition between the late Pliocene and the early Pleistocene.
## November 5: PROGRAM AT A GLANCE

<table>
<thead>
<tr>
<th>Time</th>
<th>Name (1st author)</th>
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<tbody>
<tr>
<td>9:00</td>
<td>Enigk</td>
<td>Non-human primate behavior and genetics</td>
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<td>Hamilton</td>
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<td>Housman</td>
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<td>McCullough</td>
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<td>11:00</td>
<td>Mallard</td>
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<td>Taravella</td>
<td>Human genetics and behavior</td>
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<td>House</td>
<td>Human genetics and behavior</td>
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<td>Reina</td>
<td>Human genetics and behavior</td>
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<tr>
<td>12:00</td>
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<td>LUNCH AND POSTERS</td>
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<td>2:00</td>
<td>Glaze</td>
<td>Life history and paleoecology</td>
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<td>Blevins</td>
<td>Life history and paleoecology</td>
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<td>Lazagabaster</td>
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<td>Locke</td>
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<td>Beasley</td>
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<td>Robinson</td>
<td>Life history and paleoecology</td>
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<tr>
<td>3:45</td>
<td>Hall</td>
<td>Morphology and Biomechanics</td>
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<td>4:00</td>
<td>Grider-Potter</td>
<td>Morphology and Biomechanics</td>
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<td>4:15</td>
<td>Glowacka</td>
<td>Morphology and Biomechanics</td>
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<tr>
<td>4:30</td>
<td>Pearson</td>
<td>Morphology and Biomechanics</td>
</tr>
<tr>
<td>4:45</td>
<td>Webber</td>
<td>Morphology and Biomechanics</td>
</tr>
<tr>
<td>5:00</td>
<td></td>
<td>BUSINESS MEETING</td>
</tr>
<tr>
<td>5:15</td>
<td></td>
<td>STUDENT PRIZES</td>
</tr>
</tbody>
</table>
November 5: PROGRAM DETAIL

Session I: Non-Human Primate Behavior and Genetics (Social Sciences 105)

9:00 DREW ENIGK, MELISSA EMERY THOMPSON, ZARIN MACHANDA, RICHARD WRANGHAM and MARTIN MULLER
Adolescent male aggression toward adult females represents dominance striving, not sexual coercion, in wild chimpanzees

9:15 KRIS SABBI, MELISSA EMERY THOMPSON, MARTIN MULLER, ZARIN MACHANDA, EMILY OTALI and RICHARD WRANGHAM
Attention to social grooming among immature East African chimpanzees (Pan troglodytes schweinfurthii) of the Kanyawara community at Kibale National Park

9:30 KEVIN LANGERGRABER, DAVID WATTS, LINDA VIGILANT and JOHN MITANI
Group augmentation explains territorial boundary patrolling by male chimpanzees at Ngogo

9:45 MARIAN HAMILTON
Strontium isotopes as trackers of philopatry and home range: a case study from Kibale National Park

10:00 TIMOTHY WEBSTER and BRENDA BRADLEY
The landscape of genomic divergence across the macaque radiation

10:15 GENEVIEVE HOUSMAN, ELLEN QUILLEN and ANNE STONE.
Primate skeletal epigenetics and the evolution of complex traits

10:30 – 10:45 Break

Session II: Human genetics and Behavior (Social Sciences 105)

10:45 JOHN MCCULLOUGH, KATHLEEN HEATH, JACOB AXTON and NATHAN HARRIS
Migration, diet and iron: adaptation under change.

11:00 ANGELA MALLARD, JAMES WATSON, and BENJAMIN AUERBACH
Evaluating the limitations of biological distance models of gene flow in ancient human populations

11:15 ANGELA TARAVELLA and BRENNA HENN
Migration patterns and evolutionary history of the Duffy null mutation in African populations inferred from human genomic data

11:30 BAILEY HOUSE and JOAN SILK
Societal variation in prosociality and contingent reciprocity

11:45 KELLY REINA,¹ and JOAN SILK.
Do children share with someone who transgresses against a third-party to the benefit of the child?

12:00 – 2:00 Lunch and Poster Session (Social Sciences Atrium)
Session III: Life History and Paleoecology (Social Sciences 105)

2:00 EVELYN GLAZE and GARY SCHWARTZ
Testing the inhibitory cascade model on supernumerary molars

2:15 KELLY BLEVINS, CHARLOTTE ROBERTS, and ANA LUÍSA SANTOS.
Delineating the effects of early life experience on adult immune function in 20th century Portugal

2:30 IGNACIO LAZAGABASTER and SHEVAN WILKIN
Making sense of the mess: what can detailed analyses of ossuaries reveal?

2:45 ELLIS LOCKE and JASON KAMILAR
Predicting the climatic niche breadth of African catarrhines

3:00 MELANIE M. BEASLEY
Rediscovering ancient hominin environments

3:15 JOSHUA ROBINSON and JOHN ROWAN
A grassy corridor for pastoralist movement in the late Holocene of southeastern Africa

3:30 – 3:45  Break

Session IV: Morphology and Biomechanics (Social Sciences 105)

3:45 MARGARET HALL, JEFFREY PLOCHOCKI, and JOSE RODRIGUEZ-SOSA
The relationship between sexual anatomy and copulatory behaviors in orthograde and pronograde primates and other mammals – implications for human evolution

4:00 NEYSA GRIDER-POTTER, RYOSUKE GOTO, KENJI OKA, and YOSHIHIKO NAKANO
Posture during locomotion in Hylobates lar and implications for the evolution of human bipedality

4:15 HALSZKA GLOWACKA and GARY SCHWARTZ
Biomechanics of chewing and molar emergence in primates

4:30 OSBJORN PEARSON and ETHAN HILL
Patterns of strength and shape in the long bones upper limb

4:45 JAMES WEBBER and DAVID RAICHLEN
The effects of high speed and weighted walking on head pitch and knee forces

5:00 Business meeting

5:15 Student prizes

6:00 Dinner (on own, suggestions given at business meeting)
1. ALAN ACHENBACH
Comparison of adipogenesis enhancing transcription factor binding sites in human and chimpanzee reference genomes.

2. KAREN BAAB, MATTHEW O’NEILL, ASHLEY HAMMOND and WILLIAM JUNGERS
Digital reconstruction and comparative morphometric analysis of the Homo floresiensis os coxa

3. BRENDA BENEFIT, MONTE MCCROSSIN and ERICA DAVIS
The unusual and generically distinct face of the middle Miocene small-bodied ape “Micropithecus” leakeyorum from Maboko Island, Kenya

4. ELIZABETH S. CLAUSING, SAMANTHA STREULI and AMY NON
Trends in the use of racial terminology in biological anthropology, 1946 – 2015

5. JUSTIN D’AGOSTINO, CHRISTINA PASSETTA and ULRICH REICHARD
Preliminary results of a vocal self-recognition test in northern white-cheeked gibbons (Nomascus leucogenys)

6. HALLIE EDMONDS
A fine line: zygomaticotemporal sutural complexity in relation to primate diet

7. PETER GRAY and ELIZABETH BROGDON
Kin selection meets the grandparents: do step and biological grandparents report differences in investment and emotional closeness with their grandchildren?

8. DANIEL JAGER, HEATHER SMITH, J. HOWARD HUTCHISON, KELSEY JORGE, BRENT ADRIAN, K.E. BETH TOWNSEND
3D epilaplstral, geographic, and body size variation in Echmatemys, a geoemydid turtle from the Uinta Formation, Uinta Basin, Utah, U.S.A.

9. KENT JOHNSON
Social network analysis of human skeletal data: a new bioarchaeological approach to social organization

10. JULIE LAWRENCE, HANNAH O’REGAN and ANDREW KITCHENER
Captive versus wild ape morphology and its significance for biological anthropology

11. MONTE MCCROSSIN and BRENDA R. BENEFIT
Proximal humeral evidence for partitioning of locomotor substrates by four catarrhine species from the middle Miocene of Maboko Island, Kenya.

12. AMANDA MCGROSKY, NEYSA GRIDER-POTTER, and T. NALLEY
A balancing act: the effects of neurocranial variation on the maintenance of head posture in hominoids

13. MICHAEL MICHAYLUK, and PETER HOUDE
New partial Condylarth skeleton from the Bighorn Basin, Wyoming

14. TAYA MISHEVA, KATIE HINDE, and GARY SCHWARTZ
The role of habitat seasonality in the reproductive scheduling of wild baboons
15. REBECCA MOUNTAIN
Assessing differences in cortical and trabecular bone loss in archaeological specimens using peripheral quantitative computed tomography (pQCT)

16. SARA NIEDBALSKI and JEFFERY LONG
Analysis of Mexican American full genome DNA sequences identifies 137 SNPs of unique Native American origin

17. ALEJANDRA ORTIZ
Dental morphological diversity and human population history of early South Americans

18. JONATHAN PAIGE and DEREK MILTIMORE
Testing culture-history as cause of similarities in lithic assemblages: a case study in classic period of Tonto Basin, Central Arizona (A.D. 1200-1400).

19. ALAN ROGERS, RYAN BOHLENDER
Simultaneous estimates of archaic admixture and ancient population sizes

20. JOHN ROWAN, IRENE E. SMAIL, KAYE REED
Learning from the past: late Quaternary climate change and the future of African primate diversity

21. M. KATHERINE SAYRE, DAVID RAICHLEN, EMMA BUNKLEY, DOREEN ODERA, CASSIDY REEVES and IVY PIKE
Objectively measured physical activity among the Pokot agro-pastoralists of Kenya

22. AMANDA SLOTTER
Temporal trends in mandibular symphyseal morphology of Australopithecus afarensis

23. ANDREW SOMERVILLE and MARGARET SCHOENINGER
Analysis of rabbit and hare bones reveals strong correlations between stable isotope ratios and local environmental conditions

24. EMMA THURAU
Sex and age differences in prehensile tail use in mantled howler monkeys (Alouatta palliata)

25. NICOLE TOROSIN, KAELE FISCHER, JUNE ROUND and LESLIE KNAPP
A comparative study of human and howler monkey Toll-Like Receptor 7 under the selective pressure of yellow fever virus.

26. MICHAEL ZACCHEO and LESLIE KNAPP
Variable number tandem repeat variation: exploring the hypervariable drd4 gene in non-human primates and its possible behavioral consequences.
ABSTRACTS

Comparison of adipogenesis enhancing transcription factor binding sites in human and chimpanzee reference genomes.
ALAN ACHENBACH
Department of Anthropology, University of Utah.

In mice, PPAR (peroxisome proliferator-activated receptor) gamma transcription factor binding near and within regulatory regions of the TLE3 gene enhances adipogenesis. Current TFBS (transcription factor binding site) research suggests that average binding site strength should be higher near transcription enhancing regions and the fraction of high binding strength sites within enhancing regions is correlated with transcription levels. TFBS variation within enhancing regions of the TLE3 gene may contribute to increased body fat in humans. If this is true, a difference in average binding site strength and fraction of high strength sites within enhancing regions should be evident between human and chimpanzee reference genomes. The TFBSs likely to be functional based on JASPAR position weight matrices for PPARG::RXRA (retinoid X receptor alpha) were compared using regular expression search tools with the 1000 Genomes Browser and the NCBI Nucleotide search, FASTA display. Quantitatively, differences of average binding site strength and fraction of high strength sites within enhancing regions, between the human and chimpanzee reference genomes, were not statistically significant. Both genomes have higher average binding strength and fraction of high binding strength sites within transcription enhancing regions, confirming present theory. Qualitatively, the genomes differ by the locations of 4 average binding strength sites. The chimpanzee genome has additional sites within 5Kbp of the promoter and within intron 16. The human genome has additional sites within introns 19 and 13. All of these TFBS locations are predicted to enhance adipogenesis. Therefore, the results are inconclusive.

Digital reconstruction and comparative morphometric analysis of the Homo floresiensis os coxa
KAREN L. BAAB¹, MATTHEW C. O’NEILL², ASHLEY S. HAMMOND³, WILLIAM L. JUNGERS⁴
¹Department of Anatomy, Midwestern University, ²Department of Basic Medical Sciences, University of Arizona College of Medicine – Phoenix, ³Department of Anthropology and CASHP, George Washington University, ⁴Association Vahatra & Department of Anatomical Sciences, Stony Brook University

Pelvic remains from the type specimen of Homo floresiensis (LB1/7) may shed light on the evolutionary affinities and locomotor abilities of this species. Here, we present a series of digital reconstructions of a full os coxa and analyze both the preserved anatomy and these reconstructions using 3-D geometric morphometrics. 3D landmark data tailored to the partial left os coxa of LB1, which is missing parts of the iliac crest and pubis, were collected from a sample of modern humans and fossil hominins. Modern humans are differentiated from early australopiths (Australopithecus afarensis, A. africanus) along the first axis of a principal components analysis restricted to the preserved anatomy of LB1. H. floresiensis was approximately equidistant to these two groups along this axis, but was more distinct from two large-bodied early Homo specimens, as well as from the Kebara Neanderthal and A. sediba, which both overlapped the H. sapiens range. This component captured differences in the ischial tuberosity and iliac blade shape. Complete os coxae of A. afarensis (AL 288-1), A. sediba (MH2) and a small-bodied H. sapiens were warped to the shape of LB1 based on the regions of morphological overlap in order to reconstruct the missing portions in LB1. The addition of landmarks from the iliac crest and pubis yielded better separation between modern humans and the fossil sample. The reconstructions based on the australopiths grouped together despite the differences in A. sediba and A. afarensis pelvic shape. There reconstruction based on the human fell closer to the human range.

We acknowledge ARKENAS for access to the fossil specimens.
Rediscovering ancient hominin environments
MELANIE M. BEASLEY
Department of Anthropology, University of California, San Diego, CA

The ecological niche exploited by early hominins is assumed to have played an essential role in
the origins of bipedalism, a distinguishing characteristic of hominins. Reconstructing the
paleoenvironment at early hominin sites is essential for understanding the selective forces that
resulted in such a significant morphological change. Paleoenvironmental reconstructions in East Africa
often rely on surface-collected fossil fauna even though such collections traditionally combine multiple
temporal and geographically dispersed components. Therefore the scale of analysis often generates an
interpretation that early hominin environments were mosaic habitats. However, the term “mosaic”
encompasses a variety of ecosystems varying from closed to open-canopy each of which will be
differentially impacted by seasonal rainfall. This project will reconstruct aridity and rainfall patterns
3.97±0.03 Ma at Allia Bay, Kenya, one of the few sites with material recovered in situ. The overall goal
is to refine the meaning of 'mosaic' paleoenvironment of Australopithecus anamensis with subsequent
comparison to other hominin habitats throughout East Africa. Combining stable carbon and oxygen
isotope data from traditional bulk faunal enamel and high-resolution stable oxygen isotope analysis
from browsers (giraffidae, elephantidae, and deinotheriidae) and grazers (hippopotamidae, suidae and
bovidae) reveals higher and more variable rainfall amounts in the past at Allia Bay. This pattern would
impact the available biomass and other ecological variables during the period Au. anamensis occupied
the site.

The unusual and generically distinct face of the middle Miocene small-bodied ape “Micropithecus”
leakeyorum from Maboko Island, Kenya
BRENDA BENEFIT, MONTE MCCROSSIN, ERICA DAVIS
New Mexico State University

Small-bodied “apes” from the Miocene of Africa are an enigmatic group. Five new cranial
specimens of “Micropithecus” leakeyorum from 15 my deposits at Maboko provide evidence about its
craniofacial morphology and relationships. The maxillary sinus of “Micropithecus” leakeyorum
is anteriorly placed, originating immediately behind the canine root as in Pan and Kalepithecus (KNM-SO
417). Maxillary sinuses of Aegytopithecus, Limnopithecus, and Lomorupithecus extend only to P4/M1
and of other catarrhines less far anteriorly. Postcanine lateral inflation of maxilla KNM-MB 29101
externally resembles Cebus and Lagothrix but no other catarrhine. Other catarrhine postcanine
maxillary bone is either depressed (canine fossa) to varying depths, or is neither inflated nor depressed
as in Pliopithecus, Micropithecus clarki, SimiOlus, and Pliobates. Maximum lateral expansion of the
“Micropithecus” leakeyorum maxillary sinus occurs at the zygomatic root above and lateral to M2 as in
most catarrhines, and unlike the rare anterior position above M1 in Cebus, Cacajao, Chiropotes,
Lomorupithecus, Oreopithecus, some Pongo, and Kenyapithecus (K. wickeri and K. africanus). The
orbital rim of “Micropithecus” leakeyorum is positioned well anterior to the zygomatic root as in Aotus,
Lagothrix, Pliopithecus, Lomorupithecus, Micropithecus clarki, Pliobates, and hylobatids. However, of
these anthropoids only “Micropithecus” leakeyorum and Lagothrix share a convex rather than planar
anterior surface of the zygomatic/maxilla. Facial height below orbitale is significantly taller in
“Micropithecus” leakeyorum (FACH/P3Width=281) than Micropithecus clarki (FACH/P3Width=228).
Only Aotus (FACH/P3Width=182) has a shorter face than M. clarki. Craniofacial and other evidence
indicates that “Micropithecus” leakeyorum is generically distinct from all other catarrhine genera.
Delineating the effects of early life experience on adult immune function in 20th century Portugal
KELLY ELAINE BLEVINS1, CHARLOTTE ROBERTS2, ANA LUÍSA SANTOS3
1School of Human Evolution and Social Change, Arizona State University, USA, 2 Department of
Archaeology, Durham University, UK, 3 Department of Life Sciences, Research Center for Anthropology
and Health (CIAS), University of Coimbra, Portugal.

The developmental origins of health and disease (DOHaD) hypothesis proposes that adult
health outcomes are influenced by events that occur during critical growth and development periods.
Contemporary DOHaD hypothesis research focuses on the implications for chronic disease, such as
diabetes and obesity, but few studies have attempted to examine the impact of early life experiences
on immune function. Bioarchaeologists have an advantage over medical researchers when doing
longitudinal studies, as we can identify events chronicled in bone. This research takes advantage of the
skeleton as an archive of physiological circumstance and tests the hypothesis that skeletal stress
markers correlate to certain developmental windows and that the timing of physiological perturbations
will differentially affect adult immune function. Multiple indicators of stress events were recorded in
skeletons from the Coimbra Identified Skeletal Collection, Portugal in adult individuals who died of
tuberculosis (n=125) and those who died of non-infectious causes (n=125). Using tuberculosis infection
as a proxy for compromised immune function, this study found no significant differences in early life
circumstance between individuals who had compromised immune function (tuberculosis) and those
who did not. This suggests that either skeletal indicators of stress actually reflect an increased ability to
adapt and survive physiological insults (predictive adaptive response) or that the long-term effects of
adverse early life experiences can be eclipsed by the adulthood environment.

This research was partially funded by the Rosemary Cramp Fund, Durham University, UK.

Trends in the use of racial terminology in biological anthropology, 1946 – 2015
ELIZABETH S. CLAUSING, SAMANTHA A. STREULI, AMY L. NON
Department of Anthropology, University of California, San Diego, La Jolla CA.

The discipline of biological anthropology has historically been fraught with problematic
approaches to the study of human race (e.g., looking for racial differences, polygenism, exploiting
minority populations for research). In recent history, biological anthropologists have been engaged in
an ongoing debate over the role of racial and ethnic classification in anthropological research. Here we
contribute to that debate by examining the use of racial terminology in biological anthropology
research in order to determine how concepts of race and ethnicity have been applied by biological
anthropologists over time in the United States. We present a content analysis of the American Journal
of Physical Anthropology, based on a systematic review of a randomly selected set of empirical
research articles. We conducted two searches of this journal in PubMed using MeSH terms related to
Americans of European descent (e.g., white, Caucasian, Euro-American etc., 1946-2015, n=100) and
terms related to Hispanic populations (e.g. Hispanic, Mexican-American, Latino/a, etc., 1954-2015,
n=75). We identified both differences and similarities in the ways that the concepts of race and
ethnicity have been used in biological anthropology to refer to Hispanic and European American
populations. For instance, articles referring to Hispanic populations tended to use the term “ethnicity,”
while articles referring to European American populations tended to use the term “race.” Additionally,
we identified noteworthy diachronic trends in the identification of race and ethnicity, including an
increase in self-identified race through time. Finally, we offer recommendations for ways that biological
anthropologists can engage with concepts of race and ethnicity in a consistent way that promotes
greater equality and avoids promoting racial bias, both in anthropology and in other fields.
Preliminary results of a vocal self-recognition test in northern white-cheeked gibbons (*Nomascus leucogenys*)

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Recognizing the self in a mirror is an important ability often linked to self-awareness. Among anthropoids, humans and great apes have demonstrated self-recognition in the mirror self-recognition test (MSR). In contrast, small Asian apes usually fail or show ambiguous results in the MSR task and only few researchers currently maintain that hylobatids have cognitive abilities comparable to those of great apes. We suggest that past self-recognition tests in the visual modality may have been unsuccessful because discriminating the self from others is more relevant in the auditory domain in the highly vocal hylobatids. We devised a novel auditory self-recognition test to shed more light on hylobatids potential self-awareness and cognitive capacities by testing 10 northern white-cheeked gibbons (*Nomascus leucogenys*) at the Gibbon Conservation Center, CA. We hypothesized that if self-awareness existed, individuals would discriminate their own from a neighbors’ call. We used the close-range “hoo” call, which was recently shown to be individually discriminable, and predicted individuals would gaze towards the speaker when hearing a playback of their own “hoo” call, but would look towards a neighbor’s enclosure upon hearing a neighbor’s “hoo” call. We tracked eye gaze using cardinal directions and tested experimental gaze direction against an average gaze direction taken from baseline behavioral data. Subjects significantly changed their gaze direction in the predicted way (one-way Z-tests: cv 1.645; range 0.02-1.845; α=0.05). Overall, our findings were consistent with vocal self-recognition, which suggests that hylobatids may also be self-aware.

A fine line: zygomaticotemporal sutural complexity in relation to primate diet

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Cranial suture complexity (i.e., degree of interdigitation) varies in relation to the mechanical demands of the skull. These sutures link cranial bones together, allowing movement between parts of the skull during growth. However, they also create areas of potential weakness in the presence of high loads. To combat this, increased interdigitation of the bones can minimize and/or mitigate these loads. The zygomatic arch experiences considerable masticatory loading during feeding and the zygomaticotemporal suture, the single suture on the arch, is assumed to experience similar loads. Byron (2009) noted increased sagittal sutural complexity tracked with mechanically resistant diets in *Cebus* but it is unclear whether this pattern extends to other cranial sutures. If greater loading promotes increased sutural complexity, then sutures in close proximity to the masticatory complex (e.g., zygomaticotemporal suture) are predicted to reflect to differences in diet type. This project tests whether complex zygomaticotemporal sutures are consistently associated with primates eating more mechanically resistant foods as compared to those eating less resistant foods. Data on sutural complexity were collected from microCT scans of cross-sections of zygomatic arches from 7 species of primates (n=38). Primate dietary classification was based on food mechanical properties (FMPs) and dietary mechanical category (i.e., tough, hard, soft) based on total consumption percent. Sutural complexity was measured using fractal analysis. Pairwise comparisons indicate average complexity values were generally greatest in hard object consumers compared to others diets. Additionally, sutural complexity was shown to increase with suture path length.

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Adolescent male aggression toward adult females represents dominance striving, not sexual coercion, in wild chimpanzees
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Recent studies demonstrate that adult male aggression toward females in wild chimpanzees often functions as sexual coercion. Adult males can effectively intimidate adult females because of their larger body size and strength, and coercive mate guarding is a particularly beneficial strategy for males of high rank. Adolescent male chimpanzees are neither fully grown nor high ranking, but they can be similarly aggressive to females. Here, we test between two alternative explanations for such aggression by adolescent males. One hypothesis suggests that, like adults, they use aggression for sexual coercion. Alternatively, adolescent males may use aggression primarily to establish social dominance over females. We analyzed aggression data for 12 adolescent males (aged 9-14 yrs) across 23 years of observation at Kanyawara in Kibale National Park, Uganda. We found that, unlike adult males, adolescent males initiated a greater proportion of aggression against females when they were not sexually swollen, lending support to the social dominance hypothesis. As adolescent males aged, they were more likely to win aggressive interactions against adult females. Early adolescents won less than 25 percent, and late adolescents won more than 75 percent of dyadic contests with females. Early adolescents were more successful in aggressive encounters against nulliparous than parous females, but by the end of adolescence, males dominated most parous females. Our findings suggest that female-directed aggression by adolescent male chimpanzees is a necessary precursor to subsequent status striving in the adult male hierarchy.

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Testing the inhibitory cascade model on supernumerary molars
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Supernumerary molars occur in a low percentage of human and ape individuals. The developmental causes of these additional molars are not well understood. The Inhibitory Cascade Model (ICM) of molar size proportions purports to explain relative molar size in hominoid individuals in relation to developmental order. The ICM predicts that supernumerary molars are present when the forces of activation and inhibition are balanced within an individual during molar development. Phenotypically, this would result in M1-3 that are approximately equal in size. In this study we test the ICM’s prediction that molars are more equal in size in individuals with M4s. utilize a large sample of great ape individual dentitions to test the ICM in individuals with and without supernumerary molars in order to assess the applicability of the model to supernumerary molars. Results support the influence of the ICM on supernumerary molar presence in apes, as individuals with M4 have M2 and M3 that are significantly more equal in size. These findings demonstrate how changes in simple developmental parameters can affect not only molar size proportion, but also the number of teeth that develop.
Biomechanics of chewing and molar emergence in primates
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The relationship between life history and molar emergence age is used to probe the antiquity of the unique human life history profile. Yet, knowledge is lacking about the process that yields variation in molar emergence and why emergence age is a good skeletal proxy for life history. It has been demonstrated in adult primates that molars lie anterior to the adductor muscle resultant (MR) thereby avoiding damage to the temporomandibular joint during chewing. As the skull grows and changes shape, the relative position of molars and cranial musculature changes, suggesting that a shifting masticatory configuration throughout growth may provide a fundamental constraint modulating molar emergence times. We tested the hypothesis that the position and timing of molar emergence are a consequence of the biomechanical configuration of the masticatory system. We used 3D coordinate data from cross-sectional ontogenetic samples of primate skulls (n = 18 species) to quantify the position of emerging molars within a growing masticatory configuration. For all taxa examined, all permanent molars emerged significantly anterior to the MR, and just how far anterior depended on several factors including skull size and gape. The results also indicate that the rate at which space is made available in the jaws during growth is key in determining the timing of molar emergence. Identifying this developmental constraint across taxa that vary in craniofacial configuration and timing of molar emergence suggests that ontogenetic changes in masticatory configuration regulate variation in molar emergence schedules among primates.

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Kin selection meets the grandparents: do step and biological grandparents report differences in investment and emotional closeness with their grandchildren?
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Human children are raised by a variety of caregivers including grandparents. Few studies have assessed potential differences in direct caregiving, financial expenditures and emotional closeness between biological and step-grandparents. Drawing upon kin selection theory, we hypothesized that step-grandparents would provide less care and be less emotionally close to grandchildren than would biological grandparents. A sample of 341 heterosexual U.S. adults 25-35 years of age in a long-term partnership and with a biological child 5 years of age or younger were recruited via Mechanical Turk (MTurk). Subjects provided sociodemographic information and answered questions about the dynamics between their own parent/step-parent and their own youngest biological child (hence, biological/stepgrandparenting dynamics). Main analyses were restricted to within-subject comparisons. Results showed that biological grandmothers provided more direct childcare, financial expenditures and had more emotionally close relationships with grandchildren than did step-grandmothers. However, biological and step-grandfathers exhibited no differences in these same measures. Grandmothers provided more direct care, financial investment and were more emotional close to the referential grandchild than were grandfathers. Stepgrandfathers were more emotionally close and more often played with grandchildren than stepgrandmothers. These findings partly support kin selection theory, at least for grandmother distinctions, but require additional considerations to account for null grandfather results. We discuss the relevance of factors such as competing demands on grandmothers’ investment in biological and step-grandchildren and grandfathering serving in part as mating effort. Sex differences in biological grandparenting also mirror those in parenting. We suggest directions for future research, including on grandfathers, particularly in patrilineal societies.

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Posture during locomotion in *Hylobates lar* and implications for the evolution of human bipedality

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Bipedality is one of the defining characteristics of the hominin lineage. The adaptations of the pelvis and lumbar spine to bipedalism are well understood but how the head and neck adapted to this radical change in locomotor mode requires further investigation. Both the human neck and trunk are uniquely vertical in their orientation. Trunk orthogrady is adapted to bipedal locomotion as it centralizes the trunk’s centers of mass directly above the limbs. Whether or not neck orthogrady is also related to bipedal locomotion remains unknown. Gibbons are the ideal model to experimentally examine the relationship between neck orthogrady and bipedal locomotion as they habitually walk bipedally. We hypothesize that locomotor mode affects axial posture and predict that during bipedal locomotion the neck and trunk will be oriented more vertically, in order to more effectively balance the upper body.

To test this hypothesis, palpable axial landmarks of *H. lar* (n=1), housed at the Osaka University, were marked with non-toxic marker. Brachiation and bipedal locomotor bouts (n=39) were filmed with four synchronized Sony Handycams. Three-dimensional landmarks were digitized in Frame DIAS. Linear mixed models were used to test the postural differences between locomotor modes. Results show that during bipedal locomotion, both the neck and the trunk are oriented more vertically than during brachiation. This study demonstrates the variability in axial movement and posture during different modes of locomotion. Furthermore, it suggests that the adaptations of both neck and trunk orthogrady are important in habitual bipeds and thus, were likely present in early hominins.

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The relationship between sexual anatomy and copulatory behaviors in orthograde and pronograde primates and other mammals – implications for human evolution

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Detailed descriptions of the perineal anatomy of most primates are lacking so that studies of modern human perineal anatomy in the context of general primate evolutionary morphology still require a broader framework. Our dissections of human, non-human primate, and non-primate mammal perinea (human (n=43), dog (n=16), cat (n=3), goat (n=9), pig (n=9), horse (n=3), cotton-top tamarin (n=2), ring-tailed lemur (n=1), potto (n=1), and Verreaux’s sifaka (n=1)) suggest that modern human perineal anatomy likely follows a general primate pattern. Primates with a habitually orthograde locomotor position copulate ventro-ventrally and initial observations suggest that they have different perineal anatomy than primates and non-primate mammals that employ habitually pronograde locomotor position and copulate dorso-ventrally. Specifically, females of orthograde primate species have a relatively shallow vulva with easy access to a ventrally facing, prominent clitoris – easily stimulated during sexual courtship. Conversely, females of pronograde primate and non-primate mammal species possess deep vulvae with subcutaneous constrictor muscles. These restrict access to a dorsally facing, recessed clitoris and vaginal orifice during courtship and the clitoris is only available during copulation. We suggest that adaptation of the pelvis for orthograde locomotor posture during the evolution of bipedalism followed a general pattern of primate perineal anatomy. This pattern of female perineal morphology enables easier access to the clitoris so that pre-copulatory stimulation is possible. This female perineal anatomy possibly set the stage for loss of estrus in women that facilitates the modern male-female pair bond social structure.

19
Strontium isotopes as trackers of philopatry and home range: a case study from Kibale National Park
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Hominid behavioral evolution is difficult to study empirically because so few behaviors leave concrete traces in the fossil record. Mobility patterns, such as philopatric dispersal, home range size, and microhabitat preferences, have direct consequences on primate social behavior; strontium isotope ratios can potentially record these patterns of movement, providing an avenue for empirical behavioral reconstruction. However, correlations between environmental/faunal strontium isotope ratios and mobility patterns have never been tested in a living primate community, so their application to the fossil record remains theoretical. This study uses 172 water and plants samples from Kibale National Park, a rainforest in southwestern Uganda, to create a strontium isotopic map. Then, I used bone and tooth enamel isotope ratios from 97 individuals from 25 species, including chimpanzees, to address the following questions: 1) Do bone strontium isotope ratios predict known provenance data? 2) Can comparing an individual’s tooth enamel (juvenile signature) and bone/local vegetation (adult signature) establish philopatry patterns? 3) Does intra-individual variability correlate with relative home range size? Bone strontium isotope ratios matched known provenance data for all specimens. Differences between tissue types did not significantly differentiate between male and female chimpanzees, potentially due to insufficient dispersal mobility or confounding male mobility within a territory (ex: periphery-to-center movement at maturity). Intra-individual variation accurately placed species in relative home range groups under certain conditions. This study suggests that strontium isotope ratios are highly predictive regarding mobility in space, but less reliable at identifying movement through the lifetime.

Societal variation in prosociality and contingent reciprocity
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Cooperation between non-relatives is widespread in humans, and humans also show striking societal variation in the nature and degree of cooperation. Some have argued that human prosocial behavior is largely founded on evolved psychological adaptations for contingent reciprocity, and this would predict that societal variation in prosociality is due to societal differences in how these adaptations mature in different environments. Here, I explore the development of societal variation in prosocial and reciprocal behavior in three very different populations: rural Fijian children living in small-scale village societies, urban Fijian children, and urban American. Using very simple experimental task in which pairs of children take turns making choices in a sequential cooperative dilemma, I found that reciprocal and prosocial behavior both began to increase in children after about 6-7 years of age. However, reciprocity developed very similarly across societies, while prosociality did not, indicating important differences in the emerging psychological foundations of prosociality and reciprocity. These results suggest that human prosociality doesn’t develop solely through the maturation of cognitive adaptations for reciprocity. They also point to a plausibly important role for culture in motivating our cooperative behavior.
Primate skeletal epigenetics and the evolution of complex traits
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Epigenetic mechanisms, such as DNA methylation, regulate gene transcription and play crucial roles in the expression of diverse phenotypes within and between species. Among nonhuman primates, DNA methylation patterns have been identified in several soft tissues and associated with phylogenetic, behavioral, and disease-related phenotypes. This study attempts to expand on such exploratory research by assessing how genome-wide DNA methylation patterns from hard skeletal tissues vary among primate taxa and relate to aspects of bone morphology. Skeletal tissue DNA methylation patterns were assessed in right distal femur trabecular bone from baboons, (n=28), macaques (n=10), vervets (n=10), chimpanzees (n=4), and marmosets (n=6) using Illumina Infinium MethylationEPIC arrays. Femur morphologies included 29 linear measurements and 55 three-dimensional digitized landmarks. The methylation states of quality controlled and filtered probes (n=15,947) were averaged within each species, and the global changes in methylation between species were calculated using Euclidean distances and used to construct species trees. As hypothesized, these topologies reflect known phylogenetic relationships between taxa. Similar pairwise comparisons also identified species-specific differentially methylated positions – 148 sites in baboons, 75 in macaques, 152 in vervets, 942 in chimpanzees, and 6650 in marmosets. These sites are associated with genes involved in several morphological developmental processes, including skin, muscle, brain, and bone development. Associations of such differentially methylated regions with femoral morphologies provide further insight into species-specific differences. In summary, these data reveal several molecular differences between nonhuman primate taxa and provide possible clues regarding how diverse epigenomes are related to phenotypic variation.

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3D epiplastral, geographic, and body size variation in *Echmatemys*, a geoemydid turtle from the Uinta Formation, Uinta Basin, Utah, U.S.A.
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Numerous fossil turtle specimens from the genus *Echmatemys* have been recovered from the Uinta Formation, Uinta Basin (middle Eocene, 46.2-42 MA). *Echmatemys* is associated with lacustrine environments and can be a reliable paleoecological indicator, providing valuable environmental context for sympatric mammal species from these localities, including primates. Isolated shell elements of Uintan *Echmatemys* specimens (40 neurals and 31 epiplastra) were 3D laser scanned and photographed. Landmark and semilandmark data were digitized along the epiplastral gular sulcus, and analyzed using geometric morphometric techniques. The 3D shape of dorsal and ventral gular scales were significantly different between species (*p* < 0.001), as were 2D dorsal and ventral landmarks (*p* < 0.001). Thus, these species can be reliably differentiated by gular scale shape, using either 2D or 3D techniques, and that geometric morphometrics will be able to improve identification of fragmentary specimens.

ArcGIS revealed overlapping geographic ranges for *E. callopyge* and *E. uintensis*, and an Analysis of Variance found no significant differences in stratigraphic distribution of species within the section. Maximum plastron length was calculated for each specimen. Body size was significantly larger (*p* =
0.012) in specimens from Uinta B than Uinta C, indicating that *Echmatemys* decreased in body size between earlier and later localities. These findings, together with other paleoecological data including other Uintan turtle taxa, suggest that the Uinta Basin became increasingly cool and arid towards the end of the Uintan NALMA, and the large lacustrine water bodies of the early middle Eocene transitioned to smaller riverine environments and marshes.

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**Social network analysis of human skeletal data: a new bioarchaeological approach to social organization**

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Social network analysis has been applied to anthropological data in other subdisciplines of anthropology, but bioarchaeologists have yet to employ social network analytical techniques to human skeletal data. This paper applies social network analysis to phenotypic data from archaeological samples of human skeletal remains from Middle Horizon period (AD 500-1100) Tiwanaku-affiliated colonies in the Moquegua Valley, Peru to investigate family- and ethnic-based aspects of social organization.

Social network visualization and analytical techniques were applied to basicranial and temporal bone shape data from 102 individuals from five sites to assess phenotypic similarity and identify potential clusters of close biological relatives. Results are compared to results of agglomerative hierarchical cluster analysis and multidimensional scaling to evaluate the use of social network techniques with phenotypic data.

Results indicate the study sample formed a network with a dense main component and numerous isolated individuals. Efforts to identify potential family groups using social network analysis were mixed. While there is no clear partition of the network into distinct subgroups representing different extended family networks, there is a cluster of closely related individuals at the core of the network who anchor an interconnected web of less closely related actors. Agglomerative hierarchical clustering produced similar results, but multidimensional scaling was unable to identify subgroups within three-dimensional representation space. Results suggest that social network analysis can scale up kinship analysis to investigate family-based social organization at a regional scale. More broadly, social network visualization and analytical techniques have myriad potential applications within bioarchaeology.

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**Group augmentation explains territorial boundary patrolling by male chimpanzees at Ngogo**

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Chimpanzee (*Pan troglodytes*) territoriality is distinguished by “patrols” in which males move along territory boundaries, often intrude into neighboring territories, and sometimes attack neighbors; attacks can be lethal. Numerical superiority reduces the risks of aggression, but patrols are never risk free and they entail energetic and opportunity costs. This raises questions of whether they pose collective action problems. Collective action can be difficult to achieve because the fitness of “free-riders” can exceed that of cooperators, especially in large groups. We used data on 284 patrols by members of the unusually large Ngogo chimpanzee community, collected over 20 years, to examine
whether variation in short-term benefits and costs explained variation in male participation, as expected if patrolling presents a collective action problem. Some results were consistent with this hypothesis: patrol participation varied positively with male paternity success and rank, and individuals were less likely to patrol when community size was larger. However, participation did not depend on how many maternal relatives males had at the times of patrols and males with no offspring often patrolled. Overall patrolling effort did not decrease as community size increased. In this large community, male reproductive skew is low and many males who patrolled when they had no offspring, reproduced later. We suggest that group augmentation theory explains these results better than collective action theory: males cooperate in territorial defense because this enhances community size, which in turn increases success in competition with other communities and male fitness.

Captive versus wild ape morphology and its significance for biological anthropology
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The effect of captivity on an animal’s biology has immediate repercussions for the welfare of the individual and can impact the conservation and future of entire species. For biological anthropologists, the potential influence of captivity on the morphology of our closest relatives, the African non-human apes, questions a fundament of our discipline, the model of comparative anatomy. Anatomists at the beginning of the twentieth century argued that ‘atypical’ captive animals biased morphological studies, but this assumption has not yet been thoroughly tested. Here, we use geometric morphometrics to capture, analyse and visualise the detailed size and shape differences between the crania and mandibles of wild-shot gorillas (n = 34) and chimpanzees (n = 30), and their captive counterparts (gorilla, n = 13; chimpanzee, n = 20). The preliminary results of our study show that the inclusion of captive-bred animals in a comparative sample can significantly affect the levels of shape variation within species. We pinpoint particular morphological areas that tend to differ in captive animals, i.e. orbital region, anterior portion of the jaws and muscle attachment sites. Nevertheless, the size differences between captive and wild apes were not significant in our sample. We discuss some of the potential reasons for this variation and its importance for biological anthropology. This study fits within a wider framework of mammalian taxa, and therefore also speaks to the more general processes of domestication at the macro-evolutionary scale.

Making sense of the mess: what can detailed analyses of ossuaries reveal?
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Ossuaries are secondary interments of human remains that are the result of the transportation of skeletal material from their original deposition site to a new chamber or burial. As a consequence, bones from different individuals become comingled and/or lost, making their study challenging. Here we present a guide for the best practices to the study of large ossuaries and exemplify the method with the study of a medieval (15th-18th centuries) ossuary recovered from the Church of Santa Maria de la Soledad (Almansa, Spain). We calculated the Minimal Number of Individuals (MNI) and estimated sex, age, and skeletal preservation status from a sample of at least 159 individuals. Our results indicate that the paleodemographic profile corresponds to the pattern expected from a “normal” population, with high mortality during early infancy and old age, and a close 50-50 percent male-female distribution. The high preservation of small skeletal elements and the presence of articulated remains with lime residue, indicates that a significant number of reinterred individuals were still in process of decomposition at the time of their deposition at the ossuary. This fact opens the possibility that the remains were moved.
due to an urgent necessity of space after a High Mortality Event (HME), like the “Battle of Almansa” (1707) or an epidemic episode. Furthermore, while there are several interesting pathological cases within the collection, there is no indication that the individuals died as a consequence of a HME, but that a HME most likely occurred shortly after their primary burial.

Predicting the climatic niche breadth of African catarrhines
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Climate impacts organisms directly through thermoregulation and indirectly through controls on distribution of resources and suitable habitats. Studies of the climatic niche of vertebrates have sought to quantify the climatic tolerance of species and examine its relationship to species’ adaptations and geographic distributions. Climatic niche breadth (CNB) has been implicated in explanations of global biodiversity patterns, yet an understanding of what predicts CNB is lacking, particularly for mammals. Here we quantify the climatic niche position and breadth of African catarrhines by extracting climatic variables from 1,530 georeferenced occurrences representing 40 taxa. Relative to other primate clades, Old World primates vary widely in their geographic distribution and habitat preference, making them a group of interest for understanding ecological flexibility in primates and other mammals.

Using PGLS we test hypothesized relationships between CNB and a set of geographic, physical and behavioral variables. Of our set of predictor variables, latitude and habitat breadth are shown to be the strongest predictors of CNB. Yet it is difficult to determine the direction of cause and effect between these variables, and further work is required to understand the historical factors that affect present-day species ranges. African catarrhines may share a broad fundamental niche but exhibit a realized niche that is constrained by barriers to dispersal, anthropogenic habitat destruction, and past climate change. This work is relevant in light of recent studies on the evolution of the primate climatic niche, and concerns that climatic niche evolution cannot keep pace with the projected rate of climate change.

Evaluating the Limitations of Biological Distance Models of Gene Flow in Ancient Human Populations
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Anthropologists frequently use skeletal trait metrics to identify relationships between archaeological populations and within archaeological sites. Most methods for estimating biological distances model relationships by examining measures of trait mean distances and comparisons of within-group variances. Gene flow is difficult to ascertain using these methods. Studies have generally assumed that increased variances in traits over time stand as indicators of gene flow. However, such changes in variance are contextually driven by the number of groups being compared and the assumptions of the model.

In this study, we calculate relationship matrices (after Relethford and Blangero) to evaluate variance of odontometric traits of the molar occlusal surface. We examine three archaeological groups from the southwestern U.S. and northern Mexico (N=69). Two are from the site of La Playa in Sonora, Mexico, and represent temporally and culturally separate groups of the Early Agricultural period: San Pedro phase (1600-800 B.C.) and Cienega phase (800 B.C.-A.D. 200). Grasshopper, Arizona – a Pueblo III (A.D. 1150-1300) site – is our third group. Based on craniometric studies, we expect the San Pedro phase group to exhibit evidence of gene flow. Though later and farther north, studies of architecture at Grasshopper suggest that multiple groups settled there; we anticipate higher than expected trait variance. Results indicate gene flow contributed to variance in the San Pedro sample, but, surprisingly,
evidence for relative homogeneity at Grasshopper. We evaluate these results against simulated samples, and use these comparisons to explore limitations and directions for improving interpretations of gene flow between archaeological populations.

Proximal humeral evidence for partitioning of locomotor substrates by four catarrhine species from the middle Miocene of Maboko Island, Kenya.
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A unique perspective on cercopithecoid-hominoid differentiation is provided by proximal humeri of four catarrhine species from Maboko Island, Kenya: *Victoriapithecus macinnesi*, “*Micropithecus*” *leakeyorum*, *Mabokopithecus clarki* or *Nyanzapithecus pickfordi*, and *Kenyapithecus africanus*. These species reveal partitioning of locomotor substrates by sympatric monkeys and apes during the African middle Miocene.

Ancestral catarrhine conditions are seen in the slow arboreal quadrupedalism of *Aegyptopithecus*: posteriorly directed humeral head, greater tuberosity projecting proximally to the same level as the humeral head, relatively massive lesser tuberosity, and broad/shallow intertubercular sulcus. Proximal projection of the greater tuberosity above a flattened humeral head suggests acquisition of semi-terrestrial adaptations by the formative cercopithecoid *Victoriapithecus* (5-7 kg) and the large-bodied ape *Kenyapithecus* (28-32 kg). In contrast, significant proximal projection of a spheroidal humeral head above a relatively reduced greater tuberosity in the diminutive ape “*Micropithecus*” *leakeyorum* (3-5 kg) and the primitive oreopithecid *Mabokopithecus* or *Nyanzapithecus* (8-10 kg) indicates that they had evolved enhanced shoulder mobility.

The emergence of more seasonal woodland environments during the middle Miocene resulted in the independent colonization of open-country terrestrial habitats by ancestral cercopithecoids and large-bodied African apes. Although none of the Miocene apes exhibits the medial orientation of the humeral head, strong reduction of the lesser tuberosity, and the narrow/deep intertubercular sulcus of modern species, small- and medium-sized hominoids from Maboko were engaging in more active arboreal climbing than was true of the common ancestor of Old World monkeys and apes, reflective of foraging patterns involving greater consumption of ripe fruits and mature leaves, respectively.

Migration, diet and iron: adaptation under change.
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During the Paleolithic and Mesolithic humans occupied all habitable ecozones in Europe. Beginning 8000 years ago waves of humans from the Middle East brought a new economy, dramatically shifting the food intake from a high iron hunting and gathering diet based on game and shellfish to a lower-iron diet based on grains and milk, resulting in increased indications of anemia. Physiological studies have shown that available iron is needed for thermoregulation in temperatures 16 degrees Celsius or colder. We recently demonstrated that during the Neolithic in Europe the C282Y mutation, responsible for increased iron retention and most cases of hemochromatosis, has a negative relationship with chilly mean of mean temperatures.

In Africa a different mutation is responsible for excess iron retention. The ferroportin mutation Fpn Q248H of the SLC40A1 gene appears to have been carried along with migrating populations during the Bantu Expansion of the last 3000 years. They too were moving into new chillier environments with a horticultural based diet.

Similar to the C282Y mutation of Europe, we find a close negative relationship of the Fpn Q248H frequencies with mean mid-winter temperatures in sub-Saharan African populations. We infer
that selection is also responsible for this distribution and we here present another example of genetic adaptation as people move into chilly environments while practicing a poor iron diet.

A balancing act: the effects of neurocranial variation on the maintenance of head posture in hominoids
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Efficient maintenance of head stability is vital to all mammals as the head houses vestibular and visual organs. Cervical vertebrae and their associated musculature are critical for head balance, particularly during locomotion. Vertebral morphology has thus been used to infer postural patterns in the primate fossil record; however, these skeletal elements are adapted to functions beyond those directly related to posture alone. Within the hominin lineage, the size and shape of the face and neurocranium, which are supported by cervical vertebrae and musculature, have undergone major morphological changes. Notably, the brain experienced not only an increase in overall size but also an expansion of the frontal, parietal, and cerebellar regions. These changes likely affected the way neurocranial mass is distributed around the head’s center, thus affecting the manner in which head balance is maintained. We hypothesized that cervical vertebral morphology is adapted to maintain efficient balance of the head such that the shape of cervical vertebrae will change as neurocranial shape changes. Specifically, we predict that a more anterior center of mass (COM) will result in longer, more inferiorly angled spinous processes in order to increase the moment arms of the nuchal musculature. Similarly, we predict that a wider neurocranium will be associated with longer transverse processes in order to increase the mechanical advantage of lateral flexors of the neck.

To test this, we collected cervical morphological data from skeletal collections, calculated neurocranial COM, and quantified brain shape by analyzing the location of COM relative to major cranial landmarks across 9 extant and fossil hominoid taxa. The extent to which neurocranial morphology can predict cervical morphology was assessed using phylogenetic generalized least squares regressions. We found that more anterior COM is associated with longer spinous processes and a wider neurocranium is associated with longer transverse processes. These results suggest that shifts in neurocranial morphology observed in the fossil record are accompanied by concomitant changes in cervical morphology, emphasizing that both neurocranial shape and postural pattern should be considered when making adaptive inferences about vertebral morphology in fossil taxa.

New partial Condylarth skeleton from the Bighorn Basin, Wyoming
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A new phenacodont condylarth skeleton from Clarkforkian deposits of the Willwood Formation, Bighorn Basin, north central Wyoming is being recovered by acid etching of a calcareous nodule. Skeletal elements include a near complete cranium with P3-M1 in the left maxilla, an isolated canine, left and right femora, proximal humerus, distal tibia, several vertebrae, and still more to be uncovered. Condylarthra is a diverse and probably polyphyletic order of ancient mammals whose relationships to modern mammals is uncertain.

The Bighorn Basin preserves an amazingly complete sequence of strata during a time of dramatic climate change known as the Paleocene-Eocene Thermal Maximum (PETM). One of the most intense periods of warming during life’s history on earth, this event is well documented by a C isotope excursion in the strata. More data from small mammals, including condylarths, during this dynamic
The role of habitat seasonality in the reproductive scheduling of wild baboons
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Reproductive scheduling for female primates is influenced by numerous ecological and social factors. The interbirth interval (IBI) reflects maternal recovery during the transition from one reproductive effort to the next. As such, it brings into sharp contrast the life history tradeoffs between maternal condition and reproduction. Modern humans are characterized by a short average IBI, though the origins of this trait are unclear. A comparative approach can help us to elucidate which socioecological factors structure intra-generic variation in IBI. Previous studies have shown that in wild-living baboons, groups’ mean IBI has a nonlinear relationship with mean annual temperature and a positive correlation to annual primary productivity. Here we examined whether rainfall seasonality, used as a proxy of within-year variability in productivity, is related to mean IBI across nine yellow (Papio cynocephalus), chacma (Papio ursinus), and olive (Papio anubis) baboon populations from across a range of habitats (gallery forest, grassland savanna, and swampland). We also examined whether the presence of seasonal birth peaks influences mean IBI. We used a general linear model on data collated from the literature and found positive but non-significant relationships between mean IBI and both yearly rainfall variance and birth seasonality. The correlation between rainfall variance and birth seasonality was very low. This preliminary study suggests that rainfall seasonality and birth seasonality play a weak role in shaping IBI in Papio. Nevertheless, baboons’ long reproductive cycles and diverse ecology make them a good model for testing hypotheses about how socioecological factors affect reproductive scheduling in hominins.

Assessing differences in cortical and trabecular bone loss in archaeological specimens using peripheral quantitative computed tomography (pQCT)
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Osteoporosis is a growing health concern with an estimated 54 million people currently affected in the United States. Despite the identification of multiple risk factors, it remains poorly understood, prompting research into the natural history of the disease. Archaeological studies, however, have produced conflicting results, reporting varying bone mineral density (BMD) patterns and fracture rates in past populations. While physical activity, diet, and reproductive factors may explain some differences, these studies lack methodological consistency, and typically do not consider differences in cortical and trabecular bone. Cortical and trabecular bone are differentially affected by environmental variables, producing dissimilar rates of BMD loss, thus measurements of cortical or trabecular bone alone and total BMD are unlikely to produce comparable results. Peripheral quantitative computed tomography (pQCT) potentially resolves this issue by separately calculating cortical and trabecular BMD, but remains underutilized in bioarchaeology. In this study, we evaluated the effectiveness of pQCT in measuring BMD of the radius and femur in an archaeological sample of 30 individuals from 13th c. Arizona, and tested the hypothesis that patterns of BMD loss differ significantly between cortical and trabecular bone. pQCT successfully measured BMD, and distinct patterns of cortical and trabecular BMD loss were observed, with significant trabecular bone loss in male radii and femora, and significant cortical and trabecular bone loss in the female femora after young adulthood. These results indicate potential contributing factors to the disparate results seen in previous
archaeological studies, and demonstrate the importance of evaluating cortical and trabecular BMD separately.

Analysis of Mexican American full genome DNA sequences identifies 137 SNPs of unique Native American origin
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The goal of this study was to discover genetic variants that are common in Native Americans but absent in other continental populations. Such variants will shed light on the evolutionary history of Native Americans and they may provide insight into distinctive patterns in Native American health. To achieve our goal, we queried the Thousand Genomes Project (TGP) dataset for single nucleotide polymorphism (SNPs). This project provides whole genome DNA sequences for N=2,577 individuals that belong to 26 populations. The DNA sequences were produced using next-generation methods with 50X coverage. Although TGP sample does not include un-admixed Native Americans, many Native American genomes are represented in the TGP Mexican American sample (N=69). Roughly 50% of Mexican American ancestors were Native American. We labeled Native American Specific alleles as those with a frequency above 0.15 in Mexican Americans and below 0.01 in all other non-American populations. The 0.15 threshold implies a frequency above 0.30 in Native Americans and implies that 50% of Native Americans would carry the allele. We found 137 SNPs that met our criterion. This is enigmatically low. Elsewhere, we found 25,209 SNPs specific to indigenous Africans and 2,253 specific to non-Africans. 137 SNPs is far fewer than predictions from coalescent simulations that accurately predict the observations in all other global regions. Furthermore, none of the American alleles identified suggest any functional link to Native American disease disparity. These findings are noteworthy in that they challenge commonly cited predictions for the health and genetic structure of Native American people.

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Dental morphological diversity and human population history of early South Americans
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Human dental morphology has provided important information on the origins and dispersals of the first Americans. Most of this work has focused on North America, whereas less research has been devoted to Central and South America. This study examines the dentition of 476 individuals from eight pre-Hispanic South American populations, placing them in a global context. Twenty-three dental features were collected using the ASU system, and intra- and inter-regional comparisons were assessed using the Mean Measure of Divergence and Mahalanobis distances. Affinities among groups were visualized using a Principal Component Analysis.

All samples possess high frequencies of UM1 enamel extension and LM1 deflecting wrinkle and low frequencies of UM1 cusp 5 and LM2 Y-groove pattern. Results indicate that Chile, Venezuela and Peru (North and Central Coast) are dentally similar and follow the Sinodont dental pattern. The Apurimac sample is the most divergent of the groups examined, showing the closest affinities with Sundadonts. No clear pattern was found for Bolivia and Peru (Amazonas and Cuzco), as most of their trait frequencies fall within the range of overlap between Sinodons and Sundadonts. The first two components explain 35.4% and 27.9% of the variance, respectively, and show a clear separation between samples from low and high altitude regions. The greatest phenetic distance was found between two Peruvian populations: Apurimac and Peru-North Coast, suggesting that regardless of geographic distance, the observed pattern of dental variation may be the result of different rates of gene flow and genetic drift operating in the lowlands and highlands.

Withdrawn
Testing culture-history as cause of similarities in lithic assemblages: a case study in classic period of Tonto Basin, Central Arizona (A.D. 1200-1400).

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Archaeologists increasingly use variation in flake attributes to reconstruct cultural interactions and migrations of human populations across the Pleistocene. One key assumption in these studies is that culture-history (how your cultural ancestors made tools) should better predict technological variation than either functional pressures or mechanical constraints. This assumption, however, remains untested. It cannot be directly tested within the Pleistocene, as assemblages are often coarsely dated and lack independent lines of evidence for culture-history. The fine grained chronologies and rich records of the Late Holocene are likely more useful in assessing whether different flake attributes used to infer common history are likely to retain historical information across generations. We compare variation in classic period (A.D. 1200-1400) flakes (n=470) from five site clusters across the Tonto Basin of Central Arizona to 1) the known culture-history of that area based on architectural and ceramic variation and 2) to variation in outgroups (experimental and archaeological assemblages). Attribute data (e.g. platform dimensions, dorsal scar orientation) were statistically compared using χ², Kolmogorov Smirnov, and Mantel tests. Results show that some flake attributes cannot be used to diagnose cultural interaction as variation is heavily constrained by fracture mechanics. Other attributes may vary more freely and their similarities are predicted at some scales by geographic distance and culture history. Comparing variation in late Holocene assemblages to known culture-historical relationships, and to variation in independent outgroups is a new and promising strategy for quantifying the usefulness of lithics for historical reconstruction.

Patterns of strength and shape in the long bones upper limb

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The present study investigates patterns of correlations among measures of strength (torsional section modulus standardized for bone length and estimated body mass) and shape (here taken as the index of maximum to minimum external diameter) in the midshaft humerus, radius, and ulna. Initial expectations include moderate to high correlations between the strengths of all upper limb bones, no strong correlations between measures of strength and shape, and a strong relationships between the shapes of the radial and ulnar midshafts. The sample consists of 279 modern and fossil humans (sexes pooled). Torsional second moments of area were predicted from external maximum and minimum diameters and transformed into section moduli by division by half of the maximum diameter. Body masses were estimated from femoral head diameter. The results show moderate correlations between all measures of strength (0.61 ≤ r ≤ 0.64) but weak correlations among shape indices, even for the radius and ulna (r = 0.36). Correlations between indices of shape and strength were also universally low; the strongest (r = -0.26) was between ulnar shape and strength. A principle components analysis (on correlations) for these data underscores the general pattern of independent variation, with the first component (mainly capturing generalized strength) explaining 38.5% of the variance and slow decay of variance explained by later components. Comparisons among groups subdivided by sex show that the highly significant differences occur in all of the variables but 70-80% of the variance usually occurs within samples.
Do children share with someone who transgresses against a third-party to the benefit of the child?
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Previous work shows that children prefer prosocial individuals to harmful individuals. Children help helpful adults over harmful adults and even help accidentally harmful adults over adults who intend, but fail, to harm. In these experiments, children observed an interaction between two adults, an interaction in which the child had no stake. The following experiment adds variable costs and benefits for the child and examines whether children (3-7 years old) share with someone whose transgression against a third-party benefits them (i.e. the child). In this experiment, an experimenter divides glow stars between the subject and a third-party (an anonymous child). The divide is either to the subject’s advantage, the subject’s disadvantage, or equal. The subject is then given a new set of glow stars and allowed to share them with the experimenter. Children shared with the experimenter in the equal condition and the advantageous condition (when the transgression is against a third-party), however they gave significantly fewer stars in the disadvantageous condition (when the child received less stars than the third-party). Children also shared more stars with age. This suggests that children are sensitive to receiving relatively fewer rewards than others but that their preference for prosocial individuals may diminish when the child’s own interests are factored in.

A grassy corridor for pastoralist movement in the late Holocene of southeastern Africa
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The paleoenvironmental conditions surrounding the origins of pastoralism and the movement of herders from eastern to southern Africa sometime between ~ 4,000 to 2,000 ybp have been much debated. We lack, however, detailed paleoenvironmental data from sites sampling the hunter-to-herder transition in southeastern Africa, the likely corridor from eastern to southern Africa for early pastoralists. One site in the under-sampled area of eastern Zambia, Makwe Rockshelter, has two aggregates of archaeological horizons representing a foraging society in the mid-Holocene (~ 5,700-5,000 ybp) and a late Holocene pastoralist society with both wild game and domestic livestock (~1,600-800 ybp). Makwe Rockshelter offers a rare opportunity to investigate how climatic and environmental conditions differ between foraging and pastoral intervals at the same site. Based on stable carbon ($\delta^{13}C$) and oxygen ($\delta^{18}O$) isotopes of ungulate enamel (n=107), the shift from mid-Holocene to late Holocene paleoenvironments was characterized by an increase in C$_4$ vegetation and aridity. These results are supported by paleoenvironmental records from Lake Malawi that show that C$_4$ vegetation peaked after ~ 2,000 ybp and was coincident with the onset of cooler, more arid climates. This combined paleoenvironmental record has implications for the spread of pastoralism across southeastern Africa between ~ 4,000-2,000 ybp and potential 'animal disease barriers' these early herders may have faced.

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Simultaneous estimates of archaic admixture and ancient population sizes
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To estimate archaic admixture, one must control for the sizes and separation times of ancient populations. We describe a new method that provides simultaneous estimates of these parameters in complex models of population history. Preliminary results indicate that (1) throughout Eurasia, the level of Neanderthal admixture is uniform (about 2%) and Denisovan admixture is near zero; (2) contrary to published results, there is no evidence of excess Neanderthal DNA in East Asia; (3) the
situation is different in Melanesia, which exhibits higher levels of admixture from both archaic populations, (4) the population ancestral to modern humans numbered about 18,000 as did that ancestral to moderns and archaics; and (5) the population ancestral to Neanderthals and Denisovans may have numbered only a few dozen individuals.

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Learning from the past: late Quaternary climate change and the future of African primate diversity
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Conservation scientists are increasingly concerned about the impact of anthropogenic climate change on the world’s large mammal diversity and much effort has been placed into projecting how climate change will alter mammal communities. Such projections, however, are hampered by the fact that they are based on data that is of limited temporal scope and magnitude (e.g., variations in El Niño-Southern Oscillation) compared to estimates of climate change over the next century. Virtually all attempts to project mammalian responses to climate change overlook the fact that this natural experiment occurred in the recent past, during the glacial-interglacial cycles of the late Quaternary. For example, the terminus of the last glacial period 12,000–11,000 years ago was characterized by abrupt warming of several degrees over a few decades’ time, which is similar to the Intergovernmental Panel on Climate Change’s trajectories for the twenty-first century. Here we use a large dataset of African primate communities (n=5,309) to investigate how glacial-interglacial climate change impacts the patterning of species and functional richness across communities today. We find that the magnitude of precipitation change is positively related to functional richness (r²=0.27, p <0.001) and negatively related to species richness (r²=0.04, p <0.001), while temperature change is positively related to species richness (r²=0.05, p <0.001) and negatively related to functional richness (r²=0.31, p <0.001). Our findings suggest a complex response of primate communities to future anthropogenic climate change depending on the relative influence of future precipitation versus temperature change across Africa.

Attention to social grooming among immature East African chimpanzees (Pan troglodytes schweinfurthii) of the Kanyawara community at Kibale National Park
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Recent developmental studies of chimpanzees (Pan troglodytes schweinfurthii) argue that sex differences in adult sociality may be rooted in mothers adjusting their social strategies when they have sons versus daughters. Underlying differences in attention to and modeling of social interactions could exacerbate differential social exposure to encourage diverging social strategies. In this case immatures’ attention to social interactions should reflect adult social patterns. As adult males are more gregarious and groom peers more often than females, young males should spend more time watching grooming bouts between neighbors and be more likely than females to begin grooming immediately following exposure. To test this, we video-recorded immature chimpanzees at Kanyawara (n=24) in Kibale National Park, Uganda, for two minutes immediately at the start of a grooming bout between their nearest neighbors. We then scored the amount of time that focals spent watching (TSW) their neighbors grooming and whether or not the focal groomed a social partner after watching their neighbor. There was was no sex difference in TSW (diff=1.32, p=0.39). Males were more likely to groom immediately following exposure (logistic regression, Intercept=-3.39, p<0.01; βsex=4.09, p=0.03) and likelihood of grooming increased with age (βage=0.87, p<0.01). Sex also interacted with TSW such that males that watched longer were even more likely to groom (βsex*tsw=0.08, p=0.03). Thus males seemed
to be more sensitive to social exposure than females, supporting the conclusion that developing sex
differences in chimpanzee behavior may be shaped not only by differential social exposure but also
underlying difference in attention.

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Objectively measured physical activity among the Pokot agro-pastoralists of Kenya
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Abstract: Levels and patterns of physical activity impact individual health, fitness, and longevity.
Individuals living in industrialized societies are often characterized as more sedentary than those who
live in smaller scale societies, and this inactivity is generally linked with increased incidence of chronic
disease. However, less empirical data exists regarding levels and patterns of physical activity (PA)
among smaller scale societies. The goal of this study is to characterize levels of MVPA (moderate-to-
vigorous physical activity) among the Pokot agro-pastoralists of rural Kenya. MVPA was measured in 45
participants ranging in age from 14 to 78 using Actigraph wrist-worn accelerometers. Wear-time
spanned 24 hours to 72 hours, with a modal wear time of 48 hours. Average daily MVPA was 178.63
minutes (±82.15 minutes) for all participants. MVPA in men (n=22) was 210.44 minutes (±63.52
minutes), and MVPA for women (n=23) was 148.20 minutes (±87.56 minutes), though the difference
between men and women was not significant (p=0.07). These values far exceed US governmental
guidelines of 150 minutes of MVPA per week. The Pokot show a significant (p=0.001) age-related
decline in MVPA across the lifespan, with adolescents displaying the highest levels of MVPA for both
men and women. Levels of PA among the Pokot will be discussed in a comparative context with PA
levels recorded for societies who engage in other subsistence strategies, including foragers, other
pastoralists, and individuals living in industrialized societies. Implications for the intersection between
activity levels, subsistence strategies, and health will also be discussed.

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Temporal trends in mandibular symphyseal morphology of *Australopithecus afarensis*
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As a species, *Australopithecus afarensis* is represented by a remarkably large fossil collection. In
particular, there are dozens of mandibles attributed to the species that cover the temporal breadth of
*A. afarensis*, providing a window into the morphological changes that the species experienced through
time. With hundreds of individuals and a geologic span of almost a million years, *A. afarensis* provides a
unique opportunity among early human ancestors to explore both variation and temporal changes
within itself and compared to extant apes and humans. There are temporal changes in the mandibular
symphyseal morphology of *A. afarensis*, particularly in regards to the angle of inclination of the
symphysis. However, variation in the symphyseal inclination of *A. afarensis* falls within the range of
variation seen in humans and other great ape species. Although diet does not appear to play a
significant role, the trend towards a more vertically-oriented symphysis could be a consequence of a
variety of other morphological changes in the mandible and dentition. In the absence of changes in
post-canine tooth size, reduction of mesiodistal length of lower canines and P3 combined with an
increase of mandibular corpus size may reduce the prognathism in the mandibular symphysis. Timing of
changes in symphyseal inclination mirror changes in the anterior dentition of *A. afarensis*. 
Analysis of rabbit and hare bones reveals strong correlations between stable isotope ratios and local environmental conditions
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This study investigates the use of stable isotope analysis (δ¹³Capatite, δ¹⁸Oapatite, δ¹³Ccollagen and δ¹⁵Ncollagen) of leporid (rabbit and hare) bones to reconstruct past environmental landscapes. Leporids are among the most frequently found mammals in pre-Hispanic archaeological sites of North America and at many early hominin sites. The relatively small home ranges and short lifespans of leporids make them an ideal species to serve as proxies for local environmental and climatological conditions. Here we present the preliminary results of stable isotope analysis of 145 modern specimens representing multiple environmental zones from across the United States and Mexico, and 348 specimens from four New World archaeological sites (Teotihuacan, La Quemada, La Ferrería, and Pueblo Grande). Strong correlations between environmental/climatological parameters (i.e., mean annual precipitation, temperature, grass coverage, and ecosystem type) and bone isotope values within the modern sample indicate the utility of using leporid bones in environmental research. These baseline data are used to interpret results from the archaeological sample. Our results demonstrate that isotope ratios of leporid bones faithfully predict environmental types and indicate their usefulness for studies seeking to reconstruct environmental conditions of ancient human settlements and early hominin sites.

Migration patterns and evolutionary history of the Duffy null mutation in African populations inferred from human genomic data
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The Duffy negative allele mutation is close to fixation in many sub-Saharan African populations; likely due to positive selection for resistance to malaria, specifically to combat Plasmodium vivax or a related Plasmodium species. In southern Africa, however, the Duffy negative allele is at a much lower frequency. I propose that the low frequency in southern African KhoeSan populations is due to recent gene flow from western and eastern African populations. I analyzed data from 84 South African KhoeSan individuals for average ancestry, local ancestry and allele frequency at the Duffy locus. The Duffy null allele was determined to be at a frequency of 0.20 in our sample and is significantly associated with overall admixture from Bantu-speaking populations. Using exome and single nucleotide polymorphism (SNP) array data from KhoeSan and a globally diverse dataset of individuals, I constructed a phylogenetic network of the Duffy locus. However, there is little to no linkage disequilibrium within the DARC region. Subsequently, the phylogenetic network showed a high level of reticulation. All of the Duffy null KhoeSan haplotypes were identical to the northern or central African Duffy null haplotypes in the phylogenetic network. We argue that KhoeSan populations likely did not carry the Duffy null mutation and its current presence is due to gene flow of the Duffy null mutation into these populations by recent (<2,000y) migration events.

Sex and age differences in prehensile tail use in mantled howler monkeys (Alouatta palliata)
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The prehensile tail is a trait found in several Platyrrhine families. It is adaptive for the arboreal environments of the Neotropics and used across various state behaviors by New World monkeys including the mantled howler monkey (Alouatta palliata). Studying how sex and age class influences
prehensile tail use allows for a more nuanced understanding of how individual differences impact behavior in Atelidae primates. To examine the effect of sex and age on prehensile tail use in mantled howler monkeys, we collected 26 hours of focal data on juvenile and adult howler monkeys of both sexes at the La Suerte Biological Field Station in Costa Rica in July 2016. Focal animals were classified as juvenile or adult, male or female and individuals were followed for 15 minutes each with instantaneous point samples taken at 30 second intervals on state behavior and tail position. We found that juveniles demonstrated a greater proportion of tail mass bearing behaviors than adults (19.9% vs 6.2% of total tail behaviors), while adults displayed a greater proportion of tail body touching behaviors than juveniles (18.8% vs 2.4%). We also found that females used tail mass bearing behaviors in greater proportion than males (9.4% vs 5%). Adults rested more than juveniles and used tail body touch while resting, while juveniles and females traveled more than adult males and used tail mass bearing while traveling and foraging. Our findings inform how individual differences impact tail use and behavior in the mantled howler monkey.

A comparative study of human and howler monkey Toll-Like Receptor 7 under the selective pressure of yellow fever virus.

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Human and non-human primates (NHPs) share many genetic similarities, particularly loci coding for immune responses. We looked at genetic changes in immune genes using a novel comparative approach that focuses on humans and NHPs sharing an environment and pathogenic exposure. Our comparative model was humans and howler monkeys (Alouatta palliata) in Veracruz, Mexico. We studied genetic polymorphism in TLR7, a highly conserved innate immune gene, under the pathogenic pressure of the Yellow Fever Virus (YFV). Research has shown that howler monkeys are much more sensitive to YFV than humans. This may reflect differential abilities to respond to immune challenge. Microbiome composition has also been linked to disease susceptibility; therefore we also examined the microbiomes of humans and howler monkeys. We hypothesized that 1) regional pathogenic selection pressure on TLR7 has led to DNA sequence differences in humans and howler monkeys and 2) microbiome composition is associated with TLR7 genotypes. We collected fecal samples from howler monkeys in three forest fragments surrounding Veracruz, Mexico and from humans in two nearby villages. Sequence analysis revealed that the coding region of TLR7 has functional nucleotide differences when species are compared. Further analysis is needed to understand whether microbiome composition differences between the two species, beyond those due to phylogeny, are responsible for YFV susceptibility. In the future, we aim to compare human and howler monkey TLR7 sequences and microbiomes to those living in regions with recent YFV outbreaks and in regions that are not threatened by this pathogen.

The effects of high speed and weighted walking on head pitch and knee forces

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Previous research suggests that humans have derived skeletal adaptations to aid endurance terrestrial locomotion. Two adaptations, enlarged hindlimb joint surfaces and expanded posterior semicircular canals, have been used to support the hypothesis that fossil hominins engaged in endurance running behaviors. Large joints dissipate high impact forces that may travel up the limb during running. These same impact forces likely affect head pitch which enlarged semi-circular canals may accommodate. However, human endurance locomotion encompasses a range of behaviors including high-speed walking and load carrying that may produce forces similar to running. Here, we
test the hypothesis that these understudied behaviors lead to loads and kinematics similar to those experienced during running by examining knee forces and head pitch during high-speed, weighted walking. Subjects (n=5) were filmed using a high-speed motion capture system and wore an accelerometer on their distal femur while walking at two speeds (Slow=1.2 m/s, Fast=2.2 m/s), carrying three different loads (unweighted [U], Light [L]=15% of bodyweight, Heavy [H]=30% of bodyweight). Participants also completed one unweighted running (2.7 m/s) trial. A linear mixed effects model with Bonferroni adjusted post hoc tests found no differences in rates of head pitch between running and fast walking trials (U $p=0.235$, L $p=1.000$, H $p=1.000$). The estimated vertical force at the knee was also similar between fast walking and running (U $p=1.000$, L $p=0.587$, H $p=1.000$). Thus, forces thought to produce running-specific adaptations appear within the range of human walking behaviors.

The landscape of genomic divergence across the macaque radiation

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Speciation is central to evolutionary biology as it is the major force shaping biodiversity. Recent technological and methodological advances have made genome-wide studies of speciation and diversification possible in a variety of taxa. In this study, we examined the landscape of genomic divergence across the macaque adaptive radiation. We sequenced and assembled the exomes of 70 captive macaques from eight species. After filtering, we analyzed a final set of approximately 40 million sites callable in all individuals. Using these data, we calculated measures of diversity and divergence in sliding windows across the genome. Overall, we found that patterns of divergence were very similar among comparisons: divergence consisted of a heterogeneous landscape with many small, local peaks across the genome. However, as evolutionary distance increased, divergence increased across the entire genome – a pattern consistent with genomic divergence primarily being driven by genetic drift, rather than selection. Finally, we observed greater divergence on the X chromosome than autosomes when considering only variant sites, but the opposite pattern when considering all sites. We argue that these results are best explained by increased efficacy of selection on the X chromosome because of its hemizygosity in males. This research was supported by the NSF (BCS-1455818).

Variable Number Tandem Repeat Variation: exploring the hypervariable DRD4 gene in non-human primates and its possible behavioral consequences.

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In primates, dopamine receptors in many mid-brain neurons are synthesized by a variable number tandem repeat region of the DRD4 gene. Each repeat is 48 bp long and the number of repeats varies both within and between species. For example, in humans between 2 and 11 repeats occur, whereas for vervet monkeys (Chlorocebus pygerythrus) there are either 5 or 6 repeats. DRD4 receptors are inhibitory and along with input from nearby neurons equipped with excitatory receptors (DRD1 & DRD5), motivational values are encoded. In humans, the 7 repeat allele produces a receptor with smaller inhibitory effect than the more common 4 repeat and is associated with a long list of behavioral propensities, from high time preference to addictions. For non-human primates, there is an association between repeat number and important risk/reward decision tendencies. Using both DRD4 published sequences and DNA extracted from wild and captive non-human primates, this study will explore intra and interspecies patterns of DRD4 variation not only as to the number of repeats, but also as to SNP’s within the repeat regions; will formulate a hypothesis of the evolutionary history of DRD4; and will consider how and why different alleles of DRD4 influence primate behavior.