Program of the Seventy-Fourth Annual Meeting of the American Association of Physical Anthropologists

to be held at
The Hilton Milwaukee City Center Hotel
Milwaukee, Wisconsin
April 6 to April 9, 2005

AAPA Scientific Program Committee:

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Message from the Program Committee Chair

The 2005 AAPA meeting, our seventy-fourth annual meeting, will be held at the Hilton Milwaukee City Center Hotel in Milwaukee, Wisconsin. There will be 651 podium and poster presentations in 36 sessions, with a total of almost 1,250 authors participating. The program includes eight podium symposia and four poster symposia on a variety of topics: lorises and galgos, dental anthropology, sexual dimorphism, 75 years of the AAPA, adaptability of Mexican populations, *Callimico*, burned human bones, Southwestern US bioarchaeology, the metabolic syndrome, and human genetic variation. The program also includes the Third Annual Wiley-Liss Symposium; this year's topic is the human – non-human primate interface, and includes talks by a number of distinguished colleagues from across the globe.

As in past years, this year's meetings reflect the international nature of our meetings. Roughly 21 percent of the senior authors live outside the United States, representing 22 nations. The largest representation is from the United Kingdom (31 senior authors), Canada (25), Japan (12), Germany (10), Austria (8), Mexico (7), Spain (7) and Australia (5). Our meeting also serves as an important avenue for presentation of student research; about 36 percent of all first authors are students.

This is the fourth year that we have used an online registration system for payment of registration fees and submission of abstracts. The entire meeting volume is once again available at the AAPA web site: http://www.physanth.org.

As in the past, we will meet in conjunction with a number of affiliated groups including the American Association of Anthropological Genetics, the American Dermatoglyphics Association, the Dental Anthropology Association, the Human Biology Association (Wednesday and Thursday, April 6 – 7), the Paleoanthropology Society (Tuesday and Wednesday, April 5 – 6), the Paleopathology Association (Tuesday and Wednesday, April 5 – 6), and the Primate Biology and Behavior Interest Group.

The following pages provide a map of the Hilton City Center Milwaukee; a summary table of conference events; a daily conference schedule, including meetings of affiliated associations, editorial boards, workshops, and various business meetings; a detailed listing of AAPA poster and podium sessions; the abstracts of the presentations; and an index of the authors showing the session numbers of their presentations.

AAPA activities commence on Wednesday evening, April 6, with a panel discussion organized by our Career Development Committee. The discussion is titled "Give me a job, any job! ... Or, how to read between the lines in job ads," with an introduction by Marilyn London, and panelists Lorena Madrigal (University of South Florida), Kaye Reed (Institute of Human Origins, Arizona State University), and Mark Teaford (Johns Hopkins University) participating. This event will be followed by our annual reception. Poster and podium sessions begin Thursday morning and continue through Saturday afternoon.

The plenary session, held on Thursday evening, is an event entitled " 'Bones' of the Academic Ancestors." In honor of the 75th Anniversary of the founding of the AAPA, a panel of physical anthropologists will present eight "osteobiographies." See if you can identify all eight "academic ancestors." The student and regular member with the most correct answers will win a refund of their meetings registration fee (ties to be settled by a drawing at the Business Meeting), so

you won't want to miss any of the plenary session. Our annual luncheon on Friday features Bob Martin, Vice President of Academic Affairs and Curator in Biological Anthropology at The Field Museum, speaking on "The Evolution of Human Reproduction." Our annual business meeting is on Friday evening. On Saturday evening, we will have our Student Awards Reception.

The AAPA Program, Local Arrangements, and Executive Committees cordially invite you to our seventy-fourth annual meeting. We look forward to seeing you in Milwaukee.

Lyle W. Konigsberg

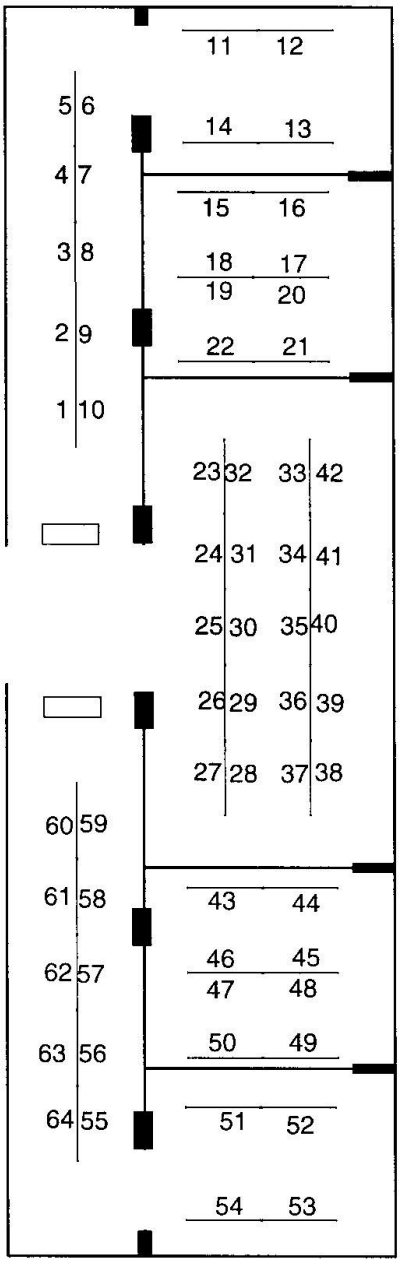
AAPA Vice President and
Program Committee Chair

Contents

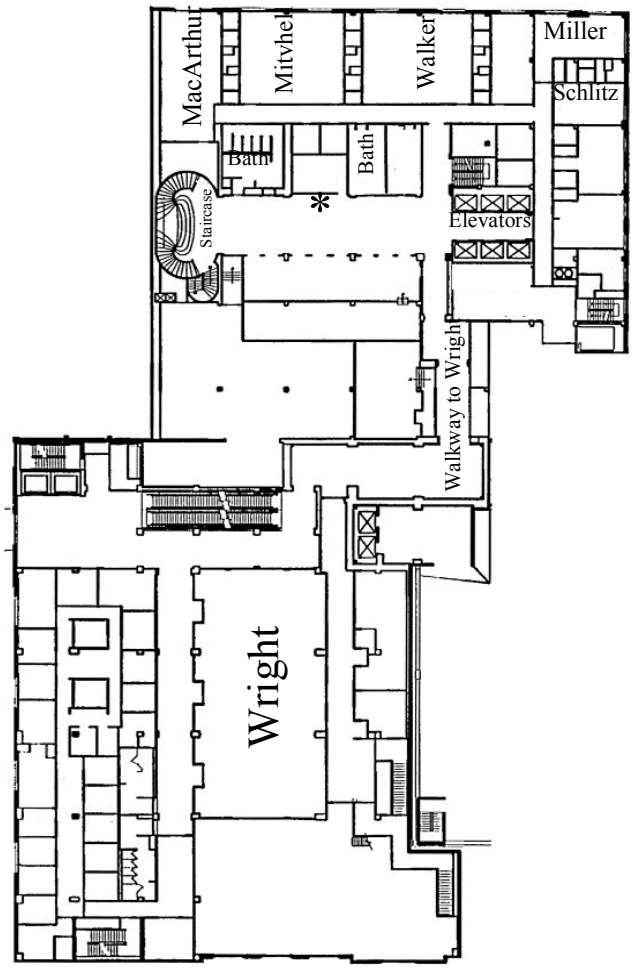
On the cover: The Hilton Milwaukee City Center Hotel, site of the 74th annual meeting of the American Association of Physical Anthropologists. Inset: Banquet at the 4th annual meeting of the American Association of Physical Anthropologists, Marlborough-Blenheim Hotel on the Atlantic City Boardwalk, New Jersey.

Hilton Milwaukee City Center

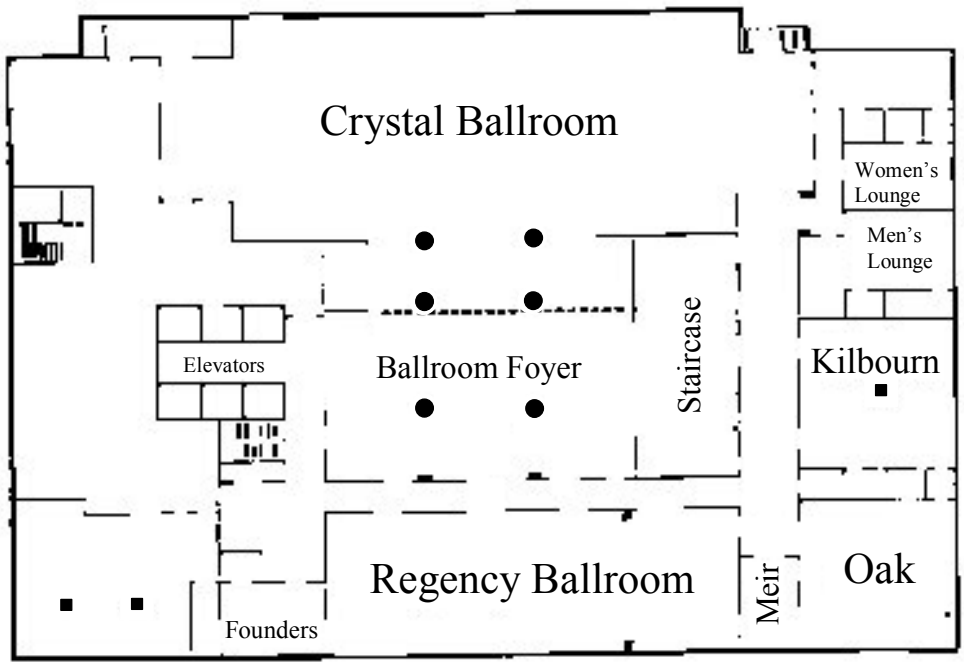
Upper Lobby – The upper lobby has two rooms which will be in use during the AAPA meetings. The Monarch Ballroom will house the book exhibitors. The Empire Ballroom will be for all poster sessions. The drawing below shows the layout for posters. Please note that the Empire Ballroom is not wheelchair accessible. "Backhouse" access is available near posters 4 and 5, but there are steps between the following poster areas: 1 – 14, 15 – 22, 23 – 42, 43 – 50, and 51 – 64.



Fourth Floor – The fourth floor is the location for the Walker, Mitchell, MacArthur, Miller, Schlitz, and Wright Rooms. Meetings registration is between the elevators and the staircase (marked with an asterisk).



Fifth Floor – The fifth floor is the location for the Crystal and Regency Ballrooms and the Oak, Kilbourn, Meir, and Founders Rooms.



The Conference at a Glance

	Tue Morning	Tue Afternoon	Tue Evening	Wed Morning	Wed Afternoon	Wed Evening
Fourth Floor, by staircase	PS & PPA Registrations, 8 am – 5 pm			PS & HBA Registrations, 8 am – 5 pm PPA Registration, 8 – 10 am AAPA Registration, 9 am – 5 pm		
Empire		PPA & PS Poster Sessions		PPA Poster Session	HBA Poster Session	
Crystal				PPA Podium Session	PPA Podium Session	AAPA Reception, 8 – 11 pm
Regency	PS Podium Session	PS Podium Session		PS Podium Session	PS Podium Session	
Wright		PPA Podium Session	PPA Reception, 6 – 7:30 pm	HBA Plenary Session		AAPA Career Development, 6:30 – 7:45 pm
Walker				AJHB Editorial Board breakfast, 7:30 – 9 am		
MacArthur	PPA Workshop			AAPA Executive Committee Meeting, 8 am – 6 pm		
Kilbourn	PPA Workshop					
Oak			*Human Biology* Editorial Board Dinner, 6 – 8 pm		AJPA Editorial Board Meeting, noon – 2 pm	HBA Student Workshop / Reception, 5 – 7 pm
Monarch				Book Exhibitors, 8 am – 5 pm		
Miller			HBA Executive Committee Dinner, 6 – 10 pm			
Schlitz	Press/job interviews	Press/job interviews		Press/job interviews	Press/job interviews	
Meir	Speaker Ready	Speaker Ready		Speaker Ready	Speaker Ready	

Monday evening: PPA Registration, Fourth floor by staircase, 5 – 7 pm

Key to acronyms:

AAAG American Association of Anthropological Genetics
AAPA American Association of Physical Anthropologists
ADA American Dermatoglyphics Association
AJHB *American Journal of Human Biology*
AJPA *American Journal of Physical Anthropology*
DAA Dental Anthropology Association
HBA Human Biology Association
JHE *Journal of Human Evolution*
NCSE National Center for Science Education
PPA Paleopathology Association
PS Paleoanthropology Society

	Thurs Morning	Thurs Afternoon	Thurs Evening
Fourth Floor, by staircase	AAPA Registration, 8 am – 8 pm HBA Registration, 8 am – 5 pm		
Empire (*posters*)	Session 1. Hominid Evolution I, 8:30 – noon	Session 7. Genetics I, 1:30 – 5:00 pm Session 8. Primate Behavior I, 1:30 – 5:00 pm	
Crystal	Session 6. Hominid Evolution II, 8:00 – noon	Session 10. Symposium: Sexual Dimorphism, 1:00 – 4:30 pm	AAPA Plenary Session, 6:15 – 7:45 pm
Wright	Session 2. Symposium: Lorisoids, 8:00 – noon	Session 9. Symposium: Dental Anthropology, 1:00 – 4:45 pm	HBA Business Meeting, 5:30 – 6:30 pm Wiley-Liss Reception, 8:30-10:30
Regency	HBA Podium Session	HBA Podium Session, 2 – 4 pm Raymond Pearl Lecture, 4 – 5 pm	HBA Reception 7:30 – 10:30 pm
Walker	Session 3. Dental Anthropology I, 8:00 – 9:15 am Session 4. Brain Evolution, 9:30 - noon	Session 11. Primate Behavior II, 1:00 – 5:00 pm	
Mitchell	Session 5. Skeletal Biology I, 8:00 - noon	Session 12. Skeletal Biology II, 1:00 – 5:00 pm	
MacArthur			DAA Business Meeting, 7:45 – 8:45 pm
Kilbourn			AAAG Business Meeting, 7:45 – 8:45 pm
Oak		HBA Luncheon, noon – 1:30 pm	Primate Biology/Behavior Interest Group Meeting, 7:45 – 8:45 pm
Miller			ADA Business Meeting, 7:45 – 8:45 pm
Monarch	Book Exhibitors, 8 am – 5 pm		
Schlitz	Press/job interviews	Press/job interviews	
Meir	Speaker Ready	Speaker Ready	

	Fri Morning	Fri Afternoon	Fri Evening	Sat Morning	Sat Afternoon
Fourth Floor, by staircase	AAPA Registration, 8 am – 5 pm			AAPA Registration, 8 am – noon	
Empire (*posters*)	Session 13. Skeletal Biology, 8:30 – noon	Session 18. Symposium: Mexican Populations, 2:30 – 4:00 pm Session 19. Symposium: *Callimico*, 3:00 – 4:30 Session 20. Symposium: Burned Bones, 3:30 – 5:00 pm Session 21. Symposium: American SW Bioarchaeology, 4:00 – 5:30 pm		Session 26. Dental Anthropology II, 8:30 – noon Session 27. Primate Biological Variation I, 8:30 – noon	Session 32. Human Biology III, 1:30 – 5:00 pm
Crystal	Session 15. Hominid Evolution III, 8:00 – noon	Session 24. Primate Evolution I, 2 – 6 pm	AAPA Business Meeting, 8 – 11 pm	Session 30. Primate Evolution II, 8 – noon	Session 33. Symposium: Primate Craniofacial Biology, 1 – 5 pm
Wright	AAPA Luncheon, noon – 2 pm			Session 28. Symposium: Primate Interface, 8:30 – 11:45 am	Session 35. Primate Behavior IV, 1 – 5 pm
Regency	Session 14. Symposium: AAPA 75th Anniversary, 8:15 – noon	Session 22. Symposium: Metabolic Syndrome, 2 – 6 pm		Session 29. Symposium: Human Population Genetics, 8 – noon	Session 36. Primate Biological Variation II, 1 – 5 pm
Walker	Session 16. Genetics II, 8:00 – noon	Session 23. Primate Behavior III, 2 – 6 pm		Session 31. Skeletal Biology IV, 8 – noon	Session 34. Genetics III, 1 – 5 pm
Mitchell	Session 17. Human Biology I, 8:00 – noon	Session 25. Human Biology II, 2 – 6 pm		Teaching Outreach Program, 8 am – noon	
Oak			JHE Editorial Board Dinner, 5:30 – 8 pm		Ethics Discussion, 12:30 – 2 pm
Founders					Student Awards Committee Meeting, 4 – 5 pm
Monarch	Book Exhibitors, 8 am – 5 pm			Book Exhibitors, 8 am – 5 pm	
Schlitz	Press/job interviews	Press/job interviews		Press/job interviews	Press/job interviews
Meir	Speaker Ready	Speaker Ready		Speaker Ready	Speaker Ready

Saturday evening: Student Awards Reception, Mitchell, 5 – 7 pm

Conference Schedule

For a schedule of individual AAPA poster and podium presentations, see page 16.

Tuesday, April 5, 2005

Paleopathology Association

8:00 am – 5:00 pm Registration. *Fourth Floor by Staircase.*

8:00 am – 5:00 pm Workshops, Scientific Sessions. *Wright, Empire, MacArthur, and Kilbourn.*

Paleoanthropology Society

8:00 am – 5:00 pm Registration. *Fourth Floor by Staircase.*

8:00 am – 5:00 pm Scientific Sessions. *Regency and Empire.*

Human Biology (Journal)

6:00 pm – 8:00 pm Editorial Board Dinner. *Oak.*

Wednesday, April 6, 2005

American Association of Physical Anthropologists

9:00 am – 5:00 pm Registration. *Fourth Floor by Staircase.*

8:00 am – 6:00 pm Executive Committee Meeting. *MacArthur.*

12:00 pm – 2:00 pm *American Journal of Physical Anthropology* Editorial Board Luncheon. *Oak.*

6:30 pm – 7:45 pm Career Development Committee Panel Discussion: "Give me a job, any job! ... Or, how to read between the lines in job ads." Introduction: Marilyn London; Panelists: Lorena Madrigal (University of South Florida), Kaye Reed (Institute of Human Origins, Arizona State University), and Mark Teaford (Johns Hopkins University). *Wright Ballroom.*

8:00 pm – 11:00 pm Reception & Cash Bar. *Crystal and Regency Ballrooms.*

Paleopathology Association

8:00 am – 10:00 am Registration. *Fourth Floor by Staircase.*

Wednesday, April 6, 2005

8:00 am – 5:00 pm Scientific Sessions. *Empire and Crystal Ballrooms.*

Human Biology Association

7:30 am – 9:00 am *American Journal of Human Biology* Editorial Board Breakfast. *Walker.*

8:00 am – 5:00 pm Registration. *Fourth Floor by Staircase.*

8:00 am – 12:00 pm Podium Session. *Wright.*

1:00 pm – 5:00 pm Poster Session. *Empire.*

5:00 pm – 7:00 pm Student Reception. *Oak.*

Thursday, April 7, 2005

American Association of Physical Anthropologists

8:00 am – 8:00 pm Registration. *Fourth Floor by Staircase.*

8:30 am – 12:00 pm **Session 1. Hominid Evolution I.** Contributed Posters. *Empire Ballroom.*

8:00 am – 12:00 pm **Session 2. Evolution, Functional Morphology, and Behavioral Ecology of Lorises and Galagos (Lorisoids).** Symposium. *Wright Ballroom.*

8:00 am – 9:15 am **Session 3. Dental Anthropology I.** Contributed Papers. *Walker Room.*

9:30 am – 12:00 pm **Session 4. Human and Primate Brain Evolution**. Contributed Papers. *Walker Room.*

8:00 am – 12:00 pm **Session 5. Skeletal Biology I.** Contributed Papers. *Mitchell Room.*

8:00 am – 12:00 pm **Session 6. Hominid Evolution II.** Contributed Papers. *Crystal Ballroom.*

Thursday, April 7, 2005

1:30 pm – 5:00 pm	**Session 7. Molecular and Population Genetics I.** Contributed Posters. *Empire Ballroom*.
1:30 pm – 5:00 pm	**Session 8. Primate Behavior I**. Contributed Posters. *Empire Ballroom*.
1:00 pm – 4:45 pm	**Session 9. Dental Anthropology 20 Years After: The State of the Science**. Symposium. *Wright Ballroom*.
1:00 pm – 4:15 pm	**Session 10. Sexual Dimorphism: Patterns, Evolution, and Variation.** Symposium. *Crystal Ballroom*.
1:00 pm – 5:00 pm	**Session 11. Primate Behavior II.** Contributed Papers. *Walker Room*.
1:00 pm – 5:00 pm	**Session 12. Skeletal Biology II.** Contributed Papers. *Mitchell Room*.
6:15 pm – 7:45 pm	**Plenary Session** – " 'Bones' of the Academic Ancestors." In honor of the 75th Anniversary of the founding of the AAPA, a panel of physical anthropologists will present eight "osteo-biographies." *Crystal Ballroom*.
8:30 pm – 10:30 pm	Wiley-Liss Reception. *Wright Ballroom*.

Human Biology Association

8:00 am – 12:00 pm	Plenary Session. *Regency Ballroom*.
12:00 pm – 1:30 pm	HBA Lunch. *Oak Room*.
2:00 pm – 4:00 pm	Plenary Session (continued). *Regency Ballroom*.
4:00 pm – 5:00 pm	Raymond Pearl Lecture. *Regency Ballroom*.
5:30 pm – 6:30 pm	Business Meeting. *Wright Ballroom*.
7:30 pm – 10:30 pm	Reception. *Regency Ballroom*.

Dental Anthropology Association

7:45 pm – 8:45 pm	Business Meeting. *MacArthur Room*.

American Association of Anthropological Genetics

Thursday, April 7, 2005

7:45 pm – 8:45 pm Business Meeting. *Kilbourn Room*.

American Dermatoglyphics Association

7:45 pm – 8:45 pm Business Meeting. *Miller Room*.

Primate Biology & Behavior Interest Group

7:45 pm – 8:45 pm Business Meeting. *Oak Room*.

Friday, April 8, 2005

American Association of Physical Anthropologists

8:00 am – 5:00 pm Registration. *Fourth Floor by Staircase.*

8:30 am – 12:00 pm **Session 13. Skeletal Biology III.** Contributed Posters. *Empire Ballroom*.

8:15 am – 12:00 pm **Session 14. 75 Years of the American Association of Physical Anthropologists.** Symposium. *Regency Ballroom*.

8:00 am – 12:00 pm **Session 15. Hominid Evolution III.** Contributed Papers. *Crystal Ballroom*.

8:00 am – 12:00 pm **Session 16. Molecular and Population Genetics II.** Contributed Papers. *Walker Room*.

8:00 am – 12:00 pm **Session 17. Human Biology I.** Contributed Papers. *Mitchell Room*.

12:00 pm – 2:00 pm AAPA Luncheon. *Wright Ballroom*.
Speaker: Bob Martin. "The Evolution of Human Reproduction."

2:30 pm – 4:00 pm **Session 18. Adaptability of Mexican Populations.** Poster Symposium. *Empire Ballroom*.

Friday, April 8, 2005

3:00 pm – 4:30 pm **Session 19. Advances in Marmoset and Goeldi's Monkey (*Callimico*) Research: Anatomy, Behavioral Ecology, Phylogeny, and Conservation.** Poster Symposium. *Empire Ballroom*.

3:30 pm – 5:00 pm **Session 20. Current Research in the Analysis of Burned Human Bones.** Poster Symposium. *Empire Ballroom*.

4:00 pm – 5:30 pm **Session 21. Reanalysis and Reinterpretation in Southwestern Bioarchaeology.** Poster Symposium. *Empire Ballroom*.

2:00 pm – 6:00 pm **Session 22. The Metabolic Syndrome: Epidemiological, Methodological, Genetic, and Cross-Cultural Perspectives.** Symposium. *Regency Ballroom*.

2:00 pm – 6:00 pm **Session 23. Primate Behavior III.** Contributed Papers. *Walker Room*.

2:00 pm – 6:00 pm **Session 24. Primate Evolution I.** Contributed Papers. *Crystal Ballroom*.

2:00 pm – 6:00 pm **Session 25. Human Biology II.** Contributed Papers. *Mitchell Room*.

8:00 pm – 11:00 pm Annual Business Meeting. *Crystal Ballroom*.

Journal of Human Evolution

5:30 pm – 8:00 pm Editorial Board Meeting. *Oak Room*.

Saturday, April 9, 2005

American Association of Physical Anthropologists

8:00 am – 12:00 pm Registration. *Fourth Floor by Staircase.*

8:00 am – 12:00 pm **Teaching Outreach Program**. *Mitchell Room*.
This progam is intended for local area teachers, but is open to AAPA members on an available-space basis. The program is as follows:

Michael Park: "Using the Fossil Record in Teaching Human Evolution"

Saturday, April 9, 2005

Linda Winkler and Judy Corr: "Primate Clues to Human Behavior"
K. Lindsay Eaves-Johnson and Nancy Tatarek: "Who are you?: Strategies for Presenting Forensic Anthropology and Human Variation in the Classroom"
Pamela Ashmore and Barbara O'Connell: "Human Skin Color Variation and Race"
Martin K. Nickels: Organizer and Chair

8:30 am – 12:00 pm **Session 26. Dental Anthropology II.** Contributed Posters. *Empire Ballroom*.

8:30 am – 12:00 pm **Session 27. Primate Biological Variation I.** Contributed Posters. *Empire Ballroom*.

8:30 am – 11:45 am **Session 28. The Human - Non-Human Primate Interface: History, Evolution and Conservation.** Third Annual Wiley-Liss Symposium. *Wright Ballroom*.

8:00 am – 12:00 pm **Session 29. Inference of Human Population History from Genetic Variation: Bridging the Gap Between Theory and Data.** Symposium. *Regency Ballroom*.

8:00 am – 12:00 pm **Session 30. Primate Evolution II.** Contributed Papers. *Crystal Ballroom*.

8:00 am – 12:00 pm **Session 31. Skeletal Biology IV.** Contributed Papers. *Walker Room*.

12:30 pm – 2:00 pm Ethics Discussion. *Oak Room*.

1:30 pm – 5:00 pm **Session 32. Human Biology III.** Contributed Posters. *Empire Ballroom*.

1:00 pm – 5:00 pm **Session 33. Primate Craniofacial Function and Biology: Symposium in Honor of William L. Hylander.** Symposium. *Crystal Ballroom*.

1:00 pm – 5:00 pm **Session 34. Molecular and Population Genetics III.** Contributed Papers. *Walker Room*.

1:00 pm – 5:00 pm **Session 35. Primate Behavior IV.** Contributed Papers. *Wright Ballroom*.

1:00 pm – 5:00 pm **Session 36. Primate Biological Variation II.** Contributed Papers. *Regency Ballroom*.

Saturday, April 9, 2005

5:00 pm – 7:00 pm Student Awards Reception. *Mitchell Room.*

Thursday Morning – April 7, 2005

AAPA Poster and Podium Presentation Schedule

For a schedule of all conference events, see page 10.
For an author/session index see page 52.

Session 1. Hominid Evolution I. Contributed Posters. *Empire Ballroom*.

Chair: R. CIOCHON, University of Iowa.

8:00 – 8:30 am	Poster set-up.
8:30 – 10:00 am	Authors of even-numbered posters present for questions.
10:30 am – 12:00 pm	Authors of odd-numbered posters present for questions.
12:00 – 12:30 pm	Poster take-down.

1. The pelvic girdle in Fgf4 and Fgf8 conditional knockout mice. BURT A. ROSENMAN, C. OWEN LOVEJOY.

2. Developmental integration and evolution: using a zebrafish model to test the correlation between cranial morphology, gene expression and gene evolution. LISA D. NEVELL, L. PATRICIA HERNANDEZ.

3. Soft tissue-linked cranial structures and the reconstruction of fossil primate phylogeny. DANIELE SERDOZ, MARK COLLARD, LESLIE AIELLO.

4. Geometric morphometric data of the hominoid infraorbital region as discrete phylogenetic characters. BRIAN A. VILLMOARE.

5. Foramen magnum ontogeny and evolution in humans, great apes, and fossil hominids. GARY D. RICHARDS, REBECCA S. JABBOUR, SUSAN STANDEN.

6. Digital reconstruction of *P. boisei* OH5. SIMON NEUBAUER, PHILIPP GUNZ, GERHARD W. WEBER.

7. Cladistic analysis of early Homo crania from Sterkfontein and Swartkrans, South Africa. HEATHER F. SMITH, FREDERICK E. GRINE.

8. Internal functional morphology of BAR 1002'00 documents ape-human divergence circa 6 Ma: That's impossible, but anyway, everyone knew it all the time. KAROL GALIK, ROBERT B. ECKHARDT, ADAM J. KUPERAVAGE.

9. Morphological change of the P3 within *Australopithecus afarensis* and *Australopithecus anamensis*. LUCAS K. DELEZENE.

10. Root morphology of the anterior dentition of extant higher primates. PAUL J. CONSTANTINO, SUSAN ABBOTT, ROSANNA PICASCIA, BERNARD WOOD.

11. Reduced canine sexual dimorphism in *Pan paniscus*: A morphometric approach to canine sexing in hominoids using high resolution polynomial curve fitting (HR-PCF). DAVID R. BEGUN, ANDREW DEANE.

12. Differences in patterns of shape variation among cranial regions in the Papionini. TARA A. PEBURN.

13. Age at death in a juvenile specimen of *Megaladapis edwardsi* (Primates, Lemuriformes): Implications for understanding life history variation in sub-fossil lemurs. PATRICK MAHONEY, GARY T. SCHWARTZ, LAURIE R. GODFREY, FRANK P. CUOZZO.

14. New discoveries of *Hadropithecus stenognathus*, a subfossil lemur from Madagascar. LAURIE R. GODFREY, WILLIAM L. JUNGERS, GARY T. SCHWARTZ, PIERRE LEMELIN, LIZA J. SHAPIRO, DAVID A. BURNEY, WILLIAM F. WHEELER, FRANK P. CUOZZO, NATALIE VASEY.

15. Dietary adaptations of early and middle Miocene dendropithecids and other small-bodied non-cercopithecoid catarrhines from Kenya. BRENDA R. BENEFIT, ELIZABETH LYNCH, SOUMITRA GHOSHROY, SCOTT KERSEY.

16. A new hominoid partial maxilla from Buluk, early Miocene, Kenya. ELLEN R. MILLER, ROBERT ANEMONE, ARI GROSSMAN, RONALD T. WATKINS, MUSA KYEVA, ROBERT MORU.

Thursday Morning – April 7, 2005

17. New small-bodied ape postcrania from the middle Miocene of Maboko Island, Kenya. MONTE L. MCCROSSIN.

18. Intraspecific incisor variation in hominoids: A comparison between five Miocene genera and extant apes. CANDACE A. DAVIS.

19. An infant skeleton of *Nacholapithecus* and ontogenetic development of postcranial features. MASATO NAKATSUKASA, YUTAKA KUNIMATSU, YOSHIHIKO NAKANO, DAISUKE SHIMIZU, HIROSHI TSUJIKAWA, HIDEMI ISHIDA.

20. Late Miocene hominid biogeography and extinction patterns. MARIAM C. NARGOLWALLA, DAVID R. BEGUN.

21. Using functional morphology to compare primate communities. ARI GROSSMAN, JOHN G. FLEAGLE.

22. Chimpanzees as fauna: comparisons of sympatric large mammals across longterm study sites. SAMANTHA M. RUSSAK, WILLIAM C. MCGREW.

23. A methodology for assessing heterogeneously occluded hypsodont dental specimens using computerized tomography. JUSTIN W. ADAMS.

24. Signature bone fragmentation: an actualistic study identifying bone fragments exhibiting no distinguishable marks resulting from percussion. JULIET K. BROPHY.

25. What can plants tell us about fossil oxygen isotopes? Laying the groundwork for dietary interpretation. ANNA T. WILLIAMS.

27. Decoupling the shoulder from above-substrate locomotion: A new idea for the origin of hominid bipedalism. ADAM D. SYLVESTER.

28. The role of arm swing and thermoregulation in the evolution of bipedality and hominin limb proportions. ALAN CROSS.

29. Did *Australopithecus afarensis* make the Laetoli footprint trail? New insights into an old problem. WILLIAM E.H. HARCOURT-SMITH, CHARLES E. HILTON.

30. Plantigrady, bipedalism, and adaptations in the hominoid plantar fascia. CASSONDRA A. BAUER, D. JEFFREY MELDRUM.

31. A regressional analysis of sex differences in the cost of human walking. MICHAEL J. TILKENS, KAREN L. STEUDEL-NUMBERS.

32. Hominid locomotion development and the importance of brachiation: how zoo design can show brachiation as a precursor to bipedalism through a gibbon exhibit. MICHELE R. SCHWARTZ, DOUGLAS BROADFIELD, TERRY WOLF.

33. Validation of a non-invasive model for predicting long bone loading. JOHN D. POLK, DANIEL E. LIEBERMAN, AUSTIN E. BETZ, BRIGITTE DEMES.

34. Forelimb compliance and arboreality in primates and marsupials. DANIEL SCHMITT, LAURA T. GRUSS, PIERRE LEMELIN.

35. A Monte Carlo simulation method for estimating interspecific scaling relationships in the absence of specimen-specific body mass data. MATTHEW W. TOCHERI, JEREMIAH E. SCOTT, CALEY M. ORR, ROBERT C. WILLIAMS.

36. A new portable scanning system for the acquisition of data from three-dimensional objects from three-dimensional objects. JODI BLUMENFELD, STEVEN R. LEIGH, JESSE SPENCER-SMITH, DANIEL E. WEBER.

37. Hip bone trabecular structure/architecture in African *Homo erectus*. VIRGINIE VOLPATO, LUCA BONDIOLI, ROBERTO MACCHIARELLI.

38. Midfacial variation in recent human, Zhoukoudian Upper Cave, and Paleoindian crania. JAMES C.M. AHERN, GREG WILLSON, GEORGE W. GILL.

39. Can the mandible speak? Mandibular variation in *Homo erectus* and *Homo sapiens*. JOSEPH R. CALIFF, CHRIS ROBINSON.

Thursday Morning – April 7, 2005

40. A new *Homo erectus* maxilla from the Bapang basal unit, Sangiran Dome, Java. R. CIOCHON, Y. ZAIM, F. GRINE, Y. RIZAL, R. LARICK, A. BETTIS, III, R. FRANCISCUS, J. POLANSKI.

41. Quantitative analysis of modern human and fossil mandibles using 3-D geometric morphometrics. ELISABETH K. NICHOLSON, KATERINA HARVATI.

42. Inventory and preliminary description of Middle Pleistocene pelvis remains from the site of the Sima de los Huesos, Atapuerca (Spain). ALEJANDRO BONMATI, JUAN LUIS ARSUAGA.

43. Ecogeographical trends in pedal apical tuft breadth: implications for postcranial robusticity in Homo neanderthalensis. ALICE A. ELDER.

44. Comparative morphometrics of Neandertal zygomatic bones. IVOR JANKOVIC, FRED H. SMITH.

45. Was the early hominid brain musclebound? ROBERT B. ECKHARDT, ADAM J. KUPERAVAGE.

46. Comparison of Gravettian skulls from Predmostí with recent skulls from Pachner collection: roughness penalty approach in shape analysis. ALENA SEFCAKOVA, STANISLAV KATINA, JAROSLAV BRUZEK, JANA VELEMINSKA, PETR VELEMINSKY.

47. New research into the context of the Roc de Marsal (Dordogne, France) Neandertal. SHANNON P. MCPHERRON, BONNIE BLACKWELL, JEAN-CHRISTOPHE CASTEL, ISABELLE COUCHOUD, HAROLD L. DIBBLE, PIERRE GUIBERT, PAUL GOLDBERG, BRUNO MAUREILLE, DENNIS SANDGATHE, ALAIN TURQ.

48. Is the Vindija late Neandertal mandibular sample biased? MATT KESTERKE, JAMES C.M. AHERN, SANG-HEE LEE, JOHN HAWKS.

49. A radiographic analysis of Middle Pleistocene hominin cranial morphology: Implications for classification and methodology in human evolution. LEISA DEFELICE.

50. Variation in mandibular gonial flare in Neandertals and recent humans: a pattern recognition study. NATHAN E. HOLTON, ROBERT G. FRANCISCUS, MATTHEW KILBERGER, AMY MICHAEL.

51. Neandertal mandibular traits in modern *Homo sapiens*. M. KATHRYN MAHER.

52. Development of Bayesian discriminant analysis for multivariate data with missing values, with an application to the origin of modern humans. OSBJORN M. PEARSON, TIMOTHY E. HANSON.

53. The digital graphic analysis of the facial skeleton of Upper Palaeolithic skulls from P□edmostí near P□erov (Czech Republic). JANA VELEMINSKA, PETR VELEMINSKY, JAROSLAV BRUZEK, ALENA SEFCAKOVA, STANISLAV KATINA.

54. Changes in mobility patterns from the European Upper Paleolithic through Bronze Age as reflected in femoral and tibial cross-sectional geometry. VLADIMIR SLADEK, BRIGITTE HOLT, MARGIT BERNER, CHRIS B. RUFF.

55. Molar microwear analysis on ungulates from the “La Berbie” locality (Dordogne, France): implications for the environmental context of late Pleistocene human occupation of western France. GILDAS MERCERON, STEPHANE MADELAINE.

56. The ancient human occupation of Britain. CHRIS B. STRINGER.

57. A review of the putative Paleolithic human remains from Japanese Archipelago. HISAO BABA.

58. Morphological characteristics of Earliest Jomon human remains from Tochibara rock shelter, Kita-Aiki, Nagano, Central Japan. ERI OHTANI, HISAO BABA, YUKINARI KOHARA.

59. Microevolutionary trends in the temporal muscle structure in Japanese populations. AYUMI SHIRAHASE, HISAO BABA.

Thursday Morning – April 7, 2005

Session 2. Evolution, Functional Morphology, and Behavioral Ecology of Lorises and Galagos (Lorisoids). Symposium. *Wright Ballroom*.

Organizers and Chairs: ANNE M. BURROWS, Duquesne University, and LEANNE T. NASH, Arizona State University.

Traditionally, much of our focus and understanding of prosimians has come from studies on lemurids and indriids (lemuroids), mainly diurnal prosimians. The nocturnal lorises and galagos (lorisoids) are relatively poorly understood but knowledge of their history, morphology, and behavior is critical to an understanding of primate evolution, origins, locomotory behavior, special senses, and social systems. Accordingly, this symposium presents recent findings regarding lorises and galagos with a focus on locomotory behavior, taxonomic and phylogenetic issues, craniomandibular morphology, and habitat use. Key topics to be discussed include vocal behavior, the fossil record of lorisoid evolution, trends in craniomandibular morphology and feeding behavior, olfaction, and approaches to taxonomic and phylogenetic issues.

8:00 am Morphological constraints on vocal behavior in a prosimian primate. MICHELLE L. BECKER, JOEL C. KAHANE, JOHN D. NEWMAN.

8:15 am Temporomandibular joint histomorphology in exudativorous and frugivorous galagos. ANNE M. BURROWS, TIM D. SMITH.

8:30 am Ontogeny of limb proportions in *Galago senegalensis* and potential implications for locomotor development. MELISSA S. SCHAEFER, LEANNE T. NASH.

8:45 am All lorises are not slow: rapid arboreal locomotion in the newly recognised red slender loris (*Loris tardigradus tardigradus*) of southwestern Sri Lanka. K.A.I. NEKARIS, NANCY J. STEVENS.

9:00 am Morphological and functional differentiation in the lumbar spine of lorisoids. LIZA J. SHAPIRO.

9:15 am Relationships of male condition, sociality, ranging and habitat use in the Slender Loris (*Loris tardigradus*) in Kalakad-Mundanthurai Tiger Reserve, India. KABERI KAR GUPTA.

9:30 am Infant dependency and perinatal morphology of olfactory and accessory olfactory organs in lorisoids and lemuroids. TIMOTHY D. SMITH, ANNE M. BURROWS, KUNWAR P. BHATNAGAR, JOHN C. DENNIS, PRAPHUL TULADHAR, EDWARD E. MORRISON.

9:45 am Break

10:00 am Ontogeny of craniomandibular morphology in lorisiforms. MATTHEW J. RAVOSA.

10:15 am Integration and evolution of covariance structure in the masticatory apparatus of galagos and lorises. CHRISTOPHER J. VINYARD.

10:30 am Lorisoid evolution in Africa - the fossil evidence. ERIK R. SEIFFERT, ALAN WALKER.

10:45 am Penile anatomy of East African galagos and implications for taxonomy and phylogeny. ANDREW W. PERKIN.

11:00 am Perfect congruence of molecular-phylogenetic and fossil-record divergence age estimates for the Lorisiformes. ANNE D. YODER.

11:15 am Lorisoid phylogeny as revealed by craniodental and rRNA sequence data. JUDITH C. MASTERS, ALFREDO SANTOVITO, LUCA POZZI, MASSIMILIANO DELPERO.

11:30 am Considering prosimian diversity: why so many galagos and so few lorises? JEFFREY H. SCHWARTZ.

11:45 am Discussion: ANNE M. BURROWS.

Thursday Morning – April 7, 2005

Session 3. Dental Anthropology I. Contributed Papers. *Walker Room*.
Chair: HEATHER J.H. EDGAR, Maxwell Museum, University of New Mexico.

8:00 am Using growth structures in teeth from victims of the Black Death to investigate the effects of the Great Famine (AD 1315-1317). DANIEL M. ANTOINE.

8:15 am Secular trends in the male facial skull from the 19th century to the present analyzed with geometric morphometrics. ERWIN JONKE, HERMANN PROSSINGER, FRED L. BOOKSTEIN, KATRIN SCHAEFER, MARKUS BERNHARD, JOSEF W. FREUDENTHALER.

8:30 am Detecting weaning in human dental enamel through intra-tooth isotopic analysis. JACQUELINE E. RABB, BENJAMIN H. PASSEY, JOAN B. COLTRAIN, THURE E. CERLING.

8:45 am A measurement based technique for dental microwear analysis: applying confocal microscopy and scale-sensitive fractal analysis. ROBERT S. SCOTT, TORBJORN S. BERGSTROM, CHRISTOPHER A. BROWN, MARK TEAFORD, ALAN WALKER, PETER UNGAR.

9:00 am An investigation of ultrasound methods for the assessment of sex and age from intact human teeth. ROBIN N.M. FEENEY.

Session 4. Human and Primate Brain Evolution. Contributed Papers. Walker Room.
Chair: JOHN HAWKS, University of Wisconsin – Madison.

9:30 am The color vision of muriquis (*Brachyteles arachnoides*). MAURICIO TALEBI, NATHANIEL J. DOMINY.

9:45 am Comparing white matter fiber tracts in monkeys, apes and humans with Diffusion Tensor Imaging (DTI). JAMES K. RILLING, TODD M. PREUSS, XIANGYANG MA, SARAH K. BARKS, LEONARD HOWELL.

10:00 am Comparing resting brain activity in monkeys, apes, and humans. SARAH K. BARKS, JAMES K. RILLING, LISA A. PARR, TODD M. PREUSS, J. DOUGLAS BREMNER, JOHN R. VOTAW.

10:15 am Brain/body allometry: Using extant apes to establish appropriate scaling baselines. BRIAN T. SHEA.

10:30 am Brain-body allometry and the mind of early *Homo*. JOHN HAWKS.

10:45 am A new method for assessing endocast morphology: Calculating local curvature from 3D CT images. BRIAN AVANTS, JAMES C. GEE, P. THOMAS SCHOENEMANN, JANET MONGE, JASON E. LEWIS, RALPH L. HOLLOWAY.

11:00 am The lunate sulcus in Taung: where is it? DOUGLAS BROADFIELD, RALPH L. HOLLOWAY.

11:15 am The Bodo brain endocast: a strange frontal lobe feature. RALPH L. HOLLOWAY, MICHAEL S. YUAN, DOUG C. BROADFIELD.

11:30 am The human corpus callosum: growth and morphological integration with cranial shape. PHILIPP MITTEROECKER, PHILIPP GUNZ, PETER BRUGGER, DANIELA PRAYER, FRED L. BOOKSTEIN, HORST SEIDLER.

11:45 am Brain shape asymmetries in right-handed and left-handed men and women. DEAN FALK, HARTMUT MOHLBERG, N.J. SHAH, KARL ZILLES.

Session 5. Skeletal Biology I. Contributed Papers. *Mitchell Room*.
Chair: DENNIS E. SLICE, University of Vienna.

Thursday Morning – April 7, 2005

8:00 am A test of the Lamendin method on two historic skeletal samples. MARY S. MEGYESI, DOUGLAS H. UBELAKER, NORM SAUER.

8:15 am Auricular surface ageing - Worse than expected? Results from a blind test using a documented skeletal collection. HOLGER SCHUTKOWSKI, CERI G. FALYS, DARLENE A. WESTON.

8:30 am Modeling age-related changes in human rib cage geometry. DENNIS E. SLICE, JOEL STITZEL.

8:45 am Age estimation in fetal and neonatal skeletal remains using bones of the shoulder and pelvis. JESSICA A. NEWNAM.

9:00 am The morphology of the lower mid-face in three American skeletal populations. GREGORY F. WILLSON.

9:15 am The affect of tissue depth variation on craniofacial reconstructions. JOHN M. STARBUCK, RICHARD E. WARD.

9:30 am Body mass estimation from anthropometric measurements in female collegiate athletes. SHAMSI R. DANESHVARI, OSBJORN M. PEARSON, ROBERT M. MALINA.

9:45 am Occupational health: bioarchaeology and subsistence transition at Ganj Dareh Tepe. DEBORAH C. MERRETT.

10:00 am Break

10:15 am Prediction of age-at-death from 3D changes in the dimensions and structure of the cortical canal network at the anterior femoral midshaft. DAVID M.L. COOPER, ANDREI L. TURINSKY, CHRISTOPH W. SENSEN, JOHN G. CLEMENT, C. DAVID L. THOMAS, BENEDIKT HALLGRÍMSSON.

10:30 am Analysis of the reputed remains of Fray Pedro de Corpa/Fray Francisco de Verascola: An anthropological contribution to the Cause of the Georgia Martyrs. CHRISTOPHER M. STOJANOWSKI.

10:45 am The effect of a "bent-knee" gait on trabecular orientation: an experimental test of Wolff's Law. HERMAN PONTZER, DANIEL E. LIEBERMAN, ERIC N. MOMIN, MAUREEN J. DEVLIN, JOHN D. POLK, BENEDIKT HALLGRIMSSON, DAVID M.L. COOPER.

11:00 am Bone density differences in rib and iliac crest samples from a modern and an archaeological Peruvian population. HEATHER L. RAMSAY, SAM D. STOUT, JANE E. BUIKSTRA.

11:15 am Ontogeny of three-dimensional trabecular bone architecture in the human proximal femur. TIMOTHY M. RYAN, GAIL E. KROVITZ.

11:30 am Sex and disease: A Central African Exposé. BRUCE M. ROTHSCHILD, FRANK RUHLI.

11:45 am A model for promotion of science education through physical anthropology. PHOEBE R. STUBBLEFIELD.

Session 6. Hominid Evolution II. Contributed Papers. *Crystal Ballroom*.

Chair: UNA STRAND VIDARSDOTTIR, University of Durham.

8:00 am The cervical vertebrae from the Sima de los Huesos site (Sierra de Atapuerca, Burgos, Spain). ASIER GOMEZ, JOSE MIGUEL CARRETERO, LAURA RODRIGUEZ, REBECA GARCIA, JUAN LUIS ARSUAGA.

8:15 am Upper limb long bones from Sima de los Huesos site (Sierra de Atapuerca, Burgos, Spain). JOSE MIGUEL CARRETERO, LAURA RODRIGUEZ, REBECA GARCIA, ASIER GOMEZ, JUAN LUIS ARSUAGA.

8:30 am Auditory capacities in Middle Pleistocene humans from the Sierra de Atapuerca, Spain. IGNACIO MARTINEZ, ROLF QUAM, CARLOS LORENZO, JUAN LUIS ARSUAGA, ANA GRACIA, MANUEL ROSA, PILAR JARABO.

8:45 am New Neandertal remains from the site of Cova Negra (Spain). JUAN LUIS ARSUAGA, ROLF QUAM, VALENTIN VILLAVERDE, IGNACIO MARTINEZ, CARLOS LORENZO, JOSE MIGUEL CARRETERO, ANA GRACIA.

Thursday Morning – April 7, 2005

9:00 am Did Neandertals bury their dead? A taphonomic test using immature cranial remains. GAIL E. KROVITZ, PAT SHIPMAN.

9:15 am Testing for functional convergence in Neandertal and Inuit lower rib morphology in terms of cold-adaptation. K. LINDSAY EAVES-JOHNSON, ROBERT G. FRANCISCUS.

9:30 am Neanderthal peripheral nasal apparatus reconstruction: a comparative approach to understand adaptive plasticity. SAMUEL MARQUEZ, PATRICK J. GANNON, KEN MOWBRAY, JEFFREY T. LAITMAN, LYNN COPES, WILLIAM LAWSON.

9:45 am Break

10:00 am Longevity in the Middle Paleolithic: Did modern humans live longer than Neandertals? RACHEL CASPARI, SANG-HEE LEE.

10:15 am Metric traces of a phenotypic link between Neanderthals and anatomically modern *Homo sapiens*. GERHARD W. WEBER, PHILIPP GUNZ, PHILIPP MITTEROECKER, ANDREA STADLMAYR, HORST SEIDLER, FRED L. BOOKSTEIN.

10:30 am Polymorphism, terminal taxa, and a phylogenetic approach to Middle Pleistocene systematics. MELANIE L. CHANG.

10:45 am Basicranial morphology of Pleistocene Australians: implications for modern human origins. ARTHUR C. DURBAND.

11:00 am An explanation for WLH-50's robusticity using computerised tomography. MICHAEL C. WESTAWAY, ROSS O'NEIL.

11:15 am Mobility in Neolithic Liguria (Italy): a biomechanical approach. DAMIANO MARCHI, VITALE SPARACELLO, VINCENZO FORMICOLA.

11:30 am Body size, body shape, and long bone strength of the Tyrolean ice man. CHRISTOPHER B. RUFF, BRIGITTE M. HOLT, VLADIMIR SLADEK, MARGIT BERNER, WILLIAM A. MURPHY, DIETER ZUR NEDDEN, HORST SEIDLER, WOLFGANG REICHEIS.

11:45 am Morphology and molecules: a study of diversity and dispersal in the island populations of South Asia. UNA STRAND VIDARSDOTTIR, TRUDI J. BUCK, ALAN COOPER, PHILLIP ENDICOTT, CHRIS STRINGER.

Thursday Afternoon – April 7, 2004

Session 7. Molecular and Population Genetics I. Contributed Posters. *Empire Ballroom*.
Chair: MICHAEL C. MAHANEY, Southwest Foundation for Biomedical Research.

1:00 – 1:30 pm Poster set-up.
1:30 – 3:00 pm Authors of even-numbered posters present for questions.
3:30 – 5:00 pm Authors of odd-numbered posters present for questions.
5:00 – 5:30 pm Poster take-down.

1. Searching for signatures of natural selection in high altitude populations. ABIGAIL W. BIGHAM, XINYUN MAO, LORNA MOORE, MARK D. SHRIVER.

2. Allelic variation at alpha-synuclein and alcohol dependence in two American Indian populations. LINDSEY N. WILLIAMS, CONNIE J. MULLIGAN.

3. Polygenotype-environment interaction and the Boas immigrant data. LYLE W. KONIGSBERG, RICHARD L. JANTZ, JOHN H. RELETHFORD.

4. A reassessment of human cranial metric and nonmetric trait heritabilities. E. ANN CARSON.

Thursday Afternoon – April 7, 2005

5. Genetic influences on dental variation in pedigreed baboons: QTLs influencing normal variation in second molar crown size and shape. LOREN R. LEASE, LESLEA J. HLUSKO, LAURA A. COX, JEFF ROGERS, MICHAEL C. MAHANEY.

6. A rapid genetic method for sex-typing primate DNA. ANTHONY DI FIORE.

7. Reliable mitochondrial DNA sequence data from non-invasively collected samples. ANDREW S. BURRELL.

8. The phylogenetic position of the simakobu monkey (*Simias concolor*) based on mitochondrial DNA sequence data. NELSON TING, DANIELLE J. WHITTAKER, DON J. MELNICK.

9. Identifying kinship clusters: SatScan for genetic spatial analysis. BETHANY M. USHER, KARI L. ALLEN.

10. An application of ancient DNA analysis to an early Byzantine monastic community. ALISON M. FRENCH, FREDERIKA A. KAESTLE.

11. STR variation in four provinces of the Basque country. KRISTIN L. MELVIN, ARANTZA G. APRAIZ, RANJAN DEKA, MICHAEL H. CRAWFORD.

12. Comparison of genetic and linguistic phylogenetic reconstructions as a means of investigating the evolution of the Semitic language family. ANDREW A. KITCHEN, CONNIE J. MULLIGAN.

13. Genetic differentiation in Newfoundland outports. ELLEN E. QUILLEN, TIBOR KOERTVELYESSY, CHRIS JENKINSON, MICHAEL CRAWFORD.

14. A pilot study on mitochondrial DNA and Y chromosome variation in north New Guinea. DANIELLE N. JAMES, JONATHAN S. FRIEDLAENDER, JOSEPH LORENZ, GEORGE KOKI, CHARLES MGONE, D.A. MERRIWETHER.

15. Mitochondrial DNA variation in Northern Altaians: Affinities with Siberian and Turkic populations. SERGEY I. ZHADANOV, MATT DULIK, LUDMILA P. OSIPOVA, THEODORE G. SCHURR.

16. Significantly high levels of variation at the mitochondrial 9bp repeat locus in the Sakha of Siberia. REBECCA R. GRAY, LARISSA TARSKAIA, CONNIE J. MULLIGAN.

17. Prehistoric change and continuity in the Illinois and Ohio Valleys. BETH A.S. SHOOK, DEBORAH A. BOLNICK.

18. Molecular perspectives on the origins of Chibchan speaking populations from the Sierra Nevada de Santa Marta, Colombia. PHILLIP E. MELTON, S.S. PAPHIA, IGNACIO BRICEÑO, J. BERNAL, ERIC DEVOR, MICHAEL H. CRAWFORD.

19. The origin of Aymara and Quechua (Inca) Amerindians from Bolivia Highlands according to HLA genes. ANTONIO ARNAIZ-VILLENA, NANCY SILES, JUAN MOSCOSO, JORGE ZAMORA, JUAN I. SERRANO-VELA, EDUARDO GOMEZ-CASADO, MARIA JOSE CASTRO, JORGE MARTINEZ-LASO.

20. Use of a silica matrix DNA purification method in sex determination from archeological bone remains. MÁRIA BAUEROVÁ, MÁRIA VONDRÁKOVÁ, RADOSLAV OMELKA, MIROSLAV BAUER, MARIAN FABIŠ, MONIKA MARTINIAKOVÁ.

Session 8. Primate Behavior I. Contributed Posters. *Empire Ballroom*.

Chair: JOANNA E. LAMBERT, University of Wisconsin – Madison.

1:00 – 1:30 pm	Poster set-up.
1:30 – 3:00 pm	Authors of even-numbered posters present for questions.
3:30 – 5:00 pm	Authors of odd-numbered posters present for questions.
5:00 – 5:30 pm	Poster take-down.

23. Academic Genealogy on the History of American Field Primatologists. ELIZABETH A. KELLEY, ROBERT W. SUSSMAN.

24. The relationship between limb morphology and locomotor behavior in brown and weeper capuchins. KRISTIN A. WRIGHT.

Thursday Afternoon – April 7, 2005

25. Head kinematics during locomotion and the semicircular canals of free-ranging New World monkeys. JOSEPH D. ORKIN.

26. Laterality of hand function in captive orangutans (*Pongo pygmaeus*). ROBERT C. O'MALLEY, WILLIAM C. MCGREW.

27. Manual laterality in bonobos: cross-populational differences. SARAH K. ADAMSON, LINDA F. MARCHANT, WILLIAM C. MCGREW.

28. Ontogenetic patterns of positional behavior in *Cebus capucinus* and *Alouatta palliata*. MICHELLE BEZANSON.

29. A preliminary study of the ontogeny of feeding behavior in mantled howler monkeys. MELISSA L. RAGUET-SCHOFIELD.

30. Troop structure of the Mesoamerican black howler monkey (*Alouatta pigra*) and consequences of habitat fragmentation. SARIE VAN BELLE, ALEJANDRO ESTRADA.

31. Testing the model for male-male coalitions: Data from male mantled howling monkeys (*Alouatta palliata*). MARGARET R. CLARKE.

32. Male mating behavior in black and gold howler monkeys (*Alouatta caraya*) in northern Argentina. MARTIN M. KOWALEWSKI, SILVANA M. PEKER.

33. Inter-group variation in the neigh vocalization of the northern muriqui, *Brachyteles hypoxanthus*. LUISA F. ARNEDO, CHARLES SNOWDON, JEAN PHILIPPE BOUBLI, KAREN B. STRIER.

34. Spider monkey (*Ateles geoffroyi*) rehabilitation, reintroduction and conservation at Curu Wildlife Refuge, Costa Rica. TRACIE N. MCKINNEY, ADELINA SCHUTT.

35. Intergroup encounter variability among brown capuchins (*Cebus apella*) in Suriname: importance of individual troop identity. LAURIE M. KAUFFMAN, ERIN E. EHMKE, SUE BOINSKI.

36. A survey of primate populations in northeastern Venezuelan Guayana. BERNARDO URBANI.

37. They came, they saw, they conquered - now what? Management of a Costa Rica rain forest for three species of primates. MICHAELA E. HOWELLS, JILL PRUETZ.

38. Effects of the illegal animal trade on primate conservation in Vietnam. NGUYEN MANH HA, HERBERT H. COVERT.

39. Competition between chimpanzees and humans over *Saba senegalensis*. MICHEL T. WALLER.

40. A recently discovered population of Tonkin snub-nosed monkeys. HERBERT H. COVERT, LE KHAC QUYET, BARTH W. WRIGHT.

41. Status of the Hatinh langur in Phong Nha-Ke Bang National Park. CATHERINE C. WORKMAN, HERBERT H. COVERT, PHAM NHAT, NGUYEN HAI HA.

42. New Survey data on *Pygathrix nigripes*, the black-shanked douc langur, from Cat Tien National Park, Viet Nam. PHAN DUY THUC, HERBERT H. COVERT, GERT POLET, INA BERKER, TRAN VÃN MÙI.

43. Ethnoprimatology and the long-tailed macaques of Tinjil Island, Indonesia: integrating conservation and ethnography. ANDREA E. DUNCAN, ENTANG ISKANDAR, AGUS S. SUMANTOR, LISA JONES-ENGEL, RANDALL C. KYES.

44. Anthropogenic change in and around Beza-Mahafaly Reserve: methodology and results. DANA WHITELAW, MICHELLE L. SAUTHER, JAMES E. LOUDON, FRANK CUOZZO.

45. Application of population demographic modeling to the predator-prey interactions of chimpanzees and red colobus monkeys in Gombe National Park. MARC S. FOURRIER, ROBERT W. SUSSMAN, GEOFF CHILDS.

46. Digestion, cheek pouches, and mechanisms of species coexistence: an evaluation of the cercopithecine nutritional niche. JOANNA E. LAMBERT.

47. Preliminary investigation of seed dispersal by red-fronted brown lemurs (*Eulemur fulvus rufus*) in Ranomafana National Park, Madagascar. WENDY M. ERB.

Thursday Afternoon – April 7, 2005

48. Mmmm…Dirt: Implications for geophagy by the Milne-Edwards' sifaka (*Propithecus edwardsi*) at Ranomafana National Park, Madagascar. ANDREA L. BADEN, SUMMER J. ARRIGO-NELSON, PATRICIA C. WRIGHT.

49. Social behavior in captive red-fronted lemurs (*Eulemur fulvus rufus*). ADAM M. SCHAEFER.

50. Correlates of dominance rank in female ring-tailed lemurs (*Lemur catta*) at the Beza Mahafaly Special Reserve, Madagascar. RENEE N. BAUER, LISA GOULD, MICHELLE L. SAUTHER.

51. Variation in fecal testosterone levels, intermale aggression, dominance rank and age during mating and post-mating periods in wild adult male ring-tailed lemurs (*Lemur catta*). LISA GOULD.

52. Correlates of ecological and behavioral diversity in *Eulemur*. KERRY M. OSSI, JASON M. KAMILAR.

53. Activity budget and feeding ecology of *Macaca fascicularis* in Mauritius. CHRISTOPHER A. SHAFFER, ROBERT W. SUSSMAN.

54. Dispersal by force: Residence patterns of wild female hamadryas baboons. LARISSA SWEDELL.

55. A learning opportunity versus the real deal: Are adolescent female rhesus macaques (*Macaca mulatta*) fertile? CHRISTY L. HOFFMAN, MELISSA S. GERALD.

56. Genetic and environmental influences on acquired dominance status in free ranging male rhesus macaques (*Macaca mulatta*). TIMOTHY K. NEWMAN, SUE HOWELL, PAUL L. BABB, GREG C. WESTERGAARD, J. DEE HIGLEY.

57. Sex, age, and life history differences in the utilization of enrichment in captive lowland gorillas. KAREN ZAMBETTA.

58. Gendered play in juvenile bonobo chimpanzee (*Pan paniscus*): Observations of gender differences. KRISTEN A. LINDTVEDT, SONIA RAGIR, STEVE TAKACH, JASON DOUGLAS, DAN RICE, WILLIAM FIELDS.

59. Play signals and self-handicapping amongs Bonobo infants and juveniles. SONIA RAGIR.

60. Play, a negotiation of male Bonobo social relationships. JASON A. DOUGLAS.

61. Food patch choice of bonobos (*Pan paniscus*) in Lui Kotal, the Democratic Republic of Congo. KARIN BERKHOUDT, BARBARA FRUTH, PAUL A. GARBER.

62. Opportunistic hunting and occasional consumption of prey items by chimpanzees (*Pan troglodytes*) at the Primate Foundation of Arizona. ELAINE N. VIDEAN, JO FRITZ, JAMES MURPHY.

63. GIS analysis of range use by sympatric mountain gorillas and chimpanzees. CRAIG B. STANFORD, J. BOSCO NKURUNUNGI, TATIANA WHITE.

Session 9. Dental Anthropology 20 Years After: The State of the Science. Symposium. *Wright Ballroom*.

Organizers and Chairs: JOEL D. IRISH, University of Alaska – Fairbanks, and GREG C. NELSON, University of Oregon.

Commemorating the 20th anniversary meeting of the Dental Anthropology Association, this symposium highlights recent research in the subfield that is illuminating issues of fundamental anthropological importance. Using both established and innovative new methodological and technological approaches, scholars with interests ranging from the micro- to macroscopic levels of structure and expression present their latest findings on dental genetics, histology, growth and development, pathology, and morphometrics across a broad range of living and fossil human and non-human primate taxa. Thus, unlike many symposia that focus on specific topics and/or regions, the unifying theme here is diversity. The intent is to assess the current state of the subfield, emphasize its insights into diverse anthropological questions, and explore its potential future directions. Cosponsored by the Dental Anthropology Association.

1:00 pm Conceptualizing dental characters: Implications from baboon quantitative genetic analyses. LESLEA J. HLUSKO, MICHAEL C. MAHANEY.

1:15 pm Inferring primate growth, development and life history profiles from dental microstructure. GARY T. SCHWARTZ.

1:30 pm Dental age revisited. HELEN M. LIVERSIDGE.

1:45 pm Using perikymata to estimate the duration of growth disruptions in fossil hominin teeth. DEBBIE GUATELLI-STEINBERG.

2:00 pm Identification of the neonatal line using LA-ICP-MS. LOUISE T. HUMPHREY, M. CHRISTOPHER DEAN, TERESA E. JEFFRIES.

2:15 pm Insights from life's little abrasions: Dental microwear at middle-age. MARK F. TEAFORD.

2:30 pm Dental topographic analysis: Tooth wear and function. PETER S. UNGAR, SARAH R. TAYLOR.

2:45 pm Break

3:00 pm The current state of dental decay. SIMON HILLSON.

3:15 pm At what cost a full belly? An investigation of the seductive allure wrought by sedentary horticulture in the Great Basin. BRIAN E. HEMPHILL.

3:30 pm Methods of ingestion and incisal designs. KALPANA R. AGRAWAL, PETER W. LUCAS.

3:45 pm Inter- and intraspecific variation in Pan tooth crown morphology: implications for Neandertal taxonomy. SHARA E. BAILEY.

4:00 pm Dental reduction in late Pleistocene and early Holocene hominids: alternative approaches to assessing tooth size. CHARLES M. FITZGERALD, SIMON W. HILLSON.

4:15 pm Virtual dentitions: touching the hidden evidence. ROBERTO MACCHIARELLI, LUCA BONDIOLI.

4:30 pm Discussion: JOHN LUKACS, EDWARD F. HARRIS

Session 10. Sexual Dimorphism: Patterns, Evolution, and Variation. Symposium.

Crystal Ballroom.

Organizer and Chair: SANG-HEE LEE, University of California – Riverside.

A topic with a long history of research, sexual dimorphism is an important aspect of morphological variation in a species and is often associated with socio-ecological variables. This symposium presents a collection of papers that addresses critical questions on sexual dimorphism. Topics include patterns of sexual dimorphism in primates and fossil hominins, in different skeletal elements, innovative methods to study sexual dimorphism, behavioral implications, and developmental biology. This symposium provides a venue to reach an understanding of what is known and what is unknown about sexual dimorphism, and suggest promising areas of future research.

1:00 pm Sources of biological variation. Is sex really important? MACIEJ HENNEBERG, CARL N. STEPHAN, RACHEL M. NORRIS.

1:15 pm Intraspecific variation in sexual dimorphism. ADAM P. VAN ARSDALE, MARC R. MEYER.

1:30 pm Phylogenetic analyses of canine size dimorphism in primates. PATRIK LINDENFORS, SANDRA THORÉN, PETER M. KAPPELER.

1:45 pm Evolutionary developmental biology of sexual dimorphism: contrasting pelvic and nonpelvic anatomy. ROBERT G. TAGUE.

2:00 pm Variance dimorphism and the evolution of sexual dimorphism in the hominoid postcrania. PATRICIA S. VINYARD.

2:15 pm Break

2:30 pm Patterns of postcranial and body mass dimorphism in hominoids. DEBORAH L. CUNNINGHAM, THEODORE M. COLE, III, WILLIAM L. JUNGERS, CAROL V. WARD, DANIEL J. WESCOTT.

Thursday Afternoon – April 7, 2005

2:45 pm The skeletal dimorphism of *Australopithecus afarensis*. C. OWEN LOVEJOY, PHILIP L. RENO, RICHARD S. MEINDL.

3:00 pm Patterns of hard tissue sexual dimorphism within the hominin clade. BERNARD A. WOOD, DAVID GREEN.

3:15 pm Patterns of sexual dimorphism in the facial skeleton of fossil hominins. CHARLES A. LOCKWOOD, J. MICHAEL PLAVCAN.

3:30 pm Changes in sexual dimorphism in Europeans in the last 30,000 years. SANG-HEE LEE, DAVID FRAYER.

3:45 pm Inferring hominin behavior from dimorphism in a phylogenetic context. J. MICHAEL PLAVCAN, CHARLES A. LOCKWOOD.

4:00 pm Discussion: MILFORD H. WOLPOFF

Session 11. Primate Behavior II. Contributed Papers. *Walker Room*.

Chair: WILLIAM S. MCGRAW, Ohio State University.

1:00 pm Vulnerability and conservation of Ivory Coast's Tai monkey fauna. WILLIAM S. MCGRAW.

1:15 pm The effects of hunting on the densities of the Pagai, Mentawai Island primates. LISA M. PACIULLI.

1:30 pm Primates in agroecosystems: conservation value of some agricultural practices in Mesoamerican landscapes. ALEJANDRO ESTRADA.

1:45 pm My habitat or their habitat? Human and nonhuman primate overlapping resource use in Lore Lindu National Park, Indonesia. ERIN P. RILEY.

2:00 pm Slow or fast - first life history data for wild Phayre's leaf monkeys (*Trachypithecus phayrei*). CAROLA BORRIES, ANDREAS KOENIG.

2:15 pm Effects of early environment on life history strategies of female primates. DARIO MAESTRIPIERI.

2:30 pm Break

2:45 pm Predictors of Local Variation in Lemur Abundance at Ranomafana National Park, Madagascar. STEIG E. JOHNSON, PATRICIA C. WRIGHT, TIMOTHY H. KEITT, KAREN L. KRAMER, FÉLIX J. RATELOLAHY, RAVALISION, CHRISTOPHER M. HOLMES, WENDY GORDON, JEAN-PHILIPPE PUYRAVAUD.

3:00 pm Dietary demand and niche breadth among six primates in Guyana, South America. BARTH W. WRIGHT.

3:15 pm The effect of group size and season on diet and activity budget of Phayre's leaf monkeys (*Trachypithecus phayrei*). ANDREAS KOENIG, LAUREN A. SARRINGHAUS, SCOTT A. SUAREZ.

3:30 pm Effects of group size and season on the ranging behavior of Phayre's leaf monkeys (*Trachypithecus phayrei*). SCOTT A. SUAREZ, PIA TERRANOVA, ANDREAS KOENIG.

3:45 pm Group size, scramble competition and social organization in blue monkeys. MARINA CORDS, KATIE E. ROSS.

4:00 pm Effects of group composition and mating season on the agonistic and affiliative behavior of rhesus macaques (*Macaca mulatta*). LAUREN D. COX.

4:15 pm Intergroup aggression by male black and white colobus monkeys - mate or food defense? TARA R. HARRIS.

4:30 pm Ecological and social correlates of coalition formation in white-faced capuchin monkeys, *Cebus capucinus*: Why escalate? ERIN R. VOGEL.

4:45 pm Gibbon duets: what do they communicate? ULRICH H. REICHARD.

Session 12. Skeletal Biology II. Contributed Papers. *Mitchell Room*.

Thursday Afternoon – April 7, 2005

Chairs: MEGAN B. BRICKLEY, University of Birmingham UK.

1:00 pm Isotopic evidence of consumption of marine foods by ancestral Chumash. HENRY P. SCHWARCZ, SEAN BUCHNER, PHILIP L. WALKER.

1:15 pm Isotopic evidence for peripatetic behaviour at Pacatnamu, Peru. CHRISTINE D. WHITE, ANDREW J. NELSON, FRED J. LONGSTAFFE.

1:30 pm Resource intensification and sedentism in pre-contact Central California: temporal changes in health among hunter-gatherers from the Sacramento Valley and San Francisco Bay. ERIC J. BARTELINK.

1:45 pm The paleopathology of pellagra and malnutrition: investigating the impact of prehistoric and historical dietary transitions to maize. BARRETT P. BRENTON, ROBERT R. PAINE.

2:00 pm A lack of potatoes? Infantile scurvy in nineteenth century Birmingham, England. MEGAN B. BRICKLEY, RACHEL A. IVES.

2:15 pm A river with parasites runs through it: porotic lesions as evidence for iron loss and anemia among three prehispanic populations in the Andes of Peru. TIFFINY A. TUNG.

2:30 pm Break

2:45 pm Trauma patterns in the massacre victims from Punta Lobos, northern coastal Peru. SARA S. PHILLIPS, JOHN W. VERANO.

3:00 pm Changing patterns of violence: An analysis of cranial trauma in prehistoric San Pedro de Atacama. CHRISTINA TORRES-ROUFF.

3:15 pm Urban trauma: female injury recidivism in medieval london. DONALD WILLIAM WALKER, REBECCA REDFERN, AMY GRAY JONES, BRIAN CONNELL.

3:30 pm Health effects of the Black Death and Late Medieval agrarian crisis in medieval Denmark. CASSADY J. YODER.

3:45 pm Pompeii 79 CE.Demographic model for archaeologicaly derived skeletal samples. RENATA J. HENNEBERG, MACIEJ HENNEBERG.

4:00 pm The effect of migration on the dental and skeletal health of protohistoric and early historic Susquehannock Indians (AD 1575-1675). SARA K. SIMON, CELESTE M. GAGNON.

4:15 pm Masculinity and the health of the biological male, a Romano-British perspective. REBECCA C. REDFERN.

4:30 pm Early South Americans in craniofacial metric perspective: Lagoa Santa. NORIKO SEGUCHI, A. RUSSELL NELSON, SAMUEL AUSTIN, C. LORING BRACE.

4:45 pm Model-free and model-bound approaches to population variability in the Maya area. ANDREW K. SCHERER.

Friday Morning – April 8, 2004

Session 13A. Skeletal Biology III. Contributed Posters. *Empire Ballroom*.
Chair: SAMANTHA M. HENS, California State University, Sacramento.

8:00 – 8:30 am Poster set-up.
8:30 – 10:00 am Authors of even-numbered posters present for questions.
10:30 am – 12:00 pm Authors of odd-numbered posters present for questions.
12:00 – 12:30 pm Poster take-down.

1. Mummified trauma: SEM analysis of obsidian and chert induced wounds. ALAINA K. GOFF, DEBRA KOMAR.

2. Interpersonal violence at Hawikku: Interpreting perimortem trauma. ERICA B. JONES, DAWN M. MULHERN.

Friday Morning – April 8, 2005

3. Trauma in an early medieval Welsh cemetery. KATHLEEN A. BLAKE.

4. A variety of morbid symptoms: Subadult death and ill health from a turn of the century potter's field (MCIG I). JESSICA L. ZOTCAVAGE, SEAN DOUGHERTY, COLLEEN MILLIGAN, TIM PRINDEVILLE, NORMAN SULLIVAN.

5. What are paleopathologists missing? A comparison between historically-recorded and skeletally-observed diseases in a late 19th century Pima cemetery sample from southern Arizona. MARCIA H. REGAN.

6. A health assessment of 115 high status burials recovered from the Roman-Byzantine archaeological site of Elaiussa Sebaste, Turkey. R.R. PAINE, R. VARGIU, C. MORSELLI, E.E. SCHNEIDER.

7. Sinkhole burial sites in Central Texas: A comparison of pathological conditions. CHRISTINE E. ALVAREZ.

8. Late Prehistoric Infectious Disease on the Upper Texas Coast: Caplen Mound (41GV1). MATTHEW S. TAYLOR.

9. Interpreting skeletal lesions at Hawikku: Evidence for mycotic infection. DAWN M. MULHERN, DONALD J. ORTNER, CYNTHIA A. WILCZAK, ERICA B. JONES.

10. A preliminary investigation of occupational stress, health and disease, grave goods, and burial context, as determinants of social status at Umm-el Jimal (c. 300- 400 A.D.), Jordan. PAMELA K. STONE, MICHAEL A. TRAINA.

11. The quality of health of early 20th century historic blacks from the Providence Baptist Church Cemetery. REBECCA J. WILSON, LEE M. JANTZ, M. KATE SPRADLEY.

12. Locomotory apparatus and health status of the Early Medieval Population in Great Moravia (Czech Republic). PETR VELEMINSKY, MILUSE DOBISIKOVA, PETRA STRANSKA, JAKUB LIKOVSKY, VIT ZIKAN, MILAN STLOUKAL, PETRA ZITKOVA, MARTINA ZALOUDKOVA, LUCIE FIALOVA, LUMIR POLACEK.

13. Feast of the Dead: analysis of the talus and calcaneus bones from the Poole-Rose Ossuary. ADRIENNE E. PENNEY, HEATHER I. MCKILLOP.

14. Life during the early medieval period in southern Wales: evidence from the Atlantic Trading Estate skeletal collection. DENISE C. HODGES, KATHLEEN A. BLAKE, AMY L. DAVIDHIZER.

15. Questioning the relationship of cranial deformation to ossicle formation: Results from Hawikku. CYNTHIA A. WILCZAK, STEVE D. OUSLEY.

16. Congenital and developmental defects of the vertebral column in samples from Hawikku and Puye, New Mexico. MARILYN R. LONDON, CYNTHIA A. WILCZAK, J. CHRISTOPHER DUDAR, STEVE OUSLEY.

17. Cranial robusticity, teeth and diet in ancient Egypt. SONIA R. ZAKRZEWSKI.

18. A measure of biological distance in Nubians: a look at intrapopulation variation. KANYA GODDE.

19. Biodistance analysis of postmarital residence and social structure in Jomon period Japan: migration patterns and status determinants in a dynamic setting. DANIEL H. TEMPLE, PAUL W. SCIULLI.

20. Craniometric variation in the Providence Baptist Church, Shelby County, Tennessee. M. KATE SPRADLEY, REBECCA J. WILSON, LEE MEADOWS JANTZ, NICHOLAS P. HERRMANN.

21. Analysis of the human skeletal remains from the Memphis-Shelby County Airport historic cemetery (40SY619). LEE MEADOWS JANTZ, REBECCA J. WILSON, NICHOLAS P. HERRMANN, M. KATE SPRADLEY, DONNA M. MCCARTHY.

22. The Old Frankfort Cemetery: A preliminary report on a pre-Antebellum population. AMY C. FAVRET.

23. Dietary reconstruction of the Albany County Almshouse skeletal sample through the analysis of dental calculus. MARTIN C. SOLANO, KARL J. REINHARD.

24. Sexing from hands and feet in a Euro-American sample. ANN H. ROSS, D. TROY CASE.

25. 3-D landmark coordinate data sex determination of the adult human fragmented os coxa and the potentiality of euclidean distance matrix analysis. JOAN BYTHEWAY.

26. The distal humerus - A blind test of Rogers' sexing technique using a documented skeletal collection. CERI G. FALYS, HOLGER SCHUTKOWSKI, DARLENE A. WESTON.

27. A test of Meindl and Lovejoy's method of estimating adult age at death from cranial suture closure. STEPHEN P. NAWROCKI, CARLOS J. ZAMBRANO.

28. A new qualitative method for age estimation from dental radiographs with tests of observer agreement. DAVID G. MCBRIDE.

29. A preliminary study of adult age-related morphological changes of the seventh thoracic vertebra. A. MIDORI ALBERT, ERYN H. MURPHY.

30. An examination of age correction factors in the estimation of actual living height among modern skeletal material. LARA E. MCCORMICK.

31. A methodological quandary: Aging juvenile human remains. ERIN B. WAXENBAUM.

32. Stature estimation from the calcaneus. SHANNON L. VELLONE.

Session 13B. Skeletal Biology III. Contributed Posters. *Empire Ballroom*.

Chair: HOLGER SCHUTKOWSKI, University of Bradford.

8:00 – 8:30 am Poster set-up.
8:30 – 10:00 am Authors of even-numbered posters present for questions.
10:30 am – 12:00 pm Authors of odd-numbered posters present for questions.
12:00 – 12:30 pm Poster take-down.

33. If I Only Had a..: Missing element estimation accuracy using the Fully Technique for estimating statures. BENJAMIN M. AUERBACH, MICHELLE H. RAXTER, CHRISTOPHER B. RUFF.

34. A test of Fully's stature reconstruction technique in Terry Collection whites and blacks. MICHELLE H. RAXTER, BENJAMIN M. AUERBACH, CHRISTOPHER B. RUFF.

35. Stable strontium and geolocation : The first step in identification of deceased Mexican undocumented aliens, Preliminary results. CHELSEY JUAREZ.

36. Recontextualization and identity assessment of un-provenienced mummified human remains. GWYN D. MADDEN.

37. The truth is out there: how NOT to use FORDISC. DONNA FREID, M.K. SPRADLEY, RICHARD L. JANTZ, STEVE D. OUSLEY.

38. A relational database design for osteological and odontological data. ARTI MANN, NORMAN C. SULLIVAN.

39. Developmental field defects in the William M. Bass donated skeletal collection. DONNA M. MCCARTHY.

40. Dietary carbohydrates (C3, C4, marine) influence collagen stable isotope values and the collagen to apatite offset in diets with normal protein levels. CORINA M. KELLNER, MARGARET J. SCHOENINGER.

41. Variation in the juvenile craniofacial form: A pilot study. RICHARD A. GONZALEZ.

42. Mandibular changes in a mouse model for craniofacial disorders. CHERYL A. HILL, ROGER H. REEVES, JOAN T. RICHTSMEIER.

43. Chewing biomechanics in *Sus scrofa*: how do mandibular cross-sectional properties and dental microwear compare along the tooth row? JASON M. ORGAN, CHRISTOPHER B. RUFF, MARK F. TEAFORD, RICHARD A. NISBETT.

44. Metatarsal articular modifications and kneeling in Byzantine monks. JAIME M. ULLINGER, MARY ELIZABETH KOVACIK, DENNIS P. VAN GERVEN, BERT DEVRIES, SUSAN G. SHERIDAN.

45. A comparative study of pelvic variability in relation to sexual dimorphism and geography in both modern and pre-historic populations. DAWN M. CORSO.

Friday Morning – April 8, 2005

46. Quantifying cross-sectional geometry in modern human long bones using Elliptic Fourier Analysis for the purposes of ancestry attribution. MELISSA C. TALLMAN.

47. Factors influencing osteological changes in the hands of rock climbers. ANGI M. CHRISTENSEN, ADAM D. SYLVESTER, PATRICIA A. KRAMER, GITTA H. LUBKE.

48. Intraskeletal variability in bone mass. JOSHUA J. PECK, SAM STOUT.

49. Primary tissue type variability in primate bone microstructure. JOHANNA WARSHAW.

50. Ontogenetic variation in bone microstructure of catarrhines and its relationship to life history. SHANNON C. MCFARLIN, ADRIENNE L. ZIHLMAN, TIMOTHY G. BROMAGE.

51. Comparison of bone type proportions between tibiae of exercised and sedentary swine. THIERRA K. NALLEY, CAROL V. WARD, MARGARET STREETER.

52. The effects of parity on bone mineral density: pregnancy or lactation? LORENA M. HAVILL, MICHAEL C. MAHANEY, DEBORAH E. NEWMAN, JEFFREY ROGERS.

53. Metacarpal head biomechanics: A comparative backscattered electron image analysis of trabecular bone mineral density in *Pan troglodytes* and *Homo sapiens*. ANGEL ZEININGER, GIDEON HARTMAN, BRIAN G. RICHMOND.

54. A three-dimensional analysis of the geometry and curvature of the proximal tibial articular surface of hominoids. EMILY K. LANDIS.

55. Epigenetic differences in articular surface area in captive and wild chimpanzees (*Pan troglodytes*). KRISTI L. LEWTON.

56. Foramen ovale; lateral fossa: A previously undescribed plastic response of bone to pterygoid muscle forces. RICHARD T. KORITZER, GARY D. HACK.

57. Human bite force: the relation between EMG activity and bite force at a standardized gape. MATTHEW J. OLMSTED, CHRISTINE E. WALL, CHRISTOPHER J. VINYARD, WILLIAM L. HYLANDER.

58. Histological examination of femoral cortical bone in mammals: a method for species identification. MONIKA MARTINIAKOVÁ, BIRGIT GROSSKOPF, MÁRIA VONDRÁKOVÁ, RADOSLAV OMELKA, MÁRIA BAUEROVÁ, MARIAN FABIŠ.

59. An anatomically based 3-D musculo-skeletal model of the human hand for evaluation of precision grip capabilities. NAOMICHI OGIHARA, TAKEO KUNAI, MASATO NAKATSUKASA.

60. The connection between body size and enthesis morphology. CHARLOTTE Y. HENDERSON, CHARLOTTE A. ROBERTS.

61. Skeletal Biology Past and Present: Are We Moving in the Right Direction? SAMANTHA M. HENS, KANYA GODDE.

Session 14. 75 Years of the American Association of Physical Anthropologists. Symposium. *Regency Ballroom*.

Organizers and Chairs: MICHAEL A. LITTLE, Binghamton University, and KENNETH A.R. KENNEDY, Cornell University.

The symposium provides an overview of the history of physical anthropology in North America over the past century with a focus on the AAPA from its incorporation in 1930 up to the present. The symposium is arranged into two blocks of six papers each, where each group of six papers is followed by a 15-minute panel discussion. The first block of papers covers the period up to the 1950s, and the second block covers the period into the 21st century. The principal objective of the symposium is to celebrate the seventy-fifth anniversary of the AAPA (1930-2005), but another objective is to inform the younger members of the Association about the history of our profession and its primary society, the AAPA.

8:15 am Physical anthropology at the turn of the century. C. LORING BRACE.

8:30 am Principle figures in early 20th century physical anthropology. KENNETH A.R. KENNEDY.

8:45 am Ales Hrdlicka and the founding of the AJPA: 1918. DONALD J. ORTNER.

9:00 am The founding of the American Association of Physical Anthropologists (AAPA): 1930. EMÖKE J.E. SZATHMÁRY.

9:15 am Principal figures in physical anthropology before and during World War II. EUGENE GILES.

9:30 am The immediate post-war years: the Yearbook of Physical Anthropology and the Summer Institutes. MICHAEL A. LITTLE, BERNICE A. KAPLAN.

9:45 am Panel discussion: issues and directions during the first half of the century. BRACE, GILES, KAPLAN, KENNEDY, LITTLE, ORTNER, SZATHMÁRY.

10:00 am Break

10:15 am Sherwood Washburn and "The New Physical Anthropology". WILLIAM A. STINI.

10:30 am Anti-anti-racism in the Cold War. JONATHAN M. MARKS, SUSAN SPERLING.

10:45 am Race and the conflicts within the profession during the 1950s and 1960s. JOHN H. RELETHFORD.

11:00 am 75 years of the annual AAPA meetings, 1930-2004. KAYE BROWN, MATT CARTMILL.

11:15 am The modern synthesis, modern genetics, and the worldview of physical anthropology. KENNETH M. WEISS.

11:30 am Description, hypothesis testing, and conceptual advances in physical anthropology. CLARK S. LARSEN.

11:45 am Panel discussion: issues and directions during the second half of the century. BROWN, CARTMILL, LARSEN, MARKS, RELETHFORD, SPERLING, STINI, WEISS.

Session 15. Hominid Evolution III. Contributed Papers. *Crystal Ballroom*.

Chair: DANIEL E. LIEBERMAN, Harvard University.

8:00 am Testing locomotor hypothesis in early hominids: 3D modeling and simulation of bipedalisms using anatomical data. GILLES BERILLON, GUILLAUME NICOLAS, FRANCK MULTON, FRANÇOIS MARCHAL, GEORGES DUMONT, YVETTE DELOISON, DOMINIQUE GOMMERY.

8:15 am Upright posture and vertebral anatomy in *Australopithecus*. CAROL V. WARD, BRUCE LATIMER.

8:30 am Comparative prezygapophyseal morphology: implications for postural and locomotor adaptations in hominin evolution. KRISTIN E. ERICSON.

8:45 am Did the short hindlimbs of many ancestral hominids result in lower energetic efficiency in running? KAREN L. STEUDEL-NUMBERS, TIMOTHY D. WEAVER.

9:00 am Froude Number (Fr): Is it useful in comparing individuals with different leg lengths? PATRICIA A. KRAMER.

9:15 am Hip breadth and forces on the lower limb during human walking. LAURA T. GRUSS.

9:30 am Does femoral head size reflect the magnitude of hip joint reaction force in adult humans? TIMOTHY D. WEAVER.

9:45 am Break

10:00 am Why is the human gluteus so maximus? DANIEL E. LIEBERMAN, HERMAN PONTZER, ELIZABETH CUTRIGHT-SMITH, DAVID RAICHLEN.

10:15 am Functional implications of variation in lumbar vertebral count within Hominini. KATHERINE K. WHITCOME.

10:30 am Cooking, time-budgets, and the sexual division of labor. RICHARD WRANGHAM, ZARIN MACHANDA, ROBERT MCCARTHY.

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10:45 am Environmental context of early Pleistocene hominins from the Ileret subregion (Area 1a) of Koobi Fora, Kenya. RHONDA L. QUINN, CHRISTOPHER J. LEPRE.

11:00 am A comparative analysis of the KNM-ER 42700 hominin calvaria from Ileret (Kenya). FRED SPOOR, MEAVE G. LEAKEY, LOUISE N. LEAKEY.

11:15 am Bootstrap method and the analysis of cranial capacity variation in the Dmanisi fossils and *Homo ergaster*. CARLOS LORENZO, IGNACIO MARTINEZ, JUAN LUIS ARSUAGA, ANA GRACIA.

11:30 am A pubic symphysis of early Homo from the late Early Pleistocene at Buia (Danakil Depression, Eritrea). LUCA BONDIOLI, ALFREDO COPPA, DAVID W. FRAYER, YOSIEF LIBSEKAL, LORENZO ROOK, ROBERTO MACCHIARELLI.

11:45 am Late Pleistocene teeth from the Altai: A reappraisal. BENCE VIOLA, MARIA TESCHLER-NICOLA, OTTMAR KULLMER, ANDRE DEREVIANKO, HORST SEIDLER.

Session 16. Molecular and Population Genetics II. Contributed Papers. *Walker Room*.

Chair: ALAN R. ROGERS, University of Utah.

8:00 am Reading social structure from the genome: some insights from Bali. J. STEPHEN LANSING, TATIANA KARAFET, MICHAEL HAMMER.

8:15 am Assessing gene flow and population subdivision in chacma baboons (*Papio hamadryas ursinus*) using mitochondrial and nuclear DNA markers. RIASHNA SITHALDEEN, PAUL L. BABB, REBECCA ROGERS ACKERMANN, TIMOTHY K. NEWMAN.

8:30 am MtDNA Diversity in Six West Indian Islands throughout the Anglophone Caribbean. JADA P. BENN TORRES, ANNE C. STONE.

8:45 am Molecular phylogeny of the Papionini. TODD R. DISOTELL, ANDREW S. BURRELL, STEPHEN L. CLIFFORD, RYAN L. RAAUM, KIRSTIN N. STERNER, ANTHONY J. TOSI.

9:00 am Demographic and genetic estimates of the population size of the Hadzabe of Tanzania. UMA RAMAKRISHNAN, NICHOLAS BLURTON-JONES, SARAH TISHKOFF, JOANNA MOUNTAIN.

9:15 am Patterns of relatedness and the population genetic effects of male-biased dispersal in savannah baboons at Gombe National Park and Mikumi National Park, Tanzania. AMANDA VINSON.

9:30 am The distribution of ancestral alleles among populations. ALAN R. ROGERS, HENRY C. HARPENDING, STEPHEN WOODING, LYNN B. JORDE.

9:45 am Using measures of locus-specific differentiation to find genes underlying traits subject to recent genetic adaptation: A test case using skin pigmentation. HEATHER L. NORTON, RICK KITTLES, CAROLINA BONILLA, JOSH AKEY, MARK D. SHRIVER.

10:00 am Break

10:15 am Fine-scale patterns of LD across a recombinational hotspot and the recent origin of the HbC beta-globin allele. ELIZABETH T. WOOD, DARYN A. STOVER, MICHAEL W. NACHMAN, MICHAEL F. HAMMER.

10:30 am Contrasting patterns of male and female-mediated gene flow in wild bonobo populations. LINDA VIGILANT.

10:45 am Mitochondrial DNA variation among populations of Mesoamerica and the American Southwest: Does Uto-Aztecan represent a biological unit? BRIAN M. KEMP, ANDRES RESENDEZ, RIPAN S. MAHLI, JOHN MCDONOUGH, CARA MONROE, GILLIAN RHETT, DAVID G. SMITH.

11:00 am A genetic analysis of group relatedness in free-ranging black-handed spider monkeys (*Ateles geoffroyi*). CHRISTINA J. CAMPBELL, K. ANN HORSBURGH, ELIZABETH MATISOO-SMITH.

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11:15 am A genome-wide scan for quantitative trait loci influencing childhood bone mass. DANA L. DUREN, JOHN BLANGERO, THOMAS DYER, SHELLEY A. COLE, ALEX F. ROCHE, ROGER M. SIERVOGEL, BRADFORD TOWNE.

11:30 am Evolution of dental formulas and tooth development genes in primates. GEORGE H. PERRY, ANNE C. STONE.

11:45 am Genetic variation in Eastern European countries as revealed by short tandem repeat polymorphism: Utility for human identification and parentage testing. RANAJIT CHAKRABORTY, WEN - NIU, XIAOHUA - SHENG, HEE S LEE.

Session 17. Human Biology I. Contributed Papers. *Mitchell Room*.

Chair: TIMOTHY B. GAGE, University at Albany.

8:00 am Natural selection in the Tibet Autonomous Region. CYNTHIA M. BEALL, KIJOUNG SONG, ROBERT C. ELSTON, MELVYN C. GOLDSTEIN.

8:15 am Towards an "evolutionary behavioral teratology": Speculations from the endophrenology of a common birth defect. FRED L. BOOKSTEIN.

8:30 am Genotype-by-sex interaction in the regulation of high-density lipoprotein (HDL): The Framingham Heart Study. M.J. MOSHER, LISA J. MARTIN, L.A. CUPPLES, Q. YANG, TOM D. DYER, JEFF T. WILLIAMS, KARI E. NORTH.

8:45 am Are modern environments really bad for us: Revisiting the epidemiological transition. TIMOTHY B. GAGE.

9:00 am Environmental variability, life history tactics, and Neanderthal extinction. JAMES H. JONES.

9:15 am Two case-study challenges to the thrifty genotype hypothesis: an argument for expanding our etiological models of diabetes-prone populations. DANIEL C. BENYSHEK.

9:30 am A prediction model for the geographical distribution of antimicrobial resistance genes by wild and domestic animals: Mobilized reservoirs and human health implications. JESSICA F. BRINKWORTH.

9:45 am Break

10:00 am Taste, learning and food choice: expanded, multidisciplinary frameworks. BETHANY L. TURNER.

10:15 am Sex and age related changes in activity patterns: a Central California example. ROBIN M. CORDERO, JENN MALCOM.

10:30 am Pelvic size and shape in a Later Stone Age southern African sample. HELEN K. KURKI.

10:45 am A geo-spatial perspective on behavior and activity in late prehistoric eastern North America. KIMBERLY D. WILLIAMS, CLARK SPENCER LARSEN.

11:00 am New statistical methods for estimating age-at-death distributions from skeletal data: A validation study. L. JAIMESON STUART, LYLE W. KONIGSBERG.

11:15 am A reexamination of the etiology and formation of wormian bones. JENNIFER S. MALCOM, ROBIN CORDERO.

11:30 am Phenotypic integration of brain and skull. JOAN T. RICHTSMEIER, KRISTINA ALDRIDGE, ALEX A. KANE, JEFFREY L. MARSH, JAYESH PANCHAL, VALERIE B. DELEON.

11:45 am Geographical height variation in Ohio convicts born 1780-1849. NANCY E. TATAREK.

Friday Afternoon – April 8, 2004

Session 18. Adaptability of Mexican Populations. Poster Symposium. *Empire Ballroom*.

Friday Afternoon – April 8, 2005

Organizers and Chairs: FRANCISCO GURRI GARCÍA, and LAURA HUICOCHEA GÓMEZ, El Colegio de la Frontera Sur, Campeche, México.

This symposium is composed of physical anthropologists who work full-time in Mexican institutions, and has been organized so that they can share their views on the adaptability of Mexican populations. The symposium, organized by the Mexican Association of Biological Anthropology (AMAB in Spanish) presents posters that make adaptive inferences on skeletal and living Mexican populations based on their physical characteristics.

2:00 – 2:30 pm Poster set-up.
2:30 – 3:30 pm Authors present for questions.
3:30 – 4:00 pm Discussion by posters (FRANCISCO D. GURRI).
6:00 – 6:30 pm Poster take-down.

55. Microadaptation: Health and nutrition in prehispanic México. LOURDES MÁRQUEZ.

56. The mortality increment by the hepatic cirrhosis in Yucatán, México. MARTHA PIMIENTA, ALFONSO GALLARDO.

57. Changes in body composition as an adaptation to seasonal variation in food availabilty in Calakmul, Campeche, Mexico. FRANCISCO D. GURRI.

58. Fertility and demographic change in ancient Mesoamerica: Evidencies of a successful adaptation. PATRICIA O. HERNÁNDEZ, LOURDES MÁRQUEZ, MARÍA EUGENIA PEÑA.

59. Health and society in Mexico. A research line of Mexican Physical Anthropology. FLORENCIA PEÑA.

60. Epidemiological auxology of an Indian population of the central part of Veracruz, Mexico. CARLOS SERRANO SÁNCHEZ, MARÍA ELENA SÁENZ FAULHABER.

61. Body, perception and Illness after the Isidoro hurricane in Calakmul Campeche. LAURA HUICOCHEA.

62. Antioxidants and pollution among the young and elderly in México. LUIS A. VARGAS, VÍCTOR M. MENDOZA, MARTHA A. SÁNCHEZ.

Session 19. Advances in Marmoset and Goeldi's Monkey (*Callimico*) Research: Anatomy, Behavioral Ecology, Phylogeny, and Conservation. Poster Symposium. *Empire Ballroom*.

Organizers and Chairs: SUSAN M. FORD, Southern Illinois University, LEILA PORTER, University of Washington – Seattle, and LESA C. DAVIS, Northeastern Illinois University.

In the last fifteen years, there has been an explosion of new information on the marmosets and the Goeldi's monkey. Overwhelming genetic evidence now indicates that they represent a unified clade within the callitrichid radiation of New World monkeys. Seven new species have been identified, and ten others have been raised to full species status, with at least one other pending. One group of marmosets has been raised to generic level (*Mico*), and an entirely new genus has been discovered (*Callibella*). This is the first new genus of New World monkey discovered since *Callimico* a hundred years ago. We also have seen a dramatic increase of knowledge on their anatomy, locomotion, diet, ecology, and social behavior, much of which is quite surprising. For example, groups often have more than one breeding male and occasionally more than one breeding female; *Callibella*, like *Callimico*, appears to have lost twinning; *Callimico* eats fungi; and the group displays measurable craniodental and postcranial differences related to vertical clinging and other ecobehaviors. In addition, many of these species are at risk or highly endangered. Increasing our understanding of their biology, behavior, and distribution will assist their conservation. A great deal of this work has been done by Brazilian researchers, and much of it has been presented in venues not readily accessed or regularly read by American scholars. This symposium brings together scholars from the United States, Brazil, and Europe, providing a unique opportunity for the exchange of information and viewpoints as well as presentation of this new information to a wider audience of primatologists and other biological anthropologists.

2:00 – 2:30 pm Poster set-up.
3:00 – 4:00 pm Authors present for questions.
4:00 – 4:30 pm Discussion by posters (ANTHONY RYLANDS).
6:00 – 6:30 pm Poster take-down.

23. The phylogeny of the Callitrichinae, with special emphasis on the marmosets (including *Callibela*), *Callimico* and new information on Brazilian Saguinus. HORACIO SCHNEIDER, IRACILDA SAMPAIO, MARCELO VALLINOTO, JOSE A.R. BERNARDI, PERICLES S. REGO, JULIANA ARARIPE, CLAUDIA TAGLIARO.

24. New light on relationships of *Callimico* from reproductive biology. ROBERT D. MARTIN, ANN-KATHRIN OERKE, J. KEITH HODGES.

25. Social behavior of wild Goeldi's monkeys (*Callimico goeldii*). LEILA M. PORTER, PAUL A. GARBER.

26. Range use by *Callimico* in a mixed-species group. JENNIFER A. REHG.

27. A comparative study of the kinematics of leaping in Callimico goeldii and Callthrix jacchus. PAUL A. GARBER, ANA SALLENAVE, GREGORY BLOMQUIST, GUSTL ANZENBERGER.

28. Locomotion, postures, and habitat use by pygmy marmosets (*Cebuella pygmaea*). DIONISIOS YOULATOS.

29. Is infanticide by females more common in the common marmoset (*Callithrix jacchus*)? Implications for how callitrichines balance cooperation and competition. LESLIE J. DIGBY, WENDY SALTZMAN.

30. Anatomical correlates for trunk-to-trunk leaping in the forelimb and hindlimb of *Callimico goeldii*. LESA C. DAVIS.

31. The biomechanics of tree gouging in common marmosets (*Callithrix jacchus*). AMY L. MORK, CHRISTINE E. WALL, SUSAN H. WILLIAMS, BROOKE A. GARNER, KIRK R. JOHNSON, DANIEL SCHMITT, WILLIAM L. HYLANDER, CHRISTOPHER J. VINYARD.

32. Stretching the limits: Jaw-muscle fiber architecture in tree-gouging and nongouging callitrichid monkeys. CAROLYN M. ENG, CHRISTOPHER J. VINYARD, FRED ANAPOL, ANDREA B. TAYLOR.

33. Cranial morphology of callitrichid genera: variability and diversification. JOHN M. AGUIAR, THOMAS E. LACHER, JR.

34. Size and shape in marmosets skulls: allometry and heterochrony in the morphological evolution of small critters. GABRIEL MARROIG, JAMES M. CHEVERUD.

35. The skeleton of the dwarf marmoset, *Callibella humilis*: functional and phylogenetic implications. SUSAN M. FORD, LESA C. DAVIS.

Session 20. Current Research in the Analysis of Burned Human Bones. Poster Symposium. *Empire Ballroom*.

Organizers and Chairs: CHRISTOPHER W. SCHMIDT, University of Indianapolis, and STEVEN A. SYMES, Mercyhurst College.

This symposium concerns the study of thermally affected human bones. It consists of poster presentations representing both the archeological and forensic realms. The goal is to share current research in methods and theory so that osteologists can maximize the biological and cultural data that they can glean from these often highly fragmented, discolored, and commingled remains.

2:00 – 2:30 pm	Poster set-up.
3:30 – 4:30 pm	Authors present for questions.
4:30 – 5:00 pm	Discussion by posters (CHRISTOPHER W. SCHMIDT, STEVEN A SYMES).
6:00 – 6:30 pm	Poster take-down.

11. Bone biomechanical considerations in perimortem vs. postmortem thermal bone fractures: Fracture analyses on victims of suspicious fire scenes. STEVEN A SYMES, ANNE M. KROMAN, CHRISTOPHER W. RAINWATER, ANDREA L. PIPER.

12. Time, temperature, and oxygen availability: an experimental study of the effects of environmental conditions on the color and organic content of cremated bone. PHILLIP WALKER, KEVIN P. MILLER.

13. Using electron spin resonance (ESR) to quantify the thermal history of burned bones. MARK SCHURR, ROBERT G. HAYES, DELLA C. COOK.

Friday Afternoon – April 8, 2005

14. Analysis of modern cremated human remains: Gross and chemical methods. JOHN J. SCHULTZ, MICHAEL W. WARREN, JOHN S. KRIGBAUM.

15. A taphonomic analysis of burned remains from the Fox Hollow Serial Homicide Site. AMANDA BAKER BONTRAGER, STEPHEN P. NAWROCKI.

16. Analysis of burned dental remains. CHRISTOPHER W. SCHMIDT, GREGORY A. REINHARDT, STEPHEN P. NAWROCKI, MOLLY K. HILL.

17. Laboratory excavation of an Early Woodland cremation from Ross County, Ohio. CHERYL A. JOHNSTON, PAUL W. SCIULLI.

18. Interpretation of a Late Woodland cremation burial in the American Bottom. MELINDA L. CARTER.

19. Putting together the pieces: reconstructing commingled ossuary cremains. A. JOANNE CURTIN.

20. GIS analysis of the cremated skeletal material from the Walker-Noe site, Kentucky. NICHOLAS P. HERRMANN, JOANNE DEVLIN, DAVID POLLACK.

21. Replication experiments as a method for understanding cremation. MISTY A. WEITZEL.

Session 21. Reanalysis and Reinterpretation in Southwestern Bioarchaeology. Poster Symposium. *Empire Ballroom*.

Organizer and Chair: ANN L.W. STODDER, Field Museum of Natural History.

The posters in this session address a broad range of topics within the bioarchaeology of the Greater Southwest: human taphonomy and mortuary behavior, interpersonal conflict and traumatic injury, diet, the paleoepidemiology of nutritional pathologies, parasitism and infectious disease, sexual size dimorphism and analyses of metric and nonmetric traits. But they all present new research on previously studied archaeological assemblages and/or archived data. The authors use new analytical methods and new interpretive frameworks to address current issues in human biology of the prehistoric Southwest at local and regional scales. The work presented demonstrates the fundamentally cumulative nature of bioarchaeological research, the value of repeated inquiry and reanalysis, and the importance of data curation

2:00 – 2:30 pm	Poster set-up.
4:00 – 5:00 pm	Authors present for questions.
5:00 – 5:30 pm	Discussion by posters (ALAN SWEDLUND).
6:00 – 6:30 pm	Poster take-down.

43. Reassessing the Tower Kiva skeletal remains from Salmon Ruins, New Mexico. NANCY J. AKINS.

44. A reassessment of skeletal pathologies at Arroyo Hondo. ANN M. PALKOVICH.

45. Reassessing trauma: Bilateral hyoid fracture in an adult male from Arroyo Hondo Pueblo, New Mexico. ANNA S. TISON.

46. A reanalysis of Tijeras Pueblo: another look at developmental defects in the Prehispanic Southwest. HEATHER S. WILLIAMS.

47. Bioarchaeology in the Point of Pines Region: warfare, interpersonal conflict, and domestic violence explored. TERESA RODRIGUES.

48. Reassessing sex in the Pecos Pueblo skeletal sample. KATHERINE E. WEISENSEE.

49. Diachronic analysis of stature in the northern Anazazi: influence of population density and dietary protein. NANCY J. MALVILLE.

50. A current view of Ancestral Puebloan diet: starvation vs. dietary stability. SARA H. LEROY-TOREN, KARL J. REINHARD.

51. Effects of parasitism on Ancestral Pueblo maternal and infant health. KARL J. REINHARD.

52. Infant and child diseases in the pre-Columbian Grasshopper Pueblo, Arizona. MICHAEL SCHULTZ, TYEDE H. SCHMIDT-SCHULTZ.

53. Health in the prehistoric Southwest: looking for the big picture. ANN L.W. STODDER.

54. Secondary processing of human remains at the pre-hispanic site of Paquimé (Casas Grandes), Chihuahua, Mexico. GORDON F.M. RAKITA, ALLISON E. WARNOCK.

Session 22. The Metabolic Syndrome: Epidemiological, Methodological, Genetic, and Cross-Cultural Perspectives. Symposium. *Regency Ballroom*.

Organizers and Chairs: BRADFORD TOWNE, Wright State University School of Medicine, and STEPHEN T. McGARVEY, Brown University Medical School.

By the 1980s, researchers and clinicians specializing in the study and treatment of cardiovascular disease (CVD) and non-insulin dependent diabetes mellitus (NIDDM) had come to realize that CVD and NIDDM risk factors often co-occur in individuals. These risk factors primarily consist of adverse lipid profiles and impaired glucose metabolism, but also include hypertension and chronic vascular inflammation. Furthermore, it is now recognized that excess adiposity significantly contributes to each of these categories of risk factors. Over two decades ago, Kissebah (1982) popularized the term "Metabolic Syndrome" to describe this clustering of CVD and NIDDM risk factors. Since that time, increasing efforts have been made to understand the physiological, environmental, and genetic connections between the constituent components of the Metabolic Syndrome. These efforts have taken place against a backdrop of ever increasing prevalence rates of overweight and obesity, not only in the developed world, but also in developing nations. The purpose of this symposium is to examine epidemiological, methodological, genetic, and cross-cultural aspects of the Metabolic Syndrome paradigm from the perspective of clinicians, statisticians, molecular biologists, human biologists, and anthropologists. Cosponsored by the Human Biology Association.

2:00 pm Biology and genetics of the metabolic syndrome. AHMED H. KISSEBAH.

2:15 pm Structure of the metabolic syndrome: Implications for measurement, classification, and theory. RAYMOND NIAURA, JEANNE M. MCCAFFERY, BIING SHEN, JOHN TODARO, AVRON SPIRO, III, KENNETH D. WARD, MATT MULDOON, STEPHEN MANUCK.

2:30 pm Sensitivity and specificity of body mass index as a definition of the obesity component of metabolic syndrome. BANDANA M. CHAKRABORTY, RANAJIT CHAKRABORTY.

2:45 pm Measurement and assessment of centralized adiposity for genetic epidemiological studies of the Metabolic Syndrome. ELLEN W. DEMERATH, AUDREY CHOH, STEFAN A. CZERWINSKI, ROGER M. SIERVOGEL, BRADFORD TOWNE.

3:00 pm Quantitative genetic architecture of adiposity and associated Metabolic Syndrome risks. BRADFORD TOWNE, AUDREY C. CHOH, STEFAN A. CZERWINSKI, ROGER M. SIERVOGEL, ELLEN W. DEMERATH.

3:15 pm Genetic analysis of abnormalities in lipid metabolism in individuals with the metabolic syndrome. MICHAEL OLIVIER, AHMED H. KISSEBAH.

3:30 pm Break

3:45 pm Growth Patterns During Infancy and Childhood as Risk Factors for the Metabolic Syndrome. NOEL CAMERON.

4:00 pm Clinical Manifestations of the Metabolic Syndrome in Hispanics. RAUL A. BASTARRACHEA.

4:15 pm Risk Factors for Metabolic Syndrome in Alaska Natives. BERT B. BOYER, ROSEMARIE PLAETKE, SCARLETT H. HUTCHISON, GERALD V. MOHATT.

4:30 pm Health consequences of economic and lifestyle changes among indigenous Siberian populations: The emergence of the Metabolic Syndrome. WILLIAM R. LEONARD, J. JOSH SNODGRASS, MARK V. SORENSEN, LARISSA TARSKAIA, V.P. ALEKSEEV, V.G. KRIVOSHAPKIN.

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4:45 pm Prevalence of metabolic syndrome in an island population of the eastern Adriatic coast of Croatia. RANJAN DEKA, NINA SMOLEJ NARANCIC, HUIFENG XI, STJEPAN TUREK, MIRJANA CUBRILO-TUREK, DANIJELA VRHOVSKI-HEBRANG, BRANKA JANICIJEVIC, LAJOS SZIROVICZA, IGOR RUDAN, LI JIN.

5:00 pm Prevalence of the metabolic syndrome in Samoans. STEPHEN T. MCGARVEY, LINDA BAUSSERMAN, SATUPAITEA VIALI, JOSEPH TUFA.

5:15 pm Energy expenditure and traits of the metabolic syndrome in Yoruban and Africa-American women. AMY LUKE.

5:30 pm Beyond the thrifty gene: human life history, energetics, and the metabolic syndrome. CHRISTOPHER W. KUZAWA.

5:45 pm Discussion. AHMED H. KISSEBAH.

Session 23. Primate Behavior III. Contributed Papers. *Walker Room*.

Chair: GARY P. ARONSEN, Yale University.

2:00 pm Edge effects and their influence on lemur biogeography in southeast Madagascar. SHAWN M. LEHMAN, ANDRY RAJAONSON, SABINE DAY.

2:15 pm Conservation applications of positional behavior, support use, and forest structure data. GARY P. ARONSEN.

2:30 pm Population viability of the endangered Milne Edward's Sifaka (*Propithecus edwardsi*). AMY E. DUNHAM, PATRICIA C. WRIGHT, DEBORAH OVERDORFF, SHARON POCHRON, TONI LYN MORELLI, SUMMER ARRIGO-NELSON, FELIX RATELOLAHY, RAYMOND RATSIMBAZAFY.

2:45 pm Foraging in a complex niche: The development of foraging and social skills in chacma baboons. SARA E. JOHNSON.

3:00 pm Demographic analysis of a wild lemur population at Beza Mahafaly Special Reserve, Madagascar. RICHARD R. LAWLER, ALISON F. RICHARD, ROBERT E. DEWAR, CHRISTINE M. HUNTER, HAL CASWELL.

3:15 pm Patterns of mortality and trauma in a wild population of ring-tailed lemurs, Lemur catta. MICHELLE L. SAUTHER, FRANK P. CUOZZO.

3:30 pm The impact of habitat disturbance on fruit consumption by the Milne-Edwards' sifaka (*Propithecus edwardsi*) in Ranomafana National Park, Madagascar. SUMMER J. ARRIGO-NELSON.

3:45 pm Break

4:00 pm The lean season lasts all year: Diademed sifakas (*Propithecus diadema*) in forest fragments show reduced dietary diversity and rely heavily on parasitic mistletoes. MITCHELL T. IRWIN.

4:15 pm The relationship between leaf chemistry and feeding patterns in a small-bodied nocturnal folivore (*Avahi laniger*). ANDREA L. FAULKNER, SHAWN M. LEHMAN.

4:30 pm Independent and social learning in the development of aye-aye tap-foraging skills. ELISSA B. KRAKAUER, CAREL P. VAN SCHAIK.

4:45 pm Patterns of male scent marking in Propithecus edwardsi of Ranomafana National Park, Madagascar. SHARON T. POCHRON, TONI LYN MORELLI, PIA TERRANOVA, JESSICA SCIRBONA, JUSTIN COHEN, GIRISH KUNAPAREDDY, GEORGES RAKOTONIRINA, RAYMOND RATSIMBAZAFY, REMI RAKOTOSOA, PATRICIA C. WRIGHT.

5:00 pm Sex differences in vigilance in Verreaux's sifaka: Are males providing a predator-detection service? REBECCA J. LEWIS.

5:15 pm On the origins of strong polygyny and socially imposed monogamy in humans. CAREL P. VAN SCHAIK, SAGAR PANDIT.

5:30 pm Female competition: applying the socioecological model of primate coalition formation to humans. NICOLE H. HESS, EDWARD H. HAGEN.

5:45 pm Straight to the point: mediolateral forces associated with linear lemurid locomotion. KRISTIAN J. CARLSON, BRIGITTE DEMES, THERESA M. FRANZ.

Session 24. Primate Evolution I. Contributed Papers. *Crystal Ballroom.*

Chair: HERMANN PROSSINGER, University of Vienna.

2:00 pm Dietary reconstruction of Archaeolemur using dental topographic analysis. STEPHEN J. KING, MARINA B. BLANCO, LAURIE R. GODFREY.

2:15 pm Timing of growth and development of late juvenile and adolescent Japanese macaque females (*M. fuscata*). YUZURU HAMADA, HERMANN PROSSINGER.

2:30 pm Allometry of anthropoid femoral neck trabecular architecture using 3D microCT. ROBERTO J. FAJARDO, RALPH MUELLER, RICH A. KETCHAM, MATT COLBERT. 2:45 pm
compared to non-primate quadrupeds. DAVID A. RAICHLEN.

3:00 pm Diet and jaw form in *Pongo*. ANDREA B. TAYLOR.

3:15 pm Walking backwards: testing the association between centers of mass and footfall patterns. MATT CARTMILL, ERICA A. CARTMILL, DANIEL SCHMITT, PIERRE LEMELIN.

3:30 pm Sexual dimorphism and the mandibular fossa of great apes. ALON BARASH, YOEL RAK.

3:45 pm Teaching evolutionary theory: conceptual understanding of evolution among undergraduate anthropology students. DARCY L. HANNIBAL, MELISSA J. CHEYNEY.

4:00 pm Break

4:15 pm Categorization of primate molar enamel thickness. LAWRENCE B. MARTIN, ANTHONY J. OLEJNICZAK.

4:30 pm Ghosts of the past II: forelimb muscles and fasciae in some Primates. CHARLES E. OXNARD.

4:45 pm The approach to sexual maturity in Japanese macaque females (*M. fuscata*): a longitudinal growth study. HERMANN PROSSINGER, FRED L. BOOKSTEIN, YUZURU HAMADA.

5:00 pm Ecological and morphological correlates of the infraorbital foramen and its paleoecological implications. MAGDALENA N. MUCHLINSKI.

5:15 pm High-resolution (3D SR-μCT-based) structural analysis of the primate proximal tibia: Evidence for locomotion-related topographic variation. ARNAUD MAZURIER, LUCA BONDIOLI, ALBERTO BRAVIN, CHRISTIAN NEMOZ, ROBERTO MACCHIARELLI.

5:30 pm Siamang and orangutan limb anatomy: possible functional convergence? MARISSA A. SOUSA RAMSIER, ADRIENNE L. ZIHLMAN.

5:45 pm Ontogenetic Allometry in the Papionin Face. STEVEN R. LEIGH.

Session 25. Human Biology II. Contributed Papers. *Mitchell Room*.

Chair: MICHELLE LAMPL, Department of Anthropology, Emory University.

2:00 pm Possible Etiological Significance of Altered Growth Patterns in Children with Clefts of the Lip and Palate. EVELYN J. BOWERS.

2:15 pm The pre-pubertal origins of sex differences in digit ratios, and their development from infancy to maturity. MATTHEW H. MCINTYRE, BARBARA A. COHN, ELLEN W. DEMERATH, BRADFORD TOWNE, PETER T. ELLISON.

Friday Afternoon – April 8, 2005

2:30 pm The "phrenology" of testosterone: studies in the endocrinology and psychology of facial form. KATRIN SCHAEFER, BERNHARD FINK, KARL GRAMMER, PHILIP MITTEROECKER, PHILIPP GUNZ, NICK NEAVE, FRED L. BOOKSTEIN, HORST SEIDLER, JOHN T. MANNING.

2:45 pm Cognition and electroencephalography across the lifespan among the Ache. JOHN D. WAGNER, ROBERT S. WALKER, KIM R. HILL.

3:00 pm The experience of menopause in Paraguay. LYNNETTE LEIDY SIEVERT, MARIO CARLOS GONZALEZ, ANA MAGDALENA HURTADO.

3:15 pm Low social status and soy protein increase insulin sensitivity in premenopausal monkeys. JAY R. KAPLAN, JANICE WAGNER.

3:30 pm Thyroid function and pollutant exposure among Akwesasne Mohawk youth. LAWRENCE M. SCHELL, MELINDA DENHAM, MIA V. GALLO, JULIA RAVENSCROFT, ANTHONY DECAPRIO, AKWESASNE TASK FORCE ON THE ENVIRONMENT.

3:45 pm Break

4:00 pm The cost of reproduction in the Gambia: does investment in reproduction decrease women's survival rates? REBECCA SEAR, RUTH MACE.

4:15 pm Progesterone levels during conception and implantation do not predict subsequent fetal loss. VIRGINIA J. VITZTHUM, HILDE SPIELVOGEL, JONATHAN THORNBURG.

4:30 pm Novel variation in diurnal rhythms of salivary testosterone in rural Bolivian men. CAROL M. WORTHMAN, VIRGINIA J. VITZTHUM, CYNTHIA M. BEALL, E. VARGAS, M. VILLENA, R. SORIA, H. SPIELVOGEL.

4:45 pm Grandma's right: A sleeping baby may be a growing baby. MICHELLE LAMPL.

5:00 pm Tracking the emergence of childhood obesity in a rural Papua New Guinea population using historical data. STANLEY J. ULIJASZEK.

5:15 pm Nighttime parenting behavior among first-time adolescent and adult mothers: implications for child development. LANE E. VOLPE, JAMES J. MCKENNA.

5:30 pm In Dogon families, who helps and who harms children's nutritional status? BEVERLY I. STRASSMANN, RUSSELL P. HERROLD, IV.

5:45 pm Quality and consistency of infant care in daytime and nighttime parenting of first-time adolescent and adult mothers. WILLOW A. WETHERALL, JAMES J. MCKENNA.

Saturday Morning – April 9, 2005

Session 26. Dental Anthropology II. Contributed Posters. *Empire Ballroom*.

Chair: EDWARD F. HARRIS, University of Tennessee – Memphis.

8:00 – 8:30 am	Poster set-up.
8:30 – 10:00 am	Authors of even-numbered posters present for questions.
10:30 am – 12:00 pm	Authors of odd-numbered posters present for questions.
12:00 – 12:30 pm	Poster take-down.

1. Genetic and environmental influences on tooth crown diameters in twins. EDWARD F. HARRIS.

2. X-linked loci influence morphological variation on molar crowns in pedigreed baboons. MICHAEL C. MAHANEY, JACK W. KENT, JR., LOREN R. LEASE, LESLEA J. HLUSKO.

3. Comparison of deciduous and permanent dental morphology in a European American sample. HEATHER J.H. EDGAR, LOREN R. LEASE.

4. An evaluation of microCT for assessing in 3D the concordance of dental trait expression between the dentin-enamel junction and the outer enamel surface of modern human molars. MATTHEW M. SKINNER, RASESH KAPADIA.

5. Non-metric dental variation among the ancient Maya of Northern Belize. GABRIEL D. WROBEL.

6. Differences in dentine/enamel proportions between the first and second permanent mandibular molars. NETTA LEV-TOV CHATTAH, URI ZILBERMAN, PATRICIA SMITH.

7. A mesio-buccal mandibular molar trait in ancient populations of Ireland. JAIMIN D. WEETS.

8. Cementum Luminance Analysis (CLA): a new approach to dental cementum studies. CARA M. WALL.

9. Measuring the amount of exposed dentine: A comparison of two methods. CHRIS A. DETER.

10. Analyses of dental microwear of heavily worn occlusal surfaces of mandibular molars from Neolithic Japan using SEM. TERUYUKI HOJO.

11. Possible congenital hypoplasia in Jomon period Japanese. KARA C. HOOVER, DANIEL H. TEMPLE, HIROKO HASHIMOTO.

12. Linear enamel hypoplasias in early Medieval population of Great Moravia (Czech Republic). PAVEL TREFNY, PETR VELEMINSKY.

13. Childhood health in the community of Portus Romae (2nd to 3rd Century BCE) determined from microscopic enamel defects in children with mixed dentitions. ALESSIA NAVA, LUCA BONDIOLI, CHARLES M. FITZGERALD, SHELLEY SAUNDERS, ALFREDO COPPA, ROBERTO MACCHIARELLI.

14. Dental health decline in the Chesapeake Bay, Virginia: the role of European contact and multiple stressors. SALLY M. GRAVER.

15. Prehistoric diet and dentan health at the Grand Bay site - Carriacou, Grenada, W.I. RYAN R. REEVES, CLAUDIA KRAAN.

16. The People of Nebira, Papua New Guinea: Subsistence, Health, and Disease. COREY J. JOSSELYN, CHRISTINA TORRES-ROUFF.

Session 27. Primate Biological Variation I. Contributed Posters. *Empire Ballroom*.

Chair: MICHELLE SINGLETON, Chicago College of Osteopathic Medicine.

8:00 – 8:30 am	Poster set-up.
8:30 – 10:00 am	Authors of even-numbered posters present for questions.
10:30 am – 12:00 pm	Authors of odd-numbered posters present for questions.
12:00 – 12:30 pm	Poster take-down.

23. MRI analysis of the calcarine and lunate sulci in modern humans. JOHN S. ALLEN, JOEL BRUSS, HANNA DAMASIO.

24. Is humanlike lateralization of cytoarchitecture found in other species with complex social vocalization? A stereologic examination of mustached bat auditory cortex. MARY ANN RAGHANTI, JEFFREY WENSTRUP, CHET SHERWOOD.

25. Cell Columns In Frontal Cortex of Apes and Humans. DANIEL P. BUXHOEVEDEN, KATERINA SEMENDEFERI.

26. The ontogeny of cranial capacity and dental development: a study of growth patterns in primates. NANCY L. BARRICKMAN.

27. Exploring whether or not chimpanzees (*Pan troglodytes*) can discern oppositions and its implications on human evolution. ANDREW R. HALLORAN, DOUGLAS BROADFIELD, DAVID BJORKLUND, ROSE HORES.

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28. Independence of biomechanical forces and craniofacial pneumatization in *Cebus*. TODD C. RAE, THOMAS KOPPE.

29. Correlates of frontal sinus evolution in strepsirrhines. SANDRA TÜCKMANTEL, ALEXANDRA E. MÜLLER, CHRISTOPHE SOLIGO.

30. New insights into the paranasal sinuses of *Callithrix jacchus*. THOMAS KOPPE, TODD C. RAE OLIVIA S. SCHIWALL, SCOTT LOZANOFF.

31. An interspecific analysis of relative posterior facial height in strepsirrhine and anthropoid primates. BROOKE A. GARNER, CHRISTOPHER VINYARD.

32. A comparative geometric analysis of cranial ontogeny in genus *Macaca*. MICHELLE SINGLETON.

33. Analysis of cranio-mandibular shape differences among *Pan troglodytes* subspecies using geometric morphometrics. CHRIS ROBINSON, KATERINA HARVATI.

34. 3-D geometric morphometric analysis of the papionin temporal bone. CHRISTOPHER C. GILBERT.

35. Skeletal pathologies in wild chimpanzees from Tai National Forest, Cote d'Ivoire. ADRIENNE L. ZIHLMAN, CHRISTOPHE BOESCH.

36. Mobility of the muscles of facial expression in *Papio hamadryas*. SETH D. DOBSON.

37. A study of the scaling patterns of physiological cross-sectional area of the chewing muscles in prosimians. JONATHAN M.G. PERRY, CHRISTINE E. WALL.

38. Molar cusp formation in common chimpanzees (*Pan troglodytes*). TANYA M. SMITH, ANTHONY J. OLEJNICZAK, LAWRENCE B. MARTIN, DONALD J. REID, M. CHRISTOPHER DEAN.

39. Histologically determined age at first molar emergence in *Pongo pygmaeus*. JAY KELLEY, GARY T. SCHWARTZ.

40. Sex differences in emergence of deciduous dentition in captive lowland gorillas (*Gorilla gorilla gorilla*). ANNA BELLISARI, DANA L. DUREN, RICHARD J. SHERWOOD.

41. Sexual dimorphism in the anthropoid os coxae. ELIZABETH M. ST CLAIR.

42. Patterns of dimorphism of the hominoid forelimb and the relationship of phylogeny, allometry, and function with interspecific pattern similarity. LAURA K. STROIK.

43. Sexual dimorphism and morphological integration in baboons. BRENDA FRAZIER, KRISTINA ALDRIDGE, JOAN T. RICHTSMEIER.

44. Mid-lumbar transverse process orientation: relationships to thoracic shape and locomotion in Anthropoidea. DANIELLE F. ROYER.

45. Variation in internal structure of distal humerus among small primates. NAOKO EGI, MASATO NAKATSUKASA, NAOMICHI OGIHARA.

46. Comparative analysis of human and great ape proximal and subtalar ankle joints. MATTHEW G. NOWAK.

47. Thumb reduction in colobines: Adaptation or pleiotropy? MICHAEL S. SELBY, PHILIP L. RENO, MELANIE A. MCCOLLUM, C. OWEN LOVEJOY.

48. Phylogenetic and functional analysis of primate carpal ossification sequences: a test of two methods. TRACY L. KIVELL.

49. Dynamic plantar pressure distribution during locomotion in bipedally trained Japanese macaques. EISHI HIRASAKI, JANDY B. HANNA, NAOMICHI OGIHARA, HIROO KUMAKURA, MASATO NAKATSUKASA.

50. The development of muscle lever arms in primates: a longitudinal study of *Cebus albifrons* and *Cebus apella*. JESSE W. YOUNG.

51. Growth-related hormones in great apes. ROBIN M. BERNSTEIN.

52. Lemurs diverge in expression of a hormonal biomarker of life history. DIANE K. BROCKMAN, PATRICIA L. WHITTEN, JAMES MILLETTE.

53. Milk composition varies in relation to maternal condition in captive rhesus macaques (*Macaca mulatta*). KATHERINE HINDE.

54. Concentration of sIgA in the milk of *Macaca mulatta*. LAUREN A. MILLIGAN.

55. Low birth weight and hypothalamic-pituitary-adrenal (HPA) axis function in infant rhesus macaques. MELANIE L. SCHWANDT, COURTNEY SHANNON, STEPHEN G. LINDELL, STEPHEN J. SUOMI, JAMES D. HIGLEY.

56. The fetal/placental ratio in *Callithrix jacchus* and its relation to litter size. JULIENNE N. RUTHERFORD, DONNA G. LAYNE, SUZETTE D. TARDIF.

57. Lemur Genital Anatomy and Clitoris Length. KATE TREATMAN-CLARK, PATRICIA WRIGHT.

58. Eye morphology in Eulemur - evidence of cathemeral adaptation. EDWARD CHRISTOPHER KIRK.

59. Factors influencing the biogeography of anthropoid primate community structure in Africa. JASON M. KAMILAR.

Session 28. The Human - Non-Human Primate Interface: History, Evolution and Conservation.

Third Annual Wiley-Liss Symposium. *Wright Ballroom*.

Organizers and Chairs: TRUDY R. TURNER, University of Wisconsin – Milwaukee, AGUSTIN FUENTES, University of Notre Dame, and FRED ANAPOL, University of Wisconsin – Milwaukee.

The human – non-human primate interface is a core component in conservation and an emerging area of relevance to biological anthropology. Long term sympatry between human and non human primates has resulted in a complex web of behavioral, ecological, epidemiological and economic relationships. These relationships effect the long term survival of many primate species. The tool kit of biological anthropology, including primatology, human biology, paleontology and behavioral analyses, provides an appropriate set of perspectives to assess this interface. In this symposium we discuss aspects of these diverse relationships in the context of biological, anthropological and evolutionary approaches. Researchers from habitat countries as well as those from the United States working with non-human primates around the world will share results of studies of humans and non-human primates living side-by-side.

8:30 am Human-Nonhuman primate interconnections and their relevance to Biological Anthropology. AGUSTIN FUENTES.

8:45 am Humans, baboons and vervet monkeys: exploring sympatry and synchrony for evolutionary insights. DARREN CURNOE, TRUDY TURNER, JACK COATE, KERRY SLATER.

9:00 am Primate sanctuaries, taxonomy and survival: A case study from South Africa. PAUL J. GROBLER, MAGALI JACQUIER, HELENE DE NYS, MARY BLAIR, PATRICIA L. WHITTEN, TRUDY R. TURNER.

9:15 am Ethnoprimatology of the rhesus monkeys of India. LINDA D. WOLFE.

9:30 am Bi-directional pathogen transmission between humans and nonhuman primates: Implications for conservation and public health. LISA E. JONES-ENGEL, GREGORY A. ENGEL.

9:45 am Monkey-human interactions in Thailand. NANTIYA AGGIMARANGSEE, WARREN Y. BROCKELMAN.

10:00 am Break

10:15 am Neotropical monkeys and Amazonian culture. LORETTA A. CORMIER.

10:30 am Human dimensions of muriqui conservation efforts. KAREN B. STRIER, JEAN PHILIPPE BOUBLI, SERGIO L. MENDES.

10:45 am Coexistence and exclusion between humans and monkeys in Japan: Is either really possible? DAVID S. SPRAGUE.

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11:00 am The limits of using traditional taboos for primate conservation at Boabeng-Fiema, Ghana. TANIA L. SAJ, PASCALE SICOTTE.

11:15 am Three Primates-One Reserve: Applying a holistic approach to understand the dynamics of behavior, conservation, and disease amongst ring-tailed lemurs, Verreaux's sifaka, and humans at Beza Mahafaly Special Reserve, Madagascar. JAMES E. LOUDON, MICHELLE L. SAUTHER, KRISTA D. FISH.

11:30 am Discussion. TRUDY TURNER, AGUSTIN FUENTES, FRED ANAPOL.

Session 29. Inference of Human Population History from Genetic Variation: Bridging the Gap Between Theory and Data. Symposium. *Regency Ballroom*.

Organizers and Chairs: JOANNA MOUNTAIN, Stanford University, and CONNIE J. MULLIGAN, University of Florida.

Successful inference of human population history from genetic variation requires that we disentangle the effects of population size, gene flow, shared ancestry, migration and population subdivision. Spurred by the wealth of genetic data available as a result of whole genome sequencing projects, researchers have developed new analytic tools that allow us, in theory, to resolve these phenomenon to a finer degree than was previously possible. The papers in this symposium focus on the application of both novel and existing methods to molecular genetic data in the context of reconstructing various events and processes of human evolution. Given the growing number of pertinent datasets, the extent to which different genomes or chromosomes reveal sex-biased distinctions in human population history is of particular importance. The overall goal of the symposium is to bridge the gap between general theories or methods and specific anthropological genetic datasets or hypotheses.

8:00 am Models for predicting patterns of X-chromosomal genetic variation from autosomal variation. NOAH A. ROSENBERG, SOHINI RAMACHANDRAN, LEV A. ZHIVOTOVSKY, MARCUS W. FELDMAN.

8:15 am Comparing male and female demographic histories using autosomal and X-chromosomal microsatellites. SOHINI RAMACHANDRAN.

8:30 am Methods for inferring population size change from genetic data. STEPHEN WOODING.

8:45 am Population expansions in South Indian caste and tribal populations: inferences from genetic data. LYNN B. JORDE, STEPHEN P. WOODING, MICHAEL BAMSHAD, W. SCOTT WATKINS, B.V.R. PRASAD.

9:00 am Demographic history of African populations inferred from mtDNA analysis. SARAH TISHKOFF, MARY K. GONDER, HOLLY MORTENSEN, JIBRIL HIRBO, ALEXANDRA DE SOUSA, TRINI MIGUEL, FLOYD REED.

9:15 am Demographic and selective history of African populations inferred from genome wide genetic markers. FLOYD A. REED, SARAH A. TISHKOFF.

9:30 am Break

9:45 am Testing models of ancient admixture using sequence polymorphism data. JEFFREY D. WALL.

10:00 am Sequence data from the autosomes and X chromosome: Evidence for ancient admixture in the history of *H. sapiens*? MICHAEL HAMMER, DANIEL GARRIGAN, JASON WILDER, ZAHRA MOBASHER, TESA SEVERSON, SARAH KINGAN.

10:15 am History of modern human population structure inferred from the worldwide survey on Xp11.22 sequences. MAKOTO K. SHIMADA, JODY HEY.

10:30 am Assessing complex demographic models of human history. JODY HEY.

10:45 am Population structure and history in Peru. ANNE C. STONE, GRACIELA S. CABANA, RAUL Y. TITO, PAUL W. LOPEZ, GIAN CARLO IANNACONE, CECIL M. LEWIS, BEATRIZ LIZARRAGA.

11:00 am Inference of population history from DNA haplogroup frequencies using computer simulation modeling. GRACIELA S. CABANA, CECIL M. LEWIS, ANNE C. STONE.

11:15 am Predictions of isolation by distance and alternatives for human gene geography. JEFFREY C. LONG, KEITH HUNLEY.

11:30 am Rejection of isolation by distance for human gene geography and suggested alternatives. KEITH L. HUNLEY, J.C. LONG.

11:45 am Discussion. CONNIE J. MULLIGAN, JOANNA MOUNTAIN.

Session 30. Primate Evolution II. Contributed Papers. *Crystal Ballroom*.

Chair: WILLIAM L. JUNGERS, Stony Brook University School of Medicine.

8:00 am A re-analysis of activity pattern in *Teilhardina asiatica* and the evolution of activity pattern in early primates. CHRISTOPHER P. HEESY, CALLUM F. ROSS.

8:15 am Three newly discovered skulls of *Homunculus patagonicus* support its position as a stem platyrrhine and establish its diurnal arboreal folivorous habits. RICHARD F. KAY, SERGIO VIZCAINO, ADÁN TAUBER, M. SUSANA BARGO, BLYTHE A. WILLIAMS, CARLOS LUNA, MATT W. COLBERT.

8:30 am The paleobiology of Pachylemur. NATALIE VASEY, LAURIE R. GODFREY, VENTURA R. PEREZ.

8:45 am New body mass estimates for extinct Malagasy lemurs based on long-bone geometry. WILLIAM L. JUNGERS, B. DEMES, KRISTIN S. LAMM.

9:00 am A new small-bodied ape from the middle Miocene Ngorora Formation, Tugen Hills, Kenya. JAMES B. ROSSIE, ANDREW HILL.

9:15 am Craniofacial growth and development in Parapapio and other Plio-Pleistocene southern African cercopithecines. FRANK L. WILLIAMS, REBECCA R. ACKERMANN, STEVE R. LEIGH.

9:30 am A reevaluation of the phylogenetic utility of incisor heteromorphy. VARSHA C. PILBROW.

9:45 am Break

10:00 am New evidence for dietary function in *Afropithecus turkanensis* canines: An application of high resolution polynomial curve fitting (HR-PCF) to canine curvature. ANDREW S. DEANE.

10:15 am Interpreting hallucal prehensility from cuboid morphology in Hominoid primates. BIREN A. PATEL.

10:30 am Are Paranthropus crania only scaled variants of gracile Australopithecines? PHILIPP GUNZ, PHILIPP MITTEROECKER, SIMON NEUBAUER, FRED L BOOKSTEIN, GERHARD W. WEBER.

10:45 am Multivariate analysis of the axillary border of the scapula in juveniles. AMANDA M. BUSBY, JAMES DEGNAN.

11:00 am Morphology and keeling of the trochlear notch articular surface in extant and fossil hominoids. MICHELLE S. DRAPEAU.

11:15 am Introducing a new three-dimensional technique (curve matching) to study of the midfacial region in European Mid-Upper Pleistocene hominids. HAMED VAHDATINASAB, DONALD CARL JOHANSON, GEOFFREY ANDERSON CLARK, WILLIAM H. KIMBEL, PUSHPAK KARNICK..

11:30 am Pleiotropic relationships between ossicular and mandibular robusticity. MARK N. COLEMAN.

11:45 am Examining affinities of the Taung cranium based on morphometric ontogenetic simulation. KIERAN P. MCNULTY, STEVE R. FROST, DAVID S. STRAIT.

Session 31. Skeletal Biology IV. Contributed Papers. *Walker Room*.

Chair: BENEDIKT HALLGRIMSSON, University of Calgary.

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8:00 am The brachymorph mouse and human evolution. JEVON J.Y. BROWN, ALICE FORD-HUTCHINSON, FRANK JIRIK, DANIEL E. LIEBERMAN, BENEDIKT HALLGRIMSSON.

8:15 am Little mice and the developmental basis for craniofacial allometry. BENEDIKT HALLGRIMSSON.

8:30 am In vitro strain of monkey facial sutures. QIAN WANG, PAUL C. DECHOW, DAVID STRAIT, CALLUM ROSS, BRIAN RICHMOND, MARK SPENCER.

8:45 am Three-dimensional analysis on the variation in maxillary sinus anatomy among platyrrhine monkeys. TAKESHI NISHIMURA, MASANARU TAKAI, TAKEHISA TSUBAMOTO, NAOKO EGI, NOBUO SHIGEHARA.

9:00 am Vertebral body bone mineral density decreases as a function of body weight in strepsirhine primates. JEREMY M. DESILVA, LAURA MACLATCHY, MARY BOUXSEIN, ROBERT FAJARDO.

9:15 am Comparative analysis of murine metatarsal ossification and implications for differential skeletal growth in primates. PHILIP L. RENO, DENISE L. MCBURNEY, C. OWEN LOVEJOY, WALTER E. HORTON, JR.

9:30 am Break

9:45 am On the classification of abnormal head shape: interpreting artificial cranial deformation and craniosynostosis. TYLER G. O'BRIEN, KELLEN P. SENSOR.

10:00 am Artificial cranial deformation in the prehistoric lower Mississippi river valley. STEVEN N. BYERS.

10:15 am Diets and sutures: does dietary consistency influence sutural complexity? JENNIFER L. HOTZMAN.

10:30 am Carpal coalition: Identification and population variation. SCOTT E. BURNETT, D. TROY CASE.

10:45 am Tarsal coalition: Identification and population variation. DANIEL T. CASE, SCOTT E. BURNETT.

11:00 am Spondylolysis patterning in two native Alaskan skeletal collections. SCOTT S. LEGGE.

11:15 am Out of joint: what patterns of osteoarthritis might tell us about activity. ELIZABETH WEISS, ROBERT JURMAIN.

11:30 am Estradiol, estrogen receptor alpha, and osteogenic responses to mechanical loading. MAUREEN J. DEVLIN, DANIEL E. LIEBERMAN, BJORN R. OLSEN, NAOMI FUKAI.

11:45 am Biodistance, regional gene flow and the ossuary tradition on the Late Woodland (AD 800-1650) North Carolina coast. ANN M. KAKALIOURAS.

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Session 32. Human Biology III. Contributed Posters. *Empire Ballroom*.
Chair: BENJAMIN CAMPBELL, Boston University.

1:00 – 1:30 pm Poster set-up.
1:30 – 3:00 pm Authors of even-numbered posters present for questions.
3:30 – 5:00 pm Authors of odd-numbered posters present for questions.
5:00 – 5:30 pm Poster take-down.

1. Human infant sleep locations as determined by primiparous adolescent and adult mothers. KRISTIN P. KLINGAMAN, LANE E. VOLPE, JAMES J. MCKENNA.

2. Body orientations, sleep positions, and breast feeding behavior amongst solitary and co-sleeping (bedsharing) human mother-infant pairs: mutual physiological regulatory effects. THEODORE BROWN, KRISTIN P. KLINGAMAN, DANIEL STEVENSON, JAMES J. MCKENNA.

3. Patterns of mother-infant vocal interactions during nighttime routines: implications for child development. JOHN P. ROWLANDS, WILLOW A. WETHERALL, LANE E. VOLPE, JAMES J. MCKENNA.

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4. Beyond the weanling's dilemma: Feeding patterns as a predictor of infant. ELIZABETH A. QUINN, ANDREA CATALANO, MICHELLE L. LAMPL.

5. Noninvasive methods for steroid measurement during infancy. AMANDA L. THOMPSON, MICHELLE LAMPL, JAMES B. MILLETTE, PATRICIA L. WHITTEN.

6. Development technology increases birth rate and childhood malnutrition in rural Ethiopia. MHAIRI A. GIBSON, RUTH MACE.

7. Child anthropometry and cultural variation in four Mayan refugee communities. JENNIFER SOIKA, BAGLINI LINDSAY, FAITH WARNER.

8. A longitudinal analysis of adolescent long bone growth. SHELLEY L. SMITH, PETER H. BUSCHANG.

9. Variation in the development of postcranial robusticity: an example from Çatalhöyük, Turkey. LIBBY W. COWGILL, LORI D. HAGER.

10. Age Related Changes in Body Composition and Physical Function among Ariaal Males. BENJAMIN CAMPBELL, PETER GRAY.

11. Heritability of appendicular skeletal muscle mass in healthy adults. STEFAN A. CZERWINSKI, AUDREY C. CHOH, MIRYOUNG LEE, ELLEN W. DEMERATH, BRADFORD TOWNE, ROGER M. SIERVOGEL.

12. The effects of the Civil War on the health of the United States population: evidence from secular trends in stature. DANIEL J. TYREE.

13. Sex differences in the effect of managerial positions on blood pressure in Hawaii hotel workers. DANIEL E. BROWN, GARY D. JAMES, LYNN A. MORRISON, ANGELA REZA, NICOLA M. NICOLAISEN.

14. Features of metabolic syndrome in premenopausal women in the UK: immigrants from Pakistan compared to Pakistani and European-origin women born in the UK. TESSA M. POLLARD, NIGEL UNWIN, COLIN FISCHBACHER, JAGDIP K. CHAMLEY.

15. The relationship between a quantitative measure of facial harmony and subjective measures of facial attractiveness. PAUL L. JAMISON, RICHARD E. WARD, LESLIE G. FARKAS.

16. Total energy expenditure in the Yakut (Sakha) of Siberia as determined by the doubly labeled water technique. JAMES J. SNODGRASS, WILLIAM R. LEONARD, LARISSA A. TARSKAIA, V.P. ALEKSEEV, VADIM G. KRIVOSHAPKIN, DALE A. SCHOELLER.

17. Assessment of factors affecting BMR in humans and chimpanzees, and derivation of new predictive equations. ANDREW W. FROEHLE, MARGARET J. SCHOENINGER.

18. Human variation in the American Journal of Physical Anthropology. SARA STINSON.

19. A test of the Grandmother Hypothesis using genealogical data in Costa Rica. LORENA MADRIGAL, MAURICIO MELENDEZ-OBANDO, RAMÓN A. VILLEGAS-PALMA.

20. The effect of breastfeeding intensity on bone mineral density. KAREN L. PEARCE.

21. Changes in breastfeeding practices among migrant Bangladeshi women in London. ALEJANDRA NUNEZ DE LA MORA, DORA NAPOLITANO, OSUL CHOUDHURY, GILLIAN R. BENTLEY.

22. Variation in diurnal electrolyte excretion over the menstrual cycle. GARY D. JAMES.

23. Preliminary examination of skeletal remains excavated between 1999 and 2004 at Gz 4, an early medieval cemetery site in Giecz, Poland. HEDY M. JUSTUS, AMANDA M. AGNEW.

24. Stature at the site of Hierakonpolis compared with earlier and later periods. ALI M. KHWAILEH.

25. Little Deaths: Infant and child mortality from a late 19th century poorhouse cemetery. SEAN P. DOUGHERTY, JESSICA ZOTCAVAGE, COLLEEN MILLIGAN, JULIANNE IVANY, ARTI MANN, NORMAN SULLIVAN.

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26. Subadult skeletal growth at Hierakonpolis, a working-class cemetery of predynastic Egypt. ERNEST K. BATEY, III.

27. Spatial and temporal dynamics of respiratory disease in Orkney, Scotland 1855-1940. COREY S. SPARKS, NICOLE M. GOODWINE, NITA BHARTI, JAMES W. WOOD.

28. Reading between the lines, an assessment of stress from HK-43 tibiae. ANDREW J. WARD.

29. Proximal limb muscle attachments and work levels of a Predynastic Egyptian population. MELISSA ZABECKI.

30. Relationships between health, burial, and social structure at Úcupe (Zaña River Valley): A new perspective on the Chimú of ancient Northern Coastal Peru. HAAGEN D. KLAUS, CARLOS WESTER.

31. Stable isotope analysis of diet in a Byzantine monastic community. MELISSA K. REGAN, LESLEY A. GREGORICKA JAIME ULLINGER, MARK SCHURR, SUSAN GUISE SHERIDAN.

Session 33. Primate Craniofacial Function and Biology: Symposium in Honor of William L. Hylander. Symposium. *Crystal Ballroom*.

Organizers and Chairs: MATTHEW J. RAVOSA, Northwestern University Feinberg School of Medicine, CHRISTOPHER J. VINYARD, Northeastern Ohio Universities College of Medicine, CHRISTINE E. WALL, Duke University.

In a mature discipline like biological anthropology, significant advances and arguably most paradigm shifts are likely to be derived via several routes: new fossil finds which compel us to revise our notions regarding the adaptive significance of pronounced morphological transformations; the advent of innovative techniques to address seemingly intractable problems; and the application of analyses which synthesize and integrate evidence concerning outstanding issues. Over a 30-year research career, it is these last two categories in which Prof. William L. Hylander has radically revised and expanded our understanding of the evolution of the skull and masticatory apparatus in human and non-human primates. In honor of William Hylander's distinguished, life-long contribution to bioanthropology, we present the following symposium surveying recent developments in primate craniofacial function and biology. We have selected experts in the fields of primatology and mammalogy, all of whom have collaborated directly with Bill and have benefited from his mentoring and scholarship.

1:00 pm Facial development in marsupials: Functional requirements and developmental constraints. KATHLEEN K. SMITH.

1:15 pm Biomechanics of the fused mandibular symphysis in placental and marsupial herbivores. ALFRED W. CROMPTON, DANIEL E. LIEBERMAN.

1:30 pm In vivo data provide insights into alternative explanations of symphyseal fusion in mammals: The case of the selenodont artiodactyls. SUSAN H. WILLIAMS, CHRISTINE E. WALL, CHRISTOPHER J. VINYARD, WILLIAM L. HYLANDER.

1:45 pm Relationship between three dimensional microstructure and elastic properties of cortical bone in the human mandible and femur. PAUL C. DECHOW.

2:00 pm Understanding the mechanical effects of dental alveoli. DAVID J. DAEGLING, RUXANDRA MARINESCU, JENNIFER L. HOTZMAN, ANDREW J. RAPOFF.

2:15 pm What else is the tall mandibular ramus in *A. boisei* good for? YOEL RAK.

2:30 pm A critical biological function: mastication and the evolution of *Homo*. SUSAN C. ANTÓN.

2:45 pm Break

3:00 pm Mechanical loading and functional adaptation in the masticatory apparatus. STUART STOCK, MATTHEW J. RAVOSA, RAVI KUNWAR, EUGENE P. LAUTENSCHLAGER, SHARON STACK.

3:15 pm Are jaw-muscle activity patterns correlated with masticatory apparatus morphology among primate species? KIRK R. JOHNSON, CHRISTINE E. WALL, SUSAN H. WILLIAMS, WILLIAM L. HYLANDER, CHRISTOPHER J. VINYARD.

3:30 pm Comparative muscle activity and temporomandibular joint loading in strepsirrhine and haplorhine primates. MARK A. SPENCER, CALLUM F. ROSS.

3:45 pm Myosin expression, muscle function and craniofacial form. DAVID S. CARLSON.

4:00 pm Functional heterogeneity of the temporalis muscle of male and female baboons. CHRISTINE E. WALL, CHRISTOPHER J. VINYARD, KIRK R. JOHNSON, SUSAN H. WILLIAMS, WILLIAM L. HYLANDER.

4:15 pm Primate chewing kinetics: How do primates chew harder? CALLUM F. ROSS.

4:30 pm A preliminary analysis of occlusal events during mastication in baboons employing an intra-molar force transducer. WILLIAM L. HYLANDER, KIRK R. JOHNSON.

4:45 pm Discussion. MATT CARTMILL, RICHARD F. KAY.

Session 34. Molecular and Population Genetics III. Contributed Papers. *Walker Room*.
Chair: LORI E. BAKER, Baylor University.

1:00 pm Matrilineal affinities and mortuary ritual: the 'Lokomotiv' cemetery from Neolithic Siberia. KAREN P. MOODER, THEODORE G. SCHURR, FIONA J. BAMFORTH, VLADIMIR I. BAZALIISKI.

1:15 pm Mitochondrial DNA analysis of dental remains from two Honduran ossuary caves. LORI E. BAKER, NICHOLAS P. HERRMANN.

1:30 pm Population structure in sub-Saharan Africans based on mitochondrial, Y chromosomal and X chromosomal DNA sequences. MAYA METNI PILKINGTON, MICHAEL F. HAMMER.

1:45 pm Strain analysis and prevalence of tuberculosis in ancient North America; Evidence from the Schild Mississippian cemetery. JENNIFER A. RAFF, DELLA C. COOK, FREDERIKA A. KAESTLE.

2:00 pm Improved method for genetic sexing of ancient humans. FREDERIKA A. KAESTLE, JENNIFER A. RAFF, ALISON M. FRENCH.

2:15 pm The relationship between bone condition and DNA preservation. KRISTA E. LATHAM, MARY K. RITKE, STEPHEN P. NAWROCKI.

2:30 pm Ethnic and biological identity in New Kingdom Nubia. MICHELE R. BUZON.

2:45 pm Break

3:00 pm Sex chromosomal markers suitable for non-invasive studies of guenon hybridization. ANTHONY J. TOSI.

3:15 pm Genomic data support the hominoid slowdown and an Early Oligocene estimate for the hominoid-cercopithecoid divergence. MICHAEL E. STEIPER, NATHAN M. YOUNG, TIKA SUKARNA.

3:30 pm MtDNA variation in North, East, and Central African populations gives clues to a possible back-migration from the Middle East. ANNE D. HOLDEN, PETER FORSTER.

3:45 pm Analysis of mtDNA haplogroup monomorphism in a sample of a Native American population combining modern and ancient DNA research. ELIZABETH E. MARCHANI, DENNIS H. O'ROURKE, ALAN R. ROGERS.

4:00 pm Mitochondrial DNA sequence evidence for a deep phylogenetic split in chacma baboons (*Papio hamadryas ursinus*) and the phylogeographic implications for *Papio* systematics. PAUL L. BABB, RIASHNA SITHALDEEN, REBECCA ROGERS ACKERMANN, TIMOTHY K. NEWMAN.

4:15 pm Molecular systematics of the lar group of gibbons (*Hylobates*). DANIELLE J. WHITTAKER, JUAN CARLOS MORALES, DON J. MELNICK.

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4:30 pm Identfying ape nests using molecular genetic techniques. JESSICA A. SATKOSKI, JEF DUPAIN, DON J. MELNICK.

4:45 pm Gene flow and the Andes: tests of migration at the archaeological site of Chen Chen. CECIL M. LEWIS, JANE E. BUIKSTRA, ANNE C. STONE.

Session 35. Primate Behavior IV. Contributed Papers. *Wright Ballroom*.
Chair: WILLIAM C. MCGREW, Miami University (Ohio).

1:00 pm Ovarian hormones and reproductive development in wild female chimpanzees (*Pan troglodytes schweinfurthii*). MELISSA EMERY THOMPSON.

1:15 pm Parturition in wild chimpanzees. ANNE E. PUSEY, SARA BEBUS, MARTIN MULLER, JOANN SCHUMACHER STANKEY, WILLIAM WALLAUER, MICHAEL WILSON.

1:30 pm Female sexual and social preferences in wild West African chimpanzees: One and the same? REBECCA M. STUMPF, DIANE DORAN, CHRISTOPHE BOESCH.

1:45 pm The effects of aging on reproductive cycles in female chimpanzees (*Pan troglodytes*) at the Primate Foundation of Arizona. JO FRITZ, ELAINE N. VIDEAN, JAMES MURPHY.

2:00 pm Role modeling and the ontogeny of male chimpanzee behavior. HOGAN M. SHERROW.

2:15 pm Sex-differential rearing effects in *Pan troglodytes*. STEPHANIE L. MEREDITH, JO FRITZ.

2:45 pm Male-female social relationships in mountain gorillas. TARA S. STOINSKI, STACY ROSENBAUM, KATHRYN FAWCETT, H. DIETER STEKLIS.

3:00 pm Related dyads of females are common in western gorilla groups despite routine female dispersal. BRENDA J. BRADLEY, DIANE DORAN-SHEEHY, CHRISTOPHE BOESCH, LINDA VIGILANT.

3:15 pm Agonistic relationships in female western gorillas at Mondika. DIANE M. DORAN-SHEEHY, JESSICA LODWICK.

3:30 pm Male dominance relationships and intra-tree feeding heights in Kanyawara chimpanzees. SONYA M. KAHLENBERG, RICHARD W. WRANGHAM.

3:45 pm Lethal intergroup coalitionary aggression by chimpanzees at Ngogo, Kibale National Park, Uganda. DAVID P. WATTS.

4:00 pm Mahale and Gombe compared: patterns of research on wild chimpanzees over four decades. WILLIAM C. MCGREW.

4:15 pm Cave use by wild savanna chimpanzees in Senegal: Behavioral adaptation to heat stress? JILL D. PRUETZ.

4:30 pm Manual laterality in ant fishing by wild chimpanzees of Mahale Mountains National Park, Tanzania. LINDA F. MARCHANT, WILLIAM C. MCGREW.

4:45 pm Termite de jour: termite fishing by West African chimpanzees (*Pan troglodytes verus*) at Fongoli, Senegal. STEPHANIE L. BOGART, JILL D. PRUETZ, WILLIAM C. MCGREW.

Session 36. Primate Biological Variation II. Contributed Papers. *Regency Ballroom*.
Chair: CLIFFORD J. JOLLY, New York University (NYCEP).

1:00 pm Methods for assessing primate growth and development with attention to sex differences. DEBRA R. BOLTER, ADRIENNE L. ZIHLMAN.

1:15 pm Congruence between canalization and developmental stability in *Macaca mulatta* crania. KATHERINE E. WILLMORE, CHRISTIAN P. KLINGENBERG, BENEDIKT HALLGRIMSSON.

Saturday Afternoon – April 9, 2005

1:30 pm What it means morphologically to be a hybrid: evidence from known-pedigree baboons. REBECCA R. ACKERMANN, JEFF ROGERS, JAMES M. CHEVERUD.

1:45 pm Cutting corners: The dynamics of lemur turning behavior. BRIGITTE DEMES, KRISTIAN J. CARLSON, THERESA M. FRANZ.

2:00 pm A sensory division of labor: sex differences in lingual fungiform papillae and the evolution of primate taste perception. LAURA ALPORT.

2:15 pm Mesio-distal and angular obliquity in studies of dental sections. ANTHONY J. OLEJNICZAK.

2:30 pm Eye on haplorhine orbits. RUSSELL T. HOGG, ALFRED R. ROSENBERGER, SAI MAN WONG.

2:45 pm Break

3:00 pm Vertical climbing energetics in two prosimian primates. JANDY B. HANNA.

3:15 pm Body size dimorphism: do not correct for size. ADAM D. GORDON.

3:30 pm Scaling of reduced physiologic cross-sectional area in primate masticatory muscles. NAZIMA SHAHNOOR, FRED ANAPOL, CALLUM ROSS.

3:45 pm Primate ancestral body mass revisited. CHRISTOPHE SOLIGO, ROBERT D. MARTIN.

4:00 pm Tooth loss in wild ring-tailed lemurs (Lemur catta): a function of life history, behavior, and feeding ecology. FRANK P. CUOZZO, MICHELLE L. SAUTHER.

4:15 pm Phyletic valence of craniofacial traits: clues from quantitative genetics. RICHARD J. SHERWOOD, DANA L. DUREN, JOHN BLANGERO, BRADFORD TOWNE.

4:30 pm White babies and the zone of contact and probable intergradation among three distinct baboon allotaxa in the Luangwa valley, Zambia. CLIFFORD J. JOLLY, JANE E. PHILLIPS-CONROY.

4:45 pm Trabecular bone structure in a bipedally trained macaque. BRIAN G. RICHMOND, MASATO NAKATSUKASA, NICOLE L. GRIFFIN, NAOMICHI OGIHARA, RICHARD A. KETCHAM.

Author/Session Index

Decimal numbers represent poster numbers within a poster session (e.g., "8.56" is poster number 56 within Poster Session 8). Brackets represent time on a 24 hour clock within a podium session (e.g., "35[16:45]" is a paper at 4:45 pm within Podium Session 35). A number followed by a "C" indicates a chair for a session, while a number followed by a "D" indicates a discussant for a session.

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Abstracts of AAPA Poster and Podium Presentations

What it means morphologically to be a hybrid: evidence from known-pedigree baboons.

R.R. Ackermann[1], J. Rogers[2], J.M. Cheverud[3]. [1]Department of Archaeology, University of Cape Town, [2]Department of Genetics, Southwest Foundation for Biomedical Research, [3]Department of Anatomy and Neurobiology, Washington University.

Baboons have recently been resurrected as a valuable model for understanding human evolution. They are a particularly compelling model system as they allow us to tackle important questions about how we should expect morphology to be distributed across a large geographic region. This is especially interesting taxonomically, as their specific (versus subspecific) status has been a matter of debate, and they freely form hybrid zones where populations come into contact. There are a number of situations in human evolution where it is unclear whether differences among samples represent subspecific versus specific level differences, and whether gene flow is likely to have occurred between the groups. In particular, there has been recent debate over hybridization between Neanderthals and modern humans; there are undoubtedly other similar situations in hominin evolution. At the core of our ability to make sense of variation in the fossil record is our understanding – both qualitatively and quantitatively – of what it means to be a morphological hybrid.

This study compares cranial morphology between non-hybrid (yellow and anubis) baboons (n=141) and their hybrids (n=66), derived from a known-pedigree sample from the SFBR. The results of the study show significant heterosis (i.e. hybrid vigor) in first generation hybrids, with less pronounced heterosis as well as negative heterosis in other hybrids. Additionally, there are a number of non-metric traits which occur at high frequency in the hybrid animals, including some rather unusual dental and sutural anomalies. The implications of these results for interpreting the human fossil record are explored.

A methodology for assessing heterogeneously occluded hypsodont dental specimens using computerized tomography.

J.W. Adams. Department of Anthropology, Washington University.

A limitation in assessing faunal dental specimens from taxa with hypsodont dentitions (e.g. Bovidae, Equidae, Suidae, Rodentia, etc.) has been the difficulty in accurately identifying individual dental specimens at the extreme ends of the occlusal wear spectrum – from the unworn dentitions of juvenile or sub-adult individuals to the heavily worn dentitions of mature and elderly adults. This problem extends from analyses addressing single assemblages and time horizons to more broad-scale research attempting to assess morphological features and changes within taxonomic lineages across spatially and temporally diverse faunal assemblages. This project describes a non-invasive methodology combining simple measurements and computerized tomography (CT) in order to generate virtual occlusal states of isolated, hypsodont teeth. Here, several specimens of the extinct suid *Metridiochoerus andrewsi* from the Gondolin GD 2 Plio-Pleistocene faunal assemblage have been CT-scanned to demonstrate the application of this technique to hypsodont fossil faunal dental specimens. The results of this study indicate that CT can be successfully applied within individual dental specimens to mimic the occlusal wear of virtually any stage throughout the scanned specimen. This greatly increases the ability for researchers to directly compare specimens of any wear stage both within, and between faunal assemblages. This method for providing 'virtual occlusal states' of hypsodont dental specimens has several wide-reaching implications for faunal analysis, from simple specimen identification to better understandings of the changes in dental morphology which accompany occlusal wear, as well as greater inroads into understanding the diet-related adaptive changes to dentition that have occurred within certain faunal lineages.

Manual laterality in bonobos: cross-populational differences.

S.K. Adamson[1,2], L.F. Marchant[1], W.C. McGrew[1,2]. [1]Department of Anthropology, [2]Department of Zoology, Miami University, Ohio.

Manual laterality in the bonobo (*Pan paniscus*) is far less well known than in the often-studied chimpanzee (*Pan troglodytes*). This is not surprising, given many fewer bonobos in captivity and no habituated populations of wild bonobos. Here we report the largest repertoire of ethological data (N = 25 categories) on the largest number of bonobos (N=19) based on a review of the published literature. Observational data on spontaneous behavior were collected at Cincinnati (N=6) and Columbus (N=13) Zoos, where subjects were in groups. Focal-subject sampling was used to record bouts of social, subsistence, and self-directed behavioral patterns.

At population-level, bonobos were behaviorally unlateralized, when data were pooled across subjects and behavioral categories. Similarly, they were ambilateral across subjects for seven of the eight most common behavioral categories (Eat, Pick Up, Scratch, Hold, Nose Wipe, Carry, Poke, and Groom). This prevalence of amiblaterality replicates previous results for captive bonobos (e.g. Hopkins and de Waal, 1995), when data are analyzed by percent right-handed.

However, significant differences emerged when the two populations were compared. Cincinnati bonobos deviated more from chance laterality (50%L: 50%R) than did Columbus bonobos, both for pooled and individual categories. Several variables could explain this difference, including closer human contact at Cincinnati. Caution should be used in pooling laterality data across populations of apes.

Funded by an Undergraduate Summer Scholars Award, Miami University.

Monkey-human interactions in Thailand.

N. Aggimarangsee[1], W.Y. Brockelman[2]. [1]Department of Biology, Faculty of Science, Chiang Mai University, [2]Center for Conservation Biology, Institute of Science and Technology for Research and Development, Mahidol University.

During 1989-1991 a survey of free-ranging populations of *Macaca spp*. near human habitations such as temples, mon-

asteries and parks was initiated to gather information regarding the distribution of macaques outside of forest conservation areas in Thailand. A preliminary assessment of human attitudes towards macaques at the 52 study sites was also undertaken in order to characterize the conservation implications of human-primate contact at these diverse sites. Thai culture is strongly influenced by the Buddhist religion which has a great respect for the rights of all living things. In rural areas, the Thai Buddhist wat or 'temple' is the center of religious activities. In Thailand, most populations of macaques that occur outside of protected areas are found in and around Buddhist temples and forest monasteries. Temples, besides providing a safe refuge for macaques, also assure food supply through provisioning. Unfortunately, Buddhist practices towards macaques are not applied so strictly away from temple areas. Macaques that range outside of the temple complexes are usually subjected to hunting, they are either killed for meat or because they are pests to crops and property. This practice is in keeping with Thai Buddhism which is noted for its tolerance for deviation from principles when people are in need of subsistence.

Methods of ingestion and incisal designs.

K.R. Agrawal, P.W. Lucas. Department of Anatomy, University of Hong Kong.

Anthropoids ingest food in variable fashion (Osborn *et al.* 1987, Ungar 1991, Yamashita 2003), making mechanical analysis difficult. Yet variation in incisal size, procumbency, over/under-bite, and ease of dentinal exposure needs explaining. Categorizing incisal use as either (i) *fracturing* objects between upper and lower teeth or (ii) *gripping* objects, we ran mechanical tests to establish structural factors that favor these possibilities. Artificial upper and lower incisal pairs were cut from dental study models (Nissin, Kyoto) and mounted on a portable mechanical tester with variable tooth orientation. Teeth were driven into food blocks (cheeses) at angles of +60 to -40 degrees to movement direction (positive angles represent procumbent, negative angles retroclined, crown orientations). The work to fracture standardized crack surface areas varied significantly with attack angle, being minimal at zero degrees. However, lower incisors were hardly sensitive to angulation unless > +40 degrees. Frictional coefficients were measured using a sliding test jig for 10 individual upper/lower real human incisors, dry or wetted by saliva, against upper surfaces of *Ficus benjamina* (Moracaeae) leaves. Coefficients for lowers were smaller than for uppers, particularly with wetted leaves, but there was no relationship with tooth size.

Most incisal usage in leaf-eating involves frictional grip, fracture events being distant from tooth edges. This favors vertical orientation for loading efficiency: tooth size is unimportant. Fruit-peeling is sculpture; size matters there. If lower incisors peel while uppers anchor the fruit, then this favors the uppers being more obliquely oriented than lowers.

Supported by CRCG (University of Hong Kong).

Cranial morphology of callitrichid genera: variability and diversification.

J.M. Aguiar[1,2], T.E. Lacher, Jr.[2]. [1]Wildlife & Fisheries Sciences, Texas A&M University, [2]Center for Applied Biodiversity Science, Conservation International.

Since 1990, eight new species of callitrichid have been discovered, ten more taxa elevated to species status and a new genus proposed for the dwarf marmoset, *Callibella humilis*. These recent discoveries highlight both the deep biodiversity of the Amazon world and the overwhelming need for swift and effective conservation. Intelligent and targeted conservation efforts, however, require a clear understanding of the delineation and geographic extent of species about which very little is reliably known. The examination of morphological features, especially cranial characters, may provide supporting data about the ecology and behavior of species which are difficult to locate and observe at length, and may also allow for a more informed understanding of taxonomic relationships. Here we assess the variability in cranial morphology of callitrichids within and between genera, species and populations where possible. We focus on details of mandibular shape, which may reveal diagnostic aspects of diet and behavior. We apply principal components and discriminant analyses to test for variability and separation within and among callitrichid taxa, and present our results in the context of conservation biogeography. We find that *Callibella* is morphologically discrete and unique within the callitrichids, and merits generic status; but we do not find morphological evidence to support the separation of Amazonian *Callithrix* into the distinct genus *Mico*.

Midfacial variation in recent human, Zhoukoudian Upper Cave, and Paleoindian crania.

J.C.M. Ahern, G. Willson, G.W. Gill. Department of Anthropology, University of Wyoming.

This study tests the hypothesis that the midfaces of select Late Pleistocene Asians and Paleoindians cannot be distinguished from recent Amerindians. Recent interpretations of Paleoindian remains have highlighted their variability and affinities to a variety of living non-Amerindian human populations. Although midfacial anatomy has been touched upon in some of these analyses, metric treatment of upper and lower midfacial anatomy has not been thoroughly examined. Given that midfacial anatomy is useful for determining population affinities among recent people, it may also prove effective at assessing past prehistoric population affinities.

Measurements of the upper and lower midface were collected on samples of three extant human populations: Amerindians (n=46), African Americans (n=58), and Euroamericans (n=62). Measurements were also collected on casts of the three crania from Zhoukoudian Upper Cave and the Spirit Cave and Wizards Beach Paleoindian specimens. The Upper Cave crania were chosen since they may represent a population ancestral to the first people to colonize the Americas. Spirit Cave and Wizards Beach were chosen since their differences epitomize the degree of variation and contrasting population affinities of North American Paleoindians. Using discriminant function analysis, Spirit Cave fell in the area of overlap between Amerindians and African Americans, while the other fossil crania had a higher probability Amerindian classification. Unlike some previous analyses, none of the fossil crania showed affinities with Europeans. Our results further indicate that the pattern of relationships and variation among Late Pleistocene Asians and Paleoindians was complex.

Reassessing the Tower Kiva skeletal remains from Salmon Ruins, New Mexico.

N.J. Akins. Office of Archaeological Studies, Museum of New Mexico.

In 1973 and 1974, excavators encountered human bones in a tower kiva destroyed by fire. The remains were interpreted as those of 35 to 45 individuals trapped on the roof at the time of the fire.

Skeletal analysis of 44 collections of bones treated as "skeletons" and 18 batches of bone from grid or quadrant excavations, reported 33 infants and young children and no more than two adults (a male and a female). The skeletal remains were described in a 1980 publication as extremely fragmented and commingled with all degrees of burning. Two studies in the 1990s offer alternative interpretations of the event. One suggests that cannibalism and violence occurred on at least the adults. The other felt the remains represent a cremation that was part of a secondary mortuary ritual that took place around the time the site was abandoned.

This analysis suggests a complex series of events followed the burning of the tower kiva and surrounding rooms. It evaluates the prior conclusions by focusing on demography, patterns of burning, and the archaeological context. Data on age and element presence and composition, and taking the amount and kind of burning and provenience into consideration, suggests that the number of individuals is more like 24, 20 subadults and 4 adults. Subadult ages range from a new born to at least one 9 to 11 year old child. Most of the subadults were between about 3 and 6 years of age. Poor representation of elements is common with over half of the individuals less than a quarter complete. The adult remains suggest at least four individuals, two males and two females. Some of the individuals appear to have been deliberately cremated while others were incompletely burned from below, but not by the burning kiva roof. Still others have burning that suggests they were at least partially dry when burned or burned. Unburned bone was found throughout the structure and comprises the majority of that found in the southwest quadrant. The far northwest held most of the cremated bone while two clusters of children in the east half were partially burned. One group of three children laying side by side are burned on the parts that faced down while those that were up are unburned, scorched or partially burned black. This presentation uses spatial distributions of the age and sex data and the burning patterns to discern patterns within the structure.

A preliminary study of adult age-related morphological changes of the seventh thoracic vertebra.

A.M. Albert, E.H. Murphy. University of North Carolina at Wilmington.

This study examined three features of morphological change of the seventh thoracic vertebra's (T7) superior centrum. The features are: (1) Centrum Central Density, the circumference of the dense area; (2) Costal Pit Morphological Change, where, as age increases, pits become "U"-shaped, and bevel into the pit; and (3) Anterior Widening of the Superior "Ring" (i.e. the remnant of what was once the epiphyseal ring), where the ring thickens with age, widens anteriorly, becoming progressively narrower laterally. Our sample was composed of 29 individuals (7 white females, 4 black females, 7 white males, and 11 black males) of known age at death (27 to 67 years), from the Smithsonian Institution's Terry Collection.

Preliminary observational analyses showed fairly consistent changes in each of the three features over the course of the adult lifespan. Centrum Central Density in younger individuals was greater in circumference, diminishing in later adulthood. Costal Pit Morphological Change involved the progressive lateral sloping of the ring into the pit, as age increases. Anterior Widening of the Superior "Ring" occurred as age increased, where in younger individuals, the ring tended to be uniform in width, progressively becoming wider.

Although our sample size was small and our study qualitative in nature, our observations of a consistent pattern of shape changes of vertebral centra hold promise as a possible future age estimation method. Our plans are to increase our sample size and to quantify these data for statistical analyses. Thus, findings from this present study are encouraging, and warrant further exploration.

MRI analysis of the calcarine and lunate sulci in modern humans.

J.S. Allen, J. Bruss, H. Damasio. Department of Neurology, Division of Cognitive Neuroscience and Behavioral Neurology, University of Iowa College of Medicine.

The visual processing regions of the occipital lobe have undergone reorganization during hominid evolution. Since the 19th century, the occipital sulci, especially the lunate and calcarine, have drawn much attention from neuroanatomists, evolutionary biologists, and neuroanthropologists. Despite this, there have been relatively few quantitative studies of normal variation in the size and/or course of these sulci in modern humans.

We report on a quantitative MRI study of the lunate sulcus (assessing its course and position) and the calcarine sulcus (volume). Sulci were identified on 3D reconstructions of T1-weighted contiguous coronal sections through the whole brain (1.5-1.6mm slices, 110-120 per brain). The calcarine sulcus was manually traced in each hemisphere on coronal slices. For the calcarine study, subjects were 23 men (22-49 years) and 23 women (23-47 years); an additional 54 subjects were included in the lunate study. All were right-handed, healthy, and without neurological or psychiatric disease.

Preliminary results indicate that the course and even presence of the lunate sulcus is so variable that it is difficult to confirm/replicate the findings of previous researchers (Connolly 1950; Ono 1990). We find that the calcarine gray matter volume is lower than the total striate cortex volume (reported from histological studies) because with MRI, the limits of the striate cortex on the mesial occipital surface cannot be determined. We find that the right calcarine is about 10% larger than the left, and in three-fourths of subjects, it is larger in the right than the left hemisphere.

Funding: PPG NINDS NS 19632; Mathers Foundation.

A sensory division of labor: sex differences in lingual fungiform papillae and the evolution of primate taste perception.

L. Alport. Department of Anthropology, University of Texas at Austin.

Dietary selections are critically important to the reproductive success of female primates. In the context of foraging, taste is one of the most important senses and is involved in assessing the nutritional content of food items. Unsurprisingly, women tend to have better taste sensitivity than men. This sex difference in sensitivity is reflected in the density of lingual fungiform papillae (DFP). Fungiform papillae are the only structures on the anterior two-thirds of the tongue containing taste buds and are the first structures to come in contact with oral tastants. It is hypothesized that sex differences in human DFP are due to the division of labor that may have occurred in *Homo erectus*. Although data on human gustation are abundant, little is known about the evolution of primate taste perception or its comparative anatomy. To test the hypothesis that sex differences in taste sensitivity are unique to humans, DFP were calculated for 20 wild vervet monkeys (*Cercopithecus aethiops*) and 20 wild howling monkeys (*Alouatta palliata*). There were no significant sex differences in the DFP of either species. Vervet monkeys had significantly higher DFP than the

howling monkeys over all ($p < 0.001$; *C. aethiops* mean 162.56 FP/cm^2, *A. palliata* mean 23.43 FP/cm^2). These results are consistent with the idea that taste differences in humans are unique and may be associated with the evolution of a sexual division of labor. Because chimpanzees also show a division of labor, data on DFP *Pan* are needed to test this hypothesis further.

Sinkhole burial sites in Central Texas: a comparison of pathological conditions.

C. Alvarez. Department of Anthropology, Texas State University-San Marcos.

A minimum of nine individuals were excavated from the Stiver Ranch burial sinkhole (41KM140) in inland central Texas, as part of South Texas Archaeological Association field schools in 1999 and 2000. The sinkhole was being used for burial during the Middle Archaic (4950 BP-2950 BP) but most of the remains are thought to date to the Transitional Archaic through the Late Prehistoric period (2000 BP-300 BP). The purpose of this study is to compare the rates of pathological conditions in the Stiver ranch sinkhole burial population with other hunter-gatherer burial populations who utilized this unique form of mortuary practice in the Central Texas region.

The skeletal material from Stiver ranch was analyzed for evidence of infection, trauma, and degenerative conditions, as well as dental pathological conditions such as caries, LEH and abscesses. The study sample also included data from previously published studies at Seminole Sink, dated to the Early Archaic period (6000-4950 BP) with an MNI of 22; and Bering Sinkhole, dated from the Early Archaic through the Late prehistoric (n=62).

Results show that individuals at Stiver ranch had higher rates of infection, trauma, and degenerative conditions (30-50%) when compared with both Bering sinkhole and Seminole sinkhole (2-20%). The Stiver ranch population also shows lower rates of caries and LEH, but a higher rate of abscesses than at Bering and Seminole sinkholes. This evidence suggests differences in diet and mobility patterns in these populations over time.

Using growth structures in teeth from victims of the Black Death to investigate the effects of the Great Famine (AD 1315-1317).

D.M. Antoine[1], S.W. Hillson[1], D. Keene[2], M.C. Dean[3], G. Milne[1]. [1]Institute of Archaeology, University College London; [2]Institute of Historical Research, University of London; [3]Department of Anatomy & Developmental Biology, University College London.

The Great Famine of AD 1315-1317 is recorded as one of the greatest calamities of Medieval Europe, but little is known about its direct effects on the people who survived it. An opportunity to address this question was provided by the excavation of the Royal Mint Black Death cemetery in London, containing burials dating to 1349 when the epidemic was at its height. Those people buried in the cemetery who were in their thirties at the time of their death would have lived through the Great Famine as children. As teeth form during childhood, any systemic disturbance experienced during dental development, such as episodes of nutritional stress, can create defects in dental tissues. Standard age estimation methods were employed to select 30 skeletons most likely to be in this age group and dental growth structures were used to investigate the impact of the famine on their overall health. Five teeth from each individual were extracted and sectioned for microscopy. Enamel and dentine incremental structures were used to build detailed growth records of the early years of their lives, including any period growth disruption visible as surface defects or, internally, as areas of disturbed, slowed or accelerated ('catch-up') growth. Overall, their teeth showed several periods of growth disturbance that appear to match the chronology of the Great Famine, including the possible occurrence of a second famine in 1322-23.

Research supported by the Wellcome Trust.

A critical biological function: mastication and the evolution of *Homo*.

S.C. Antón. Center for the Study of Human Origins, Department of Anthropology, New York University.

Dietary shifts and foraging strategies are critical to understanding hominid evolution. The morphology of the primate skull is also strongly influenced by mastication. In the 1970's Bill Hylander began his career by combining morphological analysis of Eskimo cranial remains with biomechanical principles related to masticatory loading. Over the course of that career this tradition has brought together morphologists and experimentalists to interpret skeletal morphology in light of *in vivo* data. The mandible has been the most frequently analyzed fossil element and in hominid paleontology this has resulted in insights into Australopithecine evolution. Genus *Homo* has been less amenable to this approach given a preference for cranial remains in analyses and perhaps less interspecific variation in mandibular form, yet foraging shifts are argued to occur early in genus *Homo* and to account for morphological changes from body size to cranial shape.

I consider the hypothesis of dietary differences between early African *Homo* and far eastern *Homo*. Mechanically significant measures of the corpus and ramus are scaled against dental size and mandibular length in fossil and extant groups. Accessory cusp complexes of potential mechanical importance are compared. Modern human groups include sex-balanced samples of at least 30 individuals from Australia, Alaska, Peru, Africa and 20th century America. For the majority of these biomechanical properties from CT scans at M1 are also used. Although we should anticipate some link between occlusal area and corpus size – exAfrican *Homo* show additional increases in occlusal area possibly supporting a foraging shift.

Supported by NSF BCS 9804861.

The origin of Aymara and Quechua (Inca) Amerindians from Bolivia Highlands according to HLA genes.

A. Arnaiz-Villena, N. Siles, J. Moscoso, J. Zamora, JI. Serrano-Vela, E. Gomez-Casado, MJ. Castro, J. Martinez-Laso. Universidad Complutense, Madrid, Spain/ H. Militar, La Paz, Bolivia.

Both Aymara and Quechua (Inca) speaking people come originally from the Titikaka Lake Highlands placed between Bolivia and Peru. Aymara people represent an older substratum related to Tihuanaco culture. They were overwhelmed by the Inca Empire, that ranged from Ecuador, South to Chile when Spanish conquerors seized the Empire by 1532 AD.

HLA-A, -B, -DR and –DQ gene frequencies were studied in 102 unrelated present-day Aymara and 80 Quechua people from the Titikaka Lake area. Gene frequencies and Nei's chord genetic distances to worldwide populations were obtained by using 14200 chromosomes. Neighbor Joining dendrograms and correspondence analyses showed that: 1) Quechuas and Aymaras are not genetically close within the Amerindian group, although they speak related languages; 2) Common Asian and Athabascan HLA features are found in Quechuas, but not in

Aymaras; 3) Amerindians group separately from other world ethnic groups, including Athabascans and Inuits. Discussion is centered in the genetic uniqueness of Amerindians and the lack of correlation between genes and languages.

Inter-group variation in the neigh vocalization of the northern muriqui, *Brachyteles hypoxanthus*.

L. Arnedo[1], C. Snowdon[2], J. P. Boubli[3], K. Strier[1]. [1]Anthropology Department, University of Wisconsin – Madison, [2]Department of Psychology, University of Wisconsin – Madison, [3]Zoological Society of San Diego.

Understanding how vocal communication mediates social interactions between groups can provide information into primate societies that is not possible to obtain from other behavioral observations. This project investigated inter-group variation in the neigh vocalization of northern muriqui monkeys (*Brachyteles hypoxanthus*) at the Estação Biologica de Caratinga (EBC-RPPN/FMA), Minas Gerais, Brazil. A total of 168 hours of neigh vocalizations was recorded from adult males and females belonging to four discrete social groups from June-August 2004. Current spectrographic analyses of maximum, minimum, and fundamental frequencies of vocalizations are being developed to compare the vocal structure of neighs from members of the four groups. Our initial perception from the recordings is that the difference between neigh vocalizations of individuals from the Matão and Jaó groups is larger than the difference between each of these groups and the other two groups. Differences in vocal structure between Matão and Jaó may reflect the longer time that these groups have existed and the greater spatial distance in the ranges that these groups occupy compared to the other two groups. These differences could also suggest that dispersing females might alter their vocalizations in the new social environments of the groups that they join. Thus, distinctive characteristics of muriqui neigh vocalizations may allow individuals to differentiate between group memberships and identify potential mates.

Funded by a Tinker-Nave Short- Term Field Research Grant from the UW-Madison and Primate Conservation Inc.

Conservation applications of positional behavior, support use, and forest structure data.

G.P. Aronsen. Department of Anthropology, Yale University.

Previous studies discuss canopy structure and its influence on positional behavior and support use variation in primates. I propose that these data, combined with habitat structure analyses, can be used to evaluate the energetic costs of living in fragmented forests. This provides critical information for the development of conservation strategies. I present positional behavior and support use data for three arboreal monkeys (*Lophocebus albigena, Cercopithecus ascanius,* and *Piliocolobus badius*), and canopy structure data from two sites within Kibale Forest, Uganda. Frequencies of “expensive” locomotion (leaping, bridging, and climbing) are greater at the less disturbed forest at Ngogo, while the “cheaper” locomotor mode of quadrupedalism is more common at Kanyawara. These data correlate with differences in canopy continuity, tree size, and microhabitat availability between sites. These results, combined with data on lower lean body mass in *L. albigena* inhabiting logged areas, suggest that positional behavior data provide insights into the health and energy availability/expenditure of arboreal primates. The impact of logging on canopy structure disrupts the architecture, support availability, and options for primates to navigate canopies in an efficient or economic manner. This has long-term effects on population health, which can be measured in part via positional behavior and support use patterns across different habitats (e.g. forests and refuges). Ultimately, the costs of living in a fragmented environment may be evaluated via collection and comparison of positional behavior data across species and sites for a comprehensive perspective of primate conservation and management.

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The impact of habitat disturbance on fruit consumption by the Milne-Edwards' sifaka (*Propithecus edwardsi*) in Ranomafana National Park, Madagascar.

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The selective logging of portions of Ranomafana National Park (RNP), Madagascar has affected the forest habitat by altering tree species composition, reducing food patch size, and changing food availability patterns for the forest's lemur species. This study investigates the impact that these changes have had on the feeding behavior of seven *Propithecus edwardsi* social groups living within logged (4 groups) and unlogged (3 groups) forest sites over the course of an annual cycle. Data analyses reveal that social groups *within* each site consume fruit, leaves, and flowers according to the same monthly and annual patterns. However, *between* site comparisons reveal that groups within the unlogged forest consume greater proportions of fruit and flowers and fewer leaves during the lean season (austral winter) than do their disturbed forest counterparts. As this difference is the most marked during the period of lowest fruiting within the forest, the austral-winter *and* early lactation season for sifaka (June-August), these data suggest that *Propithecus* within the unlogged forest may have a nutritional advantage over those animals living in previously logged areas. This disparity in fruit consumption may lead to a decline in *Propithecus* reproductive success in selectively logged areas, which – given the current rate of habitat disturbance within Madagascar's rainforests – may impact population viability over the long-term.

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New Neandertal remains from the site of Cova Negra (Spain).

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New Neandertal fossils from the Upper Pleistocene Mousterian site of Cova Negra in the Mediterranean coastal region of Spain are described and include cranial and postcranial elements mainly from immature individuals. The new specimens significantly augment the sample of human remains from this site, and, in addition to the previously published fossils, make Cova Negra one of the richest hu-

man paleontological sites on the Iberian Peninsula. Derived Neandertal features, such as a medial orientation for the radial tuberosity, have been identified in several specimens, while others show anatomical features, such as thick cortical bone, which are considered to be archaic within the genus *Homo* and are consistent with a Neandertal assignment. The association of all the remains with a Western European Mousterian technocomplex suggests the entire assemblage represents Neandertals. The large number of immature remains provides an opportunity to study the juvenile anatomy and the ontogenetic appearance of adult Neandertal characteristics in this Pleistocene population. The remains from the uppermost levels correspond to OIS 3, and offer further evidence of a late persistence of Neandertal anatomy and Mousterian tools on the Iberian Peninsula.

If I only had a...: missing element estimation accuracy using the Fully technique for estimating statures.

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Fully's (1956) technique for estimating statures relies on the rare completeness of skeletal remains. Few studies have systematically investigated how to account for missing elements, or how the accuracy of total skeletal height reconstruction is affected by estimating missing elements. We investigated these issues using 160 skeletons from four population samples: 111 Terry Collection whites and blacks, and two populations of Native Americans (total n=59), all measured using a revised protocol for Fully's method.

Contributions of individual vertebrae to total vertebral column length, though statistically different between populations in some cases, do not significantly affect the estimation of missing vertebral elements. Sex differences in vertebral element contributions to total column length, however, are significant, with females having relatively taller lumbar vertebrae in all populations; thus, sex-specific equations are necessary to estimate missing vertebral heights. All populations differ in limb to trunk length proportions, as expected from ecogeographic principles. Therefore, both sex and population affinity must be considered in reconstructing missing skeletal elements.

The Terry sample, because it includes individuals of known stature, was used for further tests of the accuracy of proposed missing element reconstruction techniques. The complete Fully method (no missing elements) yields non-significantly different estimates compared with living statures in this sample. Fully and Pineau's (1960) stature equations based on lumbars and one lower limb long bone do not differ significantly from true statures for white males, but do for the tibia-based equation for black males ($p<0.05$) and for both equations for both populations of females ($p<0.05$).

A new method for assessing endocast morphology: calculating local curvature from 3D CT images.

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Assessment of endocranial morphology is central to research on brain evolution. Unfortunately, endocranial surfaces frequently do not unequivocally and clearly indicate surface features of the brain. Controversies over the existence and/or placement of subtle features on particular fossil endocasts have thus been relatively common and difficult to adjudicate. A method of objectively identifying and marking surface features evident on a particular specimen, in such a way that accurate measurements could be made between and among features, would therefore be particularly useful. Methods for highlighting surface features date back to Le Gros Clark et al. (1936), who rubbed soot-blackened plaster endocasts with cloth, thereby revealing ridges and bumps as white areas. We describe an analogous, but mathematically rigorous method of evaluating endocranial surfaces, in which the curvature of each point of the surface of CT-derived virtual endocasts is calculated. By determining both the mean and Gaussian curvature at each point, it is possible to objectively classify areas of the surface as either pits, peaks, ridges, troughs, planes or one of three saddletype shapes. These areas can then be color-coded and rendered in 3D, aiding in the objective assessment of endocranial features. Specific locations can be easily identified in 3D space, allowing measurements between features of interest. These methods are demonstrated on CT-derived virtual endocasts of Taung, SK 1585, and several modern *Homo sapiens* and *Pan troglodytes* specimens. The usefulness of these methods in illuminating debates on features such as the lunate sulcus in early hominid brain endocasts will be discussed.

A review of the putative Paleolithic human remains from Japanese Archipelago.

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Since 1931 nearly twenty Paleolithic sites in Japan were reported to have yielded human remains. Our recent re-evaluation of these remains indicate that about a half of them belong to Neolithic and later ages (e.g. Akashi, Mikkabi, Hijiridaki, and part of Kuzuu), and that some of them are not human but animal remains (e.g. Ushikawa and part of Kuzuu).

Morphological characters of definitive human remains with secure Paleolithic ages are reviewed. Except the Hamakita remains from Central Japan, relatively well preserved and well-dated Paleolithic human remains are found in the Okinawa Islands, southwestern Japan, where limestone deposits are abundant. For example, the Minatogawa remains consist of at least four skeletons, dated around 17,000 BP. They possess short and gracile limbs and a primitive and robust skull. This may indicate adaptation for a probable nomadic gathering and hunting life in the small islands of Okinawa. The Pinza-abu remains, consist of skull and other fragments, dated around 25,000 BP. They show similar features to those of the Minatogawa remains. Yamashitacho remains, consist of a femur and a tibia of a seven year old child, they are dated around 32,000 BP, which is the oldest chronological date for human remains from Japanese Archipelago.

Mitochondrial DNA sequence evidence for a deep phylogenetic split in chacma baboons (*Papio hamadryas ursinus*) and the phylogeographic implications for *Papio* systematics.

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In a recent publication, Newman, Jolly and Rogers (2004) proposed a phylogenetic hypothesis for *Papio* based on sequence variation in the Brown region of the mito-

chondrial genome. Their analysis revealed 4 major lineages and identified chacma haplotypes as the oldest (1.8mya) and most divergent, being the sister clade to other *Papio* allotaxa. While paleontological and morphometric data support this conclusion, their sampling scheme did not encompass the spectrum of morphologically distinct populations that fall under the taxonomic umbrella of "Chacma baboon" (*P.h. ursinus*). We collected 44 samples representing 7 distinct, well provenienced locations throughout South Africa (Western Cape - two locations, Eastern Cape, central South Africa, Gauteng province, Limpopo province). We sequenced the samples and aligned them with published sequences used in the Newman et al. study, and employed the standard battery of phylogenetic methods as implemented in MacClade and PAUP4. Our analysis revealed two major lineages divided geographically along a southwest to northeast transect. The Southern clade includes the Western and Eastern Cape populations, and is distinguished by a unique, three nucleotide deletion. The Northern clade includes the Gauteng and Limpopo populations. Although tentative at present, we estimate the divergence between the Northern and Southern Clades to have occurred approximately 1.2mya (+/- .18my). The deep phylogenetic split present in chacma populations may reflect accumulated changes driven by local geographic and climatic barriers to gene flow, or the influence of gene flow from northerly, non-chacma populations (i.e. Greyfoots, Kinda) that have yet to be sampled.

Mmmm…dirt: implications for geophagy by the Milne-Edwards' sifaka (*Propithecus edwardsi)* at Ranomafana National Park, Madagascar.

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Geophagy has been observed in nearly every long-term study of folivorous primates. Despite frequent observations of this behavior, conclusive explanations for soil consumption remain ambiguous. Prior work has resulted in five major hypotheses to explain geophagy: the facilitation of secondary plant-compound absorption, mineral supplementation, self-medication (diarrheal treatment, pH buffers, etc.), tactile or taste enhancement, and cultural tradition. This study examines the possible utility of geophagy in the subsistence of the Milne-Edwards' sifaka (*P. edwardsi*) at Ranomafana National Park, southeastern Madagascar. Soil consumption was compared within and between groups (N=7) and individuals (N=29) at two sites with varying levels of habitat disturbance. Behavioral data were collected during approximately 3,375 hours of focal sampling from December 2002-November 2003, during which time samples of soil and preferred plant species were collected for nutrient and mineral analyses. Results suggest that the frequency of soil consumption does not vary significantly between disturbed and undisturbed habitats. Additionally, annual frequencies of geophagy remain consistent amongst individuals and between sexes throughout seasons. The consistency at which soil consumption occurs suggests the rejection of hypotheses pairing geophagy with immediate dietary fluctuations, and instead supports alternative hypotheses suggesting that geophagy may provide integral mineral supplementation, self-medication for suppressing parasite load, or even tactile or taste enhancement.

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Inter- and intraspecific variation in *Pan* tooth crown morphology: implications for Neandertal taxonomy.

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Measures of divergence based on dental morphology are known to reflect biological distance in contemporary modern humans. Previous studies of Neandertal tooth crown morphology have shown that they possess a pattern of trait frequencies that differs significantly from that of contemporary and fossil anatomically modern humans. However, there is no taxonomic 'yard stick' against which to interpret the degree of dental divergence observed. The goal of this study was to test whether the dental morphological differences between Neandertals and anatomically modern humans were typical of subspecific (*Pan troglodytes troglodytes:Pan troglodytes schweinfurthi*) or closely related specific (*Pan troglodytes:Pan paniscus*) taxa. Eighteen dental crown traits were used to assess inter- and intraspecific variation. A Mean Measure of Divergence statistic was used to calculate morphological distance. The hominin sample included 33 Neandertals, 7 early modern humans, 19 Upper Paleolithic Europeans, and 179 contemporary humans from seven geographic regions. The *Pan* sample included 37 *P.t. troglodytes*, 44 *P.t. schweinfurthi* and 33 *P. paniscus* specimens. Measures of divergence based on pair-wise comparisons of Neandertals and anatomically modern humans were found to be higher than those derived from both subspecific and specific pair-wise comparisons of *Pan*. Moreover, Neandertals show no morphological affinity to either Upper Paleolithic or contemporary Europeans and are more than twice as divergent from all contemporary human samples as these samples are from each other. In as much as *Pan* represents an appropriate model for interpreting dental morphological divergence in *Homo*, these results are broadly supportive of the specific status of Neandertals.

Mitochondrial DNA analysis of dental remains from two Honduran ossuary caves.

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Mitochondrial DNA analysis was performed on the dental remains of two eastern Honduran ossuary caves, Cueva del Rio Talgua or "The Cave of the Glowing Skulls" (n=18) and Cueva de las Arañas or "The Cave of the Spiders" (n=5). Multiple radiocarbon dates of Cueva del Rio Talgua indicate the cave was used roughly 3100 to 2500 ybp and Cueva de las Arañas roughly 2800 ybp making the two caves contemporaneous. Previous skeletal analysis by Herrmann (2002) showed that the basic age distributions of the two caves are similar supporting a conclusion that interments in the two caves are derived from the same population. Despite the remains being encased in calcite, DNA extraction was successful for most of the samples. Stringent precautions were employed during extraction and analysis.

The purpose of this study was to examine the genetics of a sub-set of the individuals located in dispersed areas of the caves to determine the amount of mitochondrial genetic diversity as well as to determine if both caves were used by the same maternal population. In addition, this diversity was compared with the Copan Maya. In the future, the examination of the Y-chromosome may be benefi-

cial for a better understanding of this population.

A taphonomic analysis of burned remains from the Fox Hollow Serial Homicide Site.

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For the forensic anthropologist, identifying heat-exposed human remains presents a challenge. A working knowledge of the characteristic pattern of destruction that fire has on bone facilitates an analysis of the remains. Coloration, fracture pattern, warping, and shrinkage can all give distinctive clues regarding the manner in which the bone was burned, if the bone was fleshed, the duration of burning, and the presence of perimortem trauma. This presentation reports on the analysis of the burned remains of at least 5 individuals from the Fox Hollow Serial Homicide Site in Westfield, Indiana. The heavily fragmented and commingled remains had been subjected secondarily to fluvial transport across the scene. The goal of this study was to ascertain the original condition of the remains (green or dry) at the time of burning, to document the sorting and dispersal effects of water, and to reconstruct assailant behaviors. The remains were compared to a number of cremated and burned specimens from prehistoric sites and documented recent deaths. Results suggest that some victims from Fox Hollow were burned in a dry state and some were burned in a green state, a finding that is consistent with what is known of the changing activities of the assailant through time. Mean fragment size was intermediate between commercial cremations and cases of incidental burning, but the Fox Hollow fragments showed much less calcination than commercial cremations. Post-depositional forces clearly increased the fragmentation of the Fox Hollow remains. Not surprisingly, smaller, more heavily-burned fragments were transported more easily by water.

Sexual dimorphism and the mandibular fossa of great apes.

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Sexual dimorphism among the great apes is a readily observed phenomenon, extending to soft tissues and skeletal elements alike. Both size and shape are sexually dimorphic throughout the great ape body, particularly in the skull. The most dimorphic of the African apes is the gorilla, with a difference of up to 40% in body size; and substantial differences in morphology (shape) are also apparent--for example, in the canines and the sagittal crest.

We studied the morphology of the mandibular fossa in the three African apes. Using a MicroScribe® digitizer, we plotted three-dimensional points. The results indicate that the shape of the fossa in chimpanzees exhibits sexual dimorphism, whereas in bonobos and, surprisingly, gorillas, no sexual dimorphism is manifested. These results might be attributable in part to the differences in lifestyle of the three species, including their dietary preferences.

Comparing resting brain activity in monkeys, apes and humans.

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To identify specializations of the human brain, many studies have compared human and non-human primate brain anatomy, but few have compared human and non-human primate brain function. Here, we use ^{18}F-[FDG] Positron Emission Tomography (PET) imaging to compare regional cerebral glucose metabolism at rest in monkeys, apes and humans.

Human subjects were injected intravenously with 10 mCi ^{18}F-[FDG] while lying motionless in the PET scanner. Following the 40-minute brain-uptake period, an emission scan was collected. To match the human condition as closely as possible, both macaques and chimpanzees were moved from their home cage to minimally familiar cages. ^{18}F-[FDG] (~15 mCi) was delivered to macaques by i.m. injection and to chimpanzees by oral consumption. After 50 and 90 minutes brain uptake for macaques and chimpanzees respectively, animals were sedated with 5 mg/kg telazol and transported to the PET Center where they were scanned under 1% isoflurane anesthesia.

For each species, all PET scans were normalized to mean whole-brain activity to control for differences in injected dose. Images were coregistered to T1-weighted anatomical MRI scans, spatially normalized and then averaged within species. The 5% most metabolically active voxels were identified and compared across species. In addition, specific anatomical regions of interest were defined on MRI scans and average PET activity within these ROIs was compared across species. These analyses revealed common regions of activation across species, as well as species differences in activation that are plausibly related to differences in resting cognition.

The ontogeny of cranial capacity and dental development: a study of growth patterns in primates.

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Dental development is frequently used to compare the rate and duration of growth among different species. Brain size has also been shown to be a strong predictor of the overall pace of growth and development. This study compares the ontogenetic progression of these two traits to test the hypothesis that they mature concordantly across primate species with divergent rates and durations of development. The ontogenetic sample consists of specimens from Hominoidea (*Gorilla, Homo*, *Pan,* and *Pongo*) and Cercopithecoidea (*Macaca* and *Papio*). Cranial capacity was obtained by filling the crania with mustard seeds, and dental development was assessed using radiographic images. Dental stages were devised and plotted against cranial capacity. Any individual that was more than two standard deviations below the mean of a sample of adult cranial capacities was regarded as not having completed brain growth.

The results show that most primate species, with the exception of *Homo*, that have a small neonatal brain size relative to adult brain size reach adult levels of cranial capacity at a later stage of dental development than species with large neonatal brain sizes. This finding indicates that brain growth and dental development are decoupled, and the maturation patterns of these two traits could be affected by different factors such as diet or life history. In addition, this result suggests that the rate of brain growth is limited in most primate species, with the exception of humans, and longer periods of postnatal growth are necessary in species with relatively small neonatal brains.

Resource intensification and sedentism in pre-contact Central Califor-

nia: temporal changes in health among hunter-gatherers from the Sacramento Valley and San Francisco Bay.

E.J. Bartelink. Department of Anthropology, Texas A&M University.

Although bioarchaeological research in the Americas has focused on health changes at the transition to agriculture, complex forager societies have received much less attention by physical anthropologists. Pre-contact Central California represents a region where population densities were among the highest in North America at the time of European contact, and yet were maintained through an intensified acorn-storage economy. Research over the past few decades indicates that acorns were of minor importance during the Early Period (3000-200 BC). During the Middle Period (200 BC-AD 900), archaeological data indicate a greater degree of sedentism, higher population density, and a major focus on acorn subsistence. This paper investigates temporal and regional trends in health associated with sedentism and subsistence change using a large curated skeletal series (n=450) from Central California. In this study, I focus on temporal changes in stature, and relative frequencies of porotic hyperostosis, cribra orbitalia, and dental disease in adult and subadult skeletons from archaeological sites dating between 3000 BC to AD 1800. Regional differences are assessed between populations from seven archaeological sites from the central Sacramento Valley and from four sites along the San Francisco Bay. Preliminary results indicate that Valley populations were taller than their Bay counterparts, while both groups experienced high levels of dental disease and porotic hyperostosis. This study is part of ongoing project that will explore changes in health and diet in Central California combining data from both paleopathology and stable isotopes analysis.

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Clinical manifestations of the Metabolic Syndrome in Hispanics.

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The Metabolic Syndrome encompasses a set of clinical findings including hypertension, low HDL-cholesterol, high triglycerides, high fasting glucose levels and abdominal obesity. Also, it is accompanied with several abnormalities in clotting and inflammatory markers. The recently released Adult Treatment Panel III (ATP III) provided a definition of the metabolic syndrome in adults and drew attention to the importance of the syndrome as an entity that places individuals at risk for type 2 diabetes and cardiovascular disease. According to the ATP III, persons meeting at least 3 of the 5 criteria mentioned above qualify as having the Metabolic Syndrome.

The age-adjusted prevalence of the Metabolic Syndrome was recently found to be 23.7% among 8814 U.S. adults participating in the National Health and Nutrition Examination Survey (NHANES) III. Hispanics had the highest age-adjusted prevalence of the metabolic syndrome (31.9%). Overweight children and adolescents are now being diagnosed with impaired glucose tolerance and type 2 diabetes, and they show early signs of the insulin resistance syndrome and cardiovascular risk as well. Recent studies have shown that overweight Hispanic youth with a family history for type 2 diabetes are at increased risk for cardiovascular disease and type 2 diabetes.

This presentation will introduce new and ongoing data from 692 adults from the San Antonio Diabetes/Gallbladder study regarding the prevalence and the mean values of the various components of the Metabolic Syndrome, according to the NCEP/ATP III definition. We will also present brief preliminary anthropometric, body composition and prevalence data for the different components of the Metabolic Syndrome in Hispanic children from the Houston-area enrolled in the Viva la Familia Study. The aim of the presentation will be directed to examine the associations between the epidemiological data and the clinical implications of the Metabolic Syndrome.

Subadult skeletal growth at Hierakonpolis, a working-class cemetery of predynastic Egypt.

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This study investigates diaphyseal long bone growth of a subadult sample from the predynastic, labor-class cemetery HK43 at Hierakonpolis, Upper Egypt. Six variables (diaphyseal lengths of the clavicle, humerus, radius, ulna, femur, and tibia) were considered in a sample of individuals, aged birth to 19 years (N=41). Diaphyseal length data from a Nubian sample (Armelagos et al., 1972; Hummert and Van Gerven, 1983) and a historic African-American cemetery in southwest Arkansas, Cedar Grove (Rose et al., 1985), were added to the analysis for comparison.

Growth curves, velocities, and the ratio of bone length to femur length were calculated for the data. The Hierakonpolis sample does not exhibit a "mid-childhood" growth spurt cited for Nubian samples (Armelagos et al., 1972, 1984); however, a dramatic increase in tibial length after about 12 years was observed. Also, at HK43, the humerus shows nearly 30% increase in length from the 5-10 year and 10-15 year age groups. The growth curves at HK43 are most similar to the Nubian samples. The Cedar Grove growth curves fall behind those of HK43 and the Nubian groups, but finish ultimately higher. The results of this analysis suggest that living conditions for the working class at Hierakonpolis provided sufficient nutritional stability for normal skeletal growth.

Plantigrady, bipedalism, and adaptations in the hominoid plantar fascia.

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While much attention has been directed at the evolution of the hominid foot skeleton, relatively little comparative research aimed at the internal architecture of the plantar fascia of the hominoid foot has been conducted. The sole pad of the plantigrade hominoid foot is compartmentalized by a complex of connective tissue trabeculae and septa. Previous studies have noted distinctions in the human plantar fascia correlated to the forces imposed during bipedal locomotion. Fascia thickness and trabeculae orientation and architecture were determined from sagittal magnetic resonance images (MRI) for a sample consisting of 22 human, 10 chimpanzee, 2 gorilla, 2 orangutan, 2 macaque, 1 baboon feet. MRI reveals that human and chimpanzee fascia thickness differs beneath both the heel and the metatarsal heads, with the greatest differences found beneath the medial metatarsal heads. A moderately developed heel pad in the African apes suggests that hominoid plantigrady was preadaptive for bipedalism with a heel strike. A major evolutionary adaptation to modern human bipedalism was the elaboration of the fascia beneath the hallucial metatarsophalangeal joint forming the ball of the human foot, and thinning of the fascia beneath the fixed arch. In contrast, the

fascia is undifferentiated beneath the divergent hominoid hallux and midtarsus. Indications from the fossil record suggest these human innovations for striding gait were of relatively recent origin, i.e. middle Pleistocene.

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Correlates of dominance rank in female ring-tailed lemurs (*Lemur catta*) at the Beza Mahafaly Special Reserve, Madagascar.

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Dominance status in female ring-tailed lemurs (*Lemur catta*) has a pervasive effect upon social organization, however the proximate mechanisms underlying dominance rank in females of this species remain poorly understood. With the rarity of alliances and lack of maternal rank inheritance in this species, it appears that adult females are reliant upon individual attributes and aggressive abilities to earn their respective rank positions. We investigated how three such attributes – weight, age, and agonistic frequency – relate to female rank-order in a wild population of ring-tailed lemurs during the birth and lactation season at the Beza Mahafaly Special Reserve in southwestern Madagascar. We used continuous-time focal animal sampling methods to calculate rates of agonism and delineate female rank-order in six social groups. Our results indicate that: (1) The mean weight of high-ranking females (i.e. those occupying the alpha, beta, and gamma positions in the dominance hierarchy) are significantly higher than that of lower-ranking females; (2) The relationship of age in relation to rank follows an inverted J-shaped pattern, with old adults attaining the highest average rank, followed by prime adults, young adults, and very old adults; (3) Significant, positive correlations between rank and rates of agonism exist in four of the six study groups. Results of this research will contribute to our understanding of the intricacies of female social interactions, while providing key insights into how female rank-relations govern several important aspects of social organization in this species, including feeding ecology and possibly infant survivorship.

Use of a silica matrix DNA purification method in sex determination from archeological bone remains.

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One of the questions first asked of excavated human skeletal remains is its sex. Sex typing generally depends on the anthropological analysis of skeletal characters. However, anthropological sex determination is complicated in a case of fragmentary bones and in skeletons from infants and children. The development of DNA-based techniques, especially PCR, has led to improvements in sex determination. Effective DNA isolation is a crucial step in ancient DNA analysis. Many workers have reported that inhibitors of PCR frequently co-purify with DNA extracted from ancient material.

We used a silica matrix for extraction of DNA from medieval human skeletal material (the 8th-9th centuries A.D.). Spongy bone from proximal epiphysis was employed. To eliminate the risk of contamination with recent DNA during each step of sample preparation, strict precautions were followed. DNA was isolated by silica matrix and by classical phenol/chloroform/isoamyl alcohol extraction.

Obtained DNA was amplified by multiplex PCR assay according to Palmirotta et al. (1997). This method enables an amplification of relatively long fragments and the quality of DNA could be tested after this manner.

Our results demonstrate that DNA amplification was much more successful in a case of silica matrix isolation and purification than in the other method. The silica matrix probably removed inhibitory activities from ancient bone sources. PCR analysis was compared with anthropological sex determination. Both conclusions were in complete agreement.

The silica matrix purification is inexpensive and efficient technique of aDNA isolation. It can be useful for any DNA-based analyses of historical skeletal material.

Natural selection in the Tibet Autonomous Region.

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Indigenous high-altitude populations have been exposed to the opportunity for natural selection. The ability detect natural has been hampered because the genetic bases of the quantitative traits that appear to be adaptive are often unknown. However, Tibetan populations have a major gene for oxygen saturation of hemoglobin. One allele at the inferred locus is associated with 6-10% higher levels and less hypoxemia. We reported that Tibetan women residing at 4000m altitude with a high likelihood of having one or two alleles for high oxygen saturation had more living children because fewer of their live births died during infancy. Those findings suggested that high-altitude hypoxia is acting as an agent of natural selection on the locus for oxygen saturation of hemoglobin. Here, we consider the implications for understanding the evolution of adaptations to the environment. The relative fitness of the low saturation genotype as compared with the two high saturation genotypes was 0.44 based on the ratio of the number of living children. This relative fitness was lower than reported for comparisons of Hb AA and AS genotypes in malarial areas (0.66 – 0.88). Hypoxic stress differs qualitatively from malaria stress: hypoxia is constant whereas malaria parasitemia level fluctuates. Thus, the selective advantage of the high saturation allele is probably constant whereas the selective advantage of an antimalarial genotype may be intermittent. Large fitness differences among genotypes indicate the potential for rapid change in allele frequency. Human genetic adaptation may be rapid and may depend upon the nature of the environmental stress.

Morphological constraints on vocal behavior in a prosimian primate.

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Nocturnal, non-gregarious prosimian primates, such as bushbabies, rely on vocalizations for communication. Although the repertoire of bushbabies is limited, calls that are loud and show little structural variability are for long-distance communication. Calls that are soft and

vary in structure with level of arousal occur when animals are in close proximity. Based on ecology and life history, the vocal repertoire of the bushbaby need not be as large as gregarious anthropoid primates. Or is it possible that the limited repertoire results from morphological constraints of the vocal tract? Through micro-dissection and histology, we examined the head-neck region of 6 available *Otolemur garnettii* cadavers to better understand the mechanisms responsible for vocalizations. The tongue occupied most of the oral cavity, leaving little room for changes in articulatory posturing to create varied calls. The pharynx was short and coupled with the nasal cavity through a reinforced portal. Differential separation of the nasal cavity from the remainder of the vocal tract is perhaps impossible and may be the source of stereotypical nasality found in loud calls. The vocal folds of the larynx had little musculature, were thick, and filled with a gelatinous matrix. Thus, responsiveness to differential tensing and aerodynamic forces is limited, and likely the source of "bleeting" rather than tonal sounds. Whether life history and ecology shaped the vocal repertoire, or if the anatomical limitations of the vocal tract shaped the repertoire, remains to be understood.

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Reduced canine sexual dimorphism in *Pan paniscus*: A morphometric approach to canine sexing in hominoids using high resolution polynomial curve fitting (HR-PCF).

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Although overlapping with *Pan troglodytes* in body weight, cranial size and in some limb bone proportions, *Pan paniscus* has been shown to exhibit a marked reduction in sexual dimorphism in all characters with the exception of canine breadth and body weight (Cramer and Zihlman, 1979; Johanson, 1984). We present new evidence here which confirms that *P. paniscus* canine dimorphism, although present, is significantly reduced from levels observed for other hominoids.

Canine crown curvatures were quantified using high resolution polynomial curve fitting (HR-PCF) for a representative sample of extant hominoid canines (*Pan paniscus* n=3, *Pan troglodytes* n=30, *Gorilla* n=30, *Pongo* n=30, *Hylobates* n=30). Discriminant analysis of the resulting dataset identifies greater assignment error rates in sex determination for *P. paniscus* (i.e. as much as 25%) than for all other hominoids except *Hylobates*. Much lower assignment error rates for other hominoids known for a high degree of sexual dimorphism (i.e. *Pongo, Gorilla*) confirms the apparent reduction in canine dimorphism for *P. paniscus*.

Curvature quantification with HR-PCF has a considerable advantage over traditional sexing techniques (i.e. canine shape indices) (Kelley, 1995; Waddle et al., 1995) because it does not exclude worn and damaged teeth from analyses (Deane et al., in press). This is especially significant for analyses of fragmentary fossil specimens and particularly for analyses of fossil assemblages from localities where limited unworn canine samples do not clearly identify the exact number of taxa represented and additional, but worn, specimens can be used to increase sample sizes (i.e. Pa□alar, Lufeng, Rusinga).

Sex differences in emergence of deciduous dentition in captive lowland gorillas (*Gorilla gorilla gorilla*).

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The emergence of deciduous dentition through the gingiva in 12 infant gorillas (5 males, 7 females) was compared with human deciduous dental emergence. The gorilla infants were born and reared at the Columbus (Ohio) Zoo. Data were collected by the African Forest nursery staff.

In humans the sequence of deciduous tooth emergence – incisors, first molars, canines, second molars -- is similar in males and females. Timing of emergence differs between sexes, with deciduous incisors and canines emerging earlier in human males than females, but females' deciduous molars and permanent teeth appearing before males' dentition. The sequence of gorilla emergence is also similar in males and females but differs from humans, with canines appearing after incisors and molars. In the gorillas, all deciduous tooth types emerged earlier in females than in males, with increasing discrepancy from anterior to posterior dentition. In humans, illness and malnutrition are associated with delays in deciduous tooth emergence. Such a delay was also evident in a female gorilla with Vitamin D and calcium deficiency. However, a male with serious long-term intestinal symptoms had earlier deciduous dental emergence than the healthy males in the study group.

To our knowledge, this is the first report of sex differences in the emergence of deciduous teeth in apes. In humans, sexual dimorphism is known to persist through the emergence of permanent dentition. If sex differences also persist in apes, the use of ape dental development stages based on combined samples of males and females to estimate the ages of fossil hominids may need to be reevaluated.

Dietary adaptations of early and middle Miocene dendropithecids and other small-bodied non-cercopithecoid catarrhines from Kenya.

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Early and middle Miocene dendropithecids and related small bodied "ape" taxa are a highly diverse, but poorly known group. Our goal is to better understand dietary diversity within this group and to document potential changes in the trophic structure of primate communities from the early to middle Miocene.

To accomplish this, we first measured dental features known to be correlated to diet in living primates (molar shear crest lengths, occlusal cusp relief, degree of flare) on samples of *Dendropithecus, Micropithecus* and *Simiolus, Limnopithecus* and *Kalepithecus* from the early Miocene sites of Koru, Chamtwara, Songhor, Legetet, Kalodirr, and Rusinga, and the middle Miocenes sites of Maboko and Fort Ternan housed at the National Museums of Kenya. Second, high precision epoxy casts made from President Jet molds of the specimens measured were examined using an SEM. The Bioquant Image Analysis system was used to measure the length and width of microwear features within standardized areas of SEM micrographs.

Both approaches to reconstructing diet indicate that *Simiolus enjiessi* from the early Miocene of Kalodirr (SUMshear/L=239, pit %=12.8%) and middle Miocene "*Micropithecus" leakeyorum* from Maboko (SUMshear/L=239, pit %=8.9% (Palmer 2000)) are among the most folivorous of the dendropithecids. Early Miocene *Micropithecus clarki* from Legetet and Chamtwara appear to have been more frugivorous based both on morphology (mean SUMshear/L=222) and molar microwear (pit % =39%). In addition to comparing results between species at the same localities, we compare conspecific

samples at different localities to assess the effect of local environment on morphology and microwear.

MtDNA diversity in six West Indian Islands throughout the Anglophone Caribbean.

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The Caribbean is an example of a convergence of people and cultures from several continents. Few researchers have investigated how this phenomenon affected immigrants and their subsequent communities, even fewer have attempted to examine this convergence using anthropological genetics. In this analysis, mtDNA hypervariable region I (HVI) and haplogroup diagnostic RFLPs are examined in 318 individuals from six Afro-Caribbean communities in Dominica, St. Lucia, St. Kitts, St. Vincent, Grenada, and Trinidad. Genetic diversity and maternal genetic contributions to contemporary Caribbean populations are examined and comparisons are made between these data and those published from other African and African-derived populations.

All samples were collected from buccal swabs, extracted, and amplified using standard methods. The HVI was sequenced and 14 RFLPs were typed to determine the haplogroup. The Caribbean sequence summary statistics (pi, theta, gene diversity, average number of nucleotide differences, and Tajima's D) are all similar to each other and similar to published African data. MtDNA haplogroup L is detected in 93% of the total sample, while the remaining 7% consists of haplogroups A, C, F, J, N1c, U6, and U7. The presence of non-L types is indicative of non- Sub-Saharan African female gene flow into these communities and for the most part, is likely due to recent immigration. Different ethnic groups make up the African Diaspora, such as African-Americans, West Indians/Afro-Caribbeans, and Afro-Latinos, this study examines the origins of a little studied group within this Diaspora.

Two case-study challenges to the thrifty genotype hypothesis: an argument for expanding our etiological models of diabetes-prone populations.

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The "thrifty genotype hypothesis" has become firmly entrenched as one of the orienting concepts in biological and medical anthropology since first being proposed some forty years ago. Since that time, the hypothesis has been used almost exclusively to explain the disproportionately high rates of type 2 diabetes among the world's highest prevalence populations—especially in the South Pacific and Native North America. This paper suggests that the thrifty genotype hypothesis may have been applied far too broadly than current anthropological and epidemiological evidence warrants. The present paper takes a case study approach and examines two classic "thrifty genotype populations," one in Australia, and the other in the North America's Subarctic, that do not meet the predictions of the thrifty genotype hypothesis. In the Australian example, diabetes prevalence among Aboriginal peoples there are some of the highest in the world, despite little evidence of particularly frequent or severe food shortages in their prehistoric past. In the North American example, while diabetes prevalence has increased significantly among sedentary and obese Alaskan Eskimos over the last 25 years, diabetes prevalence remains well below that of U.S. Caucasians. This is the case in spite of the fact that the North American Arctic/Subarctic is commonly cited as one of the best theoretical examples of a thrifty-gene selecting environment. These and similar case studies would benefit from the application of additional evolutionary and etiological models, such as those focusing on fetal origins, to help explain the current complex epidemiological patterns evident in the global diabetes epidemic.

Testing locomotor hypothesis in early hominids: 3D modeling and simulation of bipedalisms using anatomical data.

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Since more than a decade, recent discoveries increasingly evidenced morphological variety in early hominid postcrania. Meanwhile, functional interpretations feed the idea that there was not a unique way of walking bipedally in the hominid clade (human-like or transitional). Many ways would have existed, each one being adapted to various environmental conditions. Recent biomechanical developments using living human and non-human primate models allow testing such locomotor hypothesis. Yet, the place they leave to anatomical data is reduced.

We developed a biomechanical approach that integrates quantified anatomical data. Using simulating procedures, we aim to evaluate the influence of a given anatomical parameter on the bipedal displacement, in the frame of its anatomical complex. We propose a first test that concerns the rearticulated pelvic girdle and lower limb chain of a sample of 70 *Homo sapiens*, *Pan troglodytes* and *Pan paniscus* and both A.L. 288-1 and A.L. 129-1 original specimens. Articular chains are described by 3D coordinates of anatomical landmarks, centers of rotation, planes and values of maximum joint excursions. The mathematical tool we developed uses inverse kinematics.

As a procedure of validation, the generated motion is 3-dimensionally visualized and individual joint angular trajectories of living species are calculated and compared to acquired trajectories. Simulations are then performed by varying femoral and tibial angles so that functional patterns can be generated. Finally, angular trajectories for *Australopithecus afarensis* are calculated and lower limb peculiarities in early hominids are functionally interpreted in the light of the generated functional patterns.

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Food patch choice of bonobos (*Pan paniscus*) in Lui Kotal, the Democratic Republic of Congo.

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Studies of female sociality in African great apes suggest that, when compared to chimpanzees, bonobos are characterized by lower levels of feeding competition enabling females to forage closer together, in larger parties, and to form stronger social bonds. In this study, data based on direct feeding observations, fecal analyses, and measurements of patch size were collected between 20 May and 20 July 2004 at Lui Kotal, a research site recently established by the Max Planck Society.

Food intake and related behavior were observed in 14 food patches, including seven tree fruit patches, five liana fruit patches, one flower patch, and one THV patch. They spent an average of 35.5 min-

utes in a patch (s.e. 7.92), with an average party size of 5.0 (s.e. 0.76). Despite the fact that liana fruit patches were characterized by a significantly smaller basal area than tree fruit patches (71 m², n = 22 versus 257 m², n = 16; p = 0.0001) and a lower density of fruits (9% of the lianas and 38% of the trees had more than an estimated 1,000 fruits), this resource was fed on during 43% of 498 observation minutes and its seeds were present in 78% of 50 fecal samples. There was a positive correlation between basal area and the time a party spent in a patch (n = 11, p = 0.0262), but not between basal area and party size (n = 11, p = 0.6744). Unlike previous reports, the results of this study suggest that bonobos are able to maintain large party size, spatial cohesion, and social tolerance even if food patches are small.

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Growth-related hormones in great apes.

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Great apes have an extended period of postnatal development relative to other primates. It has been hypothesized that this extension is due in part to the activity of certain hormones during development. In particular, the shared pattern of postnatal increases in levels of dehydroepiandrosterone sulfate (DHEAS) has been implicated as a marker of an extended "childhood" phase of development in humans and chimpanzees. Recent research in other primate groups has suggested that the postnatal increase in this hormone is unique to humans and chimpanzees. However, levels of this hormone have not been analyzed in other pongids, and therefore it is unclear whether this developmental profile is shared among all great apes, or only between humans and chimpanzees. Additionally, it remains to be determined how similar great apes are with regard to other hormones during development.

Cross-sectional serum samples (N=54) were obtained from *Pan paniscus*, *Pan troglodytes*, *Gorilla gorilla*, and *Pongo pygmaeus* individuals from 3 to 45 years of age. Weight data were available for a subset of individuals. Radioimmunoassay was used to analyze serum for levels of insulin-like growth factor-I (IGF-I), DHEAS, and testosterone. Enzyme-linked immunosorbent assay was used to quantify levels of growth hormone binding protein (GHBP). Results suggest that bonobos and chimpanzees both share a significant postnatal increase in DHEAS levels with humans, while other pongids do not. Among all pongid taxa, IGF-I and GHBP levels are positively correlated with size. Testosterone levels do not show any significant differences among the species studied.

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Ontogenetic patterns of positional behavior in *Cebus capucinus* and *Alouatta palliata*.

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Cebus and *Alouatta* exhibit differences in life history timing and patterns of linear skeletal growth. In the genus *Cebus*, limbs are shorter at birth and grow at a relatively slower rate when compared to the genus *Alouatta*. However, behavioral research has shown that *Cebus capucinus* reaches reproductive maturity much later when compared to *Alouatta palliata*. Given these differences in rates of growth and reproductive maturity, it is expected that juvenile *Alouatta palliata* would resemble an adult pattern of positional behavior earlier than *Cebus capucinus*.

In this research, I examine ontogenetic patterns of positional behavior in *Cebus capucinus* and *Alouatta palliata* inhabiting a tropical rainforest in Costa Rica. *Cebus* and *Alouatta* were observed for 773 hours during 2002 and 2003 at Estación Biológica La Suerte in Northeastern Costa Rica. Statistical analyses incorporating randomization procedures indicated that adult positional patterns develop at an earlier age in *Cebus capucinus*. Young *Cebus* juveniles resembled adults in most positional categories by 6 months of age while *Alouatta* varied significantly from adults throughout the juvenile period. Juvenile howlers were observed to leap significantly more often than adults ($p < 0.001$ in all comparisons). Bridging significantly increased during ontogeny ($p < 0.01$). Significant differences in positional categories were not observed in *Cebus* juveniles and adults. These data suggest that ontogenetic differences in skeletal growth, body mass, and life history timing do not predictably alter locomotion in mantled howling monkeys and white-faced capuchins. Additional relationships among positional behavior, forest structure, diet, and ontogeny are discussed.

Searching for signatures of natural selection in high altitude populations.

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Hypoxia, caused by lowered barometric pressure at high altitude (defined as >2500 m above sea level), results in severe physiological stress to the human body. Although the suite of human physiological responses to this environmental condition has been well documented, the genetic bases for these adaptations remain unknown. To search for genes possibly involved in adaptation to high altitude, we used F_{ST} and other measures of allele frequency differentiation. Local natural selection especially positive selection can lead to elevated allele frequency differences measured as high F_{ST} and locus specific branch length (LSBL). Although demographic factors as well as genetic drift can also affect differences between populations, identifying high LSBL and high F_{ST} on genome-wide SNP datasets can be a powerful tool to rank candidate genes. Next, by comparing a high altitude, Indigenous American population (Quechua) to a low altitude, Indigenous American population (Nahua) using these statistics, a list of 451 SNPs (threshold F_{ST} >0.20) and 636 genes within 40kb region of those markers was generated. Based on this dataset, candidate genes that may have undergone natural selection in the Quechua population were revealed. Among these are nitric oxide synthase 2A (NOS2A) and endothelin 1 (Edn1).

Trauma in an early medieval Welsh cemetery.

K. Blake. Northern Illinois University.

The skeletal remains of 42 individuals from the Atlantic Trading Estate site in Barry, Wales, were examined to assess traumatic injury patterns. The burials date to the early medieval period, AD 350 – 900. The remains were recovered from a cemetery on the southern coast of Wales, in a formerly agricultural area. Little is known about life in this time period in Wales. Injury patterns in this Welsh population are reviewed quantitatively, outlining rates of trauma for individuals as well as prevalence rates for specific bones. These rates are compared to other

studies from this time period and geographic area, including studies from Raunds, Eccles, Kent, St. Andrew's, Fishergate and Cox Lane, and Ipswich in Great Britain.

This population showed a high rate of trauma, with a frequency rate of 14.3 % of individuals affected (n=42). Trauma was observed more frequently in males than in females. Traumas found include fractures to the clavicle, radius, ulna and parietals. Traumatic injuries included both blunt and sharp force wounds. Two individuals experienced multiple fractures. Other populations from this time period typically experience rates of trauma closer to six percent; however, rural populations have shown rates as high as 19.4 percent. In conclusion, these results may reflect the difficulties of rural life in that time period and possible health and environmental risks associated with it.

A new portable scanning system for the acquisition of data from three-dimensional objects.

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This analysis introduces a new digital photographic method for collecting three-dimensional coordinate data, applied to a study of variation in hominin browridge morphology. This area of the skull has played a crucial role in studies of taxonomy, function, and sexual dimorphism, but studies of variation in browridge morphology have been constrained due to the subtlety and limited number of discrete osteological landmarks present in this region of the skull. In this study, we use the ShapeCam system by Eyetronics, in order to capture the 3D geometry of a small sample of hominin frontal bones in order to assess the capabilities of this technique for measuring subtle anatomical details.

The ShapeCam system consists of a calibrated digital camera and a specially designed flash device, both affixed to a lightweight frame. Using the ShapeCam, high-resolution digital images were taken of each sample specimen. During image acquisition, the flash device projected a grid onto the surface of each skull. Deformations in the appearance of the calibrated grid lines were used to calculate the 3D structure of each skull from the 2D digital images. The projected grid was also used to extract 3D coordinate data from the supraorbital region of each specimen. This process enabled us to produce fast and accurate 3D digital models that recreate the original shape, colors and textures of each specimen. We utilize a variety of analytical approaches with ShapeCam data, including bivariate, multivariate, and geometric morphometric techniques. The advantages and disadvantages of using this method of data collection will also be discussed.

Termite de jour: termite fishing by West African chimpanzees (*Pan troglodytes verus*) at Fongoli, Senegal.

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Chimpanzee tool use to fish for termites occurs across Africa, but the ecology of this insectivory has been largely ignored. West African chimpanzees (*Pan troglodytes verus*) at Fongoli, in southeastern Senegal, fish for termites most months of the year with peaks from March to July and in October. We collected data on 124 termite mounds that included nearest neighbor mound, shape, habitat-type, percent cover by woody vegetation, height, width, termite activity, chimpanzee activity, and vegetation. The presence of chimpanzee activity was assessed using ethoarchaeological methods, that is, artifacts and remnants left behind were systematically collected and measured. Tool length and diameter at the proximal and distal ends, fraying of the distal end, and whether the proximal end was clipped or stripped from the source were recorded. Of the mounds used by the chimpanzees, 57% were in open woodland. Tools were found at 28 mounds (23%), and 20 revisits also proved positive for tools, for a total of 48 assemblages of tools. Results are compared to other sites.

At least six genera of termites occur at Fongoli. Data suggest that the chimpanzees of Fongoli may fish for three of these: *Macrotermes*, *Trinervitermes*, and *Amitermes*. *Macrotermes* (*subhyalinus, bellicosus,* and an as-yet unidentified species) comprise 73% of the fished mounds, and 81% of the tool assemblages. Thus, termite diet may be more diverse in the chimpanzees of Fongoli, with their longer fishing season than other sites.

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Methods for assessing primate growth and development with attention to sex differences.

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Immaturity represents an evolutionary challenge. A young primate must survive a non-reproducing life stage while its entire body undergoes reorganization to transition into adulthood. During growth, body weight of live animals is relatively easy to measure and records one basic dimension of somatic change. Focusing on body mass as a growth baseline, however, may impair insights into the transitions of other body systems. Teeth are erupting, brain size is increasing, limbs are growing, bones are fusing, and overall body shape is restructuring. This paper addresses two major methodological questions. First, how can we compare the developing systems of immatures against those same systems in conspecific adults to help reveal differential growth patterns in body systems? Second, how do females and males compare in the timing of growth in body systems (e.g. skeletal and dental)? We use the eruption of specific teeth to establish relative age classes, e.g. infant, juvenile, subadult, and adult, which allows application to species in museum collections of unknown age as well as known-age captives. Using dental age classes, we examine growth in brain size, trunk and limb lengths, bone fusion, body mass, and at times muscularity. Catarrhine monkeys and African apes provide examples to illustrate the efficacy of this methodology, for example, that intra-specific sex differences in pelvic growth occur in cercopithecines (N=43) and pongids (N=42), but not colobines (N=66). We discuss our findings on somatic growth patterns with regard to known behavioral and reproductive findings from wild species.

A pubic symphysis of early *Homo* from the late Early Pleistocene at Buia (Danakil Depression, Eritrea).

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In November 2003 a left pubic symphysis face (with portions of the ilio-pubic and ischio-pubic rami) was discovered at the Uadi Aalad (UA) site in Eritrea. This 1mya specimen (UA-466) represents the oldest *Homo* symphysis in the fossil record. It derives from Early Pleistocene sediments in the Buia basin which have already produced likely female remains consisting of a cranium and an incomplete right hip bone.

UA-466 consists of an undistorted, only slightly eroded symphysis, preserving considerable detail on the broken rami and face. Below a moderately projecting pubic tubercle, the concave ventral margin stretches from the ilio-pubic ramus to just above the inferior-medial angle of the obturator foramen. Its anterior, medial margin lacks a ventral arc. Beneath the symphysis face is a broad, uncrested anterior ischio-pubic ramus. Mirroring the opposite side shows that the two symphyses met in a tight angle. These morphologies indicate the specimen belongs to a male. The symphysis face preserves details which permit the application of modern ageing procedures. A remnant ridge and furrow system is present, with the formation of a dorsal rampart, delineation of the inferior angle and demarcation of the ventral bevel. All these are consistent with late stage 2-early/stage 3 in the Suchey-Brooks' technique. There are no features inconsistent with this age categorization.

The pubis is evidence for at least two individuals at Buia. Furthermore, given its close accordance with modern patterns, the discovery suggests sex and age indicators used today are fully in place by 1mya.

Inventory and preliminary description of Middle Pleistocene pelvis remains from the site of the Sima de los Huesos, Atapuerca (Spain).

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The Middle Pleistocene site of the Sima de los Huesos (SH) in the Sierra de Atapuerca (Spain) has yielded a large sample of fossil human remains classified as ancestors of the Neandertals. The pelvic remains include a nearly complete male pelvis (Pelvis 1), three very complete coxal bones (AT-800, AT-1004 and Coxal I) and numerous other pelvic remains representing at least 18 individuals. The anatomy of the pelvic remains suggests a robust and very broad pelvis with a very long superior pubic ramus, a lateral iliac flare and a large acetabular diameter with very prominent and protruding margins. This morphology is considered to represent the ancestral condition, from which *Homo sapiens* evolved.

Relying on criteria for sex determination in living populations, we have established the sex for 8 individuals according to the right side and 9 for the left. Following modern human patterns of remodeling of the auricular and symphyseal surfaces, we have assigned an age range to 8 Individuals according to the right side and 9 for the left side. We have also estimated the body mass from acetabular size in 5 individuals based on the right side and 2 individuals based on the left and compare the values obtained with that achieved previously for Pelvis 1.

The large sample size, good state of preservation and Middle Pleistocene age of the Sima de los Huesos fossils make them a critical source for understanding the evolutionary emergence of Neandertal postcranial anatomy.

Towards an "evolutionary behavioral teratology": speculations from the endophrenology of a common birth defect.

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Sociobiological styles of evolutionary explanation would benefit from examples of a neuroanatomical basis for behavioral evolvability. One of these may be available from studies of a common birth defect, Fetal Alcohol Spectrum Disorder (FASD), of which some of the more inconvenient traits (impulsivity, strong rule-based loyalties) might be beneficial in an evolutionary context. Recent morphometric studies demonstrate that while FASD is characterized by mean deficits of brain size and psychometric intelligence, it is also characterized by inflated variance without mean shift in some other measurement domains. One of these, excess variability of corpus callosum shape (owing to disrupted neuronal migration), proves highly correlated with behavioral variation, including variation in obedience behavior: FASD's can be either more or less obedient than their unaffected conspecifics, depending on social context.

This "endophrenological" pattern may exemplify one ecophenotypic mechanism for a sociobiological selection gradient on conditional behavioral variability. In this speculative view, although neither alcohol nor FASD was likely involved in human evolution, an epigenetic mechanism preadapted to creating variation in obedience behaviors in the presence of trace neurotoxins might have contributed to group fitness during periodic environmental catastrophes via increased chances of survival of small bands. The central tendency of callosal shapes affected by alcohol seems selectively neutral, and what would otherwise be a substantial phenotypic cost is even today managed by spontaneous abortion. Assuming intermittent strongly directional group selection in humans at times of recurrent severe environmental stress, there may be a selective role for some such neuroanatomical mechanism of ecophenotypic behavioral hypervariability.

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Slow or fast - first life history data for wild Phayre's leaf monkeys (*Trachypithecus phayrei*).

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In a given species, life history traits set the stage for individual reproductive tactics and in a comparative framework may mirror the phylogenetic background as well as the nutritional conditions of the population under study. The harsher the conditions are, the slower animals grow and reproduce. Together with several assistants we documented life history traits of Phayre's leaf monkeys (*Trachypithecus phayrei*), a medium sized primate of about 7 kg body mass, at Phu Khieo Wildlife Sanctuary (Northeast Thailand). Data for more than 30 individual females and their offspring living in three groups were collected since October 2000 (eight group years in total). Infants are born with a flamboyant, orange, natal coat, which changes to a gray coat in the first half year of life. The lactational period averages around 1.5 years and females begin to reproduce when they are about five years of age. There is a pronounced birth peak with most births occurring during six months of the year. The interbirth interval averages about two years depending on infant survival. Infant survival is moderate and falls within the expected range for wild primates of medium body size. Phayre's leaf monkeys at Phu Khieo Wildlife Sanctuary seem to develop and reproduce at a speed expected for their body mass, i.e. faster than larger and heavier colobines. The seasonal pattern of reproduction indicates an annual, nutritional bottleneck, which is currently investigated.

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Possible etiological significance of altered growth patterns in children with clefts of the lip and palate.

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Andre Prader and colleagues have argued that alterations in the direction of the growth acceleration curve indicate changes in the hormonal milieu, and so changes in the set of genes being read. The growth patterns of children with clefts of the lip and palate are slightly different from those of unaffected children, and the alterations are different in girls and boys. Clefts of the lip-and-palate are more frequent in males than females, and in those of Asian Ancestry than those of European descent. Clefts of the lip and palate, stemming from failure of the embryonic facial precesses to unite properly, occur about day 38 post conception, which is too early to be influenced by testosterone. Children with clefts of the lip and palate show delayed growth in infancy due to feeding difficulties, but usually by age two years they are no different from other children, and remain so until mid childhood when andrearche appears to be delayed or defective. Girls with CLP appear to end up short, while boys reach expected heights, but are delayed in maturation. This pattern of growth deficit in embryogenesis and then again in late childhood suggests an alteration in the metabolism of the adrenal steroid dihydroepiandrosterone (DHEA). This paper uses growth data from children with clefts of the lip-and-palate to demonstrate that this is a systemic disorder, and to examine whether alterations in the metabolism of DHEA explain its epidemiology, as well as the ontogeny of affected individuals, and so could have etiological significance.

Risk factors for metabolic syndrome in Alaska natives.

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Metabolic syndrome is characterized by the aggregation of risk factors for cardiovascular disease and type II diabetes. We assessed the prevalence of metabolic syndrome and distribution of risk factors in 397 adult Yupik Eskimos residing in 6 rural villages and a small town in Western Alaska. In this cross-sectional study, villages were stratified by population, geographic location (coastal and river), and religion. Within these villages randomly-selected households were targeted for recruitment; enrollment in the study was also offered to the community at large. Participant's ages ranged from 18-94 yrs and prevalence of metabolic syndrome was classified according to the ATP III criteria. The unadjusted and age-adjusted prevalence of metabolic syndrome was 10.6% (n=42) and 9.1% respectively among our Alaska Native participants. The prevalence among female participants was 12.7% (n=29) compared to 7.7% (n=13) in males (Fisher's Exact Test: p=0.07). Estimates of age-adjusted prevalence rates of metabolic syndrome in different ethnic groups include: 32% in Hispanic Americans, 22% in African Americans, and 24% in Caucasian Americans (Ford et al., JAMA 2002; 287:356-359). Among the 397 participants, 42% did not have a risk factor for metabolic syndrome, 32% had one risk factor, 16% had two, 7.6% had three, 2.5% had four, and 0.5% had five risk factors. Our preliminary results suggest the metabolic syndrome is not yet common among Yupik Eskimos. Further research needs to be completed to define potential protective factors among Yupik Eskimos, as well as to determine the overall prevalence of metabolic syndrome in additional Alaska Native tribes.

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Physical anthropology at the turn of the century.

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Biological – "physical" – anthropology at the turn of the century had two chief areas of concern. One was in classifying the variation in appearance of living human groups, i.e. the assignment of "racial" designations. The other was the treatment of the fossil record of prehistoric hominid remains.

The model for the treatment of "race" was in the writings of the head librarian of the Muséum d'Histoire Naturelle, Joseph Deniker, who articulated what was the outlook of La Société d'Anthropologie de Paris. The Société had been founded by the physician Paul Broca and had adopted the pre-Civil War outlook of the American anatomist, Samuel George Morton. Morton's ideas had lost favor in the English-speaking world because of their association with the losing side in the American Civil War. Although they were rigidly typological, they found widespread favor after the turn of the century because they were thought to be French.

"*Pithecanthropus*" (now *Homo*) *erectus*, found in Java in the last decade of the 19th century, and remains from Neanderthal in Germany in the middle of the century plus Spy in Belgium in the last quarter of the century provided the basis for treatments in straightforward evolutionary fashion by Gustav Schwalbe in Germany and by William J. Sollas and Arthur Keith in England during the first decade of the 20th century. Neanderthal material found in France prior to 1910 was interpreted by Marcellin Boule who rejected the idea of evolution. France was the senior partner on the winning side in World War I. The pre-World War I French outlook still characterizes the approach taken by most subsequent students of human "evolution."

Related dyads of females are common in western gorilla groups despite routine female dispersal.

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The socioecological model for primates predicts that when female kin associations are important (e.g. when resources can be monopolized by small coalitions) females will be philopatric. This expectation is well-met by many, but not all, primate species. For primates living in one-male groups in which male tenure can exceed the age of female sexual maturity, inbreeding avoidance may promote female dispersal even when female kin associations are beneficial. In these cases, female kin associations might come about, not through female philopatry, but through female co-transfer (simultaneously or sequentially) to the same group. This scenario has been suggested for western gorillas (*Gorilla gorilla*) that live in single-silverback groups from which females have been observed to transfer alone or in pairs. However, in these cases the genetic relationships among females, and thus the extent to which co-transfers are kin-biased, are unknown. Here we evaluate the genetic relationships among adult females (n = 22) within and between eight groups of western gorillas at Mondika Research Center, Central African Republic - Republic of Congo. DNA extracted from feces samples collected at nesting

sites was typed at up to 10 microsatellite loci. Relatedness was evaluated using the degree of allele sharing and likelihood analysis of hypothetical relationships (full-sibs, half-sibs, parent-offspring). Results indicate that, despite female dispersal, related dyads of females within western gorilla groups are more frequent than would be expected if dispersal was random. This suggests that female dispersal does not preclude female kin associations from potentially playing an important role in western gorilla social dynamics.

The paleopathology of pellagra and malnutrition: investigating the impact of prehistoric and historical dietary transitions to maize.

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This presentation offers a unique analysis of both macro- and microstructural skeletal indicators from 35 individuals known to have died from pellagra (n=14) and non-specific general malnutrition (n=21). These cases are part of the "Raymond Dart" skeletal collection, housed at the University of Witwatersrand Medical School, Johannesburg, South Africa. This sample was drawn from a mid-to-late 20th Century Black South African population.

In an earlier report we demonstrated that these individuals were found to exhibit a high incidence of alveolar bone loss, dental caries, enamel hypoplasias, periostitic lesions, osteomyelitis, cribra orbitalia, and cranial pitting. The frequency of specific pathological indicators separated the pellagrins from those with general malnutrition, however the indicators were not pellagra specific.

We've also reported on the histological findings for rib samples taken from a subset of pellagra (n=10) and general malnutrition (n=16) cases. In comparison to a non-malnutrition control population (n=45), pellagrins and non-specific general malnutrition individuals were found to have statistically significant larger Haversian canals, smaller cortical areas, and a tendency for larger secondary osteons. The critical difference between pellagrins and non-specific malnutrition cases and the control population was a decreased cortical area for pellagrins.

Given its implications for interpreting the paleopathology of intensive maize horticulture we present a checklist of macro- and microlevel indicators for investigating a signature pattern for the skeletal biology of pellagra, a niacin deficiency disease, often associated with high-maize/low protein diets. The overall synthesis of our findings offers new insights into skeletal-based interpretations of nutrition and micronutrient-related health problems.

A lack of potatoes? Infantile scurvy in nineteenth century Birmingham, England.

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Excavations in advance of redevelopment at the churchyard of St. Martin's, Birmingham, England produced 857 individuals from the late Eighteenth and early Nineteenth centuries. The presence of individuals from the middle classes (vault burials) and poorer members of society (earthcut graves) provided a valuable social context for the investigation of scurvy.

Detailed analysis of 164 juveniles was undertaken following Ortner et al.'s (1997-2001) criteria for diagnosing scurvy. Specifically cranial bones, scapulae and long bones were examined for the presence of an increased vascular response comprising of abnormal porosity penetrating the cortex indicative of scurvy. In addition SEM examinations were also undertaken. Changes on bones across the skeleton indicative of scurvy were recognized in six juveniles from earthcut graves (6/144) but none from vaults (0/20).

A range of foods rich in vitamin C would have been available in Birmingham at this time; e.g. citrus fruits, marine fish and potatoes. However, of these foods only potatoes would have been readily affordable by poorer individuals. Documentary research confirmed that the potato blight, famous for it's effects in Ireland, also destroyed potato crops in Britain for many years. The period of potato blight infection corresponds to the last years of use of St. Martin's cemetery. It is likely that many of the juveniles analysed date to this period, and a shortage of potatoes may be a contributory factor to the changes recorded. This example provides a clear illustration of the potential of palaeopathological studies to investigate the impact of socio-economic conditions on past health.

A prediction model for the geographical distribution of antimicrobial resistance genes by wild and domestic animals: mobilized reservoirs and human health implications.

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As an urgent human health issue, the spread of antimicrobial resistance (AMR) between bacterial populations needs to be better understood. While recent publications have noted the occurrence of antimicrobial resistant bacteria in wild animals, little work has been completed to elucidate possible wild animal-based distribution networks for AMR bacteria and assess the possible health implications for humans. I will discuss domestic and wild animal AMR enteric flora and posit an ecological hypothesis and prediction model to explain some geographical distributions of AMR bacteria in an attempt to account for the role of wildlife in the spread of antimicrobial resistant bacteria. Wild and domestic animals as well as humans are reservoirs of AMR and virulent bacteria. The geographical distribution of these hosts can explain AMR bacteria occurrence in areas under heavy, moderate and no apparent antimicrobial pressure. Bacteria that acquire AMR genes tend to acquire virulence factors, experience niche expansion and can more readily exploit a host environment. Opportunistic, omnivorous and carnivorous hosts will most readily transport AMR bacteria, migratory birds and fish bring AMR bacteria into non-anthropogenic regions, while humans are the primary transporter of antimicrobial resistant bacterial species into anthropogenic/ nonanthropogenic transitional zones. Isolates transported by wildlife or humans will show AMR and virulence factors that are human or domestic animal in origin. It is concluded that the human health implications of animal mediated transport of AMR bacteria include limited infectious disease treatment options, pre-market resistance to new drugs, and increased pathogen transmission.

The lunate sulcus in Taung: where is it?

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When Dart first announced the discovery of Taung as a possible human ancestor, he listed among its humanlike features a lunate sulcus positioned more posteriorly on the endocast than one

would expect in an African ape. However, except for a drawing of the endocast, Dart never fully described where he thought the lunate sulcus was located. This ambiguity as to the location has led to some confusion as to the precise location of the lunate sulcus in Taung. Keith (1931) and later Falk (1985) place the lunate in a more anterior position, while Le Gros Clark (1947), Tobias (1991), and Holloway (1985) position the lunate more posteriorly.

In our reexamination of this issue, we placed an overlay of Dart's (1925) figure of the Taung endocast depicting the lunate sulcus on a digitized figure of the endocast. We found that Dart's intention was to identify a shallow, medio-lateral depression on the posterior aspect of the endocast as the lunate sulcus. This is consistent with the findings of Le Gros Clark, Tobias, and Holloway. Moreover, Dart appeared to be very confident in his interpretation, clearly stating in a later work that his principle reason for excitement on first seeing the Taung endocast was the position of the lunate. While it has been argued as to whether any sulcal features are clearly present on the Taung endocast, this review leaves little doubt where Dart, a student of G. Elliot Smith's (who was also the discoverer of the lunate sulcus), understood it to be.

Lemurs diverge in expression of a hormonal biomarker of life history.

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The adrenal synthesis of the androgens DHEA and DHEA-sulphate is unique to primates. Considerable evidence suggests that DHEA/S are biomarkers and regulators of life history. Serum levels decline with age in adult men and women, reflecting life expectancy. Baboons and macaques exhibit similar changes with more rapid rates of decline consistent with their shorter lifespans.

This study tested whether these patterns are primate-wide by examining the age-specific patterning of DHEA/S in strepsirrhine primates. It was predicted that a slower pace of life typified by a longer lifespan and later onset of reproduction would be associated with higher DHEA/S and a slower rate of decline.

These predictions were tested in lemur species differing in the onset of reproduction and lifespan: *Lemur catta*, *Eulemur mongoz*, *Propithecus verreauxi coquereli*, and *Varecia variegata*. A total of 33 males, varying in age from 1-20 years of age, were sampled at the Duke University Primate Center (DUPC). Serum samples were analyzed for DHEA and DHEAS concentrations using highly specific radioimmunoassays.

DHEAS immunoreactivity was not detectable in the serum of any of the lemur males, but DHEA was present in detectable amounts in all of the lemur samples. ANOVA showed significant differences among species in age-specific DHEA, with higher levels in *Propithecus* and *Varecia*. Age specific changes were evident in the latter but not in *Lemur* or *Eulemur*. These results demonstrate substantial species differences in steroid metabolism that may reflect phylogeny as much as life history.

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Signature bone fragmentation: an actualistic study identifying bone fragments exhibiting no distinguishable marks resulting from percussion.

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The research differentiating hominid-induced percussion marks and carnivore tooth marks on a bone is both conclusive and prolific. The distinctions that have been made can be used to identify bone manipulators at a site by examining the diagnostic bone fragments. However, bone fragments often occur at a site with no distinguishing marks. This study attempts to identify two signatures of bone fragmentation resulting from bipolar hammer and anvil breakage that yield no percussion marks. By systematically manipulating *Bos taurus* bones in a manner analogous to hominid behavior, i.e. in an effort to obtain marrow, the study endeavors to reproduce an assemblage of skeletal fragments commonly encountered at hominid occupation sites. Despite the fact that only ~6% of the bones exhibited percussion marks, the repetitive characteristics of a portion of the non-diagnostic pieces suggest it is possible to identify bone fragments as resulting from hominid influence but without percussion marks. The existence of signature fractures among the non-diagnostic bone fragments (i.e. the percussion fragments and wafer flakes identified here) offers another possible means for anthropologists to examine and interpret hominid behavior in assemblages where percussion marks and/or other traditionally recognized indications of hominid activity may be rare or absent.

Sex differences in the effect of managerial positions on blood pressure in Hawaii hotel workers.

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Studies of the effects of occupational stress have had mixed results in terms of sex and job status as predictors of elevated blood pressure (BP). Ambulatory BP was monitored in a multiethnic sample of Hawaii hotel workers (122 females, 23 managerial, 99 non-managerial; and 73 males, 22 managerial, 51 non-managerial). Ambulatory BP measurements were taken every 20 minutes during waking hours and every 30 minutes during sleep over a typical workday. Among managers, there were no significant sex differences in either systolic (SBP) or diastolic (DBP) pressure (ANCOVA with age as covariate; no significant sex difference for mean BP at work, home or sleep, nor for the standard deviation of waking BP). However, among people in non-managerial positions, there were significant mean BP sex differences in several daily settings (work SBP $F=25.5$, $p<0.001$; work DBP $F=8.3$, $p<0.01$; home SBP $F=21.0$, $p<0.001$; home DBP $F=3.9$, $p<0.05$; sleep SBP $F=18.9$, $p<0.001$; and sleep DBP $F=3.4$, $p=0.07$), and significant sex differences were observed in the standard deviation of waking SBP ($F=4.6$, $p<0.05$) but not for waking DBP ($F=0.9$, ns). There were no significant BP differences between managerial and non-managerial workers within sexes. The sex differences in non-managerial workers are not simply due to the activity involved in their employment because the BP differences persist in non-work settings, including during sleep.

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The brachymorph mouse and human evolution.

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The degree to which evolutionary

change in the cranial base was an integrative influence on other aspects of craniofacial evolution in hominids is a subject of much debate. Using a mouse model, we test the hypothesis that a mutation which produces a shortening of the cranial base creates some of the same changes seen in hominid evolution, such as increased cranial flexion, retraction of the face and increased neurocranial height. The Brachymorph (*bm*) mutant mice posses an autosomal recessive mutation that affects the sulfation of cartilage matrix glycosaminoglycans, initiating hyper-ossification and stunting of endochondral bone. In the cranium, this produces a reduction of the size of the basicranium. We obtained 3D reconstructions of brachymorph mutants (N=21) and wildtype littermates (N=19) using computed microtomography and performed morphometric analysis of 3D landmarks. Principal components analysis of Procrustes coordinates for the combined sample revealed a clear separation in shape for the two groups as well as shape variation consistent with the hypothesis. Euclidean distance matrix analysis revealed that the Brachymorph mutants had a significantly shorter (>10%) cranial base (at p=.05), as well as a significant increase in neurocranial height (>10%). We also found a significant increase in both cranial base flexion ($t=3.899$, $df=25$, $p<<.05$) and facial retraction ($t=-3.157$, $df=24$, $p<<.05$). These results demonstrate that the Brachymorph mutation produces cranial characteristics that mirror some of the changes seen in hominid evolution. This study provides evidence, in a mouse model, which suggests an integrative role for the basicranium in human evolution.

75 years of the annual AAPA meetings, 1930-2004.

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The AAPA came into existence at the 1928 meeting of Section H of the AAAS, and its first two meetings, both held in 1930, were convened in conjunction with the meetings of other and older organizations. The AAPA's independent meetings began in 1932. Their history traces two parallel trends. The first is the slow decline of the discipline's initial focus on the anthropometry and classification of racial groupings, betokened in the early meetings by papers and plenary sessions with such titles as "Wild Native Types of Formosa." The second theme is the growth of the Association and the correlated specialization and increasing fragmentation of its component subdisciplines.

Compared to those of many other, comparable professional organizations, the AAPA meetings have been distinguished by their intellectual democracy. The original "Declaration of Principles" of the new Association resolved "to help the most distinguished and advanced students so that they can carry out original research and fieldwork." Since the Association's 36th meeting in 1967, outstanding student presentations have been rewarded with honors and prizes. The AAPA has made a concerted effort to ensure that the ideas and research of students are afforded equal prominence with those of senior scientists, that debates between students and professors are conducted on a level playing field, that student presentations are afforded ample program time, and that excellent student work is given the credit it deserves. The relatively democratic character of our meetings may be a key reason for their high rates of membership attendance and research reporting.

Body orientations, sleep positions, and breast feeding behavior amongst solitary and co-sleeping (bedsharing) human mother-infant pairs: mutual physiological regulatory effects.

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Since the "back-to-sleep" campaign initiated in 1992, the rate per 1000 live births of American infants dying from SIDS has been reduced by half. This NIH funded research provides a basis for further appreciating how the mother's body and responses in addition to the infant sleeping on its back can create an adaptive "micro-environment" for the human infant, and how both the mother and infant, by virtue of their sensory interactions, changes each other's physiological status. 15 routinely solitary sleeping breastfeeding infants and their mothers and 23 routinely bed sharing breastfeeding mother-baby pairs sleeping apart and together over three consecutive nights were filmed using infrared cameras. Data collected on body orientation, sleep position, crying, breastfeeding, and maternal responses, as mothers and infants shift between bedsharing and separate room sleeping reveal changes in maternal-infant interactions involving partner-induced arousal patterns and overall sleep duration. Breastfeeding doubled when mother and their infants slept together, and infants cried significantly less. Decreased infant crying may be related to the shortened temporal latencies between when the infant aroused and when their bedsharing mothers responded. This makes problematic a 1999 recommendation by the American Consumer Product Safety Commission, to "never sleep with a baby."

Carpal coalition: identification and population variation.

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Carpal coalition is a congenital defect characterized by abnormal segmentation of two or more carpals during fetal development. Coalition may be either osseous or non-osseous. The latter occurs when carpals are joined by cartilage, fibrous tissue, or some combination of both. Osseous coalition is readily identified as a carpal block. Non-osseous coalition can be recognized through analysis of matching lesions occurring at typical sites on adjacent carpals. Carpal coalitions are of interest because they are heritable and may occur as isolated defects or as part of a syndrome.

This study aims to examine variation in the frequency and form of carpal coalitions between populations. Data were gathered on 541 African Bantu from the Dart Collection (University of Witwatersrand), 342 Euro-Americans from the Terry Collection (Smithsonian Institution), and 1020 medieval Danes from the University of Southern Denmark (Anthropological Database, Odense University). The Dart and Terry Collections are anatomical samples while the Danish sample is archaeological.

Six different forms of carpal coalition were identified. Bantu are more likely to exhibit carpal coalition with 9.9% of observable carpal pairings exhibiting some form of coalition, a rate four times that found in the combined Euro-American sample. Lunate-triquetral coalition is the most common form in Africans, affecting 7.1% of the Bantu sample while only 0.1% of the combined Euro-American sample was affected. Capitate-trapezoid coalition is most common in both the Terry (2.6%) and Danish (1.6%) samples, while second in prevalence among the Bantu (1.1%). Other coalition types identified include capitate-hamate, trapezoid-trapezium, hamate-pisiform, and scaphoid-lunate.

Reliable mitochondrial DNA se-

quence data from non-invasively collected samples.

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Mitochondrial pseudogenes in the nuclear genome (numts) present a challenge to researchers using mitochondrial DNA (mtDNA). As numts and mtDNA are non-orthologous, it is necessary to be able to differentiate 'true' mitochondrial sequences from numts. This is usually done by looking for abnormal substitution patterns across gene segments. However, these methods may not detect numts that differ slightly from the true mtDNA sequence, and they often do not work in non-coding regions such as the d-loop.

One way to identify numts is to generate two large (~9 kb or larger), overlapping mtDNA amplicons. If the sequence in the overlapping areas is identical, the amplicons must have been generated from a circular molecule - i.e. the mitochondrial genome. This approach works for high-quality DNA, but may be difficult for template from poor-quality sources, like non-invasively collected samples.

To determine the upper size limit of PCR products generated from poor-quality samples, a series of primers designed to amplify mtDNA products ranging from 1,000bp – 11,000bp were amplified from the fecal-extracted DNA of several catarrhine species. The effects of several variables were tested, including freshness of the sample, sample storage method, and sample storage temperature. The results suggest that (1) under certain conditions, mtDNA fragments large enough to verify the circular nature of mtDNA can be obtained from fecal samples, that (2) medium-length products (>2500bp) can be regularly amplified, and that (3) these moderately-sized amplicons may be reliably numt free, as nuclear loci over 2000bp are difficult to amplify from feces.

Temporomandibular joint histomorphology in exudativorous and frugivorous galagos.

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Exudativory is the acquisition of saps/gums by creating a wound in tree bark or a dried exudate drop and is practiced by a variety of mammals including some primates. This dietary niche has been associated with specific mandibular, cranial, and dental morphologies that are thought to assist in generating high muscle forces to create the wound, creation of a large jaw gape, and/or resisting high forces generated when creating the wound. This study aims to examine the articular cartilage of the temporomandibular joint in exudativorous galagos (*Otolemur crassicaudatus*) and frugivorous galagos (*O. garnettii*). Temporomandibular joints with intact joint capsules were harvested from cadaveric specimens of these species. Samples were decalcified and processed for paraffin sectioning. Specimens were embedded in paraffin, sectioned at 10-18 microns, and stained with hematoxylin/eosin, Gomori trichrome, and alcian blue procedures. For analysis, articular cartilage covering the mandibular condyle was divided into lateral, central, and medial portions as was the cartilage covering the mandibular fossa. Depth of the cartilage at these points was measured using a Leica photomicroscope with an ocular grid calibrated to a stage micrometer. In addition, the distribution and relative density of glycosaminoglycans (GAGs) in the articular cartilage was inferred based on alcian blue stained sections. Results will be discussed in terms of the relationship between thickness of articular cartilage and distribution of GAGs to force generation, creation of a large gape, and force resistance.

Multivariate analysis of the axillary border of the scapula in juveniles.

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The axillary border of the scapula is of interest in the debate about the phylogenetic relationship between Neandertals and modern humans. Examining the juvenile morphology of these closely related groups may clarify the mode of development and possible genetic influence on this morphology. Five morphological features of the axillary border were coded for degree of development in three samples. These features are thought to contribute to the complete morphology of the axillary border. The samples for the study comprise Krapina Neandertal juveniles, modern human juveniles from a Southeastern Mississippian culture, and recent juveniles from the Hamann-Todd collection. Our null hypothesis was that the five features develop at the same rate in anatomically modern populations and in Neandertals. Alternative hypotheses include altered rate of development or differing morphologies from early postnatal life but similar subsequent rates of development.

We used canonical correlation analyses on each of the five morphological traits within each population to examine differences in the pattern of expression. The five features do not all develop at the same rate within populations, although some of the traits do develop at similar rates. Some traits typically develop prior to other traits. Contingency tables were utilized to determine if the development of the traits differed across populations. Results indicated that the rate of development differs between the Neandertals and the modern human groups and also differs among modern groups.

Cell columns in frontal cortex of apes and humans.

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We examined horizontal cell spacing distances of cell arrays in layer IIIb in three regions of the frontal cortex in the brains of five ape species: the common chimpanzee, bonobo, gorilla, orangutan, and gibbon. Data were compared with results obtained in three human adults. We used a semi-automated method to detect and measure cell spacing distances in Nissl-stained material. The method is based on ImageJ software and the only operator input is the determination of the R01 and a threshold level for cell size. The tissue was cut in the coronal plane. We measured spacing distance and mean particle size (after threshold). Statistics were done using a one-way ANOVA and Tukey's post test. Among the apes, the orangutan had the smallest cell columns, being statistically different from the rest of the group. Gorilla and gibbon displayed the largest. The orangutan also had the largest mean cell size while that of the gibbon was the smallest ($p<0.01$). A combined look at column spacing revealed that cell columns in human brain were larger than that the apes, with a mean column spacing of 46.6+/- 6.6um for the apes versus 59.4+/-14.7um for humans ($p<0.0001$, two –tailed t-test). These results show that (a) cell columns are larger in frontal cortex of humans compared to that of anthropoid apes, (b) cell columns may be larger in frontal cortex compared to posterior regions in both apes and hu-

mans, (c) within the apes, there is no correspondence between column size and brain volume.

Ethnic and biological identity in New Kingdom Nubia.

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The populations of Nubia and Egypt have had a long history of interaction. While past studies have often focused on the unidirectional changed forced on Nubia by Egypt, more recent paradigms emphasizing the dynamic and bidirectional nature of these power relations are more appropriate for this situation. The events that occurred around the time of the Egyptian New Kingdom occupation of Nubia are significant. It is during this time that the foundations of the Nubian Napatan Kingdom, which ruled Egypt as the 25th Dynasty, were being built. Scholars disagree about who controlled Nubia during this important time: Egyptian colonists or native leaders. In this paper, these issues are addressed using a bioarchaeological approach.

The people buried using Egyptian and Nubian ritual at the New Kingdom site of Tombos, located at the third cataract of the Nile in Nubia, are the focus of this research (N=100). In addition, 1,287 individuals from contemporaneous Egyptian and Nubian sites are examined in order to comparatively assess the Tombos population. Multivariate statistical analyses of cranial measurements and cranial nonmetric traits are used to evaluate the genetic relationships between Tombos and these comparative populations. The analyses of genetic affinities suggest that the cranial morphology of the Tombos population is more heterogeneous than that of the Egyptian populations. This heterogeneity, however, is also characteristic of the native Nubian populations. Combined with the mixed ethnicity portrayed through archaeological indications of burial ritual, it is apparent that Tombos was comprised of an ethnically and biologically mixed group of people.

Artificial cranial deformation in the prehistoric lower Mississippi river valley.

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A study was performed on the cranial deformation found among prehistoric individuals from Louisiana. The type, degree, and characteristics of the deformation are presented. In addition, hypotheses are tested concerning the association between presence or degree of cranial deformation and social/biological groups: warriors vs. non-warriors, elites vs. commoners, priests vs. commoners, male vs. female, and all members of society. Testing protocols are generated for each hypothesis and the fit between the data and the protocols tested. The results of these tests indicate that cranial deformation is not more common in some groups than in all members of society, indicating that the practice was not limited to groups such as warriors, elite, priests, or even only one of the sexes. The major finding is that this cultural practice appeared to increase in frequency through time from the oldest to the youngest site.

3-D landmark coordinate data for sex determination of the adult human fragmented os coxa and the potentiality of Euclidean distance matrix analysis.

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Sex determination derived from the human skeleton is best assessed from the pelvic bone. There are both observation and metric analyses that have a high degree of accuracy and reliability that can successfully determine sex. Commonly, in archaeological or forensic contexts the pelvis is damaged and features needed for observation or metric analyses are missing. The present study explored the possibility of using three-dimensional landmark coordinate data collected from the more durable regions of the fragmented pelvis (acetabulum and surrounding thick bone) that withstand taphonomic damage to determine if there were significant sex differences local to particular landmarks that could be used in the development of a new sex determination method. Thirty-six landmarks were digitized on 200 Black and White male and female adult human os coxae. Euclidean Distance Matrix Analysis (EDMA) revealed that there are significant landmarks on the durable regions of the pelvis that distinguish between male and female os coxae.

Inference of population history from DNA haplogroup frequencies using computer simulation modeling.

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Ideally, distributions of haploid DNA lineages (i.e. haplogroups) map directly onto clear scenarios of population history. In reality, population histories are obscure. DNA haplogroup frequencies are products of multiple factors, such as random genetic drift, mating patterns and gene flow, population sizes, geographic distance, and shared ancestry.

We used computer simulations to assess and statistically evaluate the relative contribution of these factors on observed population haplogroup frequencies. To do so, we developed a demographic model of small-scale populations drawn from ethnographic, archaeological, and population genetic theory. We then simulate the long-term effects of these factors on the DNA haplogroup frequencies of small-scale populations, and subsequently statistically evaluate the difference between observed and simulated conditions.

Results of trial simulations show that in small populations with a low rate of gene flow, haplogroup frequencies remain stable over time; it takes over a hundred (simulated) generations for random genetic drift to effect significant changes in haplogroup frequencies. But, the specific way in which any of these factors will impact a population's haplogroup frequencies depends on the socio-cultural, geographic, and historical context of that population. We demonstrate that, given some knowledge of local demographic conditions, we can hone in on, and test for, the range of conditions that best explain observed haplogroup frequencies in an area.

Can the mandible speak? Mandibular variation in *Homo erectus* and *Homo sapiens*.

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Cranial variation has been analyzed extensively in attempts to determine the population structure of specimens attributed to *Homo erectus*. The mandible has been less frequently used in differentiating the regional variants, partly because mandibular morphology has been closely linked to masticatory function. However, this does not necessarily preclude its effectiveness as an indicator of population structure. The present study employs a modern human comparative sample to examine whether the mandible is useful for differentiating both prehistoric and

modern human groups, to discuss variation in *Homo erectus*, and to determine the extent of variation in modern humans from several geographic regions.

In this study we analyzed the 3-D shape of the mandibular symphyses and corpora of *H. sapiens* and *H. erectus* to determine if morphological variation corresponds to temporally, spatially, and taxonomically defined groups. Nineteen mandibular landmarks were gathered using a Microscribe 3DX portable digitizer. Specimen configurations were superimposed using GPA. The data and shape differences were analyzed using discriminant and principal components analyses.

On average 90.03% of individuals were classified to the correct modern human population. Asian and African *H. erectus* separate from *H. sapiens* and one another in the PCA and individual fossil specimens generally cluster with their respective geographic groups. The degree of variability in modern humans implies that species separation between African and Asian *H. erectus* is probably not necessary to account for regional variation in mandibular form. Further study of the mandible will be important to confirm its validity in delineating fossil and modern human populations.

Growth patterns during infancy and childhood as risk factors for the metabolic syndrome.

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Catch-up growth is known to occur in both infants and children and is characterised by an increased growth velocity in height and/or weight that occurs following the removal of some constraint upon normal growth and brings the child's height-for-age or weight-for-age status back to the normal centiles or, in the best-case scenario, actually returns the child's growth pattern to its pre-insult status. Rapid growth during infancy in children who have not been suffering from intrauterine insult and are not small-for-gestational-age has been the focus of more recent research. Rapid growth in such children is distinguishable from catch-up growth in that high height and weight increments cause an overshoot of the expected growth canal. This unexpectedly rapid growth in infancy is associated with an increase in overweight, obesity, and non-insulin dependent diabetes; risk factors for that are characteristics of the metabolic syndrome. Children exhibiting unexpectedly rapid growth are characterised by their normal to lower weight, length, and ponderal index at birth, significantly greater height and weight during childhood, and significantly greater subcutaneous fat, total body fat, and lean tissue at equivalent BMIs. Their skeletal maturity is consistent with chronological age in late childhood and with the skeletal maturities of their peers who do not demonstrate rapid growth in infancy.

This paper explores the current evidence for the causes and consequences of rapid growth during infancy and childhood as a means of identifying biologically and clinically significant modifiable factors that might reduce future risk.

Age related changes in body composition and physical function among Ariaal males.

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Declines in muscle mass and physical strength are a hallmark of male aging in western societies. However, little is known about physical aging under conditions of energy limitation. To determine age related changes in body composition and physical function in a subsistence population, we collected data from 102 settled and 104 nomadic Ariaal males from Northern Kenya, ages 20+ years. Measures included height, weight, waist circumference, 4 skinfolds, grip strength, and standing balance. Results were analyzed on the basis of 10 year age groups. The two sub-populations did not differ in BMI (18.0 $\pm$ 2.1 vs. 17.7 $\pm$ 1.9) or % body fat (10.2 $\pm$ 4.5 vs. 10.2 $\pm$ 3.9). FFM, % body fat, MPBA and waist circumference all showed significant differences between age groups. Grip strength, FFM and MBPA peaked in the 30 year old group; waist circumference and % body fat peaked in the 50 year old group. Multivariate analysis indicated that FFM and MPBA are predictors of grip strength. Standing balance was predicted by grip strength, but not MPBA or FFM. These findings are consistent with results from western samples. However, they differ from earlier findings among the Ariaal, suggesting that environmental fluctuation may have an important effect on body composition in this group. In addition, the relationship of standing balance and grip strength to body composition suggests that age related changes in muscle function may be largely independent of changes in body composition in this population.

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A genetic analysis of group relatedness in free-ranging black-handed spider monkeys (*Ateles geoffroyi*).

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The study of spider monkey (*Ateles* spp.) reproductive biology and behavior is hampered by the difficulty of observing copulations in this genus, which typically take place in seclusion from other group members. Available data indicate that female spider monkeys are very active in the initiation and maintenance of sexual encounters, and are therefore likely to have great influence in the choice of partners they copulate with. In addition, spider monkeys are known to copulate at times when conception is unlikely (i.e. when the female is pregnant, lactating or non-ovulatory). Thus female choice may be even more important in the timing of copulations with individual males and the likelihood of said males siring offspring. We present here the first known study of paternity analysis in free-ranging spider monkeys. Fecal samples were collected during the summer of 2004 from most members of a 35-member group of black-handed spider monkeys (*Ateles geoffroyi*) on Barro Colorado Island, Panama. It was not possible to collect samples from young infants however. Samples were amplified for mtDNA and nuclear DNA and examined to determine group relatedness and paternity patterns. Implications for socioecological theory regarding spider monkey behavior will be discussed along with implications for inbreeding in light of the unusual history of this group.

Myosin expression, muscle function and craniofacial form.

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This study examines differences in the composition and cross-sectional areas of type I and type II muscle fiber types within the muscles of mastication of male and female rhesus monkeys (*Macaca mulatta*). Adult male rhesus monkeys have a significantly greater number of muscle fibers that express type II myosin heavy

chain than females (P<.05). Type II fibers are always significantly (P<.05) greater in cross-sectional area than fibers expressing type I myosin in adult males. Adult female rhesus monkeys have fewer type II fibers, and are always smaller than type I fibers in cross-sectional area. Juvenile rhesus monkeys of both sexes express the adult female pattern of fiber types and relative cross-sectional areas, suggesting an underlying hormonal basis for fiber type distribution and size. This dimorphic pattern of cross-sectional area of type I and type II fiber is not expressed in postcranial muscles. While the masseter and temporalis mm. are significantly more powerful in males, male muscles are actually significantly less efficient than females in terms of force production, probably due to their extreme hypertrophy and lack of proportionate growth of craniofacial skeletal structures. These data are most interesting in light of findings of mutational inactivation of myosin heavy chain (*MYH16*) gene exclusively in masticatory muscles that apparently occurred after the lineage leading to chimpanzees and humans (Nature 428, 25 Mar 2004). Contrary to that report, these data fail to support the hypothesis that reduction in muscle mass and cross-sectional area of type II fibers led to increased encephalization in humans.

Straight to the point: mediolateral forces associated with linear lemurid locomotion.

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Mediolateral (ML) peak forces and impulses during primate locomotion are known from few studies, none of which investigate lemurids. Since ML components of substrate reaction forces (SRF) provide an estimate of the ML bending regime encountered by limb diaphyses, evaluating ML force magnitudes and comparing them to other SRF components (e.g. fore-aft forces) may elucidate the relative importance of ML forces during locomotor behaviors. We quantified SRFs of forelimb (FL) and hind limb (HL) contacts in two primates – *Eulemur fulvus* and *Lemur catta* – using linear quadrupedal gaits. Three individuals of each taxon traversed a force transducer incorporated into terrestrial or simulated arboreal substrates.

ML peak forces and impulses are largely independent of speed. Arboreal ML peak forces are consistently lower than terrestrial, which may reflect reduced peak forces associated with arboreal "compliant" gait. However, ML peak forces do not follow primate trends toward higher HL than FL forces. While fore-aft (FA) peak forces generally are larger than ML, differences are not consistently significant. Furthermore, average ML peak forces occasionally exceed average FA. Limbs often encounter laterally-directed SRFs during arboreal locomotion and medially-directed SRFs on the ground, but this varies, particularly for HLs. ML impulses often shifted between lateral and medial, which we attribute to balance requirements. ML forces appear pertinent for evaluating joint moments and bending regimes of long bones during linear quadrupedal locomotion, and maybe even more so during other locomotor behaviors, particularly those incorporating changes in the direction of movement.

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Upper limb long bones from Sima de los Huesos site (Sierra de Atapauerca, Burgos, Spain).

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The Sima de los Huesos (SH) is an exceptional Middle Pleistocene site in northern Spain which has yielded more than four thousand human fossils. Among the collection are 179 specimens (some composed of several fragments) representing the long bones of the upper limb (humerus, radius and ulna). Many are complete or almost complete bones (four humeri, eight radii and three ulnae) and represent individuals of both sexes and different ages, almost all of them classified as adolescents and young adults. The minimum number of individuals established varies by long bone: humerus (18), radius (13) and ulna (14).

Comparative analysis of the SH specimens reveals some traits that are primitive features within the genus *Homo* or even for all hominids, while others display a large degree of variation within the SH hominid sample. A few characteristics have only been detected in the SH hominids and the Neandertals, and could represent derived traits exclusive to the European phyletic lineage (clade) of *Homo*. Finally, based on the likely associations between some of the upper limb elements, we explore the arm proportions (brachial index) in these Middle Pleistocene humans.

A reassessment of human cranial metric and nonmetric trait heritabilities.

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Quantitative genetics models of human populations often rely on trait heritability rates to represent the genetic variability of phenotype. The heritability 'gold standard' was established 20 years ago by Sjøvold (1984) and Devor (1987), whose estimates of genetic inheritance for craniometric and, in Sjøvold's case, cranial nonmetric traits are universally used and often averaged to obtain an overall heritability rate for population genetics models. Each of these studies, however, is problematic. The heritabilities reported by Sjøvold were calculated using linear regression, a technique which makes assumptions regarding the variance matrices and parental-offspring environmental correlation that are not valid for humans. In addition, measures typically included in anthropological studies such as nasal breadth, maximum cranial length and breadth, were not assessed in Sjøvold's study. While Devor (1987) did report heritabilities for these established cranial dimensions, his data were collected on living humans; the use of soft tissue measurements as a proxy for skeletal dimensions has since been called into question.

The current study addresses each of these problems by utilizing maximum likelihood variance component analysis to calculate heritability estimates from a sample of 200 parental-offspring pairs of crania from the Hallstatt, Austria ossuary, the same skeletal population assessed by Sjøvold. Metric data were collected on 58 standard cranial landmarks using a Microscribe 3-D digitizer that allow for the calculation of 36 linear cranial measurements commonly used by physical anthropologists (Howells, 1989). This poster presents updated heritability estimates for these measures, as well as for 36 standard cranial non-metric traits.

Interpretation of a Late Woodland cremation burial in the American Bottom.

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This presentation illustrates the recovery and interpretation of an *in situ* cremation burial from the Lillie site (11MS662) in the American Bottom of Illinois. This burial is important because of the scarce evidence for mortuary ritual during the Late Woodland period (A.D. 400-1050). Despite the archaeological evidence that the Late Woodland was a time of population growth stemming from immigration to the region, cemeteries are lacking. The Lillie site is a Patrick phase (A.D. 650-900) bluff-crest village overlooking the Mississippi River floodplain. Incomplete, isolated elements representing a minimum of seven individuals were recovered from habitation features. A single cremation burial of a child, aged 8-12 years, was located at the base of a deep, bell-shaped pit feature. The fragile cremated remains were removed *en bloc* from the field for controlled excavation in the laboratory. The systematic procedure used to expose and document the fragile, calcined remains is discussed. Details of the mortuary archaeology and taphonomy are addressed, and the hypothesis is proposed that cremation was conducted on the floor of the pit using a slow-burning method rather than a pyre. The prevalence of cremation burials in the surrounding regions is examined, both temporally and spatially, to test if mortuary ritual supports the current hypothesis that the Late Woodland inhabitants resettling the American Bottom immigrated from neighboring regions.

Walking backwards: testing the association between centers of mass and footfall patterns.

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In walking, most quadrupeds employ diagonal-couplets gaits, in which diagonally opposite limbs move together as a pair. In typical mammals, the leading (fore) foot in the diagonal pair strikes down before the trailing hindfoot (the lateral sequence or LS pattern). In most primates, the trailing (hind) foot strikes down first (diagonal sequence, DS). The LS pattern seems preferable, since it gives the animal a larger, more stable support base throughout the gait cycle. It has been suggested that the DS gait may be preferable for primates because they have an exceptionally posteriorly located center of mass. If this were the case, then animals walking backward (which inverts the positions of the leading and trailing feet in the diagonal couplets) might be expected to invert their footfall sequences, with tail-heavy primates becoming "head-heavy" and putting down the leading (hind) foot before the trailing forefoot, and conversely. To test this, we filmed primates (*Nycticebus, Loris, Lemur*) and nonprimates (*Canis, Equus*) walking backwards. Our preliminary data indicate that the differences between primates and nonprimates persist during backing up: dogs and horses put down the leading foot first, while lemurs and lorises walking on poles put down the trailing foot first. These findings suggest that the differences in gait between primates and typical quadrupeds are not associated with differences in the distribution of body mass.

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Tarsal coalition: Identification and population variation.

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Tarsal coalition is a congenital defect that results when adjacent tarsals fail to separate completely during early development. These coalitions present as osseous or non-osseous bridges between the two bones. Non-osseous bridges are composed of cartilage, fibrocartilage, or fibrous tissue, and are more common than osseous bridges. In skeletons, non-osseous coalitions are recognizable as matching lesions between two adjacent bones at very regular locations. Tarsal coalitions are of interest because they are known to be heritable, and because they can be misinterpreted as trauma or joint disease.

In order to better understand variability in tarsal coalition frequencies, data were gathered on 342 Euro-Americans from the Terry Collection (Smithsonian Institution), 533 African Bantu from the Dart Collection (University of Witwatersrand), and 1020 medieval Danes from the University of Southern Denmark (Anthropological Database, Odense University). The first two collections are anatomical. The Danish sample is archaeological, with sample sizes by trait ranging from 449-627 individuals.

Examples of ten different types of intertarsal and tarsometatarsal coalition were identified. Among the intertarsal coalitions, Bantu exhibited high frequencies in the forefoot, with naviculocuneiform I coalition (1.0%) the most common type. Conversely, no coalitions of the forefoot were found among the Euro-Americans or medieval Danes, and calcaneonavicular coalition (2.0% and 2.1% respectively) was the most common type in the hindfoot. All three samples exhibited tarsometatarsal coalition, usually between the third metatarsal and cuneiform. However, these frequencies were much lower among the Danes (0.7%) than the Euro-Americans (5.0%) or African Bantu (3.6%).

Longevity in the Middle Paleolithic: Did modern humans live longer than Neandertals?

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Increased longevity, expressed as the number of individuals surviving to older adulthood, represents one of the ways that Upper Paleolithic Europeans differ from earlier European populations. It remains unclear whether this increase in adult survivorship is an attribute of the Upper Paleolithic itself, or whether it occurred in earlier anatomically modern humans migrating into Europe from elsewhere. In this paper we address this issue by comparing anatomically modern humans associated with the Middle Paleolithic of Western Asia to their Upper Paleolithic counterparts.

We examined differences in longevity by assessing the ratio of older to younger adults (OY ratios) in two earlier penecontemporary dental samples, both associated with the Middle Paleolithic: Neandertals and fossils considered anatomically modern *Homo sapiens* from Western Asia. Younger and older adult status was assessed by M3 eruption and wear seriation of each sample: M3 eruption indicated adulthood, and older adulthood was defined as the age at which individuals could first potentially become a grandparent (double the age of M3 eruption). Significance of the difference in ratios between the groups was tested using distributions generated by random resampling with replacement. Our results do not reject the null hypothesis of no difference between the two Middle Paleolithic populations. We conclude that the dramatic increase in adult survivorship was not a hallmark of the earliest modern humans, but instead occurred more recently coinciding with the Upper Paleolithic. Whether or not modern

humans and Neandertals were conspecifics, this suggests that the increase in adult survivorship associated with the Upper Paleolithic was not directly linked to speciation.

Sensitivity and specificity of body mass index as a definition of the obesity component of metabolic syndrome.

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Metabolic syndrome (MS) is defined as a combination of risk factors that are associated with several chronic diseases. The components of MS (obesity, dyslipidemia, carbohydrate intolerance, hypertension, microalbuneria) are diverse, and their thresholds vary in different alternative definitions. For example, the obesity component of MS, according to the definition of a World Health Organization (WHO) panel, is based on extreme waist-hip ratio, or large waist circumference, or high body mass index (BMI). In contrast, the National Cholesterol Education Program (NCEP) defined an obesity component of MS simply by a large waist circumference. Since in large-scale epidemiological studies, obesity is commonly measured by BMI alone, it is natural to ask how accurately the obesity component of MS is captured by BMI alone. In this research we show that in a population where obesity is highly prevalent, the specificity of detecting the obesity component of MS by BMI alone is almost 100%. However, the sensitivity is compromised (falling even below 50%) when BMI is taken as the only indicator of obesity. Individuals with high BMI do generally have large waist hip ratio and wide waist circumference, but the reverse is not necessarily true. Consequently, centralized obesity is not necessarily captured by BMI alone. As centralized obesity has long been advocated as a risk factor for chronic diseases, we argue that for detecting obesity, epidemiologic studies should include measurements of both centralized and general obesity, which can be accomplished by adding measurements on waist and hip circumferences to the height and weight data.

Genetic variation in Eastern European countries as revealed by short tandem repeat polymorphism: Utility for human identification and parentage testing.

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In the context of using DNA markers for human identification, the east-west demic diffusion model of genetic diversity in Europe raises a question as to whether or not in Eastern Europe different country-wise genetic databases would be needed when any battery of short tandem repeat loci is used. We addressed this issue by compiling allele frequency data for 13 short tandem repeat loci used from 19 East European countries, ranging from Estonia to Turkey in the north-south, and Bulgaria to Austria in the east-west directions. Analyses based on coefficient of gene differentiation suggest that the proportion of genetic variation attributable to between country differences is small, although some allele frequencies are significantly different across these countries. The different commercial kits, for which the markers typed vary, yield approximately the same power of discrimination. Estimates of the chance of coincidental match, conditional match probability, probability of parentage exclusion, etc. are similar across countries for the same set of loci. For the purpose of searching potential perpetrators, country-wise databases may be beneficial; but the statistical strength of DNA evidence can be reliably predicted by using average allele frequencies across these countries. Further, the relative homogeneity of regional genetic variation at these loci suggests that for the purpose of database preparation, detailed ancestral history of individuals may not be needed, as long as they are known to be of East European descent. DNA profiles based on these loci do not adequately predict the country of origin of individuals for this region of Europe.

Polymorphism, terminal taxa, and a phylogenetic approach to Middle Pleistocene systematics.

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Critics of applying phylogenetic systematics to the human fossil record have argued that cladistic methods cannot account for variation within terminal taxa. This criticism is inaccurate. Polymorphism in phylogenetic characters is not unique to human fossils, and a number of methods exist for coding polymorphic characters. Another, possibility is to subdivide polymorphic terminal taxa into monomorphic subunits, or even to use individual organisms as terminal taxa. These approaches have been recommended for situations where there may be doubts about the taxonomic homogeneity of OTUs.

This study evaluates the level of polymorphism in Middle Pleistocene *Homo* and the performance of alternative coding methods for polymorphic characters. Forty-five discrete cranial and mandibular characters commonly cited as having phylogenetic significance were observed for crania (n □ 30 and fragmentary samples where necessary) and mandibles assigned to *Homo antecessor, H. heidelbergensis, H. neanderthalensis,* and *H. sapiens*. A series of analyses in PAUP 4.0* and MacClade 4.05 using alternative coding methods produced unrooted trees using paleospecies as terminal taxa. The results of these analyses suggest that coding methods based on frequency perform best for these characters, a result in agreement with previous research. Analyses were also conducted using individual specimens and site samples as terminal taxa. These analyses served as a test of current taxonomic schemes because if such OTUs are actually conspecific, this should be reflected in the results of the analysis. The results of analyses employing individuals and site samples as terminal taxa suggest that some Middle Pleistocene taxonomic hypotheses should be revised.

Factors influencing osteological changes in the hands of rock climbers.

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In recent years, recreational and competitive rock climbing have been on the rise. Consequently, there has been an increase in reports of climbing-related injuries. While reports of acute and overuse soft tissue injuries are relatively abundant, studies describing the osteological changes as well as potential long-term effects of rock climbing on finger and hand bones remain minimal. This study examines osteological changes in the hands of rock climbers, specifically, climbing-related metacarpal and phalangeal remodeling in the form of osteoarthritis and increased cortical bone thickness. This study also attempts to identify factors that may affect the development of these conditions such as age, build, and

climbing intensity, frequency and ability.

Participants in the study included a group of rock climbers paired with a matched control group of non-climbers. Posterior-anterior and lateral hand radiographs were taken of each participant. Subjects also completed a questionnaire concerning personal rock climbing history and family history of osteoarthritis in order to separate the impact of these two factors on bone structure. The radiographs were examined and scored for signs of osteoarthritis, and the cortical thickness of the bones was measured directly from the radiographs. The radiographic assessments, in conjunction with the questionnaires, were used to determine which factors affected the development of osteoarthritis and the thickness of the cortical bone.

Preliminary results suggest a significant difference in the cortical thickness of climbers as compared to non-climbers, and a higher incidence of osteoarthritis. Further analysis will reveal which climbing-related factors have the greatest influence on these conditions.

A new *Homo erectus* maxilla from the Bapang basal unit, Sangiran Dome, Java.

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In April 2001, our research team recovered a partial *Homo erectus* maxilla a few meters below a sedimentary level that produced our oldest 40Ar/39Ar age of 1.51 ± 0.01 Ma. The fossil is one of only four *Homo erectus* maxillae recovered from all of Indonesia. It is one of the oldest hominins in the Sangiran Dome with incontestable provenience linked directly to dated volcanic mineral.

The specimen is an incomplete left maxilla from an adult individual. It preserves the LP3 - LM2. We have compared the BPG 2001.04 dentition with other Asian *Homo erectus* maxillae. Average Dental Ratio analysis, and standard scatter-plots of crown areas in BPG-2001.4 shows a linear relationship with the Sangiran sample, and is not close to the maxillary remains of the Zhoukoudian group. As in the other Sangiran dentitions, the P3 of BPG-2001.4 is more incorporated into the molar row than it is to the anterior teeth, and may have functioned differently.

We construct a digitized three-dimensional, stratigraphically-controlled excavation grid of Zhoukoudian Locality 1, using AutoCAD, in order to assess the spatial relationships of the excavated materials. The estimate of 51 hominid individuals from Locality 1, still based largely on Weidenreich's original identifications, requires morphological reassessment. Archaeological context should also be re-assessed. Fossil vertebrate and artifactual specimen numbers from Locality 1 can be used to identify provenience to within 1 m^3. We have used this approach to associate equid skull remains, putatively burned while fresh, with Locus B *Homo erectus*. The Locality 1 three-dimensional grid data are available to researchers by request from the authors.

Testing the model for male-male coalitions: Data from male mantled howling monkeys (*Alouatta palliata*).

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Pandit and Van Schaik (2003) propose a model for coalition formation without dominance rank change in unrelated primate males, resulting in access to estrous females by low-ranking males. The mantled howlers of La Pacifica live in groups of unrelated adults, females are not seasonal breeders, and groups regularly experience takeover by a new male. Two takeovers (1995, 2004) involved two "candidates" and in each instance the successful male formed a coalition (evidenced by social proximity and "greets") with the low-ranking old male. While relative ranks (measured by supplants) of males did not change, in both takeovers the old, low-ranking males were observed copulating with several females. In 1995, 98 hours of focal and ad lib observations revealed that sub-adult Orf and low-ranking Reggie were together on 26 occasions, sub-adult Walnut and high–ranking Volio were together on 20 occasions, and no other male combination occurred more than once. Reggie copulated with 3 different females on 4 occasions. In 1996 Walnut was observed as a solitary and Orf was the dominant male. In 2004, 33 hours of observation revealed that Carter was dominant. Carter and Volio were together 2-6 times more frequently than any other combination, and Volio copulated with three females. The other "candidate" was observed in a new group as the dominant male. Evidence exists for coalition formation associated with success eliminating a competitor for the new dominant males, and temporary access to females for the low-ranking males. A similar takeover occurred in 2001, but the observations are incomplete.

Pleiotropic relationships between ossicular and mandibular robusticity.

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The selective forces and adaptive significance associated with the transition of the malleus and incus from post-dentary bones into components of the auditory complex are not well understood. In fact, it has been suggested that the sizes (robustness) of the malleus and incus are pleiotropically linked to that of the mandible. Until, it can be proven that these ossicles are free from genetic linkage to the jaw, ideas about selection on auditory function must be put on hold.

This study tests the idea of ossicular and masticatory pleiotropy by comparing the masses of the malleus and incus with measures of mandibular robusticity. Ossicular mass (in micrograms), symphyseal and corporeal dimensions of the mandible, and a suite of cranial measurements were taken on a broad taxonomic sample of primates including Old and New World monkeys, prosimians, and apes. An index of "robustness" was developed by dividing ossicular and mandibular measures by the geometric mean of skull size.

A significant correlation was not detected between the robustness of the mandibular symphysis and either the malleus or incus. In contrast, the robustness of the corpus and both ossicles was found to be significantly correlated ($.001<p<.05$). In both cases however, the size of the mandible explained less than 50% of the variation in ossicular size. These results suggest that although there is some association between the size of the mandible and the malleus and incus, selection is able to act on ossicular mass in relation to auditory function independent of masticatory adaptations.

Root morphology of the anterior dentition of extant higher primates.

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Teeth form a substantial component of the hominin fossil record. However, of the two major components of a hominin tooth,

its crown and its root(s), the former receives substantially more attention than the latter. Compared to crowns, roots are perceived to be relatively bereft of taxonomic and functional information, are often inaccessible, and there are few comparative studies of how they vary within and among the extant taxa in the human/great ape clade, and how root, crown and gnathic morphology covary.

This presentation reports the results of using plain radiography to image the roots of the anterior dentition of samples of extant great apes. The sample comprised 40 *Gorilla gorilla* (F=17; M=23); 31 *Pan troglodytes* (F=11; M=20); 34 *Pongo pygmaeus* (F=15; M=19), and 34 *Homo sapiens* (F=16; M=18). Lower canines and both upper and lower incisors of adult specimens were examined. All the specimens included in the sample were free of obvious dental or gnathic pathology.

Preliminary results show a strong correlation between canine root area and crown area as well as between root height and mandible height (depth). For both the canine and the incisors, root height is also correlated with crown mesiodistal length (root area for the incisors could not be calculated). Discriminant function analysis shows complete separation of the *H. sapiens* sample by size. The implications of these results for both functional and taxonomic analyses are discussed.

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Prediction of age-at-death from 3D changes in the dimensions and structure of the cortical canal network at the anterior femoral midshaft.

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The network of canals that perforates human cortical bone plays an integral role in the remodeling process. Therefore, we hypothesized that the canal network undergoes 3D age-related changes which may prove useful for age-at-death estimation. This hypothesis was tested on a modern autopsy collection of 83 anterior femoral midshaft specimens of known age (18-92 years) and sex (30 females, 53 males). The specimens were micro-CT scanned at 7 □m isotropic resolution and cylindrical subperiosteal volumes of interest (3mm diameter, 3mm long) were isolated for analysis. Parameters describing the dimensions (relative volume, surface area to volume ratio, mean canal diameter, mean canal separation) and the 3D structure (canal number, degree of anisotropy, branching density) of the canal network were measured using model-independent 3D methods. Stepwise multiple linear regression was used to generate equations for age estimation. The best coefficients of determination (r^2) were 0.844, 0.449, and 0.597, for females, males, and pooled sexes, respectively. The corresponding standard errors (SE) of the estimate were 10.6, 15.3, and 13.9 years, respectively. These results revealed age prediction based upon the 3D dimensions and structure of the canal network, although possible, is limited to imprecise estimates with large confidence intervals. However, 3D analysis demonstrated significant ($p<0.05$) correlations between age and all parameters for females, males and pooled sexes (except degree of anisotropy for males). Therefore, we believe this approach holds great promise for the further investigation of the remodeling process and its relationships with variables of life history and disease.

Sex and age related changes in activity patterns: a Central California example.

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A review of ethnographic literature on modern hunter-gatherer populations reveals a dichotomy between men and women's activities related to age. In many groups, women practice the same domestic activities throughout life, often increasing their workload during post-menopausal years. Males often shift their activities from manual labor in early and middle adulthood to more domestic and politically-oriented tasks in late adulthood. We hypothesize that this dichotomy will manifest itself in the osteological record as a shift in frequencies of activity-related markers of the lower limb in males and a continual increase through life in females. Using a skeletal sample of 195 adult males and 162 adult females from the Sacramento-San Joaquin River Delta (ca. 3,000 B.C. – 1,800 A.D.), we recorded sex, age group (early, middle or late adulthood), and assessed the presence/absence of seven features commonly described as squatting and kneeling facets. In females, many of these features increased in frequency from early to late adulthood. By contrast, these features increased in frequency in males from early to middle adulthood but not from middle to late adulthood. We suggest that these distributions reflect a shift in male activity patterns from middle to late adulthood and a continuation of similar female activity patterns from early to late adulthood. We also hypothesize that the development of these features in males and females occur as a result of different activities. Further consideration of these distributions by chronology/cultural periods suggests additional interesting patterns of change in labor over time.

Group size, scramble competition and social organization in blue monkeys.

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Socioecological models relate patterns of social relationships to the types of competition in which animals engage. Where the distribution, abundance and food-site depletion time of foods favor scramble competition among group members, dominance relations should be weak and non-nepotistic. Guenons have been described as having these social characteristics, but their relationship to scramble competition remains unexplored. We studied a wild population of *Cercopithecus mitis stuhlmanni* in the Kakamega Forest, western Kenya, comparing activity records among four groups of different size to investigate whether scramble competition was strong. Because of the largely frugivorous diet and typical patchy distribution of fruit sources, we expected that females in larger groups would have longer daily paths, larger ranges, and would spend more time feeding and moving relative to those in smaller groups. However, we did not find evidence for systematic differences in these variables related to group size. Differences in home range quality did not explain our results. We suggest that the relatively tolerant social style of blue monkeys relates more to the importance of between-group territorial competition than to relatively strong within-group scramble competition. Group fissions nevertheless suggest disadvantages to larger group sizes. While our data do not support an energetic cost to large group size, the spatial disorganization in such groups may be costly in terms of defense against predators, con-

specific males, or conspecific groups.

Neotropical monkeys and Amazonian culture.

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Neotropical primates interface with human cultures through multiple domains in Amazonia. During fieldwork in cultural anthropology among the Guajá foragers of Eastern Amazonia, data was collected on the role of monkeys in the Guajá diet, social organization, and religious system. Random spot checks demonstrated that monkeys accounted for 30.92% of game foods eaten during the wet season. In addition, Guajá ethnobotany is linked to their hunting strategy with plants eaten by monkeys accounting for 52.16% of game plants identified by the Guajá. Information about Guajá kinship and cosmology were assessed through qualitative participant observation and informal interviewing. Infant and juvenile monkeys whose mothers are killed for food are raised as pets by the Guajá, given a quasi-human status, and incorporated into their kinship system. Further, monkeys play an important role in Guajá animistic religion and cosmogony, particularly for howlers, who are believed to have been human at one time. Comparisons of the Guajá with other Amazonian groups demonstrate considerable variation in the means through which various cultures interface with Neotropical monkeys. Further, variation exists in the cultural meanings ascribed to these interactions. The data presented here reveal a complex cultural landscape in Amazonia which present many challenges for primate conservation.

A comparative study of pelvic variability in relation to sexual dimorphism and geography in both modern and prehistoric populations.

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This project is an attempt to document pelvic variation based on geography and sexual dimorphism. The pelvis has received little attention with respect to population variability around the world, in comparison to the thorough documentation on the human crania. The methods employed repeat those utilized by both Wu et al. (1982) and Davivongs (1963), in order to ensure comparability with their results on populations of the Han and the Australian Aborigines. Twelve variables (ischial length, sciatic notch breadth, sciatic notch depth, OB of greater sciatic notch, acetabular vertical height, horizontal diameter of acetabulum, maximum length of innominate, iliac breadth, length of pubic symphysis, pubic length, as well as pelvic and sacral chilotic lines) were measured on four different populations, with some repeated due to different measuring techniques. These include prehistoric populations from New Mexico, Utah, and Colorado and a modern day population from New York. Indices were calculated from this data, including the ischio-pubic index, the coxal index, greater sciatic notch index, the chilotic index and an OB index for efficient population comparability. SPSS was used to perform statistical analysis of these results, including One-Way ANOVA and Post Hoc tests. Results show a clear deviation of means between sexes when considering areas of the pelvis related to the greater sciatic notch as well as the ischium; but overlap exists in every case. The modern collection was the only group showing statistically significant differences to the other groups. Differences in measuring techniques alone are not sufficient to explain the observed variation.

A recently discovered population of Tonkin snub-nosed monkeys.

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The Tonkin snub-nosed monkey (*Rhinopithecus avunculus*) is listed by IUCN as critically endangered and has been identified as one of the 25 most endangered primate species in the world in both 2002 and 2004. The second author discovered a population of 50 to 60 individuals of this species in Du Gia Nature Reserve of Ha Giang Province during surveys in northern Vietnam between October 2001 and November 2002. The discovery of this new population increases the known number of individuals of Tonkin snub-nosed monkeys to approximately 250 individuals. Du Gia Nature Reserve is characterized by steep and mountainous topography covered by lowland evergreen forest, montane evergreen forest, and limestone forest. Due to the extremely low number of individuals remaining for this species it is of utmost importance to strengthen conservation capacity in this protected area. Observations on the Tonkin snub-nosed monkey here confirms that it is more arboreal than the three species of Chinese snub-nosed monkeys and that like other odd-nosed monkeys it more frequently uses suspensory postures while feeding than do other colobines. Finally, four other primate species have been observed in Du Gia Nature Reserve including the endangered Francois' langur (*Trachypithecus francoisi*), thus additional field work here promises to provide important information on the ecology of the poorly known primates of northern Vietnam.

Variation in the development of postcranial robusticity: an example from Çatalhöyük, Turkey.

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While the study of variation in adult postcranial robusticity has a long history, relatively few analyses have examined the development of postcranial robusticity within an ontogenetic context. This study evaluates the differences in the ontogenetic trajectories of three diverse Holocene samples of juveniles in order to assess when differences in levels of adult postcranial robusticity arise during development. Femoral midshaft cross-sectional properties were compared between three samples: early Neolithic agriculturalists from Çatalhöyük, Turkey (N = 42); Byzantine agriculturalists from Çatalhöyük, Turkey (N = 24); and urban Americans from the Denver Growth Study (N = 20).

The results indicate that, while the two adult Turkish samples do not differ, both adult Turkish samples have shorter femora and relatively larger cortical and total areas than the American urban adults. While these differences are not present in the juvenile specimens between the ages of birth and three years, they are clearly established by the age of six. In addition, by the age of three, the Denver Growth juveniles have already attained a greater percentage of their adult length, total area, and cortical area relative to both the archaeological samples. It appears clear that the differing levels of postcranial robusticity that characterize adult populations appear relatively early during development, and that populations vary in the rate and pattern through which adult levels of postcranial robusticity are achieved. This developmental variation is likely related to several intrinsic and extrinsic factors, including genetics, nutrition, and physical activity

during growth.

Effects of group composition and mating season on the agonistic and affiliative behavior of rhesus macaques (*Macaca mulatta*).

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This study analyzes the effects of group composition and mating season on grooming and aggression in captive rhesus macaques (*Macaca mulatta*). Three groups of rhesus macaques housed in breeding corrals at Tulane National Primate Research Center were observed during the summer of 2003 (N=42). The behavior of these three groups was compared in order to determine if any group differences were present. More specifically, all occurrence observation focused on contact aggression, noncontact aggression, grooming, and mounting. The following January, two of these groups (one had been disbanded) were observed again to determine if behavior varied in the mating season (N=28).

The results suggest that the number of intergroup fights has an inverse relationship to intragroup aggression. In addition, because the group with only one male showed significantly less grooming than the other two groups (p=0.022), grooming appears to be used by males to gain access to reproductive females.
Findings also revealed that male aggression toward other males increased during the winter mating season (p=0.023) suggesting that there is male competition for access to reproductive females during the mating season.

This study has implications for animal husbandry. The data indicate that grouping one male with multiple females is detrimental to the group. Additionally, placing corrals close to each other may prove beneficial by stimulating fighting between groups and thereby lowering the potentially harmful intragroup aggression. Further research is recommended to assure that these results indicate a species approach to behavior and not merely individual differences in personality.

Biomechanics of the fused mandibular symphysis in placental and marsupial herbivores.

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The fused mandibular symphysis in placental mammals permits the transfer of both vertical and horizontally directed forces from the balancing side to the working side of the jaw during the power stroke of mastication. We report on the role of the fused symphysis in two marsupials.

Activity of the working and balancing side adductors during mastication was recorded in hairy-nosed wombats and koalas. Strain of the mandibular symphysis was recorded synchronously with EMGs in the wombats. Although wombats have a massive fused mandibular symphysis, no vertical or horizontal forces are transferred from the balancing to working side during the power stroke; the balancing side muscles are silent. The forces required to draw the working side jaw in a medial direction are generated by the horizontally orientated part of the working side medial pterygoid muscle that inserts on the dorsal surface of the inflected mandibular angle. During the power stroke the entire mandible rotates slightly around the longitudinal axis of the working side hemi-mandible. The molars are isognathic and this rotation prevents the balancing side molars coming into contact.

In koalas the medial pterygoid muscles also appear to control horizontal jaw movements. In contrast to wombats the temporalis and deep masseter muscles active bilaterally and forces generated by the balancing side muscles are transferred via the fused symphysis to the working side.

The role of arm swing and thermoregulation in the evolution of bipedality and hominin limb proportions.

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Although numerous hypotheses have been formulated in attempts to explain the origin of habitual bipedality, considerably less attention has been given to the evolution of bipedality after it was adopted. This research is intended to demonstrate the need for new approaches to the exploration of a striding bipedal gait. While stressing the importance of studying fossil hominins as dynamic subjects special attention is given to the importance of considering arm swing in bipedal gait analysis.

To consider how different species interacted with their respective environments it must first be possible to track the various body segments through both time and space. Through the use of a summed segment model of the primate body I analyze the differences in surface area distributions between Pan (here modeled as fully bipedal) and Homo. This model permits the quantification of the roles that each of the body's segments plays in the thermoregulation of the body during a striding bipedal gait as well as the physiological effects of proportional changes.

Effective thermoregulation reduces dependency on water resources and could therefore increase both the duration of travel, and the distance traveled away from known water supplies. This may have been important to the geographic dispersal of early hominins. It is shown that, depending on the environment, a more Pan-like morphology could actually have been more advantageous (or at no disadvantage) during long distance bipedal travel. Possible mechanical and environmental factors are considered as to why a Pan-like morphology may have been selected against during hominin evolution.

Patterns of postcranial and body mass dimorphism in hominoids.

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Quantifying sexual dimorphism in extant hominoids is a necessary first step in determining both the level and pattern of dimorphism in extinct species. The relation between body mass dimorphism (likely a result of sexual selection) and skeletal dimorphism is not easily quantified, as both parameters may vary inter- and intraspecifically. We examine skeletal and body mass dimorphism among extant species and subspecies of *Pongo, Gorilla, Pan,* and *Homo*, and compare the levels and patterns observed to skeletal dimorphism in *Australopithecus afarensis* and *A. africanus.*

Using the Sexual Dimorphism Index ([Mmean – Fmean]/Fmean*100), we find that the relationship between skeletal and body mass dimorphism varies at the subspecific level in extant hominoids. While the relationship between skeletal and body mass dimorphism is consistent between subspecies of *Pongo*, it varies in *Gorilla* and *Pan troglodytes*. *G. g. gorilla* and *G. g. graueri* both exhibit greater body mass dimorphism than skeletal dimorphism, but in *G. g. beringei* the pattern is reversed. In *P. troglodytes*, each subspecies shows a different pattern.

The degree of skeletal dimorphism also

differs between limbs. *Pongo*, *Gorilla*, and *P. troglodytes* all have a greater degree of dimorphism in the upper limb compared to the lower limb. *Homo* shows the opposite pattern, as do *A. afarensis* and *A. africanus*. Our analyses highlight the need for caution when using skeletal dimorphism to estimate body mass dimorphism - with the ultimate goal of reconstructing behavior - in fossil taxa.

Tooth loss in wild ring-tailed lemurs (*Lemur catta*): a function of life history, behavior, and feeding ecology.

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The ring-tailed lemurs at Beza Mahafaly Special Reserve, Madagascar, exhibit a high frequency of tooth loss (Cuozzo and Sauther, 2004). As part of a long-term study, we collected dental data on 83 adult ring-tailed lemurs during 2003 and 2004. Here we present information on the pattern of tooth loss in this population, and discuss the impact of life history, feeding ecology, and behavior on this pattern. Among these individuals, 192 teeth were scored as absent. The most frequently missing tooth position is M1 (24%). As M1 is the first tooth to erupt (Eaglen, 1985), its high frequency of absence (resulting from wear) is not remarkable. However, the remaining pattern of tooth loss does not correlate with the sequence of eruption, as P3 and P4, both of which erupt after M2, are more frequently lost. We suggest that this pattern is in part a function of food processing, which often occurs in this region (P3-M1) of the mouth. In addition, social behavior apparently influences tooth loss. Orange 156, a 17-year old female, is only missing her maxillary first molars (6% loss). In contrast, Black 432, a 10-year old female, displays 36% tooth loss. As Orange 156 is dominant in her troop, she likely has access to higher quality foods, thereby leading to less severe wear and fewer missing teeth than younger individuals. The relationship of tooth loss, behavior, and ecology in this population has implications for understanding the evolution of *Lemur catta*, and the paleobiology of subfossil lemurids (e.g. *Pachylemur*).

Humans, baboons and vervet monkeys: exploring sympatry and synchrony for evolutionary insights.

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The lineages leading to both the Old World monkeys and humans emerged during the Miocene. In broad outline, they have contrasting histories. Fossil and molecular records indicate cercopithecoids radiated rapidly, possess high taxic diversity, low extinction rates and longevity of modern species mostly dating to the Lower Pleistocene or earlier. The hominin record, while showing rapid radiation and speciation, exhibits moderate taxic diversity, a high extinction rate and only one modern species that emerged during the upper Pleistocene. We argue that on a finer scale modern baboons and vervet monkeys provide both a compelling model for hominin evolution as well as an understanding of the sympatric and affiliative relationships between the two families. Both groups share wide geographic distribution, largely terrestrial lifestyle, ecological generality, and marked phenotypic plasticity. While the fossil record for vervets is sketchy, molecular clocks indicate they diverged within the timeframe of hominins. Fossils indicate a concurrent emergence of *Homo* and *Papio hamadryas* >2.5 Mya. Most fossil locations in southern Africa demonstrate sympatry of hominins and *Papio* baboons, although this is not the case for East Africa. In southern Africa, both families have been found together for a long period of time.

Putting together the pieces: reconstructing commingled ossuary cremains.

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Cremations pose challenging analytical problems to biological anthropologists due to the shrinkage, warping, and high degree of skeletal fragmentation that typify such remains. These problems are exacerbated when cremains are commingled in an ossuary context. This study presents the results of a spatial analysis of commingled cremated remains from a prehistoric ossuary on the Northwest Coast. A total of 159,323 human bone and tooth fragments, representing the remains of a minimum of 118 individuals, were recovered from an 8 x 2 m, cave-like recess on Gabriola Island, British Columbia, dating to 1260-3120 years BP.

Recovered specimens were catalogued according to three-dimensional field provenience (50 x 50 x 5 cm unit) and sorted according to skeletal element; all fractured edges were then compared for possible joins with other fragments. A total of 11,952 fragments were fitted to other pieces to form conjoined sets of from two to more than fifty pieces. Vertical and horizontal dispersal scores were calculated for conjoined sets, based on whether the fragments came from the same unit, adjacent units, or more dispersed units. Results indicate relatively low dispersal rates of fragments from the same bone, and of elements from the same individual (where discernible), suggesting that the bodies were processed individually, rather than as part of a mass cremation event. Post-depositional disturbance from animals scavenging, or from subsequent interments, may account for the relatively few conjoined sets with very high dispersal scores.

Heritability of appendicular skeletal muscle mass in healthy adults.

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Sarcopenia is a condition of aging characterized by age-related muscle loss. It is associated with increased susceptibility to falls, functional impairment, and disability. Currently, little is known about the genetic mechanisms underlying age-related muscle loss. In this study, we estimate the heritability of appendicular skeletal muscle mass and assess the contribution of age, sex and stature to phenotypic variation in skeletal muscle traits. Appendicular skeletal muscle mass was quantified in the arms (ASM) and legs (LSM) using dual energy x-ray absorptiometry in a sample of 370 adults (160 males and 210 females) from five large extended families participating in the Southwest Ohio Family Study. Ages ranged from 18 to 83 years. We used a maximum likelihood variance components method to estimate the heritability of ASM and LSM. After adjusting for covariate effects, heritability (h^2) estimates for ASM and LSM were significant ($p<0.000001$) and of moderate magnitude ($h^2=0.44\pm0.11$ for ASM and $h^2=0.47\pm0.10$ for LSM). The covariates of age, sex, and stature together accounted for over 60% of the total phenotypic variance in each trait. Female sex and shorter stature were significantly associated with lower ASM and LSM. Increasing age had a significant negative impact on LSM, but not on ASM. These results demonstrate

that measures of appendicular skeletal muscle mass are significantly heritable, and influenced to a large degree by age, sex and stature.

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Understanding the mechanical effects of dental alveoli.

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In his landmark work describing the loading regimes of mastication in primates, Hylander (*J. Morphology* 159:295) noted that a precise stress analysis of the primate mandible would have to await, among other factors, an understanding of how the presence of alveoli impact the mechanical behavior of the jaw. At issue are the following problems: 1) do the presence of the alveoli cause the mandible to behave as a member with open sections?, 2) do the periodontal ligament and tooth roots mitigate these geometric effects?, and 3) how do material properties of alveolar bone informed at the tissue and structural levels influence the potential stress-concentrating effects of alveoli?

In vitro strain gage data indicate that the mandible does not function as an open section. These data also suggest that the presence of tooth roots within alveoli have measurable mechanical effects on corpus stiffness. Even so, one does not observe large stress concentrations surrounding open alveoli (those without teeth). We present results from finite element models of a *Macaca fascicularis* mandible indicating that teeth unloaded by occlusal forces are probably not load-bearing with respect to bending and twisting moments.

Because the presence of tooth roots alone does not account for the mechanical invisibility of alveoli, we consider the influence of material properties of alveolar bone incorporating tissue (via microindentation) and structural (via microscopy) level information. We offer a theoretical solution that includes the interactive effects of geometry and material as being instrumental in limiting stress concentrations in the alveolar process.

Body mass estimation from anthropometric measurements in female collegiate athletes.

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A variety of skeletal and anthropometric measurements have been utilized to estimate body mass in humans. Debate continues about which measurements provide the best predictors, especially in skeletal samples. We assessed the ability to predict mass from anthropometric measurements that approximate skeletal dimensions as well as measures of skinfolds and limb circumferences. The study comprised a series of multiple regression analyses on anthropometric data from 387 female athletes from the University of Texas. Analyses were conducted on the pooled data set and on sport-specific subsets of the data.

The best predictor equation (R^2=0.92; SEE=3.54 kg,) of mass for the pooled sample consisted of 10 variables, half of which were soft tissue measurements. For osteological applications, measurements that primarily reflect skeletal dimensions were the most relevant for predictions of mass. Restricting the predictors to bi-iliac breadth and known stature greatly decreased the accuracy and precision (R^2=0.56; SEE=7.21 kg); adding bicondylar and biepicondylar breadths to those dimensions substantially improved the estimates (R^2=0.73; SEE=5.9 kg,). This result suggests that addition of distal humeral and femoral epiphyseal breadths provides a simple way to improve the accuracy of body mass estimation. The overall patterns of accuracy were similar in the pooled and sport-specific dataset. Estimation of mass in volleyball players was especially precise.

Intraspecific incisor variation in hominoids: a comparison between five Miocene genera and extant apes.

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Minor morphological variations on *Kenyapithecus* sp. incisors found at Fort Ternan have been used by Ward et al. (1999) and Kelley et al. (2002) to justify creation of a new genus, "*Equatorius*," under which they have claimed *K. africanus* should be subsumed. However, intraspecific variation in incisor morphology has been found frequently throughout studies of hominoid fossils dating from the early Miocene to the Pliocene. Two morphological studies of incisor variation in extant great apes were carried out at the Cleveland and National Museums of Natural History (Davis, 2002). In addition, incisors of *Kenyapithecus africanus*, *K. wickeri*, *E. africanus*, and incisor casts of *Oreopithecus bambolii* and *Ouranopithecus macedoniensis* from the Kenya National Museum were examined for comparison. Results show that incisor variation occurs intraspecifically and intraindividually in extant genera. Lingual topography was more variable than root shape or mamelon number intraindividually, intraspecifically, and across genera. Some variation (in particular, between antimeres) can be attributed to differential wear patterns; other variation can be attributed to genetic factors. This research project demonstrates that some traits of incisor topography, heretofore considered diagnostic of particular fossil species (e.g. incisor spiraling in *"E." africanus* and incisor enamel curling in *K. wickeri*), are not unique to these species. Furthermore, these traits are not discrete; they vary along a continuum. The aforementioned traits lack polarity to be useful traits for determining phylogeny. Therefore, a re-examination of *"Equatorius" africanus* needs to be undertaken before assigning it generic status distinct from *Kenyapithecus.*

Anatomical correlates for trunk-to-trunk leaping in the forelimb and hindlimb of *Callimico goeldii.*

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Recent field and captive studies have significantly expanded our understanding of the ecology and behavior of Goeldi's monkey (*Callimico goeldii*), including quantitative details of its positional repertoire. *Callimico* frequently employs trunk-to-trunk leaping, vertical clinging, and a distinctive bounding hop. It is now possible to evaluate more fully the relationship between anatomy and positional activity in this species. The present study examines the anatomical correlates of leaping and vertical clinging in *Callimico*.

Over 220 osteological traits of the forelimb and hindlimb of *Callimico* were compared to those of a large callitrichine sample and an outgroup of prosimian and additional platyrrhine species. All measurements were corrected for body size and compared using univariate and multivariate statistical methods.

Traits consistent with a habitual vertical clinging posture in *Callimico* include a somewhat narrowed anterior and posterior humeral trochlea. Additional features that may facilitate vertical clinging are noted in the scapula, humerus, and proximal radioulnar articulation. Traits correlated with leaping in this species

were found in the hindlimb but no clear leaping correlates were identified in the os coxae. Several features in the femur, tibia, and calcaneum, including an enlarged femoral head and mediolaterally expanded knee region, appear to accommodate increased compressive forces but are curious given this species' habit of landing forelimb-first after a leap.

Comparisons are drawn between leaping and vertical clinging adaptations in *Callimico*, other callitrichines, and the more specialized vertical clinging and leaping prosimians.

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New evidence for dietary function in *Afropithecus turkanensis* canines: An application of the high resolution polynomial curve fitting (HR-PCF) method to canine curvature.

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Dietary reconstruction of the fossil taxon *Afropithecus turkanensis* has primarily focused on the dental morphological parallels that exist between that taxon and the New World pithecines (*Cacajao*, *Chiropotes*, *Pithecia*). Although only distantly related, both possess robust and laterally splayed canines. Variation in anthropoid canine shape and size is mostly associated with intermale competition, however the pithecines are unique as their canine morphology primarily reflects a dietary function (ie. hard object food processing) (Anapol and Lee, 1994; Plavcan, 1993; Roosmalen et al., 1988). Owing to these dental similarities, it has been suggested that *Afropithecus* may also have exploited hard object food resources in a similar manner (Leakey and Walker, 1997; Leakey et al. 1988). Although this assessment is consistent with the short, broad and tusk-like canines, large canine roots and the thickly enameled posterior dentition known for that taxon, a quantitative morphometric treatment of *Afropithecus* canines has not been attempted.

I used a high resolution polynomial curve fitting (HR-PCF) method to evaluate and quantify *Afropithecus* canine crown curvature. HR-PCF quantifies anatomical curvature by digitizing and then modeling selected contours as 2nd order polynomial functions (Deane et al. in press). Upper canines from the type specimen (KNM-WK 16999) were compared with a sample of extant anthropoids including *Pan* (n=25), *Gorilla* (n=25), *Pongo* (n=25) and *Chiropotes* (n=10). Discriminant analyses of the resulting dataset identifies a strong correlation between the upper canine contour morphology of *Afropithecus* and *Chiropotes* and supports the hypothesis that *Afropithecus* canines served a dietary purpose functionally similar to extant pithecines.

Relationship between three dimensional microstructure and elastic properties of cortical bone in the human mandible and femur.

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Elastic properties of cortical bone are important for understanding biomechanics of skeletal organs. Classic studies on long bone diaphyses suggest that remodeled cortical bone is best modeled as transversely isotopic with maximum stiffness oriented along the long anatomical axis and minimum stiffness in all orientations perpendicular to this axis. This model has been applied to other skeletal regions although its utility is unclear. Recent studies suggest that orthotropy is a better model of elastic structure for mandibular cortical bone. Our aim was to assess whether differences in femoral and mandibular cortical elastic structure could be accounted for by supraosteonal organization.

Cylindrical cortical specimens (10mm in diameter) were obtained from the anterior proximal aspect of the midshaft of a femur and the buccal inferior surface of a mandibular corpus of adult human cadavers. Ultrasound was used to determine the orientation of maximum stiffness and the elastic properties. The specimens were then scanned with a ScanCo □CT 40 at a nominal isotropic resolution of 9□m. Volumes were digitally reconstructed using Analyze 5.0 software to analyze the structure of the osteonal canal network.

Striking differences were seen in canal structure among specimens. As in classic models of Haversian structure, femoral canals were oriented parallel to the anatomical long axis. In the mandible, there was considerably more variation, which was greater when the canals were viewed parasagitally rather than transversely. This suggests that directional variation in mandibular osteonal orientation is the microstructural basis for the orthotropic model of elastic structure suggested by ultrasonic studies.

A radiographic analysis of Middle Pleistocene hominin cranial morphology: implications for classification and methodology in human evolution.

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The study of form is basic to the biological sciences, but a major problem has been the extraction of all of the information present in complex biological forms. This paper argues that, in paleoanthropology, the methodology commonly utilized for the quantification of cranial morphology does not access all of this information, or morphological variation, because it does not consider the entire contour of the exocranium or the endocranium in analyses studying the cranium in sagittal midsection. These omissions may cause variation relevant for the purposes of taxonomic attribution in two-dimensional analyses of fossil hominin crania to be overlooked.

To test this claim, cranial radiographs of both a modern human and a fossil cranial sample were analyzed to determine first, if any relevant biological information can be extracted endocranially in the midline; and second, what, if any, structural relationship exists between the endocranium and exocranium in the mid-line. Elliptical Fourier Function Analysis was substituted for conventional metrical analyses using landmarks to capture the entire outline of these structures with what appears to be an extraordinary degree of accuracy**.** The results indicate that these two cranial systems exhibit some independence, yet also covary in a manner that reveals the underlying relationship between brain growth and positioning, and the evolution of exocranial structures. Therefore, the addition of endocranial variation into morphological studies of hominin crania provides information about shape not present in purely exocranial analyses, and thus improves the method of quantifying cranial shape for the purposes of classification.

Prevalence of metabolic syndrome in an island population of the eastern Adriatic coast of Croatia.

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Metabolic syndrome (MS), an assemblage of risk factors (obesity, dyslipidemia, carbohydrate intolerance, hypertension) associated with development of cardiovascular diseases and type 2 diabetes, has assumed epidemic proportions in western societies. However, data on its prevalence in worldwide populations, particularly in non-industrialized societies is sparse. We report the prevalence of MS in an island population of the eastern Adriatic coast of Croatia, a distinctly homogeneous population living in relative isolation with a traditional way of life style pattern. The participants consist of 381 unrelated individuals (136 males, 245 females), age 19 and above from the island of Hvar, one of the most populated Croatian islands with a population of over 11,500 individuals. MS was assessed using the National Cholesterol Education Program criteria, with the exception of using body-mass index (BMI) and/or waist-hip ratio (WHR) as the predictors of obesity. Age-adjusted prevalence of MS was 26% (32% in males and 24% in females) with BMI and 42% (57% in males and 36% in females) with WHR as the measures of obesity. Pairwise correlations of age and sex-adjusted individual components, with the exception of fasting plasma glucose, are significantly associated with each other suggesting their comorbidity. Prevalence of MS is substantially high in population of Hvar, comparable only to the Mexican American and Native American populations. Our data also illustrates that prevalence and associated risks of MS are dependent on the definition used for describing the syndrome.

Morphological change of the P_3 within *Australopithecus anamensis* and *Australopithecus afarensis.*

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This study examines metric and nonmetric features of the P_3 in *Australopithecus afarensis*, *Australopithecus anamensis*, *Pan troglodytes,* and *Gorilla gorilla.* Metric features are assessed using scaled occlusal photographs. This study demonstrates consistent morphological differences in the P_3s of *Australopithecus anamensis*, from Kanapoi and Allia Bay, Kenya, and *Australopithecus afarensis*, from Hadar, Ethiopia and Laetoli, Tanzania. The *A. afarensis* P_3s from Hadar and Laetoli are considered as separate samples to determine if there are morphological differences in the two samples of *A. afarensis* P_3s and also to investigate the possibility that Laetoli represents an intermediate morphology between the earlier *A. anamensis* morphotype and the later morphotype from Hadar. Results indicate that most characters that distinguish the pooled *A. afarensis* sample from *A. anamensis* do not appear intermediate in the Laetoli sample, i.e. the Laetoli sample appears phenetically most similar to Hadar. For at least one metric character, the orientation of the transverse crest, Laetoli does possess a morphology intermediate between *A. anamensis* and *A. afarensis* from Hadar.

Measurement and assessment of centralized adiposity for genetic epidemiological studies of the Metabolic Syndrome.

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Centralized adiposity is a core component of the Metabolic Syndrome, posing increased disease risk independent of general overfatness and has been measured using anthropometrics, DXA (dual energy x-ray absorptiometry), and more recently, imaging techniques such as magnetic resonance imaging (MRI). Here we focus on 1) methodological refinements in the measurement of centralized adiposity, and 2) the influence of genes on centralized adiposity. Contiguous 1 cm thick axial MR images were obtained across the abdominal region to quantify total visceral (VAT) and subcutaneous (SAT) adipose tissue in 479 individuals (104 Blacks, 375 Whites) aged 18 to 88 years from 100 families. Proxy measures of centralized adiposity included waist circumference (WAIST), waist hip ratio (WHR), and DXA trunk fat (DXATRUNK). In an analysis of the agreement between total abdominal VAT and VAT from a single image taken between the 4^{th} and 5^{th} lumbar vertebrae (L4L5 VAT), we found significant interaction effects between L4L5 VAT and sex ($p<0.0001$), race ($p< 0.0001$), and age ($p=0.02$). In other analyses, DXATRUNK and WAIST were moderately correlated with both SAT and VAT ($r=0.72$ to 0.95), while WHR was less so ($r=0.36$ to 0.81). In our quantitative genetic analyses, the h^2 estimates were 0.59±0.12 for SAT, 0.45±0.12 for VAT, 0.57±0.12 for WAIST, 0.65±0.13 for WHR, and 0.57±0.14 for DXATRUNK, and the genetic correlations among these traits were generally high ($\rho_G>0.90$). More refined measurement of the central obesity phenotype will likely improve our understanding of the genetic architecture of the Metabolic Syndrome.

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Cutting corners: The dynamics of lemur turning behavior.

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Maneuverability is an important aspect of locomotion in arboreally adapted primates, as substrate properties require frequent turns. Morphological adaptations to maneuverability have been widely discussed, yet the forces involved in turning are completely unknown. Substrate reaction forces were collected for three individuals of *Lemur catta* performing turns on a force plate integrated either into a wooden runway or an elevated pole. Limb contacts at the onset of turns were analyzed. Turning requires a redirection of the linear velocity vector, and a rotation of the animal's trunk to align its long axis with the new direction. The change in direction of the linear velocity vector is primarily accomplished by a lateral push of the limbs at the outside of the turn, in particular the outer hind limb. Angular acceleration for trunk re-alignment is generated by the horizontal impulses of several limbs. The outer hind limb is again of particular importance, with a propulsive impulse rotating the animal in the direction of the turn that is at least an order of magnitude higher than any of the horizontal impulses of the other limbs. These findings suggest that the animals steer predominantly with their hind limbs. Impulses and torques opposite to the direction of the turn do occur; i.e. turning dynamics are not optimally efficient. Mediolateral forces associated with turning behaviors are considerably higher than those in linear locomotion and should be considered when characterizing the dynamic environment of limbs.

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Vertebral body bone mineral density decreases as a function of body weight in strepsirhine primates.

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cal School.

To adapt to larger body weights species can alter their bone tissue material, geometry, and/or amount of bone material. Interspecific scaling studies focus on structural properties of bone and their relationship with body weight (BW). Tissue material properties are often assumed to be the same across species. In this study we examined the relationship between the bone mineral density (BMD) of last lumbar vertebral centra and BW in small- to medium-sized adult strepsirhine primates.

We used microCT imaging to analyze the last lumbar vertebra of 10 strepsirhine species (total N=28). Species spanned a fifty-fold range in body mass, from the 42g mouse lemur (*Microcebus rufus*) to the 2150g brown lemur (*Eulemur fulvus*). Trabecular and anterior cortical shell volumes of interest were defined and analyzed separately. We determined the BMD using a soluble hydrogen dipotassium phosphate phantom with a mineral density similar to that of hydroxyapatite. We analyzed the data using Spearman's rank correlation.

Species mean trabecular BMD decreased as BW increased (rho=-0.73, p=0.02). The anterior cortical shell BMD also displayed a decaying function with increased BW (rho=-0.84 ; p=0.002). These results imply that small-bodied strepsirhine primates, who have absolutely less bone, employ a unique adaptive strategy to strengthen their bones. Finite element analyses incorporating this new finding will help to elucidate what effect these material differences have on the mechanical properties of bone. At the least, these results indicate that bone tissue properties cannot be assumed to be similar, especially when comparing very small-bodied and larger strepsirhine taxa.

Measuring the amount of exposed dentine: A comparison of two methods.

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This study proposes a new method of recording the amount of exposed dentine. The most commonly used and respected method for scoring occlusal attrition wear is the Smith (1984) method (adapted from Murphy (1959)). Inconsistencies arise when using the Smith method for studying the gradient of the occlusal surface wear. A digital method has therefore been created to remedy this problem.

The digital method counts of the number of pixels in the area of the exposed dentine and divides it by the total number of pixels in the occlusal surface area. This ratio represents the amount of exposed dentine. This study compared a digital imaging method to the Smith method to determine if the digital method is more reliable for studying the gradient of occlusal surface wear. Results found that the wear stages from the Smith method overlap, especially in the first molar. Data from the first incisor, first premolar and first molar show that the digital image method is more accurate for recording the gradient of dentine exposure than the Smith method.

Estradiol, estrogen receptor alpha, and osteogenic responses to mechanical loading.

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Despite evidence that mechanical loads can induce diaphyseal bone growth, there is little consensus about how, and to what extent, strain affects human skeletal phenotype. This project tests a mechanism of mechanotransduction in bone that may underlie variation in human skeletal robusticity. One hypothesis of particular relevance to humans is that hormones, particularly estradiol (E_2) and its receptor, estrogen receptor alpha (ER-□), affect mechanotransduction in osteoblasts. Previous experiments demonstrate that E_2 increases osteogenic responses to loading, but the mechanism involved is unclear. This project tests the hypothesis that E_2 affects osteogenesis by upregulating ER-□, making osteoblasts more sensitive to mechanical loading.

To test this hypothesis, 36 ovariectomized C57BL/6J mice were divided into normal, high, and low E_2 treatment groups implanted with 0.25 mg, 2.5 mg, or placebo E_2 pellets. Half of the mice in each E_2 group were fed normal mouse pellets, while half were fed a soft paste made from the same pellets. Results indicate that in the lateral mandibular corpus, hard diet animals exhibit 260% (high E_2), 21% (low E_2), and 82% (placebo) more growth than soft diet animals (p=.01 to 0.03). *In situ* hybridization shows that ER-□ is expressed in mandibular osteoblasts and hypertrophic chondrocytes, and expression appears to increase with increasing E_2 dose. Evidence that E_2 level affects diaphyseal bone growth via regulation of ER-□ may help explain patterns of variation in human skeletal robusticity.

A rapid genetic method for sex-typing primate DNA.

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Molecular ecological studies can provide insights into the mating system, dispersal pattern, social organization, and population structure of wild primates. For such studies, it is useful for researchers to be able to reliably identify the sex of sampled animals. Several genetic methods for identifying the sex of DNA samples have been developed for humans, most of which rely on the presence of fixed polymorphisms between the X- and Y-borne copies of the enamel protein gene amelogenin. Amelogenin-based assays are currently used in human forensic cases and have proven effective for determining sex in several other hominoid primates. Unfortunately, however, these assays are not broadly applicable across the rest of the primate order.

I present a simple, universal method for sex-typing primate DNA that uses multiplex PCR to simultaneously target small portions of the X-linked amelogenin and Y-linked SRY genes. The larger, X chromosome amplicon serves as a positive PCR control, while the Y chromosome amplicon determines whether a sample is male or female. The X and Y fragments differ in size by ~35 base pairs and are easily separated and visualized using benchtop methods, thus requiring no specialized laboratory equipment. Importantly, both target fragments are short and can be amplified reliably even from the degraded DNA templates typically recovered from noninvasively collected samples. The procedure is tested and shown to be effective for sexing individuals from 33 anthropoid genera, and a variant of the method, utilizing an alternative primer set, appears effective for sex assignment in strepsirrhines and tarsiers.

Is infanticide by females more common in the common marmoset (*Callithrix jacchus*)? Implications for how callitrichines balance cooperation and competition.

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We examine interspecific differences in

the occurrence of infanticide by females and their implications for limiting reproduction in both wild and captive populations of callitrichines. At least six cases of infanticide by females other than the mother have been observed in wild groups of common marmosets, with several more cases described for captive groups. Infanticide by females other than the mother has not, however, been documented for wild groups of other callitrichine species. Why might such overt aggression toward infants occur in one species and not others? In the common marmoset, the prevalence of polygynous groups (which in turn may be related to the presence of an unrelated male), reproductive state of other females in the group (including overlapping pregnancies and presence of lactating females) and overall cost of infant care may contribute to the prevalence of infanticide. These conditions, especially the presence of multiple breeding females, are less common in wild groups of *Saguinus*, *Mico*, *Callimico*, and *Cebuella*. Why infanticide has not yet been observed in wild *Leontopithecus* is less easily explained. All callitrichines balance the need for cooperative care of young with the reproductive competition that results from limited reproductive opportunities. But ecological and social conditions appear to tip the balance toward infanticide more frequently in common marmosets than other callitrichine species.

Molecular phylogeny of the Papionini.

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While the basic outline of papionin phylogeny has been known for over a decade, several unresolved issues remain. Molecular analyses first raised the issues of mangabey polyphyly and the distant relationship of mandrills and baboons despite their morphological similarities. Subsequent morphological analyses have strengthened these findings. However, the exact nature of the relationships among *Papio*, *Theropithecus*, and *Lophocebus*, and the divergence dates of the different papionin lineages remain unclear. Previous molecular studies utilized several rather short unlinked loci that yielded incongruent gene trees from which reliable dates could not be derived. Fortunately, the congruence of multiple gene trees inferred from sequences of sufficient length from different components of the genome greatly reduces the possibility of inferring a molecular phylogeny that does not match the species' phylogeny. Advances in molecular techniques and technologies have allowed us to sequence over 35,000 base pairs from complete mitochondrial genomes, two tightly linked Y chromosome loci, a long intergenic region of the X chromosome, and four autosomes. With our increased understanding of the evolution of primate mtDNA and improved methods for estimating molecular divergence dates, a robust, well-dated papionin phylogeny is inferred.

While it is not surprising that *Papio* and *Theropithecus* are sister-taxa, this relationship was never strongly supported by previous data. This robust phylogeny, including divergence dates with confidence intervals, will allow the Papionini to continue to serve as a model group to test hypotheses regarding both molecular and morphological character evolution.

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Mobility of the muscles of facial expression in *Papio hamadryas*.

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Facial expressions are routinely used in social interactions among anthropoids. Qualitative observations suggest that there is significant interspecific variation in the mobility of the muscles of facial expression, however the factors responsible for this variation have not been studied. This is largely due to a lack of comparative data. The purpose of this paper is to present an application of the Facial Action Coding System (FACS) to the question of facial mobility in *Papio hamadryas*.

FACS is the main method used in psychology to study human facial movement. The method differentiates 18 action units (AUs) that correspond to visible changes in the face resulting from individual muscle contractions. Since humans exhibit the greatest differentiation of the muscles of facial expression, FACS represents the entire range of possible movements for anthropoids. Video recordings of the face were collected in 10-minute focal samples from 5 adults of *P. hamadryas* at the Saint Louis Zoo. AUs were scored using standardized FACS criteria. Sampling continued until no new AUs were observed. Over 200 facial events were scored. The number of AUs observed was used to estimate facial mobility.

Mean facial mobility for *P. hamadryas* is 12 AUs, roughly 67% of human facial mobility. Several movements absent from the *P. hamadryas* repertoire are important signals in hominoid facial communication (e.g. Brow Lowerer). Quantitative data on facial mobility estimated in the same manner for other nonhuman anthropoids will help bring facial mobility into the realm of comparative primatology.

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Agonistic relationships in female western gorillas at Mondika.

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Socioecological theory predicts that unidirectional dyadic relationships occur when females face contest competition, since as a result dominant females gain better access to food and (ultimately) greater reproductive success. Western gorilla females are likely to face higher levels of contest competition than mountain gorillas due to differences in resource density and distribution. However, like all large-bodied apes, they may reduce the effects of competition through solitary foraging. In this study we examine whether western gorilla female social relationships are consistent with greater contest competition.

Data derive from all-day focal follows of 3 of 6 adult females (approximately 80 hours per female) combined with ad lib data on aggression in one group of western gorillas during a 10-month period. The majority of aggressive bouts had a decided outcome, with one individual responding to aggression by stopping its current activity, moving away, or replying with a submissive vocalization, in contrast to female mountain gorilla behavior where < 25% of outcomes were decided. In most of the decided cases, the initiator won the contest. Females differed in how often they won contests. One focal female won frequently, the other two focal females rarely won aggression, and the 3 less habituated females were intermediate. Greater group spread than in mountain gorillas may explain low frequency of interactions among females. Although preliminary, data are suggestive that consistent dyadic female relationships and rank differences may be present in western gorillas at Mondika.

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Little deaths: infant and child mortal-

ity from a late 19th century poorhouse cemetery (MCIG II).

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Often made orphans by family poverty or the incarceration of their parents, the underclass children of late 19th century Milwaukee were placed into the care of the Poor Farm. During the mid-century, those who could not be bound-out were left to dwell "ragged and neglected" among the insane, infirm, and overwhelmingly adult poor. In 1898, amid pressure from local and state reformers, the Home for Dependant Children was opened to care for those children who would become either temporary or permanent wards of the county. Yet, despite the efforts to provide effective care for the children in need, the care provided did not always successfully meet those needs. Many children were thus given over to the Potter's Field. From 1992 through 1994, the Milwaukee County Institutional Grounds cemetery (1882-1925) was excavated. Of the 1588 burials discovered, 588 were those of indigent children. Ages were estimated using dental and post-cranial development. As expected, infant mortality was high, peaking between the ages of three to six months. Comparisons with contemporaneous mortality records demonstrate that infant and child mortality was higher among the poorhouse sample. This suggests that the mortality profile among poorhouse samples may not adequately represent the greater municipal population.

Play, a negotiation of male Bonobo social relationships.

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Studies of wild Bonobo behavior rarely mention play between juvenile and adult males. We have observed this kind of play in a laboratory colony, and it may be related to conditions of captivity. In the Language Research Facility where humans and Bonobo spend considerable time interacting, the human participants firmly discourage overt aggression and agonistic display for safety. We hypothesized that this relatively unstudied adult-juvenile male play negotiated a strategy alternative to more aggressive display; whereby a maturing male playfully tests and the older male gently maintains their social relationship. All data come from video archives of eight Bonobos housed at the Language Research Center in Atlanta, Georgia from 2002 to 2003. We have used our proprietary video-coding software to track behavior, intensity, and communicative gesture between the breeding male and one of his juvenile male offspring.

The adult and juvenile males show self-handicapping in their social play. We observed an initially careful, gradual escalation of rough-play by the juvenile while the adult exercised an exaggerated self-restraint. As the activity reached an unacceptable level of intensity, the adult terminated the encounter with a brief, aggressive gesture. The juvenile showed a similar self-handicapping while playing with two much younger male infants. This behavior may reflect a less controlled version of the same process in the adult male. Play generates a pool of behavioral forms and expectations shared by everyone in the group through which adults can maintain relatively peaceful social relations with their more volatile youngsters.

Morphology and keeling of the trochlear notch articular surface in extant and fossil hominoids.

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Among hominoids, taxa specialized for forelimb-dominated arboreal locomotion are considered to have deeply grooved humeral trochleas. They should also have correspondingly strongly keeled ulnar trochlear notches. This may be because keeled humeroulnar joints are better positioned to resist eccentric loading of the joint generated by strong wrist and finger flexor muscles that cross the elbow obliquely, muscles critical for forelimb dominated climbing. This relationship should be useful for testing the hypothesis that early hominins species were, in part, forelimb-dominated arboreal climbers.

A principal component analysis of the 3D trochlear articular surface reveals that extant hominoid species can be discriminated from one another. *Oreopithecus bambolii,* a suspensory Miocene hominoid, is more similar to *Pan* than to any other extant taxa, while *Australopithecus afarensis* specimens are more similar to modern humans.

Angular measurements of the keeling show that the proximal half of the trochlear notch is flattest in humans than in any other extant, large-bodied hominoid taxa, and that it is most keeled in *Pan* and *Pongo*. As in *Oreopithecus,* the Pleistocene hominin fossil OH36 is most similar to *Pongo* and *Pan,* supporting the previously formulated proposition that this specimen had an arboreal component to its locomotor repertoire. On the other hand, *A. afarensis* specimens are more similar to modern humans, suggesting that this fossil species had wrist and long finger flexor muscles that were relatively less powerful than other extant apes, possibly reflecting that arboreality was not a significant component of its locomotor repertoire.

Ethnoprimatology and the long-tailed macaques of Tinjil Island, Indonesia: integrating conservation and ethnography.

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The study of human-nonhuman primate interactions is integral to the creation of viable conservation models and socio-economic policies meant to maintain primate populations in harmony with human populations as natural habitats continue to shrink. This study examines human perceptions of monkeys and the impact of conservation on the communities of Muarabinuangen, Java, and nearby Tinjil Island.

Tinjil was established as a natural habitat breeding facility (NHBF) in 1987 with two main goals: 1) to provide healthy, SRV-free macaques (*Macaca fascicularis*) for biomedical research and 2) to provide conservation protection for other wild primate populations.
Data were collected on human demographics, local community perspectives and experiences with human-nonhuman primate interactions, as well as on economic and cultural value and usefulness of nonhuman primates. Interviews (N=72) were conducted in Bahasa Indonesian, Sundanese and English in and around Muarabinuangen and on the island of Tinjil. Data analyses indicate a general ambivalence toward monkeys by

local residents. However, within these communities there is substantial support for monkeys' usefulness in biomedical and behavioral research. This perception may be attributed to the success of the Tinjil NHBF which has raised local consciousness of conservation techniques that can work in concert with human interests.

Population viability of the endangered Milne Edward's Sifaka (*Propithecus edwardsi*).

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Population viability analysis has become an important tool for focusing conservation priorities and estimating efficacy of management efforts. However, few such studies have involved primates, a diverse order with a majority of its species endangered. Here we explore the long-term viability of the Milne Edward's Sifaka (*Propithecus edwardsi*) through the combination of long-term field studies and modeling approaches. The endangered lemur is restricted to southeastern rainforests of Madagascar. Its persistence is threatened by habitat loss, hunting, and population fragmentation. We estimate less than 30,000 individuals remain in 5 isolated patches. Only 2 areas within the metapopulation are protected with the remaining habitat undergoing rapid deforestation. The largest of the protected areas, Ranomafana National Park, contains 2600 individuals, and is the site of two long-term field studies. Over 18yrs of demographic data were employed to develop a stage-structured population model incorporating demographic and environmental stochasticity. This model was used to identify conservation problems and demographic features that drive the dynamics of the population and to predict risk of extinction and decline under a varied set of assumptions and management scenarios. Results suggest an overall 74% chance of declining by 50% within 3 generations. Outlook in protected areas is only slightly better with a 58% chance. Habitat loss accounted for 28% of predicted decline in unprotected areas, while other impacts remain unknown and require further study. The species' long generation time results in a low extinction risk over the next 50 years, however, recruitment is below replacement and the population is declining. The model suggests that if no further management actions are taken to preserve this species, we may be facing an extinction debt in the future.

Basicranial morphology of Pleistocene Australians: implications for modern human origins.

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Previous work has highlighted a number of basicranial features in the Ngandong and Sambungmacan fossil crania that are potentially autapomorphic for those specimens. These features include the location of the squamotympanic fissure in the mandibular fossa, an opisthionic recess, a doubled foramen ovale, and pronounced postcondyloid tuberosities. While these features have been tested in both the Indonesian *Homo erectus* sample as well as a large sample of modern humans, they have yet to be examined in the late Pleistocene and early Holocene fossils from Australia. These specimens, from sites like Kow Swamp, Lake Mungo, and Nacurrie, have long been regarded as possessing morphologies that are intermediate between the Ngandong fossils and modern Australians.

For this project, non-metric observations taken on the skull base will be used to compare the fossils from the Indonesian sites of Ngandong and Sambungmacan to a number of early Australian specimens. The analysis will examine the null hypothesis that a plurality of these non-metric features will indicate similarity between these samples, and this hypothesis will be rejected if significant dissimilarity exists between them.

The results of this project highlight significant dissimilarities between the Ngandong fossils and the early Australians. Fisher's exact tests indicate that eight of the fourteen features examined show statistically significant differences in expression. Most notably, none of the features deemed potentially autapomorphic for the Ngandong/Sambungmacan sample were found in the Australian crania. These findings are consistent with the replacement of the Ngandong hominids by a later migration of modern humans into Australasia.

A genome-wide scan for quantitative trait loci influencing childhood bone mass.

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Bone mass is accrued throughout childhood, typically reaching its peak during early adulthood. Despite the growing awareness regarding the importance to later bone health, few studies have examined the genetic underpinnings of childhood bone mass. To identify genetic influences on this trait, we examined radiographic cortical thickness of the second metacarpal in 600 Fels Longitudinal Study participants at age 10 years. These individuals are from 144 nuclear and extended families. An initial set of 356 individuals have been genotyped for ~400 autosomal markers spaced approximately every 10 cM. Using a variance components-based linkage analysis method (SOLAR), ten suggestive (>1.9) and two significant (>3.0) LOD scores were found for the cortical bone-related traits. The significant LODs were: a LOD of 3.29 for linkage of total cortex to a QTL on 3p at 24 cM, and a LOD of 4.13 for linkage of lateral cortex to a QTL on 3p at 26 cM (both QTL are located between markers D3S1304 and D3S1263). One potential positional candidate gene in this region is OXTR (oxytocin receptor gene). Because the oxytocin receptor was recently found to function in osteoblasts and osteoclasts, OXTR is a plausible candidate gene for childhood bone accrual. Further results suggest the existence of genes on chromosomes 2, 3, 4, 10, and 12 influencing measures of bone mass at age 10. Future work will seek to identify other specific genes that influence the accrual of bone mass at different stages of childhood development.

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Testing for functional convergence in Neandertal and Inuit lower rib morphology in terms of cold-adaptation.

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The modern thoracic bauplan appears to have been present in human evolution by 1.6 million years ago (Jellema et al., 1993). A recent reassessment of thoracic morphology in Neandertals (Franciscus & Churchill, 2002) reinforced this observation, but also revealed more subtle details in rib profile patterns that are unique or

particularly well-expressed in Neandertals. In particular, Neandertals have relatively more robust and rounded cross-sections in the ribs of the lower thoracic cage compared to the upper thorax. This is particularly true for the 11th and 12th ribs which show unusually large and rugose muscle scarring for *intercostalis* m. attachments, and pronounced *quadratus lumborum* m. attachments. In the present study, we test the hypothesis that these lower rib-cage features in Neandertals are associated with their well-documented and presumably cold-adapted, wide bi-iliac breadths using a functional convergence approach. Discrete coding of the 11th and 12th ribs for the size and rugosity of muscle scarring was compared between a mixed-sex sample of Point Hope Inuits who derive from cold Arctic Circle climates and have wide bi-iliac breadths, and a mixed-group, mixed-sex African sample derived from hot-climates with narrow bi-iliac breadths. Our results reject a simple isomorphic relationship between variation in bi-iliac breadth and the patterning of lower rib robusticity and muscle insertion rugosity. These results, and further considerations, suggest that alternative, non-climatic explanations for unusual Neandertal lower rib features are likely. Principle among these are higher and/or more frequent levels of forced expiration during elevated activity bouts or, alternatively, non-functional (i.e. neutral) explanations.

Was the early hominid brain muscle-bound?

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Stedman et al. (2004) announced "findings on the age of the inactivating mutation in the MYH16 gene raise the intriguing possibility that the decrement in masticatory muscle size removed an evolutionary constraint on encephalization…." Here we test this hypothesis.

Among classic experiments, Washburn (1947) removed skull muscles unilaterally in newborn rats, producing temporal lines either absent or displaced far into the temporal fossa, yet brain endocasts were unchanged on the operated side. Most domestic animals have jaws, teeth and brains that all are evolutionarily reduced relative to wild ancestors; in comparison with Canis lupus arctos, cranial capacities of husky dogs diminish along with jaw sizes (Clutton-Brock et al., 1994). Among free-living hominoids, the largest nonhuman cranial capacity was recorded for a West African gorilla (Schultz, 1962). Its skull combined a markedly high sagittal crest, indicative of massive jaw musculature, with an endocranial volume of 752 cc that exceeds by 40% the average for 400 conspecifics, as well as many fossil hominid crania for several hundred thousand years following the 2.4+ 0.3 ma time estimated for the MYH16 mutation. Overall, the sizes and attachments of jaws principally shape the external surfaces of skulls rather than limiting internal volumes. Consequently, the idea that the early hominid brain was fettered by muscles whose confines were struck off by a single mutation is intriguing but unproved. "Recently, evolutionary studies have been revitalized and revolutionized by an infusion of genetics into paleontology and systematics" (Washburn, 1951). "Hope springs eternal in the human breast" (Pope, 1733).

Comparison of deciduous and permanent dental morphology in a European American sample.

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The expression of characteristics of dental morphology has been shown to be partially genetically controlled. It has long been thought that characteristics appear similar in the deciduous and permanent dentitions of the same individual. Strong correlations have been found by several researchers for tooth size as well as for dental anomalies, such as agenesis and twinning. However, no study has yet presented a comparison of the expression of normal morphological variation between the two dentitions in the same individuals.

To address this issue, observations were made of 54 European American individuals whose teeth were cast as both children and adults as part of the Bolton Brush longitudinal growth study. We observed expressions of 22 morphological traits in both the deciduous and permanent dentitions. The scores were then converted to a common scale and compared using Goodman-Kruksal's Gamma for ordinal data. The data were also dichotomized and compared using tetrachoric correlation. It was expected that high correlations would be found between expressions in the two dentitions for all traits, and that both statistics would yield similar results. However, results varied widely from correlations of –0.8 to 1.0, with several traits showing no correlation at all. Also, tetrachoric correlation analysis resulted in several more positive, high correlations than did the categorical data analysis. We interpret that these results reflect variation in rarely occurring traits and differences in strength of trait expression. The results also suggest that there are more complex genetic and environmental interactions than previously anticipated.

Variation in internal structure of distal humerus among small primates.

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Structures of both cortical and cancellous bones have been suggested to be highly influenced by the loading environment. Most studies to date dealt with the cortical bone morphology and the cancellous bone properties separately. This research compares internal structure of distal humeral articulation among primates and aims to clarify contributions of cortical and cancellous bones to the articular bone structure.

Distal humeri are scanned using a pQCT scanner using a 0.05 mm voxel size. Our sample includes taxonomically and behaviorally diverse primates weighing 0.7 to 4 kg (lemurids, galagids, lorids, platyrrhines, and *Cercopithecus*). Volume dependent measurements are taken to quantify amount of cortical and cancellous bones and cancellous bone volume fraction at the capitulum, the trochlear gutter, and the trochlea.

Distal humeral articulation generally bear relatively thinner cortex at the capitulum and thicker at the trochlear gutter. Among the sample species, lorids show thick cortices throughout the articulation, suggesting that cortical bone rather than cancellous has rigidity to greater loadings. Capitulum and trochlea of lemurids and capitulum of *Cercopithecus* have relatively thinner cortices and higher cancellous bone volume fraction. Therefore, the percentages of trabeculae in the articular parts are higher in these taxa than in the other primates. The cortical and cancellous bones are maintained under different production systems, and it is expected that they have different ways of adjustments to the loading environment. It is necessary to study both cortical morphology and cancellous properties to increase our understandings on structural adaptation of articulation to loading environment and primate locomotion.

Ecogeographical trends in pedal api-

cal tuft breadth: implications for postcranial robusticity in *Homo neanderthalensis*.

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Attempts to explain the markedly robust body form of *Homo neanderthalensis* have led to two main hypotheses: the hyper-activity model and the hyper-polar model. In light of the medullary stenosis and long bone curvature exhibited by Neanderthal infants and the recognition of thick cortical bone as the primitive condition within Homininae, a developmental explanation for Neanderthal postcranial robusticity is poorly supported. The hyper-polar model proves more plausible on examination of modern human body design across an ecogeographical gradient. The greatly expanded relative apical tuft breadth of Neanderthal distal phalanges has been proposed as a hyper-polar adaptation. However, analysis of modern human populations reveals a pattern of greater manual tuft expansion in warm-adapted individuals than in cold climate individuals. This study compares relative distal pedal apical tuft breadth among modern cold-adapted and warm-adapted human populations from collections housed at the American Museum of Natural History. Results reveal adherence to a common climatic pattern for relative distal pedal and manual phalangeal apical tuft breadths. There are statistically significant differences between warm and cold-adapted apical tuft breadths relative to proximo-distal phalangeal length and medio-lateral base breadth. Cold-adapted populations exhibit absolutely larger phalangeal lengths and base breadths than warm-adapted individuals, but values of apical tuft breadth are unexpectedly reduced relative to other dimensions of the distal phalanges in cold climate populations. The broad apical tufts of the Neanderthal manus and foot contradict the hyper-polar model as a unicausal explanation of Neanderthal postcranial robusticity.

Ovarian hormones and reproductive development in wild female chimpanzees (*Pan troglodytes schweinfurthii*).

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Young female chimpanzees in the wild begin displaying sexual swellings at approximately 10 years of age, though they do not typically give birth for another 3-5 years. Many hypotheses have been generated to explain this long period of apparent infertility and the relative lack of sexual interest from males. However, the relationships among the many aspects of reproductive maturation in female chimpanzees have not been thoroughly examined. In this study, I analyzed longitudinal patterns of ovarian hormones, sexual swellings, and sexual behavior in young female chimpanzees from three wild study populations (Kibale National Park and Budongo Forest Reserve, Uganda, and Gombe National Park, Tanzania). I conducted non-invasive fecal and urine sampling of 25 juvenile and adolescent females for periods of one to six years. In longitudinal analyses, attainment of the first, tiny sexual swellings and later adult-like swellings were coincident with marked hormonal shifts. This finding suggests that swellings in young chimpanzees are indicative of underlying physiological changes rather than being deceptive signals. Copulation rates of nulliparous females showed a significant positive increase with gynecological age (months since first swelling). Thus, it appears that, rather than being uniformly unreceptive to nulliparous females, males increase their sexual interest as the likelihood of first conception approaches. These puberty profiles from wild subjects have implications for the understanding of adolescent subfecundity, female transfer, and sexual swelling function in chimpanzees.

Stretching the limits: Jaw-muscle fiber architecture in tree-gouging and nongouging callitrichid monkeys.

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Common marmosets (*Callithrix jacchus*) are tree-exudate feeders that actively stimulate exudate flow by biting trees with their anterior teeth. Laboratory and field studies demonstrate that common marmosets generate relatively wider jaw gapes during gouging as compared to chewing behaviors. Likewise, morphological studies show that tree-gouging primates exhibit features of the skull that have been functionally linked to the production of wide gapes during gouging. Previously, Taylor and Vinyard (2004) found that common marmoset superficial masseter differs from that of closely-related nongouging primates (*Saguinus oedipus*) in exhibiting architectural features that are functionally linked to facilitating wide gapes. Specifically, these include relatively longer muscle fibers, a greater potential maximum tendon excursion, and a higher mass/tetanic tension ratio. Here we compare fiber architecture of the anterior temporalis muscle in four adult *C. jacchus* and four adult *S. oedipus*. We hypothesize that the anterior temporalis may also play an important role in facilitating the production of wide gapes in common marmosets. Our preliminary findings indicate that *C. jacchus* has significantly longer anterior temporalis fibers relative to both jaw length and muscle weight (Mann-Whitney U-tests, $p < 0.05$). These results suggest that the anterior temporalis muscle in *C. jacchus* is suited to facilitating stretching during jaw opening. Collectively, our results substantiate that the jaw muscle architecture of tree-gouging callitrichids is patterned to facilitate relatively wide gapes during gouging. Thus, the jaw muscles, along with the skull and teeth, appear to be functionally and/or evolutionarily adapted to this unusual feeding behavior.

Preliminary investigation of seed dispersal by red-fronted brown lemurs (*Eulemur fulvus rufus*) in Ranomafana National Park, Madagascar.

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Primates are reported to play an important role as seed dispersers for many tropical tree species. This should be especially true in Madagascar, where large avian, chiropteran, and terrestrial frugivores are absent. Previous studies investigating seed processing and germination of seeds passed by *Eulemur fulvus rufus* (red-fronted brown lemur) in eastern rainforests have yielded conflicting results about the potential for this animal to serve as a major seed disperser. However, research in the dry forests in western Madagascar has suggested that forest regeneration depends on the presence of *E. fulvus*. The current study aimed to directly measure the dispersal of seeds by brown lemurs in the rainforest of Ranomafana National Park in eastern Madagascar in a preliminary attempt to evaluate this role.

Data were collected on feeding and defecation behavior of individuals from three groups from June–July 2004. Gut

passage rates were determined, and distances between seed ingestion and defecation sites were measured. In addition, fecal samples were collected, and germination trials conducted. Seeds passed by lemurs germinated faster than control seeds. No correlation was found between the total number of feeding bouts on a fruit species (i.e. proportion of diet) and the distance its seeds were dispersed. Although a negative correlation was found between seed mass and dispersal distance, there was no correlation between seed mass and gut passage time. Overall, these results suggest that brown lemurs are effective dispersers of seeds in Madagascar's rainforests; however, larger seeds may not be dispersed as far as smaller ones.

Comparative prezygapophyseal morphology: implications for postural and locomotor adaptations in hominin evolution.

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Previous studies of lumbar vertebral pre- and post-zygapophyses demonstrated their weight-bearing role. This study explores whether differences in prezygapophyseal morphology can be related to orthograde versus pronograde postures. It compares (1) the angle of orientation of each prezygapophysis and (2) the transverse distance between the midpoints of the right and left prezygapophyseal surfaces at diaphragmatic, lumbar, and first sacral vertebral levels in *Homo sapiens, Pan, Papio,* and three hominin fossils: Kebara 2, AL 288-1, and Stw 431. Because lumbar vertebral numbers differ in these taxa, correlations were made and scaled to human numbers (e.g. *Papio* L9 = human L5).

Significant differences between taxa in prezygapophyseal orientation angles were observed at most levels. Although *Papio* has a smaller angle than *Pan, Homo* and Kebara 2 at the diaphragmatic level, *Pan*, *Homo* and the fossils all display smaller angles than *Papio* at the lumbar and first sacral levels. The latter condition may reflect a mechanism acting to prevent or limit axial rotation. Midinterfacet distances in *H. sapiens* and Kebara 2 increase greatly in width down the vertebral column, i.e. last lumbar or first sacral distance is much larger than first lumbar or diaphragmatic. There is no such increase in width in either *Pan* or *Papio*. For AL 288-1 and Stw 431, midinterfacet distances at last lumbar or first sacral levels are only marginally greater than at upper lumbar levels. This condition of increasing width may reflect a mechanism acting to increase load-bearing ability due to the demands of human-like bipedal locomotion.

Primates in agroecosystems: conservation value of some agricultural practices in Mesoamerican landscapes.

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While there is a general perception that agricultural activities are the principal threat to primate biodiversity in the tropics, in this paper we address this issue and argue that in fragmented heterogeneous landscapes, agroecosystems may help sustain primate populations. Presence or absence of primates was investigated in Los Tuxtlas, Mexico, in 132 sites representing 12 types of agroecosystems present in fragmented landscapes. We also compared populations parameters (density, group size and immature to adult female ratios) between agroecosystems and extensive and fragmented forests for *Alouatta palliata* and *Ateles geoffroyi* in Los Tuxtlas and for *A. pigra* in Lachúa, Guatemala. In Los Tuxtlas, howler and spider monkeys were present in eight and in seven of the 12 types of agroecosystems investigated, respectively. Howler and spider monkeys were detected residing in shaded (e.g. cacao, coffee), but not in unshaded plantations (e.g. citrus, allspice). Mean values of primate demographic parameters in agroecosystems more closely resembled those in extensive than in fragmented forests. Farmers reported crop damage by primates in banana, mango, citrus and allspice plantations with negative responses toward the monkeys. However, howler and spider monkeys cause no damage to the shaded cacao, coffee and cardamom plants. Our study suggests that certain types of agroecosystems favor the persistence of primate populations in fragmented landscapes. At these habitats, the presence and feeding activities of primates may benefit the plantations by accelerating primary productivity, by dispersing the seeds of their fruit sources, and by adding important amounts of nutrients, via their defecation, to the soil of the plantation.

Allometry of anthropoid femoral neck trabecular architecture using 3D microCT.

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This study used 3D microCT methods to examine the interspecific relationship between body weight (BW) and femoral neck trabecular bone architecture. This topic has received little attention in the evolutionary and orthopedics literature and reports have offered contradictory interpretations.

The proximal femora of six anthropoid species (3-11 kg range) were scanned using microCT (Total N=48). Proximal neck trabecular architecture measurements included the volume fraction (BV/TV), trabecular thickness (Tb.Th), and the trabecular number (Tb.N). Phylogenetic independent contrasts were used to determine the relationship between species mean BW and trabecular architectural parameters. Study samples consisted of size-monomorphic species and either males or females from size-dimorphic taxa.

BV/TV showed an increasing but non-significant trend in both sexes. Tb.Th increased with BW in both male- and female-dominated samples but the scaling patterns were dissimilar for the two groups. Tb.Th scaled with negative allometry in the female group (slope=0.21, $p<0.001$) but with slight positive allometry in the male group (slope=0.38, $p<0.001$). Furthermore, a mathematical index characterizing the shape of the trabeculae indicated that trabeculae become more plate-like as they thicken (male $r=-0.96$, $p<0.01$, female $r=-0.87$, $p<0.05$). Lastly, Tb.N decreased with BW, scaling negatively allometrically for both groups (male slope=-0.27, $p<0.001$, female slope=-0.24, $p<0.001$).

The opposing scaling patterns of Tb.Th and Tb.N indicate that increasing strut thickness rather than increasing the relative number of trabeculae accommodates greater bone volumes. The lower female Tb.Th scaling coefficient possibly reflects the higher turnover of adult female primates who are often in one or another reproductive stage.

Brain shape asymmetries in right-handed and left-handed men and women.

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MRI (magnetic resonance imaging) scans of brains were obtained *in vivo* from 24 left-handed men, 60 right-handed men, 26 left-handed women, and 56 right-handed women. Virtual images of the surfaces of the brains were warped to match precisely the shape of their mirror images using an elastic transformation. The 3-D deformation fields that describe quantitatively the regional distribution of the forces effecting the warping were visualized as color-coded maps, with warmer colors (reds) indicating the brain is significantly more expanded than its counterpart in the other hemisphere and cooler colors (blues) indicating significantly greater compression.

Results indicate that each group is characterized by a unique mean pattern of significant external brain shape asymmetries: Right-handed women manifest the least asymmetrical brain shape, but show a significantly protruded area near the left occipital pole (left occipital petalia). Left-handed women are characterized by significant shape asymmetries over most of the lateral surfaces of their temporal lobes, which favor the right hemisphere rostrally and the left caudally. Left-handed men manifest a more protruded left frontal lobe (left frontal petalia), whereas right-handed men show significant asymmetries in their cerebellar hemispheres that favor the left side rostrally and the right side caudally. Both groups of men show a caudally located region on the ventral surface of the temporal lobes that is significantly expanded on the right side. Because this investigation quantifies and visualizes the extent of asymmetries across the brain's entire surface, the results supplement and extend findings from traditional studies of frequencies of petalia patterns.

The distal humerus – A blind test of Rogers' sexing technique using a documented skeletal collection.

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Assessment of existing methods of skeletal diagnosis is important as it allows to continuously monitor and improve the reliability of personal identification in archaeological and forensic contexts. This study presents the results of a blind test re-evaluating the sexing technique proposed by Rogers (1999) involving morphological traits of the distal humerus. A total of 351 humeri (184 male and 167 female specimens) from the documented skeletal assemblage of St. Bride's, London, spanning from the late 17th to the early 19th century, was analysed for the following traits: trochlear constriction, trochlear symmetry, olecranon fossa shape, and angle of the medial epicondyle. All four traits were found to show substantial sex-discriminatory capacity with 'olecranon fossa shape' being most consistently correct (84.6%) in predicting sex from the documented St. Bride's individuals. Taking all four traits together the overall accuracy was 82.9%, however only if also those individuals were included (as categories 'probably male' and 'probably female') for whom not all traits revealed unambiguous sex indicating information. While this figure is lower than the overall accuracy suggested in the original study, it still remains useful even for forensic applications. The distal humerus can thus be recommended for providing a set of suitable traits for assessing sex from the skeleton in addition to known markers, especially since this part of the skeleton is frequently well preserved.

The relationship between leaf chemistry and feeding patterns in a small-bodied nocturnal folivore (*Avahi laniger*).

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A folivorous diet is generally characterized as low-quality due to the difficulties of cellulose digestion, the low energy value, and the possible presence of secondary compounds. Several primate species exhibit morphological adaptations to folivory, such as a complex sacculated stomach and/or increased body size. Because *Avahi laniger* is one of the smallest folivorous primates and has a simple monogastric stomach, we sought to determine how this lemur can subsist on a diet of leaves. This study tested a hypothesis formulated by Ganzhorn and Wright (1994), in which they suggest that circadian chemical property changes in leaves influence feeding times in diurnal folivores in Madagascar. Data were collected from May-August, 2004 on feeding times and durations of *A. laniger* at the Vatoharanana satellite camp in Ranomafana National Park. Leaves from food trees were collected at 4-hour intervals, dried immediately upon collection at 40-50°C, and then analyzed for chemical properties (soluble carbohydrate, soluble protein, and condensed tannins). The diet of *A. laniger* was composed primarily of young leaves (98.3% of total feeding scores) and mature leaves (1.7% of total feeding scores). There were clear peaks in feeding at 18:00 hours, 0:00 hours, and 2:00 hours. Various ecological and chemical correlates to observed dietary patterns will be presented.

This research is amongst the first conducted on how resource quality impacts feeding behaviour and resource choice of a nocturnal folivore in Madagascar, and results from this study will have an important impact on studies of the evolutionary ecology of extant and extinct folivorous primates.

The Old Frankfort Cemetery: a preliminary report on a Pre-Antebellum population.

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The Old Frankfort Cemetery (15Fr154) is one of the earliest cemeteries in use in the capital of the Commonwealth of Kentucky. Records indicate this cemetery was initially used by a mixture of early settlers from 1800 to the 1860s. It appears, however, that the cemetery came to be neglected after the opening of a new cemetery in the mid 1840s. Subsequent development of the site through the 19th and 20th centuries effectively removed the cemetery from the landscape and public memory.

The results of previous studies indicate that the majority of people interred in the Old Frankfort Cemetery experienced adverse social, economic and political conditions. A total of 272 burials were recovered, including 91 sub-adults. This study focuses on the health of the children by assessment of Harris' Lines, and age at their first appearance as well as stature. Mean age of the sub-adults is 6.19 years. Of the 91 sub-adults, 78 are free of Harris' Lines; however those that exhibit Harris' Lines show multiple insults. Estimates of stature of sub-adults show the mean height of the children from Frankfort are on average 4.9 cm shorter than the average provided by Eveleth and Tanner (1990). Height for weight has also been examined, and though the children are short in stature, there is a marked in-

crease in weight, as they get older, with a mean weight of 7.2 kg. It is suspected that foods high in sugar or fat were being substituted for nutritionally healthy foods.

An investigation of ultrasound methods for the assessment of sex and age from intact human teeth.

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Determining sex and age in human remains is necessary for achieving positive identifications of individuals in forensic settings, and for providing data required for demographic analyses in archaeological samples. Due to their denser mineralization, teeth are generally better preserved than other skeletal elements, which are often fragmentary and poorly preserved. This work is the first to investigate the use of ultrasound methods to accurately, objectively, and non-destructively assess sex and estimate age of human skeletal remains from intact teeth.

An ultrasound imaging system using pulse-echo technique and nominal frequency (3.5 MHz) longitudinal waves was developed for application on teeth. Mechanical and acoustic properties of teeth were examined to explore their relationship with the interaction of ultrasound wave propagation. Experiments were conducted to determine differences in wave propagation in permanent vs. deciduous teeth, archaeological vs. non-archaeological dental samples, and in teeth from individuals of different ages and sex.

Consistent differences in integral acoustic response patterns in the different types of teeth were found. It is concluded that pulse-echo ultrasound is a viable non-destructive technique to yield integral acoustic characteristic properties of teeth, potentially useful for assessing sex and estimating age, and resolving minimum numbers of individuals from commingled and scattered remains. Information developed from this study will be significant to future research insofar as it introduces a new potential method that is non-destructive, fast, and easy to administer *in situ*.

Dental reduction in late Pleistocene and early Holocene hominids: alternative approaches to assessing tooth size.

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The traditional way to access crown size using the mesiodistal and buccolingual diameters is very strongly affected by wear, so that even the slightest approximal amount reduces the former significantly, and moderate amounts reduce the latter. This means that any study involving tooth size in early hunter-gatherers, who experienced severe wear, must establish the degree of attrition before measuring a tooth to ensure the efficacy of the result. Therefore, such studies have suffered from: a) much reduced sample sizes as improper measures have been correctly kicked out, b) a suspect data set if invalid measures have not been eliminated, or c) a combination of the two if strict criteria for elimination have not been consistently applied.

We undertook a three-year study of dental reduction in Late Pleistocene and Early Holocene hominids, incorporating cervical measures of teeth in our protocol. Cervical diameters are taken at the base of the crown, along the cement-enamel junction, which means that even worn dentitions can be measured. Not only did this overcome the problems identified for conventional measurements, but it also permitted the question of variability in crown size to be considered in a meaningful way.

This paper discusses the techniques used to assess tooth size in our dental reduction study, including the equipment developed to take cervical measures. Results of comparisons between conventional diameters, which we captured where it was appropriate to do so, with our novel cervical diameters, show that there are circumstances where only conventional measures may be taken. We conclude that cervical measures do not replace conventional ones, rather they are complimentary to them and both should be used in dental studies.

The skeleton of the dwarf marmoset, *Callibella humilis*: functional and phylogenetic implications.

S.M. Ford[1], L.C. Davis[2]. [1]Southern Illinois University, [2]Northeastern Illinois University.

Callibella humilis, the dwarf marmoset, was first identified in 1998 (van Roosmalen, et al.) and placed in a new, monotypic genus in 2003 (van Roosmalen and van Roosmalen). It is distinctive in pelage, behavior, ecology, DNA, and craniodental anatomy. Recent work has also confirmed the distinctions between Amazonian marmosets (*Mico*), Atlantic coastal marmosets (*Callithrix*), and pygmy marmosets (*Cebuella*) including postcranially. This is the first description of the postcranium of *Callibella*.

Discriminant function analyses place *Callibella* outside of the distributions of all other marmosets, in discrete morphometric space. While sharing general marmoset traits, *Callibella* shares no special affinity with *Callithrix*. The forelimb is closest to that of *Mico*, approaching *Mico* in its narrow elbow articulations. However, the hindlimb is most like the generalized tamarin *Saguinus midas*. It particularly lacks most of *Cebuella's* many highly derived hindlimb traits, sharing only a few, such as a narrow, short femoral head and narrow lateral knee articulation. *Callibella* does have several unique features of the pectoral girdle, forelimb, and hindlimb.

These results support suggestions elsewhere for a three-way division of the Amazonian marmoset ancestor into separate *Mico, Callibella,* and *Cebuella* lineages. The marked differences in their skeletons suggests that high dependence on exudates evolved independently in the pygmy and dwarf marmosets, associated with different postcranial adaptations, in agreement with results of analysis of cranial anatomy. These specializations likely relate to the apparent heavy use of a single tree species by dwarf marmosets.

Application of population demographic modeling to the predator-prey interactions of chimpanzees and red colobus monkeys in Gombe National Park.

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Construction of deterministic demographic models can have many uses in understanding primate behavior and ecology. They can be used to validate the quality of observed data as well as to project population-level responses to future changes in mortality, fertility and migration schedules. We used age-specific death rates from the literature for groups of red colobus (*Procolobus badius*) in Gombe National Park, Tanzania. We then constructed life tables using conservative high and low mortality estimates. Our objective was to evaluate the viability of colobus populations under various degrees of predation by chimpanzees. Consideration was given to variation among red colobus monkey life-history traits and their potential response to various mortal-

ity schedules in an attempt to understand the population's intrinsic capacity to buffer severe levels of predation. Results indicate that if fertility and mortality schedules remain constant, intensely hunted red colobus populations will experience negative intrinsic rates of growth when certain assumptions of stable age structure life tables are allowed to persist into the future. Plasticity in life-history traits, such as inter-birth interval, as well as movements of individuals between groups show some limited ability to buffer the effects of predation. However, at Gombe, current predation pressures in conjunction with site-specific factors such as small reserve size and isolation allow us to predict the extinction of the hunted red colobus groups in the near future.

Sexual dimorphism and morphological integration in baboons.

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Morphological integration (MI) reflects developmental relationships between parts of an organism. Sexual dimorphism results from differences during development in males and females, therefore differences in patterns of MI between males and females should mirror differences in development. Savanna baboons are highly sexually dimorphic primates, indicating strong differences in development between males and females. This study compares patterns of MI in the skulls of male and female savanna baboons, to assess sexual dimorphism in developmental associations between regions of the skull.

Three-dimensional coordinates were collected for 26 landmarks from the midline and right side of the neurocranium, face, and palate of adult baboon skulls in the collections of the AMNH and NMNH (N=28 males, 19 females) using a Polhemus 3Space™ digitizer. MIBoot© was used to statistically compare the patterns of MI in males and females of three subspecies of *Papio hamadryas*: *P. h. cynocephalus*, *P. h. anubis*, and *P. h. ursinus*.

Results show an overwhelming pattern of significantly increased MI in the skulls of male baboons. The highest levels of MI in males represent the relationship of landmarks on the premaxilla with the rest of the skull, indicating the robust incorporation of the extended rostrum with the rest of the skull in males. These results suggest a plan of modularity that allows for overlapping and hierarchical patterns of integration in males, as well as differences in the degree of canalization of development in male and female baboons.

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The truth is out there: how NOT to use FORDISC.

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FORDISC is an interactive computer program designed to classify an unknown adult cranium based on the reference samples in its database. FORDISC uses discriminant functions to construct a classification matrix and assign group membership of the unknown cranium into one of the selected reference groups. The researcher guides the analysis by choosing the populations against which to classify the unknown, choosing from eleven population samples from the Forensic Anthropology Data Bank or twenty-eight population samples from Howells' (1989) worldwide database. The utility and efficacy of FORDISC has been criticized for providing 'incorrect' classifications, however these disputed results are often due to inappropriate reference samples and failure to properly evaluate the typicality and posterior probabilities provided by the program. In this paper, unknown crania from populations known not to belong to any of the reference samples will be analyzed, demonstrating the interpretation of posterior and typicality probabilities provided in the FORDISC output and the importance of the use of an appropriate reference sample.

An application of ancient DNA analysis to an early Byzantine monastic community.

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The degree of contact among ancient populations and the extent of human historical movement have long been topics of interest and debate. While archaeological, linguistic, and textual evidence provide much information on historical patterns of migration, the record is often incomplete. A combination of biological and historical data and the introduction of methods such as ancient DNA analysis provide a more complete picture of historical migration patterns. Populations from the early Byzantine period (5th – 7th c. C.E.), when cultural and probably biological interaction among peoples of different geographic regions was common, are especially appropriate for such an analysis. An examination of genetic material from adult and subadult remains at St. Stephen's, a Byzantine monastery in Jerusalem, has proven particularly useful in revealing some patterns of migration during the Byzantine period.

In this study, levels of genetic heterogeneity of mitochondrial DNA both within and between the subadult and adult populations at St. Stephen's are examined to determine the likelihood that the individuals were members of the same genetic population. As many of the subadults are too young to be pilgrims they are, most likely, representative of the local region. Additionally, the sequences from the St. Stephen's collection are compared with genetic data from worldwide populations in order to determine the most likely place(s) of origin for members of the St. Stephen's assemblage. The genetic data, in conjunction with textual and archaeological evidence, illuminates some patterns of population movement during the Early Byzantine era into Jerusalem, especially those associated with ecclesiastical institutions.

The effects of aging on reproductive cycles in female chimpanzees (*Pan troglodytes*) at the Primate Foundation of Arizona.

J. Fritz, E. N. Videan, J. Murphy. Primate Foundation of Arizona.

Studies of the aging process in the wild chimpanzee and in captivity have primarily focused on behavioral correlates of aging and neurobiology. In contrast to the human female, data available thus far for chimpanzees indicates menstrual cycling until death. This study documents age-related changes in estrus cycling in 14 female chimpanzees (*Pan troglodytes*) ranging in age from 33 to 49 years, at time of study or death, in an effort to provide a comparative viewpoint with human female senescence. Data was analyzed from daily cycle charts for each subject beginning at approximately 20 to 25 years of age to present (or time of death). This averaged 12.5 years of cycle data per subject, after omission of gestation and postpartum amenorrhea. Analysis of cycle charts revealed 6 of 14 females with significant negative correlations between age and the percentage of cycle days at maxi-

mal tumescence ($p<0.01$). Nine of 14 females had significant positive correlations between age and the percentage of cycle days at complete detumescence ($p<0.01$). Analysis of variance model (ANOVA) was run using data summarized into 5-year age categories by subject. Mean cycle length was significantly longer and the mean percent of cycle days at complete detumescence was significantly higher in the 40+ age category. The mean percent of cycle days at maximal tumescence was significantly lower in the 40+ age category. Hormone and serum clinical chemistry results compared across age categories, provided further evidence of reproductive senescence and probable menopause in the chimpanzee.

Assessment of factors affecting BMR in humans and chimpanzees, and derivation of new predictive equations.

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Comparative energetic models of human evolution that estimate basal metabolic rate (BMR) in extinct hominids often rely on published equations and data, yet several factors affecting BMR in extant primates are generally not considered. Here, we use published BMR data for *Homo sapiens* and *Pan troglodytes* to determine the effects of sex, age, and latitude (a proxy for climate, in humans only). BMR was normalized for body size using fat free mass (FFM) in humans and body mass in chimpanzees.

Consistent with expectations, body size was the primary factor affecting BMR in both species. There was no effect of sex, but juveniles differed significantly from adults in both species (ANCOVA: $p<0.001$ for *H. s.*; $p=0.016$ for *P. t.*). For a given body mass, adults of the two species did not differ significantly from each other while juveniles did ($p<0.001$). The latter finding requires further investigation. Latitude affected human BMR ($p=0.004$), isolating circumpolar, European, and tropical populations from one another.

Based on these observations, we derived equations for each species using only adults and limited to tropical human data. Controlling for body size, these equations yield very similar BMR values across chimpanzees, humans, and *H. erectus*, in contrast to some previous findings using other methods. This implies that no shift occurred in relative adult BMR during hominid evolution, and that fundamental energetic needs grew along with increases in body size. Further work on differences between chimpanzee and human juveniles could reveal life history changes that accompanied shifts in adult body size.

Human-nonhuman primate interconnections and their relevance to biological anthropology.

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The human-nonhuman primate interface is a core component in conservation and an emerging area of discourse across anthropology. Ongoing research projects and a growing number of publications demonstrate that long-term sympatry between human and nonhuman primates results in a complex web of behavioral, ecological, epidemiological, and economic relationships. These relationships have received limited attention in the construction of models for the behavior and evolution of primate societies. For example, most socioecological investigations into primate groups or populations do not incorporate human behavior (beyond predation), human pathogens, and human-constructed environments into their assessments. Also, current relationships between humans and nonhuman primates are generally assumed to be rooted in conflict over land use and relatively recent, and thus have limited evolutionary impact. Finally, few studies have attempted to incorporate specific aspects of human cultural conceptualizations of nature and primates and their subsequent behavioral repercussions into explanations/examination of either human or nonhuman primate behavioral and ecological patterns. Minimally, the relationships between humans and nonhuman primates affect the long-term survival of nonhuman primate species and potentially impact facets of human behavior and physiology. Reviewing available data regarding areas of overlap and interconnection demonstrates the need for an increased attention by biological anthropologists to this topic.

This opening presentation illustrates theoretical and practical considerations suggesting the need for a focusing of the biological anthropological gaze towards the human-nonhuman primate interface. Reviewing specific examples and highlighting their connections to aspects of biological anthropology will establish a contextual baseline for the presentations and discussion of this symposium.

Are modern environments really bad for us: Revisiting the epidemiological transition.

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The epidemiological transition describes the historical transition from predominately infectious disease mortality to predominately degenerative disease mortality that accompanied industrialization. The emergence of the degenerative diseases is often cited as evidence that human populations, who evolved for hundreds of thousands of years as hunter-gatherers, may not be well adapted to industrial environments. The aim of this paper is to critically review the evidence that the risk of degenerative disease increased during industrialization.

Mortality data by 12 cause of death categories for an international sample of 330 life tables (165 male and 165 female) spanning the period 1850-1964 are reviewed. Five cause of death categories are largely infectious, three degenerative, and four are miscellaneous. Additional evidence is obtained from published sources.

Simple statistical analyses suggest that the risk of all three degenerative diseases increase as mortality declines, supporting the traditional interpretation of the epidemiological transition. On the other hand, if the statistical analysis is corrected for misreporting of cause of death, i.e. "unknown causes of death", the degenerative diseases as a whole, decline particularly "cardiovascular" diseases. The risk of neoplasms does increase, driven largely by lung cancer, but overall the risk of degenerative diseases decline. This is consistent with other epidemiological findings that degenerative diseases have declined since the 1960s. The decline since the 1960s is often attributed to life style and medical improvements. However, these are unlikely to explain earlier declines. We propose that the general decline in degenerative risk might best be explained by the Barker hypothesis.

Internal functional morphology of BAR 1002'00 documents ape-human divergence circa 6 Ma: That's impossible, but anyway, everyone knew it all the time.

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Unlike "intelligent design" and other forms of creationism, the study of human

evolution is not based on unchanging dogmas. The scientific enterprise operates, instead, as a set of processes, from discovery through validation. Thus scientists should not ask about an idea or result "Is this true?" but rather, "How might we test it?"

For more than 30 years Eckhardt has maintained that the ape-human divergence occurred 6-8 Ma. In the 1970s and early 1980s, when "Ramapithecus" was regarded as the earliest hominid, this estimate appeared wrong by a factor of two, as it did later, though with sign reversed, after the mid-1880s, when Hasegawa et al. (1985) dated the divergence of a chimpanzee lineage to 2.7 +/- 0.6 million years ago.

Recently it became possible to test our divergence time hypothesis. Lukeino Formation deposits in Kenya's Tugen Hills, dated biostratigraphically, geologically, radiometrically, and paleomagnetically to 6 Ma, yielded pertinent hominoid fossil remains. The initial inference that the population sampled was hominid (Senut et al., 2001) was challenged, but using AMIRA software to analyze CT scans, we demonstrated that, consonant with its external morphological features, internal bone structure in the BAR 1002'00 femur exhibited a pattern supportive of hominid bipedal locomotion. Subsequently, we discovered that it already was "generally accepted" that the ape-human divergence happened about 7 million years ago and that the Tugen Hills hominid population exhibited bipedalism. Empirical research findings are used here to test which theorist, Voltaire or Coue, has the better hypothesis representing the current state of disciplinary knowledge.

A comparative study of the kinematics of leaping in *Callimico goeldii* and *Callthrix jacchus*.

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Recent investigations of playtrrhine systematics suggest that *Callimico goeldii* may share a more recent common ancestry with marmosets than with other calltrichine taxa. In this study, we examine the kinematics of trunk-to-trunk leaping in Geoldi's monkey (*C. goeldii*) and the common marmoset (*Callithrix jacchus*). In the wild, both species are reported to exploit vertical trunks during locomotor and feeding behavior. These species differ, however, in body mass and limb proportions. Compared to common marmosets, *Callimico* are heavier and have longer hindlimbs relative to forelimbs.

Data on leaping behavior were collected on captive family groups of *C. goeldii* and *C. jacchus* housed at the Primate Facility of the Anthropological Institute, University of Zuerich, Switzerland. Video sequences of leaping to and from noncompliant vertical poles that varied in diameter (2.5 cm, 6 cm, or 15 cm) and distance (1-2 meters apart) were recorded. Measurements were taken directly from the video and analyzed using equations provided by Warren and Crompton (1998). Analyses of 122 leaps were analyzed for *Callimico* and 180 leaps were analyzed for *Callithrix*.

Results indicate that C. jacchus failed to leap a distance of 2 meters between vertical poles, whereas *Callimico* leaped this distance frequently. During leaps 1.6-1.7 m, *Callimico* was characterized by significantly greater takeoff velocity, greater landing velocity, and smaller loses in vertical height than *Callithrix* ($p<.0001$). However, the mechanical cost of transport was higher in *Callimico* than in *Callithrix*, indicating important species differences in leaping. Relationships between the kinematics of leaping, locomotor anatomy, and positional behavior are discussed.

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An interspecific analysis of relative posterior facial height in strepsirrhine and anthropoid primates.

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Differences in relative posterior facial height among primate species has been linked to variation in several craniofacial traits. For example, relative posterior facial height is thought to be correlated with relative molar areas, a relationship considered to have mechanical implications for chewing and biting. Additionally, morphological variation in facial features from the first pharyngeal arch, such as facial height, are hypothesized to correlate with molar areas because of shared developmental pathways. Basicranial flexion has also been argued to influence facial morphologies in anthropoids through effects on facial kyphosis and orbital axis orientation. This relationship led Ravosa et al. (2000) to hypothesize that changes in basicranial flexion in stem anthropoids had a correlated effect on masticatory apparatus morphology, including posterior facial height, in extant anthropoids.

Patterns of association between relative posterior facial height and both basicranial angle and relative molar area were explored across 45 strepsirrhine and 32 anthropoid species. We examined correlations between shape ratios and partial correlations holding specific skull dimensions constant for both conventional and independent contrast data.

Posterior facial height was significantly correlated with molar area when holding palate length constant in both strepsirrhines ($r=0.74$) and anthropoids ($r=0.72$) using conventional data. Basicranial angulation correlated with relative posterior facial height in anthropoids ($r=0.60$) but not strepsirrhines ($r=0.01$). Across primates, posterior facial height appears to be integrated with molar area as part of the first pharyngeal arch, while in anthropoids neurocranial expansion has integrated posterior facial height with basicranial morphology.

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Development technology increases birth rate and childhood malnutrition in rural Ethiopia.

M.A. Gibson, R. Mace. Department of Anthropology, University College London.

Evolutionary life history theory predicts that, in the absence of contraception, enhancement of maternal condition will increase fertility. Energetic trade-offs are likely to be resolved in favour of maximizing reproductive success, rather than health or longevity. Hence, development initiatives designed to improve maternal and child welfare may also incur the costs associated with increased family sizes. In this study we investigate the consequences of demographic change occurring as a response to a labor-saving intervention scheme in a rural Ethiopian community. Using multivariate logistic hazards and general linear modelling techniques we identify that whilst infant mortality has declined, birth rates have increased, causing increased scarcity of resources within households. This study is the first to demonstrate a link between a specific technological intervention and an increase in both birth rates and childhood malnutrition.

3-D geometric morphometric analysis of the papionin temporal bone.

C.C. Gilbert. Interdepartmental Doctoral

Program in Anthropological Sciences, Stony Brook University, Stony Brook, NY.

Phylogenetic analysis of papionin morphology, especially the craniodental region, has proven difficult to reconcile with the generally accepted molecular phylogeny for this group. However, 3-D geometric morphometric analysis of the hominid and hominoid temporal bone has indicated that this bone potentially retains a wealth of phylogenetic information. In one instance, phylogenetic trees generated from temporal bone morphology agree with established hominoid molecular phylogenies down to the subspecies level (Lockwood et al., 2004).

In this study, ninety-eight temporal bones representing eight different papionin taxa were digitized and subjected to geometric morphometric analysis. Twenty-one landmarks were used to define the temporal bone, and males and females were analyzed separately. After generalized procrustes analysis, each sample was subjected to a principal components analysis in the Morphologika software package (O'Higgins & Jones, 1998). The first two principal components were correlated with centroid size, and therefore were excluded from the remaining analyses in order to see if non-allometric shape variation was correlated with the molecular phylogeny. A mean matrix of principal components for each sex of each taxon was generated, and Euclidean distances were then calculated. The resulting distances were then used in neighbor-joining and least-squares clustering algorithms to generate phenograms/phylogenetic trees at the genus and species levels. Results suggest that the neighbor-joining methods variably produce clusters corresponding to at least one and sometimes both African molecular clades. The neighbor-joining methods consistently outperform the least-squares methods, and the male data set was much better for recovering the molecular groupings than was the female data set.

Principal figures in physical anthropology before and during World War II.

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The years between World Wars I and II saw the organizational and research activities of Ales Hrdlicka, culminating in the founding of the *AJPA* and the AAPA, complemented by the teaching and publications of Earnest A. Hooton. Although Hooton was a charter member of the AAPA, published in the first issue of the *AJPA*, and during the depression supported the *AJPA* financially through his wife, he focused his activities around Harvard University, where he taught from 1913 until his death in 1954. His research, initially in human osteology, moved into anthropometric variation in living populations with outcomes that have had little lasting interest. His importance lies in his extraordinary success as a graduate teacher and in his ability to convey his broad view of physical anthropology to a wide audience. Probably no anthropologist save Margaret Mead was better known (not always favorably) to the American public in the mid-twentieth century through his popular articles and the sardonic quotes he provided journalists. He was reviled by Nazi propagandists for his denunciations of their racial ideology, and recruited by the NAACP to present their Spingarn Award to Dr. Charles R. Drew in Chicago's Washington Park in 1944.

Twenty-eight scholars completed physical anthropology Ph.D.s with Hooton; three did so with Franz Boas. Although there were outstanding non-Hooton-trained physical anthropologists in this period (for example, M. F. Ashley-Montagu, W. M. Cobb, W. M. Krogman, M. Trotter) it was Hooton's students *en suite* who secured an inclusive perspective for physical anthropology in the field's post-war expansion.

A measure of biological distance in Nubians: a look at intrapopulation variation.

K. Godde. California State University, Sacramento.

Biological distance studies typically measure the genetic distance between populations. However, little has been done to assess the distance within specific populations. This study looked at six subpopulations of Nubians separated geographically and/or temporally to determine if variability within populations was statistically significant. In order to measure this, twenty nonmetric traits were observed on a total of 319 skulls, representing three temporally distinct periods from Semna South, including the Meroitic, X-Group, and Christian eras. Tsuneko Hanihara provided data on 180 additional crania (personal communication) from three other Nubian subpopulations that were spatially and temporally distinct from the other groups. These data were from the sites of Kerma (12^{th} –13^{th} dynasty), Sesebi (recent population), and the islands of Hesa and Biga (pre-Christian). All six subpopulations were compared to one another using Mean Measure of Divergence (MMD), its variance, standard deviation and the standardized MMD. The results of the statistical analysis showed that there was little variability between most of the samples. However, the MMD results of the Meroitics and Hesa and Biga were only .01 away from being statistically significant at the .05 level. Additionally, the difference between Kerma and the Meroitics was statistically significant at the .05 level. These samples were not separated by the greatest amount of geographic or temporal distance, and thus these explanations cannot completely account for the difference. In light of this study, further analysis should address whether it is necessary to separate highly variable subpopulations when attempting to measure biological distance on a global scale.

New discoveries of *Hadropithecus stenognathus*, a subfossil lemur from Madagascar.

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In 1997, Godfrey and colleagues suggested that Lamberton's long-accepted hindlimb attributions for *Hadropithecus* were erroneous. Associated elements of a partial skeleton of *Hadropithecus*, discovered in 2003 at Andrahomana Cave in southeast Madagascar, confirm this assessment, and corroborate Godfrey et al.'s (1997) alternative hindlimb attributions. They also add to the roster of postcranial elements now known for *Hadropithecus* (many vertebrae, a partial scapula, sacrum, ribs, carpals, metacarpals, and possible sternebrae). Certain enigmatic specimens long housed in museums (including the Natural History Museum, London; Muséum National d'Histoire Naturelle, Paris; Laboratoire de Paléontologie des Vertébrés, Université

d'Antananarivo) can now be recognized as belonging to *Hadropithecus*. In addition, an analysis of the enamel microstructure of an isolated molar has elucidated previously unknown aspects of its life history.

Hadropithecus exhibits highly derived postcranial characteristics, some of which are cercopithecid monkey-like (e.g. carpal), African ape-like (e.g. femoral), or unique (e.g. metapodial). The hindlimb is robust and anteroposteriorly compressed, the forelimb relatively long and gracile. The digits are short. The thorax is relatively deep and narrow, the pelvis broad, and the tail long. The terrestrial quadrupedalism signal in the skeleton is verified but should not be overstated; there is no evidence for suspensory behaviors in the arbo-terrestrial repertoire. Molar crown formation time is far longer than that of any other lemur analyzed to date, including its sister taxon, *Archaeolemur*.

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Mummified trauma: SEM analysis of obsidian and chert induced wounds.

A.K. Goff, D. Komar. Department of Anthropology, University of New Mexico.

This research highlights the capability of mummified tissues to retain wound morphology, and the value of using Scanning Electron Microscopic (SEM) analysis for identifying class characteristics of weapons in soft tissue trauma.

Previous SEM analyses of trauma have demonstrated that the morphology of kerf surfaces can indicate the class of implements that produced the kerf (Tucker, 2001). Thus, SEM analysis of skin trauma from prehistoric mummies or modern homicides should reflect the class of implements that produced the trauma. Although trauma can be caused by innumerable weapons, the present study will be limited to the analysis of mummified cut marks inflicted by chert and obsidian stone tools on fresh human skin.

To simulate trauma, obsidian and chert stones were knapped, and used to induce trauma by striking the stone onto the intact and in situ skin. A total of 9 samples were harvested, which were mummified naturally or induced by silica. SEM images of the kerf walls were then obtained and analyzed.

The results from this preliminary study provide two important contributions. This study shows that mummified tissues are capable of retaining soft tissue trauma, and that SEM analyses could allow for chert-induced trauma to be differentiated from trauma produced by obsidian. Thus, mummified tissues may represent an alternative source for analysis of trauma and for weapon identification from both prehistoric and modern forensic contexts.

The cervical vertebrae from the Sima de los Huesos site (Sierra de Atapuerca, Burgos, Spain).

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The Sima de los Huesos (SH) site in the Sierra de Atapuerca (Burgos, Spain) contains the largest known sample of fossil humans from the Middle Pleistocene. To date more than four thousand human remains have been recovered. Among these are more than 350 vertebral fossils, more than 100 of which belong to the cervical segment, representing both immature and adult individuals. We present here an inventory and preliminary description of all the cervical vertebral remains with the most accurate anatomical determination and age at death. Among the cervical vertebrae, we have identified a minimum of 9 atlases, 10 axes and 35 C3-C7 specimens, all of which, after recognizing some associations between the elements, represent at least 10 individuals, based on the axis.

Metric and morphological analysis of the most complete vertebrae reveals that most of the metric dimensions are well within the modern human range. Nevertheless, the SH vertebrae share some features with the Neandertals which differentiate both of them from modern populations of *Homo sapiens*, such as the ratio of maximum height of the axis/superior transverse diameter and the length of the spinous process of the C5. This first feature is also present in Skhul V, and it could represent a primitive feature for the genus *Homo*.

Variation in the juvenile craniofacial form: a pilot study.

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Much research has been conducted in the area of age determination of juvenile skeletal remains for biological profiling purposes within a medico-legal context. However, the ability to determine sex and group affiliation from juvenile skeletons is limited and often unreliable (Kerley, 1976). In fact, identifying sex and group specific differences with any degree of reliability is one of the major problems in the analysis of juvenile skeletal remains (Scheuer and Black, 2000).

This pilot study presents initial findings of human variation as expressed in the juvenile craniofacial form. A sample of 28 groups divided according to age, sex, and group affiliation was studied utilizing 22 common cephalometric measurements of American children of African and European descent. A glm manova procedure and principal component analysis served to test for the presence of sex and group specific features in the juvenile craniofacial skeleton throughout development.

The findings of this initial investigation demonstrate a statistically meaningful sex and group specific pattern of size and shape differences throughout development. Additionally, this study suggests that for each age group category utilized in the analysis, ages 6-12, it is possible to clearly identify the sex and group affiliation of juvenile skeletal remains for forensic biological profiling purposes. If the preliminary results are correct, then this investigation provides evidence of morphological differences that can be accurately identified throughout craniofacial development. These findings provide the basis for future research in which this investigator will use to develop biological profiling standards for juvenile skeletal remains.

Body size dimorphism: do not correct for size.

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A persistent question for researchers of body size dimorphism (BSD) is whether it is appropriate in comparative analyses to account for relationships between size and BSD, usually by analyzing residuals from regressions of BSD on size. Alternatively, researchers can analyze BSD itself. Both techniques have been used in primate literature, yielding different results. Size correction is appropriate only if changes in size cause changes in BSD; if not, size "correction" removes important variation relevant to other variables that likely influence BSD (e.g. variables related to sexual selection such as mating system).

Inter-specific relationships between female body size, BSD, and mating system

for 111 anthropoid species are analyzed here using traditional (ordinary least squares regression) and phylogenetic methods (phylogenetic generalized least squares models) to determine whether relationships between size and BSD exist when mating system has been taken into account. Traditional analyses show that although BSD scales positively with size among anthropoids as a whole and within platyrrhines, cercopithecines, colobines, and hominoids (at alpha = 0.05), positive scaling is not present in analyses of covariance that include mating system nor in regressions performed separately within each mating system. Comparisons of phylogenetic models where BSD is the dependent variable show that addition of mating system as an independent variable always significantly improves model fits; addition of body size does not significantly improve model fit for any of the study groups. These results indicate that it is inappropriate to "correct" for size in analyses of BSD.

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Variation in fecal testosterone levels, intermale aggression, dominance rank and age during mating and post-mating periods in wild adult male ring-tailed lemurs (*Lemur catta*).

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In primate species exhibiting seasonal reproduction, patterns of testosterone secretion in adult males are highly variable: in some species, peaks correlate with female receptivity periods and heightened male-male aggression over access to estrous females, in others, neither heightened aggression nor marked elevations in testosterone have been noted. In this study, I examined mean fecal testosterone levels and intermale aggression in wild adult male ring-tailed lemurs residing in three groups at Beza Mahafaly Reserve, Madagascar. Results obtained from one mating season and two post-mating periods were compared in order to test the "challenge hypothesis", which predicts a direct relationship between male testosterone levels, mating systems, and reproductive strategies. A significant difference was found in mean fecal testosterone levels between mating and immediate post-mating periods in 2003, and there was also a marked difference in rates of pre- and post-mating intermale aggression. The highest-ranking males in the groups prior to the onset of mating exhibited higher mean testosterone levels than lower-ranking males, and young males exhibited lower levels compared to prime and old males during the breeding season. In the post-mating periods of 2001 and 2003, individual male mean testosterone levels did not differ between groups, nor were there rank or age effects. Thus, although male testosterone levels rose in relation to mating and heightened male-male aggression, males offset the costs of mating (marked male-male competition) by immediately reducing levels of aggression as soon as females were no longer receptive, which correlated with a dramatic decrease in mean testosterone levels.

Dental health decline in the Chesapeake Bay, Virginia: the role of European contact and multiple stressors.

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This study tests the hypothesis that the arrival of Europeans in Jamestown, Virginia had a negative impact on the dental health of native populations in the Chesapeake Bay. Data were collected on three variables—dental caries, periapical cavities, and antemortem tooth loss—in a sample of 644 individuals from four prehistoric (N=500) and two contact era ossuaries (N=144) from the Potomac Creek site in Virginia (44ST2).

Statistical analysis reveals a clear trend of poorer dental health for the post-contact sample (chi-square; $p<0.05$). The temporally latest ossuary had the highest prevalence of all indicators. There is also a trend toward poorer dental health for females relative to males. In particular, females have a higher prevalence of carious lesions and antemortem tooth loss than males. Sex differences in dental health probably correspond to sex-based differences in food production and preparation in this setting. Multiple factors likely explain the general pattern of decline in dental health, including: 1) a change in diet involving greater consumption of carbohydrates, 2) increased exposure to infectious pathogens, 3) warfare and other forms of conflict, 4) strain on resources, and 5) increased population density.

Significantly high variation at the mitochondrial 9bp repeat locus in the Sakha of Siberia.

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The mitochondrial 9bp repeat locus is a commonly studied polymorphism. The most common variant is a single copy of the repeat sequence, also known as the deletion allele, which exhibits a frequency cline in Asian populations from 0-100%. We assayed variation at the 9bp repeat locus in 779 Sakha, 88 Khakas, and 30 Kalmyk individuals from Siberia. The deletion allele was present at a frequency of 1.7% in the Sakha, which was significantly lower than in other southern Siberian populations ($p<0.01$). A triplication allele was found in six individuals in the Sakha and the heteroplasmy allele was detected in four individuals (two individuals with 2/3/4 copies, one with 2/3 copies, and one with 1/2 copies). This represents the highest frequency of triplication and heteroplasmic variants ever reported for a single population ($p=0.004$).

HVRI sequencing was performed on all individuals with derived variants. Heteroplasmic variants were detected in conjunction with three haplogroups (C, D, and K) and triplication alleles were found on three haplogroup backgrounds (C, D, and T). The deletion variant was found in conjunction with Asian haplogroup B and with European haplogroup W. All of these haplogroups are common in the Sakha. No neighboring populations have been reported to carry the heteroplasmy or triplication variants, suggesting that admixture or presence in a pre-Sakha population are unlikely explanations for the high number of variants in the Sakha. Furthermore, the presence of four heteroplasmic individuals suggests a recent evolution of these variants, which may implicate a mechanism involving mutation rate or natural selection.

Primate sanctuaries, taxonomy and survival: a case study from South Africa.

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The relationship between humans and non-human primates in South Africa is both complex and problematic. On the

one hand, baboons and vervets were designated vermin species in the early 1900s. As such they could be destroyed at will. On the other hand, young vervets are often kept as pets even though this is illegal and the animals are confiscated if discovered. Sanctuaries were established to accommodate large numbers of orphaned and confiscated animals. Owners of some of the sanctuaries have attempted to rehabilitate the animals, establish normal troop structure, release the animals back into the wild and relieve overcrowding. However, local farmers, fearing crop damage, resist this release. Nature conservation authorities also resist release fearing possible disruption of natural patterns of variability, even though there is no consensus on the number of subspecies or evolutionary significant units among South African vervets.

We have designed a genetic sampling strategy to help resolve some of the taxonomic issues involved in this controversy. We have sampled both extensively over much of the distribution range of vervets in South Africa as well as intensively among several troops in the Blyde River Canyon Nature Reserve. We have currently trapped and sampled 100 animals representing 10 social groups. Data from microsatellite loci indicate considerable heterogeneity and no obvious patterning linked to geographic distribution. Coefficients of population differentiation show that over 87% of variation occurs within populations, suggesting relatively limited differences between populations. This information in addition to mtDNA studies will help contribute to informed management decisions.

Using functional morphology to compare primate communities.

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Previous research has used ecological and behavioral data to describe and compare patterns of diversity in extant primate communities (Fleagle and Reed, 1996). However, there have been few attempts to compare the ecological diversity of extinct primate communities. One reason for this is that ecological and behavioral data are unavailable for most extinct primates. However, many aspects of morphology are widely recognized to be strongly related to behavior and ecology. Thus, it may be possible to use morphological correlates of behavior to compare patterns of community diversity in extinct primates.

This study uses elbow joint morphology in a sample of New and Old World primates to compare patterns of community diversity. The distal humerus and proximal ulna were examined because their functional morphology is understood, and because these elements preserve well in the fossil record. The data were analyzed using principal component analysis. Results suggest that: a) overall, communities in Africa have a greater morphological space; b) communities in South America, Africa and Asia show a large overlap in morphological space; and c) phylogenetic groups occupy distinct morphological spaces with little overlap. This suggests that, based on one limited morphological region, different primate communities show similar patterns of morphological diversity irrespective of geography or phylogenetic diversity.

Hip breadth and forces on the lower limb during human walking.

L.T. Gruss. Biological Anthropology and Anatomy, Duke University.

Several fossil hominin species have relatively wide hips compared to modern humans (Trinkaus, 1981; Ruff, 1995). A broad pelvis has been suggested to increase the medio-lateral loads placed on the lower limb, resulting in elevated M-L reinforcement of the femoral shafts of these hominins (Ruff, 1995). This research tests the hypothesis that wider hips lead to greater external M-L bending forces on the lower limb during walking in modern humans. Fifteen subjects with a range of hip breadths (bi-iliac and bi-trochanteric breadths, BIB and BTB) were videorecorded at 60 Hz as they walked across AMTI force plates. Medio-lateral bending moments (standardized for body mass) at the hip, knee, and midshaft femur during stance phase were calculated from the video and force data using OrthoTrak software (Motion Analysis Corporation). Individuals with wider hips (BTB and BIB) did not experience higher M-L bending moments during stance phase. No relationship was found between hip breadth and M-L moments at the hip, using partial correlations to eliminate the effects of speed. However, significant *negative* relationships with hip breadth were found for M-L moments at the midshaft femur ($R = -0.6552$, $p = 0.01$) and the knee ($R = -0.7559$, $p = 0.0003$). These data demonstrate that M-L forces acting on the lower limb in normal locomotion are not elevated in individuals with wide hips, and suggest that other factors must be influencing the M-L reinforcement of the femoral shaft in broad-hipped fossil hominins.

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Using perikymata to estimate the duration of growth disruptions in fossil hominin teeth.

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Microscopic methods for estimating the duration of enamel growth disruptions manifested as linear enamel hypoplasias (LEHs) are described, evaluated and applied to samples of the following hominin species: *A. afarensis*, *A. africanus*, *P. robustus*, early *Homo*, *Homo neanderthalensis*, and *Homo sapiens*.

Hillson and Bond (1997) determined that the widely spaced perikymata (enamel growth increments) in the occlusal wall of a linear enamel hypoplasia reflect the period of disrupted growth. When occlusal wall perikymata can be identified, growth disruption duration can be directly estimated. However, the transition between occlusal and cervical walls of defects is not always clear, such that the total number of perikymata within LEH defects can be used as a second, although indirect, indicator of growth disruption duration. A third indirect indicator is defect width, which should only be used if the number of perikymata within defects in a sample is a strong predictor of defect width. These methods will be illustrated in hominin samples using SEM images and multiple linear regression analyses of defect width on the number of perikymata within defects and the spacing of perikymata prior to defect formation.

Using these methods, several interesting differences in growth disruption duration in hominins are evident: for example, the average number of perikymata within defects is statistically significantly greater in *A. afarensis* than it is in *P. robustus;* the same is true for an Inuit archaeological sample compared to a sample of Krapina Neanderthals. Although sample differences in perikymata periodicities may influence these results, they are unlikely to entirely explain them.

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Are Paranthropus crania only scaled variants of gracile Australopithe-

cines?

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The notion of robust and gracile Australopithecines implies that many shape differences among these two groups can be explained by allometry. The extent to which this is true matters for the debate whether the East-African *Paranthropus boisei* and the South-African *P.robustus* really belong into the same genus or might instead be convergent allometric variants of their gracile geographical neighbors. We compare gracile and robust Australopithecine crania in the context of the ontogenetic scaling patterns of *Pan troglodytes*, *Gorilla gorilla*, and *Homo sapiens*.

Our sample consists of juvenile and adult crania of both sexes, as well as the *A.africanus* specimens Taung, STS5, STS71, and STW505, the *P. robustus* SK48, *P. boisei* OH5, KNMER406, and KNMWT17000 (*P. aethiopicus*). Taphonomic distortion of STS71 and STW505 was corrected from a CT scan by thin-plate-spline warping. 34 facial landmarks and semilandmarks on ridge curves on orbit, supraorbital torus, piriform aperture and alveolar ridge, were digitized. Landmark configurations were converted to Procrustes shape coordinates and analyzed by principal-components. Ontogenetic trajectories were estimated via regressions of shape-coordinates on log Centroid-Size, and the growth trajectory of *A.africanus* was taken as the vector from the juvenile Taung to the adult average of *A.africanus*.

Interpreted in light of the standard errors of these vectors, shape differences between robust and gracile australopithecines can be explained as allometric to a large extent, but not wholly. We visualize these two components of shape difference and pursue their implications for the question raised in the title of this presentation.

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Changes in body composition as an adaptation to seasonal variation in food availabilty in Calakmul, Campeche, Mexico.

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This poster shows a comparison of the ability of two adaptive peasant strategies from Calakmul, Campeche to protect their children from loosing energy stores during times of scarcity. The body composition of 1000 children belonging to a traditional agricultural strategy and to a conventional agricultural strategy was calculated using height, weight, arm circumference, triceps and sub scapular skin folds. Two measurements were taken during one agricultural cycle. The first one, two months after the October-November harvest of 1999 and the second one right before the October-November harvest of the year 2000. A repeated measures analysis was used to compare relative changes in body fat and muscle tissue. It was observed that seasonal body composition changes vary between strategies. All children loose energy stores during times of scarcity. Children from the traditional strategy, however loose muscle tissue while those from conventional households only loose body fat. We conclude that the conventional strategy is better adapted to seasonal scarcity than the traditional one.

Little mice and the developmental basis for craniofacial allometry.

B. Hallgrímsson. Department of Cell Biology & Anatomy and the Joint Injury and Arthritis Research Group, Faculty of Medicine, University of Calgary.

Evolutionary changes in body size are often accompanied by changes in shape. Using a mouse model, we explore the effect of a reduction in body size on craniofacial morphology and variability. We compared 30 day old mice homozygous for a null mutation in the growth hormone releasing hormone receptor (Ghrhr) to heterozygous littermates with samples of 40 per group. Mice homozygous for the Ghrhr null mutation exhibit 40-50% reduction in body mass at 30 days while heterozygotes do not exhibit reduced growth. Analysis relied on both geometric morphometric methods and Euclidean Distance Matrix Analysis (EDMA). The two groups differed significantly in shape with the Ghrhr null mice exhibiting relatively higher and rounder neurocrania as well as shorter faces compared to their heterozygote littermates. The first principal component for the covariance matrix of Procrustes coordinates for the combined sample explained 41% of the variance in shape and was very highly correlated with cranial centroid size (r=0.97) and body mass (r=0.92). Comparison to a smaller group (N=20) of older mice of the same genotypes revealed that the size related shape variation among genotypes closely resembles ontogenetic variation in shape. Measures of phenotypic variability (canalization, developmental stability, and integration) did not differ between the genotypes. This is consistent with the existence of a well canalized age/size pathway for craniofacial shape variation. In a mouse model, these results provide insight into the developmental basis for allometric and heterochronic variation in craniofacial morphology which is so ubiquitous in interspecific as well as evolutionary variation in primates.

Exploring whether or not chimpanzees (*Pan troglodytes*) can discern oppositions and its implications on human evolution.

A. Halloran, D. Broadfield, D. Bjorklund, R. Hores. Lion Country Safari, Florida Atlantic University Anthropology Department.

The ability to discern oppositions is important to how the human mind perceives the world. It is the foundation of the binary structure of the abstract mind. This structure gives the mind its ability to create a linear story. The ability to piece together a story in a linear fashion is imperative to the creation of a historical record, cosmology, and culture as a whole. It is of interest to anthropology to learn when this mental structure evolved. As part of an ongoing project, we tested chimpanzees (*Pan troglodytes)* to determine whether or not they have the ability to percieve oppositions and, in turn, possess this mental structure.

In these experiments chimpanzee subjects were given a set of three familiar symbols. For example, a picture of a full food bucket is presented. Under it are three choices: An identical full food bucket (representing same), an empty food bucket (representing its opposite), and a food bucket with different food (representing something different but not opposite). The subject is then trained to choose the full food bucket at the “same” command and the empty food bucket at the “opposite” command. In order to see if the chimp can generalize this concept, the symbols are changed. If the subject can generalize this concept of same and opposite, then an ability to discern oppositions is determined. These results would suggest that certain neurological components thought to be linked only to humans may have had their origin in our anacestors at or preceeding the ape/human split.

Timing of growth and development of

late juvenile and adolescent Japanese macaque females (*M. fuscata*).

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Japanese macaques (*Macaca fuscata*) live in multi-male multi-female societies. The anogenital swellings that indicate to the males a female's sexual attractiveness and her physical fitness must be detectable in the body mass as a function of time curves. The masses of five females, housed together in the Kyoto Primate center, were measured several times per week from slightly less than 2 years of age to almost 6 years — a total of ~850 measurements over 1376 days. The masses showed both a general growth trend and an annual cycle in which peaks were found in winter and troughs in summer. We regress piecewise quadratic functions using maximum likelihood methods to find the timings of mass peaks, which we interpret as coinciding with peak of reproduction-related physiological activity. With our methodology, we can determine the timing of the peak to the nearest day, with a statistical uncertainty of a few days.

We observe that the peaks are separated by a period close to one year, and also observe that the timings first vary, but seem to become close to synchronous by the time first ovulation occurs. We also observe that the masses of the females at the peaks diverge despite "emerging" synchronization, which we interpret as the onset of divergent sexual attractiveness, because most of the mass increase around the peak is ascribable to sexual skin swelling.

Sequence data from the autosomes and X chromosome: Evidence for ancient admixture in the history of *H. sapiens*?

M.F. Hammer, D. Garrigan, J.A. Wilder, Z. Mobasher, T. Severson, S.B. Kingan. Division of Biotechnology, University of Arizona.

A longstanding question in anthropology asks whether the history of our species is characterized by an expansion from an isolated panmictic population with complete replacement of archaic forms, or by admixture among divergent allotaxa. While mtDNA data support a recent and complete replacement model, nuclear loci present a more complicated picture. Two major problems associated with interpreting the heterogeneous patterns of variation observed at multiple nuclear loci are that sampling procedures vary across studies, and experimental designs generally lack statistical power to detect archaic admixture. We are undertaking a systematic survey of DNA sequence variation at 90 unlinked nuclear loci and developing a statistical framework (to be presented by Jeff Wall) to explicitly test the hypothesis of no admixture between modern and archaic forms, and for estimating the admixture ratio (if the null hypothesis is rejected). Our approach involves sequencing three windows of ~2 kb spanning ~16 kb at each locus in a panel of 90 individuals from 6 populations. Preliminary data from two loci that show evidence of ancient admixture will be discussed. A gene tree constructed from sequence data at the first locus roots in East Asia and has a most recent common ancestor ~2 million YBP. The pattern of nucleotide variation at the second locus reveals two major lineages that have not undergone recombination for over 2 million years, and statistically rejects the null hypothesis of panmixia during the early ancestry of modern humans.

Vertical climbing energetics in two prosimian primates.

J.B. Hanna. Biological Anthropology and Anatomy, Duke University.

All primates possess morphological and behavioral characteristics related to their arboreal lifestyles, but only some (i.e. apes, atelines, and lorisines) possess specializations that are thought to be related to vertical climbing. These shared characteristics, such as relatively long limbs and long step lengths, may be energetically advantageous during vertical climbing (Isler, 2003). This study tests the hypothesis that specialized vertical climbers use less energy during climbing than more generalized quadrupedal primates, and examines whether differences in metabolic costs may be related to differences in step length.

This study provides the first data on the metabolic costs of vertical climbing in two species of prosimians: the specialized vertical climber *Loris tardigradus* (n=2), and the generalized quadruped *Cheirogaleus medius* (n=2). Subjects were enclosed in a chamber and videotaped during climbing on a speed-variable, ½-inch vertical rope treadmill for 20-30 minutes. The metabolic cost of vertical climbing was calculated by collecting oxygen content of the air using a Sable© gas analysis system. Resting metabolic rate was also collected.

Results suggest that *L. tardigradus* (13.0ml O_2/kg/min) uses relatively less energy during vertical climbing at the same speed as *C. medius* (18.3ml O_2/kg/min), after accounting for resting metabolic rate. These data, combined with previous work indicating that *L. tardigradus* uses longer steps than *C. medius* (Hanna, 2004), suggest that the metabolic cost of vertical climbing is influenced by step length. Primates with traits related to long step lengths may have an energetic advantage during vertical climbing.

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Teaching evolutionary theory: conceptual understanding of evolution among undergraduate anthropology students.

D.L. Hannibal, M.J. Cheyney. Department of Anthropology, University of Oregon.

Previous studies suggest that even after exposure to scientific models of evolution, many students still accept popular misconceptions of evolution. The main purposes of this study are to: 1) describe conceptions held by undergraduate anthropology students regarding evolutionary theory; 2) determine whether student conceptions of natural selection are associated with student belief in the theory of evolution as scientific fact; 3) determine whether previous biology coursework is correlated with comprehension of evolutionary theory; and 4) test whether experimental instruction facilitates a conceptual shift toward a better understanding of evolutionary theory. We discuss central challenges and common misconceptions in teaching evolutionary theory and why it is critical to improve methods for teaching evolutionary theory. We present the results of a diagnostic survey, experimental instruction method, and post instruction survey given to introductory anthropology students. The instruction method uses "conceptual change teaching," which recognizes that students enter courses already having developed explanations of natural phenomena. These preconceptions are often incompatible with the scientific theory, difficult to change, and reinforced through popular media. Students were given pre-test survey, an experimental lab, and then a post-test survey. Responses were scored on a scale to assess whether students hold popular conceptions or scientific conceptions of evolutionary theory. Differences in pre- and post-test scores are reported as

well as the relationship between scores, previous coursework in biology, and acceptance of evolutionary theory. Tests for differences in scores after experimental lab instruction are reported. Implications for teaching evolutionary theory in introductory anthropology course will be discussed.

Did Australopithecus afarensis make the Laetoli footprint trail? New insights into an old problem.

W.E. Harcourt-Smith. Department of Paleontology, American Museum of Natural History.

The Laetoli hominin footprint trails have been a topic of considerable debate with regard to the nature of early hominin bipedality. This debate has often surrounded the issue of whether *A. afarensis* produced the trails. Reconstructing the overall locomotor patterns of earlier hominins, and determining if they are similar to modern human gaits requires a fuller understanding of the functional-morphology of hominin feet and the pattern of gait seen in unshod traditional peoples.

In light of these requirements, we combine observations of early hominin fossil foot bones with gait analysis of the Laetoli G1 and G2/3 using two samples of modern humans, one post-industrial group (n=100) and the other a group of unshod Venezuelan foragers (n=37). Gait dimensions from Laetoli are derived from 11 consecutive footprints from both the G1 and G3 trails. Traditional and geometric morphometric analyses were conducted on 3D coordinate data representing hominin tarsals from Hadar and modern humans and great ape comparative samples.

Results indicate that *A. afarensis* is unlikely to have had a longitudinal arch in the foot, and had a weight-bearing mid-tarsal region. Comparative analyses indicate that the Laetoli G1 and G3 individuals exhibit gait features that fall within the range of normal variation of striding adult modern humans. We suggest that derived walking speeds for the Laetoli hominins ranged between 4.967-5.327 km/hr. The functional-morphological pattern seen in the Hadar foot bones would appear to be incongruent not only with the Laetoli trails, but also with the normal striding gait seen in modern humans.

Genetic and environmental influences on tooth crown diameters in twins.

E.F. Harris. Orthodontics, University of Tennessee, Memphis.

Analysis of twins—monozygotic compared to dizygotic—has long been the basis for heritability estimates for many sorts of biological data. But, until recently, critical assumptions of the twin model have been ignored or unappreciated, leading to biased results. This study used mesiodistal and buccolingual permanent tooth crown dimensions to test three assumptions of the twin model, namely null hypotheses (1) that mean crown size is the same across twin types, (2) that total variances are homogeneous between types, and (3) that environmental covariances are equal. Dental casts of 90 MZ twin pairs and 65 DZ pairs were measured from young adults (excluding M3s). Extensive red cell antigens and enzymes and HLA typing confirmed zygosity. Significant differences in mean trait size were infrequent across the 28 variables tested, but total variances commonly were unequal between zygosities, commonly with the DZ sample having larger variances. Partitioning total variance into within- and among-pair components showed that the among-pair portion was far larger, but that DZ twins almost always have significantly larger within-pair values. Testing environmental covariances used F = ADZ/WDZ. In these data, size of the maxillary lateral incisor was the one tooth without detectable genetic variance. In sum, heterogeneous variances commonly occur in human odontometrics, affecting all tooth types. Prior studies have not corrected for the various biases implicit in the standard twin model, leading to questionable interpretations. The fundamental issue may well be that twins are not representative of the bulk of the population that consists of singletons.

Intergroup aggression by male black and white colobus monkeys – mate or food defense?

T.R. Harris. Anthropology Department, Yale University.

When intergroup aggression in a primate species is largely between adult males, it is usually assumed that it functions as mate defense, since the main factor limiting male reproductive success is generally access to mates. Previous research on a relatively frugivorous population of black and white colobus monkeys (*Colobus guereza*, "guerezas"), however, found that males were more aggressive toward other groups in heavily fed-in areas, suggesting that males may defend food resources for the females in their groups (Fashing 2001). This study tests whether intergroup aggression by male guerezas in a highly folivorous population represents mate defense and/or food defense. Six groups of guerezas with overlapping home ranges were studied in Kibale National Park, Uganda. Here I show that patterns of aggression by male guerezas are consistent with the defense of food resources, and not with direct defense of mates. The implications of these results for the primate socioecological model will be discussed.

The effect of parity bone mineral density: pregnancy or lactation?

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Hormonal changes and calcium demands associated with reproduction influence bone mineral density (BMD) and are potential contributors to higher risk of osteoporosis among women. Studies of the long term effects of female reproductive history variables on BMD have produced ambiguous results. Pregnancy and lactation clearly affect BMD, but the relative importance of these two variables is unresolved.

We conducted the current study to evaluate the relative impact of pregnancy and lactation on the maternal skeleton. Baboons share physiological characteristics with humans making them particularly well-suited for studying the effects of reproductive history on BMD. We measured BMD (via DEXA) of the lumbar spine and forearm in 676 olive baboons, yellow baboons, and their hybrids (5.5 to 30.0 years). We previously reported a significant negative correlation between parity and BMD in these baboons. In the present study, in addition to age, weight, and parity, we also incorporate a measure of each female's lactation history (the total number of days of each female's life during which she was nursing an infant). We compared maximum likelihood models incorporating all possible combinations of these covariates to ascertain which group of covariates best account for the variance in BMD using a Bayesian model averaging approach. The best models indicate that while parity has a significant negative effect on BMD, this effect is not due to the increased amount of time spent lactating that would occur with increased parity.

Brain-body allometry and the mind of early *Homo*.

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Recent discoveries of *Australopithecus* and early *Homo* have greatly expanded our knowledge of brain size evolution. The habilines (referred to *A. (H.) habilis* and/or *A. (H.) rudolfensis**) had larger brains than earlier australopithecines but underwent no significant increase in body size. In contrast, early humans (*H. erectus** or *H. sapiens*) were significantly larger than australopithecines and habilines in both brain and body size. This study tests the null hypothesis that the brain-body allometry explains the evolutionary increases in brain size among these samples. The study includes brain and body size data from living humans and other hominoids together with the best estimates of these in *A. afarensis, A. africanus,* habilines, and early humans.

The increase in brain size observed in the early human sample is entirely explained by brain-body allometry, assuming an ancestor with habiline-sized brains and bodies. In contrast, the brain sizes of the habilines cannot be explained by allometry ($p<0.05$), unless body size estimates are substantially in error. These findings suggest that known habilines and early humans both derived from a Late Pliocene ancestor with significant behavioral innovations compared to *Australopithecus*, consistent with the archaeological record of hominid behavior. This suggests that the habilines are appropriately referred to *Homo*. From such an ancestor, the evolution of the early human brain occurred without significant selection related to size. The later evolution of human mental complexity may have been facilitated by this allometric expansion, with added neural tissue releasing some pleiotropic constraints among genes influencing brain structure.

A re-analysis of activity pattern in *Teilhardina asiatica* and the evolution of activity pattern in early primates.

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Several adaptive scenarios of primate origins assume that nocturnality is primitive for the group. The recent analysis of relatively complete skull of the basal omomyiform *Teilhardina asiatica* led Ni and colleagues to infer that this animal was diurnal based on the relative size of the bony orbit. This result is striking because using similar comparisons, all other omomyiforms for which data are available are interpreted to be nocturnal. A phylogenetically based character analysis led Ni and colleagues to suggest that diurnality was the primitive primate activity pattern based in part on their diurnal reconstruction for *T. asiatica.* One problem is that *Teilhardina* is small sized, requiring extrapolation beyond the extant distribution of primates for orbit-to-body size allometry. However, the viability of this extrapolation has yet to be demonstrated.

In this study, we evaluate the impact of several assumptions on the linear scaling relationships between orbit size and body size. We also conduct a new analysis of activity pattern character evolution wherein we recode several primate ingroup and outgroup taxa and add taxa that were excluded in the previous study. Our results show that among primates and across mammals, the allometry of eye and orbit size at small body size is not linear, thereby complicating inferences of activity pattern at very small sizes. The phylogenetic analysis of activity pattern reconstructs nocturnality at the basal primate node as well as several adjacent ingroup and outgroup nodes. We conclude that the available comparative evidence supports previous hypotheses for the nocturnal origin of primates.

At what cost a full belly? An investigation of sedentary horticulture in the Great Basin.

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Numerous studies indicate that the transition from hunting and gathering to sedentary horticulturalism usually results in an overall decline in health. Nevertheless, many populations made this transition and such transitions are often locally uniform and irreversible. The Fremont Complex (A.D. 400—1350) is a two-fold exception to this pattern. First, despite horticultural practices and residential stability, this complex is also characterized by evidence for populations of hunter and gatherers living adjacent to permanent villages inhabited by sedentary horticulturalists. Second, sedentary horticulture is completely abandoned and local residents return to a nomadic hunter-gatherer lifeway. Two strategies, *symbiosis* and *opportunistic switching*, have been offered to account for this duality in lifeways and increased physiological stress, due to food shortages caused by decreases in rainfall, has been invoked to explain the disappearance of the Fremont Complex.

This study tests these explanations through assessment of dental pathology affliction patterns, stable isotope signatures, and osteoarthritis prevalence among 45 Fremont Complex individuals recovered from the Great Salt Lake wetlands. These data are contrasted against 78 Great Basin hunter-gatherers from Malheur Lake, Oregon and Stillwater Marsh, Nevada. The results obtained fail to confirm that sedentary horticulture led to an overall decline in health, fail to confirm physiological stress as a contributing factor behind abandonment of the Fremont lifeway, reveal a blunting of sex-based differences in labor, and are in greater accordance with expectations from opportunistic switching than symbiosis for the duality of Fremont Complex lifeways.

The connection between body size and enthesis morphology.

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Lifestyle modelling is regularly performed using muscle attachments (entheses) to bone. Most of these models assume a direct association between movement and enthesis abnormality (e.g. enthesopathies, or lytic changes). However, there seem to have been no studies to assess the relationship between body size (as assessed by bone measurements) and enthesis size. This study proposes two hypotheses: 1) the larger an individual is, the larger the enthesis should be, as larger bones should theoretically require more muscle to move them and 2) that abnormalities at entheses could be related to disproportionate enthesis size. To test these hypotheses entheses in the humerus were studied. This bone was chosen because the upper limb is most often studied in relation to activity and lifestyle. The entheses chosen were those in close proximity to articular surfaces (e.g. the subscapularis insertion), which resemble the smoothness of the articular surfaces themselves. This makes these attachment sites well-suited to measuring, as they are also well-delimited from the rest of the bone. The results of this study demonstrate that these hypotheses are too simplistic. Many factors affect the attachment sites, especially those close to joints. Age, sex, normal anatomy, injury, and the presence of diseases all need to be taken

into account when studying these sites. Further work is required to study the actual cross-sectional area of muscles in comparison to the size of entheses and the size of individuals, to provide further groundwork on the effect of muscle size and strength on enthesis morphology.

Sources of biological variation. Is sex really important?

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Metric characters are often discretly defined using means while variation of these traits is given less attention. Sex is but one of many factors contributing to individual variation. Although averages of various male and female characters may differ statistically significantly, there is wide overlap of male and female distributions. In paleoanthropological studies size differences between individual fossils are either interpreted as taxic or sex, while individual variation is largely ignored. Physical anthropologists have long argued that the amount of variation between different populations is so small in relation to the total human variation that the "race" is not an important explanatory category whilst nobody questions categorizing data into male and female. We partitioned variance in cranial characters of extant humans into that resulting from sexual dimorphism, population affinity and from differences between individual males and individual females in the same population. Data used included body weight, cranial capacity, skull length and width, face width, nose height, minimum frontal breadth and soft tissue depths in six locations on human faces. Typically, the largest portion of variance (>50%) in these characters, resulted from individual differences, while sex and population affinity contributed only about 20% each. Why then do we stake so much on determining that a particular individual is a male or a female while differences individuals of the same sex may be much greater?

Pompeii 79 CE. Demographic model for archaeologicaly derived skeletal samples.

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It is still debated whether skeletal samples from burial grounds can provide reliable information about demographic dynamics of past populations. In 79 CE Pompeii and nearby settlements were devastated within two days by eruption of Vesuvius. A part of Pompeian population was trapped under several metres of volcanic material. During 250 years of excavations skeletal remains of nearly 1100 individuals were unearthed in Pompeii. At present they remain in various states of preservation. We have estimated sex and age of all available remains (428 skulls and 244 pelves) and constructed life tables assuming that skeletal material represents age structure of the living population at the time of the disaster. Biometric functions of this life table were compared with life tables derived from large skeletal samples excavated at burial grounds used over several centuries each in ancient and medieval sites studied by ourselves using the same methods of sex and age estimations. These were: ancient Greek colonies of Metaponto (7^{th}-2^{nd} c. BCE) and Paestum (5^{th}-3^{rd} c. BCE) in Italy and Medieval rural churchyard in Slaboszewo, Poland. We have also compared our results to life tables constructed from early 19^{th} c. parish records of Slaboszewo. In all instances newborn life expectancies were in the early twenties, subadult survivorship being close to 50%. Average age of adults at death was close to 40 years. Thus, it can be concluded that skeletal materials from extensive burial grounds provide valid information about mortality as corroborated by the "census" of Pompeii and written records.

Skeletal biology past and present: are we moving in the right direction?

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Frank Spencer's *A History of American Physical Anthropology: 1930-1980* provided a forum for numerous authors to document the state of our science, including a critical examination of skeletal biology. Armelagos and colleagues characterized the first 50 years of skeletal biology with the descriptive-historical approach, accompanied by little regard for processural problems. In a content analysis of the *American Journal of Physical Anthropology* (AJPA), Lovejoy et al. documented a move towards multivariate morphometrics; but found little in the way of a true analytical approach based in theory.

In an effort to determine whether the above works may have had an impact on the field in the last 23 years, a content analysis was carried out for the AJPA from 1981 to the present. The percentage of osteological articles increased slightly over previous decades. In a shift from previous decades, analytical articles dominated (70% in the 1980s, 63.6% in the 1990s, 68.8% in the 2000s) compared to descriptive articles. In a breakdown by subject matter, paleontology and pathology comprise the largest percentages of descriptive articles. Also of significant interest, the number of articles taking a processual approach, or seeking a functional interpretation, is on the rise. The 1980s contained 36.4%, the 1990s had 44% and the 2000s had 41%, suggesting a shift in theoretical thinking, i.e. an attempt by some to explain processes rather than a simple description of events. We remain optimistic that skeletal biology is heading in the right direction, but we still have far to go.

Fertility and demographic change in ancient Mesoamerica: evidences of a successful adaptation

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Gestation is a complex physiological process, but commonly it is the larger social and physical environment that constrains or enhances a woman's ability to meet the metabolic demands of pregnancy successfully. We suggest in this paper that a successful adaptation process to their social and physical environment is the clue to explain the increasing levels observed in osteological and demographic data from different, cultural and chronological, osteological samples like Tlatilco (Preclassic), Palenque and Monte Alban (Late Classic); Chac Mool and Xochimilco (Posclassic). Osteological analysis provided information about health and nutrition conditions of female adults of these samples; paleodemographic data based in Weiss' methodology, lead us to suggest that demographic change observed through different periods was the result of the improvement in ancient women's health and in their ability of successful adaptation.

GIS analysis of the cremated skeletal material from the Walker-Noe site, Kentucky.

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Situated in the southern Bluegrass Region of Kentucky, the Walker-Noe site (15Gd56) represents a small Middle Woodland period mound. The mound encompasses 60 square meters with excavations conducted during the fall of 2000 yielding over 18 kilograms of charred and calcined human bone. Concentrations of bone were recovered from the periphery of a centrally located, 5cm thick zone of intensive burning. Additionally, human skeletal material was identified and recovered from regions adjacent to the central area suggesting reuse of the crematory facility. Osseous fragments display traditional indicators of thermal alteration and subsequent modification attributable to post burning deposition.

In an attempt to thoroughly document the collection and gain an appreciation of heat exposure as an indicator of cremation practice, we digitized identifiable fragments in a modified version of the *BoneEntryGIS* software for ArcView 3.x (Marean et al., 2001). Utilizing the software extension, skeletal elements are recorded by location, fracture pattern, external and internal Munsell color, and presence of other traditional human skeletal characteristics (pathology and discrete variants). The GIS system was selected in an attempt to truly quantify the skeletal material from Walker-Noe. We propose this approach as a means by which to overcome the inadequacies of traditional inventory systems in managing fragmentary remains such as cremated samples. The GIS provides a visual inventory and a means to assess MNE estimates. We focus on the cranial elements in this discussion to highlight the utility of this system for documenting cremated and burned human remains from archaeological and forensic contexts.

Female competition: applying the socioecological model of primate coalition formation to humans.

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The degree to which females form alliances and coalitions to aggress against competitors varies markedly among non-human primate species. The socioecological model of primate social organization has been relatively successful at explaining this variation in terms of resource competition. We apply this model to the evolution of coalitional behavior in human females. Empirical and theoretical work suggests that reputation was an important mediator of access to valuable and monopolizable social and material resources in ancestral human environments. The manipulation of reputations by the strategic collection, analysis, and dissemination of information about the actions and capabilities of group members (i.e., gossiping) may have been one way to compete for such disputed resources. Over evolutionary time, women may have experienced more within-group competition than men, and female reputations may have been more vulnerable than male reputations to gossip. Consequently, gossiping may have been a more important strategy for women than men, selecting for adaptations that might facilitate success in the competitive use of gossip. Recent evidence strongly suggests that women compete with other women using non-physical forms of aggression like gossip. Using experimental and survey data, we explore the hypothesis that coalitions facilitate the ability to strategically manipulate reputations with gossip, a phenomenon we refer to as informational warfare. We also outline why coalitions have a competitive edge over individuals in the strategic manipulation of reputations: 'cliques' are better than individuals at the 'detective work' required for informational warfare.

Assessing complex demographic models of human history.

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A family of new demographic models that include processes of population fission as well as changing population sizes and migration are described. These 'Isolation with Migration' models can be applied to genetic data sets, included data from multiple loci that vary in their mutation processes. Model fitting is accomplished by developing a Markov chain simulation that reveals the posterior distribution of model parameters.

These methods were applied to multilocus data sets that permit parameter estimates associated with the founding of New World populations. In particular, inclusion of a new parameter for population splitting permits the estimation of the size of the population that founded the New World. The new methods were also applied to a newly collected data set of approximately 700 DNA sequences collected from a worldwide panel of populations. The data come from a 10 kilobase pair region of the X chromosome and include two internally linked microsatellite loci. Together the two regions - unique sequence *and* tightly linked microsatellites - offer high resolution of recent demographic events. Results will be discussed.

Mandibular changes in a mouse model for craniofacial disorders.

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Dimensions of the mandible and midface are reduced in Down syndrome (DS) individuals, and the magnitude and pattern of these differences change during ontogeny. The purpose of this study is to use a murine model for DS, the Ts65Dn mouse, to evaluate the pattern of ontogenetic change in the trisomic mandible. We compare adult and newborn (P0) Ts65Dn mice to test the null hypothesis that the magnitude and pattern of dysmorphology remains constant during ontogeny.

The study sample includes adult Ts65Dn euploid (N=17) and aneuploid (N=12) mice and P0 Ts65Dn euploid (N=8) and aneuploid (N=8) mice. Ts65Dn mice have three copies of a 15.6 mB segment of mouse chromosome 16 which is orthologous to human chromosome 21. Three-dimensional landmark coordinate data were collected from adult mandibles using a Reflex microscope and from micro-CT scans of P0 mice using the software etDips. Coordinate data were analyzed using Euclidean Distance Matrix Analysis (EDMA).

Aneuploid mice are smaller than their euploid littermates in both age groups. Differences are localized to the incisive alveolar process and the anterior portion of the mandible in P0 mice. In adult mice, increased magnitudes of differences extend to the coronoid and condylar processes. These results indicate that morphological differences between trisomic and normal individuals increase during ontogeny in Ts65Dn mice and provide information pertaining to the continued dysmorphogenesis of skeletal structures in aneuploid individuals during growth.

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The current state of dental decay.

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Dental caries is found at low levels in most wild primates, and was present in humans at the end of the Pleistocene. One of the most visible trends in human palaeopathology is the rise of caries through the Holocene, and the way in which the disease changed fundamentally in character. It reached its highest levels with the rapid growth of large urban centres during the 19th century. Throughout most of the 20th century, dental caries rates were the highest they have ever been, except during the sugar rationing of the two world wars. The end of the century in Europe and North America was however marked by a pronounced decline in the number of people affected by the disease, the number of teeth per individual involved, the number of carious lesions per person and a change in the age groups affected, and most common type of lesion. Partly, this was the effect of fluoridation, but it seems to have been most strongly linked to improvements in general health.

This paper surveys the development of dental caries in humans over the past 30,000 years and points particularly to the way in which the type of lesions, their distribution in the mouth, and the role of dental wear, have changed. Caries is a strongly age-related condition, and there have been changes in the nature of lesions, as well as their frequency, in different age groups. The changing nature of caries has implications for the way in which it is recorded.

Milk composition varies in relation to maternal condition in captive rhesus macaques (*Macaca mulatta*).

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Primates require extensive maternal investment, the most expensive aspect of which is lactation. Mothers mobilize bodily reserves to support lactation and maternal condition impacts the relative cost, as mothers in prime condition are better able to meet the demands of lactation than are mothers in marginal condition. However, the relationship between maternal condition and milk composition has been largely uninvestigated. To better understand this relationship, mid-lactation milk samples were collected from 46 captive multiparous rhesus macaques (*Macaca mulatta*) from the Caribbean Primate Research Center Sabana Seca Field Station, Puerto Rico during the 2003 and 2004 birth seasons. Maternal variables assessed were age, weight, weight for height, and presence of parasites. Additionally the analysis included infant age, weight, and sex. Protein and carbohydrate content in milk showed little inter-individual variation, whereas fat had high variance. Fat content in milk was significantly associated with presence of lower intestinal parasites in the mother, as mothers without parasites provided 50% more fat in their milk than mothers with parasites. Presence of parasites in the mother remained associated with fat content when controlling for infant age ($p=0.02$), the only other measure associated with fat content in milk ($p=0.05$). No other maternal or infant variables were associated with fat content. These results, emerging from a largely homogenous population, indicate that even small inter-individual differences in maternal condition are associated with milk composition.

Dynamic plantar pressure distribution during locomotion in bipedally trained Japanese macaques.

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This study examined foot pressure distribution during quadrupedal and bipedal locomotion in bipedally-trained Japanese macaques compared to ordinary macaques. Subjects walked at their preferred speeds across a level surface instrumented with a pressure mat (Nitta, Japan). Dynamic plantar pressures were recorded at 100 Hz with a resolution of 5 mm. Two digital video cameras were placed perpendicular to the walkway to record the lateral view of the foot. During bipedal locomotion, the two macaque groups exhibited differences in the center of pressure (COP) trajectory. Ordinary macaques made initial ground contact with the lateral mid-foot. The COP then shifted backward to the tarsal part, followed by anterior progression, and finally by a slight medial transfer of pressure across the metatarsal heads in late stance phase. At toe-off, the COP of ordinary macaques shifted laterally. In contrast, the COP of trained macaques started at the tarsal part of the foot and traveled relatively straight forward to the 3rd metatarsal head. Although functional foot length was much longer in trained macaques than in ordinary macaques, neither group exhibited heel strike. This trait for both macaque groups during bipedalism is similar to findings for other Old World monkeys during quadrupedalism (Wunderlich, 1999). However, a comparison of bipedal versus quadrupedal walking in the macaques revealed a difference in hallux pressure potentially like that found between quadrupeds and obligate bipeds. During bipedal walking, peak hallucial pressure occurred in late stance phase, while during quadrupedal walking, peak hallucial pressure occurred during mid-stance phase.

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Conceptualizing dental characters: Implications from baboon quantitative genetic analyses.

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Studies of primate odontologic variation often are conducted with little or no knowledge of the underlying biology of the traits of interest. This situation has implications for choices of research question, design, analytical methods, and interpretation of results. When combined with recent advances in developmental biology and genetics, statistical genetics can provide us with the means to more thoroughly interrogate the underlying biology of dental variation in primates.

We illustrate this point with results from an ongoing study of the genetics of dental variation in >600 captive, pedigreed baboons. Our quantitative genetic analyses provide estimates of the additive genetic (heritability) and non-genetic contributions to the overall morphological variance in traits such as size, enamel thickness, cusp positioning, and cingular remnants. Additionally, we are identifying pleiotropic affects between dental traits on the same tooth crown, between teeth in the same tooth row, and across the dental arches.

We believe the results of some of our analyses of dental variation in living baboons can provide new, derived or synthetic dental "traits." Defined on the basis of genetic contributions to – and patterns of genetic covariation between – them, these traits essentially are hypotheses to be tested both in other primate taxa and the fossil record. Conservation of similar patterns of genetic covariation throughout the Order Primates, would support our suggestion that dental anthropologists consider employing traits defined by genetic analyses, rather than by tradition or intuition, as they may better represent genetically integrated morphological units

subject to evolutionary forces.

Life during the early medieval period in southern Wales: evidence from the Atlantic Trading Estate skeletal collection.

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In the 1980's a small cemetery was excavated during the construction of the Atlantic Trading Estate in Barry, Wales. From the cemetery, located on the current shoreline of the Bristol Channel, 45 graves were excavated. The skeletal remains of 42 individuals were recovered. Radiocarbon dates for the remains range from early 4th to late 6th century A.D. Very few skeletal analyses have been reported from prehistoric Wales thus this collection, albeit small in size, provides important insight into the Welsh population. This paper focuses on the demography and dental health of the sample.

All individuals were aged and sexed using standard methods. The sample consists of 16 adult females, 16 adult males, 4 adults indeterminate sex/age, and 6 subadults. The majority of adults were aged to the younger adult groups: 17 to 35 years (n = 18), 35 to 50 years (n = 13) and 45+ years, (n = 3). The sub-adult age profile is: 0 to 5 years (n=2) and 5 to 15 years (n=4).

Dental caries were observed on 30.3% of adults (n=33) and 50% of sub-adults (n=4). The frequency of affected males and females were similar: 25% vs. 31%. The carious tooth frequencies were: 3.8% (all adult teeth, n=715), 5.8% (adult premolar & molars, n= 447) and 8.7% (deciduous premolar & molars, n= 23). Dental abscesses were observed on 18% of adults (n=33) with 26.7% of males affected (n=15) and 6.25% of females (n=16). These patterns of dental pathology are interpreted along with ante-mortem tooth loss and calculus rates.

A learning opportunity versus the real deal: Are adolescent female rhesus macaques (*Macaca mulatta*) fertile?

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When a female rhesus macaque (*Macaca mulatta*) enters adolescence, she experiences changes that propel her toward adulthood. Changes include colorful, swollen hindquarters and newfound male grooming and mating partners. Unlike adult females, however, adolescent females have not had personal opportunities to consort with and assess prospective mates. Therefore, they could potentially benefit from a period of sterility that would allow them to learn proper mating behavior and make fitness assessments of males without assuming costs of raising offspring fathered by undesirable mates.

To examine this question, we focally observed 20 adolescent female rhesus macaques between 3.5 and 4.6 years old during the 2002 mating season on Cayo Santiago, Puerto Rico. As expected, 90% of subjects exhibited pronounced sexual swellings, and the presence of swellings was significantly correlated with several types of heterosexual interactions, such as grooming bouts with adult males (r=.622, p<.001). However, there was little evidence to support the adolescent sterility hypothesis. Fourteen of the 19 surviving adolescent females gave birth following the 2002 mating season, and female ages did not significantly affect whether they conceived (r=.240, p=.309) or timing of conception (r=.274, p=.343) during the mating season. With the potential of high infant survivorship, our findings suggest that adolescence is more than a learning period for female rhesus macaques, as choices adolescents make can result in dependent young during subsequent mating seasons.

Eye on haplorhine orbits.

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The interrelationships among tarsiers, omomyids, and anthropoids have been intensely debated as the crux of our understanding of haplorhine evolution. A shared-derived postorbital septum with an alisphenoid element has been promulgated as evidence that tarsiers and anthropoids are sister-taxa, whereas orbital hypertrophy (among other features) has been advanced as proof that tarsiers are more closely related to various fossil tarsiiforms. There is no developmental evidence that the postorbitum of tarsiers and anthropoids is homologous. There is both neontological and paleontological evidence that it is not, including differences in the ontogeny of the alisphenoid. We find that orbital hypertrophy is more common among omomyids than previously thought, and that all haplorhines, including the controversial smaller-eyed *Rooneyia,* share a uniquely derived morphology of the lower orbit in which the maxilla forms an enlarged, platform-like orbital floor. If the unique, foveate retina of haplorhines required bony stability against eyeball wobble in order to operate effectively, it would appear that it was first insulated by this new orbital floor. The empirical evidence suggests that modern tarsiers evolved an elaborate circumorbital morphology in connection with a remarkable autapomorphic state of eyeball hypertrophy. This is an extension of a derived pattern seen in its precociously large-eyed omomyid relatives, which nonetheless still appear to retain a small euprimate postorbital process. The hardly acknowledged partial postorbital septum of the small-eyed *Rooneyia* may thus represent a derived homology shared with anthropoids. Strip it down dentally, and there is little to deny *Rooneyia* from being a most viable protoanthropoid.

Analyses of dental microwear of heavily worn occlusal surfaces of mandibular molars from Neolithic Japan using SEM.

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Analyses of dental microwear using a scanning electron microscopy (SEM) have revealed changes of the striations and pits on heavily worn occlusal surfaces of teeth of Neolithic western Japan (e.g. Hojo, 1989, 2000, 2002). Micrographs of the high resolution casts of M2 and M3 from Neolithic West Kyushu seacoast were taken using SEM in the present study, and the casts were made by the same method as in my previous studies. The areas of SEM micrographs at x500 were about 3.4 square mm on the facets named after Kay (1977), and were analyzed using Microwear Image Analyzing Software Version 2.2 (Ungar, 1996). As for the striations of the M2, on the inner area of the facet M: N=16, the mean length = 39.4 microns, and the mean width = 4.8 microns; on the marginal area of the facet E: N=25, the mean length = 66.3 microns, and the mean width = 5.8 microns. As for the striations on the M3, on the inner area of the facet 7n: N=10, the mean length = 34.4 microns, and the mean width = 5.4 microns; on the marginal area of the facet 7n: N=53, the mean length = 57.5 microns, and the mean width = 2.5 microns. The results showed that the striations on the marginal areas of lingual areas of these teeth were more in number and longer

than those on the inner areas, and pits were larger on the inner areas.

MtDNA variation in North, East, and Central African populations gives clues to a possible back-migration from the Middle East.

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The general timeline for human occupation of Africa has been studied extensively. However, questions involving Upper Palaeolithic migrations still persist. One remaining question is the presence of the mitochondrial M1 haplogroup in North and East Africa. Some (Quintana-Murci et al. 2004, 1999) argue that the presence of M1 in modern Africans is a remnant of the original M haplogroup that left Africa 60 kya via the Horn of Africa. Others (Forster, 2004) propose that it is instead the result of a back-migration from the Arabian Peninsula from 20 kya. This research aims to test these two competing hypotheses.

We analysed mtDNA variation in ~250 persons from Libya, Somalia, and Congo/Zambia, as representatives of the three regions of interest. Our initial results indicate a sharp cline in M1 frequencies that generally does not extend into sub-Saharan Africa. While our North and especially East African samples contained frequencies of M1 over 20%, our sub-Saharan samples consisted almost entirely of the L1 or L2 haplogroups only. In addition, there existed a significant amount of homogeneity within the M1 haplogroup.

This sharp cline indicates a history of little admixture between these regions. This could imply a more recent ancestry for M1 in Africa, as older lineages are more diverse and widespread by nature, and may be an indication of a back-migration into Africa from the Middle East. Further research on this topic includes more extensive population samples from the Middle East, as well as possible correlations of M1 to the Afro-Asiatic language family.

The Bodo brain endocast: a strange frontal lobe…

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Dated at roughly .6 MY, the Bodo cranium has yielded a well-preserved frontal portion. The CT scan study of Conroy et al. (2000) provided a volume of 1250 ml, using mirror-imaging techniques to correct for distortion. Our endocast reconstruction yielded a volume of 1205 ml, but we believe the 1250 ml figure is more accurate. The Bodo frontal lobe, however, presents a unique, if not strange, convolutional picture. While the overall shape of the prefrontal and orbital portion is quite similar to both Neandertal and modern *Homo sapiens* frontal portions, there is a striking 30 mm long frontal torus just anterior to the left *pars triangularis* region of Broca's cap. Interestingly, this morphological feature also appears on the Kabwe (Rhodesian) endocast, although more attenuated than on Bodo. This feature does not appear on any of the *Homo erectus* endocasts we have studied thus far, and perhaps in that sense, this feature could be specific to *Homo heidelbergensis*. The Broca's caps appear somewhat asymmetrical, slightly larger on the left side, and similar to the modern *Homo* condition, but with the occipital portions missing, it is not possible to know about overall cerebral asymmetry, handedness, language or cognition. The functional significance of this extended and protruding prefrontal portion is unknown. While this author has not seen it on any modern *Homo sapiens* he has studied, perhaps others have encountered such.

Variation in mandibular gonial flare in Neandertals and recent humans: a pattern recognition study.

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Recent studies have noted differences between Neandertals and modern humans in masticatory muscle scarring patterns on the mandibular ramus. One feature that has been largely ignored is the high frequency of gonial inversion among Neandertals. While the degree of gonial lateral flare, or eversion, in recent humans is typically associated with robusticity, the Neandertal gonial region, in contrast, is characterized by gonial inversion, and pronounced mediolateral thinning. This study examines the relationship between gonial flare/thickness in Neandertals and modern humans with a large number of other cranio-mandibular measurements to explore possible interrelationships. Measurements were taken on Neandertals and Early Modern Human casts and a recent human sample from The University of Iowa's Department of Anthropology osteology collection. Previous studies noting greater gonial eversion in recent human males relied on qualitative (i.e. discrete) measures for the degree of flaring. Gonial eversion was quantified in the present study as a ratio of three breadth measurements between the gonial regions to a standardized breadth measurement taken at the midpoint of a vector marking the minimum breadth of each ramus, and was deemed to be more reliable with respect to both inter- and intra-observer error. Principal components analysis of craniofacial and mandibular measurements in the combined sample (n=145) reveals that gonial eversion and thickness loads most heavily in opposition to measures of mandibular length and facial projection relative to facial breadth. These and further results suggest that gonial inversion and thinning in Neandertals is related, in large part, to the maintenance of mid-sagittal prognathism.

Possible congenital hypoplasia in Jomon period Japanese.

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Yoshigo is a Late to Final Jomon archaeological site located on the Bay of Ise, Aichi Prefecture, Japan. An abnormal frequency of enamel hypoplasias (66%) were recorded during the course of bioarchaeological research on the Yoshigo skeletal series. Such elevated hypoplasia frequencies are unexpected among a population with a marine based subsistence. Furthermore, hypoplastic defects in 31.3% of the sample were bilaterally distributed on the cervical two-thirds of anterior and posterior tooth crowns. This manifestation is inconsistent with stress-related hypoplasia and may be an example of prehistoric congenital hypoplasia or amelogenesis imperfecta.

Simple correspondence analysis was applied to test the relationship between enamel defect class (e.g. possible congenital, hypoplasia absent, and nutritional) and three biological stress indicators (e.g. porotic hyperostosis, stature, and age-at-death). Data on four craniometric variables for 21 individuals were subjected to discriminant function analysis with cross-validated results to understand if individuals in the congenital group were more

closely related with each other than the other two groups.

Simple correspondence analysis shows that possible congenital and hypoplasia absent groups were associated with porotic hyperostosis absence and older age-at-death. The nutritional hypoplasia group was associated with short stature, porotic hyperostosis presence, and younger age-at-death. Discriminant function analysis accurately classified 80% of individuals in the possible congenital hypoplasia group. These results suggest both a non-nutritional etiology for the enamel defects and a close relationship between individuals in the congenital group. An inherited condition best explains the etiology of the defects grouped as possible congenital hypoplasia.

Diets and sutures: does dietary consistency influence sutural complexity?

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Fractal analysis provides a quantitative way of measuring the geometric complexity of cranial sutures. Experimental studies support the idea that sutural morphology is related to the mechanical loading environment. Under this hypothesis, sutures experiencing a magnified loading environment should be more complex than sutures exposed to reduced loading. To test this hypothesis, the fractal dimensions of the mid-palatal sutures of *Colobus polykomos* (n=13) and *Procolobus badius* (n=39), were calculated. These two species of colobus monkeys are sympatric and similar in size, but *Colobus polykomos* has a tougher dietary consistency compared to *Procolobus badius*. Due to this dietary difference, *C. polykomos* sutures are expected to exhibit higher fractal dimensions, which indicates more complex sutures, than those of *P. badius*.

These sutures were photographed using a 35mm camera with the palate oriented parallel to the lens. These images were digitized and imported into Benoit 1.3 fractal analysis software (TruSoft Int'l Inc., St. Petersburg, FL). Ruler and box-counting methods were used to calculate the fractal dimensions. A 2-way ANOVA was performed with species and sex as factors; no significant differences between the fractal dimensions distinguish either species or sex. One explanation for these results is that their dietary consistencies do not differ enough to cause significant differences in sutural complexity. Another explanation may be that the palate simply does not experience sufficiently large loads during mastication to elicit a morphological response from this suture. Research into the nature of loads experienced by the palate would inform the validity of these explanations.

They came, they saw, they conquered – now what? Management of a Costa Rican rain forest for three species of primates.

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Humans have a dramatic impact on non-human primate ecology throughout the world. In Costa Rica the devastating effects of deforestation from farming and cattle ranching have had a limiting effect on many primates' population ranges, as well as gene flow between populations. El Zota Biological Field Station in northeastern Costa Rica provides a case study of the interplay between source country land owners, anthropologists and other scientists. At the 1000 ha privately-owned site, *Gmelina* tree plantations account for the majority of disturbed areas (270 ha) at El Zota. Their extensive rooting systems prevent native pioneer species from reclaiming the rain forest after these trees have been harvested. At El Zota, primatologists were asked to determine 1) if and how the three species of primates (*Cebus capucinus, Ateles geoffroyi,* and *Alouatta palliata)* were using the non-native tree species, 2) to what extent, and 3) which trees could be removed and the area replanted with native pioneer species with as little impact on the primate species as possible. Results from over 100 hours of survey and behavioral data indicate that the three species of primates utilize *Gmelina* plantations as travel corridors but not as a food source and limit their travel to the outer edges of the plantations. These results have been used to create a forest management plan that includes selectively removing most of the *Gmelina* trees while leaving usable corridor areas open to non-human primates. This study elucidates how anthropologists (specifically primatologists) can be used as resources for source country land-owners interested in utilizing their property in an ecologically conscientious way.

Body, perception and Illness after the Isidoro hurricane in Calakmul Campeche.

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This poster analyzes the physical and emotional illness attributed by families of four peasant communities from Calakmul, Campeche to hurricane Isidoro in September of 2002. The data analyzed was obtained from interviews with 8 traditional healers *(curanderos*), 15 mothers, and a survey of 90 mothers. The interviews were carried out between December of 2002 and April of 2003, and the survey was applied in the summer of 2003. The interviews, and later the survey questionnaire were designed to obtain information on health perception before, during and after a hurricane.

We observed that during the hurricane, thunder, rain and wind were responsible for a disease called "*susto*" or loss of soul, *sobreparto* felt as pain in belly or hip and *mal aire* concieved as a spirit possession . We argue that the supernatural explanations of the cause of illness belong to pre-Hispanic and colonial perceptions of illness.

Identification of the neonatal line using LA-ICP-MS.

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Incremental structures in enamel are laid down during the secretory stage of amelogenesis. Episodes of physiological stress that occur during the formation of tooth enamel and are visible as accentuated increments represent disturbances in this process. The neonatal line is an accentuated increment that can sometime be detected in teeth forming at birth. The neonatal line is an important marker since it distinguishes between enamel that starts to form in prenatal life and enamel that starts to form after birth, and provides a secure anchor point for the chronological interpretation of enamel formation. However the neonatal line cannot always be reliably identified using microscopic techniques.

Strontium and calcium are incorporated into developing teeth in a manner that reflects changing physiological concentrations in the body. Physiological levels change significantly at birth, during breast-feeding and with the first intake of solids, primarily because of differential discrimination against strontium by the placenta, mammary gland and gut. Here, laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) is used to record Sr/Ca ratios in 40 micron diame-

ter samples taken at regular intervals along a series of trajectories running from the enamel dentine junction (EDJ) to the enamel surface. There is an underlying trend for Sr/Ca ratios to decrease from the EDJ to the enamel surface. A particularly marked drop in Sr/Ca ratios occurs between the last prenatal and first postnatal samples in breastfed infants, and provides a basis for identifying the neonatal line in recent and fossil teeth.

Rejection of isolation by distance for human gene geography and suggested alternatives.

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Isolation by distance population structure is tested for the worldwide pattern of human genetic diversity using a large short tandem repeat (STR) data set (Cann et al., 2002, Science, 298: 261-2). A subset of 27 populations, chosen on the basis sample size, was analyzed. Each individual was represented by 377 autosomal short tandem repeat (STR) genotypes. Malecot's genetic kinship was calculated between population pairs. Scatterplots and regression methods were applied analyze the relationship between genetic kinship and geographic distance.

All African/non-African population pairs show about the same degree of genetic kinship, regardless of geographic distance. European/non-European comparisons show two strata of genetic kinship. The first stratum presents European/African pairs, while the second stratum contains European/Asian and European/Native American pairs. There is no trend for genetic kinship to decrease with increasing geographic distance. Finally, comparisons between Asian with non-Asian samples reveal three strata, the first stratum includes Asian/African pairs, the second stratum includes Asian/European pairs, and the third stratum includes Asian/Native American pairs. The pattern is remarkable. Rather than isolation by distance, it reflects a pattern of nested subsets. Non-Africans possess a subset of the variation in Africans; Asians and Native Americans possess a subset of the variation in Non-Africans; and Native Americans possess a subset of the variation in Asians. The nested subset pattern of genetic diversity is consistent with a model that postulates a succession of ancient founder events that occurred as the human species expanded its range and occupied new continents.

A preliminary analysis of occlusal events during mastication in baboons employing an intra-molar force transducer.

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In studies of the masticatory apparatus, mandibular bone strain and electromyographic (EMG) data have been used as indicators of the timing and magnitude of the bite force during chewing. Recently we have been developing an intra-tooth force transducer so as to measure occlusal force during chewing directly from the mandibular second molar (M2). This transducer consists of a single-element strain gage attached to a gold alloy casting that is inserted into a previously prepared occlusal cavity in the M2. A transducer of this design was inserted on multiple occasions either unilaterally or bilaterally into the M2 of an adult female baboon. Furthermore, superficial masseter EMG and/or zygomatic-arch bone strain data were also recorded along with the bite force data.

An analysis of the EMG, bone strain and molar transducer data support the hypothesis that peak molar force occurs during Phase I occlusal movements, and that this force is negligible or absent during Phase II movements. Furthermore, during the chewing of mechanically resistant three-dimensional food objects such as monkey chow, peak molar force occurs after peak balancing-side (b-s) masseter force and slightly before peak working-side (w-s) masseter force. In contrast, during the chewing of a 2-dimensional object such as apple skin, although peak molar force also occurs before peak b-s masseter force, peak molar force occurs essentially simultaneous with the w-s masseter force. Finally, in those instances where transducers were placed bilaterally, b-s tooth contacts were often detected. As expected, the b-s tooth contacts occurred well after the w-s tooth contacts.

The lean season lasts all year: Diademed sifakas (*Propithecus diadema*) in forest fragments show reduced dietary diversity and rely heavily on parasitic mistletoes.

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Forest fragmentation is thought to seriously threaten primate populations, yet the presumption that fragmentation disrupts food resources and causes energetic stress remains untested. I present the results of a 12-month study of the feeding ecology of *Propithecus diadema* at Tsinjoarivo, eastern Madagascar, including two groups in small (<30 ha) fragments and two groups in nearby continuous forest. Continuous forest groups fed on a higher diversity of plant species and ate more fleshy fruit. During the lean season (June–August), dietary diversity was reduced and they relied heavily on the hemiparasitic mistletoe *Bakerella*. In contrast, sifakas in fragments employed this "lean season" strategy year-round; the fruit-bearing tree species that sustain the continuous forest groups throughout the rainy season (November–April) are largely absent from fragments. The level of specialization on the mistletoe species was extreme: fragment groups regularly devoted 30-60% of their feeding time to *Bakerella* (a level matched by continuous forest groups only briefly, during the lean season). The major characteristic of *Bakerella* enabling it to be a year-round keystone resource is its "extended phenology" (reproductive parts are available year round). This study suggests that parasitic plants may be important resources for primates in degraded forest fragments where preferred resources are unavailable. However, other effects of this resource shift remain to be investigated; for example, the much smaller size of *Bakerella* feeding patches relative to other resources may affect the foraging strategy and social cohesion of fragment-dwelling groups.

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A pilot study on mitochondrial DNA and Y chromosome variation in north New Guinea.

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Anthropological research shows New Guinea to be an extremely diverse area in terms of culture, language and genetics. The north coast is a particularly interesting area because it apparently was the most easily used route connecting eastern Indonesia and Island Melanesia. The first

settlers to move into New Guinea and its adjacent islands more than 40,000 years ago would have first colonized the north coast before moving further inland, or south because of its relatively benign geography and environment. Recent literature points to the north coast as the possible homeland for several mitochondrial DNA variants. Y chromosome analysis in this region is more recent and less well defined, and some of the variants found in New Guinea also appear to be restricted to the region.

A more intensive sampling of mtDNA and Y chromosome variation in this region, extending from the coastline south to the Eastern Highlands, should determine if male and female mediated diversity here is particularly extensive, indicating the location of ancient population expansions. An extensive survey of the region with urine sampling has already been completed with the cooperation of the PNG Medical Research Institute. Samples were collected from several villages in Madang Province (38 villages), Eastern Highlands Province (34 villages) and Simbu (4 villages). We selected a linguistically diverse panel of males for the pilot study and analyzed them for several informative mtDNA and Y chromosome markers. The preliminary study has been successful, showing a high rate of DNA recovery and extensive mtDNA and Y variability.

Variation in diurnal electrolyte excretion over the menstrual cycle.

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Several studies have shown that hormones that regulate electrolyte (Na, K) balance increase from the follicular to luteal phase of the menstrual cycle; however, it is unclear as to whether electrolyte excretion is actually affected by this hormonal change. This study evaluated menstrual phase differences in diurnal urinary Na and K excretion measured in timed urine collections at work (11AM-3PM), home (6 PM-10PM) and overnight (10 PM- 6AM) in 44 women (age=35.9$\pm$ 8.0) who worked in New York City. Variation in urine volume and urinary aldosterone were also examined. The effects of phase and location of collection were assessed using repeated-measures ANOVA. The results show that averaging across all locations, the rates of Na ($p<.03$) and K ($p<.003$) excretion were significantly higher in the luteal phase . The rate of Na excretion overnight ($p<.01$) and the rates of K excretion at home ($p<.003$) and overnight ($p<.015$) were also individually higher in the luteal phase. During the day, in both phases, the rates of excretion of both electrolytes were highest at work and lowest during sleep ($p<.001$), even though urine volume increased significantly overnight ($p<.001$). Since aldosterone directly regulates K excretion and increased in the luteal phase as well ($p<.001$), the increase in K excretion is expected. However, Na excretion is inversely related to aldosterone, and thus the increase excretion in the luteal phase is unexpected. These results suggest that the mechanisms that regulate Na but not K balance may change over the menstrual cycle.

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The relationship between a quantitative measure of facial harmony and subjective measures of facial attractiveness.

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The craniofacial variability index (CVI) summarizes the variation in Z-scores across a set of sixteen common craniofacial measurements and can be used as a measure of facial harmony. Previously we have shown that high values of this summary statistic correlate strongly with individuals known to have congenital craniofacial syndromes. In the present study we hypothesized that low values of this measure correlate with attractive or harmonious faces. The CVI was calculated for 205 adult females who had previously been ranked for attractiveness using a panel of male and female judges. The judges used a seven point Likert scale to rate each subject from above average in appearance to below average in appearance. Mean ranking scores for each subject were then used to create three groups, above average (n-34), average (n=145), and below average (n=21). ANOVA demonstrated significant differences in CVI scores of the three groups and Bonferroni post hoc tests revealed that the subjects in the "above average" group had significantly lower CVI scores than the subjects in the other two groups. Mean CVI did not differ significantly between the average and below average groups. These results indicate that the CVI is an effective measure of facial harmony and suggest that it may be a useful tool in testing some of the hypotheses that have been put forward regarding physical attractiveness and reproductive fitness.

Comparative morphometrics of Neandertal zygomatic bones.

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Neandertal zygomatic bones have been described as differing from those of modern humans in a number of anatomical features. However, detailed morphometric assessments of many aspects of zygomatic morphology have not been undertaken. To test the distinctiveness of this region in Neandertals, we conducted a morphometric study using a Central European Neandertal sample compared to an anatomically modern human sample, ranging from the Neolithic to recent human skeletal remains. Neandertal zygomatics are shown to differ significantly from those of modern humans in the pillar-like morphology of the frontal process - as shown by the frontal process index (ratio of the lateral plate breadth to the minimum breadth of the frontal process), expansion of the maxillary sinus into the zygomatic body, number and positioning of the zygomaticofacial foramina, and the marked attachments for the anterior fibers of the temporalis muscle in the temporal fossa. Linear least-squares regression analysis shows no significant correlation of size (based on zygomatic height) and the frontal process index. Z-scores indicate non-modern human affinities for the frontal process indices of such significant isolated zygomatics as Vindija 307, Neandertal 34, and Klasies 16651. This index, as well as the morphological observations made in this study, provide an additional indicator for the morphological affinities of isolated and fragmentary human fossil zygomatics and midfaces from the Late Pleistocene.

Are jaw-muscle activity patterns correlated with masticatory apparatus morphology among primate species?

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A long-standing hypothesis in primate mastication studies argues that morphological changes in the masticatory apparatus have evolved within a conserved behavioral framework. Thus, jaw-muscle activity patterns are thought to vary little across primate species with one pattern purportedly describing strepsirrhines and a second pattern characterizing anthropoids. Until now, we have lacked sufficient in vivo data on jaw-muscle activity patterns during mastication to adequately test this hypothesis.

We compared the recruitment and firing patterns of the superficial and deep masseter and the anterior and posterior temporalis muscles to measures of jaw and tooth form in *Otolemur* sp., *Lemur catta*, *Propithecus verreauxi*, *Callithrix jacchus*, *Aotus trivirgatus*, *Macaca* sp., *Papio anubis* and *Tupaia belangeri*. The above hypothesis predicts little association between jaw-muscle activity and morphology.

Morphological estimates of relative symphyseal strength (Beecher, 1974) are significantly inversely correlated with the average working-to balancing-side (W/B) ratio for these jaw muscles (r_s=-0.93) and the deep masseter W/B ratio (r_s=-0.97) across these species. Thus, primate species with relatively greater symphyseal strength estimates tend to increase the relative recruitment of their balancing-side muscles during mastication. Similarly, W/B ratios exhibit a significant canonical correlation (r=0.99) with mandibular dimensions related to load resistance: corpus depth, symphyseal area and condylar area. Finally, the timing of peak firing is correlated with hypoconid height, Phase II facet area and cristid obliqua length suggesting that jaw-muscle firing patterns are linked to dental form and function.

Primate jaw-muscle activity patterns appear to be an integrated and evolving component of the masticatory apparatus.

Supported by NSF.

Foraging in a complex niche: the development of foraging and social skills in chacma baboons.

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This paper examines how age and dominance rank interact to influence disparity in resource acquisition among chacma baboons (*Papio hamadryas ursinus*) in the Okavango Delta, Botswana. Each time an individual is supplanted (disrupted) while they are feeding they lose time and energy. The time it takes to locate the same resource again is time lost to energy acquisition.

I hypothesize that the cost of this competitive disruption varies with position in the social hierarchy and age. Predictions include: 1) feeding bouts of lower ranking and younger individuals will be more likely to end in a supplant; 2) it will take longer for lower ranking and younger individuals to resume eating the same resource from which they have been disrupted; and 3) the total cost to competitive disruption will be greater for lower ranking and younger individuals.

Foraging behavior was measured during 30 minute focal follows. There is no significant difference in resume time for high versus low ranking adult females. High ranking adult females are significantly less likely to be supplanted while feeding than mid ranking adult females. Low ranking adult females are significantly more likely to be supplanted while feeding than mid ranking adult females. Juvenile females of low maternal rank take 2.3 times longer than those of high maternal rank to resume feeding on the same resource after being supplanted. These results contribute to our understanding of the ontogeny of foraging skills and the role of social hierarchies in resource acquisition among nonhuman primates.

Predictors of local variation in lemur abundance at Ranomafana National Park, Madagascar.

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This project investigates the dynamics of coupled human and natural systems in the rainforest region of Ranomafana National Park, Madagascar. To measure anthropogenic impacts, we monitor edge-interior transects and botanical plots adjacent to eight study villages in the park periphery. To examine baseline local variation in lemur abundance, we restrict our analysis herein to relatively intact interior transect segments and focus on five common day-active taxa. We found significant variation in relative abundance among these species at most sites. However, only two species (frugivorous *Eulemur fulvus* and *Varecia variegata*) differed significantly in abundance across sites, a result linked to their patchy distribution in the park. Local habitats also varied across the park interior, including in tree biomass and altitude. We use these habitat features as potential predictors of lemur populations in multiple regression models. We also include richness and abundance of other lemur species in these models. Contrary to recent analyses examining edge effects, where distance to edge and altitude were the strongest influences on abundance, we find that community ecology measures are the only significant predictors. As expected, individual species' numbers diminished as those of competing species increased, and as the total number of species increased. These results suggest community dynamics are more important influences on lemur populations in relatively intact environments. In ongoing research, we apply these data to spatially-explicit models of deforestation and land-use to better predict future threats to Madagascar's exceptional biodiversity.

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Laboratory excavation of an Early Woodland cremation from Ross County, Ohio.

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Interpretation of cremated human remains presents a challenge to the bioarchaeologist especially when contextual information is lacking. Most studies of Woodland Period cremations from the Ohio Valley rely on data derived from cremations in museum collections. Even when field photos and notes are available, they rarely provide enough information for the researcher to determine whether the bones were in articulation prior to excavation. Similarly the kind of fine grained stratigraphic information necessary for interpretation of the cremation event is often missing. Additional information may be lost as the fragile calcined bones are handled over the years. This study reports findings made during laboratory excavation of an Early Woodland Period human cremation from Ross County, Ohio. The cremation was removed from a mound in situ and stored for several decades by the landowner thus preserving its primary context. Methods used to recover the remains and interpret their context will be presented and ques-

tions related to the location of the cremation event will be addressed. Quantity and quality of information gleaned from this investigation will be compared to that yielded by study of curated cremated remains. How these results can be used to formulate hypotheses about other, less carefully recovered, Woodland Period cremations will be discussed.

"White babies" and the zone of contact and probable intergradation among three distinct baboon allotaxa in the Luangwa valley, Zambia.

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The ranges of three distinct baboon taxa – grey-footed chacma (*Papio griseipes* or *P.ursinus griseipes*), yellow (*P.cynocephalus* or *P. c.cynocephalus*) and Kinda baboons (*P.kindae* or *P.c.kindae*) – meet in eastern Zambia. In a recent search for the *griseipes-cynocephalus* boundary, we scored troops on the east bank of the Luangwa River for taxon-specific pelage features. At Ndevu, the furthest downstream, intra-troop variation ranged from *griseipes*-like to *cynocephalus*-like. Most baboons in South Luangwa and Luambe National Parks (NP), further upstream, had typical *cynocephalus*-like coloration. At both these localities, we observed single infants with white natal coats, as well as others with the usual blackish coats. These "white babies" were not albino, having normally pigmented irides and some black hair on the head. Residents reported that such animals are born rarely but regularly. J. Rogers and A. Burrell (pers. comm.) note that white natal coats are characteristic of Kinda baboons, found north and west of the Muchinga escarpment bordering the Luangwa Valley. At Kasanka NP, just west of the Muchinga escarpment, we observed baboons with pelage of the distinctive Kinda type, and a single infant, which was white. Our working hypothesis – to be tested against molecular data – is that all three taxa have contributed genetically to the Luangwa valley baboon populations, and that white natal pelage may be used as a readily observable marker of Kinda ancestry. The type and only known specimen of *P.pruinosus* Thomas 1896, from Malawi (BM-95.12.7.8) is perhaps an aberrant yellow baboon that retained white pelage into subadulthood.

Interpersonal violence at Hawikku: Interpreting perimortem trauma.

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Interpersonal violence and warfare in the American Southwest is increasingly well-documented in the anthropological and historic literature. Recent studies support claims of conflict among prehistoric Puebloan groups and reports of population destabilization and intermittent warfare following European contact. For example, evidence of violence throughout the occupation of the Pueblo site of Hawikku (ca. 1300 to 1680 AD, with Spanish contact at 1539) has been identified by osteologists, primarily based on healed trauma.

The purpose of this study is to provide evidence of perimortem trauma at Hawikku. Perimortem trauma was identified in seven of 276 (2.6%) individuals from Hawikku: four males, two females, and one adolescent. Traumatic lesions were concentrated on the skull, with the exception of a female displaying a parry fracture and cutmarks on a cervical vertebra of a male. Major perimortem trauma that likely was the cause of death was present on five individuals, three of which involved multiple blows. Notable are the injuries of a young adult male, including blunt-force trauma to the cranium and penetrating sharp-force trauma to the chest suggesting at least four separate puncture wounds. Remains of a wooden instrument are embedded in the sternum. One adolescent exhibits extensive fractures to the anterior dentition related to massive blunt-force trauma to the cranium. The skull of this individual was buried without the postcrania, suggesting decapitation.

The severity and patterning of these injuries is suggestive of intense conflict at Hawikku. This research also supports reports of violence in the late prehistoric and historic Pueblos.

Environmental variability, life history tactics, and the Neanderthal extinction.

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In this paper, I use the demographic theory for structured populations in variable environments to shed light on the demise of the Neanderthals. Humans are – and probably most hominins were – characterized by highly structured life cycles. That is, age-specific schedules of reproductive investment are far from constant across the life cycle. In the presence of environmental variability, this structure induces correlations in vital rates across environments that can fundamentally alter optimal life history tactics. I present stochastic models of human population dynamics in a variety of stochastic environments showing that, in general, increased variability favors (1) delayed age at maturity and (2) long reproductive span. Recent histological analyses of Neanderthal teeth suggest their age at maturity was significantly earlier than that of anatomically modern humans. I show that under a reasonable range of demographic schedules, this early age at maturity would have increased the probability of extinction of Neanderthal populations under the right environmental conditions. Drawing upon Pleistocene temperature proxy data from the Greenland Ice Core Project, I show that high-frequency fluctuations increased significantly in the period more or less coincident with the disappearance of Neanderthals, consistent with this hypothesis. These results suggest the possibility that Neanderthal extinction was driven by intrinsic features of their biology and not through competition with anatomically modern humans.

Bi-directional pathogen transmission between humans and nonhuman primates: Implications for conservation and public health.

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Over the past decades political, social and economic forces have brought human and nonhuman primate populations into increasingly frequent contact, creating new contexts for interspecific pathogen transmission. However, given the emphasis placed on HIV/SIV, which has its origins in Africa, the issue of cross-species transmission in Asia and South America has been largely ignored. What is needed is a global assessment of the diverse contexts of cross-species pathogen transmission which takes into account the infectious agents, primate populations, affected human populations and the diverse and complex manner in which the three interrelate. Our research group has studied bi-directional pathogen transmission be-

tween humans and nonhuman primates in Southeast Asia using a multidisciplinary approach that combines serological, epidemiological and ethnoprimatological data to describe both the pathogens involved and the contexts in which they are transmitted. Our work has shown that humans and nonhuman primates come into contact in a variety of contexts: pet ownership, "monkey temples," bushmeat hunting and consumption, performance monkeys, zoos, and agriculture production. In addition to describing human-nonhuman primate interactions that may lead to transmission of infectious agents we have identified evidence of both human-to-nonhuman primate and nonhuman primate-to-human transmission of infectious agents. These data have important implications for efforts to conserve nonhuman primate populations and to promote public health by preventing the emergence of nonhuman primate-borne zoonoses.

Secular trends in the male facial skull from the 19th century to the present analyzed with geometric morphometrics.

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Over the last one hundred years, Austrian facial form has changed for what might be a variety of reasons: changes in growth pattern, changes in shape pattern, or some combination. We investigated this in cephalograms from a combined sample of 54 recruits in the present Austrian Federal Army together with 49 dried skulls of soldiers in the Imperial Hapsburg army. Age distributions of the two samples were comparable. Body height was measured or acquired from military records, and 43 landmarks were located on each lateral cephalogram roughly in keeping with the system of Riolo et al. (1974). Secular change and growth allometry were analyzed by standard Procrustes methods.

Body height correlates only weakly with size of the facial skull in these samples, and secular change in facial size is less than that in height. Growth allometry is nearly unchanged over the century, emphasizing the typical changes of vertical to horizontal proportions and bimaxillary prognathism. Secular changes over the century take the form of far more localized remodeling around the coronoid process and the anterior maxilla.

The observed trends shed considerable light on secular changes in the range of dysmorphologies that present for clinical orthodontic correction. At the same time, the discrepancy between within-century and between-century allometry is an important possibility that was hitherto typically observed only at far larger time scales than the century spanned by the data here.

Population expansions in South Indian caste and tribal populations: inferences from genetic data.

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The origins and affinities of Hindu caste populations remain poorly understood. To investigate the relationships between Hindu caste populations, Indian tribal populations, and other populations, we have genotyped 45 short tandem repeat polymorphisms (STRPs) in 151 members of tribal populations and 437 members of caste populations from South India. These same STRPs have also been assayed in 142 Africans, 117 Europeans, and 61 East Asians. STRP heterozygosity was quite similar among all caste populations, with an average of 69%. The average heterozygosity among tribal groups was somewhat lower (66%), and it varied considerably among populations, with a range of 54% to 74%. The Fst value for the caste populations was relatively small (0.9), but the Fst value for the tribal populations (4.8%) was slightly higher than for our collection of sub-Saharan African populations (3.7%). Genetic distance analyses show that the caste and tribal populations occupy a position intermediate between E. Asian and European populations, as expected. In marked contrast to the caste populations, several of the tribal populations (Yanadi, Kattuniaken, Paniyan, and Chenchu) are extreme outliers on a neighbor-joining tree. These results are all highly similar using either STRPs or *Alu* insertion polymorphisms, and they are consistent with a much higher rate of genetic drift in the tribal populations than in caste populations. The matrix coalescent approach was applied to these data to estimate population growth parameters in caste vs. tribal populations, and these results will be discussed.

The people of Nebira, Papua New Guinea: subsistence, health, and disease.

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Human skeletal remains representing 44 individuals were excavated at Nebira, Papua New Guinea (AD 1000 – 1500). The majority of the remains are between 20 and 40 years of age, with a mean age at death of 27. This is surprising considering the plentiful hunting, fishing, gathering, and garden land that surrounded these people. In this study six dental conditions were examined to help determine the health and lifestyle of this population: caries, calculus deposits, wear rates, antemortem tooth loss, dental abscesses, and enamel defects. Overall, the people of Nebira display moderate dental health. Nevertheless, the prevalence of dental enamel defects in this group is high (65.5%), suggesting that they were affected by malnutrition and perhaps infectious disease at an early age. Malaria is hyperendemic in the area and may have contributed to the incidence of dental enamel defects and poor dental health. This is also evidenced by the fact that 48.3% of the population displayed evidence of cribra orbitalia suggesting anemia, possibly from malnutrition or dehydration and iron loss resulting from malaria. Furthermore, it is suggested that the population was shifting from hunting and gathering into agriculture as the primary means of subsistence. This transitional pattern of subsistence has health effects, and may have contributed to the high number of dental enamel defects seen in the sample. Through the examination of dental traits an overall picture of the dental health of this population has been obtained and questions concerning diet, food acquisition, and early age at death are addressed.

Stable strontium and geolocation: The first step in identification of deceased Mexican undocumented aliens, preliminary results.

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This study examines the development of a mass spectrometry-based method for the identification of region of origin through ICPMS analysis of strontium in the permanent first molar. Strontium isotope ratios present in teeth and bones

have been analyzed by archaeologist to investigate patterns of residential mobility and migration in prehistoric peoples. In this study a similar methodology is applied to forensic material to determine the region of origin for Mexican individuals that died while crossing the border into the United States. Strontium, absorbed through the small intestine, commonly substitutes for calcium and becomes fixed in the crystalline lattice of bones and teeth. Tooth enamel incorporates strontium only during amelogenesis which for most teeth takes place in early childhood. The isotopes of strontium are geologically specific, and through mass spectroscopy analysis can be traced to a geological source.

The teeth for this project came from several bay area clinics that donated the extracted teeth of their Mexican born patients. This preliminary investigation utilized the permanent molar teeth of 20 individuals from four different Mexican states. Each tooth was washed with dilute acetic acid to ensure the removal of any depositional contamination and processed following which, the tooth strontium was analyzed using Inductively Coupled Plasma Mass Spectrometry (ICPMS). The delta units obtained through this analysis were compared to known geological ratios for the provided area. The Strontium database results reveal four specific ranges for each of the four states involved in the analysis providing the possibility to determine state affiliation.

New body mass estimates for extinct Malagasy lemurs based on long bone geometry.

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Body mass estimates for "giant" extinct lemurs vary enormously depending on the independent variable used in predictions. Interpretations of life histories, relative brain size and other comparative aspects of lemur paleobiology are impacted by such choices. We offer new body mass estimates for sixteen taxa of subfossil lemurs based on cortical bone area at the midshafts of the humerus and femur. Biplanar radiographs were taken of 123 long bones; external diameters and cortical thicknesses were used to calculate areas using an elliptical model. We used the Polk et al. (2000) data set to predict body mass from the entire mammalian sample (N=177) and from the primate subset (N=85). Least squares regressions were computed from both raw and logged data; the latter estimates were adjusted for log-transformation bias.

Considerable intraspecific variation in estimates was observed; reference sample, regression equation, and individual bone all contribute to this variability. For example, the range of **mean** values for *Archaeoindris* is 150-188 kg; 72-101 kg for *Megaladapis edwardsi*; 39-51 kg for *Palaeopropithecus maximus*; 14-28 kg for *Babakotia*; 11-17 kg for *Daubenonia robusta*, 19-33 kg for *Archaeolemur edwardsi*; 30-40 kg for *Hadropithecus*; 8-15 kg for *Mesopropithecus globiceps*; and 9-14 kg for *Pachylemur insignis*. For five of the taxa, the new ranges do not include the prior estimates presented by Jungers et al. (2002), but the rank order correlation between the two data sets is highly significant (Spearman's rho=0.99, p=2.168E-13). Confidence intervals on estimates for **individuals** would greatly expand these ranges and impact comparisons and inferences accordingly.

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Preliminary examination of skeletal remains excavated between 1999 and 2004 at Gz 4, an early medieval cemetery site in Giecz, Poland.

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Excavations at site Gz 4 in Giecz, Poland have been conducted by the Muzeum Peirwszych Piastow archaeological team since 1999 and are on-going. More than 160 burials have been excavated thus far with an unknown number still remaining interred. This collection, subsequently referred to as the 'Giecz Collection', represents an early medieval population of a historically important region of Poland. The graves were interred adjacent to a 'stronghold', an earthwork serving as a defensive military post, in the center of the newly developing Polish State during the 10th to 11th centuries.

During the 2003 and 2004 field seasons, an inventory of the Giecz Collection was conducted and analysis was undertaken to determine sex, age-at-death, and stature. The preliminary paleodemographic profile reveals a high infant mortality rate (22% of recorded population, n=35), yet the majority (55%, n=88) of the total recorded population survived to adulthood, predominantly (24% of adults, n=39) surviving to middle adulthood (35-50 years). In the adult population, approximately 48% (n=42) are male, 9% (n=8) are possible male, 34% (n=30) are female, 3% (n=3) are possible female and for the remaining 6% (n=5) sex cannot be confidently determined.

Pathologies observed include severe attrition, enamel hypoplasia, periodontal disease, spinal osteophytosis, porotic hyperostosis, cribra orbitalia, osteochondritis dissecans, periostitis, button osteomae, Schmorl's nodes, DISH, severe arthritis with eburnation, sharp force trauma and numerous healed fractures. Thorough analysis and documentation of pathology and trauma is planned for the coming seasons and a complete skeletal report will follow.

Improved method for genetic sexing of ancient humans.

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Anthropological research has shown that kinship and sex represent basic units of social organization in ancient and contemporary populations. In particular, sex identification can inform researchers about social stratification, division of labor, patterns of descent and demographic factors such as population structure and differential mortality/morbidity. While osteological methods exist for sex determination, there are several problems associated with these methods, and they are not always applicable to all skeletal assemblages. As most skeletal features fall along a continuum, morphological methods can misidentify individuals that fall outside of the typical range of characteristics designated as "male" or "female," and sex determination of juveniles and fragmentary material is not always possible.

Genetic sex determination of ancient remains has proven to be a valuable alternative to morphological techniques, particularly in situations such as those described above. The majority of genetic sex identification methods are based upon the amplification of the amelogenin gene, which has homologous copies on the sex chromosomes containing significant sequence variation. While useful, the disadvantages of these methods include an increased potential for contamination during the handling of amplified DNA as well as low sensitivity due to electrophoretic detection systems. We propose to overcome these disadvantages by applying real-time PCR, established in other fields such as forensics, to the sex determination of ancient individuals. Preliminary applications of this new method to ancient samples from various sites have proven successful. Given the difficulty of sex iden-

tification for particular ancient samples, real-time PCR represents an important emerging tool for anthropological research.

Male dominance relationships and intra-tree feeding heights in Kanyawara chimpanzees.

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Outside the mating context, the consequences of high male dominance rank have remained largely unexplored in wild chimpanzees (*Pan troglodytes*). Here, we test the hypothesis that high-ranking males of the Kanyawara chimpanzee community in Kibale National Park, Uganda receive priority of access to the best feeding sites within fruit trees. Previous work at this site (Houle, 2004) has shown that the quality of chimpanzee feeding sites increases with height within fruit trees. That is, higher feeding sites within tree crowns offer more fruit per area and fruits with more pulp.

We recorded chimpanzee feeding heights at Kanyawara for 17 months (Sep. 2002 – Jan. 2004), and predicted that when co-feeding, high-ranking males would feed above subordinates. A matrix correlation test revealed that dominants tended to feed above subordinates ($p = 0.01$). A second analysis showed, however, that the only significant difference in feeding height was between low-ranking males and the rest of the males in the community. When co-feeding, low-ranking males fed lower than middle- ($p < 0.05$) and high-ranking ($p < 0.01$) males and the alpha male ($p < 0.01$); however, there was no difference in feeding height between the latter three categories. The rank-related feeding height difference is best explained by a difference in feeding priority, since it was only present during the feeding context and neither age nor asymmetries in physical ability could adequately explain this pattern. These findings represent the first empirical evidence of male contest competition over feeding sites in fruit trees in chimpanzees.

Biodistance, regional gene flow and the ossuary tradition on the Late Woodland (AD 800-1650) North Carolina coast.

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Recent critiques of biological distance have characterized the practice as hopelessly typological and therefore antithetical to population-based research and interpretation in bioarchaeology. Analysis of dental discrete traits from Late Woodland North Carolina coastal ossuaries, however, provides a strong case for the relevance of biological distance to the re-evaluation of antiquated and untested archaeological classifications. Previous to the current study, ossuary sites were assigned both a cultural and linguistic label based on rough estimates of skeletal robusticity. To test the underlying "genetic" assumptions of this ethnolinguistic model, discrete dental data was collected following Scott and Turner (1997) for 45 traits from a total of 944 individuals across 13 coastal ossuary sites. No statistically significant differences were found between the North Carolina groups. Significant differences were observed, however, between North Carolina ossuaries and comparative skeletal samples (using the 13 traits suggested by Nichol and Turner 1986 for minimizing interobserver error) from the Georgia and Florida coast (Griffin et al. 2001). These results indicate that the North Carolina ossuary populations cannot be considered biologically distinct from each other, as the older model implied. Additionally, following work by Hutchinson and Aragon (2002), this research suggests that a longstanding, region-wide tradition of ossuary burial may encourage significant gene flow between groups, irrespective of mortuary site formation and persistent linguistic, cultural or political differences.

Factors influencing the biogeography of anthropoid primate community structure in Africa.

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Africa exhibits a wide array of habitats and an equally diverse number of primate communities. This variation in primate community structure may be influenced by several factors. For example, species may prefer specific habitat characteristics such that they will only disperse into these locales if they are available. Alternatively, primate taxa may move to adjacent areas, placing less importance on the habitat type. Over time, these factors should influence the species composition of primate communities. Therefore, in this study, the relative importance of environmental similarity and geographic distance among individual primate communities were examined in relation to species composition of the overall anthropoid community. Data for over ten African primate communities were gathered from the literature. Partial Mantel tests were conducted to examine the correlation between geographic distance and similarity of anthropoid primate species composition among communities while controlling for environmental similarity among sites. A similar analysis was conducted between community composition and environmental similarity with geographic distance held constant. The results showed that there was a significant negative correlation between the geographic distance among communities and their species composition, when controlling for environmental similarity. In addition, there was no relationship between the species composition of communities and their environmental characteristics, when controlling for distance among communities. These results suggest that the proximity of primate communities to each other may be more important than the environmental characteristics at these locations.

Low social status and soy protein increase insulin sensitivity in premenopausal monkeys.

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Decreased insulin sensitivity is thought to be a stage in the development of the metabolic syndrome, and hence a predisposing factor to diabetes and cardiovascular disease. Here we describe a study assessing the influence of soy protein and behavioral stress (subordinate social status) on insulin sensitivity among 86 adult female cynomolgus monkeys (*Macaca fascicularis*) housed in social groups of 5 or 6 animals each. Social status (dominant/subordinate) was based on the outcome of fights within each group. Monkeys initially consumed a diet derived from animal sources and relatively high in fat and cholesterol. Half of the monkeys continued eating this diet for 16 months while the remainder consumed a diet that substituted isolated soy (containing a human equivalent of 130 mg total isoflavone/day) for animal protein. All animals were then subjected to an intravenous glucose challenge, with blood samples for the determination of glucose and insulin concentrations taken at the time of injection and again after 5, 10, 20, 30, and 60 minutes. Diet and social status independently affected baseline and body weight-adjusted insulin responses (Diet: $F = 5.17$, $p = 0.02$; Status: $F = 6.37$, $p = 0.02$), with subordinate monkeys and those consuming the soy diet displaying

30% decreases in insulin response. Integrated glucose clearance ("K") did not differ by treatment or status. These results suggest that both soy protein and (surprisingly) social subordination increase insulin sensitivity; the latter effect may reflect either the disordered (episodic) eating common to subordinate monkeys or a perhaps time-limited response to stress.

Relationships of male condition, sociality, ranging and habitat use in the Slender Loris (*Loris tardigradus*) in Kalakad-Mundanthurai Tiger Reserve, India.

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This study addresses the socio-ecological determinants of habitat use among the male slender lorises (*Loris tardigradus*) in India. I examine 1) morphological and behavioral variables characterizing three types of males and 2) differing range size and habitat use of such males. Mundanthurai plateau of the Kalakad-Mundanthurai Tiger Reserve contains deciduous forest with patches of plantations, moist, riverine, and scrub forest.

During 2002-2003, 22 adult males were radio-collared or marked, then followed at night and at daytime sleeping sites. GPS unit was used to locate sleeping sites and night ranging. An index of body condition was made using factor analysis of morphometric variables (body weight and girth, and face width loaded in Factor 1). The three male types differed in general ranging pattern and association with females. Such males differed in body condition ($p<.01$) and testes volume ($p<0.001$), with settled paired (n=10) and settled unpaired males (n=4) exceeding roaming males (n=6). Range size paralleled these differences, maximum of 5 ha in settled paired, 20 ha in settled unpaired, and 150 ha in roaming males. Habitat structure (canopy structure and type, patch type) within home ranges varied among males. Females and settled males occupied closed canopy patches, whereas roamer males were relegated to open patches ($p<0.0001$).

As is the case with other recent studies of nocturnal prosimians, lorises do not have a simple social system where males and females are both solitary foragers with small ranges. More in depth studies combining behavior, genetics and ecology are required to fullyunderstand the loris social system.

Intergroup encounter variability among brown capuchins (*Cebus apella*) in Suriname: importance of individual troop identity.

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Between group competition is a determining factor in brown capuchin (*Cebus apella*) behavioral ecology. Frequency and aggressiveness of intergroup encounters (IGEs) may be correlated with aspects of capuchin social organization and behavior patterns such as troop size, age and sex composition of the troop, foraging decisions and patterns of dispersal. Intergr oup encounters of brown capuchins in Raleighvallen do not appear to follow any predicted patterns but are variable according to intertroop dynamics.

In Raleighvallen, Suriname, IGEs between capuchin troops are common. During 8,000 hours of data collection conducted over a four-year study period, we observed a total of 354 IGEs involving nine different *C. apella* troops. Most IGEs involved two or three troops in various group combinations, with biases toward certain troop pairs. The frequency of these encounters varies by group pair and 68% of all observed encounters occurred between two particular groups. The presence of aggression, however, does not correlate with IGE frequency. In addition, group size and composition does not correlate with IGE frequency or presence of aggression. Natal males participate more in IGEs than immigrant males; natal males, however, may lessen their participation as they near the time of their own emigration. Intergroup encounters occurring over food resources accounted for 23% of all IGEs and 63% of these IGEs involved one particular food resource – bamboo patches.

Three newly discovered skulls of *Homunculus patagonicus* support its position as a stem platyrrhine and establish its diurnal arboreal folivorous habits.

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Three remarkably well-preserved skulls, a mandible, and the distal two thirds of a humerus of the early Miocene platyrrhine *Homunculus* were recovered in 2003-2004 from Patagonian Argentina at 52^0 south latitude. These finds nearly double the number of known early Miocene crania from the SA continent. A phylogenetic analysis of cranial, dental and postcranial characters suggests that *Homunculus* was a stem platyrrhine, as indicated by the absence of derived characters shared by the clade of extant platyrrhines. For example, *Homunculus* is more primitive than in living platyrrhines in having well-developed molar hypoconulids, a P4 hypocone, and upper molar paraconules. The skull structure is more primitive in having the 'catarrhine' (primitive anthropoid) suture pattern at pterion, an infraorbital foramen positioned posteriorly on the face, and a robust posterior nasal spine. Furthermore, the nuchal plane forms an angle steeply oblique to the Frankfort horizontal.

Homunculus was about the size of a cebus monkey - 2-3 kgs. It does not appear to have been sexually dimorphic. CT-scans reveal an endocranial volume (brain) that is relatively small for a platyrrhine. A small olfactory fossa (and olfactory bulbs) and small orbits with enlarged optic canals suggest diurnal habits and an anthropoid-like level of visual acuity. Molar shearing is well developed, suggesting a mixed folivorous/frugivorous diet. The femur (described previously) is unusual (and primitive for a platyrrhine) in having a deep and narrow knee joint and suggests that leaping played a significant role in the locomotor repertoire. The morphology of the humerus suggests that *Homunculus* was adept at above-branch quadrupedalism.

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Academic genealogy on the history of American field primatologists.

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In this paper, we present the genealogy of American field primatologists. Data for this genealogy have been collected from three main sources: 1) e-mail surveys 2) library and Internet research and 3) verbal communication through forums such as national primatology meetings. Lineages of primatologists have been displayed graphically using Microsoft Visio. As of July 2004, 498 names and 191 affiliated universities, organizations and institutions have been recorded in the genealogy. The names have been cataloged into thirteen distinct lineages as well as some

remnants. Of these lineages, that derived from Sherwood Washburn and fifteen of his former students is the largest; 44.4% of the current genealogy is linked to the Washburn lineage.

Since Washburn's time, fifteen primatologists who have influenced American primatology have been major advisors for ten or more PhD graduates. Eight of these major advisors are a part of the Washburn lineage. American field primatology has been growing steadily since the mid 1960's and is becoming increasingly interconnected with zoology/primatology, most notably through the influence of zoologists from England, Western Europe and Japan. Conversely, the Washburn lineage is still primarily comprised of anthropologists. In conclusion, we have found that American field primatology is a rapidly growing discipline that is becoming infused with primatology from abroad yet is still heavily influenced by the teachings of Sherwood Washburn.

Histologically determined age at first molar emergence in Pongo pygmaeus.

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Age at M1 emergence scales differently in relation to body mass among primate higher taxa. The scaling relationship for great apes is unknown because M1 emergence data exist for only one species, *Pan troglodytes*. Here we present data on age at M1 emergence in an individual of another great ape species, *Pongo pygmaeus*. M1s begin to form just before birth in all higher primates, so that age at M1 emergence can be determined by calculating the duration of M1 crown and root formation in individuals that died during M1 eruption.

The emerging maxillary M1 of a wild-shot Bornean orangutan infant was extracted and four ~100 μm thick sections were produced. Using counts of the incremental growth lines preserved in enamel and dentine, M1 crown formation time was calculated at 2.9-3.0 years, while the approximately 5 mm of root formed in 1.8-1.9 years, yielding a total M1 formation time of 4.7-4.9 years. Since the mesial cusps had just reached the occlusal plane, age at gingival emergence was estimated to be about 4.6 years. This is outside the known range for captive chimpanzees (2.1-4.0 years), and is greater than the recently published age at M1 emergence for one wild chimpanzee (4.1 years). The latter value, and the M1 emergence age for *Pongo* presented here, tentatively suggest both a positive slope in the scaling relationship for age at M1 emergence in apes, as well as a great ape M1 emergence/body mass regression line that is elevated compared to that recently published by Kelley & Smith (2003).

Dietary carbohydrates (C_3, C_4, marine) influence collagen stable isotope values and the collagen to apatite offset in diets with normal protein levels.

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Recent stable isotope studies of ancient human diet assume that $\delta^{13}C$ values of bone apatite reflect those of the total diet while $\delta^{13}C$ values of bone collagen reflect those of dietary protein. In combination, the experimental feeding data support the former assumption; but the relation between collagen $\delta^{13}C$ values and dietary protein is variable. Bone collagen values show input of dietary carbohydrate (C_3 and C_4) on all diets but the collagen to apatite offset is smaller with C_3 carbohydrates (0-5‰) than with C_4 carbohydrates (5-11‰) irrespective of the type of dietary protein. The data sort into three parallel but significantly different regression lines according to type of dietary protein. The few faunal field studies reporting carbon isotope data from both bone collagen and apatite largely match the experimental data. Seals, C_3 consumers, and C_4 consumers fall on the marine, C_3, and C_4 protein lines, respectively, with one exception, a zebra, which probably reflects dietary selectivity. Where diets can be reconstructed from floral and faunal data, most archaeological populations follow these patterns. Ontario pre-agriculturists, Cahokia, and a Georgia Late Woodland sample fall along the C_3 protein line, as expected. Fisher-hunter-gatherers from Tierra del Fuego and the southwestern Cape, South Africa fall near the marine protein line. In contrast, Ontario and Maya agriculturists, and California island foragers fall above their expected regression lines. This suggests that these groups relied on C_4 proteins or foods to an extent greater than previously recognized.

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Mitochondrial DNA variation among populations of Mesoamerica and the American Southwest: Does Uto-Aztecan represent a biological unit?

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Anthropologists have long noted the archaeological, cultural, and linguistic parallels between indigenous populations residing in Mesoamerica and the American Southwest. The most notable ties are the northward spread of agriculture from central Mexico into the Southwest and the presence of Uto-Aztecan speaking populations in both regions. Thus, it has been suggested that proto-Uto-Aztecan speakers were responsible for the spread of agriculture, possibly taking the form of a northward human migration. If true, Uto-Aztecan speakers from both areas should be more genetically related than they are to non-Uto-Aztecan speaking populations, regardless of geographic location.

This hypothesis was evaluated by assigning the mtDNA of over 900 individuals from fourteen extant populations (Uto-Aztecan and non-Uto-Aztecan from the Southwest and Mesoamerica) and one pre-Columbian population (Aztecs from Tlatelolco, Mexico) to one of the five Native American haplogroups: A, B, C, D, or X. These data exhibit a pattern of regional continuity and, therefore, substantial difference between regions. Additionally, the haplotypes (from the sequence of hypervariable regions I, II, and III) of over 700 of these individuals were identified. Analyses of these data demonstrate that very few maternal lineages are shared between populations and network analyses demonstrate that the majority of clades are geographic, not linguistic. The patterning of mtDNA variation suggests these regional genetic differences are of great antiquity and opposes an accompanying human migration with the spread of agriculture. We, however, point out alternative possibilities not covered by our investigation, but that are currently being tested by other colleagues.

Principle figures in early 20th century physical anthropology.

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Writing in 1918, Ales Hrdlicka asserted that "The actual birth of a new science

may be counted from the commencement of substantial research work in the new field, which in due time is followed by … a gradual development of regular instruction and means of publication." While Hrdlicka sets the date of 1866 for the beginning of this level of academic maturity of American physical anthropology, it is in the first half of the 20th century that historians of science recognize the emergency of an "American School" of physical anthropology. The present study defines and describes the *Weltanschauung*, research foci, curricula and principle figures marking the advancement of our discipline from 1900 to 1950. Selecting teaching and curricula of undergraduate and graduate training as significant indicators of what American academic and institutional masters of our discipline thought their students should know, a survey of numbers of courses offered in 1902, 1940 and 1950 from a series of 54 to 600 universities is analyzed in the present study. It is concluded that the character of physical anthropology in the first half of the 20th century is definable by some concepts no longer acceptable after. It is from this "grandparental" generation of scholars that we have inherited the broad spectrum of modern research areas including recovery of a rich hominid fossil record, primatology, forensic anthropology, human biology relating to studies of growth and development, adaptation to changing and different ecological settings, nutritional anthropology, dental anthropology, molecular biology and genetics, and the history of our discipline.

Is the Vindija late Neandertal mandibular sample biased?

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The Vindija late Neandertal sample has been described as transitional between the earlier Neandertals from Krapina and modern humans. However, the morphological differences indicating this transition may rather be the result of different sex and/or age compositions between the samples. A previous analysis (J. Hum. Evol. 43: 419-432) indicated that sample bias could not explain the differences observed between the Krapina and Vindija supraorbital samples. The current study tests the hypothesis that the metric differences between the Krapina and Vindija mandibular samples are due to sampling bias. We focus upon the mandibles because past studies have posited this region as second only to the supraorbital region as indicative of the Vindija sample's transitional nature.

We analyzed four chords and one index that indicate that the Vindija mandibular sample is more modern-like than the mandibles from Krapina. For each variable, we analyzed relative sample bias of the Krapina and Vindija samples using three resampling methods. The forms of sample bias we tested were: 1) the Vindija sample contains an overrepresentation of females and/or young while the Krapina sample is normal or female/young biased, 2) the Vindija sample is female/young biased while the Krapina sample is male/old biased, and 3) the Vindija sample is normal while males and/or old are overrepresented in the Krapina sample. Unless we assume that the Vindija sample is female/young and the Krapina sample is male/old biased, our results falsify the hypothesis that the metric differences between the Krapina and Vindija mandibular samples are due to sample bias.

Stature at the site of Hierakonpolis compared with earlier and later periods.

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Hierakonpolis is a site in Upper Egypt that represents the transitional from Predynastic to the Dynastic periods (5000-3100 BC). This drastic social change to the formation of the Dynastic state was associated with the intensification of agriculture. These changes in the subsistence strategy should be reflected in the skeletons of the people.

Stature is a measure not only of human health, but also of subsistence strategy and economy. In this study, the stature of 86 adult individuals (39 males and 47 females) from the HK43 Predynastic cemetery at Hierakonpolis was calculated and compared with the calculated stature from earlier El-Badari (6 males and 4 females) and with Abydos and Al-Amrah (11 males and 11 females) later sites. All these bones were measured using the same methods, and stature was computed using the same equations derived by Robins and Shute (1986) specificly for Egyptian samples.

The results show an increase of human stature from the Badarian period and slightly stable stature during the later periods. This can be explained as by health status being decreased during the intensification of agriculture resulting in the short stature of the Badarians and increasing during the later periods, including the societal transition to Pharonic society, with the development in agriculture. The increased availability of food during these later periods resulted in the relative stability of stature.

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Dietary reconstruction of *Archaeolemur* using dental topographic analysis.

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The diet of *Archaeolemur*, subfossil lemur of Madagascar, has been reconstructed as similar to that of: (1) papionins, subsisting mainly on fruit; or (2) *Cebus apella*, an omnivore and hard-object specialist. Greater folivory and consumption of tough but pliant vegetation has also been suggested. Some researchers have noted evidence of hard-object trituration, even in very young *Archaeolemur*.

We use GIS-based, 3D dental topographic methods with standard univariate (ANOVA with Tukey's posthoc test of Honestly Significant Differences) and multivariate (Principal Component and Discriminant Function) analysis to compare the morphologies and macrowear patterns of maxillary dp4 and M1 in *Archaeolemur*, an extant papionin (*Macaca fascicularis*), an extant folivore (*Alouatta palliata*), and an extant hard-object feeder (*Cebus apella*). Specifically, we ask: (1) Are the deciduous and permanent molars of *Archaeolemur* more like those of macaques, howlers, or capuchins? (2) Does dp4 function like M1 in each of the study species, and do functional characteristics change with normal wear? (3) Is there an ontogenetic wear signal that is common to species as diverse in diet as macaques, howlers, and capuchins? The relief and crest characteristics of both dp4 and M1 of *Archaeolemur* are remarkably like those of *Cebus apella*; both taxa exhibit low cusp relief and strong development of transverse as opposed to mesiodistal crests. Despite consistent changes in relief characteristics across three ontogenetic stages in all taxa, dp4 captures the occlusal morphology of M1 in each. Taxon-specific relief characteristics are not obliterated by wear.

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Eye morphology in *Eulemur* - evidence of cathemeral adaptation.

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The visual systems of cathemeral mammals are subject to selection pressures that are not encountered by strictly diurnal or nocturnal species. In particular, the cathemeral eye and retina must be able to function effectively across a broad range of ambient light intensities. Due to the mutual antagonism between most adaptations for increased visual acuity and sensitivity, cathemeral lemurs are expected to resemble other cathemeral mammals in having eye morphologies that are intermediate between those of diurnal and nocturnal close relatives. However, if lemurs only recently adopted cathemeral activity patterns, then cathemeral lemurids would be expected to demonstrate eye morphologies more comparable to those of nocturnal strepsirrhines. Both predictions were tested through a comparative study of relative cornea size in mammals. Intact eyes were collected from 147 specimens of 55 primate species. Relative corneal dimensions of these primates were then compared with the known eye morphology of 135 non-primate mammal species. This analysis reveals that the five extant species of the cathemeral genus *Eulemur* have relative cornea sizes intermediate between those of diurnal and nocturnal strepsirrhines. Moreover, all *Eulemur* species have relative cornea sizes that are comparable to those of cathemeral non-primate mammals and significantly smaller than those of nocturnal mammals. These results suggest that *Eulemur* species resemble other cathemeral mammals in having eyes that are adapted to function under variable environmental light levels. These results also suggest that cathemerality is a relatively ancient adaptation in *Eulemur* that was present in the last common ancestor of the genus (ca. 8-12 MYA).

Biology and genetics of the metabolic syndrome.

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The metabolic syndrome is characterized by a cluster of clinical components including: obesity, increased waist circumference, glucose intolerance, increased plasma triglycerides, decreased HDL cholesterol and elevated blood pressure with high propensity for type 2 diabetes and cardiovascular disease. Central to its biology are morphologic, biochemical and proinflammatory precursors, including visceral adiposity, insulin resistance, preponderance of plasma dense LDL and HDL profiles and increased circulating cytokines/adipokines and endothelial hyperactivity/adhesion markers. In the search for its genetic etiology, we phenotyped and genotyped 504 families of predominately Northern European ancestry and localized several QTLs influencing its phenotypes. These QTLs have been confirmed in multiple independent studies. Furthermore, we identified three novel positional candidate genes, APM1, PARL and SELS whose putative functions are related to biologic precursors of this syndrome.

We have comprehensively resequenced the three positional candidate genes in the discordant sibs of our families (not sharing the same allele by identity-by-descent and phonotypically) in order to identify all polymorphisms across the entirety of the whole gene. We then genotyped for all the common variants in these genes in the most informative families that contributed highly to the QTLs and who are genetically enriched with the metabolic syndrome. We utilized the Bayesian Quantitative Trait Nucleotide (QTN) Analysis to identify the causal polymorphisms and demonstrated significant associations between those polymorphisms and the phenotypic features and biologic precursors of the metabolic syndrome.

The results and conclusions from these studies are discussed.

Comparison of genetic and linguistic phylogenetic reconstructions as a means of investigating the evolution of the Semitic language family.

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Inference of the history of the Semitic language family has long been controversial. In order to address this problem, we have taken an interdisciplinary approach in which genetic and linguistic evolutionary relationships are compared through independent phylogenetic reconstructions of genetic and lexical data.

Our phylogenetic analyses of genetic data (mitochondrial control region DNA sequence from three Semitic-speaking populations) demonstrates that Ethiopic Semitic populations are basal relative to non-African Semitic-speakers. While greater antiquity of African populations relative to non-Africans is not surprising, genetic diversity has never been explicitly compared between African and non-African Semitic-speakers. This result suggests that if Ethiopian Semitic did originate in Arabia, it may have been introduced to Ethiopia in the absence of significant gene flow from a less diverse and evolutionary younger non-African population.

Concurrent analysis of lexical data (Bender's modification of Swadesh' 100-word lists for 15 Ethio-Semitic populations) using phylogenetic techniques borrowed from evolutionary systematics allows us to contrast population history, gene-flow and linguistic evolution within Semitic populations. Applying maximum parsimony and distance phylogenetic reconstruction methods to our lexical dataset, and comparing the resulting lexical and genetic phylogenies, we test alternative hypotheses of Ethio-Semitic language evolution. Our results largely support Bender's original classificatory scheme of Ethio-Semitic languages. Comparative analyses of genetic and linguistic phylogenetic reconstructions of Semitic-speaking populations should help resolve questions concerning the genetic and geographic origin of the language family.

Phylogenetic and functional analysis of primate carpal ossification sequences: a test of two methods.

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This study will analyse the phylogenetic and functional significance of differential timing of carpal ossification in a variety of primates. Comparative analysis of ontogenetic sequences is potentially a rich source of phylogenetic data. Sequence of appearance of primary and secondary ossification centres has been relatively thoroughly studied in a number of primate species. The sequence of appearance of carpal ossification centres is highly variable in contrast to a remarkably conservative sequence in tarsal ossification, suggesting perhaps a phylogenetic and/or functional significance in the former. This change in developmental timing that alters the chronological order of the appearance of carpal ossification centres is known as sequence heterochrony (Smith, 2001). Recently, two methods have been developed that permit comparative analysis of sequence heterochrony in a phylogenetic context: 1) event-pairing using MacClade (Mabee and Trendler, 1996; Smith, 1997, 2001; Velhagen, 1997) and, 2) search-based character optimization using POY (Schulmeister and Wheeler, 2004). Both of these methods are used to analyse the potential phylogenetic and/or functional significance of carpal ossification in 12 haplorhine species and three non-

primate, mammalian outgroups. Carpal sequences are taken from the literature and used to 1) create a phylogeny and, 2) map carpal sequence characters onto an independently-determined phylogeny. Both methods render phylogenies that are largely unresolved and not congruent with accepted phylogenetic relationships, suggesting a strong functional signal. Character mapping suggests that the sequence of carpal ossification is generally correlated with broad locomotor groupings but that functional significance is best interpreted at a more specific level.

Relationships between health, burial, and social structure at Úcupe (Zaña River Valley): a new perspective on the Chimú of ancient Northern Coastal Peru.

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Associations between funerary patterns, skeletal biology, and social structure hold significance for understanding ancient societies, particularly on the pre-Hispanic north coast of Peru. In this study, we test two hypotheses: 1) health outcomes are shaped by social factors, and 2) burial platforms of Peru's pre-Hispanic Chimú Empire (AD 1200-1460) were exclusively for Chimú elite and accompanying young female sacrifices, as suggested by a handful of previous studies.

To test these hypotheses, we integrate mortuary and bioarchaeological analyses in the study of 32 individuals excavated from a Chimú burial platform and cemetery in provincial Úcupe. Osteological age assessment (dental development, epiphyseal fusion, and cranial /pelvic morphology) revealed multiple infants and a group of old adult women. In particular, the women lacked skeletal lesions indicative of nonspecific infection. With very few exceptions, they also lacked moderate to severe degenerative joint lesions in the vertebral column, shoulder, hip, elbow, and knee regions. We accept the first hypothesis. The majority of the women were likely retainers associated with the elite, buffered from disease and habitually strenuous labor due to specialized social status. However, we reject the second hypothesis on several grounds, particularly as the old women were not sacrificed and encoded burial symbolisms of ethnic identity indicate both foreign Chimú and local Mochica peoples were interred together. These findings deepen preliminary bioarchaeological perspectives of Chimú culture, and contribute to the emerging understanding of society and skeletal biology on the north coast of Peru.

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Human infant sleep locations as determined by primiparous adolescent and adult mothers.

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Relatively little is known about how parents care for their infants at night. Studies of the ecology of nighttime parenting behavior have become a focus of medical and anthropological inquiry only within the last decade. Previous studies have shown that factors intrinsic to the infant intersect with care-giving decisions and parental expectations to determine where an infant will sleep on any given night (Ball, 2002). Blanket recommendations for where all infants should sleep ignore the fluidity of infant sleeping locations and fail to acknowledge the reasons parents choose to relocate infants. Publicly preferred and reported arrangements often differ from those actually practiced (McKenna, 2000). The purpose of the present study is to identify the range of infant sleeping locations and to determine what infant behavior, if any, precipitates change in nighttime arrangements. By studying where parents put infants to sleep and what nighttime events result in a change in sleeping locations, health care practitioners can better design safety recommendations that apply to a variety of sleeping locations, and that acknowledge the fluidity of arrangements for individual parents across time. Overnight infrared video recordings were collected at the Mother-Baby Behavioral Sleep Laboratory. Participants were allowed to maintain typical sleeping arrangements and routines, and all caregiver interventions were performed at will. Data were obtained on a sample of four-month-old infants with twenty-four primiparous adolescent mothers (mean 17.4 years) and fifteen ethnically-matched high-resource adult mothers (mean 25.4 years), (56.4% Caucasian, 43.6% African-American, and 1.0% Mexican-American). Group differences in sleeping location, crying, and feeding practices were analyzed so that information could be acquired to facilitate safer infant sleep.

The effect of group size and season on diet and activity budget of Phayre's leaf monkeys (*Trachypithecus phayrei*).

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Scramble competition for food is expected to affect behavior whenever food is limiting. Folivorous primates in general are believed to be less limited by food and should thus experience less scramble competition. To investigate the effect of group size and season on diet and activity we studied Phayre's leaf monkeys (*Trachypithecus phayrei*) at Phu Khieo Wildlife Sanctuary (Northeast Thailand). Dawn to dusk follows were conducted on three groups varying in size from nine to 24 members over more than eight months. Behavior was recorded using 30-minute scan sampling of adults. We considered five activity categories (feeding, inactive, social, travel, other) and recorded diet in gross categories (item, part, age). The monkeys spent about half of their time inactive and a quarter feeding, while six percent was devoted to social activities and 17 percent to traveling. The diet consisted mostly of leaves plus about a quarter fruits. Activity was strongly influenced by season with significant variation in feeding and traveling time while group size had no effect. However, the largest group was the least frugivorous. In addition, increased travel and decreased feeding time matched an increased amount of fruits in the diet. Our results are largely consistent with earlier reports for the genus *Trachypithecus*. The absence of a strong group size effect is expected for a leaf-eater. However, the variation in diet and activity indicates that scramble competition in folivorous primates will largely depend on the degree of frugivory, which in turn varies with season.

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Polygenotype-environment interaction and the Boas immigrant data.

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The Boas immigrant dataset has recently seen a resurgence of interest, with a number of studies published using methods not available to Boas in the pre-computer era. These analyses have tended to take alternative views on the importance of polygenotypic effects as versus environmental plasticity. In this paper we re-analyze the Boas dataset with an eye to characterizing the effect of poly-

genotype-environment interaction on the cephalic index.

We use data on 13,732 individuals taken from Clarence Gravlee's website (http://lance.qualquant.net/boas). Treating the data as composed of many unrelated families and controlling for age at measurement and immigration status we estimate a narrow sense heritability for the cephalic index of about 0.74. This figure is an overestimate because it does not account for the different familial ancestries. Allowing for the original seven groups defined in Boas's study, the within-group heritabilities are substantially lower with none reaching above 0.60. This analysis shows that we cannot ignore the existence of group-structure in the Boas data, for to do so causes cephalic index to look "more genetic" (because of increasing the genetic variation around a grand mean). Neither can we ignore the effect of the environment, for as Boas and subsequent studies (as well as this one) amply demonstrate, groups' cephalic indexes are subject to differential responses following immigration to the United States. Consequently, the Boas data do not tell us whether cephalic index is about genes *versus* environment, but rather that the index is about genes *and* the environment.

New insights into the paranasal sinuses of *Callithrix jacchus*.

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The knowledge about skull pneumatization in New World monkeys is still scanty and contains many conflicting data, especially about the frontal pneumatization pattern. Because this information is crucial in order to draw further conclusions about the evolution and biological role of the paranasal sinuses, this study investigates the morphology of the pneumatic cavities in marmosets.

Volumes of the paranasal sinuses were calculated using the WinSurf Software® from serial coronal CT scans (pQCT) of a mixed-sex skull sample of adult marmosets (N=8). In addition, four heads of juvenile monkeys were serially sectioned frontally at a thickness of 7 µm. Sections were subject to digital microscopy and analyzed with the WinSurf Software®.

While both methods confirm the presence of a true maxillary sinus (MS), regarding the frontal sinus pneumatization, there are conflicts with the CT data and previous accounts. The histological analysis clearly suggests the absence of a true frontal sinus in Callithrix jacchus. Instead, the nasal cavity formed a frontal recess that enlarged into the interorbital region. This recess, however, never reached the upper border of the orbit, thus not forming a frontal sinus (*sensu stricto).* Reduced major axis regression analysis between MS volume and different cranial dimensions for Callithrix jacchus (and for available data from other platyrrhines) suggests a distinct association for this group, with Callithrix having one of the smallest MS. With regard to these results, this study points to some precautions of a solely CT based analysis of certain aspects of cranial morphology in small-sized primates.

Foramen ovale; lateral fossa: A previously undescribed plastic response of bone to pterygoid muscle forces.

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The foramen ovale contents are encased in a connective tissue sheath which is integrated with the pterygospinale ligament (sometimes muscle) and the surrounding lateral pterygoid muscle. Alternating muscle tension in contraction and relaxation moulds plastic bone proportional to these forces generated in life. This bone fossa can be measured and differs bilaterally with preferential chewing.

The mediolateral fossa dimension when multiplied by the average of the anterior-posterior measured at the foramen and at the lateral third of the fossa, which is parabolic, yields an algorithm for area. Data includes values by population, age and sex for statistical analysis. The chewing habits by group and intra-group are suggestive of cultural and/or genetic variation.

The population of Austrian skulls stored at USMNH used in this study includes ten males and ten females aged 14-70 years. Ten had left and ten right dominated chewing. The left was 0.526 sq. cm. (s.d. 0.214 sq. cm.) dominant side and 0.292 sq. cm. (s.d. 0.134 sq. cm.) lesser side. The right dominated gave reverse values 0.230 sq. cm. (s.d. 0.112 sq. cm.) and 0.557 sq. cm. (s.d. 0.221sq. cm). For the left dominant $t = 6.14$, $r = 0.788$ and right was $t = 6.7$, $r = 0.657$. Males differed right/left $t = 5.9$, females $t = 5.47$, $r = 0.934$.

This previously unrecognized skull feature can be measured to describe jaw function and may be an example of cultural/environmental adaptation. We see here an example of form (genetic) and function (environment) interaction.

Male mating behavior in black and gold howler monkeys (*Alouatta caraya)* in northern Argentina.

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As fitness of males depends largely on the number of females they inseminate, males are expected to compete actively for fertilizations. However in many species several adult males peacefully co-reside in the same social group. I investigated male mating behavior and tolerance in *Alouatta caraya* on Isla Brasilera (27º 20' S and 58º 40' W) in northern Argentina. Two multimale groups were followed 5-days a month from April 2003 to May 2004. We registered 156 copulations, 135 for the 7 males of the study groups and 21 for 6 males belonging to neighboring groups. In the study groups 48 copulations were extra-group (35.6 %) and 87 were intra-group (64.4%). Courtship, measured, as the exchange of grooming between partners before and after copulations was more frequent during intra-group than inter-group copulations ($G=83.11, df=1, p<0.001$). We found that extra-group copulations occurred most frequently outside of visual contact of other group members (N=51) ($G=47.75, df=1, p<0.001$). Intra-group copulations were not interrupted. However extra-group copulations always were interrupted by males of the female's group if observed (n=10). During inter-group encounters males vocalize and defend the group cooperatively. Multimale copulations, social tolerance and affiliative behavior may be associated with cooperative group defense in this species.

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Independent and social learning in the development of aye-aye tap-foraging skills.

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Aye-ayes (*Daubentonia madagascariensis*) differ from other strepsirhines in having a unique extractive diet characterized by a coordinated series of tapping, gnawing, and extraction. Despite the seemingly complex nature of these behaviors, no study has previously investigated how immature aye-ayes develop tap-foraging skills. Our objective was to explore the role of experience in the ontogenetic trajectory of tap-foraging components, as well as which learning mechanisms are involved in tap-foraging development. From 2002-2004 experimental data were collected at the Duke University Primate Center (DUPC), Durham, NC, on immature (n=6) and adult (n=6) aye-ayes. Wood blocks embedded with larvae were presented to subjects for a total of 700 introductions.

Results show that immature aye-ayes rely on experience, in the form of repeated exposure to wood blocks, to develop adult-level foraging efficiency, particularly gnawing precision and extraction skills. Infants often 'practice' tap-foraging skills, and spend an average of 34% of their time tapping and gnawing non-functionally. Immature aye-ayes also rely on social learning to develop tap-foraging skills. Immatures gnaw in locations previously gnawed by adults whether they are correct or incorrect (97.5% and 92.1% of adult locations, respectively), in contrast to adults, who gnaw in incorrect locations significantly less frequently (20% vs. 66.7% of correct locations). Immatures also frequently orient towards tap-foraging adults, and engage in peering and food-sharing behaviors. The apparent importance of learning reaffirms the complexity of tap-foraging behavior, and provides support for the needing-to-learn hypothesis as an explanation for the relatively late weaning age and slow overall development of the aye-aye.

Froude Number (Fr): Is it useful in comparing individuals with different leg lengths?

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Alexander has championed the use of the Froude number ($Fr = v^2/gl$, where v is velocity, g is the gravitational constant and l is leg length) as a way of accounting for size-related differences in the locomotion of dynamically similar animals. No one has specified, however, the magnitude of size differences or the taxonomic level at which the Fr correction accounts for the majority of the observed difference in locomotor parameters. Researchers have used Fr to compare animals at different levels, including among species, among groups within species, and among individuals.

Alexander and Jayes (1983) provides 5 gait variables that should vary predictably with Fr. Two of these variables (footfall pattern and duty factor) are not applicable to bipeds. I tested the 3 remaining variables (relative stride length, ground reaction force and power output) for an association with Fr in a group of humans (age = 7-50 years, leg length = 0.59-1.0 m). The data were derived from the literature and recent in-house gait analysis. Relative stride length varies predictably with leg length and velocity among humans, but ground reaction force and power output do not. Fr corrections do not account for differences among humans with different leg lengths. The question, thus, obtains: how should the locomotion of individuals with different leg lengths be compared?

Did Neandertals bury their dead? A taphonomic test using immature cranial remains.

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Whether or not Neandertals buried their dead is a contentious issue. Evidence commonly used to deduce intentional burial includes articulation of multiple skeletal elements, flexed body position, and presence of a burial pit. This study explores whether taphonomic preservation of immature hominin crania can be used to distinguish between intentionally buried remains and those covered by sedimentary processes alone. Because the immature cranium includes some of the most fragile parts of the hominin skeleton, its differential preservation should reflect differences in post-mortem disposal.

A landmark inventory of immature crania recorded the presence or absence of anatomical landmarks in pre-Neandertal (n=4), Neandertal (n=8), anatomically modern human (n=8), and modern human archaeological samples (n=272). From these data we developed a taphonomic vulnerability model of the immature modern human cranium subjected to intentional burial. This model was then compared with the fossil samples.

The fossil hominin crania were missing more landmarks on average than the modern archaeological specimens, and the patterns of vulnerability were similar in the different fossil groups. Neither Neandertals nor anatomically modern humans could be distinguished from the pre-Neandertal sample, and all groups showed a roughly similar pattern of survival of immature cranial parts. Thus, we were unable to confirm the hypothesis that immature Neandertal specimens were intentionally buried. We were equally unable to confirm the opposing hypothesis, that burial was not practiced prior to *Homo sapiens*.

Pelvic size and shape in a Later Stone Age southern African sample.

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In human females the bony pelvis must find a balance between being narrow to accommodate the mechanical requirements of efficient bipedal locomotion, and being large to accommodate a relatively large newborn. It has been demonstrated that taller/larger-bodied women have larger pelvic canals. This study investigates whether in a population where small body size is the norm, pelvic geometry (size and shape) is adapted to protect the obstetric canal.

Osteometric data (25 measurements) was collected from the pelvis (articulated and non-articulated elements), femora and clavicles (body size indicators) of adult skeletons of small-bodied Later Stone Age (LSA) foragers from southern Africa (n = 28 females, 31 males; mean estimated stature = 151 cm), and from the Hamann-Todd Osteological Collection (HT) representing the large-bodied sample (n = 40 females, 40 males; mean estimated stature = 162 cm). Patterns of sexual dimorphism are similar in both samples. While the LSA females have pelves that are smaller overall, they are not significantly smaller than the HT females for some obstetrically important dimensions of the pelvic canal (posterior spaces and outlet anteroposterior). Midplane and outlet mediolateral, and midplane posterior dimensions are not related to body size variables in either sex or sample. Principal components analysis of raw and Mosimann shape-variables support these observations, indicating that females from both samples have relatively larger pelvic canal dimensions, and the LSA females have relatively small canal inlets, but large middle and outlet planes. This study suggests that the small-bodied LSA females have large critical planes of the pelvic canal, and interestingly, that the LSA males also follow this pattern.

Beyond the thrifty gene: human life history, energetics, and the metabolic syndrome.

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Insulin resistance (IR) is a key component of the metabolic syndrome, which also includes adult onset diabetes, obesity, dyslipidemia, and hypertension. Evolutionary perspectives on IR (i.e. the thrifty gene hypothesis) have emphasized the possible adaptive value of the trait among ancestral populations faced with food shortage. A developmental perspective informed by life history theory suggests that the characteristics of IR may not have been sculpted by the genetic bottleneck of famines, but by the 'ontogenetic bottleneck' of malnutrition-related mortality during prenatal and early postnatal life. By shunting glucose away from use in peripheral tissues, IR helps protect cerebral metabolism under conditions of energetic stress. The challenge of protecting cerebral metabolism is exacerbated in humans owing to their relatively large brains, and is most acute during fetal life and infancy when the human brain consumes roughly 50% of total metabolism. Because mortality tracing to energy stress is most common at this age, the characteristics of IR may have been tailored to help boost early life survival. This perspective is supported by emerging evidence that fetal undernutrition leads to brain sparing, but also permanently alters susceptibility to IR and related conditions via developmental changes in the sensitivity of peripheral tissues to insulin. It is concluded that genetic and developmental influences on IR may allow the body's strategy of energy partitioning to be adjusted on multiple timescales – across generations and within single lifetimes. The health implications of these multiple influences on IR will be discussed.

Digestion, cheek pouches, and mechanisms of species coexistence: an evaluation of the cercopithecine nutritional niche.

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The niche concept and its role in elucidating community structure are central to modern ecology. Niches have been defined in many ways, with various components of "n-dimensional hypervolume" (Hutchinson, 1957) emphasized in species descriptions. Kinnear (1979), for example, demonstrated how symbiotic gastrointestinal microbes expand the trophic niche width of herbivores relying on those microbes for fermentation of structural polysaccharides.

In this paper, I expand upon the concept of the expanded nutritional niche and evaluate how coexistence is accomplished in species with high dietary overlap. I present digestive data on a set of cercopithecines in addition to data on cheek pouch use and diet collected in Kibale National Park, Uganda (1994-2002), on *Lophocebus albigena, Cercopithecus ascanius, C. mitis*, and *Procolobus badius*. The Kibale species exhibit considerable dietary overlap; e.g. the 3 cercopithecines overlap in >60% of their plant diet and all 4 species consumed 54% of total plant species. The cercopithecines consume a more diverse diet than the colobine; e.g. *C. ascanius* eats the most (13.4%) number of unique species and *P. badius* the least (2.9%). Cercopithecine cheek pouch use is more common with increasing numbers of inter- and intraspecific feeding competitors. I propose that the long digestive retention in cercopithecines expands their nutritional niche by facilitating a diverse diet and a capacity to switch resources. I further propose that these features, along with cheek pouches, serve as coexistence mechanisms in communities of species with overlapping diets. Implications of this model for explaining broader patterns of Catarrhine community evolution are discussed.

Grandma's right: A sleeping baby may be a growing baby.

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The irregularity of infant sleeping behavior is a significant biocultural issue, with much advice-seeking and offering with little scientific basis. This study aimed to investigate whether infant sleep patterns were a biobehavioral indicator of growth. Three independent statistical methods were used to test the hypothesis that the irregular increases and decreases in infant sleeping behaviors were related to episodic (saltatory) spurts in infant body length growth. Detailed daily diaries recorded the continuous patterns of sleep for twenty-four infants (15 females, 9 males) during the first year of life for durations of 4 to 12 months (n= 5660 daily records). Total daily hours of sleep and number of episodes were the variables studied. A pulse detection algorithm (CLUSTER) clarified that infant sleep irregularity consisted of sleeping peaks and troughs for all infants with an average of 4.7 more hours and/or 3 more naps per day for two days during peaks. These patterns were compared to previously identified growth spurts in body length by coincident analysis. Significant nonrandom copulsatility was identified between the two independently collected data sets (physical growth and sleep patterns) suggesting that daily sleeping behavior and growth in infant body length are a coupled biological process. Maximum likelihood logistic regression models quantified a 25% increased likelihood of a growth spurt for each hour the infants slept above their non-growth interval sleeping averages.

These data link behavioral state changes and the biological mechanisms underlying the timing and control of human growth spurts, adding growth biology to the enigmatic question of "why do we sleep?"

A three-dimensional analysis of the geometry and curvature of the proximal tibial articular surface of hominoids.

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Investigations of joint morphological variability are important for making functional inferences about range of motion and loading orientation. An understudied component of the knee joint is the proximal tibial articular surface, and an understanding of the functional implications of its geometry in hominoids has the potential to provide insights into the locomotor mode of early hominins. A preliminary study used discriminant function analysis (DFA) to identify both standardized AP and ML dimensions of the lateral and medial condyles and qualitative scores of lateral condyle curvature as having diagnostic value from a suite of 22 measurements. An expanded sample of extant hominoid proximal tibiae and seven fossil hominin casts were scanned with a Cyberware Model 15 laser scanner to create three-dimensional bone models from which measurements of articular curvature, surface area, and arc length were taken. Measurements were used to characterize and quantify the three-dimensional geometry and curvature of the articular surface in hominoids to create a comparative framework with which to evaluate the early hominin specimens. Standardized arc lengths were evaluated in a DFA which classified genera into groups based upon locomotor category, implying a dominant functional rather than phylogenetic signal in articular geometry. Fossil specimens clustered close

to the bipedal group but did not overlap with them. Patterns identified in joint curvature are discussed in terms of their implications for joint range of motion in different locomotor categories. Error introduced in the use of 2D caliper measurements compared with the 3D methodology is computed.

Reading social structure from the genome: some insights from Bali.

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In an ecosystem rife with water scarcity and the threat of disease and pests, Balinese farmers have evolved a cooperative system of water management that encompasses whole watersheds. Seeking to understand the historical genesis and development of this phenomenon, recently we began to supplement traditional archaeological techniques with DNA data from 24 Balinese farming communities. We studied fast-evolving (hypervariable segment 1 of mitochondrial DNA and 10 Y-chromosome short tandem repeats) and 67 slow-evolving single nucleotide polymorphisms (Y-SNPs) polymorphisms in 551 Balinese males from wet-rice cultivation subaks and from nearby highland dry-farming villages. A combination of phylogenetic and cluster analyses was employed to investigate patterns of relatedness in different Balinese farming communities. Phylogenetic analysis provides insights on questions having to do with the origins and history of particular lineages. Another technique, recently developed by Plotkin and Levin (2001, 2002) was used to examine patterns of relatedness within groups. This technique, which they call cluster analysis, is closely related to models of social networks. Our results from the comparison of observed versus simulated genetic data show clear differences in patterns of relationship between farmers in rice-growing areas (where cooperation is an engineering necessity) compared to horticulturalists in the highlands. A comparison of newer versus older rice-growing communities shows the emergence of genetic cluster patterns over historical time. Overall, it appears that over a time span of centuries, ecological feedback can influence social structure, and that these processes leave recoverable traces in population genetic structure.

Description, hypothesis testing, and conceptual advances in physical anthropology.

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Some of the presenters who participated in the symposium celebrating the 50th annual meeting of the AAPA in 1981 were highly critical of the discipline. In their view, there had remained a pervasive influence of description and typology on physical anthropology. Armelagos, Carlson, and Van Gerven, for example, argued that the "methodological entrenchment of taxonomy" and descriptive typology so characteristic of physical anthropology in the first half of the 20th century was a central perspective in skeletal biology research 30 years later. Although less explicit about trends in other areas of the field, other physical anthropologists had drawn similar conclusions (in Spencer, 1982).

How has the discipline changed in the intervening period since 1981? The purpose of this paper is to discuss how the field has developed in light of criticisms presented 24 years ago. Conclusions about the development of the field are drawn from the journals literature and key syntheses published in the last several years in the subareas skeletal biology/bioarchaeology, human and primate genetics, and primate behavior.

Viewed superficially, the publication and presentation of research findings is descriptive and some of the old typological frameworks linger. However, viewed in the context of new conceptual breakthroughs in the discipline, description plays a fundamental role in acceptance, rejection, and modification of hypotheses about human and primate evolution and variation. The influence of typology has substantially diminished in mainstream physical anthropology. As the discipline moves into the 21st century, physical anthropologists are contributing new understanding of the biological world.

The relationship between bone condition and DNA preservation.

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The purpose of this study is to investigate the relationship between gross bone condition and DNA preservation in the skeletal remains of 39 adult individuals from 19th century Euro-American coffin burials from central Indiana. A long bone from each individual was scored using a series of bone condition scales defined by the author. Five variables (delamination, epiphyseal loss, fracturing, root etching, and staining) were used to create a summary scale ranging from 0 (good preservation) to 23 (bad preservation). The 39 long bones were also seriated from best-preserved (0) to worst-preserved (39). Cortical thickness was measured at the point where each bone sample had been taken, near the midshaft. The individual condition variables, total bone condition score, seriated rank, and cortical thickness were then compared to the quantity of human DNA obtained from a one gram sample taken from each bone. The DNA from each sample was quantified using a primate-specific *Alu* DNA probe and chemiluminescent detection techniques. The bone condition scores and DNA quantity for each sample were compared using Pearson correlation. The results of this study indicate that there is a statistically significant relationship ($r = -0.350$, $p = 0.029$) between the amount of extractable DNA in a sample and the gross condition of the bone. Therefore, it is concluded that physical anthropologists confronted with choosing a bone for genetic analysis based on gross inspection alone should take a sample from a well-preserved bone with little fracturing in order to produce the greatest DNA yield.

Demographic analysis of a wild lemur population at Beza Mahafaly Special Reserve, Madagascar.

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A major goal of population biology is to understand the factors that determine population growth rate. Such factors can be both extrinsic and intrinsic, encompassing climatic as well as demographic variability. In addition, logistical factors such as imperfect census data hinder estimates of population growth rate. In this study, we develop matrix models that incorporate the effects of temporal variation, climatic patterns, and uncertainty of estimates due to imperfect census information. Our data come from a well-studied population of individually marked white sifaka (*Propithecus verreauxi verreauxi*). We develop a five-stage life cycle for the sifaka. Using multi-stage mark-recapture methods, we obtained maxi-

mum likelihood estimates of the parameters under a set of statistical hypotheses. Under these hypotheses, survival and/or growth were written as functions of time, rainfall in present year, and/or rainfall in previous year. All models accounted for the effects of imperfect census data. Using Akaike's information criterion, we selected the 5 best fitting models. The best model was a time-invariant model, followed closely by models that allowed survival and growth probabilities to be functions of rainfall. We used model-averaging techniques to average the top five models and performed several demographic calculations on this averaged model. Estimates of population growth rate were close to 1, implying a nearly stationary population. Survival probabilities of 2yr olds and pre- and post-reproductive adults increased with increasing rainfall, while yearlings and mothers had slightly decreasing survival probabilities with increasing rainfall. Our analysis makes explicit the steps required for the accurate estimation of demographic parameters in wild primate populations.

Genetic influences on dental variation in pedigreed baboons: QTLs influencing normal variation in second molar crown size and shape.

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We report statistical genetic analyses to detect, localize, and characterize quantitative trait loci (QTLs) influencing odontometric variation in 3 crown measures (mesial-distal length, plus mesial and distal buccolingual width) on mandibular and maxillary second molars (M2) of approximately 500 pedigreed baboons from the Southwest National Primate Research Center. Using a maximum-likelihood-based variance decomposition approach, we conducted multipoint linkage screens at 1 cM intervals across the 20 baboon autosomes and locus-specific analyses with X-chromosome markers. We detected significant evidence (LOD>2.71, genome-wide $P \leq 0.05$) for QTL on baboon chromosome 19 (PHA19, the baboon ortholog to human chromosome 19, HSA19), primarily influencing buccolingual width variation on multiple M2s. Additional linkage screens performed on M1 data yielded similar results. Subsequent bivariate multipoint linkage screens using paired M2 crown measures provided additional support for the PHA19 QTL (peak LOD = 4.63) and evidence for a second QTL on PHA3 (ortholog of HSA7 fused with HSA21; peak LOD = 2.83).

To further characterize these QTLs, we decomposed the matrix of additive genetic correlations between the six left quadrant M2 crown measures into two principal components (PC): respectively, PCI, a size component, and PCII, a shape component contrasting length and width, account for 75.66% and 15.50% of the variation. Results of multipoint linkage screens conducted on the PCI and PCII scores provided suggestive evidence that the PHA3 QTL influences variation in M2 crown "size" while the QTL on PHA19 influences variation in M2 crown "shape."

Changes in sexual dimorphism in Europeans in the last 30,000 years.

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In Europe, sexual dimorphism decreased from the Upper Paleolithic through the Mesolithic followed by a slight increase from the Mesolithic to the Neolithic. In all, the level of sexual dimorphism typical of recent Europeans was reached by the end of the Neolithic. Earlier work (Frayer, 1980) documented these trends by plotting means in sexual dimorphism in dental, cranial and postcranial metrics for the three periods, attributing the reduction trend to greater gracilization in males from the Upper Paleolithic to the Mesolithic. The subsequent increase in sexual dimorphism was a result of stabilization of the male trend, coupled with a decrease in female metrics from the Mesolithic to the Neolithic.

The previous study was conducted by pooling data into three time periods and testing for differences across these divisions. In this study, the pattern of gracilization over time was examined by tracking male and female metrics separately through the entire time span. Here, we treat the time period as a continuous sample and use an updated data set to address two questions: 1) the pattern of change in sexual dimorphism; and 2) the contribution of changes in each sex over time to the observed pattern of variation. We apply a data re-sampling approach and ask if changes occurred gradually through the 30,000 year time span. Our results confirm earlier work, but deepen the understanding of the temporal patterning of trends of sexual dimorphism in post-Neandertal European populations.

Spondylolysis patterning in two native Alaskan skeletal collections.

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The frequency and patterning of spondylolytic separations are examined in skeletal collections from Golovin Bay and Nunivak Island, Alaska. Previous researchers have observed high frequencies of spondylolysis among skeletal collections from the Canadian Arctic and Greenland. It was expected that the collections from Golovin Bay and Nunivak would exhibit similar frequencies and patterns of lesions given a shared genetic background, based upon language, and similar subsistence resource utilization.

All vertebrae are observed and documented utilizing the Smithsonian protocol for skeletal analysis (Verano and Urcid, 1994). In the Golovin collection, when considering only those individuals with complete lumbar segments (N = 33), spondylolysis is observed in 18 individuals giving an overall frequency of 54.5%. When considered by individual vertebra, L5 exhibits the highest frequency among both males and females. However, among males the frequency of L5 spondylolysis is significantly higher than the frequency of L4 spondylolysis. Among females at Golovin there is no significant difference in the frequencies of L4 and L5 spondylolysis. The differential occurrence of spondylolysis between L4 and L5 may reflect different activities between males and females at Golovin Bay. In the Nunivak collection only one individual out of 20 with complete lumbar segments exhibits spondylolysis. Comparisons between males and females within the Nunivak collection are not possible because of the limited occurrence of this pathology. Ethnographic data from both regions suggest that these populations utilized similar subsistence resources, however spondylolysis frequencies and patterning supports the concept of subtle differences in the methods for gathering those resources.

Edge effects and their influence on lemur biogeography in southeast Madagascar.

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Edge effects are caused by the penetration of abiotic and biotic conditions from the matrix into forest interiors. Although edge effects influence the biogeography of many tropical organisms, they have not been studied directly in primates. Edge effects are particularly relevant to studies of lemur conservation and biogeography due to the loss of 80%-90% of forests in Madagascar. In this study, we present data on how edge effects influence the distribution and density of four lemur species (*Avahi laniger*, *Eulemur rubriventer*, *Microcebus rufus*, and *Hapalemur griseus griseus*) in the Vohibola III Classified Forest in SE Madagascar. Lemur surveys were conducted along six 1250 m transects from June, 2003 to September, 2004. Data were also collected on lemur food trees along the six transects (density, number of stems, height, dbh, area, volume, and distance to forest edge). Polynomial regression analyses of lemur densities as a function of distance to forest edge indicate that *A. laniger*, *E. rubriventer*, and *M. rufus* are edge tolerant (highest densities near forest edges) and that *H. g griseus* is omnipresent. Lemur density correlates with food tree characteristics as a function of distance to forest edge in *M. rufus* (tree volume and number of stems) but not in *A. laniger* or *E. rubriventer*. Other edge factors, such as variations in predation pressures, may be influencing lemur biogeography in Vohibola III. Tolerance for edge effects may explain, in part, how lemurs have survived extreme habitat loss and forest fragmentation in SE Madagascar.

Ontogenetic allometry in the Papionin face.

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Several authors have linked facial shape differences in papionin primates to species (and sexual) size differences. Recent craniometric analyses suggest complicated patterns of size and shape associations within the skull, with important implications for understanding cranial function and papionin systematics. The present study investigates the relations between facial and somatic size measures in order to assess the relations between body size and facial shape in papionins.

This study investigates large samples of captive *Papio* and *Cercocebus*. Limited measures from other papionins supplement these data. All specimens are of known chronological age. Several cranial measures are compared with somatic measures, including estimates of mass, body length, and limb dimensions. These data enable tests of the hypothesis that ontogenetic scaling adequately describes the facial size and shape ontogeny in these species.

Ontogenetic allometric plots indicate considerable diversity in the relations between facial measures and estimates of overall body size. Allometric dissociations are common in plots of facial dimensions against size. Despite differences in allometric trajectories, shape similarities often characterize species of different sizes.

These results imply that ontogenetic scaling does not solely account for differences in facial proportions among papionin primates. Variation in allometric trajectories reflects evolutionary modifications of early ontogenetic phases. These alterations may indicate selection for consistent shapes among species. The implications of these findings for ideas about allometry and cranial diversity are considered.

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Health consequences of economic and lifestyle changes among indigenous Siberian populations: The emergence of the Metabolic Syndrome.

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Indigenous arctic populations have traditionally had low risk for cardiovascular disease (CVD), despite consuming diets that are high in animal products. In these groups, elevated basal metabolic rates and high physical activity levels appear to play a protective role against CVD. However, with acculturation and increasingly sedentary lifestyles, the rates of obesity, hyperlipidemia, high blood pressure, and type 2 diabetes are all on the rise among indigenous populations of the North.

This study examines how recent social and economic changes in the Russia have influenced measures of cardiovascular health in indigenous Siberian populations. We will draw on data collected from several different populations -- the Evenki, Ket, Buryat and Yakut -- to explore how differences in ecology and lifestyle shape variation in CVD risks. Rates of obesity are clearly increasing in all indigenous Siberian groups, particularly among women. Hypertension is a growing problem among men, and is most evident in the Yakut and Buryat. In contrast, cholesterol levels are relatively low in all of the groups, and the limited information on blood glucose levels suggests that diabetes remains relatively uncommon. Cardiovascular risk factors of indigenous Siberians differ from those observed among circumpolar populations of North America. Many of these differences reflect the distinct social and political history of native Siberians.

A current view of Ancestral Puebloan diet: starvation vs. dietary stability.

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This work examines what abundant, adequate and starvation diets look like in the coprolite evidence of Ancestral Puebloan diet. Past paleoethnobotanical research based on coprolite analysis has shown that ancestral diet was nutritionally sound. In contrast, bioarchaeological analysis has indicated a consistently deficient diet, especially for later Ancestral Puebloans. Recent coprolite analyses emphasizing pollen and phytoliths show that nutrition was variable. Importantly, in late aggregated pueblos, starvation foods such as yucca leaf bases, prickly pear pads, horsetail spores, and cattail pollen predominate in the diet. Maize reliance was reduced at such sites. The PIII occupation of Antelope House represents this late, aggregate Puebloan pattern of starvation. In contrast, other sites such as Salmon Ruin show a much more limited reliance on starvation foods with a balanced diet of maize, beans, squash, and wild fruits and nuts. These data bring the paleoethnobotanical and bioarchaeological pictures of ancestral Pueblo nutrition into closer congruence.

Differences in dentine/enamel proportions between the first and second permanent mandibular molars.

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In small-toothed humans the first molar (M1) is larger than the second (M2)

with thinner enamel, but few detailed studies have been carried out to investigate the extent of other differences between these teeth. In the present study enamel and dentine thickness of the M1 and M2 permanent mandibular molars was examined in 31 individuals from a Chalcolithic population in Northern Israel dating to circa 6000 B. P. using standard radiographs. These were taken parallel to the long axis of the teeth, scanned and measured for width and height of the crown, pulp, enamel and dentine. Measurements were taken twice by the same examiner at an interval of 10 days, differences between the measurements ranged between 2-5%.

Results showed that crown size was significantly greater in the M1 (paired t test $P<0.05$), that enamel height and pulp height were significantly greater in the M2 than in the M1, but that dentine height was significantly smaller in the M2 ($P<0.001$). These differences were maintained when standardized for the 6-year difference in eruption times as well as for attrition scores. The results indicate that differences found between the M1 and M2 in enamel height, dentine height and pulp height reflect developmental differences between the two teeth. Further studies are planned to examine the functional significance of the inverse association between enamel and dentine thickness described here.

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Gene flow and the Andes: tests of migration at the archaeological site of Chen Chen.

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This research evaluates the Tiwanaku migration hypothesis for the origin of the people from Osmore archaeological site of Chen Chen using mtDNA haplogroup data. Haplogroups were determined for 25 individuals at Chen Chen and were compared to 27 other Native American communities, including a prehistoric sample from Northern Chile. Previous studies that used archaeological materials, skeletal non-metric traits, and strontium isotope ratios argued that the Osmore Tiwanaku sites of Southern Peru (~AD 700-1000) were a product of direct altiplano colonization. The present mtDNA study provides a nuanced approach to testing this hypothesis since it incorporates evaluations of alternative models of gene flow. In addition to testing the migration hypothesis, the mtDNA data were used to test the correspondence of genetics to geography and language. Additionally, they were important in evaluating which living populations are most closely related to the people at Chen Chen. Finally, a two-migration model for the initial colonization of South America was examined using these data, providing a broader understanding of Andean population history. While these analyses did not reject the migration hypothesis for the origin Chen Chen, they also supported a complex history of gene flow that has implications beyond that of the Tiwanaku tradition.

Sex differences in vigilance in Verreaux's sifaka: Are males providing a predator-detection service?

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Researchers have suggested that male primates may provide vigilance as a service to females in exchange for mating opportunities or group membership. However, male vigilance may be focused more on conspecifics than predators. I examined vigilance in Verreaux's sifaka (*Propithecus verreauxi verreauxi*) in the Kirindy Forest of western Madagascar from November 2000-March 2002. This analysis is based upon 2875 hours of focal observations of adults in five social groups. Alarm calls were provoked by suspending a model hawk in the presence of six social groups both during and outside of the mating season. The sex of the focal animal and the month had significant effects on vigilance but group size did not (MANOVA $p<0.0001$). Both sexes spent the greatest proportion of time scanning during the mating season. Subordinate clean-chested males scanned significantly more frequently than females (Mann-Whitney $p=0.033$) but the dominant stained-chested males did not ($p=0.149$). The presence of an infant in the group did not seem to influence vigilance levels in males. Females were much more likely to make an alarm call when a predator was near in both actual and experimental situations, despite higher levels of vigilance in males. Thus, vigilance in male Verreaux's sifaka does not appear to be a predator-detection service that males provide specifically for females and their infants. Nonetheless, females may still benefit from the higher male vigilance because it functions as an economy of scale.

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Epigenetic differences in articular surface area in captive and wild chimpanzees (*Pan troglodytes*).

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A common assumption in functional morphology is that captive and wild-shot skeletal specimens differ in morphology because of differences in environment (i.e. epigenetic differences). I test the hypothesis that these two groups differ in skeletal morphology using a sample of *Pan troglodytes* specimens (captive N=19, wild-shot N=20). Articular surface areas of the humerus, radius, ulna, femur, and tibia were calculated from linear breadth measurements and compared across sex and environmental groups (captive versus wild-shot) using two-way ANOVA. Results indicate significant differences due to sex in numerous joint surfaces, and due to environment in the tibial plateau and distal ulna. Captive males differed from all other sex-environment groups in several articular surface areas, suggesting the possibility of an interaction between sex and environment. Sex differences may be a result of either behavioral differences or sexual dimorphism. Differences due to environment in tibial plateau surface area may be related to increased joint loading on concrete substrates. It is possible that differences in the distal ulnar surface area are related to increased mobility of the radioulnar joint in captive chimpanzees (as opposed to increased loading), but more data are needed to evaluate this hypothesis. The sex-environment interaction suggests that males may be more active than females, and are therefore more strongly affected by habitual locomotion on concrete substrates. In conclusion, these results indicate that some aspects of articular surfaces may be significantly affected by environment, and that caution should be taken in including captive individuals in morphological studies.

Why is the human gluteus so maximus?

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One of the most distinctive features of humans relative to other apes is a greatly expanded *gluteus maximus*. We examined the role of this muscle in walking and

running humans to test the hypothesis that the derived expansion of the *gluteus maximus* may be related to various musculoskeletal specializations for endurance running. During a walk, the trunk is relatively vertical, positioning the upper body's center of gravity over the hip joint; during a run, the trunk is more forwardly inclined, with the upper body's center of gravity well in front of the hip joint. This inclination causes the trunk to have an inertial tendency to pitch forward at foot strike. Although the gluteus is well known to be a hip extensor, its contraction will also counteract pitching of the trunk when the leg is on the ground.

The hypothesis was tested using EMG and kinematic analyses of human subjects during walking and running under various conditions. The results indicate that the *gluteus maximus* contracts bilaterally at foot strike during running but not walking. On the stance side, the *gluteus maximus* functions to stabilize the trunk against its inertial tendency to pitch at foot strike. On the swing side, the *gluteus maximus* may contract to help decelerate the leg prior to foot strike. Presence of an enlarged surface of attachment for this muscle in *Homo erectus* suggests that the expansion of this muscle may have played an influential role in early human endurance running capabilities.

Phylogenetic analyses of canine size dimorphism in primates.

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Phylogenetic comparative methods were used to analyze the consequences of sexual selection on canine size and canine size dimorphism in primates. Our analyses of previously published body mass and canine size data revealed that the degree of sexual selection is correlated with canine size dimorphism, as well as canine size in both sexes, in haplorhine primates but not in strepsirrhines. Consistent with these results, male and female canine size were found to be highly correlated in all primates. Since canine dimorphism and canine size in both sexes in haplorhines were found to be not only related to mating system but also to body size and body size dimorphism, characters which are also subject to sexual selection, it was not apparent whether the degree of canine dimorphism is the result of sexual selection on canine size itself, or whether canine dimorphism is instead a consequence of selection on body size – or vice versa. To distinguish among these possibilities, we conducted matched pairs analyses on canine size after correcting for the effects of body size. These tests revealed significant effects of sexual selection on relative canine size. Further analyses showed, however, that it was neither possible to detect any evolutionary lag between canine size and body size, nor between canine size dimorphism and body size dimorphism. Additional support for the notion of special selection on canine size were allometric relationships in haplorhines between canine size and canine size dimorphism in males, as well as between canine size dimorphism and body size dimorphism.

Fair-play in juvenile Bonobo chimpanzee (*Pan paniscus*): Observations of sexual differences.

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It is not unusual to find sex difference in play among primates that show marked physical and sexual dimorphism. Bonobos are less physically and socially dimorphic than other great apes. We investigated whether juvenile chimpanzees (*Pan paniscus*) recognize and use gender specific notions of fair-play to moderate dyadic and triadic play interactions. We coded videotapes of play behavior among infants and juveniles in a colony at the Language Research Facility at Georgia State University taken over a period of two years. A proprietary coding-software kept track of the activity and intensity of play behavior between multiple participants, including the use of objects and communicative gestures.

Our observations suggest that the juveniles had well-formed patterns of play initiation, signals for eliciting the continuation of play. The juvenile male appeared to have a higher tolerance for intense and agonistic play than the female who, nevertheless, engaged in aggressive provocation when the male was distracted or restrained by a third party Bonobo or human. The infants tended to interrupt and gently restrain the male when the intensity of rough play escalated; adult females tended to interrupt high intensity play involving their infants. We found that juvenile Bonobo males initiated predominantly rough-and-tumble play, while the female sometimes initiated "care giving" and "nesting" activity with objects such as blankets, pieces of clothing, and even a toothbrush. Our pilot data suggests that we might expect small but significant sexual differences in Bonobo rough-play behavior, and perhaps in the spontaneous initiation of "pretend" play.

The immediate Post War years: the *Yearbook of Physical Anthropology* and the Summer Institutes.

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The period immediately following World War II was marked by expanded activity in the profession of physical anthropology. No national meetings had been held in 1943 and 1944, and it was not until March 1945 that the AAPA met for its first Post War meeting. In the following year, two linked activities were initiated by Sherwood L. Washburn and Gabriel W. Lasker: the publication of the *Yearbook of Physical Anthropology* and the establishment of the Viking Fund Summer Institutes or Seminars in Physical Anthropology. Washburn persuaded Paul Fejos, Director of the then Viking Fund, to sponsor both of these activities. The *Yearbook of Anthropology* was to be edited by Gabriel Lasker, and to be constituted of reprinted articles of high scientific merit. The first volume of the *Yearbook* was published in late 1946, although it was dated "1945" because the reprinted articles were from the prior year. In addition to reprinted articles, an abstract (prepared by Bernice Kaplan and Elizabeth Richards and the editor, Lasker) of the account of the proceedings of the First Summer Seminar was published in the new *Yearbook*. The first Summer Seminar was held at the Viking Fund offices in New York City with a total of 12 evening sessions held over six weeks. The *Yearbook* continued with reprinted articles from around the world and with summaries of each of the Summer Institutes for the next five years (through 1951 – Volume 6, 1950). In retrospect, these activities played a major role in initiating the modern rise of physical anthropology in the twentieth century.

Dental age revisited.

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This study was designed to explore population differences in dental age using crown and root stages of developing permanent teeth. The aim was to ascertain if

dental age and the timing of some dental events differs between groups and over time. Numerous studies have demonstrated differences in dental maturity using Demirjian's method. In this study, the pattern of advancement or delay from 15 studies (14 published, one unpublished) was compared to the Canadian standards. Seven of these studies showed a consistent advancement with the maximum difference being close to the midpoint of the age range considered. The remaining studies show some age groups advanced and some delayed. This may be influenced by both the size of the sample studied and the method of weighted scores. In a further attempt to investigate population differences, radiographs of children aged 3 to 17 years of different ethnic groups were examined. The groups studied were 732 children from London, 305 from South Africa, 527 from Australia and 9577 from a data base of published data. Mean age of attainment of first and second permanent mandibular molars was calculated using probit regression. Data for several stages including one quarter root formed and apex mature were compared to Demirjian's published results of timing of individual tooth formation stages. Results show only small differences between groups and over time demonstrating the stability of the developing dentition. This suggests that neither population differences nor secular trend is of any consequence in determining dental age in recent humans.

Patterns of sexual dimorphism in the facial skeleton of fossil hominins.

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The hominin face is a natural target for studying sexual dimorphism because of the relatively large sample size, the importance of facial morphology in interpersonal interactions, and the connection between sexual dimorphism and taxonomic hypotheses. We ask whether early hominins share patterns of craniofacial dimorphism using three different lines of evidence: 1) correlation analyses of indices of dimorphism, 2) patterns of dimorphism in nonmetric features, and 3) the allometric scaling of sexual dimorphism in facial measurements.

Profiles of indices of dimorphism show that australopithecines share a pattern of craniofacial dimorphism with African apes rather than humans. *Homo habilis* manifests an unusual pattern, which, as shown by other researchers, largely stems from the divergent morphology of KNM-ER 1470. In nonmetric features, each species reveals different characteristics; for example, *A. boisei* shows a unique pattern related to its highly derived masticatory system, and *A. africanus* combines aspects of the human and *A. boisei* patterns.

The allometric scaling trajectories associated with dimorphism in facial dimensions are conservative in apes, humans, and early hominins, with most differences resulting from shifts in trajectories rather than modification of the underlying relationship (slope). Even cases of extreme dimorphism (*A. boisei*) follow bivariate scaling trajectories with slopes similar to those of modern hominids. Differences in slope largely relate to the variable influence of canine size.

Thus, shape differences between male and female early hominins are explicable based on patterns of allometry seen in modern hominids, but nonmetric variation combines with proportional differences to create species-specific patterns.

Congenital and developmental defects of the vertebral column in samples from Hawikku and Puye, New Mexico.

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Skeletal remains from Hawikku, in northwestern New Mexico, are evaluated for congenital and developmental defects of the axial skeleton following Barnes' (1994) morphogenetic approach. Remains from the site date to AD 1300-1680. The sample of 276 individuals represents 86 juveniles, 107 adult females, 75 adult males, and 8 adults of unknown sex.

Previous research shows distinct population histories for Puebloan groups, as shown in osteometrics, discontinuous traits, dental morphology (Corruccini, 1972), ethnography, and mtDNA haplogroup frequencies (Malhi et al., 2003). This research focuses on neural arch defects, congenital block vertebrae, and vertebral border shifting (both cranial and caudal). These conditions are documented in the Hawikku sample and compared to Barnes' analysis of skeletal remains from Puye, a Pueblo IV site in north central New Mexico. The Puye sample numbered 230 individuals, including 14 juveniles, 133 adult females, 74 adult males, and 9 adults of unknown sex.

Comparisons of the two samples indicate significant differences in vertebral shifts at the lumbo-sacral border, where Puye has a higher overall incidence ($p<0.001$). In addition, the pattern of shifting differs: Hawikku has an even distribution between cranial and caudal shifting, while Puye has a much higher incidence of cranial shifting ($p<0.01$). In contrast, other border shifts, neural arch defects, and congenital block vertebrae are not significantly different between the groups.

Predictions of isolation by distance and alternatives for human gene geography.

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Many human genetic examples of correlations between genetic and geographic distances are attributed to isolation by distance, meaning a population structure where the reproductive dispersal of individuals is restricted relative to the range of the entire population. Wright, Malecot, Kimura, and Slatkin have developed the rigorous genetic theory of isolation by distance. While each architect of the theory has developed a slightly different version, the common result is that at equilibrium there is a titration between genetic differentiation and the geographic distance between localities. Isolation by distance implies for the human data that genetic drift and local dispersal have shaped the genetic structure of our species.

Alternatively, other mechanisms such as a step-wise range expansion can create a correlation between genetic and geographic distance. In this circumstance, the correlation between genetic and geographic distance does not reflect local dispersal. Rather, it reproduces the migration paths and succession of founder events that occurred during the process of range expansion.

The purpose of this paper is to show how hierarchical F-statistics can distinguish between these two alternative population structures. Computer simulations are used to illustrate the approach and potential outcomes. We use these simulations to determine the number of genetic loci that must be assayed in order to reliably distinguish patterns of genetic divergence. In addition, we explore the effect of systematic sampling biases such as sampling clusters of widely dispersed populations on the outcome of analyses.

Bootstrap method and the analysis of cranial capacity variation in the Dmanisi fossils and *Homo ergaster*.

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Recently, systematic random sampling, such as the bootstrapping method, has been used in some paleoanthropological studies. The bootstrapping procedure consists of the generation of a large number of random samples with replacement and the comparison of a desired parameter with the fossil assemblage. This method has been shown to be useful in evaluating the variability of a sample and has been used to draw inferences on sexual dimorphism in a fossil human species. Nevertheless, some authors have critiqued the bootstrap analysis because the results change if a new random simulation is repeated. To address these criticisms, we have analyzed the "sensitivity" of the bootstrap method applied to cranial capacity variation using different sample sizes, varying the number of the simulated samples generated and recalculating different parameters. Our study indicates that better results are obtained calculating 5000 random samples with N>12.

We then apply this statistical procedure to evaluate the cranial capacity variation in the three published crania recovered from the Lower Pleistocene site of Dmanisi (Georgia Republic) as well as among three crania ascribed to the species *Homo ergaster* (KNM-ER 3733, 3833 & KNM-WT 15000). Contrary to previous suggestions, our analysis shows that the amount of cranial capacity variation seen among the Dmanisi hominids, as well as among the combined Dmanisi and Turkana samples, can be found in extant human populations.

Three primates – one reserve: Applying a holistic approach to understand the dynamics of behavior, conservation, and disease amongst ring-tailed lemurs, Verreaux's sifaka, and humans at Beza Mahafaly Special Reserve, Madagascar.

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This study investigates the interplay among three primate species, ring-tailed lemurs (*Lemur catta*), Verreaux's sifaka (*Propithecus verreauxi*), and humans (*Homo sapiens*) who live in a sympatric association around the Beza Mahafaly Special Reserve, Madagascar. We applied cultural anthropological, ethological, and parasitological methodologies to acquire a holistic understanding of the advantages and disadvantages of human-nonhuman primate sympatry. The results of interviews and questionnaires provided the researchers with important insights into the local peoples' perception of the prosimian primates. Specifically, origin myths indicate a close association between humans and ring-tailed lemurs and sifaka, which may serve as an important basis for positive conservation perspectives among the local people. These are discussed in detail, but reveal a number of built-in safety factors including lemur hunting taboos and special ancestral forests that are protected from deforestation.

Close human-primate associations also have negative implications. We found that human-nonhuman primate interactions and nonhuman primate behavioral activities, are associated with increasing or decreasing parasite loads, and potential modes of parasite transmission. Fecal analyses revealed that the three groups of ring-tailed lemurs that frequented the camp, and interact on a regular basis with the humans that occupy the camp, harbor the same endoparasites. The three lemur "camp" groups engaged in allo-coprophagy of human, dog (*Canis familiaris*), and zebu (*Bos indicus*) fecal matter. These behaviors coupled by an intimate relationship with the humans at the camp, appear to be acting as an avenue for parasite transmission. In contrast, analyses of sifaka fecal matter revealed no parasites. Sifaka were rarely terrestrial, generally avoided humans, and were not observed engaging in coprophagy. This knowledge is valuable for future conservation initiatives, in which we wish to incorporate local people from the neighboring villages.

The skeletal dimorphism of *Australopithecus afarensis*.

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The consensus view of body size dimorphism in *Australopithecus afarensis* has long been that it was similar to that of *Gorilla* or *Pongo*. However, traditional methods have been subject to systematic errors emanating from uncertain sex assignment, small sample size, and the use of intermediate parameters (e.g. estimating body mass from skeletal metrics by regression). Utilization of A.L. 288-1 (Lucy) as a template skeleton avoids such limitations, and bootstrap simulations applying identical methods to samples of *Pan*, *Homo* and *Gorilla* have yielded highly variable dimorphism distributions, demonstrating that great caution is required when assessing dimorphism in fossil taxa. In addition, the special taphonomy of Afar Locality 333 permits unique tests of the potential accuracy of dimorphism assessment in both *A. Afarensis* and other fossil species. The level of variation at A.L. 333, in combination with that of other Middle Awash fossils also assigned to *A. afarensis*, suggests moderate skeletal dimorphism more similar to that of extant *Homo* and unlike that of *Gorilla*. The poor intraspecific correlation and developmental independence of skeletal size and body mass precludes reliable extrapolation of body mass dimorphism. Skeletal dimorphism, however, appears to be more correlated with skeletal bimaturism which can be more readily associated with the social systems of extant hominoids. The co-occurrence of moderate sexual bimaturism and a feminized male canine in *A. afarensis* suggests a reproductive strategy wholly unlike that of any extant non-human hominoid.

Energy expenditure and metabolic syndrome traits in Yoruban and African-American women.

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African-American (AA) women suffer from high rates of CHD mortality and metabolic syndrome, in contrast, West African women have very low rates. A defining characteristic of this phenomenon is the prevalence of obesity in each population. We sought to define the relationships between energy expenditure, obesity and traits of the metabolic syndrome among women of African descent living in differing sociocultural environments. Yoruban women from southwestern Nigeria (n=206) and AA women from Chicago (AA, n=197) were enrolled in a study of weight change. The doubly labeled water method was used to objectively measure physical activity (PA); blood pressure, anthropometrics, and fasting plasma insulin, glucose and lipids were also assessed. Yoruban women were significantly leaner than AA (mean body mass index (BMI), 23.0 vs 30.9), with less body fat (29.3 vs 40.0%)($p<0.001$). AA women had significantly greater preva-

lences of overweight, high blood pressure, increased waist circumference, and elevated insulin and lipid concentrations. PA, adjusted for weight, was significantly higher in Yorubans than AA, 13.5 vs 10.1 kcal/kg/d ($p<0.001$). For both cohorts, there was a significant inverse association between PA and BMI ($r=-0.37$), % fat ($r=-0.50$) and waist ($r=-0.36$)(all $p<0.001$). Preliminary regression analysis indicated PA influenced blood pressure in the AA ($p<0.05$), with little impact among the Yorubans; PA was also negatively associated with fasting insulin independent of adiposity in AA ($p<0.005$). PA was significantly associated with multiple traits of the metabolic syndrome among Yoruban and AA women and may be an important determinant of the different prevalences of traits between populations.

Recontextualization and identity assessment of un-provenienced mummified human remains.

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This research sought to document and establish identity for mummified human remains lacking context. The hypothesis stated, un-provenienced human mummified remains could be culturally and biologically affiliated through a process of documentation and analyses that functions along a continuum from simple non-invasive investigation to complex invasive techniques. The Department of Anthropology at the University of Nevada, Las Vegas, houses 13 mummified human individuals lacking complete documentation, chosen to be documented and re-contextualized. While the sample was small it represented varying levels of provenience and percentage of remains present.

Guidelines were created employing one phase of non-invasive examination and a second phase of invasive analysis. The two-phase system was specially designed for those studying unknown remains with little to no documentation. The guideline proved a useful tool in the documentation of mummified human remains lacking context, as during the non-invasive phase of research 10 cases were completely documented, with only three requiring limited invasive testing.

Two individuals in particular, FHUR 60 and FHUR 63, were discovered to be historic Nevadans. Nine were found to be Native American, five at a more specific level while four were identified as Native American unaffiliated. FHUR 35 was identified as Numa or PreNuma, AHUR 124 as Aztec, AHUR 142 as Shoshone or Paiute, FHUR 2 as Paiute, and AHUR 125 as Virgin Anasazi. The two-step guideline for the study of mummified human remains was found to be an excellent method and represents a standard for museums or other holding facilities in similar situations to employ.

A test of the Grandmother Hypothesis using genealogical data in Costa Rica.

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An adaptive explanation for the origin of human menopause is the grandmother hypothesis, which proposes that menopause was selected so that post-reproductive females assist in their daughters' reproduction. At its core, the hypothesis proposes that post-menopausal females provide support to their daughters, as opposed to their sons' mates.

We report preliminary results of an exhaustive genealogical study in which we followed the contribution through a daughter's line, of females who reproduced in the 1700's in Atenas, Costa Rica. As of this writing, we have 30 genealogies starting with living members of the Atenas community, going back 7 generations, through the female line. We computed non-parametric measures of correlation between longevity an the number of grandkids, and non-parametric comparisons of the number of grandkids between grandmothers who lived less than 50 years, and who lived more than 50. We performed these tests for the entire time period as well as by "generations" of 20 and 30 years. Although for some "generations" there is an indication of a positive linear relation between longevity and production of grandkids, this correlation does not achieve significance ($r_s= 0.36$, $p=0.23$, $n=34$ for the period 1920-1950). Our data suggest that a female's death before age 50 does not significantly affect her daughter's ability to produce children. Our inability to show a correlation between longevity and number of grandkids could also be due to our low sample size, a size will be increasing in the incoming months.

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Effects of early environment on life history strategies of female primates.

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A life history model of reproductive strategies predicts that female primates exposed to stressful or unpredictable early environment should follow a developmental trajectory characterized by early reproduction and parental investment. A study of 83 adolescents in the Chicago area showed that girls who grew up without a father achieved menarche earlier than girls who lived with both parents. Father-absent girls also showed greater preferences for infant faces, suggesting earlier readiness for parenting. In another study, rhesus macaque females that were exposed to harsh and inconsistent maternal care in infancy showed higher interest in infants during adolescence and earlier date at first conception. Evidence from cross-fostered females indicated that high interest in infants resulted from early experience and not genetic inheritance from the mother. Macaque females exposed to harsh and inconsistent parental care in infancy had higher cortisol responses to stress and to CRH than controls in the first 3 years of life. Furthermore, females with higher cortisol responses to stress exhibited higher interest in infants. The effects of early parental care on female reproductive maturation and readiness for parenting are consistent with the predictions of the life history model and appear to be mediated by developmental changes in the activity of the hypothalamic-pituitary-adrenal axis.

X-linked loci influence morphological variation on molar crowns in pedigreed baboons.

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In addition to sexual dimorphism in primate teeth, dental anomalies in X-linked syndromes and sex-chromosome aneuploidies have implicated X-chromosome genes as possible contributors to dental developmental variation in humans. However, evidence for sex-linked effects on *normal* variation in dental size and morphology remains circumstantial. We conducted statistical genetic analyses to test X-linked locus effects on variation in degree of expression of two

molar crown morphological variants – the interconulus (maxilla) and interconulid (mandible) – in over 500 captive, pedigreed baboons (*Papio hamadryas ssp*). We previously showed that variation in these two primitive mammalian cingular remnants is heritable, that the same gene or genes influence within-arch trait expression (complete pleiotropy), but a combination of shared and independent genes influence expression between arches (incomplete pleiotropy). We used a recently implemented modification to a maximum likelihood-based variance decomposition approach to estimate simultaneously the mean effects of sex and tooth wear on the expression of these traits while partitioning the remaining phenotypic variance into components attributable to the additive effects of autosomal and X-linked genes, plus the effects of unmeasured environmental factors. X-chromosomal effects accounted for significant ($P<0.05$) proportions of the variance in these two traits on all 12 permanent molars: mean X-chromosome heritability ("X-h^2") = 0.24, with a range from 0.12 (mandibular left M3) to 0.42 (mandibular right M2). M2s exhibited highest mean X-h^2 estimates per dental arch. We hypothesize that this X-linked effect is responsible for much of the previously detected pleiotropy between these traits in this cercopithecoid model for human dental variation.

Neandertal mandibular traits in modern *Homo sapiens*.

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This study examines several discrete mandibular morphological traits in modern *Homo sapiens* that have been used to characterize Neandertals as a separate species (Rak et al., 2003; Klein, 2003). The traits analyzed are: a high coronoid process in relation to the mandibular condyle, a posteriorly located deepest point in the mandibular notch, a medial crest of the mandibular notch, the presence of a retromolar space, and the presence of the horizontal-oval mandibular foramen. The sample consists of 292 human mandibles from the Hamann-Todd collection at the Cleveland Museum of Natural History (European Americans, N=140; African Americans, N=143; Other Ethnicities, N=9).

In contrast to assertions that the high coronoid process, the posterior deepest point in the mandibular notch, and the medial mandibular notch crest are Neandertal autapomorphies, this study finds that each is well within the range of modern human variation with frequencies of 22%, 8%, and 3%, respectively. Contrary to the predictions that some of these traits are limited to Europe and the Middle East, all are found in both European and African Americans. The horizontal-oval mandibular foramen reaches frequencies of 4% in European Americans and 2% in African Americans. The retromolar space was also present in both subgroups, but the high degree of tooth loss in the sample makes it difficult to draw any conclusions about this trait. Overall, these traits are found to be neither Neandertal autapomorphies, nor as "discrete" as many authors believe, as each exhibits marked variation.

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Age at death in a juvenile specimen of *Megaladapis edwardsi* (Primates, Lemuriformes): Implications for understanding life history variation in sub-fossil lemurs.

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Large-bodied anthropoids exhibit prolonged dental development and slow life histories. Extrapolating from anthropoids, one might expect the same for large-bodied lemurs; indeed, slow reproductive resilience is sometimes cited as a factor contributing to their extinction. However, some of the giant extinct lemurs bear the classic eruption sequence signature of species with rapid crown formation and "fast" life histories, according to "Schultz' Rule," while others exhibit "slow" eruption sequence signatures. *Megaladapis edwardsi* is one of the largest-bodied of extinct lemurs - the size of a female gorilla -, yet its eruption *sequence* (with permanent molars erupting prior to the eruption of the replacement teeth) is typical for species with "fast" life histories. Furthermore, *Megaladapis* is the likely sister taxon to *Lepilemur* – which displays a similar eruption sequence and a rapid dental eruption schedule, but is much smaller in body size.

We examined dental development in *M. edwardsi* by charting the chronology of molar formation in a juvenile hemimandible from Anavoha with an unworn M_1. Fourteen thin sections were prepared and both long- and short-term incremental lines used to provide a chronology of molar development. Cuspal and lateral secretion rates averaged 4.1 and 2.6μm, respectively, yielding an M_1 crown formation time of 383 days (1.05 yrs.). Crown formation time in *Megaladapis* was slow in comparison to *Palaeopropithecus*, but fast in comparison to *Archaeolemur* and especially *Hadropithecus*. There is no simple relationship between crown formation time and either body size or eruption sequence in the lemurs of Madagascar.

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A reexamination of the etiology and formation of wormian bones.

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Wormian bones are small irregular accessory bones located in the sutures and fontanelles, occurring at a higher prevalence in the lambdoidal, coronal, and sagittal sutures. Rather than any single condition (i.e. sex, race, cranial deformation, cranial enlargement, and metabolic disorders), results from previous studies indicate that the occurrence of wormian bones seem to be associated with delayed suture closure caused by a range of genetic and/or environmental factors that occur prior to full suture closure. The goal of this study is to 1) reevaluate previous results with larger data sets (modern samples with known life histories and archaeological samples) and 2) examine the effects of genetic and environmental factors using a wider and more complex range of variables. In order to assess genetic factors, we examined the occurrence of wormian bones in closely related individuals. Environmental factors were evaluated using age, diet, and nutrition as possible causal factors affecting the growth and occurrence of wormian bones. We scored individual wormian bones based on their degree of complexity, maximum length and width, and location within a suture. Secondarily, we evaluated the distribution and density of wormian bones within each suture. Using chi-square tests we attempt to correlate these osteological observations with the genetic and environmental factors. The results imply that the formation of wormian bones influenced by a range of variables and that delayed suture closure plays a more direct role in wormian bone formation, rather than the singular effect of the variables examined.

Diachronic analysis of stature in the northern Anasazi: influence of popu-

lation density and dietary protein.

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The 800-year period of A.D. 500 – A.D. 1300 saw major changes in the settlement patterns of Ancestral Pueblo (Anasazi) populations in the Mesa Verde and San Juan Basin regions. The dispersed pit house clusters and residential mobility of the early Basketmaker III period gave way to movement into large, aggregated villages by the end of the Pueblo III period, prior to abandonment of these regions by A.D. 1300. Some of the detrimental consequences of population aggregation included increased crowding, less sanitary conditions, and more pressure to share natural resources. Changes in settlement patterns were accompanied by an increased dependence on maize agriculture and decreased availability of large game (artiodactyls), as indicated by faunal remains from these sites.

This study examines changes through time in the estimated stature of several northern Anasazi populations and in their faunal utilization strategies, asking whether the availability of animal protein in the diet correlates with childhood growth indicators such as adult stature and dental enamel hypoplasia. This study also considers evidence suggesting that increases in population aggregation and social complexity resulted in social stratification and the emergence of powerful 'elites' able to exclude smaller settlements from arable land and hunting territories. The high frequency of artiodactyl remains at certain Chacoan greathouses such as Pueblo Alto and at towers and biwalled structures of Sand Canyon and Yellow Jacket suggest that their occupants may have had preferential access to large game. Burials with rich grave goods and greater than average stature also indicate social stratification.

A relational database design for osteological and odontological data.

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A digital version of the Arkansas Archaeological Standards for data collection of skeletal materials has been developed. All of the forms of the digital database are arranged in the same layout as the original print version. The device is fully relational and allows the user to query the body of data in any manner. Simple algorithms are also built into the database for cranial and post-cranial ratios. The graphics component of the database allows the user to input links to photographs and use a paint program to mark the graphics inventory pages. Routines are built into the database to route chosen datasets to statistical packages.

Analysis of mtDNA haplogroup monomorphism in a sample of a Native American population combining modern and ancient DNA research.

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We observe a lack of mitochondrial haplogroup variation not only among modern Eastern Inuit, but also among their ancestors, the Thule. Both groups possess haplogroup A exclusively, in contrast to other Native American groups, who possess some combination of haplogroups A, B, C, D, and X.

This lack of variation might have been caused by genetic drift, given a recent history of small effective population size. This hypothesis seems plausible, given archaeological evidence that the Thule expanded rapidly across the far north approximately 1000 years ago from a relatively small founding population. Here, we ask what hypotheses about population history can be excluded on the basis of the observed absence of mitochondrial haplogroup variation.

We test hypotheses about population history using coalescent simulations. We are able to exclude hypotheses of a bottleneck in the distant past, while we are not able to reject hypotheses of a bottleneck within the recent past. Our results both describe and help to explain the demographic and biological processes that result in the unique phenomenon of mitochondrial haplogroup monomorphism.

Manual laterality in ant fishing by wild chimpanzees at Mahale Mountains National Park, Tanzania.

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The most lateralized of all chimpanzee (*Pan troglodytes*) manual behavioral patterns are skilled tool uses in nature: termite fish (McGrew & Marchant, 1996), nut crack (Matsuzawa, 1996), leaf sponge (Boesch, 1991), strychnos pound (McGrew et al., 1999). In each case, most practitioners are exclusively left- or right-biased. Although at population-level there is no skew either way. This total commitment of one hand or the other is the norm. This contrasts with less skilled activities that are unlateralized or only mildly (if consistently) lateralized within or across individuals.

Here we report a skilled tool use pattern shown by apes that is not exclusively lateralized: chimpanzees at Mahale, Tanzania, use thin probes of vegetation to extract wood-boring ants (*Camponotus* spp.) from their arboreal tunnels (Nishida, 1973). This entails threading the probe into a small diameter hole with one hand while the other hand provides suspensory support in the canopy. Data were collected over 4 months on ant fishing by the 44 independent members of M-group.

Results show a pattern different from that of all other skilled tool use: no individual was exclusively lateralized to right or left; instead most individuals showed strong but incomplete preferences. Sequential analyses of data show that ant fishers periodically give their non-preferred, weight-supporting hand a "break", presumably to relieve fatigue. This intermittent switching of hands need not occur in terrestrial tool use, for which postural support is unnecessary.

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Mobility in Neolithic Liguria (Italy): a biomechanical approach.

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Traditional approaches to the analysis of mobility in Neolithic samples from Liguria (Italy) provide equivocal results. Evidence of high levels of locomotory stress provided by lower limb muscoloskeletal markers is not fully supported by external diaphyseal measures of robusticity. To clarify these contrasting findings, we use cross sectional geometric properties of the mid-shaft femur.

The Neolithic sample includes eight males and eight females found in a restricted area (Finale Ligure, Savona) and dated to the fourth millennium BC. Samples of Late Upper Paleolithic (LUP) and Mesolithic European femora are used for comparisons.

While all female indicators of bending strength decrease steadily through time, Neolithic male values approach those of LUP and even show an increase relative to the Mesolithic group. This result suggests a level of mechanical stress for Neo-

lithic males that is unexpected, given patterns observed on skeletal populations and theoretical expectations for decreased mobility with the advent of food-producing economies. Interestingly, however, expectations are fulfilled at regional level, i.e. when comparing Neolithic males and the last hunter-gatherers from the same area. Liguria is a mountainous region and this finding points once again to the importance of the nature of the terrain for lower limb remodeling. Moreover, the marked sexual dimorphism characterizing the Neolithic sample suggests quite different male-female mobility patterns, probably reflecting the importance of pastoral activity, well-documented in the Ligurian archeological record.

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Anti-anti-racism in the Cold War.

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In the wake of World War II, optimism and anti-racist sentiment in America quickly yielded to anti-Communism and, insofar as American communists had been prominent anti-racists, to "anti-anti-racism." Two victims of this ideology, and of its political mobilization under Senator Joseph McCarthy, were anthropologists Gene Weltfish of Columbia and Ashley Montagu of Rutgers. While Weltfish indeed was an active communist, Montagu was a target – in spite of the fact that he was a prominent public intellectual – principally because of his anti-racism. As *rapporteur* of the 1950 UNESCO Statement on Race, Montagu promoted what we would now call a constructivist view of race. The Statement reignited a controversy about the ontology of race, and divided the field of anthropology along political, generational, and subdisciplinary lines. At the same time that Montagu and Weltfish lost their academic positions, a small group of reactionary scientists and activists led a backlash against school desegregation. These included Carleton Putnam, psychologist Henry Garrett, and anatomist Wesley Critz George. By 1962, their efforts were being complemented by the scientific work of anthropologist Carleton Coon, who corresponded extensively with them, and gave them preprints of his work, ostensibly showing that blacks were 200,000 years behind whites evolutionarily. There are some interesting continuities to the present day.

Neanderthal peripheral nasal apparatus reconstruction: a comparative approach to understand adaptive plasticity.

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It has long been noted that the Neanderthal external nose (Nen), is remarkably prominent (Stringer and Gamble, 1991) and dominates the midfacial region (Wolpoff, 1999). Here we consider a new approach to understand the Nen via assessment of soft and hard tissue variation of the living human external nose. This novel approach provides the foundation for soft tissue reconstructions (STR) of the Nen.

STR's of eight Neanderthals (Saccopastore, Monte Circeo, La Chapelle, La Ferrassie, La Quina, Gibraltar 1, Shanidar 1, and Amud) were completed. These were based on morphometrics derived from CT imaging (n=30), plain film radiography (n=11), and photography (n=28) of a wide diversity of living human populations. Nasofrontal angle and linear morphometrics of soft and hard tissue anatomy were calculated directly from CT's and subjects. Nen-STR's were based on data of modern humans that exhibited wide nasal apertures, which translated to large alar width dimensions coupled with a short osteocartilaginous septal morphology.

Preliminary results show that for nasofrontal angle Classic Neanderthals clustered together, Monte Circeo aligned with the Middle Eastern group, while Saccopastore is located peripherally. Nen-STR conformed best to a platyrrhine versus leptorrhine template that contradicts the morphologic pattern here detected in humans living in ecogeographic conditions similar to European Neanderthals. Since Nen closely parallels the African configuration, we propose that the overt anatomic plasticity seen in modern humans may indicate it permitted rapid adaptation of this upfront respiratory portal to high thermoregulatory valence thereby allowing Neanderthals to thrive in a wide range of environmentally challenging conditions.

Microadatation process: health and nutrition in Prehispanic Mexico.

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The prehistory of health and nutrition in prehispanic Mesoamerica are examined from 8 skeletal samples from sites that date from 2000 BC to 1500 AD and from diverse ecological environments in the Basin of Mexico and from the Maya area.

The investigation used the methodology based on health indicators identified in human remains. We trace the health effects for some of the groups living in an arid highland, and in the coast environment. We found also evidence of different patterns on morbidity and mortality related with diverse level of social and political complexity and organization. The study suggests a moderate deterioration of health and nutrition from the horticulturalist, early rank village, to a Post-classic urban society living in a militaristic state.

Size and shape in marmosets skulls: allometry and heterochrony in the morphological evolution of small critters.

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Marmosets and pygmy marmosets are remarkably different in absolute size despite their close phylogenetic relationship. Pygmy marmoset crania are, on average, only 70% of the common marmoset's size. Here we examine the differences and similarities in marmoset skulls in order to quantify and understand the evolution of these small primates. Our sample includes 16 species of the genus *Callithrix* (N = 547) and one *Cebuella* species (N = 32). Thirty-nine skull measurements were taken using a 3D-digitizer in adult skulls. Multivariate static allometric patterns were calculated for each genus (after accounting for within genus variation due to species differences). Both genera share the same basic allometric patterns and an inspection of bivariate regression plots (39 traits against overall skull size) show that both the slope and intercept are the same for these taxa. Pygmy marmosets simply follow the same growth patterns as common marmosets but to a smaller final size. Post-natal growth period and rate and gestation time appears to be the same, but pygmy marmosets are much smaller at birth. This small size at birth for *Cebuella* is due to a relatively slow intrauterine growth rate. Because pygmy marmosets are phylogenetically derived from common

marmosets this result suggests that heterochronic progenesis was the means by which pygmy marmosets achieved small size. Moreover, the average differences between pygmy and common marmosets skull traits have a correlation of 0.91 with an isometric vector, indicating that *Cebuella* is simply a scaled size down version of *Callithrix* caused by selection for smaller size.

Categorization of primate molar enamel thickness.

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Relative molar enamel thickness is among the key diagnostic characters among hominoid primates, evidenced by the near ubiquitous discussion of this character in the seminal diagnoses of fossil hominoid taxa. Historically, there has been a progression from the recognition of only two enamel thickness categories (thick and thin), to five categories (thick, thin, two intermediate-thickness categories, and hyperthick). These categories are based on relative enamel thickness in extant hominoids, where "thick" and "thin" taxa can be readily identified. The number of molars from hominoids, non-hominoid primates, and non-primate mammals that has been sampled for enamel thickness has substantially increased in recent years. The five aforementioned categories do not accommodate the range of enamel thickness values in this expanded sample. For example, the thin enamel classically associated with *Gorilla* and *Pan* is actually much thicker than in certain other primate taxa, chiropterans, and scandentians. Overall, the range of enamel thickness values in Order Primates cannot be distinguished from a normal curve (Kolmogorov-Smirnov Z). New categories, based on equal partitioning of the normal curve, are erected in the present study. These categories are used to explore enamel thickness throughout Order Primates, and the new categories are also used to classify the enamel thickness of fossil hominoid molars. Results indicate possible "clade shifts" from thinner to thicker enamel corresponding to major cladogenic events in primate evolution: strepsirrhines have thinner enamel than ceboids, which have thinner enamel than cercopithecoids, while hominoids have variable enamel thickness.

New light on relationships of *Callimico* from reproductive biology.

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To collect basic data on reproductive biology and help clarify the phylogenetic position of Goeldi's monkey among New World primates, transabdominal ultrasonography was used for longitudinal monitoring of prenatal development in individual pregnancies from ovulation to birth. Examinations with a 10 MHz probe were carried out on 6 unsedated *Callimico* females housed at the Institute of Anthropology at the University of Zürich, Switzerland. The protocol included three scans a week until appearance of a double endometrial echo confirmed pregnancy, two scans a week until detection of embryonic heart beat, one scan per week until visualization of fetal skulls and then every second week until birth. Ovulation was detected by measuring progesterone metabolites in urine samples collected three times a week, and presence of corpora lutea was determined by ultrasound. All females had single ovulations resulting in conception. Three stages (sonographic milestones) were determined during the 152-day gestation period: diagnosis of pregnancy (day 12 = 8% of gestation), onset of embryonic viability (day 49 = 32% of gestation) and embryonic-fetal shift (day 73 = 48% of gestation). Comparison of these milestones with those of other callitrichid and catarrhine primates indicates a period of slow embryonic development in *Callimico*, typical of the Callitrichidae. Since twinning in other callitrichids involves unique specializations whereas Goeldi's monkey has single births, the results suggest that twinning was lost as a secondary reversal during the evolution of *Callimico*. Our data therefore support recent molecular evidence that Goeldi's monkey falls between marmosets and tamarins within the calltrichid radiation.

Auditory capacities in Middle Pleistocene humans from the Sierra de Atapuerca, Spain.

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Human hearing differs from that of chimpanzees and most other anthropoids, in maintaining a relatively high sensitivity from 2 kilohertz (kHz) up to 4 kHz, a region which contains relevant acoustic information in spoken language. Knowledge of the auditory capacities in human fossil ancestors could greatly enhance the understanding of when this human pattern emerged during the course of our evolutionary history. Here we use a comprehensive physical model to analyze the influence of skeletal structures on the acoustic filtering of the outer and middle ears in five fossil human specimens from the Middle Pleistocene site of the Sima de los Huesos (SH) in the Sierra de Atapuerca (Spain). Our results show that the skeletal anatomy in these hominids is compatible with a human-like pattern of sound power transmission through the outer and middle ear at frequencies up to 5 kHz, suggesting that they had auditory capacities similar to those of living humans in this frequency range.

Since the SH hominids are not on the direct evolutionary line which gave rise to our own species, but form part of the Neandertal evolutionary lineage, it is conceivable that this condition was already present in the last common ancestor of modern humans and Neandertals. Analysis of Neandertal mtDNA suggests this last common ancestor probably lived at least 500 kya, and it has been argued to be represented among the 800,000-year-old fossils from the TD6 level at the site of Gran Dolina (Sierra de Atapuerca, Spain) attributed to the species *Homo antecessor*.

Histological examination of femoral cortical bone in mammals: a method for species identification.

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Bone development and its resulting microstructure are influenced by both biological and environmental factors. Among mammals, various differences exist in the rate of development and resulting bone histology. The purpose of this research is to present qualitative and quantitative differences in the histological

features of mammalian femoral cortical bone with an emphasis to find an adequate key for species determination.

Altogether 52 femurs of adult human, pigs, cows, sheep, rabbits and rats were analyzed. Specimens were prepared using standard histological equipment, producing thin sections approximately 70 - 100 microns thick. The qualitative differences of the cortical bone microstructure were determined according to the classification by Enlow and Brown (1956); quantitative variables were assessed using the software Scion Image (Scion Corporation, USA). Areas, perimeters, minimal and maximal diameters of Haversian systems and Haversian canals were measured. Analysis of variance and Scheffe test were used for species determination. We used discriminant function analysis to establish identification for determining an origin of the sample.

According to our results every species differed qualitatively from each of the others either in type of bone tissue or in the combination of types of bone tissue in anterior, posterior, medial and lateral views of thin sections. With quantitative differences, classification functions for analyzed species give a correct classification of 81.74% of cases. The accuracy of identification can be increased by combining quantitative analysis results with the conclusions from the qualitative analysis to produce accuracy of prediction approaching 100%.

Lorisoid phylogeny as revealed by craniodental and rRNA sequence data.

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The phylogeny of the Afro-Asian Lorisoidea is controversial. While postcranial data appear to attest without doubt to the monophyly of the Lorisidae, molecular analyses consistently portray them as paraphyletic, with the Galagidae grouping alternately with the Asian or with the African lorisids. One of the major problems that has bedeviled phylogenetic analyses of this group in the past, has been the limited number of taxa sampled for both ingroup families. In this contribution we present the results of a series of phylogenetic analyses based on 36 craniodental characters and 640 base pairs from two mitochondrial genes (12S and 16S ribosomal rRNA), representing 12 galagid species and 5 lorisid species. The outgroup was the gray mouse lemur, *Microcebus murinus*. Analyses were performed on morphological and molecular data sets independently, as well as in combination. For the molecular data sets, independent and combined analyses were conducted using maximum parsimony, maximum likelihood and bayesian methods. A range of results was obtained, depending on the data set employed and the method of analysis. We evaluate these alternate topologies, and discuss possible explanations for the lack of congruence between data sets. Finally, we assess the scenarios indicated by the tree topologies in the light of paleobiogeography and fossil record.

High-resolution (3D SR-µCT-based) structural analysis of the primate proximal tibia: Evidence for locomotion-related topographic variation.

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According to the established relationships between inner bone structural/architectural adjustment/variation and biomechanical function, deep locomotion-related differences are expected in the inner organization of the mammalian proximal tibia. Nonetheless, likely because of its complex shape, the subtle structural anatomy of this skeletal region remains poorly investigated in a comparative perspective. Currently available X-ray micro-CT systems allow non-invasive high-resolution access to the inner bone structure for 2-3D assessment of its functional-related topographic variation.

In order to comparatively detail the site-specific structural properties of the tibial plateau in a variety of primate taxa (including humans) experiencing different biomechanical constraints according to their habitual postural/locomotor habits, we make use of the µ-CT equipment set at the European Synchrotron Radiation Facility of Grenoble (ESRF Beamline ID 17). This high photon flux-based system utilizes a fan-shaped monochromatic X-ray beam. Scans are performed at 200mA/50keV and 60ms/projection. Projections are taken each 0.24° and are collected by a 2048x2048 CCD camera (resolution = 47µm/pixels).

The investigated sample is currently represented by fifty normal and pathological proximal juvenile and adult tibiae. Based on a numerical support of homologous coronal and transverse cross-sections, thickness variation of the "cortico-trabecular complex" - i.e. the inner structural unit under the plateau surface which includes both cortical bone and the most dense part of the underlying trabecular network – has been topographically quantified (lateral vs. medial condyle; anterior vs. posterior portion of the plateau) and 3D mapped.

When *Homo*, *Pan*, and *Papio* are compared, distinct functionally-related structural patterns of cortico-trabecular organization/distribution are clearly shown.

A new qualitative method for age estimation from dental radiographs with tests of observer agreement.

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Six criteria scoring age-progressive changes in the alveolar margins, dental restorations, and pulp chambers of the premolars and mandibular first molars were developed from a longitudinal sample of 37 individuals (15F, 22M) radiographed on three occasions each. Age was estimated from the longitudinal sample and tested on a separate, cross-sectional sample of 45 individuals (23F, 22M). A subset of the test sample (n=20: 10F, 10M) was scored independently by 14 colleagues using only written instructions and graphical aids. Testers' experience levels ranged from physical anthropology graduate students to professional dental and forensic anthropologists.

Mean error of age estimation for the test sample was -2.2 years (s = 10.20) from ages 17-86 using the author's scores with a mixed statistical/heuristic model. In comparison, the most accurate metric model, developed similarly but based on premolar pulp chamber height, yielded a slightly lower mean error of -1.4 years, but with a larger range of variation (s = 15.32) when applied to the same test sample. Interobserver tests of the qualitative method showed substantial agreement of raw scores among testers. Age estimations using the testers' scores showed no significant differences among testers with regard to bias or error. Mean tester error was -2.8 years (s = 15.48) for the test sample subset.

The qualitative method is shown to be relatively simple, quickly, and reliably scored among raters working independently with no prior knowledge of the criteria. Incorporation of individual variation

into the model suggests that more robust results can be expected than from purely cross-sectional models.

Developmental field defects in the William M. Bass Donated Skeletal Collection.

D.M. McCarthy. University of Tennessee.

As an aspect of paleopathology, studies of skeletal abnormalities are common; however, many studies have focused on a single trait or related group of traits (such as numerical variations in the spinal column), lumbosacral abnormalities (spina bifida), or the occurrence of particular phenomena (such as the paracondylar process). In 1994, Ethne Barnes outlined the "morphogenetic approach" to understanding the etiology and manifestations of disturbances in developmental fields within the entire axial skeleton. Comprehensive studies such as hers involving more than one part of the skeleton are rare, and few involve modern populations. The William M. Bass Donated Skeletal Collection at the University of Tennessee provides the unique opportunity to incorporate both.

While this skeletal collection is fairly large (346 adult individuals), not all ethnicities are equally represented. The largest percentage of the collection is made up of white males, with white females being the second largest group. For this study, 167 white males and 54 white females were examined. Observations for black males and females were also recorded and will be discussed, although the samples are too small for statistical comparison. Results of this study indicate that modern white males are significantly more susceptible than white females to defects in developmental fields throughout the axial skeleton. These include segmentation errors, vertebral border shifting, and developmental delays of the vertebra and sternum. Details regarding frequencies and patterns of defects will be fully described.

An examination of age correction factors in the estimation of actual living height among modern skeletal material.

L.E. McCormick. Department of Anthropology, Ohio State University.

This study examines the accuracy of three age correction formulae with the use of stature estimation formulae among modern skeletal material. Limb bone measurements from male (n=48) and female (n=24) individuals between the ages of 45 and 80 from the modern osteological collection from the Maxwell Museum at the University of New Mexico were analyzed. The stature estimation formulae created by Trotter and Gleser, in addition to the modified white female femora and tibiae formulae proposed by Jantz, were applied to each of the limb bone lengths. Age correction factors proposed by Trotter and Gleser, Galloway and Giles were applied to the results limb bone length calculations and compared to the 'living' statures of the individuals with paired t-tests ($p < 0.05$).

Among white males, statistical differences were noted in all comparisons of estimated stature with the use of age correction factors. Among white females, statistical differences were noted among comparisons of 'living' stature and estimated stature in the left humerus with Trotter and Gleser's age correction formula; in the right and left humeri, right and left ulnae, right and left radii and right fibula with Galloway's age correction factor and in the left humerus with the use of Giles' age correction factor. In the lower limb, the modified stature calculation formulae produced by Jantz demonstrated inaccuracy with the use of the three age correction factors among older individuals.

This study demonstrated that stature calculation was more accurate among older individuals without the use of an age correction formula.

New small-bodied ape postcrania from the middle Miocene of Maboko Island, Kenya.

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New postcrania from the middle Miocene of Maboko Island (Kenya) are attributed to the small-bodied ape *Simiolus* due to their small size and the fact that their anatomy is striking different from that of sympatric *Victoriapithecus*, *Mabokopithecus*, and *Kenyapithecus*.

The humeral head of *Simiolus* is globular and extends proximally above the level of the greater tubercle (to a relatively greater extent than in *Mabokopithecus*). This morphology is decidedly ape-like and indicates that *Simiolus* enjoyed a great degree of gleno-humeral mobility, perhaps employed during arm-swinging behaviors. *Simiolus* retains, however, a large lesser tuberosity, broad bicipital groove, and posteriorly facing humeral head from the ancestral eucatarrhine condition. Overall, the Maboko distal humerus resembles atelines and *Pliopithecus*; the entepicondyle is medially directed, the trochlea is only exiguously spooled (with minimal development of both medial and lateral keels), the capitulum is weakly globular, and the olecranon fossa is broad. A dorsal epitrochlear fossa is present but there is no entepicondylar foramen (unlike Neudorf and Wadi Moghara). *Simiolus* possesses a long and straight olecranon, suggesting that the elbow was habitually flexed. The radial notch is a single, antero-laterally facing concavity. The radial neck is relatively long, most like that of arboreal climbers and unlike the short neck of semi-terrestrial cercopithecoids, including *Victoriapithecus*. An intermediate phalanx is long and strongly curved, unlike the short and straight middle phalanges of *Victoriapithecus* and *Kenyapithecus*.

Functional analysis reveals that the Maboko small-bodied ape was an agile arboreal quadruped that had greater suspensory capabilities than other African early-middle Miocene catarrhines.

Ontogenetic variation in bone microstructure of catarrhines and its relationship to life history.

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The microscopic organization of bone constitutes an important source of information about growth patterns and behaviors characterizing vertebrate life histories. In particular, bone microstructure reflects ontogenetic variation in depositional rates and mechanical influences on skeletal development. However, as research on nonhuman primates has largely focused on secondary remodeling, little is known about the organization of their primary bone tissues formed during growth. This study examined the potential of primary bone microstructure for life history studies in wild-caught ontogenetic series of *Cercopithecus aethiops* (n=32), *Hylobates lar* (n=28), and *Pan troglodytes* (n=13). Primary bone tissue types, vascularization, and arrest lines were examined on brightfield and polarized light images of 100 micron-thick midshaft femur and humerus cross-sections and interpreted together with observed spatial patterns of

secondary remodeling. Body weight, bone length and geometry, and dental eruption data were obtained to examine correspondence of microstructure with other aspects of postnatal ontogeny.

Results indicate that age and species variation in primary bone microstructure reflects element-specific growth patterns and life history. Vascular fibrolamellar tissues characterize infants, while increased proportions of lamellar bone reflect declining growth rates during later ontogeny. The timing of this transition differs interspecifically; chimpanzees deposit fibrolamellar bone until M2 eruption, while deposition is exclusively lamellar by M1 eruption in vervets. Also, arrest lines and subtle changes in vascularity suggest cyclic variation in bone depositional rates. These and other results have significance for elucidating life history in fossil human and nonhuman primates.

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Prevalence of the metabolic syndrome in Samoans.

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Modern Samoans have been characterized as having high levels of risk for cardiovascular disease (CVD) based on analysis of individual risk factors, but little work has been done to estimate the aggregation of several CVD risk factors. The prevalence of the metabolic syndrome in 1,559 Samoans 20-84 years from American Samoa and Samoa is reported with an emphasis on general differences by age, sex and place of residence. Participants were recruited in 2002-03 from large pedigrees as part of genetic epidemiology study of obesity and type 2 diabetes. The metabolic syndrome was classified according to the ATP III criteria.

The highest prevalence of the metabolic syndrome occurred among middle aged women and men from American Samoa, e.g. 69% among women and 65% among men 40-69 years of age. Among young men <40 yrs from Samoa prevalence was very low, about 11% and was 41% in men 40-69 years from Samoa. In women from Samoa prevalence increased with 10 year cross-sectional age groups from 14% to 28%, to 35% to 60% among those 20-59 years of age and remained at 58% in the those 60-69 and 70-84 years. These results on the metabolic syndrome support earlier work indicating a very high level of CVD risk in modern Samoans. Further work will focus on the contribution of the individual components of the metabolic syndrome attempts to identify common underlying genetic susceptibility.

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Vulnerability and conservation of Ivory Coast's Tai monkey fauna.

W.S. McGraw. Department of Anthropology, The Ohio State University.

Tai National Park is the last stronghold for a number West African primates. Despite the park's protected status, poaching is widespread and recent analyses indicate that five monkey taxa are being harvested at unsustainable levels. The purpose of this paper is to identify species most vulnerable to extirpation by comparing criteria routinely employed to evaluate population risk (Cowlishaw & Dunbar 2000) with characteristics hunters use to target monkeys. Variables examined include habitat sensitivity, body size, substrate preference, anti-predator behavior and population density.

The most vulnerable taxa - *Procolobus badius badius*, *Cercopithecus diana* and *Cercocebus atys* - differ dramatically in population density. The least vulnerable monkeys - *Cercopithecus petaurista*, *C. campbelli* and *Procolobus verus* are among the most common West African primates despite their uniformly low densities. These results suggest the relationship between certain assessment criteria (e.g. population density) and extirpation risk is weak and may, in fact, operate in the opposite direction. For example, low population densities and small group sizes need not translate into increased vulnerability if primates offset these characteristics with cryptical behaviors.

These results are consistent with predictions that the African primates most likely to go extinct 1) are reliant on old growth forest, 2) weigh at least 4-5 kg, 3) are partly terrestrial, 4) are conspicuous and 5) inhabit areas with escalating human populations (Struhsaker 2002). Dramatic improvements in the effectiveness of anti-poaching patrols combined with changes in local attitudes are necessary to prevent further and, perhaps permanent, loss of the Tai monkey fauna.

Mahale and Gombe compared: patterns of research on wild chimpanzees over four decades.

W.C. McGrew. Departments of Anthropology and Zoology, Miami University, Ohio.

Students of science have contrasted the ideas and methods of Japanese and Western primatology (e.g. the critical work of Pamela Asquith.) This paper aims to test such claims by quantitatively comparing two long-term field projects, Mahale and Gombe, in terms of their research productivity as measured by scientific publications. Gombe, directed by Jane Goodall since 1960, and Mahale, directed by Toshisada Nishida since 1965, have much in common, in addition to their main focus on the eastern chimpanzee, *Pan troglodytes schweinfurthii*. They have produced similar total numbers (ca. 250) of journal articles, books and chapters since the projects were founded. When these are categorized by subject matter, the main topics, e.g. social relations, behavioral ecology, sex and reproduction, behavioral development, etc., make up similar proportions of publications. Although most research output is on similar subjects, there are also important differences between the sites, e.g. Mahale emphasizing medicinal plant use, ecology, infanticide, etc., Gombe predominating in morbidity and mortality, modeling human evolution, genetics, etc. Both sites favor publishing in *Primates* among the "Big Four" specialist primatological journals, but important differences exist in publishing elsewhere. Overall, there are more similarities than differences in scientific publishing between Mahale and Gombe, despite the asymmetry in flow of personnel between the two sites, and their different theoretical origins.

The pre-pubertal origins of sex differences in digit ratios, and their development from infancy to maturity.

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It has been argued that digit length ratios, especially the second-to-fourth finger length ratio, reflects prenatal exposure to androgens. Evidence includes observed sex differences among adults and children (Manning et al., 1998). We conducted two studies using left-hand radiographs of children originally conducted for bone age assessment as part of the California Child Health and Development Studies and the Fels Longitudinal Study.

In the former study, results are presented with respect to sex and ethnic differences in digit length ratios in a sample of 1,074 children, aged 2 to 10 years old, with serial replications taken at 6 and 8 years old from a subsample of 271 children. The latter study tested the stability of sex differences from infancy to age 17 years in a longitudinal sample of 111 children. Sex differences in digit ratios appear to emerge prior to 5 years old, but perhaps not as early as the first year of life. While lateromedial digit ratios increase with age, sex differences are highly stable and appear unaffected by puberty. Furthermore, the magnitude of sex differences in early childhood strongly correlate with sex differences at age 17 within subjects, but not with overall hand or body size at any age. The findings lend some support to the claim that sex differences in digit ratios reflect factors in the perinatal period, perhaps including androgenic effects.

Spider monkey (*Ateles geoffroyi*) rehabilitation, reintroduction and conservation at Curú Wildlife Refuge, Costa Rica.

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The black-handed spider monkey (*Ateles geoffroyi*) is among the most endangered of neotropical primates (CITES Appendix 1) due to habitat loss and poaching pressure. The species was once present throughout Costa Rica but in recent years has been depleted from the southern Nicoya Peninsula. Populations of the species are stable in national parks elsewhere in the country.

The Costa Rican Ministry of Wildlife has developed a number of programs to help return this endangered primate to previously inhabited regions. One such program is housed at the Refugio Nacional de Vida Silvestre Curú, a 3,750-acre private hacienda and wildlife refuge that receives orphaned, injured and confiscated animals from a variety of sources. Since it was designated a national rescue center for spider monkeys in 1989, over 30 individuals have been rehabilitated and released and their progress monitored for at least six months. Seven infants have been born to rehabilitated females, and spider monkeys have moved into new areas of the refuge. Curú staff continues to monitor the animals to assess the feasibility of reintroduction as a conservation tool.

Conservation efforts developed within habitat countries are rarely reported in the literature, despite the necessity of local involvement for the success of species survival programs. For natural populations of threatened primates to be protected, long-term projects such as this one must be encouraged. A similar project involving age-specific reintroductions of howler (*Alouatta palliata*) and capuchin monkeys (*Cebus capucinus*) is scheduled to begin at Curú next year.

Examining affinities of the Taung cranium based on morphometric ontogenetic simulation.

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Most workers today regard Taung as the ontogenetic precursor to gracile, rather than robust, South African australopiths. As such, recent studies have focused on inferred growth patterns in *A. africanus* and related analyses of extant hominine ontogeny. Here we revisit the question of Taung's taxonomic affinities, examining the assumption that Taung and STS 5 are conspecific. Building on work of Ackermann & Krovitz (2002), growth trajectories of extant hominine species were used to estimate the adult form of Taung. We collected 50 landmarks from specimens in 5 dental eruption stages. Procrustes aligned coordinates were then regressed against these stages to obtain growth trajectories. To simulate growth, regression coefficients were amplified by a factor of four (corresponding to the difference in growth stages) and added to the Taung coordinates. We tested this method on extant juveniles, examining the affinities of resultant "adults." Because permutation tests indicated significant differences between all hominine growth trajectories, each was separately applied to the Taung configuration to produce four estimated adults. Their affinities to STS 5 and SK 48 were tested against variability within extant hominine species.

Our results corroborate previous work indicating that post-M1 growth trajectories are fairly insignificant in determining species differences among adults. The seeming contradiction between this fact and statistical differences in trajectories has important implications for all trajectory-based analyses. Regarding Taung, these analyses demonstrated a slight affinity to STS 5 versus SK 48, though Procrustes distances to *both* specimens are within the range of variability in modern hominine species.

New research into the context of the Roc de Marsal (Dordogne, France) Neandertal.

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Roc de Marsal, a Middle Paleolithic cave on a small tributary of the Vézère River in southwest France, was excavated by amateur archaeologist, Jean Lafille, from 1952 to 1971. The roughly two-meter sequence yielded a series of Mousterian industries, including Denticulate, Typical, and Quina, associated with well-preserved fauna. In 1961, Lafille uncovered the remains of a partial Neandertal infant skeleton that appeared to have been placed in a burial pit dug into sterile layers at the base of the sequence. The intentionality of the burial, however, is debatable and not well demonstrated. Though work has been done on the skeletal material and collections, the excavations were not fully published and until recently dates, sedimentological analysis, and taphonomic studies, particularly of the burial, were not available.

In 2004, new excavations began at Roc de Marsal to date the sequence, carry out new, controlled collections, and assess the stratigraphic context of the hominid remains. While Lafille excavated approximately 27m^2, significant areas remain intact and can be re-sampled. Preliminary geological studies indicate that the base of the sequence is characterized by pitting from natural agencies, but a localized, extensive, and minimally disturbed layer of burned features not far from the hominid suggest areas of minimal post-depositional movement. While the stratigraphic association of the hominid remains is still being resolved, preliminary ESR and TL dates for the sequence immediately above the remains suggest a correlation with late Oxygen Isotope Stage (OIS) 5 through early OIS 3.

Analysis of the human skeletal remains from the Memphis-Shelby County Airport historic cemetery

(40SY619).

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In March, 2003, during runway improvements at the Memphis-Shelby County Airport in west Tennessee, workers discovered a coffin burial. Initial examination determined that the remains represented an historic cemetery burial. At this point, archaeologists (Weaver & Associates, LLC) were hired to investigate the site and ultimately revealed and excavated 65 burials. Because of the large number of burials involved, the Forensic Anthropology Center at the University of Tennessee, Knoxville, was contracted to analyze the remains in the hopes of identifying individuals within the disturbed section of the cemetery.

The cemetery was associated with Providence Baptist Church, a small African American church located in rural Shelby County (Warren et al., 2004). The church was at the location from about 1899 until 1933. Maps indicate the cemetery remained in this location until the completion of the airport in 1940 (Warren et al., 2004). Archaeological evidence supports the early 20th century period use of the cemetery.

Analyses revealed 62 individuals were represented in the 65 burials, including 18 females, 21 males, and 23 individuals of indeterminate sex. Thirty-seven of the individuals are estimated as having African ancestry while the others were indeterminate. Twenty-four burials represent infants and children less than fifteen years of age, four individuals are between 15-30 years of age, twenty-five burials are between 30 and 60 years of age, and nine individuals are estimated as 60+ years of age. Demographic, general pathology and oral health are examined to elucidate the life histories of this population.

A test of the Lamendin aging method on two historic skeletal samples.

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The Lamendin aging method involves the quantification of root translucency and the attachment position of the periodontal membrane. It was developed using recent medical examiner specimens and has been tested on several modern skeletal samples such as the Terry Collection (Lamendin et al., 1992; Prince & Ubelaker, 2002). The method may be one of the most useful for estimating age after the mid-thirties.

The current study is an evaluation of the Lamendin criteria on two historic skeletal samples from Britain. Both the Christ's Church Spitalfields and the St. Bride's Church collections represent documented skeletal samples that were buried in the 18th and 19th centuries. A total of 1255 teeth from 229 adult individuals were examined from these two collections. The Lamendin method requires measuring total root length (cementoenamel junction to apex), gingival regression (cementoenamel junction to the periodontal ligament attachment), and root translucency (root apex to the maximum level of root translucency) on the labial surface of single rooted teeth.

Our results indicate that taphonomy dramatically affects the applicability of the Lamendin technique to archaeological and historical samples. In particular, the periodontal ligament site disappears with time or is obscured by the postmortem erosion of the root surface. Approximately 30% of our sample showed no root translucency despite controlling for cases where staining, erosion, and degradation compromised the integrity of the tooth root. It may be that root translucency is a phenomenon that fades with the age of the sample.

Molecular perspectives on the origins of Chibchan speaking populations from the Sierra Nevada de Santa Marta, Colombia.

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Populations of the Chibchan language phylum are distributed from Honduras into Northern South America. The current archaeological, biological and linguistic evidence points to a lower Central American origin for these groups who are thought to have continuously occupied the region for the last 10,000 years. However, the biological relationship of these populations to Chibchan speakers from Northern South America remains largely unresolved. In this study we examine mitochondrial DNA (mtDNA) haplogroup and haplotype diversity in three Chibchan (Kogí, Arsario, Ijka) speaking populations and one Arawakan (Wayuú) population from Northeast Colombia in order to determine whether or not a relationship between Central and Northern South American Chibchan groups is present and if a timing of a Chibchan diaspora could be determined based on mtDNA coalescence dates. Amerindian haplogroups were determined for 190 individuals using RFLP analysis and mtDNA HVS-I sequences were sequenced in 61 of these individuals. Phylogenetic reconstruction of these populations using median-joining networks indicates that all Chibchan speaking populations have undergone a bottleneck high influenced by founder effect within the last 10,000 years. Using the □-statistic of Saillard et al. (2000) on two clusters of Santa Marta Chibchan haplotypes gives mtDNA coalescence dates of 8,072 (±4943) and 6,985 (±3557) both of which are consistent with other temporal estimates of Chibchan ethnogenesis. We suggest that this expansion was geographically widespread and occurred early, which may have effectively blocked gene flow from the north and south leading to genetic drift being the primary evolutionary force working on the South American continent.

STR variation in four provinces of the Basque country.

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Despite numerous anthropogenetic studies, the origins of the Basque population remain unclear. This study examines genetic variation among 549 Basques in four provinces in northern Spain. 115 individuals from Alava, 205 from Guipuzcoa, 126 from Vizcaya, and 39 from Navarre were typed for 9 STR loci (D3S1358, VWA, FGA, D8S1179, D21S11, D18S51, D5S818, D13S317, D7S820). Preliminary tests of Hardy Weinberg equilibrium using Guo and Thompson's (1992) exact method reveal that three of the provinces show significantly less heterozygosity than expected. In Alava, STR loci D3S1358, D8S1179, D5S818, D13S317, and D7S820 demonstrate lower than expected heterozygosity values. For Guipuzcoa, FGA, D8S1179, D21S11, D18S51 and D7S820 have significantly lower heterozygosity values. In Vizcaya, 7 of the 9 STR loci (D3S1358, FGA, D8S1179, D21S11, D18S51, D13S317, and D7S820) have low heterozygosities. In Navarre, 8

of the 9 loci show no significant deviation from Hardy-Weinberg expectations, while one locus (D8S1179) has a higher than expected heterozygosity. When the provinces are combined, all loci except VWA show significant deviation from Hardy-Weinberg equilibrium. These results differ from other STR studies in the Basque country, where most loci are found to be in Hardy-Weinberg equilibrium.

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Molar microwear analysis on ungulates from the "La Berbie" locality (Dordogne, France): implications for the environmental context of late Pleistocene human occupation of western France.

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This study reconstructs aspects of the paleoenvironment of western France during the Paleolithic using the dental microwear of ungulates. Studies of ungulate diets have long been used to infer paleoenvironment because the foods these mammals eat are closely tied to their habitat preferences (Merceron, 2004).

The ungulates at the "La Berbie" natural cave were deposited during a brief time interval (36,330-32,950 BP), which approximates the middle and late Paleolithic transition (Madelaine, 1999). Previous studies of ungulates have classified most species as "non-arctic open habitat", though a few have been considered "arctic-open habitat", and one has been inferred to have lived in a "wooded habitat" (Madelaine, 1999). This research has depended on comparative analyses based on animals living in recent ecosystems influenced by human activity. A study of molar microwear of these ungulates can add new insights into their paleoenvironments independent of taxonomic inferences made based on animals whose environments have been altered by human intervention.

Microwear of four species, *Rangifer tarandus*, *Bison priscus*, *Equus caballus* and *Rupicapra rupicapra*, was examined at 0.18 µm resolution using a white-light confocal microscope. Data were quantified using Microware 4.02 (Ungar, 2002) and feature sizes, shapes and densities were compared among the taxa.

Data suggest most specimens grazed, which is consistent with a steppe environment. These results, taken in context with ecomorphology, pollinic and isotopic analyses provide a better understanding of the environments of the last Neanderthal populations and the first "Cro-Magnon" ones in France.

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Sex-differential rearing effects in Pan troglodytes.

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This study examines the effects of sex and rearing situation (during infancy) on the juvenile and adult social behavior of 18 captive chimpanzees housed at the Primate Foundation of Arizona. It tests the hypotheses that a group of individuals reared with their mothers for at least 2.8 years (group mean = 4.41 years) will spend more time engaged in social behavior, will exhibit a greater diversity of social behavior, and will exhibit less abnormal behavior compared to a group of individuals separated from their mothers by 1.3 years (group mean = 0.45 years). Three indices were calculated to quantify the nature of the animals' social repertoire: an index of the overall time spent engaged in social behavior; Shannon's diversity index of social behavior; and an index of the frequency of abnormal behaviors. Repeated measures factorial ANOVA and randomization tests were used to analyze the effects of sex, rearing, and age on these behavioral indices. Results suggest that some rearing effects are ephemeral, but that others may not appear until later in development and may persist through adulthood. Perhaps most interestingly, results also suggest that males may exhibit more pronounced rearing effects than females both during juvenility and adulthood. Further research is needed to verify the presence of an interaction effect between sex and rearing and to elucidate its causal mechanisms in order to provide for and foster sex-typical social development in captive chimpanzees.

Occupational health: bioarchaeology and subsistence transition at Ganj Dareh Tepe.

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This research examines the largest human skeletal sample recovered from the eastern end of the Fertile Crescent, the central Zagros Mountains that dates to ca. 7,000 BC, early in the subsistence transition from hunting and gathering to agriculture. Macroscopic assessment of health status from the skeletal remains from the early Neolithic site of Ganj Dareh provides the basis for exploration of the relationships among health and subsistence strategy, and to examine human behavioural changes associated with agricultural origins.

The oral health of the Ganj Dareh people suggests that their diet resembled the earlier Epipalaeolithic mixture of plant and animal foods. Although they experienced episodes of stress, adult stature was not adversely affected relative to contemporary samples from other regions of Fertile Crescent. Two classes of skeletal lesions are also relevant to evaluation of subsistence: ectocranial porotic hyperostosis and resorption of vertebral bodies at the attachment sites of *anulus fibrosis*. The presence of both lesion types supports the diagnosis of human brucellosis, a caprine-associated zoonotic infection. These results corroborate the zooarchaeological and archaeological assertions that the morphologically wild goats recovered at Ganj Dareh were under extensive human control. The location of Ganj Dareh within the rocky, mountainous natural habitat of goats and the overall relatively good health of the people support the hypothesis that early pastoralism in the central Zagros Mountains developed in a situation of resource abundance well before plant cultivation was practiced in the region.

Population structure in sub-Saharan Africans based on mitochondrial, Y chromosomal and X chromosomal DNA sequences.

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Africans harbor the greatest genetic diversity, the deepest TMRCA estimates, and the largest effective population size of humans. Here we ask whether the large effective population size is associated with a highly structured population and how population structure compares across loci. We address these questions using DNA sequence data from the mitochondrial (mtDNA) *COIII* locus, anonymous sequences from the non-recombining portion of the Y chromosome (NRY), and two X chromosomal genes (*PDHA1* and *RRM2P4*). A total of 13.8 kb of DNA sequence was examined in each of 160 individuals from five geographically diverse African populations: the Dinka of Sudan,

the Dogon of Mali, the Bakola of Cameroon, and the Khoisan and southeast Bantu from southern Africa.

Estimates of subdivision based on mtDNA and the NRY reveal relatively high levels of population differentiation (FST = 0.284 and 0.236, respectively). Similar levels of population structure for these loci provides no evidence for sex-specific differences in migration rate among these populations. These FST values are only ~20-30% higher than we observe for the same loci sampled in six non-African populations (data not shown). FST values based on the two X chromosome loci (*PDHA1* and *RRM2P4*) were lower (FST = 0.090 and 0.073), but not unexpected because of their 3-fold higher effective population size compared with the haploid loci. These results may be explained by a long period of ongoing gene flow among widely scattered African populations.

A new hominoid partial maxilla from Buluk, early Miocene, Kenya.

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In 2004, renewed work at Buluk, early Miocene, Kenya, resulted in the recovery of a new partial hominoid maxilla preserving P4-M1. Results of comparisons between this specimen and other early Miocene hominoids indicate that it is most similar to *Heliopithecus*, and to part of the *Afropithecus* hypodigm. The resemblance between *Heliopithecus* and *Afropithecus* is well known and some have suggested that the two genera may be synonymous. Among the *Afropithecus* hypodigm, the new Buluk specimen resembles the smaller and presumably female material much more than the larger and presumably male material. This suggests that either: 1) material currently attributed to *Heliopithecus* should be recognized as female specimens of *Afropithecus*; or 2) the *Afropithecus* hypodigm is really two taxa, a larger one (*Afropithecus*) and a smaller one (*Heliopithecus*).

Analysis of size differences among specimens of *Afropithecus* could not falsify the hypothesis that the material represents males and females of a single sexually dimorphic species (Leakey et al., 1988). The major morphological difference between large and small *Afropithecus* specimens is that the large one has pronounced mesial and lingual cingula (the buccal portion is weathered) around each of the three upper molars, while the smaller one lacks this feature. In the current study, presence and development of upper molar cingula were scored for a large number of males and females from extant sexually dimorphic taxa. The pattern observed in *Afropithecus* could not be easily replicated in the extant comparative sample, suggesting that the variation observed in the fossil sample exceeds what might be expected from members of a single species.

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Concentration of sIgA in the milk of *Macaca mulatta*.

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This study examines whether human milk can be considered species-specific for secretory immunoglobulin A (sIgA) concentration and pattern of concentration change over time by comparison with milk of rhesus macaques (*Macaca mulatta*). SIgA is the predominant immunoglobulin in human milk and plays a critical role in protecting infants from enteric pathogens. Human milk is regarded as being unique in its high concentration of this important antibody. Research on bovine milk indicates production of milk low in sIgA, but little is known about sIgA concentration in the milks of phylogenetically-closer species. This study compares milk sIgA concentration (determined using radial immunodiffusion assays) of rhesus macaques (n = 8) and humans (data from Goldman et al., 1982) from three lactational stages. Human milk sIgA concentration is higher at all lactational stages, particularly the colostrum phase where selective pressure for transfer of immune factors may be greatest (human colostrum: 2000 mg/l; macaques: 250.9 mg/l, $p < 0.01$). Human milk also demonstrates a significantly different pattern of change in sIgA concentration over time, particularly from the colostrum to transitional milk phases ($p < 0.01$). Differences between human milk and milk from non-human primates may be a reflection of selective pressures from higher pathogen loads, more virulent pathogens, or a combination of both, encountered throughout human evolution. The transition from hunting and gathering to agriculture ca. 10,000 years ago provided novel environments for humans that may have favored breast milk with increased immune factor concentrations.

The human corpus callosum: growth and morphological integration with cranial shape.

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Morphological variability of brain components is of both anthropological and clinical importance, but much of this variation owes to variation of the cranium. For instance, the literature of the corpus callosum (CC) is enmeshed in substantial disagreements about sexual dimorphism that arise in part as conflicts among measuring methods. In a sample of 163 human children and adults, viewed via midsagittal MRI, we digitized 79 landmarks and semilandmarks on the cranial outline and the CC and explored ontogenetic shape change, sexual dimorphism, and integration using geometric morphometrics.

Over the first five years of life, the CC shows an almost uniform thickening in both sexes. Later on, while there is substantial shape variation in both sexes, men tend to show a larger splenium and a smaller genu. The corresponding neurocrania differ between the sexes mostly in the morphology of the forehead and the cranial base. Singular warp analysis uncovers several aspects of shape that covary strongly between braincase and CC, specifically, length-to-height ratio and the relative size of anterior vs. posterior. Not only orientation and elongation of the CC, but also its bending, show much less morphometric variation after one corrects for overall cranial geometry. Of course, multivariate descriptions of CC shape variation and sexual dimorphism are altered as well by this standardization. The resulting increase in precision of description bears considerable biological and clinical relevance.

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Matrilineal affinities and mortuary ritual: the 'Lokomotiv' cemetery from Neolithic Siberia.

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The Neolithic 'Lokomotiv' cemetery in the Lake Baikal region of Siberia has been the subject of many archaeological investigations in the last century. A fascinating array of mortuary practices have been documented for Lokomotiv including communal graves with a high frequency of decapitated burials and double burials oriented in either a side by side or head to toe fashion. This study considers whether biological affinity, as deduced through the retrieval of mitochondrial DNA (mtDNA) haplogroup markers from 31 Lokomotiv individuals, influenced mortuary ritual in this Neolithic cemetery. Statistical correlations were sought between the mtDNA data and various lines of archaeological evidence including radiocarbon dates, spatial data, grave architecture and artifact assemblages. Our analysis reveals that the long-term matrilineal structure of the Neolithic community that used Lokomotiv did not change over time; furthermore, matrilineal affinity did not appear to influence where one was buried in the cemetery. However, we observe an interesting association between mtDNA type at Lokomotiv and the amount of energy expenditure afforded to mortuary ritual. This finding suggests that different types of grave architecture and artifact assemblages may have been used to denote biological relationships in this prehistoric community. The results from this study will be integrated with impending analyses of other Lake Baikal cemeteries to gain further insight into the social complexities that governed these prehistoric Siberian communities.

The biomechanics of tree gouging in common marmosets (*Callithrix jacchus*).

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For many callitrichids tree exudates comprise a significant part of their diet. Thus, exudate feeding likely plays an important role in callitrichid behavioral ecology. Marmosets are unique among callitrichids in habitually gouging trees with their anterior teeth to stimulate exudate flow. We are interested in how performance during this biting behavior influences marmoset skull form.

To better understand skull functional morphology in tree-gouging marmosets, we quantified the forces produced at the upper and lower jaws and the extent of maximum jaw opening (i.e. gape) in four common marmosets during simulated tree gouging in the laboratory. We recorded jaw forces (at 600 Hz) using a force platform, while jaw movements were simultaneously videotaped in lateral view (at 60 fields/sec.). Finally, we measured maximum vertical bite forces during transducer biting and maximum jaw gapes during insect chewing to evaluate jaw force- and movement-related performance during gouging.

Peak resultant force along the lower jaw averaged 28 Newtons in the largest 25 gouges recorded (out of ~1500 gouges). Upper jaw forces averaged 21N in the largest 25. Maximum jaw gapes averaged 23.8mm for the largest 25 gapes among these gouges. Maximum gouging forces were significantly smaller than transducer bite forces (average of 45.3N) suggesting that marmosets are not biting as hard as they could during gouging. Gouging gapes are significantly larger than gapes during insect chewing (average of 9.6mm).

These comparisons corroborate morphological observations that compared to other callitrichids, marmoset jaws are shaped to facilitate wider gapes, while not being relatively more robust..

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Genotype-by-sex interaction in the regulation of high-density lipoprotein (HDL): The Framingham Heart Study.

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Low levels of high-density lipoprotein (HDL) are widely documented as a risk factor for cardiovascular disease (CVD). Consistently reported is the presence of sexual dimorphism in both the prevalence of CVD and plasma HDL levels, with sex-specific age trends in HDL variation suggestive of distinct environmental and genetic influences that differ throughout the lifespan. Despite these reports, however, the extent to which genetic factors contribute to such dimorphism has been largely unexplored.

We examined the evidence for sex-specific linkage of HDL in a longitudinal sample of 1562 participants from 330 families in the Framingham Heart Study, in three time points corresponding approximately to the periods 1971-1974, 1980-1983 and 1988-1991. Using a variance component methodology, we estimated the heritability and genetic correlation of HDL at each time point, in males and females, separately and combined, and tested for genotype-by-sex interaction at a QTL at each time point. Consistent findings were noted for females only on chromosome 2 near marker D2S1328, with adjusted LOD scores of 2.6, 2.2 and 2.1 across the three time points, respectively. In males, suggestive linkage was detected on chromosome 16 near marker D16S3396 at the second time point and on chromosome 18 near marker D18S851 at the third time point (adjusted LOD = 2.2 and 2.4 respectively). Although the total genetic heritability of HDL is similar in males and females, sex appears to exert a substantial effect on the QTL-specific variance of HDL. This study substantiates and extends HDL linkage findings from other populations.

Ecological and morphological correlates of the infraorbital foramen and its paleoecological implications.

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Mystacial vibrissae are specialized sensory end organs that respond to mechanical stimuli such as tension, pressure and displacement, and aid animals in processing environmental information. Vibrissae transmit sensory signals to the brain via the infraorbital nerve, which passes through the infraorbital foramen (IOF). For decades researchers have assumed that a one-to-one relationship exists between the size of the IOF and total vibrissae count. Accordingly, because vibrissae may assist animals in interacting with their environment, the IOF is currently used to derive paleoecological profiles of extinct taxa. However, little is known about how vibrissal count and IOF size are related, and systematic tests assessing the relationship between the IOF and ecological variables have yet to be performed. In order to test whether the IOF is an appropriate proxy for vibrissal

count and to test the relationship between foramen size and ecological variables, data were collected in several mammalian orders (Primates, Marsupialia, Carnivora, and Scandentia, n = 364).

Results indicate that only a weak corollary relationship exists between absolute IOF area and vibrissal count across taxonomic groups; but, with a body size correction, this relationship is more robust. Although IOF area and vibrissal count do not correlate well, relative IOF area does vary in size among animals that differ in their ecology. For example, nocturnal and crepuscular species have larger infra orbital formena than diurnal and cathemeral taxa. IOF area, in conjuncture with other morphological features, is in fact a useful osteological trait for reconstructing the paleoecology of extinct primate taxa.

Interpreting skeletal lesions at Hawikku: evidence for mycotic infection.

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The purpose of this study is to present four possible cases of mycosis, an infectious disease rarely described in archaeological skeletons. A similar pattern of lesions was identified in four out of 178 skeletons from Hawikku, New Mexico (ca. A.D. 1300-1680) through gross and radiographic observation. Lytic lesions of the spine are present in all four cases, with the involvement of other bony elements, including ribs, clavicle, pelvis and cranium in at least one case. Little or no reactive bone formation is associated with the lesions. Tuberculosis, treponematosis, mycosis, brucellosis, echinococcosis and cancer were considered for differential diagnosis; however, tuberculosis and mycosis are the most likely causes.

Although several individual vertebral lesions are not inconsistent with tuberculosis, the overall pattern of the disease, including number of vertebrae affected, lack of vertebral collapse, presence of noncontiguous lesions, and presence of lesions in the posterior aspects of the vertebral bodies is more consistent with mycotic infection. The consistency of this pattern in four individuals makes the case for mycosis even more compelling.

Coccidioidomycosis is endemic in the southwestern United States and thus mycosis is the most likely cause. Hawikku is slightly north of the current endemic range of *C. immitis* in New Mexico, however, involvement in an endemic area or occurrence of the disease in a previously unreported area is possible. This research suggests that mycosis should be considered in differential diagnosis of skeletal remains from southwestern regions, even if the skeletal remains are located near an endemic area.

An infant skeleton of *Nacholapithecus* and ontogenetic development of postcranial features.

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In 1998, a partial infant skeleton of *Nacholapithecus* (KNM-BG 37800) was collected *in situ*, in Nachola, northern Kenya (ca. 16 Ma). The deciduous teeth are completely erupted but the permanent molars are unerupted. Based on the dental developmental schedule in chimpanzee, the age is corresponding to 2-3 years. We describe the postcranial elements of this skeleton. Postcranial skeletal maturation accords with chimpanzees of this age. The postcranial elements include the left scapula, a lumbar vertebra, left distal humerus, right proximal ulna, right radius, right and left proximal femora, proximal metatarsal (left third?), and proximal and intermediate phalanges. Many of the postcranial characters known from adult materials were recognized: e.g. the robustly buttressed spine of scapula, well-developed lateral supraepicondylar ridge of the humerus, deep coronoid fossa relative to the radial fossa, posterior bar of the trochanteric fossa, large and medially projecting lesser trochanter. Some characters appeared to be developed in later stages. The lateral olecranon-humeral trochlear complex is poorly developed. The coronoid process is slanted and narrow. The coronoid fossa is shallow. The mid femur shaft is thicker mediolaterally rather than anteroposteriorly. Some characters are newly recognized, such as a strong dorsal reflection of the spine of the scapula and a caudal orientation of the spinous process of the lumbar vertebra.

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Comparison of bone type proportions between tibiae of exercised and sedentary swine.

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That physical activity influences the microscopic as well as macroscopic structure of bone has been recognized for many years, although the precise stimuli influencing bone remodeling is not well understood. It is hypothesized that strain induces remodeling in long bone diaphyses as bones are subjected to axial and bending loads during locomotion. The purpose of this research is to determine whether a distinct habitual activity (running) of juvenile swine influences bone remodeling in the tibia midshaft.

We examine the relation between physical activity and bone type formation in a sample of female, sub-adult swine (*Sus scrofa*). Pigs were exercised for approximately 1 hour per day for 16 weeks, starting when they were roughly one year old. We compare (proportions) the amount of woven and primary bone with secondarily remodeled bone.

Our results show relative differences in the amount of each bone type, but no statistically significant difference between groups. This may suggest that our test subjects were not exercised frequently enough or for a long enough period to activate a change in deposition. However, other experiments have shown substantial remodeling in similar exercise protocols. In general, a stronger response seems to be incurred by skeletally less mature animals, suggesting an important effect of age on sensitivity of the remodeling response.

Further research incorporating hormonal and chemical influences on bone development and maintenance will facilitate our understanding of the role that strain plays in the process of bone remodeling, and, in turn, our ability to infer habitual behavior from bone structure.

Late Miocene hominid biogeography and extinction patterns.

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The extinction pattern of Eurasian hominids indicates that the retreat of these taxa southward in the late Miocene was most probably the result of climatic

forcing. The onset of seasonality, cooler climates, and forest fragmentation have been used to suggest that hominids tracked their resources; demonstrating habitat specificity for arboreal niches, a reliance on soft fruit frugivory, and the origins of higher level cognitive function (Potts, 2004).

Here we use a Geographic Information Systems (GIS) approach to model the movement patterns of non-primate mammals, with the expectation that at least some faunal groups will share the same spatio-temporal distribution/ extinction pattern in response to deteriorating environments as the Eurasian hominids, particularly those taxa adapted to closed, forested habitats. ~320 Eurasian fossil localities from the NOW (Neogene of the Old World) Database, ranging in age from MN 5-MN 11 (17-8 Ma), were plotted according to their geographic coordinates in an *ArcGIS* 8.3 geodatabase. We consider the distribution of gomphotheriid and deinotheriid proboscideans, mustelids, medium/large bodied carnivores, suids, cervids, and murid rodents, as well as rare taxa (e.g. *Chalicotherium*).

Contrary to our hypothesis, all taxonomic groups continue to persist above 43□N, the latitude above which hominids cease to occur towards the end of the Miocene. This highly unusual extinction pattern suggests extreme environmental sensitivity in hominids, outcompetition by other taxa or factors yet to be determined, however, ecological specialization could explain the rarity of their putative descendants in the Early Pliocene of Africa and the Pleistocene of Southeast Asia.

Childhood health in the community of *Portus Romae* (2nd to 3rd Century BCE) determined from microscopic enamel defects in children with mixed dentitions.

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Wilson bands are microscopic enamel defects arising from a disruption in enamel formation caused by some systemic external stressor. This stress has been associated with a number of childhood morbidity events, including infections through the stages of weaning and many other common febrile childhood illnesses. The prevalence of both microscopic and macroscopic enamel defects is often interpreted as a measure of general childhood health.

We analysed a sample of 18 sub-adults with mixed dentitions, totalling more than 100 teeth, from the Imperial Roman necropolis of *Isola Sacra*, 2nd to 3rd century BCE. Using the microstructural markers of enamel growth (Retzius lines and cross striations), we have reconstructed a precise chronology of Wilson band development. Since the stress trigger is systemic, it affects all developing crowns at the time of the stress, producing microscopic defects that can be traced from tooth to tooth in the dentition, although we have found that defects may not always be detectable in the earliest and latest stages of crown growth. The use of both deciduous and permanent teeth allowed us to determine health status from birth through to six to or seven years of age. Our results indicate that overall incidence is higher than seen in most studies of modern populations and the ages of the Wilson band distribution are asymmetric, with increases in the first year of life followed thereafter by a steady decrease through to the end of the fourth year. These results are discussed in light of historical records of Roman childhood rearing practices.

A test of Meindl and Lovejoy's method of estimating adult age at death from cranial suture closure.

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Nearly two decades ago, Meindl and Lovejoy (1985) introduced a new method of estimating adult age at death from ectocranial suture closure. Using the Hamann-Todd Collection, they recorded the degree of closure at a number of discrete, 1 cm long landmarks distributed over the upper vault and within the infratemporal fossa. These scores are summed, and the sum is then used to generate an age estimate. While widely used by forensic anthropologists and bioarcheologists, the technique has not been extensively tested on 20th century populations. The current study examines a number of issues raised in the original study by using two known-age samples: 100 African- and European-American males and females from the Terry Collection, and 120 European-American males and females from modern forensic cases and cadavers. Each sample was carefully constructed so that each decade from the 20's through the 80's was equally represented, avoiding problems produced by skewed age distributions. Correlation coefficients between single or summed landmarks and age are very similar to those found in the original study. However, analysis of covariance suggests that there are significant differences in suture closure by sex and/or ancestry in the new samples. Furthermore, the landmarks in the infratemporal fossa (the "lateral anterior system") do not appear to be substantially more effective than the landmarks on the vault. Inaccuracy and bias statistics show that mean prediction error is comparable to other methods of age estimation from the skeleton, but the Meindl & Lovejoy method tends to underestimate age at death.

All lorises are not slow: rapid arboreal locomotion in the newly recognised red slender loris (*Loris tardigradus tardigradus*) of southwestern Sri Lanka.

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The unique locomotion of lorisines has been the subject of numerous studies, and is usually described as 'slow climbing quadrupedalism.' Despite this generalisation, studies of various taxa in the wild and in captivity have yielded occasional observations of more rapid locomotion amongst the Asian lorises. Slender lorises in particular have been shown to exhibit an unexpectedly high velocity for an animal with a supposedly slow movement pattern, resulting in use of the term "racewalk" by some authors to describe their locomotion in the laboratory. Yet few data are available to address lorisine locomotor adaptations in naturalistic settings.

Recent wild observations revealed that 15% of locomotor activity in red slender lorises was dedicated to a novel form of high velocity arboreal quadrupedalism! Data were collected on red slender lorises over 150 hours at two study sites in Sri Lanka's southwestern rainforests. Although viewing was obscured by dense vegetation, several locomotor sequences were filmed and analysed using Peak Motus**.** We present the first quantitative report of this rapid arboreal locomotor pattern in red slender lorises. This behaviour appears to be unique to this smallest of slender loris taxa, to the exclusion of the larger grey forms of the dry zones of

Northern Sri Lanka and Southern India. Forest structure, limb and body length proportions, and differences in body mass between the species are considered as potential catalysts for this novel gait. Small cage size, inappropriate substrate arrangement, and stressful conditions (e.g. white lights) may have sequestered this behaviour in prior captive studies.

Digital reconstruction of *P. boisei* OH 5.

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OH5, the type specimen of *Paranthropus boisei*, was assembled from several hundred fragments of fossilized bone (Leakey, 1959). The reconstruction of Tobias (1967) yields an almost complete face and a partial braincase. These two portions do not articulate and the facial part shows local asymmetry. Based on high resolution CT scans of these parts we provide new digital reconstructions that correct for this asymmetry before aligning the two major portions.

First, the CT images are segmented to remove the material used for physical reconstruction. Anatomical landmarks and semilandmarks along ridge curves are used to correct for asymmetry by thin-plate-spline warping. Then, the zygomatic arches, the left zygomatic bone, the missing parts of the left temporal bone, the pars petrosa of the right temporal bone, and parts of the cranial base are completed by mirror-imaging using the corresponding preserved parts.

We compare two different approaches: 1) a reconstruction based on KNM-ER406, another virtually complete cranium of *P. boisei* as reference specimen: the positions of the posterior landmarks in OH5 are estimated according to the reference specimen by thin-plate-spline warping based on the facial landmarks and semilandmarks, then the original braincase is aligned by a least squares criterion and 2) a manual electronic reassembling of the two parts closely following the description of Tobias (1967).

Furthermore, we create virtual endocasts and discuss the resulting endocranial capacities concerning previous estimates and capacities of other specimens.

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Developmental integration and evolution: using a zebrafish model to test the correlation between cranial morphology, gene expression and gene evolution.

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Morphological integration is the tendency for characters to covary as the result of common developmental factors. This paper uses zebrafish (a common model organism) to test the hypothesis that bony evolution in the cranium resulted from changes in positional information or gene gradients.

Observations from mutant phenotypes suggest that local region-specific signals in the midline are required for pattern formation in the neurocranium. The secreted *sonic hedgehog* (*shh*) molecule is a good candidate for these inductive signals. Ten 'midline group' mutant phenotypes result in some degree of fusion between two structures in the anterior-ventral neurocranium, namely the posterior parachordals and trabeculae; some of the midline group phenotypes also result in defects in the ethmoid portion of the anterior neurocranium. Midline group mutant phenotypes have little effect on the occipital bone in the posterior neurocranium. We test the hypothesis that covariation is stronger between the morphology of the trabeculae and ethmoid in the anterior neurocranium than between the trabeculae and the occipital in the posterior neurocranium. Coordinates of neurocranial landmarks are taken from microCT images and digital radiographs in zebrafish and 12 related species. The expression of *shh* for zebrafish and complete gene sequences of exon1 and exon2 for each taxon are known. Changes in gene sequence and neurocranial morphology are mapped onto published phylogenies. The results of this study suggest that a zebrafish model can be used to investigate the role played by developmental integration in the morphological diversification in a group of closely related organisms.

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Genetic and environmental influences on acquired dominance status in free ranging male rhesus macaques (*Macaca mulatta*).

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In multi-male, female-bonded Old World Monkey species, males typically must emigrate from their natal troop upon reaching sexual maturity. Younger migrants face greater risks, including premature death, but may profit through increased reproductive opportunities. Our previous work suggests that younger migrants are more impulsive and aggressive. Since both traits are strongly heritable, we investigated whether functional polymorphisms in monoamine oxidase A (MAOA) and serotonin transporter (SERT) genes, both associated with impulsivity and aggression in humans, influence the age of first migration and acquired dominance status in 59 male rhesus macaques (*Macaca mulatta*) from a free ranging colony on Morgan Island, SC. The youngest migrants (range, 2.5 – 9 years) had lower natal dominance rank ($p = .038$), but later acquired higher dominance status in their resident troops ($p < .001$). We detected a non-significant trend for interaction between MAOA genotype and age of migration on later acquired dominance status ($p = .078$) such that older migrants with the low activity MAOA allele attained the lowest acquired dominance ranks. While there were no main effects of genotype on age of first migration or acquired dominance status, we did detect a strong interaction between MAOA genotype, monoamine metabolites (5-HIAA, HVA) and age of emigration on later acquired dominance status ($p = .007$), which explained 75% of the variance. We have demonstrated that the age at which males disperse varies and is influenced by both genetic and environmental factors, although the relationship is complex.

Age estimation of fetal and neonatal skeletal remains using bones of the shoulder and pelvis.

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Fetal and neonatal skeletal remains are very important to the medical, legal, and anthropological fields due to their prevalence in archaeological and forensic contexts. The purpose of this research project is to determine which bones and their respective dimensions produce the most accurate osteometric regression analysis results for fetal and neonatal skeletal age estimation. Fetal and neonatal skeletal remains are very important to the medical, legal, and anthropological

fields. Research comparing the accuracy of using individual different bones is lacking because preliminary studies have primarily focused on the long bones. Additional research in *Forensic Fetal Osteology* by Fazekas and Kósa, however, suggests that other bones may be used in specialized regression formulae when long bones are missing or damaged.

For this research, the bones of the shoulder and pelvic girdles were used to assess age estimation techniques. Nine separate bone dimension measurements were taken from the clavicle, scapula, ilium, ischium, and pubis, which were used in regression formulae to estimate age of a known-age reference sample held at the Smithsonian (n=85). Since the age estimates were calculated in half-month ranges and known ages were in whole months, the accuracy of rounding up versus rounding down age estimates was tested. Statistical analysis showed that the clavicle was the best bone for age estimation. Age estimates were more accurate when the ages were rounded up instead of rounded down. The results showed that overall, the bones of the pelvic girdle and shoulder girdle can be used reliably for age estimation in fetal and neonatal skeletal remains. These bones deserve further examination in osteometric analysis.

Effects of the illegal animal trade on primate conservation in Vietnam.

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Vietnam is home to approximately 24 primate taxa, the majority of which are now listed as endangered. In fact, in both 2002 and 2004 Conservation International has included five Vietnamese primates on its 25 most endangered primate species list. As in other areas where primates are a part of the fauna they are threatened in Vietnam by lost of habitat, human encroachment, and hunting. Each of these factors contributes to the high frequency of endangered primate species in Vietnam. Here we focus our discussion on the active illegal animal trade network in Southeast Asia. Although all primates are protected by law in Vietnam, they are hunted here to be used in traditional medicine, to be kept as pets, and for food. If this trade is not significantly curtailed immediately, it is likely that a number of Vietnamese primates including the Cat Ba langur, Delacour's langur, the Tonkin snub-nosed monkey, the grey-shanked douc, and the black gibbon will become extinct in the near future. Research on the illegal animal trade in the Vietnam during the past five years has documented that it continues to thrive. Efforts to stem this illegal trade include capacity building for rangers and police, public education campaigns, and enhancing protected area management.

Structure of the metabolic syndrome: Implications for measurement, classification, and theory.

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These studies used confirmatory factor analysis to specify and test the factor structure of the metabolic syndrome (MS). A hierarchical four-factor model, with an overarching MS factor uniting the insulin resistance, obesity, lipid, and blood pressure (BP) factors, was tested with 847 men who participated in the Normative Aging Study. Multigroup analyses were also conducted to test the stability of the proposed model across younger and older participants and across individuals with and without cardiovascular disease. The findings demonstrated a good fit for the proposed structure (comparative fit index [CFI} = 0.97, root mean square error approximation [RMSEA] = 0.06), and stability across subgroups. The loadings of the insulin resistance, obesity, lipid, and BP component factors on the MS factor were .83, .80, .59, and .33 (all p's < .01), respectively. We replicated this model in 358 men (248 with hypertension) not receiving antihypertensive medications, to provide further evidence for the MS and to evaluate the role of BP in the syndrome. The results paralleled those above with CFI = 0.97, and RMSEA = 0.07. The loadings of the insulin resistance, obesity, lipid, and BP component factors on the MS factor were .71, .78, .71, and .19 (all p's < .01), respectively. These results provide further evidence that a common syndrome underlies variability in insulin resistance, obesity, dyslipidemia and high BP. While the MS can be considered in some ways truly syndromal, its measurement structure is also complex, offering alternatives for combining its defining variables into smaller clusters.

Quantitative analysis of modern human and fossil mandibles using 3-D geometric morphometrics.

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The study of the human mandible has been relatively neglected in comparison to the cranium. Mandibular morphology is often thought to reflect function and not to contain phylogenetic information. Previous descriptions show variation in ramal height and breadth to be the strongest difference among recent human groups. Populations also are thought to vary in corpus robusticity, obliqueness of the ramus, sigmoid notch depth, bicondylar breadth and mental foramen position. Several mandibular traits are believed to differentiate Neanderthals from modern humans: greater robusticity, a receding symphysis, a large retromolar space, a rounder gonial area, an asymmetric sigmoid notch and a posteriorly positioned mental foramen in Neanderthals.

This study quantitatively evaluated some of the proposed differences among modern human groups and between modern and fossil humans and explored these differences to test phylogenetic and functional hypotheses. 28 landmarks were digitized on 134 modern human mandibles from 10 geographic populations. 13 fossil specimens from Europe, the Near East and Africa were also measured. Data were collected with a Microscribe 3DX. A GPA was performed in Morpheus. The fitted coordinates were analyzed in SAS using PCA, CVA, Mahalanobis D^2 and Discriminant Analysis. Shape differences were explored using Morphologika.

Modern human mandibular shape shows some geographic patterning. Australians, Polynesians and, to a lesser extent, the Arctic population, are most distinct. Most shape differences between fossil and modern groups, but not among modern humans, are related to differences in centroid size. Functional implications are explored.

This research was supported by the Centennial Scholars Program, Barnard College.

Three-dimensional analysis on the variation in maxillary sinus anatomy among platyrrhine monkeys.

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versity.

The maxillary paranasal sinus pneumatizes the maxilla, and variation in its anatomy has been extensively examined among catarrhine primates. The sinus is shared among extant hominoids and macaques, but not among the other extant cercopithecoids. The sinus was detected in stem hominoids and catarrhines but not in the earliest fossil cercopithecoids. These facts support the arguments on a loss of the sinus in a common ancestor of cercopithecoids and re-acquisition in macaques. X-ray computed tomography has been used to demonstrate that the sinus is shared by most of the platyrrhine genera. In this study, we used this approach to demonstrate variation in the three-dimensional anatomy of the maxillary sinus among all platyrrhine genera. The sinus is present in all genera except *Saimiri*, *Cacajao*, and *Chiropotes*. Two major configurations were identified: distended forms pneumatizing the entire maxilla in larger species, and restricted sinuses pneumatizing the medial part of the maxilla in smaller species. The negative allometric relation between the body and orbital size indicates that the large diploe is secured between the orbital floor and alveolar process in larger but not in smaller species. The structural variation of the sinus is thus a passive consequence of this allometric relationship. We suggest that the restricted sinus is a derived feature in callitrichines and *Aotus*, and that a distended sinus was shared by the last common ancestor of platyrrhines. Thus, the last common ancestor of anthropoids had possibly shared the distended sinus.

Using measures of locus-specific differentiation to find genes underlying traits subject to recent genetic adaptation: a test case using skin pigmentation.

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A number of DNA sequence-based statistics are available to identify signatures of natural selection. However, sequencing large numbers of individuals across multiple genes can be costly and time consuming. An alternate method that uses allele frequency data has received less attention, but may be more efficient for large screening studies. This method is based on the idea that demographic events affect loci across the genome equally, while adaptation affects individual genes and nearby markers. We have applied the locus-specific pairwise F_{ST} ($lspF_{ST}$) to survey seven pigmentation candidate genes from six geographically diverse populations. Using the allele frequencies at these genes, we calculated the $lspF_{ST}$ statistic and compared it to an empirical distribution based on 11,078 SNPs analyzed in the same populations. With this comparison we are able to take into consideration the demographic histories of the populations and calculate likelihoods of the data given neutral evolution. Several pigmentation candidate genes show evidence of non-neutral patterns of differentiation. Interestingly, population differentiation at pigmentation candidate SNPs was observed both for populations differing in pigmentation phenotype (ASIP and OCA2), as well as for populations similar in pigmentation phenotype (TYR). Additionally, SNPs in MATP show high levels of European-specific population differentiation. These results suggest a strong role for natural (and/or sexual) selection in shaping human pigmentation variation. Patterns of allele frequency and $lspF_{ST}$ variation at TYR and MATP between Europeans and East Asians raise the possibility that natural selection may have acted on different alleles to produce a similar adaptive phenotype in these populations.

Comparative analysis of human and great ape proximal and subtalar ankle joints.

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Comparative studies of human and great ape ankles have been utilized in the past to understand fundamental biomechanics of human bipedalism and to interpret locomotor behavior in early hominids. In the last decade, substantial advances have been made in our understanding of the positional behavior of great apes in the wild and also in technical methods for collecting anatomical data. Here, samples of wild-caught great ape and human ankle bones are used to provide a detailed analysis of this critical anatomical region.

Joint surfaces of the proximal and subtalar ankle joints were examined on 26 humans, 26 gorillas, 24 chimpanzees, and 4 orangs; all apes were adult, wild-caught. 25 linear measurements were taken with calipers, 4 linear measurements using special digital equipment and software, and 4 angles with a specially designed device. Non-angular data were size corrected; Student's t-test was used to test for sexual dimorphism of the size-corrected data. Multivariate analyses (Principal Components and Discriminant Function), Analysis of Variance, and post-hoc tests for significant differences between taxa were performed.

Discriminant Function Analysis indicates canonical separation between taxa, with minimal overlap. Humans have distinct joint surfaces, as noted in the past, associated with changes due to the evolution of bipedalism. Comparisons with new data on ape behavior allow for additional interpretations of the differences in ankle morphology. Gorillas have distinct proximal talar joints, more like orangs than chimps or humans, possibly due to the combination of large body size and leg position.

Changes in breastfeeding practices among migrant Bangladeshi women in London.

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There are comparatively few studies on breastfeeding practices among migrant South Asian populations in developed countries. We therefore know little about the effects of migration on such practices. As part of a larger study looking at how migration impacts reproductive function among first and second-generation Bangladeshi women aged 19-39 in London, we collected data on lactational practices for parous women. Women were divided into three groups: women who migrated as adults (post-menarche) (n=53), women who migrated as children (pre-menarche) (n=28), and women born in the UK (n=10). Two other groups provided comparisons: Bangladeshi sedentees in Sylhet, NE Bangladesh (n=13), and white women of similar socioeconomic status (n=18). The data are retrospective and were collected from formal questionnaires that covered specific breastfeeding practices as well as women's reproductive histories.

Results show that adult women who moved to London were less likely to ever breastfeed subsequent children born in the UK (76% incidence) despite earlier practices in Bangladesh (100% incidence). The duration of breastfeeding also declined significantly ($p<0.05$) from an average of 18 to 8 months. While child migrants and second-generation women have a relatively high incidence of breastfeed-

ing (83% for both groups) compared to whites (53%), duration declines between first and second-generation women (from 8 to 5 months). We discuss the factors that contribute to this decline, including increases in paid employment and household work among women following migration, lack of privacy in overcrowded living conditions, and exposure to different cultural ideas.

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On the classification of abnormal head shape: interpreting artificial cranial deformation and craniosynostosis.

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Multiple factors contribute to altering the morphology of the human skull, thereby producing abnormal head shape. Cranial deformation can occur environmentally through the modification of an infant's head by means of physical forces, referred to as artificial cranial deformation or congenitally due to the premature closure of the cranial sutures, also called craniosynostosis. A multidisciplinary approach is favored to facilitate the study of cranial deformity in prehistoric, historic or contemporary human populations. Data were collected from a series of prehistoric, artificially deformed skulls and subjected to this approach. Results show that current methods of analyses and interpretations of cultural head modification need to be re-evaluated. It is concluded that both the environmental and congenital forms of deformation produce similar abnormalities in cranial morphology and that either may be mistaken for the other without understanding completely the full processes involved. A synthesis of the current literature is presented to construct a working knowledge of both phenomena and to help resolve the ambiguity and confusion over the classification and interpretation of abnormal head shape. The intent of this presentation is to stimulate discussion between the various investigative fields, including biology, medicine, and anthropology and to encourage more integration among these fields when trying to comprehend the etiology and pathogenesis of cranial deformity.

An anatomically based 3-D musculoskeletal model of the human hand for evaluation of precision grip capabilities.

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A 3-D biomechanical model of the human hand musculo-skeletal system was constructed for evaluation of precision grip capabilities. The skeletal part was determined based on serial CT scans of a human hand skeleton. The carpal bones were treated as a single mass neglecting the inter-carpal mobility. Joint surface areas were approximated by a quadratic function to define rotation axes and radii of rotation. The path of a muscle was defined by a series of points connected by line segments. The dorsal aponeurosis of the finger was also modeled by a web-like structure. By solving equations of equilibrium of forces, maximum biomechanically possible finger-tip forces were predicted for all 32 muscles. Then the precision grip capabilities were quantified by assessing opposabilities of the finger-tip forces between the thumb and the other fingers.

Muscle moment arms estimated by the present model were almost in agreement with experimental results published in the literature. Comparisons of estimated finger-tip forces with the data obtained by cadaveric experiments also showed that the present model accurately reproduced kinematics and statics of the actual hand musculo-skeletal system.

For precise prehension and manipulation, ability to appropriately control direction and magnitude of finger-tip forces is essential. However, due to morphological and biomechanical constraints imposed on the hand musculo-skeletal system, such ability is limited. Using the proposed model, quantitative evaluation of effects of the musculo-skeletal constraints in the precision grip capabilities becomes possible. The proposed model presents biomechanical and functional potentials for predicting manipulative dexterity in extinct hominids from fossil hand bones.

Morphological characteristics of earliest Jomon human remains from Tochibara rock shelter, Kita-Aiki, Nagano, Central Japan.

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Neolithic Jomon skeletal remains have been found in various sites throughout Japan; however, Earliest Jomon remains are rarely found. This has obscured our understanding of the relationship between palaeolithic and Jomon people. Excavations at Tochibara rock shelter have yielded a minimum of 11 well-preserved skeletons from the Earliest Jomon period. Metric and non-metric analysis on the skeletons reveal typical Earliest and Early Jomon morphological characteristics that include: cranial gracility, short upper facial height, smaller mandibles, mandibular dental abrasion that exhibits inclined wear plane in the molars and excess wear of the anterior teeth, gracility of postcranial elements especially in the upper limbs, and a well developed pilaster in the femur. Interestingly, certain features, such as a transverse depression or sulcus in the supra-iniac region, flexion of the mid-shaft of the humerus, and less curvature of the radius are also characteristic of Minatogawa human remains, some of the best preserved palaeolithic Japanese skeletal materials. The similarities between the sites in these skeletal features suggest a relationship between the two groups that aids our knowledge of this period of prehistory where the fossil record is weak.

Mesio-distal and angular obliquity in studies of dental sections.

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Studies of enamel thickness, dental development, and enamel-dentine junction morphology are typically performed on prepared histological sections of teeth. Sections through molars are usually made in an "ideal" coronal plane coursing through the tips of the mesial enamel cusps and their underlying dentine horns. Several authors have noted that measurements recorded from an oblique (non-ideal) section may be different from those recorded in the ideal section, but the impact of section obliquity on measurements has not been quantified. Obliquity may be caused by two types of deviation from the ideal plane: 1) mesio-distal deviations, in which the prepared section is plane-parallel to the ideal section but is located either mesial or distal to the ideal plane; 2) angular obliquity, in which the prepared section is not exactly coronal in orientation. In order to evaluate the impact of obliquity on cross-sectional measurements, a small sample of primate molars was scanned with high-resolution

micro-computed tomography. The molars represented small- and large-bodied primates, with thick and thin enameled taxa represented. Models of each molar were virtually sectioned in ideal, controlled mesio-distal oblique, and controlled angular oblique planes. Measurements recorded from oblique sections demonstrate that obliquity may yield substantially different measurements than those from an ideal section, and large differences in measurements can be found at small distances from the ideal plane (~50-100 microns). The magnitude of measurement differences between oblique sections and the ideal section is a function of tooth morphology (e.g. the shape of dentine horns) and tooth size.

Genetic analysis of abnormalities in lipid metabolism in individuals with the metabolic syndrome.

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One of the hallmarks of the metabolic syndrome is an altered lipid and lipoprotein profile, including elevated plasma triglyceride levels, decreased HDL cholesterol levels, and predominance of small dense LDL and HDL particles. These changes have been recognized as highly predictive of several morbidities including coronary artery disease.

As part of our investigation into the genetic basis of these abnormalities, we analyzed the lipid profile of 2207 individuals distributed over 507 families of Northern European descent. Fasting triglyceride and cholesterol (total cholesterol, HDL, LDL) concentrations, as well as LDL peak particle diameter (LDLp) and HDL median diameter (HDLm) were measured. For a genome-wide linkage analysis, all individuals were genotyped for 387 markers yielding an average map density of approximately 10cM.

Our analysis identified significant quantitative trait loci (QTL) on human chromosome 7q36 strongly linked to variation in plasma triglyceride and plasma LDL levels (LOD=3.64), and on human chromosome 12 linked to plasma HDL levels and to HDLm (LOD=3.15). Two additional QTL to plasma LDL and HDL were identified on chromosomes 7 and 15 (LOD<3.0).

Bivariate quantitative trait analysis of these lipid QTL reveals significant pleiotropy to anthropometrics (waist-hip ratio, BMI) and plasma insulin levels. This illustrates the complex interaction of lipid profile alterations with other phenotypic abnormalities characteristic of the metabolic syndrome. Studies are under way to identify genetic variants responsible for the lipid abnormalities.

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Human bite force: the relation between EMG activity and bite force at a standardized gape.

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Studies on human bite force have produced contradictory findings. Mansour and Reynik (1975) found that bite force is largest at the second molar (M2). Using EMG amplitude as a proxy for bite force, Spencer (1998) found that the superficial masseter and anterior temporalis were most active at the M1. Manns et al. (1979) and Pruim et al. (1978) found EMG amplitude to be a poor proxy for bite force due to variation in sarcomere length at varying gapes. Our goal was to study the relationship among sarcomere length, bite position, EMG activity, and bite force.

We measured vertical bite force at five locations (I1, P3, M1, M2, and M3) with an adjustable force transducer. To keep sarcomere length constant, we adjusted the transducer's height to maintain incisal gape at 75% of maximum gape while biting at each tooth position. We simultaneously measured surface EMG along the right and left superficial masseter and anterior temporalis muscles.

Our findings suggest that for submaximal bites vertical bite force is similar at M1 and M2, and declines substantially at I1, P3, and M3. EMG activity follows a similar trend. However, each muscle shows a different pattern, and variability in the activity levels of the working and balancing-side muscles is apparent. Moreover, EMG activity is higher at I1 than at P3 even though bite force decreases. Our study demonstrates that sarcomere length should be accounted for in future studies of bite force at different positions along the toothrow.

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Laterality of hand function in captive orangutans (*Pongo pygmaeus*).

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Laterality of manual function, or "handedness," may be related to the evolution of language, complex tool use, or bipedalism in *Homo sapiens*. However, the weight and sufficiency of the evidence for population-level handedness in the great apes remains a topic of debate. We conducted a study of handedness in eight orangutans at the National Zoological Park, Washington, D.C., in 1998. We recorded hand use in a selection of daily activities and in a tool use task. Degrees of manual preference were ranked according to the framework proposed by McGrew & Marchant (1997).

We analyzed five behavioral patterns: eat (unimanual or bimanual), oral tool use, manual tool use, and tool manufacture. Although some individuals showed significant manual preferences for some tasks, at the population level unimanual and bimanual eating, oral tool use, and tool modification were shown at level 1 (unlateralized, or equal use of each hand). Manual tool use was shown at level 2, with four subjects demonstrating significant hand preferences (one hand used significantly more often than the other) but no population-level bias to the right or left.

These results are consistent with previous studies of manual preference in orangutans and the other great apes, though recent work with captive chimpanzees has yielded evidence for population-level handedness. The emergence of manual lateralization in orangutans may relate to complex manipulative tasks, in this case tool use and manufacture. We hypothesize that more challenging manual tasks elicit stronger hand preferences.

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Chewing biomechanics in *Sus scrofa*: how do mandibular cross-sectional properties and dental microwear compare along the tooth row?

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Previous experimental work evaluating the effects of diet consistency on mastication has generally been limited to studies

of mandibular structure or rates and types of tooth wear. Control groups fed hard diets (HD) have consistently exhibited increased cortical remodeling and/or bone strength when compared to groups fed soft diets (SD). Results of tooth wear studies, however, have been less straightforward. This study examines both mandibular structural morphology and postcanine dental microwear together. We examined mandibles from eight miniature swine, raised from four weeks to nine months on HD and SD (n=4, each group). Mandibular structural properties were calculated from pQCT slices at the dp3-dp4 and dp4-M1 contacts. Dental microwear analysis was performed on lingual crushing facets of dp4 and M1 by digitizing and measuring photomicrographs of enamel surfaces under 500X magnification scanning electron microscopy of positive high-resolution casts.

Our results suggest that between the dp4-M1 contact, HD animals have mandibles that are stronger dorsoventrally than SD animals, yet those of our SD group have higher torsional and mediolateral rigidity and higher torsional bending strength than the HD group. Between the dp3-dp4 contact, however, the HD group has consistently more rigid and stronger mandibles. Non-parametric tests of microwear show that dp4s of the HD group have overall higher numbers of microwear features than those of the SD group, while their M1s have significantly larger pits. Our results suggest that diet consistency significantly affects both dental microwear and mandibular structure, yet a direct correlation between the two is likely to be complex.

Head kinematics during locomotion and the semicircular canals of free-ranging New World monkeys.

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Recent research (Walker A., et al., 2003. J. Vert. Pal. 23 (Suppl) 107A) has shown that fast, frequent changes in angular motion of the head are correlated with high radii of curvature of semicircular canals. This study examined the relationship between radii of curvature of semicircular canals and rotation of the head during locomotion in three arboreal species of New World monkeys: *Cebus capucinas*, *Alouatta palliata*, and *Ateles geoffroyi*. Their similarly high radii of curvature of semicircular canals should correlate with a similarly high frequency of head rotation.

The study site was a tropical wet forest in Northeastern Costa Rica at Estación Biológica La Suerte. Positional behavioral data were collected between June and August 2003 with one minute instantaneous sampling (n=1519). Five hours of footage with the head visible during locomotion were filmed from forest floor using focal animal continuous sampling between June and August 2004. Video was analyzed for average number of head rotations per second of locomotor type.

Preliminary analysis shows that each species exhibits a similar frequency of head rotation when performing the same type of locomotion. Furthermore, more acrobatic movements (e.g. leaping) require greater stabilization of the head and trunk (fewer rotations at a higher speed) than do more cautious movements (e.g. quadrupedal walking). Head and trunk stability during locomotion is a better indicator of the similarly high radii of curvature of semicircular canals in these primates than is frequency of head rotation.

Aleš Hrdlicka and the founding of the AJPA: 1918.

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The national and international preoccupation with World War I did not provide an auspicious time to inaugurate a new scientific journal. Nevertheless Hrdlicka felt strongly that a niche in scientific publications existed for papers on physical (biological) anthropology that was not met by existing journals. Research on ethnic biological variation was important in the war context because of its potential to provide data that could be consequential in creating some new boundaries between nations following the war.

Getting the Journal started was a tribute to Hrdlicka's vision as well as his tenacity. He was able to attract a remarkable initial group of Associate Editors who lent their prestige and, in at least some cases, provided supplemental funding that underwrote the cost of publication. Hrdlicka actively solicited manuscripts but emphasized the need for a high standard of scientific excellence. Throughout his tenure he remained unenthusiastic about manuscripts with a heavy emphasis on statistical analysis.

In today's scientific context one can certainly debate the scientific merit of some papers published in the AJPA during Hrdlicka's tenure as founding editor. Hrdlicka and some of the Associate Editors were active in various eugenics organizations and were surprisingly uncritical regarding some of the racist ideas embedded in them. This bias did affect editorial opinion and the content of some papers did not meet the ideal of scientific rigor that Hrdlicka embraced in other contexts. Nevertheless the overall standard of excellence set by Hrdlicka created a foundation that continues to serve science and the discipline of physical anthropology.

Correlates of ecological and behavioral diversity in *Eulemur*.

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The extent of diversity within closely related taxa may be a function of adaptive, phylogenetic and/or geographic influences and constraints. Examining variation within a genus may help to pinpoint the causal agents of adaptive phenomena since these populations have more recently diverged and are more likely living in the environment of adaptation. This study examines correlates of diversity in the genus *Eulemur*, a taxon that has a wide distribution in a variety of habitat types throughout Madagascar. Previously published data were gathered from eight long-term studies of *Eulemur* populations. Variables were categorized into five datasets: 1) environmental characteristics, 2) group composition, 3) social behavior, 4) diet, and 5) activity budget. These data were used in a two-part approach to explore potential influences on the diversity within the genus. First, principal component and cluster analyses were implemented to examine the overall similarity among *Eulemur* populations and to determine which variables contribute most to the variation among taxa. Second, Mantel tests were conducted to test for correlations among the dataset matrices. The results suggest a high degree of ecological flexibility among members of the genus. Populations in similar environments display similar ecological characteristics. In particular, a strong positive correlation was found between environment and activity budget. Additionally, social behavior was negatively correlated with geographic distance among populations. This latter result may be due to niche separation of sympatric *Eulemur* species and/or to the closer evolutionary relatedness of allopatric *Eulemur fulvus* subspecies.

Ghosts of the past II: forelimb muscles and fasciae in some Primates.

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Superficial temporal muscles, present in other primates, occur in only 35 of 400 humans (Oxnard and Wealthall, AJPA, 2003, 163). In all cadavers, however, the associated fasciae exist like "ghosts" of once present muscles. This implies past reduction in masticatory muscles in humans and is associated with jaw and cranial gracilisation. It seems to derive from inactivation of a myosin gene in the human head domain (MYH 16) occurring after the chimpanzee/human split (Stedman et al, Nature, 2004, 428: 415).

A similar phenomenon may be operating in the human forelimb. The dorsoepitrochlearis muscle of other primates exists in only 5% of humans. Yet the associated fascial "ghosts" are present in all humans. Similarly, other forelimb muscles (eg coracobrachialis) are much less complex and much smaller in humans than in other primates, though, again, variations and fascial sheets in humans indicate increased size and complexity were once the norm. This is also true for many other forelimb muscles and is associated with skeletal gracilisation. This muscle and bone reduction is not found in the human hindlimb.

Is it possible that a molecular phenomenon, not unlike that producing reduction of the jaw muscles in creatures with reduced need for powerful mastication, may also have reduced forelimb muscles and produced associated forelimb gracilisation in creatures no longer using a forelimb for powerful locomotion? If so, could this molecular change be dated (as for mastication) thus giving a date for forelimb reduction and bipedalism?

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The effects of hunting on the densities of the Pagai, Mentawai Island primates.

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Primate population densities primarily reflect a balance between reproduction and death rates, which are influenced by many variables such as genetic factors, zoogeography, habitat, natural and anthropogenic successional changes, seasonal and inter-annual variations in food production and quality, inter- and intraspecific competition, and disease and predation. Of this long and only partial list, the effects of one factor – hunting – on the Pagai, Mentawai Island primates (*Hylobates klossii*, *Macaca pagensis*, *Presbytis potenziani*, and *Simias concolor*) was examined.

Standard line transect primate surveys were conducted in nine dipterocarp forests. Three of the forests were located within one kilometer of a populated area, three were within a few kilometers of a village, and three of the forests were located within a few more kilometers of a village. In addition, data on corollaries of hunting pressure were recorded and interviews with villagers were conducted.

The results indicate that the Mentawai primates were not hunted randomly. Significantly less people hunted gibbons and leaf monkeys, while significantly more people harvested simakobus and macaques. In fact, hunting appeared to have a negative impact on colobine densities. In addition, it appeared that hunters chose prey items not only on the basis of size, but due to ease of capture, taste, and density. Although primate hunting had been a cultural trademark of the Pagai, Mentawai culture for many generations, this recent change in lifestyle will benefit the endangered and endemic primates that inhabit the islands.

A health assessment of 115 high status burials recovered from the Roman-Byzantine archaeological site of Elaiussa Sebaste, Turkey.

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During the 2003 field season, 115 Byzantine burials excavated from underneath the church floor located in the Area dell'Agora portion of the Elaiussa Sebaste site were assessed for skeletal lesions. Elaiussa Sebaste was a Mediterranean coastal community. It began as a Roman town and continued on as an early Christian Byzantine community lasting until the 8th century A.D. The burials examined for this presentation date to the middle of the 6th through middle of the 7th centuries A.D.

Since the individuals were buried in the church, we have assumed they represent the empowered members of this community. We are attempting to see how high ranking social status might influence the type and frequency of skeletal lesions. The results of our assessment suggest that they suffered from a number of chronic health problems. For example 65% of the adults exhibit arthritic lesions, with the right shoulder as the most frequently affected joint and the left ankle as the least affected joint at 9%. Nineteen percent of the adults show lesions associated with violent trauma, while 55% of them suffered from nonspecific infections. Sub-adults were not immune to health problems, 29% of them show lesions associated with nonspecific infections. And 17% of the sub-adults experienced dietary problems.

Despite the implied high social status of these individuals, they had their share of chronic health problems. This leads us to wonder how bad off the common laborers living in this community are, this question will be explored the in future.

A reassessment of skeletal pathologies at Arroyo Hondo Pueblo, New Mexico: Rickets.

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Arroyo Hondo is a 14th century ancestral publeo site located immediately south of Santa Fe, New Mexico in the foothills of the Sangre de Christo mountains. Excavation of this site by Douglas Schwartz of the School of American Research in the 1970's recovered approximately 120 individuals and additional isolated remains. Among the pathologies identified for this population was "bowing" exhibited by a number of individuals.

This reassessment focuses on the patterning of limb deformities among adults and related skeletal changes in juveniles believed to be associated with rickets. Recent work by Ortner and others identify the suite of skeletal changes found in juvenile cases of rickets. Though not often identified in prehistoric populations, these skeletal changes form a distinct pathological signature, especially if variable individual response in the population is taken into consideration. Cases of adult limb deformation are assessed and compared with juvenile instances of rickets. These cases provide a basis for assessing the age-of-onset and severity of rickets in comparison with other nutritional and disease insults experienced by the Arroyo Hondo population.

Interpreting hallucal prehensility from cuboid morphology in Hominoid primates.

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The modern human foot is unique among primates because of an adducted hallux with limited prehensile capabilities associated with habitual bipedality. Previous studies have tried to infer prehensile capabilities in fossil hominins in part by examining the calcaneus and distal fibula as indicators of peroneous longus muscle size and function, a muscle active during arboreal positional behaviors in nonhuman primates. Since the results of these studies have been inconclusive, the cuboid is examined here as a possible better indicator of peroneus longus morphology and function.

Cuboids from all extant hominoid genera and a cast of the OH-8 cuboid attributed to *Homo habilis* were measured. Linear measurements were made to determine relative peroneal sulcus depth and width and were correlated to muscle mass data in the literature. A sulcus flaring index (medial width/lateral width x 100) and sulcus angle were obtained to infer the orientation of the peroneous longus muscle insertion.

The relative depth and width of the peroneal sulcus are not strong indicators of muscle size. Modern humans and OH-8 were distinct from other hominoids in displaying a more proximal direction for the insertion of peroneous longus and a flaring index greater than 100 indicating a relatively larger medial opening. These features are related to the dual insertion of the peroneous longus on the hallux and medial cuneiform in modern humans and may indicate an adducted hallux and limited prehensile capabilities in early *Homo*. The evolution of the human foot and implications for the evolution of primate grasping feet are discussed.

The effect of breastfeeding intensity on bone mineral density.

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Breastfeeding women from Massachusetts (n=35) participated in a study measuring the effect of breastfeeding variation on BMD. Breastfeeding diaries and repeated measures of BMD (DEXA) were used to categorize breastfeeding intensity and changes in BMD throughout the postpartum period. Women entered the study between 2 weeks and 3 years postpartum. The central hypothesis tested was whether variation in breastfeeding intensity affected the rate of change in BMD during lactational amenorrhea (LA) and/or after menses resumed. Multilevel modeling was used to interpret the data. Repeated BMD measures were viewed as nested within individuals. Individuals were nested within groups based on breastfeeding intensity (low, medium-low, medium-high, or high), calcium intake (low or high), and familial history of osteoporosis (yes or no). Results show that BMD decreased during lactation and increased after menses resumed. High breastfeeding intensity had a greater effect on the increase of BMD after menses returned than it had on the loss of bone during LA. High intensity was associated with a .04 g/cm^2 increase in BMD ($t = 24.1$, $p=.000$) for every three months of post-menses breastfeeding. The same level of breastfeeding intensity during LA was associated with a decrease of .01 g/cm^2 BMD, also statistically significant ($t = 4.3$, $p=.01$). This study suggests that high intensity post-menses breastfeeding may be an important factor in attaining a net gain in BMD during lactation, with implications for osteoporosis studies of contemporary women and archaeological populations.

Development of Bayesian discriminant analysis for multivariate data with missing values, with an application to the origin of modern humans.

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Fragmentary fossils are a perennial problem in paleoanthropology. Anthropologists generally adopt one of two strategies to handle missing data; each strategy creates additional problems. First, missing data can be estimated through single or multiple imputation procedures. In the absence of computationally intensive resampling studies, this method produces misleadingly precise results by not incorporating the added uncertainly generated by the estimates. Second, missing values can be excluded, which often leads investigators to perform many partially redundant analyses on specimens that share sets of variables. Additionally, treating single, well-preserved fossils as a "group" in discriminant analysis conflates individual and between-group variation, thus exaggerating the distinctiveness of fossil "groups".

We present a Bayesian method of discriminant analysis that circumvents these problems and smoothly incorporates the added uncertainty from imputing missing values. The method assumes multivariate normality and a constant within-group variance-covariance structure. Missing data are simulated via Gibbs samplers for missing means, variances, and individual measurements. We apply the method to a large postcranial data set (305 individuals, 84 variables, 9 recent and 5 fossil groups, with an average of 19.7% missing values). We compare the results to a standard SAS CANDISC procedure that discards specimens with missing values. The Bayesian method shrank some of the distances between fossil and recent groups but also produced large (and realistic) confidence intervals around those distances. SAS discarded 62.3% of the individuals and all of the fossil groups but generated a similar pattern of distances between the remaining groups.

Differences in patterns of shape variation among cranial regions in the Papionini.

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An extensive range of morphological and molecular studies have been conducted on the Old World monkey tribe Papionini (macaques, mangabeys, baboons and mandrills/drills), yet major uncertainties remain regarding the evolution and adaptations of the tribe. Most researchers accept the consensus molecular phylogeny, however, there is disagreement among several landmark-based cranial studies regarding homoplasies and the ancestral morphotype. The basis for this disagreement may be due to differences in the species and landmarks chosen for study. In addition, there has been a lack of emphasis on the basicranium in previous studies, resulting in an incomplete understanding of cranial variation.

In this study, 3D coordinates of 162 landmarks were digitized on 240 adult crania. The landmarks were divided into three regions, the vault, face and basicranium. At least two species from each of the six papionin genera were included, except for the monotypic *Theropithecus*. Landmarks were subjected to a Generalized Procrustes Analysis, followed by multivariate analyses, including PCA, regression, CVA and tree building.

Analyses of the complete cranium, face and basicranium yield different statistically significant patterns of shape among taxa, which in turn allow possible alternative phylogenetic, functional and allometric interpretations. For example, analyses of the complete cranium and face reproduce the traditional morphological phylogeny, grouping *Papio* and *Mandrillus*

separate from a mangabey cluster. However, basicranial data produce a morphological association between *Theropithecus* and *Papio* to the exclusion of *Mandrillus*, with the mangabeys incompletely distinguished. Finally, results demonstrate that in papionin studies, careful selection of landmarks is integral to properly addressing hypotheses.

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Intraskeletal variability in bone mass.

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The reduction in bone mass that occurs in the aging human skeleton is well established. Often, for methodological or other reasons, a variety of skeletal elements are analyzed and subsequently used as a basis for describing general bone loss. However, bone mass and bone loss not only vary among individuals, but also within and among skeletal elements of the same individual as well. The causes and processes behind intraskeletal variability in bone mass reduction remain unclear. Here, using a modern autopsy sample, we explore the issue of intraskeletal variability in bone mass by examining the extent to which cortical cross-sectional area measurements for different skeletal elements within the same individual correlate and how this varies with age and sex.

Histological analysis is used to determine measures of bone mass (i.e. cortical area, marrow cavity area, and relative cortical area) from the midshafts of seven skeletal elements (rib, humerus, radius, ulna, femur, tibia, and fibula) from the same individuals (N=25). These measurements are examined for patterns of age-related bone loss and the extent of intraskeletal variability using regression analysis.

The patterns of age related bone loss that are identified are interpreted in terms of the extent to which the typical mechanical loading environments for skeletal elements determine bone mass and the rate and magnitude of bone loss with age. The implications of these findings and their role in helping to elucidate the etiology of osteoporosis are discussed.

Health and society in Mexico: a line of research of Mexican Physical Anthropology.

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Traditionally, Physical Anthropology researches human biological variation from an evolutionary perspective. As a consequence, the notion of adaptation to "natural" environments is a subtext in the great majority of the researches carried out in this field.

However, in countries like Mexico, income, ownership of lands, wealth and other material goods as well as cultural and symbolic capital are unequally distributed. Because of these conditions, it is important to emphasize these socially constructed unequal circumstances in human variation research. Hence, new theoretical categories and methodological approaches are needed.

The goal of this paper is to present how these issues are addressed in an academic team that belongs to the Graduate program of Physical Anthropology in the National School of Anthropology and History in Mexico City.

Feast of the dead: analysis of the talus and calcaneus bones from the Poole-Rose Ossuary.

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This study reports on the demography and osteological profile of the Poole-Rose Ossuary. Excavated in 1990 at the request of the Alderville First Nation, the Poole-Rose Ossuary is a Late Woodland burial site in Southern Ontario, Canada. Lack of European artifacts in the burial suggests that this site predates European contact. The Poole-Rose Ossuary is radiocarbon dated to A.D. 1550 ± 50 years**;** the skeletal remains were commingled. This ossuary likely represents the mass reburial known as the "Feast of the Dead" or the "Kettle." For the most part, closely related individuals were involved in such re-burials, which occurred every 10-12 years.

I used the talus and calcaneus in this study. The left calcaneus shows a minimum number of individuals (MNI) of 185; approximately 20% of these individuals are subadults. This MNI is within the range reported in previous studies on the Poole-Rose Ossuary (range of MNI is 169 to 300). The incidence of degenerative joint disease is low, which is consistent with the clinical literature. This study also reports on issues of concordance and discordance of the Poole-Rose Ossuary with an ethnohistoric account and other studies of Late Woodland ossuaries (e.g. burial of infants, de-fleshing, and cremation).

Penile anatomy of East African galagos and implications for taxonomy and phylogeny.

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Recent studies of the comparative penile morphology of galagos have revealed complex patterns of size, shape and distribution of re-curved spines. These characteristics remain conservative within well-documented species but vary significantly between them. They are, therefore, potentially valuable in distinguishing between cryptic species. So far the penile morphologies of 14 galago species have been studied and an identification key proposed by Anderson (2000). During this study, six species of East African galagos (*Otolemur garnettii, Galagoides cocos*, *G. zanzibaricus*, *G. grant*, *G. rondoensis*, *G. orinus*) were trapped in the wild and their gross penile morphologies photographed, drawn and described. This paper presents two new descriptions and two revisions, leading to a revised identification key. Variation in penile morphology is discussed in relation to social organisation, mating systems, taxonomy and phylogeny.

Evolution of dental formulas and tooth development genes in primates.

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We have generated MSX1 and PAX9 exon, intron and regulatory sequence data to describe interspecific patterns of molecular variation for 13 primate species representing all lineages with derived dental formulas. Dental formula variation is extensive among primates; for each permanent tooth type, and for all but canines in the deciduous dentition, differences in tooth number exist between extant species. Changes in MSX1 and PAX9 function or expression are possibly involved in this diversity. These genes are essential for dental patterning and development, and MSX1 and PAX9 mutations in humans have been associated with cases of tooth agenesis involving some, but not all, teeth. At several conserved positions we found fixed differences consistent with specific dental formula phenotypes; however, a causative relationship between these differences and changes in tooth number cannot be established without additional analysis methods. We did not observe widespread evidence for positive

selection in either MSX1 or PAX9, perhaps reflecting, in part, functional constraint related to the fact that these genes are also involved in the development of other organs. Of the regions examined, the first exon of MSX1 is the least conserved at the amino acid level. This is especially true in a comparison of the New World monkeys *Leontopithecus rosalia* (third molar absent) and *Callimico goeldii* (third molar present), with a nonsynonymous (amino acid-changing) to synonymous substitution rate ratio (d_N/d_S) of 1.81 for this exon. Finally, mutations associated with human tooth agenesis were not found in other primates.

A study of the scaling patterns of physiological cross-sectional area of the chewing muscles in prosimians.

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Models of mastication require data on the force that can be produced by individual muscles. The physiological cross-sectional area (PCSA) is a good proxy for the force a muscle can produce. The PCSA was estimated for 7 individual muscle parts of the jaw adductors for *Otolemur crassicaudatus* (4), *Otolemur garnettii* (2), *Galago senegalensis* (2), *Galago demidoff* (2), *Nycticebus coucang* (1), *Lemur catta* (1), *Cheirogaleus medius* (1), and *Tarsius syrichta* (1). These species span a wide range of body mass (60 – 2200g). Reduced major axis regressions were performed on logged data to determine scaling patterns of PCSA with body mass and mandible length, a variable commonly used to reflect bending moments.

Total PCSA scaled with strong positive allometry relative to mean species body mass (slope=0.83) and mandible length cubed (slope=0.89). This result may reflect the need for larger animals to chew more. Another factor may be size-related decreases in the efficiency of other parts of the masticatory apparatus (e.g. moment arms). Finally, the larger animals may consume more resistant foods (stems, dried gum), especially during the dry season.

Surprisingly, of the seven muscle parts examined, only three had significant regressions: deep masseter, zygomatic temporalis, and deep temporalis. Variation in PCSA of medial pterygoid, superficial temporalis, superficial masseter, and zygomatico-mandibularis underscores the importance of understanding interactions among such variables as PCSA, leverage, EMG activity, and constraint (Hylander 1985). For example, variation in PCSA of medial pterygoid may reflect species-specific spatial constraints on muscle size.

Supported by NSF and Duke.

New survey data on *Pygathrix nigripes*, the black-shanked douc langur, from Cat Tien National Park, Viet Nam.

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The two most recent comprehensive reviews of the distribution and status of primates in Vietnam note that while Cat Tien National Park is home of the largest remaining evergreen and semi-evergreen rainforests in southern Vietnam little is known of its primate populations. Field data collected in this national park primarily by the senior author allow us to begin to rectify this situation by presenting preliminary information on the population distribution and status of the black-shanked douc langur (*Pygathrix nigripes*), an endangered Old World monkey known only from southern Vietnam and Cambodia. During the past few years unofficial records (from rangers and tourists) have suggested that this species may be wide spread within Cat Tien National Park. To evaluate the validity of this suggestion a detailed census of black-shanked doucs has been undertaken. Surveys conducted during the first four months of 2004 have identified the presence of at least 18 groups of this species with a minimum of 109 individuals. To date, most of these surveys have been in the Nam Cat Tien section of the national park. In the near future we will also conduct systematic surveys in the Cat Loc and Tay Cat Tien sections of Cat Tien National Park. Data that our surveys have yielded so far indicate that a significant population of this endangered species resides in this national park. Moreover, Cat Tien may be an ideal location for gathering good ecology information about this species, data that are essential for its conservation.

Trauma patterns in the massacre victims from Punta Lobos, northern coastal Peru.

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In 1998, the remains of nearly 200 massacre victims were recovered from a beach at Punta Lobos, in the Huarmey River valley of northern coastal Peru. Many were found with their hands and feet still bound, some had the remains of cloth blindfolds covering their eyes. Osteological analysis revealed that the remains consisted of men and children, many with cut marks at the base of the throat. Calibrated radiocarbon dates place the massacre at A.D. 1250 to 1300, suggesting it may be linked to the expansion of the Chimu empire into the region. An analysis of ante- and perimortem trauma was undertaken in an effort to estimate the relative degree of interpersonal violence in the population, and the types of trauma sustained during the massacre. Nearly all the trauma observed consisted of healed fractures. Comparison of the number of fractures per individual for each of six age groups showed a general increase in the number of fractures with age. The incidence of cranial and ulnar fractures, which are commonly associated with interpersonal violence, was low. There were only two perimortem fractures, both mid-shaft fractures of the first right rib. These patterns suggest that the level of interpersonal violence experienced by the group was low, and that physical resistance to the massacre was minimal. Comparison of the Punta Lobos victims with other, known cases of captive sacrifice from Peru show significant differences in fracture incidence and archaeological context, supporting our hypothesis that these victims were not captured in combat.

A reevaluation of the phylogenetic utility of incisor heteromorphy.

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It has long been recognized that maxillary lateral incisors in the modern hominoids are narrower in mesiodistal dimension relative to the central. This disparity in incisor length, also known as incisor heteromorphy, is most severe in the *Pongo* lineage. Widely believed to be caused by narrow, peg-shaped lateral incisors, increased incisor heteromorphy is considered to be a synapomorphy of the *Pongo* group, while reduced heteromorphy is thought to characterize the *Pan-Homo* lineage. Given the phylogenetic utility of this character, the aim of this study is to reevaluate the factors underlying incisor heteromorphy in the modern hominoids. A sample of 207 chimpanzees, 155 gorillas, 115 orangutans, and 240 gibbons is used. A linear regression analysis is applied to examine the relationship between the

mesiodistal dimension of the maxillary central and lateral incisors.

The relationship between the two variables is isometric in nature. Gibbons do not deviate strongly from the 95% confidence slope. Slightly expanded upper lateral incisors cause the deviation of the chimpanzees and gorillas. In orangutans the greatly expanded upper central incisors drive the difference. This indicates that peg-shaped upper lateral incisors are not as important in characterizing orangutan incisor heteromorphy as the absolutely expanded upper central incisors.

This finding is used to assess the nature of incisor heteromorphy in several Miocene hominoids and other Miocene catarrhine primates. *Proconsul* does not exhibit expanded upper central incisors relative to the lateral. Other Miocene catarrhines, including *Limnopithecus, Kalepithecus, Micropithecus, Dryopithecus, Lufengpithecus* and *Sivapithecus* all have expanded central incisors similar to orangutans.

The impact of alcoholic hepatic cirrhosis in the mortality of Yucatan, México.

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In Yucatán State people died by different kinds of diseases in relation to social class. The liver diseases and particularly hepatic cirrhosis is found among the top ten causes of death. In this poster we present a review and analysis of the vital statistics data. The results show a mortality increase in the last decades by hepatic cirrhosis with differences by sex and age group. The mortality rates in Yucatan are higher than the national rate. The death numbers are above diseases like pulmonary diseases, with diabetes mellitus and congenital malformations between others.

Inferring hominin behavior from dimorphism in a phylogenetic context.

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Sexual dimorphism is arguably the only direct evidence for social behavior preserved in the fossil record. It is widely (though not universally) accepted that early hominins were characterized by weak canine dimorphism, but strong size dimorphism, creating a classic paradox for reconstructing hominin behavior.

Recent work on the behavioral/ecological correlates of dimorphism has yielded relatively sophisticated models of the causes of dimorphism in primates. These emphasize that dimorphism reflects changes in both male and female traits. Given this, we evaluate hominin sexual dimorphism in a phylogenetic context, comparing likely changes in dimorphism as a function of changes in male and female characters.

Hominin dimorphism is most easily derived from a *Gorilla*-like pattern of dimorphism. Canine dimorphism would reduce first, presumably indicating a shift in function, followed later by size dimorphism, with retention of size dimorphism indicating a retention of polygyny. *Pan*-like dimorphism in the common ancestor is less parsimonious as it would imply a re-development of size dimorphism. Such increases in size dimorphism would imply either substantial changes in male competition, a shift in female choice re-enforcing male reproductive skew, or natural selection favoring reduction in female size at a higher rate than male size. In either case, loss of dimorphism in *Homo* suggests a simultaneous reduction in male competition and an increase in female size associated with natural selection. While no scenario can be exclusively supported, we suggest that a phylogenetic framework focusing on character transformation offers the best format for interpreting the fossil record.

Patterns of male scent marking in *Propithecus edwardsi* of Ranomafana National Park, Madagascar.

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Scent marking behavior has been well documented in many primate species. Three common functions attributed to scent marking in males of multi-male/multi-female lemur species include: 1) advertisement of individual identity, 2) territorial defense, and 3) reproductive suppression. We examined the average number of scent marks per hour exhibited daily by adult male sifakas (*Propithecus edwardsi*), and found that patterns of scent marking changed with season, natal status, and dominance status. Males in single-male groups scent-marked at the highest rate, followed by dominant males, males of equal status and subordinate males. Non-natal males generally scent marked at higher rates than natal males. All males scent marked at higher rates in the migration season. These patterns were consistent with territorial defense and advertisement to females, and they were consistent with the suggestion that these chemical signals impart information concerning status. Since scent-marking behavior tracked seasons and varied with both dominance and natal status, it may serve multiple functions.

Validation of a non-invasive model for predicting long bone loading.

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Functional interpretation of limb bone cross-sectional geometry depends upon knowledge of the magnitude and direction of habitual loading. Quantification of bone loading has only been possible using invasive, *in vivo* strain measurement and a non-invasive alternative is highly desirable. This study presents a new biomechanical model that predicts bone loading conditions from non-invasive 3D kinematic and ground reaction force data. The model has been validated using simultaneous strain, ground reaction force and kinematic data obtained *in vitro* from an aluminum limb model, and *in vivo* from experiments on sheep metatarsals. Preliminary results suggest that the orientation of the neutral axis of bending, and its position on the bone cross section, can be determined from the non-invasive force and kinematic data. These data can be used to predict the orientation and magnitude of bone bending in distal limb segments suggesting that this model will inform studies relating bone cross-sectional geometry to loading conditions and locomotor behaviors.

Features of metabolic syndrome in premenopausal women in the UK: immigrants from Pakistan compared to Pakistani and European-origin women born in the UK.

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A high prevalence of insulin resistance and the associated metabolic syndrome is found in South Asians settled in affluent countries. Since an impoverished early environment is associated with an increased risk of metabolic syndrome in adults, we hypothesise that young women of Pakistani origin who were born and raised until adulthood in Pakistan are at greater risk of metabolic syndrome than women born in the UK, whether of Pakistani or European origin. To test this hypothesis we measured variables related to metabolic syndrome in women aged 20-40 years: 26 Pakistani-origin migrants, 29 Pakistani-origin sedentes, and 21 European-origin sedentes. BMI levels did not vary significantly across the three groups (25.8 ± 5.2 in migrants, 24.5 ± 4.8 in Pakistani-origin sedentes, 27.9 ± 6.7 in European-origin sedentes), nor did waist:hip ratio or the sum of four skinfolds. However, when BMI was controlled, sum of four skinfolds varied significantly between the groups ($p=0.03$), consistent with a greater percentage of body fat in migrants. There were significant group differences in the homeostatic model assessment (HOMA) (calculated to assess insulin resistance) ($p=0.04$), which was highest in the migrant group. HDL cholesterol levels varied significantly between groups ($p<0.001$) (1.29 ± 0.27 in migrants, 1.70 ± 0.30 in Pakistani-origin sedentes, 1.48 ±0.31 in European-origin sedentes), but triglyceride levels did not. Thus we found some evidence to support the suggestion that Pakistani immigrants were at higher risk of metabolic syndrome than lifelong UK residents.

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The effect of a "bent-knee" gait on trabecular orientation: an experimental test of Wolff's Law.

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While recent attempts have been made to link trabecular orientation to gait and posture in extinct hominoids, there have been few controlled experiments to test the hypothesis that there is a predictable functional relationship between the orientation of trabecular struts within a joint and the orientation of loads applied to the joint. We tested this hypothesis (often termed Wolff's Law) by comparing the strut orientation in the spongiosa of the distal femur in two groups of immature guinea fowl that were exercised on treadmills (10 min/day, for 60 days) at 0° versus 20° inclines. Kinematic and force plate analyses found that, at peak ground reaction force, the posture of the knee in the parasagittal plane was approximately 16° more flexed in the 20° incline group. Strut orientation was analyzed from micro-CT scans of the joints using a radon transform analysis that quantifies the orientation of peak trabecular density (OPTD). As predicted by Wolff's Law, the OPTD was approximately 18° more flexed relative to the long axis of the femur in the incline versus horizontal birds ($p<0.05$). These results demonstrate a predictable relationship between the orientations of trabecular struts and compressive loads applied to a joint during growth, supporting Wolff's Law. This technique may be useful for determining gait and posture in fossil species such as *Australopithecus afarensis*.

Social behavior of wild Goeldi's Monkeys (*Callimico goeldii*).

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Goeldi's monkey (*Callimico goeldii*) regularly produces one infant, possibly representing a derived trait. Studies of *C. goeldii* adult-infant interactions, therefore, offer important insights into the evolution of cooperative infant care in callitrichines. We studied a group of *C. goeldii*, consisting of one adult female (FH) and two adult males (MR and MJ), and one infant female (FS) at a Bolivian field site. Opportunistic data on infant care and mating behavior were taken for 3 months following FS's birth. Then, for 8 months, behavioral data and nearest neighbor distances were collected using focal animal sampling for 1199 observation hours. Nearest neighbor distances among group members varied significantly ($p<0.001$): on average FH was found 2.7 m from FS, 2.8 m from MJ, and 3.5 m from MR. The frequency of grooming behaviors varied significantly among adults ($p<0.001$): FH was groomed most (8.4 % of observations) and spent the least time grooming others (3.4%), while MR was groomed least (5.9%) and groomed others most (10.7%). Although FH was observed mating with both males, she was not observed with any new offspring. All adults shared food with and carried FS, and shared food with each other. Aggressive behavior was observed on only two occasions. These data demonstrate that despite producing singletons, *C. goeldii* like many other callitrichines is characterized by a polyandrous mating pattern, groups that are spatially cohesive, and high levels of social cooperation.

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The approach to sexual maturity in Japanese macaque females (*Macaca fuscata*): a longitudinal growth study.

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Body mass of pubescent and mature Japanese macaque females fluctuates peri-annually by virtue of the anogenital swellings that appear during the mating season. At their peak, these swellings represent 20% or more of body mass, even in sexually immature adolescents. Thus any attempt to analyze growth by body mass as a function of time is beset with methodological difficulties. Most of these can be overcome by examining sufficiently closely spaced data, as in the present study, which measured five variables — mass, anterior trunk length, rump length, skinfold thickness, and teat volume — almost every day in five peripubescent female Japanese macaques followed over the age range of 1.9 yr to 5.7 yr (nearly 1400 days).

The fluctuations of body mass over the LH surge can be modeled quite accurately once the surge events themselves have been located. Compared with the growth curves for body length, they yield the masses of the anogenital swellings by subtraction — masses that would be very difficult to assess directly. Skinfold thickness and teat volume correlate with these fluctuations of body mass. Skinfold thickness is a proxy for endocrine fluctuations in the estrous cycle, and the fluctuations of teat volume, amplitude increasing with age, are an indicator of the female's approach to sexual maturity. These remarkably detailed time series thus support a unique biometric approach to this important primate endocrine process.

Cave use by wild savanna chimpanzees (*Pan troglodytes verus*) in Senegal: behavioral adaptation to heat stress?

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Much attention has been paid to the adaptations humans have made to heat stresses, especially in open environments similar to those of fossil hominid species. In Senegal, perhaps the hottest and driest region that chimpanzees inhabit today, apes appear to exhibit behavioral mechanisms of dealing with high heat stress. Chimpanzees at the Fongoli site in southeastern Senegal have been observed to use caves selectively during dry season months. This site is a mosaic of habitats, including woodland, grassland, bamboo, plateau and gallery forest. The hypothesis that chimpanzees' use of caves is a response to heat stress was tested by collecting data on temperatures within caves and in several different habitats used by chimpanzees, and comparing chimpanzee cave use across seasons. Within the 63 km^2 study area, four different cave sites were monitored monthly, with the largest being monitored more frequently. Chimpanzees' use of caves was based on direct (observational) and indirect evidence (feeding traces, feces, hairs) gathered from April 2001 - July 2004. Results indicate that chimpanzees primarily use caves during the hottest times of year. Temperatures within the largest cave at the site were cooler than other habitats and varied less, even during the coolest times of the year at Fongoli, compared to temperatures in other non-cave areas. Insight into the way that chimpanzees in Senegal cope with extreme temperatures may help us better understand this species' limits, in terms of geographical range and environmental gradient.

Parturition in wild chimpanzees.

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Evidence of strong competition between female chimpanzees and female infanticide at Gombe, suggests that parturition may be an especially risky time. Also, the placenta may attract other individuals. Behavior around parturition is thus of great interest, but despite over forty years' study of wild chimpanzees, few births have been witnessed. Here we combine new observations of three births at Gombe, and one at Kanyawara, with other data to describe such behavior.

Gombe females that are about to give birth avoid other individuals. Twenty females that gave birth to 44 infants were sighted on average every 4.1 days (SD=3.3) during the year of birth, but were absent for an average of 14.2 days (SD=18.4) around the time of the birth (paired t-test, t=3.89, P<0.0005). Of 9 precisely known births at Gombe 67% occurred in the night nest. Most observed births occurred in nests in trees, and labor lasted 1-2hrs. However, one multiparous female made several ground nests during a difficult 7.5hr labor. Most females ate the placenta within a few hours but one kept it for over 24 hours, and baboons tried to steal it. The Kanyawara female buried her placenta in the birth nest. If present, older offspring, other young and some adults watched births intently. Some begged for the placenta and licked fluids from leaves. Following three births at Gombe, adult females chased or severely attacked the mother, but aggression was not observed in two Uganda births, raising the possibility of inter-site differences in levels of competition.

Genetic differentiation in Newfoundland outports.

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Beginning in the early 16th century, British fishermen began visiting the waters around Newfoundland annually. However, it was not until the late 18th century that permanent settlements were established. Due to the difficulty of reaching the island in the winter, relatively late establishment of local governments, and various other causes, the towns along the southern coast of Newfoundland, Canada, remained fairly small over the next two centuries. In the early 1980s, blood samples were drawn in four of these towns – Galtouis, Hermitage, Harbor Breton, and Seal Cove – in conjunction with the Canadian Red Cross.

These samples (N = 96) have been examined with a panel of fifteen STR markers drawn from different chromosomes and analyzed to determine the average heterozygosity of each population. Wright's Fst values were calculated (Galtouis = 0.122, Hermitage = 0.105, Harbor Breton = 0.065, Seal Cove = 0.122) and moderate genetic differentiation exists between the villages. This differentiation is significant and the genetic distances between these villages appear to be correlated to the geographic distances.

Small, isolated populations such as these are of great interest when studying human population genetics especially when, as is the case in some of these villages, the effective population size is reduced due to religious divisions (Martin et al., 2000) and other socio-economic factors. The genetic differentiation of these villages is of note because the inter-population differentiation is compounded by the intra-population divisions and because the small population size violates Hardy-Weinberg assumptions.

Beyond the weanling's dilemma: feeding patterns as a predictor of infant illness in the first year of life.

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The weanling's dilemma suggests that infants are at the greatest risk of morbidity and mortality during the transition from a milk based diet to a diet including foods reflecting adult dietary patterns. In the majority of settings, the transition is directly from breast milk to solids. However, in a diversity of Western and western-influenced contexts, infant formula often supplements or entirely substitutes for breast feeding, a feeding strategy that may biologically equate to weaning from birth. In this study, the relationship between infant feeding style and infant illness was investigated among a cohort of 36 healthy, middle class American infants. The infants were followed during the first year of life, with continual daily activity logs maintained by mothers. These data permitted examination of the relationships between day to day variation in feeding strategy and infant health. Sixteen infants were predominantly breastfed for at least the first three months. Infants' daily feeding strategies were categorized by amount of breastfeeding, formula feeding and complimentary foods received. Illness events (respiratory illnesses, ear infections, gastrointestinal and atopic episodes) were the outcome variable in mixed model repeated measures' logistic analyses investigating the likelihood of illness event based on feeding

strategy, with subject as the random effect. Supporting previous observations, breastfeeding was protective. The method of weaning predicted increased illness risks with breastfed infants who transitioned to formula and foods at increased risk by contrast to their formula fed peers. These observations emphasize the importance of infant feeding strategies as a challenge to developing mucosal immunity in infant morbidity.

Environmental context of early Pleistocene hominins from the Ileret subregion (Area 1a) of Koobi Fora, Kenya.

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Incremental spread of savanna ecosystems since the Miocene is commonly utilized as the impetus for hominin morphological and behavioral evolution in Africa. Selective pressures influencing the rise and dispersal of the genus *Homo* from Africa are often placed within dry and open ecosystems. Proxies of global climate and environmental change used to provide the framework for hominin habitats can obscure the signal of a buffered environment at the subregional and landscape scale.

Here we present environmental reconstructions of the Ileret subregion (Area 1a) of Koobi Fora from the upper KBS and lower Okote Members (1.7-1.5 Ma) of the Koobi Fora Formation to elucidate habitat preferences of early Pleistocene hominins in the northeastern Turkana Basin of Kenya.

Our stratigraphic interval directly brackets recent paleontological finds attributed to early African *H. erectus* and archaeological horizons that bear cut-marked faunal remains. We used sedimentological evidence, tephrostratigraphy, and isotopic data from pedogenic carbonates to assess character and timing of depositional environments and past vegetative composition. Spanning one kilometer of lateral exposures we examined nine stratigraphic sections, each interspersed by upwards of five distinct tuffaceous units and four paleosols.

We interpret the early Pleistocene hominin habitat of the Ileret subregion as a seasonally indurated proximal floodplain of the ancestral Omo River. Periodic water table rise influenced by distal flood waters allowed for woodlands and scrub to colonize wet-dry grasslands. Seasonal distribution of water in this perennial fluvial and floodplain depositional landscape lessened local aridity and influenced the development of a grassland-woodland mosaic environment.

Detecting weaning in human dental enamel through intra-tooth isotopic analysis.

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Human tooth enamel provides a unique window into an individual's juvenile dietary history: it develops incrementally from crown to cervix, is not remodeled over an individual's lifetime, and is highly resistant to diagenetic alteration. Enamel in human canines and first molars forms during the shift from breast milk to a post-weaning diet. Breast milk is commonly higher in lipids than adult diets, and lipids are depleted in ^{13}C relative to carbohydrates and proteins. Therefore carbon isotope ratios in an intra-tooth profile that forms over the weaning period should show a pattern of increasing $\delta^{13}C$ from crown to cervix. Here we present intra-tooth stable carbon isotope profiles from 21 medieval Danish human canines and first molars. Four to seven samples were taken from each canine, and two to five from each M1 for a total of 91 incremental samples. Sample mass was kept to a minimum; most samples weighed less than 2mg. Eighteen out of 21 (86%) intra-tooth profiles show the same pattern of increasing $\delta^{13}C$ from crown to cervix. These results are consistent with a weaning signal and suggest that it may be possible to compare age at weaning among prehistoric populations and fossil hominids.

Independence of biomechanical forces and craniofacial pneumatization in *Cebus*.

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Several different factors are hypothesized as explanations of variation in primate paranasal sinus volume. Biomechanical forces, particularly those associated with mastication, are frequently evoked to account for differences in primate craniofacial pneumatization. To test whether masticatory stresses are responsible for maxillary sinus volume diversity, two species of the genus *Cebus* (*C. apella* and *C. albifrons*) were examined. The former has been identified as a hard object feeder and many morphological differences between the two species are attributable to differences in the mechanical properties of their respective diets.

Sinus volumes were derived from serial coronal CT scans of the crania of adults. Several external cranial measurements were obtained using sliding calipers; these were used to scale sinus volume relative to the size of the face. Both absolute and relative measures of sinus volume were compared using standard statistical techniques.

In all comparisons, the two capuchin species do not differ from one another significantly ($p > 0.05$). Thus, this 'natural experiment' fails to support the interpretation that biomechanical forces acting on the facial skeleton substantially affect the degree of paranasal pneumatization in primates. This result suggests that it is highly unlikely that the maxillary sinus performs any function in relation to masticatory stress; other factors must be responsible for the variation in sinus volume among primates.

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Strain analysis and prevalence of tuberculosis in ancient North America: evidence from the Schild Mississippian cemetery.

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The presence of tuberculosis in the New World prior to European contact has been confirmed by multiple morphological and molecular analyses. Questions remain as to its origin and evolution. New World tuberculosis may have been transferred to human populations from an animal host already in the New World, or it may have migrated to the New World with the first human populations. Classification of tuberculosis within ancient American populations by means of genetic analysis may help to resolve this problem; likely strains include *M. bovis* (a primarily animal-infecting species) and *M. tuberculosis* (a primarily human-infecting species). We have amplified tuberculosis complex DNA from five individuals buried in the Mississippian Schild cemetery in Illinois. Two of these individuals did not exhibit any morphological signs of tuberculosis, and in all cases tuberculosis DNA was detected in ribs lacking lesions. This method of tu-

berculosis detection will allow us to estimate the infection rate at this site more accurately than a morphological study alone would permit. Sequence analysis of a single diagnostic SNP of the *gyrase B* gene from two of these individuals suggests that they were infected by *Mycobacterium tuberculosis*, implying an Old World origin for this disease. However, the *gyrase B* sequence from the ancient *M. tuberculosis* strain differs significantly from all modern strains, suggesting a separate evolutionary history in the New World.

Is humanlike lateralization of cytoarchitecture found in other species with complex social vocalization? A stereologic examination of mustached bat auditory cortex.

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Left hemispheric dominance for the perception and analysis of species-specific social vocalizations has been reported in several mammals, especially among Old World anthropoids. The link between behavioral asymmetry and neuroanatomical lateralization is best established in humans. Several cytoarchitectural features distinguish area Tpt on the left, an area involved in language comprehension, from its contralateral counterpart. These features include a greater number of magnopyramidal cells and increased neuropil space in layer III. To test whether such neuroanatomical lateralization characterizes other species with complex social vocalizations, we performed unbiased stereologic analyses of Nissl-stained cells in layer III of auditory cortical area DSCF in mustached bats. The intraspecific acoustic communication of mustached bats involves combinations of simple syllables to form complex composite sequences, with neurons responsive to communication signals found in area DSCF. We measured neuron densities, glial densities, and cellular volumes of neurons in both hemispheres of 10 adult male bats. Population-level lateralization was assessed by calculating an asymmetry coefficient (AC = [R-L/(R+L)*0.5]) and performing one-sample t-tests. Results indicated that none of the variables, including neuron density, neuron-glia ratio, or mean neuron volume were significantly lateralized. We also examined whether magnopyramidal cells (defined as the largest 10% of neurons from both hemispheres) were found more frequently on one side or the other. A binomial test revealed no asymmetry in the distribution of these neuronal subtypes. Absence of asymmetry in area DSCF of mustached bats suggests that lateralization of auditory cortex may be a unique neuroanatomical specialization in the primate lineage.

Play signals and self-handicapping among Bonobo infants and juveniles.

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As a dynamic negotiated system, rough play can serve to illustrate the emergence of communicative gestures and rule-like forms in social behavior. This poster provides a summary of observations of rough-and-tumble play between infants and juveniles at the LRC Bonobo (*Pan paniscus*) Colony that were made from a series of videotapes taken approximately every two months during the years 2002 and 2003. These tapes provide a valuable record of the development of play in infants, from brief sorties to confident, vigorous pursuits of juveniles twice their age.

Because the tapes follow only one subject at a time and we could not therefore observe what other Bonobos were doing, we decided to concentrate on the comparative changes in structure of the play-episodes in infant, infant-juvenile, and juvenile play dyads. On the basis of our observations, we hypothesized that: 1) episodes of play between two infants would be shorter in duration but more frequent than those between an infant and a juvenile; 2) infants are more likely to initiate rough-and-tumble play with juveniles than the other way around; and 3) larger juveniles and adults are more likely to produce patterns of play with lots of repetition, clear initiating- and mediating-signals, and self-handicapping than infants.

A preliminary study of the ontogeny of feeding behavior in mantled howler monkeys.

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Ontogenetic studies of primate feeding behavior offer insights into age-based differences in nutritional requirements and access to resources. This paper examines differences in dietary pattern between adult and juvenile mantled howler monkeys (Alouatta palliata), inhabiting Isla de Ometepe, Nicaragua (11°40'N, 85°50'W) and tests the hypothesis that pre-adults learn feeding behaviors from conspecifics. A total of 130 hours of data were collected on diet, activity pattern and social interactions during a six-week field study from July through August, 2004. Focal animals were infants, juveniles, and adult males and females. Gaze direction was recorded for infants and juveniles to assess the degree to which they appear to observe the feeding activities of nearest neighbor conspecifics. Results indicate that males and juveniles consumed a greater proportion of leaves than females ($p<0.04$). During nearest neighbor foraging/feeding bouts, infants and juveniles were within 2 meters of their neighbors 96.1% and 60.0% of the time. However, based on gaze direction, infants and juveniles were found to observe their neighbor's food choice approximately 6.0% of the time. The relatively low percentage of time that infants and juveniles gazed at their nearest neighbor's food choice indicates that although some dietary information may be obtained by watching conspecifics, the selection of particular food items appears to involve a process of trial and error learning. Additional relationships among leaf eating, food choice, and life history parameters are discussed.

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Relationships among limb mass distribution, kinematics, and mechanical power in primates compared to non-primate quadrupeds.

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Primates have more distally distributed limb mass compared to many other mammalian quadrupeds because of their adaptations for grasping hands and feet. Several researchers have suggested that distal limb mass distributions affect quadrupedal kinematics. Additionally, distal limb mass may lead to increased energetic costs of locomotion due to increases in the mechanical power required to move the limbs. These possibilities are examined here by comparing kinematics and mechanical power between a sample of infant baboons (*Papio cynocephalus*; n=4) and non-primate quadrupeds from the literature. Infant primates were chosen be-

cause they have more distal limb mass concentrations than adult primates and therefore provide a more extreme comparison to non-primates.

Infant baboons use lower stride frequencies and longer strides compared to non-primate mammals. Infant baboons require less power to move their limbs due to their lower stride frequencies. Due to longer strides and therefore larger vertical oscillations of their centers of mass however, the infant baboons require larger amounts of power to move their whole body center of mass. As a result, the infant baboons have similar total power requirements compared to other mammals, suggesting a trade-off mechanism that allows total power to be independent of limb shape. The results from this study suggest that, while adaptations for grasping hands and feet in primates have had profound effects on their kinematics, these adaptations have had little effect on total mechanical power.

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What else is the tall mandibular ramus in *A. boisei* good for?

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Much has been written about the advantages of a tall mandibular ramus in specific masticatory systems: improvement of the moment arm of the masseter muscle and the medial pterygoid muscle about a bicondylar axis; introduction of greater verticality to the masseteric and medial pterygoid fibers as seen in a frontal view; and simultaneous contact between the corresponding occlusal surfaces of the postcanine tooth row. However, the anteroposterior (AP) movement of the lower occlusal surface against the upper one in the last stage of occlusion has been overlooked, particularly regarding the robust australopithecine masticatory system. It is my contention that the simultaneous combination of medial chewing (phases I and II) and the AP movement of the occlusal surface creates a unique grinding pattern, which is expressed in the perfectly flat occlusal surfaces typical of *A. boisei* and the other robust species. Unlike the more generalized configuration, this topography lacks the flare of the sharp lingual margins of the lower molars and the buccal margins of the upper molars.

This biomechanical scenario seems to conform to the glenoid fossa anatomy of *A. boisei*. The steep surface of the articular eminence that terminates in a crest without extending anteriorly as a preglenoid plane minimizes the anterior translation of the mandibular condyle characteristic of more generalized masticatory systems. This diminished anterior translation, in turn, prevents the descent of the (instantaneous) axis of rotation; a descended axis would "shorten" the ramus and minimize the AP component of the mandibular tooth movement.

Secondary processing of human remains at the pre-hispanic site of Paquimé (Casas Grandes), Chihuahua, Mexico.

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The site of Paquimé in Chihuahua, Mexico is one of the most complex communities to develop in the North American desert west. One unusual aspect of the site was the diverse ways that its inhabitants treated human corpses. During the height of Paquimé (A.D. 1200 – 1450), many burial features (n=41 of 388 or 10.5%) show evidence of post-mortem processing or manipulation of the skeleton. Many of these features are secondary deposits of corpses, or show evidence of skeletal elements being removed after burial or burial pits being entirely cleaned of skeletal material. Some show extra elements being added to burials, evidence of human sacrifice, and combinations of primarily and secondarily deposited corpses. Likewise, there is evidence that portions of human remains were being curated for use in ceremonially events including a human calvarium set into the floor of one room, jewelry carved from a human bone, and six human "trophy" skulls. These new forms of corpse processing treatments suggest the ongoing ceremonial importance of some of the deceased individuals of the community.

Examinations of the spatial and temporal distribution of these secondary burial features at Paquimé using Geographic Information System (GIS) modeling suggest the emergence of a distinct mortuary cult in the region. The GIS model identifies several locations throughout the site of Paquimé that were primary loci of the activities of this cult. The development of this cult concurrently with the emergence of social complexity in the region further indicates a connection between sociopolitical complexity and mortuary ritual.

Comparing male and female demographic histories using autosomal and X-chromosomal microsatellites.

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Differences in variation across genetic systems with different inheritance mechanisms have sometimes been attributed to a disparity in male and female migration rates. Using a population divergence model as opposed to a migration model, we investigate the level of genetic differentiation across globally distributed human populations at X-chromosomal and autosomal markers. Our analysis explains observed differences by accounting for the smaller number of X chromosomes than autosomes in populations, without requiring distinct male and female migration rates. In those geographic regions where our model is appropriate, the data provide some support for a smaller effective population size for females compared to that of males.

Demographic and genetic estimates of the population size of the Hadzabe of Tanzania.

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The Hadzabe are a small Tanzanian population of long-standing anthropological and linguistic interest; many Hadzabe continue to subsist through hunting and gathering, and their click language appears unrelated to any other language. Data from Y-chromosome and mtDNA (Knight et al., 2003) reveal that the Hadzabe retain divergent lineages, suggesting a relatively constant-sized (and isolated) population history. Demographic data, however, suggest recent population fluctuations (Blurton Jones et al., 1992). Theoretically, genetic data provide the power to infer the history of human populations because of the link between effective size (N_e) and genetic variation. N_e depends on population size changes through time and the proportion of individuals that contribute genetically in a

given generation (current N_e). Current N_e is the parameter that links demography to population genetics. Estimates of current N_e are therefore critical to a detailed understanding of Hadzabe population history. We calculated current N_e from age-specific survival and fertility data for Hadzabe males and females. Using an individual-based model we estimated that Hadzabe males have higher lifetime variance in reproductive success than do Hadzabe females (5.8 and 3.4 respectively). Estimates of N_e/N (0.13), N_e/N_{adult} (0.3, N_{adult}: number of adult) and $N_e/N_{reprodadult}$ (0.41, $N_{reprodadult}$: number of reproducing adults) revealed that a low proportion of individuals contribute genetically. We also calculated sex-linked effective sizes. These are the first estimates of current N_e for a hunter-gatherer population that incorporate overlapping generations. We consider patterns of Y chromosome, mtDNA, and autosomal genetic variation of the Hadzabe in light of these estimates.

Bone density differences in rib and iliac crest samples from a modern and an archaeological Peruvian population.

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Bone mass in humans declines with age, regardless of genetic or cultural background. Archaeological populations have similar age-associated bone loss patterns, but unlike modern populations there is minimal evidence for non-traumatic bone fractures. This difference between modern and archaeological populations is of critical importance to understanding biomechanical incompetence in osteopenic bone.

Modern clinical research uses bone histomorphometric data to investigate and diagnose bone loss, and clinically derived values are readily available in the literature. Comparable histomorphometric data for paleopopulations, however, is largely unavailable. This research project involved the collection of histomorphometric data from a Chiribaya paleopopulation and its comparison to modern clinical/cadaver data.

Rib cross-sections and iliac crest wedge biopsies were removed from the Chiribaya skeletal population (n = 63) and histologically prepared. Cortical and trabecular bone density were measured for each sample. The data were separated into decade age groups, as determined by gross skeletal indicators, and compared to modern clinical and cadaver data. The Chiribaya population, comprised of three genetically related groups with different levels of biomechanical stress, was compared as a whole and as separate groups.

Two Chiribaya groups had significantly higher rib and iliac % cortical bone area ($p<.01$ and $p<.05$, respectively) and lower iliac % trabecular bone area ($p<.05$) than modern clinical/cadaver samples. These findings indicate that archaeological populations may have had increased biomechanical stress during modeling (growth) resulting in higher peak cortical bone mass. The more severe age-associated osteopenia and increased non-traumatic fractures found in modern populations may be a result of lower initial peak bone mass.

Ontogeny of craniomandibular morphology in lorisiforms.

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Extant lorisiform primates exhibit considerable taxic diversity as well as vary in body size by close to two orders of magnitude. The goal of this study is to perform the first-ever comparative examination of cranial growth allometries in a sample of 564 non-adults and adults from 12 galagid taxa, and 603 non-adults and adults from 5 lorisid taxa.

Analyses of galago growth trajectories suggest a pervasive pattern of ontogenetic scaling in skull form. Several cases are discordant. At a common skull size, *Galagoides demidovii* possesses a relatively longer skull reflecting the elongate nasal aperture of this taxon. *Euoticus elegantulus, Galago moholi* and *Otolemur crassicaudatus* exhibit an arrangement of the jaw-adductor in-levers that may facilitate increased gape during tree gouging. Such changes occur largely via transpositions and retention of primitive size-shape covariation patterns or coefficients of relative growth. Lorisids evince a moderate pattern of ontogenetic scaling of facial form, which is interesting given that the lorisid facial skull is characterized by less positive allometry. In both lorisids and galagids, more insectivorous species exhibit relatively gracile mandibular proportions; those cases where trajectories are discordant identify potential dietary adaptations linked to variation in masticatory forces during biting and chewing. As the galago growth series and adult data are largely coincidental, interspecific variation in facial form may be the result of selection for body-size differentiation among galagid sister taxa. While a similar pattern has been noted within *Nycticebus*, such a pattern does not characterize lorisids as a clade.

A test of Fully's stature reconstruction technique in Terry Collection whites and blacks.

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Fully's (1956) "anatomical" method for reconstructing stature has been increasingly used, but not systematically tested on other large samples, especially non-white samples of known stature. Fully's original description of the method also does not provide completely explicit directions for taking all of the necessary measurements. This study tested the accuracy and applicability of Fully's method and clarified measurement procedures.

The sample consisted of 29 black females, 25 white females, 33 black males, and 32 white males of known cadaveric statures from the Terry Collection. Cadaveric statures were adjusted to living statures following Trotter and Gleser's (1952) recommendations. Fully's technique already partially controls for age-related height reductions (i.e. vertebral compression), so we adjusted statures for age by one-half the amount recommended by Trotter and Gleser. We obtained the best results using maximum vertebral body heights (anterior to the pedicles).

Mean differences between Fully-estimated and true statures for all ethnic/sex groups are less than 6 mm ($p>.20$, paired t tests). Whites have slightly smaller errors (about 2 mm) than blacks (about 5 mm), although none of these ethnic differences reach statistical significance ($p=.11$, two-sample t test of differences). Within ethnic groups, sex-related differences in errors are minimal (<.5 mm). Inter-observer measurement error, tested by two observers independently measuring 20 individuals, is also minimal, with an average difference in reconstructed stature of 1.6 mm. These results support the use of the Fully technique in reconstructing stature, although care should be taken to follow recommended measurement procedures and to use a modified age adjustment.

Masculinity and the health of the biological male, a Romano-British perspective.

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Research in contemporary clinical settings has highlighted the relationship between concepts of masculinity and male health. The World Health Organization has concluded that male health cannot be separated from the socially constructed roles of men. These roles are created by the dominant concept of masculinity within the community and frequently have a higher risk of mortality and injury. Despite male activities being intensively researched within archaeology, to date limited work using masculinity theory has been undertaken on males as gendered individuals in palaeopathology. In order to investigate whether this trend can be identified in past societies, this study analysed the health-status of a regional collection (N=89 males from a collection of 279 individuals) from Dorset (England), dating to the Romano-British period (A.D. 43 to the end of the 5th Century A.D.). This period has a wealth of primary literary sources, cultural material and imagery associated with masculinity and society, making it ideal for this type of analysis. The palaeopathological study focused upon age-at-death, and indicators of stress and trauma. Data gathered was tested statistically and interpreted using masculinity theory and a life-course approach. The results demonstrated that the Roman life-course was reflected in the demographic profile, for example the achievement of adult status. The indicators of stress supported cultural evidence for higher male social ranking. Trauma data indicated interpersonal violence and injury recidivism to be low and no sharp-force weapon trauma was observed. Importantly, these results support other archaeological data for a society under the influence of the Roman Empire.

Demographic and selective history of African populations inferred from genome wide genetic markers.

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In collaboration with the Marshfield Medical Research Foundation, a large multi-locus dataset (>2,000,000 genotypes) has been generated from 1,070 microsatellite and in/del markers from ~2,000 individuals originating from >60 ethnically defined populations in Africa and in 100 African Americans. This resource has the potential to answer many questions about the history of humans both within Africa as well as history of the African diaspora into the Americas. These data have been compared to previously published analysis of the same markers in the CEPH diversity panel (Rosenberg et al., 2002). Here we present the results of our analysis of population structure within Africa and African population history. Initial results indicate considerable levels of substructure, even within small geographic regions. We are also able to infer and address several hypotheses regarding the origin of Pygmy populations in Africa, as well as the ancestry of Nilo-Saharan, Niger-Kordofanian, Afro-Asiatic, and Khoisan speaking populations. Additionally, we describe our current efforts at developing acceptance-rejection composite likelihood-approximations to estimate parameters of interest (of demography and selection) from these microsatellite data.

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Prehistoric diet and dental health at the Grand Bay site - Carriacou, Grenada, W.I.

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In the Caribbean there has been a paucity of research dedicated to analyzing skeletal remains from prehistoric Amerindian populations, particularly in the southern Lesser Antilles. To improve the knowledge we now have about the lifeways of early settlers in this region, we analyzed several burials from the Grand Bay site on the island of Carriacou in the Grenadines chain, which are c.a. 1500 BP. We recorded the location and type of caries present, and used Lukacs's (1995) caries correction factor to estimate caries rates. Calculus deposits clearly illustrate a high level of gingival and periodontal tissue recession, and caries are almost exclusively found at or under the cementoenamel junction (cervical line). Further pathological analysis indicates the presence of linear and nonlinear enamel hypoplasias on the incisors and canines of some individuals, suggesting that early episodes of severe stress were common. In addition, we found a slight cupping wear pattern that is typical of populations with mixed subsistence. This is consistent with the ceramic and midden evidence recovered from the site, and these data are consistent with peoples who practice horticulture, but supplement their diet with marine foods.

What are paleopathologists missing? A comparison between historically-recorded and skeletally-observed diseases in a late 19th century Pima cemetery sample from southern Arizona.

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The Pima Butte Cemetery site (AZ T:16:88 ASU), located on the Gila River Indian Reservation south of Phoenix, AZ, was excavated in 1990 as part of a highway mitigation project. Sixty-three individuals (29 subadults, 34 adults) were recovered, studied, and repatriated. The cemetery was in use *circa* 1870-1910. Written descriptions of the Pima during this time period exist from several sources. These sources were searched for data on the health of the Pima. A comparison between these written sources and what was diagnosed from the skeletal remains provides us with an idea of what we may be missing when doing paleopathological analyses.

The list of illnesses and epidemics that afflicted the Pima is long. Most of those diseases, however, do not affect the skeleton and therefore do not show up in a cemetery sample. Only five of the recorded diseases could be expected to show up in the skeleton: tuberculosis, syphilis (venereal and congenital), smallpox, and "rheumatism". Evidence was not found for smallpox. Evidence for the other four diseases will be presented. Although most diseases did not appear in the skeleton, they were important factors affecting the composition of the cemetery. Other biases affecting the appearance of the paleopathological record in this particular case will also be discussed. The findings from the Pima Butte Cemetery offer a caution to paleopathologists—what we can't detect may be substantial.

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Stable isotope analysis of diet in a Byzantine monastic community.

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Stable carbon and nitrogen isotope values were analyzed as part of a larger biocultural reconstruction of diet for a Byzantine (5th-7th C) monastic community from Jerusalem. Twenty-eight left innominates and 60 left femora were sampled. Age (infant, juvenile, adult) and sex

were determined for each innominate, while broader categories were used for the femora. Delta 13C and delta 15N values were determined using mass spectroscopy. Based on Keegan (1989), the data suggest that the female and juvenile portion of the community consumed a primarily C3 terrestrial herbivorous diet. However, the males display particularly high delta 15N values, indicating the regular consumption of meat with supplementation from C3 plants. Infants exhibit expected delta 15N values typical of breastfeeding and weaning.

Thus, dietary analysis for St. Stephen's monastery suggests a concentration of C3 plants within the diet, supplemented by considerable animal protein among the adult males. Previous analyses of dental pathologies and nutrition-related skeletal morphology corroborate these results. Nevertheless, this pattern is surprising when viewed in light of the historical references for the region and time period, because they clearly prescribe a strict vegetarian diet for monastic communities.

Range use by *Callimico* in a mixed-species group.

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Ranging patterns are behavioral adaptations relating to demographic and ecological variables, like population density and resource distribution. Interspecific variation in ranging may reflect responses to environmental conditions. A study of ranging patterns of *Callimico goeldii* in associations with *Saguinus fuscicollis* and *Saguinus labiatus* was conducted at a *terra firme* forest in northwestern Brazil periodically between April 1999 and August 2003. Data were collected primarily on one relatively stable mixed-species group. The joint range size of this mixed-species group was 48 ha over ten months, with approximately 22% overlap with neighboring groups. The locations of plant food resources and resting sites were found to be significantly related to range use by *Callimico* and the tamarins, while habitat type was not. There was no evidence that *Callimico* or the tamarins patrolled range boundaries, and use was concentrated in the interior of the range. Five encounters were observed among the study group of *Callimico* and neighboring callimicos. No direct intergroup encounters were observed among the tamarins, and they did not participate in the callimico encounters. All encounters were within 100 m of a plant food resource visited on the day of the encounter, although it was not clear the encounters related directly to defending access to these resources. These data suggest that neither *Callimico*, nor the tamarins, demonstrated territoriality or range defense. Previous research on other groups shows different ranging and association patterns by *Callimico*; additional investigation of intersite variation in resources or demography may help explain these differences.

Gibbon duets: what do they communicate?

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Gibbons (family *Hylobatidae*) are Asian apes which mostly form socially monogamous pairs. They are among the most vocal of all primates and, in the majority of hylobatid species, mated males and females combine a sequence of repetitive sex- and species-specific vocal phrases to produce loud, well coordinated duet songs. The function of gibbon duets is still debated. Hypotheses for gibbon duetting include within-pair communication, suggesting an important role in pair formation and/or aiding in maintaining and strengthening of a pair bond, as well as between-pair communication, such as advertising a paired status and territory occupancy. Although gibbon duetting is commonly assumed to result from paired individuals' converging interests, it may also be the product of conflicting interests of pair mates. Either sex may call to attract a different or additional mating partner, thus triggering a vocal response of their mate, or to test the strength of the pair relationship. In this paper I revisit hypotheses about gibbon duetting using a large, long-term data set from a wild white-handed gibbon population at Khao Yai National Park, Thailand. Observations are based on six habituated and more than ten neighbouring gibbon pairs studied for several years. Habituated groups were composed of one-male, one-female pairs or, at times, two adult males were present together with one female. Results of calling patterns of socially monogamous pairs are compared to non-monogamous groups and influences of female reproductive status, weather conditions, duet song location, as well as food availability on duet patterns are discussed.

Effects of parasitism on ancestral Pueblo maternal and infant health.

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Parasitic disease is and was ubiquitous in all cultures. Although not as sensational as emergent viral diseases, the more common parasitic diseases exact a greater toll of human energy. Just three species of intestinal worms have resulted in loss of an estimated 39 million disability-adjusted life-years (DALYs) which exceeds loss for malaria, which is calculated at 35.7. These three worms have been found in ancestral Pueblo communities. In fact, more intestinal parasite species have been documented among Puebloans than any other prehistoric culture. These include eight helminths (worm species) and two protozoan species. These parasites, especially *Entamoeba hystolytica*, *Giardia lamblia*, and hookworm, contribute severe anemia and to poor maternal and infant health in the world today.

Pueblo bioarchaeological research focuses on maternal and child health outcomes. A high prevalence of porotic hyperostosis (associated with anemia) has been described for various Puebloan villages. Also, higher mortalities among women of childbearing age and infants has been observed. Hypotheses have been developed to explain the anemia and mortality. Parasitism is implicated in some hypotheses. In this study, I show that the prevalence of parasite eggs in coprolites has a highly statistical positive correlation with the lesions of porotic hyperostosis in crania from several villages. I also show that the villages with greatest parasite diversity have the highest prevalence of cranial lesions. These data support the hypothesis that parasitism had a causal role in ancestral Pueblo anemia and infant-mother morbidity.

Race and the conflicts within the profession during the 1950s and 1960s.

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The purpose of this paper is to outline the developments in physical/biological anthropology during the 1950s and 1960s with particular attention to treatment of the biological race concept. These decades saw enormous growth in our profession. This growth included not only new methods and discoveries in the fields of paleoanthropology, primate behavior studies, genetic variation, and human biology, but also a fundamental shift in the way in which physical anthropology was practiced. The shift away from a fundamentally descriptive discipline to one marked

by hypothesis testing and integration with the growing field of evolutionary biology began with the call for a "new" physical anthropology by Sherwood Washburn in 1951. One of the more noticeable shifts during these decades was the treatment of biological race in physical/biological anthropology. Prior to 1950, racial analysis was a main focus within the field, although even here early work by Boas and many of Hooton's students began to shift things in a different direction. The rapid growth in populational thinking emerging from the evolutionary synthesis promoted by Washburn and others, combined with new ways of thinking about race and diversity following the Holocaust and the civil rights movement, resulted in a transformation of our field. Many of these changes, and their underlying causes, are apparent when considering the publication of, and subsequent reaction to, *The Origin of Races* by Carleton Coon in 1962.

Comparative analysis of murine metatarsal ossification and implications for differential skeletal growth in primates.

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Skeletal proportions are key morphological adaptations in primates, and evolutionary diversity of skeletal length is largely achieved by modifying physeal growth. While the molecular mechanisms regulating chondrocyte proliferation and maturation are being clarified, little is known regarding how the location and growth rates of physes are specified. The mouse has previously been utilized in anthropology to explore character integration and modularity, but this model organism is underused by comparative morphologists to explore the developmental basis of characters of interest. Here we present results from an analysis of murine metatarsal ossification. Because this bone develops only a single physis it provides an excellent model with which to explore mechanisms underlying growth plate formation and differential growth and to uncover targets by which natural selection can modify longitudinal growth. Thin-sliced, paraffin embedded metatarsals from neonatal to 14 day old mice were stained with safranin-O or monitored for protein expression via immunohistochemistry. While initially similar, the histomorphologies of the two ends diverge with respect to the organization and size of their proliferative and hypertrophic zones. PCNA expression demonstrates a specific proliferation expression profile associated with growth plate formation. The expression of PTHrP and its receptor are largely similar between the two ends suggesting more general roles in endochondral ossification for these molecules. In contrast, the expression patterns of PTC are distinct and mirror those of PCNA. Thus, Ihh signaling may have a role in specifying growth plate formation and performance and play an important role in generating novel growth centers in primate evolution.

Foramen magnum ontogeny and evolution in humans, great apes, and fossil hominids.

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Foramen magnum (FM) position changes have occurred since the quadruped-biped transition. Whereas FM space could be modified during this process, we hypothesize constraints on the direction and degree of change. This results from the FM allowing transmission of vulnerable neural structures from the brain into the joint-rich cervical spine. Evaluations of the hominid FM are available but none systematically assesses FM size and shape ontogeny. For this reason, we describe FM variation and the interactions of FM size and shape in an ontogenetic series of hominids and FM size ontogeny in great apes. These data are evaluated in relation to cranial size and shape change and related to modifications of cranial base functional matrices.

We divide the FM into two functional components. We measured or calculated 12 variables and collected shape data from 538 modern humans (0.7 fetal months - adult) and 88 subadult and adult fossil hominids (*Australopithecus*-Anatomically modern *H. sapiens*) and size data from an ontogenetic series of 280 modern apes.

In humans we found that: (1) rapid early growth is followed by ever-shortening growth spurts until adult values are reached; (2) the two FM components have different growth trajectories; and (3) shape indices do not provide a clear picture of shape or shape change. In hominids we found: (1) the value for taxonomy of FM length and breadth to differ between taxa; (2) changes in FM shape and its degree of variation to occur among species of *Homo*; and (3) little support for suggested FM autapomorphies.

Trabecular bone structure in a bipedally trained macaque.

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Previous research has shown that macaques trained to walk bipedally acquire some humanlike skeletal features, such as lumbar lordosis and deep patellar grooves, through bone adaptation during growth. To examine the influence of bipedal locomotion on internal joint structure, we compared trabecular bone structure in the knee joints of a bipedally trained macaque to a sample of wild-collected macaques.

The trained macaque (*M. fuscata*) was part of a traditional Japanese performance that included bipedal standing and walking for about one hour daily, beginning at age two until its death at the age of ten years. The right distal femora of trained and wild individuals were micro CT scanned at approximately 0.05mm pixel spacing and slice intervals. Quant3D was used to quantify trabecular structure within spherical volumes of interest approximately 5mm in diameter within the medial and lateral condyles near the articular surface, including regions likely to have experienced joint loads based on the degrees of knee flexion used during support phase in bipedal and quadrupedal gaits.

Across the sample, trabecular bone was more anisotropic (directionally organized) in the medial than in the lateral condyle. The trabeculae within the condyles were primarily oriented in the sagittal plane, corresponding with joint load directions throughout knee flexion and extension. The trained macaque distal femur had a higher degree of anisotropy, perhaps reflecting stereotypical loading in bipedal gait. Clarifying the relation between trabecular structure and joint loading should allow us to test hypotheses about gait in human evolution.

Phenotypic integration of brain and skull.

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The mammalian skull is a composite, osseous structure that supports major sense organs including the brain. Since the skull is easily decomposed into developmental modules organized around sensory organs, it lends itself readily to analysis by methods of morphological, or phenotypic integration. Previous studies focus exclusively on bone, though we know that skull shape is in large part determined by brain growth. We statistically compared levels of phenotypic integration in brain, skull, and in the two tissues combined in samples of morphologically normal children (N=12) and age-matched individuals with two forms of skull dysmorphology, unicoronal synostosis (UCS) (N=12) and sagittal synostosis (SS) (N=18). Three-dimensional coordinates of 16 biological landmarks located on cortical and subcortical brain structures were collected from 3D reconstructions of MR images, and coordinates of 18 neurocranial landmarks were collected from 3D CT images. Analysis of phenotypic integration of skull and brain required that CT and MR images be acquired during the same 24-hour period.

Phenotypic integration of the neurocranium is high and positive in all three groups, though SS shows lower levels of integration. Phenotypic integration of the brain is also high and positive in all samples, but substantially reduced in SS. Craniosynostosis follows predictions of morphological integration theory in that most parts of brain and neurocranium show strong positive associations, though these tissues are significantly less integrated in SS. Divergence in integration patterns suggests differences in developmental dynamics that underlie changes in skull phenotypes.

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"My habitat or their habitat?": human and nonhuman primate overlapping resource use in Lore Lindu National Park, Indonesia.

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In the changing contemporary world, human and nonhuman primates are forced to live in ever-increasing proximity, and thus, are more likely to experience conflict as each attempts to exploit common features of the environment. This paper explores the various forms of overlapping resource use by human and nonhuman primate (*Macaca tonkeana)* inhabitants of Lore Lindu National Park (LLNP), Central Sulawesi, Indonesia. The people of Lindu are primarily small-scale farmers of both subsistence and cash crops. Most villagers, however, also rely on forest resources for their livelihoods, many of which are also important for the Tonkean macaques. I have found that the manner of resource exploitation determines the nature of the overlapping use: mutual use or exclusive use. The conversion of forest habitat to agricultural areas is another form of human forest use that occurs in Lindu, as well as throughout most of the tropics. Some nonhuman primate species can adapt to such alterations in their environment by incorporating these areas into their ecological repertoire. In LLNP, in contrast to farmers' perceptions of the macaque as most frequent crop raider, results from surveys of crop raiding in 11 cacao gardens indicate that the macaques only consume a nominal amount of cacao fruit. These results suggest that there is potential for villagers to see the macaques as perhaps a unique species of Sulawesi worthy of protection rather than a major threat to their livelihoods. This study illustrates the importance of examining aspects of human ecology when attempting to understand the ecological plasticity and long-term conservation status of nonhuman primates.

Comparing white matter fiber tracts in monkeys, apes and humans with Diffusion Tensor Imaging (DTI).

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Most of our knowledge of connectivity in human and ape brains is inferred from terminal tract tracing studies in monkeys. Hence, we know little about how patterns of neural connectivity differ among monkeys, apes and humans. Diffusion Tensor Imaging (DTI) is a new non-invasive, in vivo neuroimaging technique that can identify and trace white matter fiber tracts. In this study, we compare white matter fiber tracts in macaques, chimpanzees and humans using DTI.

Macaques and chimpanzees were scanned under anesthesia (1 mg/ml I.V. propofol drip). Humans were scanned awake. Whole brain DTI was performed on a 3 T Siemens Magnetom Trio system. With the software program DTI Studio, diffusion weighted images were used to construct the fractional anisotropy (FA) images used in fiber tract tracing. FA values are hypothesized to be a measure of the degree of diffusion directionality of water within tissue microstructure that could reflect fiber density and/or degree of myelination. For each species, mean FA values were calculated in several regions of interest, including the corpus callosum and its subregions, corticospinal tract, cingulum bundle, uncinate fasciculus, and anterior and posterior thalamic radiations. FA values for the corpus callosum regions in monkeys were compared with known differences in fiber density and myelination to determine which variable is better correlated with FA. In addition, tractography was used to trace the trajectories of these fiber tracts which were then qualitatively compared across species. These comparisons revealed both similarities and differences in the pattern and degree of connectivity across species.

Virtual dentitions: touching the hidden evidence.

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Advances in developmental biology and quantitative genetics confirm the extraordinary amount of information preserved in primate teeth. However, a critical portion of this evidence - crucial to reconstruct the evolutionary pathways, adaptive strategies, age- and sex-related variation patterns, and even to outline aspects of an individual's life-history - is hidden within the crown and the root(s). Since it is not possible to section every tooth (notably in the case of fossil specimens), other methods must be used.

To qualitatively and quantitatively detail the normal and pathological intratooth structural morphology, enamel thickness topographic variation, and volume and three-dimensional shape variation of the pulp chamber we experienced various X-ray micro-CT scan systems, including the Beamline ID 17 set at the European Synchrotron Radiation Facility of Grenoble.

Monochromatic high photon flux-based

μ-CT analyses are performed at 200mA/50keV of energy and exposition time of 60ms/projection (images collected by a 2048x2048 CCD camera). Following a 360° rotation, projections are taken at each 0.24° (resol. of 47μm/pixels).

Our exploratory analysis concerned teeth from a number of extant and extinct hominoid taxa, including *Homo*. Volume rendering and high-resolution imaging of the primary and secondary dentitions have been successfully performed on modern and Neandertal samples. On a subsample of extant human teeth, the reliability of the μ-CT-based results has been tested by means of histological techniques.

Research developed in collaboration with: ESRF of Grenoble, BAM of Berlin, Univ. of Florence, Univ. of Bologna, Univ. of Vienna, Aristotele Univ. of Thessaloniki, Musée of Angouleme, TNT Project, Univ. of Poitiers.

Analysis of cranio-mandibular shape differences among *Pan troglodytes* subspecies using geometric morphometrics.

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Pan troglodytes is generally separated into three subspecies: *P. t. schweinfurthii*, *P. t. troglodytes*, and *P. t. verus*. Recent molecular studies found significant genetic differences between *P. t. verus* and the other subspecies, leading some to suggest that it should be considered a distinct species. A distinction between *P. t. verus* and the other subspecies also exists in locomotor and positional behavior. Although significant metric and non-metric cranio-mandibular differences have been found among the subspecies, variation in many of their morphological characters has not been not well documented.

This study explores variation in 3D shape differences among the common chimpanzee subspecies in both the cranium (n=68) and mandible (n=104) using geometric morphometrics. This analysis provides a means of quantifying shape differences of variable traits which are difficult to obtain using caliper measurements. 21 cranial and 23 mandibular landmarks were collected using a Microscribe 3DX portable digitizer. Specimen configurations were superimposed using GPA in TPSSMALL. The data were analyzed using Principal Components Analysis and shape differences along PCs were explored in Morphologika. A Discriminant Analysis was also performed.

P. t. verus was significantly separated in the PCA from the other subspecies. Cranial shape differences included a shorter mastoid process, a taller nuchal plane, lower postorbital constriction, and more medially placed zygomatic arch. Mandibular differences included a more position for the anterior root of the ascending ramus. The PC axis separating *P. t. verus* from the other subspecies was not significantly correlated with size, and separation remained after correction for size-related shape differences.

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Bioarchaeology in the Point of Pines region: warfare, interpersonal conflict, and domestic violence explored.

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Traditional approaches to the study of human populations generally utilize one of two sciences, biological study or archaeological study. Recently, however, interdisciplinary studies have gained favor due to inherent limitations of traditional science and the inherent complexities of human interactions with the landscape and other human beings. This paper combines biological and archaeological data to provide broader insights into questions regarding warfare, interpersonal violence and domestic violence in the Point of Pines region. Indicators of skeletal trauma will be evaluated from a chronological perspective in reference to levels of political organization, population aggregation, the overall health of the population, sphere of influence for the Point of Pines population, and the abundance (or lack) of resources. It is hoped that by employing aspects of two sciences a more comprehensive interpretation of the data will provide richer insights into the lives of the people in the Point of Pines region.

The distribution of ancestral alleles among populations.

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The "ancestral allele" at a given locus is the allele thought to have been carried by the last common ancestor (LCA) of all humans. These are only estimates, of course, but they are often relatively good ones. Thus, it is interesting that human ancestral alleles are usually most common in Africa. Some claim that the ancestral allele should be most common in Africa, because it is the ancestral population. We argue otherwise. In the absence of selection or ascertainment bias, the expected frequency of the ancestral allele is the same in each modern population, regardless of the history of population size, subdivision, or gene flow. The observed tendency of ancestral alleles to cluster in Africa argues either for some form of ascertainment bias or for some form of selection.

We attribute the pattern to two forms of ascertainment bias, which affect different sorts of locus. These biases, together with a history of expansion out of Africa, are capable of producing the observed pattern. The only loci that are certainly free of bias are those that sequence arbitrary stretches of DNA far from known genes. In these bias-free systems, there is no tendency for ancestral alleles to be most common in Africa.

Models for predicting patterns of X-chromosomal genetic variation from autosomal variation.

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Heterogeneity in patterns of human genetic variation across genetic systems – such as autosomes, the X and Y chromosomes and the mitochondrial genome – can potentially result from differences between male and female demographic parameters, such as population sizes and migration rates. To investigate the potential role of male and female demographic differences on genetic variability, we consider the predictions made by a population divergence model about disparity between X-chromosomal and autosomal variation across populations. The model suggests a method by which X-chromosomal and autosomal diversity can be compared to make inferences about the relative effective population sizes of males and females.

The pelvic girdle in *Fgf4* and *Fgf8* conditional knockout mice.

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sity.

Transgenic animals are an important tool for elucidating issues of morphogenesis and modularity, as well as persistent anthropological topics such as the boundaries of units of morphological selection and the putative role of mechanical stimuli in shaping the skeleton. Here we describe the pelvic phenotype in mice in which *Fgf4* and *Fgf8* have been conditionally inactivated in the early limb bud ("*Fgf4/8* mutants") (Sun *et al*. *Nature* [2002] 418:501-508). In these animals, the hindlimbs lack all skeletal elements distal to the pelvic girdle.

We analyzed ten *Fgf4/8* adult mutants and nine wild-type littermates. We used pQCT scans to create 3-D reconstructions of their pelvic girdles. While the pubis, ischium, and ilium are present in all mutants, the acetabulae are absent. Most mutants possess variably dysmorphic pubes and ischia, possibly as a consequence of reduced vascularity subsequent to a potential failure of muscle formation. The ilia, however, were less dysmorphic, and we performed a principal components analysis on seven iliac measurements. PC1, accounting for 35% of the variance, reveals that mutants possess relatively wider cranial ilia and narrower caudal ilia as compared to those in wild-types. These differences are largely explained by the absence of the acetabulum, and we therefore conclude that the mutant ilia are otherwise essentially typical of the wild-type form, even in the absence of any hindlimb forces. Moreover, the *Fgf4/8* mutants suggest that genetic specification of the pelvic girdle differs from the rest of the limb. This fact must figure prominently in discussions of primate hip evolution.

Sexing from hands and feet in a Euro-American sample.

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Sexing from the postcrania is particularly useful in the forensic setting when the skull and pelvis are not recovered. Although, long bones are preferable, sexing of the hands and feet could also be useful, particularly in cases of fragmentary remains. This study examines the accuracy of sexing using elements from both hands and the right foot. The sample consists of 121 white females and 124 white males from the Terry Anatomical collection. Axial maximum length measurements of all metacarpals and phalanges of the hand, as well as the metatarsals, proximal phalanges, and distal first phalanx of the right foot were obtained using a mini-osteometric board.

Discriminant function analyses using the crossvalidation method to reduce bias were performed to classify observations into groups defined by sex for each hand and the right foot, first using all the variables and then by row. Next, a stepwise discriminant analysis was performed to select the best measurements for discriminating sex. The left hand outperformed both the right hand and foot when using all the variables with a correct classification rate of 81.82% for females and 75% for males. Using only the left distal phalanges, the correct classification rate was improved to 84.30% for females and 85.48% for males, results that are similar to the stepwise procedure results, which ranged from 82.11%-85.95% for females and 79.70%-85.48% for males. These results are comparable to those obtained from other postcranial elements and demonstrate the potential of hands and feet for sexing in the forensic and archaeological contexts.

Primate chewing kinetics: how do primates chew harder?

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Primate mastication is rhythmic activity used to break down foods with a variety of material properties. How do primates chew harder foods? Do they chew faster or slower? Corpus bone strain data were collected from *Aotus*, *Macaca*, *Chlorocebus*, *Eulemur*, and *Varecia* during mastication of a variety of foods. Chewing frequency, power stroke duration, strain magnitude and strain rate were calculated and the relationships between them were assessed. Chewing frequency did not vary consistently with food type, strain magnitude or strain rate. Strain magnitude varies as a function of strain rate. Chewing duty factor (percentage of cycle time taken up by power stroke) increases with chew frequency, but absolute power stroke duration does not vary with chew frequency. These data suggest that primates chew at species-specific frequencies governed largely by size, although there is variation. Increases in chewing frequency within a species are achieved by reducing the amount of time in opening and closing, while keeping power stroke duration constant. Increases in corpus strain –i.e. bite force--are achieved by increasing the rate at which bite force is exerted. These data suggest that the masticatory central pattern generator maintains a relatively constant chewing frequency and that bite force must be modulated within this framework by increasing the rate at which force is exerted.

The strepsirrhines in this study were provided by the Duke University Primate Center; Grant support from NSF Physical Anthropology.

A new small-bodied ape from the middle Miocene Ngorora Formation, Tugen Hills, Kenya.

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The early Miocene primate fauna of East Africa included a diverse group of small catarrhines commonly referred to as small-bodied apes. These small apes were long regarded as early relatives of the living gibbons, but are now recognized as either stem hominoids or stem catarrhines. Like the rest of the archaic catarrhine fauna of East Africa (including the larger proconsuloids), they appear to have gone extinct at some point between the middle Miocene and the Pliocene, perhaps coinciding with the beginning of the modern radiation of cercopithecid monkeys and hominins. This transition is obscured by the paucity of the fossil record between 14 million years (Ma) and 5 Ma, but the Ngorora Formation of the Tugen Hills, Kenya, preserves evidence of this change. Lower Ngorora strata have produced specimens referable to older archaic catarrhines, such as *Proconsul* and *Victoriapithecus*, whereas the upper strata contain the earliest crown cercopithecid, *Microcolobus*, at about 8.5 Ma.

Our fieldwork in the Ngorora Formation in 2004 resulted in several catarrhine specimens representing at least two species. One of these is known well enough to warrant recognition as a new species of small-bodied ape bearing some resemblance to *Simiolus enjiessi* and *Kalepithecus songhorensis*. The new species is the latest-surviving member of the small-bodied Miocene ape radiation, at 12.4 Ma, and is also the smallest member of the group. The size and dental adaptations of this species may provide insight into the circumstances surrounding the extinction of the Miocene small-bodied apes.

Sex and disease: a Central African exposé.

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The sexual exploits attributed to the bonobo (*Pan paniscus*) provide an opportunity to clarify etiologic factors for reactive arthritis of the spondyloarthropathy variety. Sexually transmission (*Chlamydia*) and infectious-agent diarrhea both have an etiologic role in humans and produce highly characteristic patterns of disease.

The frequency and character of reactive arthritis was therefore compared in the macerated skeletons of 139 adult Pan paniscus and the two subspecies of *Pan troglodytes*.

Twenty-one percent of central African *Pan paniscus* and 28% of West African *Pan troglodytes* had characteristic peripheral and central joint erosive disease, statistically indistinguishable frequencies. Presence of subchondral erosions with reactive new bone, syndesmophytes and sacroiliac joint erosions clearly distinguish the disease from rheumatoid arthritis, osteoarthritis and direct infection.

Patterns of disease, while typical of reactive arthritis in both species, did differ. *Pan paniscus* manifested a pauciarticular pattern, while that in Pan troglodytes was predominantly polyarticular.

Possibility of habitat-determination of infectious process was investigated by comparison of *Pan paniscus* with the central African subspecies of Pan troglodytes. Not only was the frequency of reactive arthritis in the latter indistinguishable from that of Pan paniscus; the pattern was the same - pauciarticular.

Indistinguishable frequencies of reactive arthritis in *Pan paniscus* and *Pan troglodytes* and indistinguishable patterns of disease between the former and central African subspecies of the latter makes sexual transmission unlikely. Pattern of arthritis was determined by habitat, with bacterial exposure most likely to *Shigella* or *Yersinia* in *Pan paniscus* and central African *Pan troglodytes*, while the west African subspecies of *Pan troglodytes* appeared exposed to different bacterial agents, possibly *Salmonella* or *Escherichia coli*.

Patterns of mother-infant vocal interactions during nighttime routines: implications for child development.

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While parenting behavior has been a frequent subject of anthropological inquiry, fewer studies have focused on nighttime caretaking practices. Previous studies have shown that nighttime care may be as important to infants' physiological and psychological development as daytime care (McKenna 1993). The goal of the current project is to determine whether there are group differences in the amount or content of mother-infant vocalizations during nighttime routines between adolescent and adult mothers, and to examine the relationship between maternal vocalizations in early infancy and children's language and cognitive outcomes at one year of age. The current study examines nighttime vocal interactions among first-time mothers at the Mother-Baby Behavioral Sleep Laboratory. Overnight infrared video recordings were obtained on a sample of 24 adolescent (mean 18.9 years) and 15 ethnically-matched adult (mean 25.2 years) mother-infant dyads when the infants were four months of age. Participants were allowed to maintain normal nighttime caregiving routines and sleeping arrangements, and performed all caregiver interventions at will. Videotapes were reviewed for amount of infant-directed maternal vocalizations during pre-sleep and post-sleep routines, verbal content of maternal speech, and amount of non-crying infant vocalizations. Infants' language and cognitive development were measured at 12 months of age using the Bailey Mental Scale and the Pre-School Language Scale Version 4. Results of the present study help elucidate the relationship between nighttime parenting behavior and specific child outcomes, and examine how nighttime caregiving practices function as part of a larger repertoire of parenting behavior that impacts child development across time.

Mid-lumbar transverse process orientation: relationships to thoracic shape and locomotion in Anthropoidea.

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The goals of this study are to assess the variation in mid-lumbar transverse process dorsoventral orientation (DVO) in extant Anthropoidea, and determine whether DVO is tracking changes in lower thorax shape. DVO is quantified as the ventral angle of the transverse process, and is measured for mid-lumbar vertebrae from seven Anthropoid genera (*Alouatta, Ateles*, *Cebus*, *Saimiri, Papio, Hylobates, Pongo,* and *Pan*), using digital photographs analyzed with SigmaScan Pro 5.0. Lower thorax shape is measured for the same genera listed above, using a mean thoracic index calculated from the caudal thoracic levels, based on data collected by Chan (1997, Duke University PhD. Dissertation). An ANOVA plus LSD post hoc test are performed on the rank transformed DVO data to determine significant differences between genera. Two-tailed bivariate correlations (Spearman's and Pearson's) are employed to analyze the relationship between DVO and lower thorax shape. In transverse process orientation, Hominoids + *Ateles* form a group characterized by high DVO, while the remaining genera (*Alouatta, Cebus*, *Papio,* and *Saimiri*) form a group characterized by low DVO; these groupings are significantly different ($p<0.05$). Furthermore, there is a significant correlation ($p<0.05$) between DVO and cross-sectional lower thorax shape. These results suggest that mid-lumbar transverse process orientation may be tracking changes in lower thoracic shape. DVO and lower thorax shape appear to be functionally linked to Anthropoid locomotor specializations, most notably between dorsostable (e.g. suspensory) and dorsomobile (e.g. quadrupedal) modes of locomotion. These findings may have significant implications for estimating lower thorax shape from Anthropoid fossil lumbar vertebrae.

Body size, body shape, and long bone strength of the Tyrolean ice man.

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The "ice man", a late Neolithic (about 5200 years BP) frozen human mummy, was discovered in 1991 in the Italian/Austrian Alps. Here we report on his body size and shape, and long bone robusticity, as determined from spiral computed tomographic scans. Comparisons were carried out with a sample of 139 male European skeletons dating from the Early Upper Paleolithic through Bronze Age.

The ice man's stature, as determined

both from regressions on long bone lengths and from direct measurement in situ, is about 158 cm. Body mass estimated from stature and bi-iliac breadth is 61.0 kg, and from femoral head breadth 60.6 kg, both consistent with a body mass of about 61 kg. The ice man is near the lower limit of body size, particularly stature, relative to our total comparative sample or to Neolithic males only. However, he is also relatively broad-bodied, with bi-iliac breadth relative to stature or long bone lengths in the upper range of our comparative sample. Femoral diaphyseal strength relative to body size is close to the average for Neolithic males, but tibial diaphyseal strength is well above average. The tibia also demonstrates a high ratio of A-P to M-L bending strength, but the femur does not. There is a significant correlation between body shape (relative bi-iliac breadth) and femoral, but not tibial cross-sectional shape in our comparative sample, which probably explains the pattern found in the ice man. The tibial morphology is consistent with an active lifestyle involving long distance travel over rough terrain.

Chimpanzees as fauna: comparisons of sympatric large mammals across longterm study sites.

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Despite decades of field data to the contrary, wild chimpanzees (*Pan troglodytes*) are still classed as rain forest-dwellers in contemporary textbooks (e.g. Campbell & Loy, 2000), and edited volumes (e.g. Begun, 2004). Most long-term studies of wild chimpanzees are not sited in evergreen, closed-canopy equatorial forests, but instead take place in more open habitats. This paper aims to elucidate the extent of chimpanzee ethoecological diversity by scrutinizing (recently) sympatric mammalian fauna at established study sites. We compiled presence or absence data on large mammal species as predators, prey, competitors, or commensals at eight sites: Assirik, Bossou, Budongo, Gombe, Kibale, Lopé, Mahale, and Tai. The sites were rank-ordered on basic ecological variables: annual total rainfall, length of dry season, percent closed-canopy cover, etc. Almost no species of mammal was sympatric with chimpanzees at all sites; at the generic level, sympatric taxa were still in the minority; some subfamilies (e.g. colobines) were present at most sites; but some families (e.g. hyenids) were absent at most sites. Some taxa (e.g. suids, cercopithecines) correlated better than others (e.g. tragelaphines) with basic ecological variables. The most extreme chimpanzee study site for which data are available is Assirik, Senegal; nowhere else are chimpanzees sympatric with *Erythrocebus, Alcelaphus*, *Hippotragus*, etc. These living faunal assemblages have implications for paleo-ecological reconstructions of the habitats of extinct hominins (Haile-Selassie *et al.*, 2004).

The fetal/placental ratio in *Callithrix jacchus* and its relation to litter size and intrauterine growth retardation.

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The ways in which the primate placenta mediates fetal growth and development are manifold, but are poorly understood due to a paucity of primate models. Of clinical importance is the fetal/placental (F/P) weight ratio, which demonstrates the frequently independent growth trajectories and developmental demands of the fetus and placenta. Departures from a normal ratio are often associated with impaired fetal growth, and increased fetal and neonate mortality.

Common marmosets (*Callithrix jacchus*) housed at the Southwest National Primate Research Center offer a unique opportunity to study relations among neonate and litter size, and F/P ratio. Like other Callitrichids, marmosets regularly produce twins. In captivity both twin and triplet litters are common, thus allowing for the testing of hypotheses related to litter size-dependent variation in F/P ratio and fetal outcome. In this study, placental and neonatal weights from 9 term twin litters and 19 term triplet litters were used to compute F/P ratios. Triplets were significantly smaller than and had larger placentas than twins. F/P ratio per neonate was significantly smaller in triplets than in twins (2.904 vs. 4.406, $p < .005$). Twins exhibit greater variance in this variable, suggesting that for triplets, the size relation between fetus and placenta is more conservative. Per fetus, triplets are associated with a relatively greater placental mass than are twins. A similar pattern is observed in some clinical studies of intrauterine growth restriction in human pregnancies, as well as in studies of IUGR in non-primate species.

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Ontogeny of three-dimensional trabecular bone architecture in the human proximal femur.

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Ontogenetic changes in the human femur associated with the acquisition of bipedal locomotion have been well documented. The purpose of this study is to quantify changes in the three-dimensional structure of trabecular bone in the human proximal femur in relation to changing functional and external loading patterns with age. Thirteen femoral specimens ranging in age from prenatal to 8 years old were scanned on the high-resolution X-ray computed tomography scanner at the Center for Quantitative Imaging at Penn State University. The entire proximal metaphysis was scanned with voxel resolutions ranging from 0.017 to 0.046 mm. Spherical volumes of interest were defined within each dataset and the bone volume fraction, trabecular thickness, trabecular number, and fabric anisotropy were calculated. Clear differences in bone structure exist between younger and older individuals. Bone volume fraction, trabecular thickness, trabecular number, and degree of anisotropy decrease between the age of 6 and 12 months. After 12 months, the bone is distinctly thinner, less dense, and more isotropic. By age 2-3 years the bone volume, thickness, and degree of anisotropy increase slightly and regions in the femoral neck become more anisotropic corresponding to the cortical thickening of the inferior femoral neck. These results suggest that trabecular structure in the proximal femur reflects the shift in external loading associated with the initiation of unassisted walking in infants at one year of age. The ontogenetic development of trabecular bone in humans could be another useful tool for interpreting the evolution of bipedalism in early hominids.

The limits of using traditional taboos for primate conservation at Boabeng-Fiema, Ghana.

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The Boabeng-Fiema Monkey Sanctuary in central Ghana has been called a classic example of successful 'traditional' conservation. Local hunting taboos on the Ursine colobus are thought to date back to

the 1830s. After a marked decline in the 1970s, this population is now expanding, and the hunting taboo continues to be abided by. However, the same level of protection given to the monkeys at Boabeng-Fiema is not given to the surrounding forest (or other animals in the forest). In this presentation, we focus on this situation of an increasing colobus population being successfully protected and an unprotected forest declining in size. First, we present anthropological and ecological evidence outlining the forest decline, using 1- anthropological information on local use of the forest and 2- satellite images of the forest change over time. Secondly, we discuss the main reasons for the lack of forest protection, namely the lack of symbolic importance of the forest, a lack of understanding of the ecological relationship between the monkeys and the forest, i.e. people believe they are responsible for the monkeys' care, and ultimately, a need for more farmland. Finally, we discuss the consequences of a declining forest on the monkey population. We suggest that despite the protection offered by the taboo, this disconnect between the forest and monkey protection is a major threat to the survival of the monkeys in this area.

Identifying ape nests using molecular genetic techniques.

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One source of error in ape nest counts is difficulty distinguishing western gorilla and chimpanzee nests. This is rarely a problem with the other gorilla subspecies, as adult eastern lowland gorillas are reported to build tree nests infrequently (Yamagiwa, 2001), probably because of their larger body size. The usual classification of ground nests as gorilla and tree nests as chimpanzee is highly inaccurate, as most western gorilla study sites report a high percentage of gorilla nests in trees (Remis, 1993; Tutin et al., 1995). These two ape species are highly overlapping both in size, features of nest construction, and the vertical area in which nests are found. Tutin (1995) estimates that gorilla tree nests at Lopé may have caused the overestimation of chimpanzee populations by as much as 26%. In this study, fecal DNA samples collected from ape nests in the northern buffer zone of the Dja reserve were be amplified at the L1HS72 locus to determine the genus of a nest occupant. Amplification of this locus produces differently sized alleles for Pan, Gorilla, and Homo. These results are compared to genus assignments made on the basis of nest size, location, and fecal characteristics by researchers in the field. This method may be more accurate than identification in the field, but faster and less expensive than other molecular genetic techniques.

Patterns of mortality and trauma in a wild population of ring-tailed lemurs, *Lemur catta*.

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The patterns of mortality and trauma in wild primates remain an understudied component of primate socioecology. Only a handful of primates have reported such data, and there is little information available for prosimian primates. Here we develop a mortality and trauma profile for a population of wild ring-tailed lemurs. As part of a larger study of demography and health, 182 ring-tailed lemurs in and around the Beza Mahafaly reserve have been tranquilized, and have been examined for evidence of past and present trauma, which includes healed scars and fresh wounds, torn ears, missing or deformed digits and healed broken bones. Of these, 50 lemurs have been captured over two consecutive years, elucidating patterns of wounding in the same individuals over time. Complete or partial fresh remains of four individuals have also been recovered within various habitats, as well as skeletal remains of five individuals showing trauma. Of the living individuals evaluated, 41% exhibit evidence of trauma. Males exhibit more evidence of overall trauma ($t = 2.16$, $p < .03$). The number of individuals adding serious wounds from 2003 to 2004 was 27%, and was primarily male. Furthermore, only males exhibited face wounding ($t = 2.13$, $p < .04$). Location of most wounds indicates that damage occurs during "jump-fights", characteristic of this species. Ring-tailed lemur remains suggest particular patterns associated with either accidental death or predation – which may be evaluated in the field – and that lemurs can survive major traumatic events such as broken long bones and eye orbits.

Social behavior in captive red-fronted lemurs (*Eulemur fulvus rufus*).

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While there has been significant research on red-fronted lemurs (*Eulemur fulvus rufus*) in the field, there is little investigation into the social adaptations of captive red fronted lemurs. Previous studies suggest little active parenting, nor is female dominance exhibited over males in a social group. The present study was done on a group consisting of a pair-bonded male and female with their juvenile female offspring (aged 1 year 2 months at onset of study), on exhibit at Grant's Farm Animal Park in St. Louis, Missouri. The behavior of the group was recorded in summer, 2004, using both scan sampling and focal animal follows on each individual. The focus was on the juvenile's interactions with both adults and the frequency in which interactions took place. Early indications show that the female juvenile spent almost equal amounts of time alone as with the adults; however the distribution of interactions between the juvenile and each adult lemur was disproportionate. The juvenile interacted with the male 12% more than with the adult female. The adult male, however, interacted almost equally with the adult female and the juvenile female. Due to the age of sexual maturity in red-fronted lemurs (1 ½-2 years), the juvenile was reaching sexual maturity during the study period. There was no indication of either parenting or female dominance in the interactions. These data suggest that in captivity, red-fronted lemurs demonstrate the same social organization and behavior as animals in the wild and support models of their behavior as unusual among lemurs.

The "phrenology" of testosterone: studies in the endocrinology and psychology of facial form.

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The testosterone-to-estrogen (T/E) ratio is often taken to affect a number of male facial characteristics, and several studies have explained women's preferences for such "masculine" features. Yet little is known about the association of these sex steroids with facial form in either males or females. The 2D:4D ratio, which is the relative length of the index [2D] to ring [4D] finger, is accepted as a proxy for early (fetal) T/E, and recent studies using the ratio support claims of early androgene effects on facial features. This paper reports the results of two studies on the role of prenatal T and E levels (as studied via 2D:4D) and sex in the determination of facial form. In Study 1, facial photographs of 130 Austrian males and females were characterized by 51 two-dimensional landmarks. We found that prenatal T/E ratios (in terms of 2D:4D) and actual chromosomal sex dimorphism affects faces differently, and that chromosome gender explains more of shape variation than 2D:4D does. In Study 2, facial shape of 30 British adult men was investigated and correlated to (circulating) 2D:4D, salivary T, and to facial assessments by raters. Facial shape regressions upon perceived masculinity did not resemble those upon salivary T but rather those on 2D:4D, which is to say, on early T/E effects. We suggest that future studies on the perception of facial characteristics need to consider the differential effects of prenatal hormone exposure and circulating levels of T, in order not to confound either with actual chromosomal gender.

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Ontogeny of limb proportions in *Galago senegalensis* and potential implications for locomotor development.

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Since primate infants are not simply miniature adults, adult shape results from differential growth patterns of individual body segments. Initially, an infant relies on its mother for transportation, later beginning independent locomotion. Skeletal growth patterns must meet functional demands of independent locomotion. This study asks if ontogenetic attainment of adult limb proportions coincides with attainment of independent locomotion, i.e. do infants reach adult limb proportions near the time they begin independent locomotion (approximately 50 days of age). Mixed-longitudinal data were taken from a sample of 11 captive-born *Galago senegalensis*. Linear lengths of trunk, upper arm, lower arm, thigh and calf were measured from birth until approximately 500 days of age. Intermembral index (IMI) and the ratio of each limb segment to trunk length were calculated. Whether examined as paired or non-paired samples, IMI of infants at the time of initial locomotor independence were significantly higher than adult IMI. Therefore, the hypothesis that infants acquire adult limb proportions by the time they begin independent locomotion is not supported by this study. Inspection of LOWESS plots indicates that only the thigh/trunk ratio equals the adult value at the initiation of locomotor independence while the ratios of calf, lower arm, and upper arm to trunk are initially higher, not reaching adult values until approximately 100 days of age. These results indicated that ontogenetic shape changes in galagos are a complex process and do not seem to be explained by simple initial locomotor competency.

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Thyroid function and pollutant exposure among Akwesasne Mohawk youth.

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Concerns have been raised about the potential endocrine disrupting properties of persistent organic pollutants (POPs), such as polychlorinated biphenyls (PCBs), dichlorodiphenyldichloroethylene (*p,p'*-DDE), hexachlorobenzene (HCB), and mirex which are common environmental pollutants. Animal studies suggest that some POPs alter thyroid hormone levels, and adversely affect neurodevelopment. Human studies of thyroid hormones and PCB exposure have yielded mixed results and have focused primarily upon infants or adults, but not adolescents.

Here, we examine the relationship between six pollutants (PCBs, *p,p'*-DDE, HCB, mirex, lead, and mercury) and thyroid function as assessed by levels of triiodothyronine (T3), total thyroxine (T4), free thyroxine (fT4), and thyrotropin (TSH) among 232 adolescents. The sample consists of boys and girls aged 10 to 16.99 years, who are members of the Akwesasne Mohawk Nation, which spans the boundaries of Ontario, Quebec, and New York State. Toxicant levels in this sample reflect chronic exposure. Mean levels of thyroid hormones were within laboratory reference ranges. In multiple regression analyses controlling for key covariates and pollutants, PCBs were positively associated with TSH and negatively associated with fT4. In addition, HCB was negatively associated with T4, while lead was positively associated with T3. Significant associations of mirex, mercury, and *p,p'*-DDE with thyroid hormones were not observed in these models. Results suggest that chronic PCB exposure is associated with alterations in adolescent thyroid function. The implications of reductions in thyroid hormone levels include reduced postnatal growth, and possible contributions to the development of obesity via metabolic effects.

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Model-free and model-bound approaches to population variability in the Maya area.

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In recent years, skeletal biologists have incorporated models derived from population genetics in their analyses of ancient population variability based on phenotypic characters of the skeleton. Traditional approaches to ancient population differences did not incorporate population parameters, but derived conclusions based solely on levels of phenotypic similarity between skeletal populations. These two approaches have respectively become known as model-bound and model-free in the physical anthropology literature.

Both model-free and model-bound approaches were used to test the hypothesis that isolation by distance describes Classic Maya population structure. Dental metric data were collected for 741 Classic period Maya skeletons from 12 sites in Guatemala, Mexico, Belize, and Honduras. The data were analyzed using a series of model-free and model-bound approaches, including Principle Components Analysis, Mahalanobis Distance, and unscaled and scaled **R** matrix analyses. Association between biological and geographic distance in the Maya area was tested using a series of Mantel tests.

All of the Mantel tests indicate that isolation by distance does not characterize Classic Maya population structure. This

conclusion was further supported by the model-bound **R** matrix analysis which found an overall F_{ST} of 0.018 for the Maya area, indicating low genetic differentiation amongst the populations tested. Although all of the model-free approaches produced similar results, some differences were observed between the model-free and the model--bound analyses. Ultimately, both model-free and model-bound approaches provided informative results and it is recommended that both methods be included in future biological distance studies.

Analysis of burned dental remains.

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Teeth alter as a result of thermal exposure in much the same way as bone. However, there are some important idiosyncrasies. The current study documents heat-related changes in human teeth recovered from archeological and forensic contexts. The results of this study find that, like bone, teeth lose their natural color and become bluish and then white as the temperature and/or duration of thermal exposure increase. Fracture patterns tend to be radiating and patina-like along tooth roots. As roots shrink, entire enamel crowns may fall off of the single-rooted teeth. Among the molars it is common to see the crowns fragment as the radicals break apart from either shrinking or from rapid expansion of the pulp fluids. Isolated molar radicals may look like roots from anterior teeth. They are identified by subtle projections located where the radicals joined previously near the cervix. Sometimes dental remains are protected from thermal affects by their alveoli (in erupted teeth) and by there crypts (in unerupted teeth). Thus, with highly fragmented remains it is important to look for occlusal wear on suspiciously unburned crowns. An absence of wear may suggest that a tooth is unerupted, and therefore indicative of a subadult. This study underscores the notion that much information can be derived from heat-altered teeth and that field methods need to be sensitive enough to recover even the smallest dental fragments.

Forelimb compliance and arboreality in primates and marsupials.

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Primates display unusually high forelimb compliance compared to most other mammals. Forelimb compliance, which is especially marked among arboreal primates, appears to reduce vertical oscillations of the body and alleviate forelimb peak vertical forces (Schmitt, 1999). This may represent a basal adaptation of all primates for locomotion on thin, flexible branches. Larney and Larson (2004) reported that arboreal marsupials have forelimb compliance comparable to or exceeding that of many primates. If forelimb compliance is functionally linked to locomotion on thin branches, then we predict greater forelimb compliance in arboreal compared to terrestrial marsupials.

Forelimb compliance was compared between a fine-branch arboreal opossum, *Caluromys philander*, and a highly terrestrial opossum, *Monodelphis domestica*. Lateral videorecordings were taken while animals walked on a runway and a horizontal 7-mm pole (for *Caluromys* only). Elbow yield (change in elbow angle from hand contact to greatest joint flexion) was used as a proxy for forelimb compliance. Like highly arboreal primates, *Caluromys* was characterized by higher degrees of elbow yield, on both ground (30° +/-5.9) and pole (31° +/- 7.8). In contrast, *Monodelphis* had lower elbow yield (15.2° +/-2.7), intermediate between terrestrial primates and rodents (Larney and Larson, 2004).

These data strongly support a functional link between arboreality, particularly locomotion on thin branches, and forelimb compliance. Moreover, these data provide additional evidence for convergence between primates and *Caluromys* (Lemelin et al., 2003), suggesting that locomotor features common to all primates evolved from an ancestor that was a fine-branch arborealist.

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The phylogeny of the Callitrichinae, with special emphasis on the marmosets (including *Callibela*), *Callimico* and new information on Brazilian *Saguinus*.

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According to Schneider et al. (1996), the New World monkeys encompass three families, Cebidae, Pithecidae and Atelidae, the Cebidae including three subfamilies: Cebinae, Aotinae, and Callitrichinae (*Saguinus*, *Mico, Callithrix, Cebuella*, and *Callimico*). Analyses using nuclear DNA have unequivocally placed *Callimico* as the sister group of marmosets contrasting traditional arrangements based on morpho-physiological features. Recently, Roosmalen and Roosmalen (2003) based on molecular and other data, proposed that *Callithrix* (*Mico*) *humilis* should be considered a new genus *Callibella humilis*. This study intends to re-examine the phylogenetic relationships of *Mico*, *Cebuella*, *Callithrix* and *Callibella* using two mitochondrial regions, the control region and part of the rRNA16S. The relationships of *Saguinus midas* from North Amazonas and *S. niger* from three populations from South of the Amazonas river by means of genetic comparisons of D-loop sequences will also be addressed.

Control region phylogenetic trees depicted four monophyletic lineages: *Mico, Callibella*, *Cebuella* and *Callithrix*. Pairwise divergences among *Callibella* and the other genera were compatible with intergeneric differences. The analyses also show two distinct clades inside *Mico*, one including *M. mauesi*, *M. saterei* and *M. humeralifer* and another including *M. argentata*. The rRNA 16S divergences between *Callibella* and the other callitrichines are also compatible with intergeneric relationships. Divergences between *S. niger* populations from the east bank of the Xingu river and west of Tocantins were around 4% and between both banks of the Tocantins river were 8%, being higher than those of *S. bicolor* and *S. martinsi* (7.5%) and *S. imperator* and *S. mystax* (7.7%), which point out theTocantins river as an effective barrier to gene flow within *Saguinus*.

Analysis of modern cremated human remains: gross and chemical methods.

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Biological anthropologists are increasingly being asked to serve as scientific consultants to resolve legal issues involving contemporary cremations – primarily establishing personal identity and detecting commingled remains. This has resulted in a small, but growing body of research in order to better understand the effect of extreme temperature and post-cremation processing on bone, as well the preservation of artifactual clues aiding personal identification. Lines of inquiry

include examination of the basic properties of burned bone, cremation weights and volumes, and the curation of reference collections of medical, dental and mortuary artifacts.

The newest commercial processing methods have made the analysis and subsequent identification of contemporary cremations a more challenging task, and thus have necessitated new research methods in the chemical analyses of cremated bone. In this presentation, we present preliminary results from chemical analyses of human cremated bone from modern contexts. Chemical or elemental analyses for characterization of cremated remains involve the use of a number of routine techniques such as GC-ICP-MS (gas chromatography inductively coupled plasma mass spectrometry) and XRD (X-Ray diffraction). Such procedures provide a suite of elemental and mineralogical tests to characterize bone samples. Cremated samples of known provenience, unknown provenience, and a series of experimental bone samples, cremated at different temperatures, are analyzed accordingly. Preliminary results underscore the (obvious) lack of organics and the surprising variability and heterogeneity of bone mineral, as well as the utility of chemical analyses in detecting non-osseous materials introduced into, or presented as, cremated human remains.

Infant and child diseases in the pre-Columbian Grasshopper Pueblo, Arizona.

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Nature, cause, spread and frequency of deficiency and inflammatory diseases, as well as physical strain in the pre-Columbian population of the infants and children from the Grasshopper Pueblo (Arizona) were studied.

The skeletons of 358 subadults excavated at the Grasshopper Pueblo (Arizona) were examined to calculate the causes and the frequencies of diseases in the populations of three different large room blocks. The skeletons were investigated by macroscopy and a strong magnifying glass 15x.

The results characterize different living conditions in the three room blocks of this pre-Columbian community. Seven diseases were studied (scurvy, rickets, anemia, meningeal irritations, otitis media, sinusitis maxillaris). Scurvy was found in ca. 36%. No case of rickets was diagnosed. Probable anemia was found in ca. 51%. Vestiges caused by hemorrhagic and inflammatory processes of the meninges (e.g. meningitis, epidural hematoma) were observed in ca. 69%. Inflammatory processes of the paranasal sinuses were relatively common (sinusitis maxillaris ca. 40%). It is striking that otitis media was not very frequent.

The children of room block 3 show the lowest frequencies. The morbidity is also reflected in the mortality as the children who lived in room block 3 had a lower mortality.

The socio-biological causes of the different frequencies of the investigated diseases are discussed. The results document a relatively high rate of infectious diseases, probably due to climate, housing conditions and poor hygiene.

Using electron spin resonance (ESR) to quantify the thermal history of burned bones.

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Anthropologists studying burned bone have generally relied on the visual appearance of the bone for clues about its thermal history. Studies of the effects of controlled burning on bone provide a strong basis for the reconstruction of thermal histories, but the visual appearance of heated bone is a function of both time and temperature. Bones heated to very high temperatures for very short periods of time may resemble bones heated for longer periods at lower temperatures. Whether we deal with prehistoric cremations or modern forensic cases, methods are needed to quantify thermal histories of burned bone.

Electron spin resonance (ESR) has long been used to determine the maximum heating temperature of carbonized organics. The ESR g-value has been used to determine the maximum heating temperature of modern bones burned under controlled conditions. ESR data can be combined with visual examination to deduce the heating time.

ESR g-values from 124 modern bone specimens heated at a wide variety of times and temperatures demonstrate our method. We apply it to 92 bone fragments from the Archaic component of Klunk mounds and the Late Woodland and Middle Mississippian components of Yokem mounds in west central Illinois to reconstruct cremation practices dated from 5,000 to 1,000 BP.

Auricular surface ageing – Worse than expected? Results from a blind test using a documented skeletal collection.

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Age-at-death estimation from the adult skeleton is stricken with difficulties inherent to the nature of the observed traits, and over the years has received justified criticism. Accordingly, many attempts have been undertaken to modify, improve and validate existing ageing methods involving macroscopic features. Among those areas of the skeleton considered particularly promising is the auricular surface. This study presents the results and recommendations arising from a blind test of the revised age estimation method for this structure proposed by Buckberry & Chamberlain in 2002. Auricular surfaces of 167 individuals from St. Bride's, London, a documented skeletal assemblage spanning from the late 17th to the early 19th century, were analysed for the following traits: transverse organisation, surface texture appearance, macroporosity, microporosity, and morphological changes to the apex. Composite scores of trait expressions were found to generally correlate with age and to show a positive association with known chronological age ($p<0.05$). However, when composite scores are combined to define auricular surface phases, which ultimately assign age-estimations, only four distinct developmental stages, compared with seven suggested by Buckberry and Chamberlain, can be identified, all showing a high degree of individual variation in age. The most well defined stage in the St. Bride's assemblage is stage IV, where the majority of individuals are older than 55 years, whereas middle-aged adults display large variation in composite scores. The results provide little hope for a promising application of age-at-death estimation of auricular surface morphology traits, but rather suggest indications of broad stages of life.

Low birth weight and hypothalamic-pituitary-adrenal (HPA) axis function in infant rhesus macaques.

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Stress is an important consideration in the study of primate social behavior. The HPA axis is one of the major systems involved in the physiological stress response, and research with humans suggests a relationship between low birth weight and dysregulation of HPA-axis function in childhood. In this study, we tested the hypothesis that infant rhesus macaques with low birth weights exhibit a similar dysregulation of the HPA axis. Birth weight categories (low, average, and high) were determined from a sample of 257 (118 females, 139 males) rhesus monkey infants, including both mother-reared and nursery-reared subjects. The effect of low birth weight (LBW) on plasma adrenocorticotrophic hormone (ACTH) and cortisol levels was evaluated in a subsample of subjects under two conditions: 1) non-stressful baseline condition at 60 days of age, and 2) mildly stressful conditions at 14, 30, 90, 120, and 150 days of age. Data were analyzed using analysis of variance. Under the non-stressful condition, LBW mother-reared infants exhibited significantly higher baseline ACTH levels than mother-reared infants of average birth weight (ABW). Under the mild stress conditions, ACTH levels in LBW infants, regardless of rearing condition, were higher at 14 days of age, and lower at 90, 120, and 150 days of age, compared to ABW and high birth weight infants. No significant effects were found for cortisol. These results suggest that low birth weight, which is thought to indicate an adverse intrauterine environment, may have implications for the development of the stress response in infant primates.

Isotopic evidence of consumption of marine foods by ancestral Chumash.

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We have isotopically analysed bone collagen and carbonate in bone mineral from 19 individuals from a single Chumash site near Malibu, CA. From the distribution of carbon and nitrogen isotopic analyses we can infer that the diet of both historic (post-contact) and Middle Period (1400 BCE – 1150 CE) peoples included significant and similar proportions of marine foods. Adult females appear to have consumed somewhat more marine resources than males overall, but individuals ranged widely in the level of marine consumption. Based on collagen data, high trophic-level fish or seals constitute up to 95% of the protein intake of some individuals, while the diet of others includes much more terrestrial resources marked by lower N – 15, C – 13 values. The marine component of the diet of both sexes appears to be remarkably limited in trophic level, suggesting the dominance of a few (or even only one) large carnivorous marine species as the prey of these coastal people. These data are broadly consistent with earlier isotopic studies although at most other sites males exhibit higher preference for fish. There is no apparent correlation between age or status and level of dependence on marine foods.

Inferring primate growth, development and life history profiles from dental microstructure.

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Teeth are a unique biological system in that their component hard tissues (enamel and dentine) preserve a permanent record of their growth in the form of daily markings. As a result, direct evidence for the timing of important developmental events during evolution are available from even fragmentary dental remains. Using these incremental markers, it's possible to reconstruct the life history of extinct primates/hominins with unparalleled accuracy. Here I will discuss how such studies have enriched dental anthropology by reviewing current projects aimed at charting the evolutionary histories of the uniquely modern human pattern of growth, canine dimorphism, and the unique life history profiles of Malagasy lemurs, to name but a few.

Age at M1 eruption is the dental developmental event most closely tied to the pace of life history. Analyses of growth lines in teeth of hominins and extant hominoids suggest a relatively early M1 eruption age for *H. erectus*, such that prolonged growth occurred well after the earliest members of *Homo*. More generally, larger primates exhibit prolonged dental development, later M1 eruption age, and slow life history. Recent analyses show a much later M1 eruption age in *Pongo* compared to African apes, suggesting a different scaling relationship among these important biological parameters. One might expect this same relationship to hold for extinct giant lemurs. Charting rates of dental development in large taxa in comparison to their smaller-bodied, extant sister-taxa reveals some interesting dissociations between body size and growth rates, and has important implications for the evolution of life histories.

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Considering prosimian diversity: why so many galagos and so few lorises?

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During the past decade, there has been a proliferation of resurrected and/or newly recognized prosimian taxa. In the case of Malagasy primates, the number of species identified seems to double annually. With regard to lorisids and galagids, recognition of taxic diversity has largely been confined to the latter group, not only at the genus level (*Galago*, *Galagoides*, *Otolemur*), but particularly extensively at the species level. With the exception of the recently named genus and species, *Pseudopotto martini*, however, the taxonomy and systematics of the lorisids has largely remained unchanged. Could this be related to the approaches brought to bear on analyzing prosimian diversity? There is clearly a spectrum, from technology driven scrutiny of micromolecular differences (Malagasy primates), to analysis of vocalization in addition to morphology and behavior (galagids), to more traditional morphological comparisons (lorisids). In addition, for whatever reasons, the lorisids have historically been the least intensively studied prosimians. Yet, the paleontological record of fossil prosimians with arguable phylogenetic ties to extant taxa, while still not huge, contains specimens of potential lorisid relationship, both in Indo-Pakistan and in Africa. Are we to think, then, that, somewhat like hominoids, there had been a "radiation" of lorisids of which the extant taxa are the surviving few, and that, somewhat like cercopithecoids, galagid diversity reflects ongoing diversification? Or, might we find that, if lorisids were subjected to more concerted comparative study, their apparent taxonomic restriction would turn out to be an artefact?

Hominid locomotion development and the importance of brachiation: how zoo design can show brachiation as a precursor to bipedalism through a gibbon exhibit.

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Nonhuman primates have been a focus of researchers studying the evolution of bipedalism. For example, researchers have shown that while australopithecines walked bipedally, they had upper limbs more suitable for climbing. Hylobatids use brachiation and are known to walk upright for short periods of time in trees or on the ground. One hypothesis for the origins of bipedality proposes that early hominids could have evolved from an ancestor with hylobatid-like locomotive behaviors. To elucidate this problem we are studying three captive White-Handed Gibbons (*Hylobates*, *lar entelloides*). The three gibbons are housed on two islands connected by a rope bridge. One island has an apparatus that enables the gibbons to brachiate in a circular pattern approximately 50 feet in diameter. The second island has limited structures that prohibit brachiation to preferred locations such as a feeding station and an enclosed shelter. Based on focal animal data collection it is evident that the gibbons display a preference for the habitat that enables normal brachiation between important locations. Moreover, the gibbons spend more time on the ground, walking bipedally, when given access only to the island with limited structures. This would suggest that our earliest suspensory ancestors may have been forced into a bipedal posture if environmental influences prevented arboreal locomotion through a continuous canopy.

A measurement based technique for dental microwear analysis: applying confocal microscopy and scale-sensitive fractal analysis.

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Dental microwear analysis is used commonly to reconstruct the diets of extinct primates. Conventional methods of microwear analysis are, however, limited to 2D imaging, and identification of individual features is time consuming and subjective. Here we describe a new approach to microwear analysis, using confocal microscopy and scale-sensitive fractal analysis (SSFA). SSFA-based measures of surface complexity and anisotropy offer rapid, repeatable, quantitative characterizations of surfaces in 3D, free of interobserver measurement error.

For this study, buccal facets on M_2s of various primates were analyzed using a white-light confocal microscope with a lateral sampling interval of 0.18 µm, a z-axis sampling interval of 0.005 µm, and a work envelope measuring 276 x 204 µm. Results show that this new method, SSFA, clearly distinguishes species by diet. *Cebus apella*, for example, a species that often consumes hard objects, shows much more area-scale fractal complexity than does the more folivorous *Alouatta palliata*. *Macaca fascicularis* is intermediate in both material properties of preferred foods and area-scale fractal complexity.

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The cost of reproduction in the Gambia: does investment in reproduction decrease women's survival rates?

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Life history theory predicts that where resources are limited, investment in reproduction will cause a decline in body condition and ultimately may lower survival rates. We investigate the relationship between reproduction and survival in women in rural Gambia. This is a high mortality, high fertility population which suffers periodic food stress. We use a number of different measures of reproductive investment: the timing of reproduction, intensity of reproduction and cumulative reproductive investment (parity). Though giving birth is clearly a risk factor for increased mortality, we find limited evidence that the timing, intensity or cumulative effects of reproduction have a survival cost. On the contrary, we find evidence for a *positive* correlation between investment in reproduction and survival rates, so that women who have invested heavily in reproduction have higher survival rates than women with lower reproductive investment. One explanation for this finding is that our analysis is confounded by individual variation in health or 'quality': healthy women are able to invest considerably in both reproduction and in maintaining their own somatic tissue, which lowers their mortality rate. We attempt to control for differences in 'quality' between women by including measures of body condition in our models. However, even when controlling for health, the positive correlation between investment in reproduction and survival remains unchanged. We discuss alternative explanations for this finding.

Comparison of Gravettian skulls from Predmostí with recent skulls from Pachner collection: roughness penalty approach in shape analysis.

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The Middle and Upper Palaeolithic site of Predmostí is located at the southern entrance of the Moravian Gate. The site yielded the largest assemblage of Early Modern skeletons known hitherto. At the end of World War II, however, most of the accumulated material, including the human fossils, was damaged by a fire. More than 100 years after its discovery, the Predmostí hominid samples remain the best documentation available for knowledge of individual variation among European Upper Palaeolithic hominids.

The aim of the present study was to perform a detailed comparative morphological analysis of shape variation in skulls from Gravettian and recent population by geometric morphometrics. Gravettian population is represented by the best preserved skulls of adult individuals from Predmostí and recent population by skulls from Pachner collection from Charles University, Prague. Shape analysis was implemented to S-PLUS and R, employing specially constructed program routines (Katina 2002, 2004; Dryden & Mardia 1999). Using these program routines each skull was compared to the others in a particular view; a matrix of Bookstein penalties was then constructed for each view, as were global penalties for all the views together (Šefcáková et. al, 2003, Katina et.al, 2004). Global penalties were

counted as order-means of penalty-values for particular views.

Results of inter-skull differences: judging from the global penalties (allocation to orders), the skulls differ mostly in the lateral, frontal and vertical views – but adding the other views (occipital and basal) resulted in no changes to the ordering.

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Early South Americans in craniofacial metric perspective: Lagoa Santa.

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We compare the craniofacial morphology of four Sumidouro skulls and one Lund skull, representing South American Paleoindians from Lagoa Santa, Brazil, with worldwide prehistoric and recent human craniofacial metric data. Relationships in these data are illustrated using the neighbor-joining method based on a Mahalanobis distance matrix, discriminant function analysis, canonical variate plots, and posterior and typicality probabilities. We also employed Relethford and Blangero's R matrix method (Relethford and Blangero 1990, Relethford and Harpending 1994) on the same craniofacial metric data, and generated the neighbor-joining tree and principal coordinate plot. Using Howells' worldwide comparative dataset, Walter Neves et.al. (2003) recently suggested that Brazilian Paleoamericans probably were closely related to Australian Aborigines and Africans as opposed to Native Americans and Northeast Asians. In contrast, our preliminary results show that Lagoa Santa individuals exhibit stronger morphological affinities with prehistoric Jomon of Japan, recent Patagonia/Tierra del Fuego of South America; present day Mexico, Peru, and Archaic Americans of Windover and Indian Knoll of North America, than with our Australian sample. Moreover, Jomon, Lagoa Santa and Archaic North Americans all present a relatively close relationship, and tie consistently to each other. This suggests that the early inhabitants of South America were probably not related to Australo-Melanesians, but rather the Late Pleistocene descendents of Northeast Asia, such as Jomon. Also, they are related to the Archaic North American populations and recent central, and South Americans.

Lorisoid evolution in Africa – the fossil evidence.

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Until quite recently, the fossil lorisoids *Komba*, *Progalago*, and *Mioeuoticus*, known from various early and middle Miocene sites in east Africa, provided the earliest fossil evidence for both lorisoid and crown strepsirrhine evolution worldwide. Despite the availability of abundant craniodental and postcranial remains attributable to these taxa, their relationships to extant lorisoids have been controversial, likely due in part to the historical absence of more ancient fossil lorisoids. Since the turn of the century our understanding of lorisoid evolution has changed dramatically, however, thanks to new insights from molecular phylogenetics, improved methods for inferring divergence dates from nucleotide sequences, and the surprising discovery of the later Eocene fossil lorisoids *Karanisia* and *Saharagalago* in Egypt.

In this study we synthesize all of the information now available from the Eocene and Miocene fossil record of lorisoid evolution in order to provide a comprehensive assessment of the time and place of origin of major lorisoid clades. Phylogenetic analysis within the context of the broader strepsirrhine and crown primate radiation supports an Afro-Arabian origin for crown Strepsirrhini and Lorisoidea. The identification of *Saharagalago* and younger *Wadilemur* as primitive stem galagids is remarkably congruent with recently published divergence estimates based on nucleotide sequences, which tend to support at least a late middle Eocene (Bartonian) origin for crown Lorisoidea. Taken together these paleontological and molecular data suggest that much of the morphological diversity observable within Lorisoidea arose in Afro-Arabia during the Paleogene, but remarkably only a tiny fraction of this radiation has been sampled thus far.

Thumb reduction in colobines: adaptation or pleiotropy?

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Colobines have classically been described as having shorter thumbs and longer posterior (medial) digits than cercopithecines. Functional explanations for *Colobus* thumb reduction include forelimb-first landings during leaping (Morbeck, 1979) and running on pliable substrates (Tuttle, 1975). However, colobine digit elongation and pollical reduction may not be developmentally independent, nor separate adaptations. In a diverse sample of cercopithecoids, we measured the third metacarpal, and proximal and intermediate phalanges. Lengths and articular breadths of the radius and humerus were also measured to assess scaling with limb length and body size. These data were analyzed using PCA and t-tests. Component 1 of the PCA loads highly for long bone lengths and provides no separation between the subfamilies. However, thumb length and digit length load oppositely in component 2. These results suggest that cercopithecines and colobines do not differ in relative humerus or distal radius length, but differ significantly in thumb, and posterior metacarpal and digit length. This pattern may result from differences in *Hox* gene expression and/or its targets. *Hoxd11* is expressed in both the developing zeugopod (forearm) and autopod (manus), whereas *Hoxa13* is restricted to only the autopod. As cercopithecoids do not differ in distal radius length, differences may be related to *Hoxa13* expression. In colobines, reduced *Hoxa13* expression is consistent with shortened thumbs and longer posterior digits due to relaxed competition with *Hoxd11*; indeed, murine *Hoxa13* mutants largely phenocopy the colobine first digit morphology. Thus, selection may have primarily targeted posterior digit elongation, with pollical reduction representing merely a pleiotropic effect.

Soft tissue-linked cranial structures and the reconstruction of fossil primate phylogeny.

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Recent analyses have suggested that standard craniodental characters may be misleading regarding primate phylogenetic relationships. This has important implications for the study of human evolution because such characters dominate the datasets used to reconstruct the phyloge-

netic history of fossil primates. This study was designed to identify characters that will allow fossil primate relationships to be reconstructed more confidently. It is based on the finding that hominoid soft-tissue traits yield a phylogeny consistent with the strongly supported molecular phylogeny for these primates. If soft-tissue traits are phylogenetically informative, then osteological traits associated with soft tissue may also be phylogenetically informative.

We collected information regarding the number, size, shape, and position of cranial foramina and canals on a sample of 30 *Gorilla gorilla*, 30 *Pan paniscus*, 30 *Pan troglodytes*, 48 *Homo sapiens*, 31 *Pongo pygmaeus*, 59 *Hylobates* plus 20 *Colobus*. This information was coded into 112 characters and subjected to cladistic analyses. The resulting phylogeny was compared with the hominoid molecular phylogeny and with a cladogram generated from a standard craniometric dataset. Bootstrap analysis returned a partially resolved but strongly supported cladogram that was consistent with the molecular phylogeny and differed considerably from the cladogram obtained from the craniometric dataset. It placed *Hylobates* as the sister taxon of a clade that comprised *Pongo*, *Gorilla*, *Pan* and *Homo*, and *Pongo* as the sister taxon of a trichotomy formed by *Gorilla*, *Pan* and *Homo*. These results suggest that primate foramina and canals may be a better focus for phylogenetic studies than standard craniodental characters.

Epidemiological auxology of an Indian population of the central part of Veracruz, Mexico.

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The present study was carried out in the village of Ixhuatancillo, in the Gulf Coast State of Veracruz. It is a Nahuatl speaking small community located near the city of Orizaba. The sample comprises 471 children (264 girls and 207 boys) aged 6 to 14 years. Body measurements were taken crossectionally according to international standards. Nutritional and social data were taken through inquiries.

It will be discussed how these Indian children grow in relation to their physical, nutritional and social environment and data will be compared with those of other more mestizo children of nearby regions.

Activity budget and feeding ecology of *Macaca fascicularis* in Mauritius.

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Macaca fascicularis is one of the most widely distributed species of primates, yet long term studies of wild populations of this species are few. Here we report results from a long term study of the activity budget and feeding ecology of long-tailed macaques (*Macaca fascicularis*) on the island of Mauritius. This non-native population provides a unique opportunity to explore the dietary patterns of *M. fascicularis* that allow it to succeed in a variety of environments. 565 hours of scan sampling data were collected from September 1979 to October 1980.

Feeding was the most common macaque activity (30% of observation time), followed by moving (23%), resting (22%), and grooming (13%). The monkeys were eclectic feeders, eating more than 52 species during the study. Six species (*Leucaena leucocephala*, *Acacia concinna*, *Tamarindus indica*, sugar cane, *Mangifera indica*, and *Psidium sp.*) made up over 50% of the diet. The macaques were predominately frugivorous, relying on fruits, pods, and seeds for 37% of their feeding time. They exploited a wide range of food items, including leaves, flowers, insects, bark, snails, mushrooms, exudates, and sugar cane. Dietary patterns showed some seasonal differences.

These results are consistent with studies of *Macaca fascicularis* populations throughout Southeast Asia. While the species eaten by the Mauritian macaques differed from native populations in Asia, their activity patterns and the types of plant parts consumed were quite similar. This species-specific behavioral pattern may be one of the primary reasons for the ability of *M. fascicularis* to exploit a variety of different habitats.

Scaling of reduced physiologic cross-sectional area in primate masticatory muscles.

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Primates exhibit a variety of feeding behaviors generally associated with masticatory muscle structure. Scaling studies can identify such morphological deviations from models testing geometric similarity between organs and organisms. One reasonable estimator of muscle force potential is the architectural variable *reduced physiologic cross-sectional area* (RPCA). This study examines RPCA in three masticatory muscles—masseter, temporalis, and medial pterygoid—to identify scaling relationships in RPCA for 27 species of prosimians (PRO), New World monkeys (NWM), and Old World monkeys (OWM). Histologic measurement of relative sarcomere lengths was employed to restore *in situ* fiber lengths and pinnation angles to putative resting values. RPCA was then calculated using these corrected variables and muscle weights. Correlation coefficients and regression equations on measured craniobasal lengths (CBL) were computed.

For each muscle and each taxon, RPCA and CBL are strongly correlated ($r \approx 0.57$-0.84), except for masseter ($r=0.31$) in OWM. Allometric slopes for PRO and NWM range from slightly negative to slightly positive, while those for OWM are strongly positive. RPCA is positively allometric for all muscles in all taxa. Masseter and temporalis show the highest positive allometry for OWM and the least for NWM, while medial pterygoid shows the lowest in PRO.

The relatively larger PRO and OWM values for masseter and temporalis appear related to their more obdurate diets, by contrast to NWM. Furthermore, the increase in medial pterygoid from PRO through OWM may parallel the evolutionary attainment of a more sophisticated masticatory functional complex, as is supported by other morphological and experimental data.

Morphological and functional differentiation in the lumbar spine of lorisoids.

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The striking contrast in positional behavior exhibited by lorises (slow quadrupedalism/ suspension) and galagos (leaping/quadrupedalism) is well reflected in their postcranial morphology, particularly in the limbs. Vertebral adaptations have been less well explored in these taxa, despite their very different spinal postures and movements. This study addressed morphological and functional differentiation in the lumbar vertebrae of *Loris tardigradus*, *Nycticebus coucang*, *Arctocebus calabarensis*, *Perodicticus potto*, *Galago senegalensis*, *Galago alleni*, *Euoticus elegantulus*, *Otolemur garnettii*, and *Otolemur crassicaudatus* ($n = 66$). The influences of function, phylogeny and body size on vertebral form were explored by testing

for variation between and within lorises and galagos. Linear and angular measurements of lumbar vertebrae were compared statistically in the context of data collected for eleven other strepsirhines.

Compared to galagos, lorises have relatively shorter and more dorsally oriented spinous processes, relatively shorter, more dorsally situated/oriented transverse processes, and more obliquely oriented prezygapophyses. These features (combined with relatively short lumbar regions) promote lumbar stability and reflect antipronogrady, multi-plane spinal movements, and upside-down suspension. Within lorises, some lumbar features vary strongly with body size.

Despite locomotor/postural differences among galagos, they exhibit less within-group vertebral variation than do lorises. Galagos share reduced lumbar regions with lorises and large vertical clingers and leapers (indriids), a feature providing stability during upright postures. However, the features of galagos that contrast with those of lorises are functionally associated with lumbar sagittal flexibility. In this respect, galagos differ dramatically from indriids, reflecting their differences in body size and/or locomotor repertoires.

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Brain/body allometry: using extant apes to establish appropriate scaling baselines.

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Nearly all studies of functional and ecological associations with brain size in primate evolution begin by determining residuals relative to some best-fit interspecific trajectory. These encephalization quotients (EQs) are then used to test for significant patterning with variables of interest. EQs have traditionally been determined using mammal- or primate-wide samples, typically exhibiting logarithmic slopes of 0.66 to 0.75. But studies of relative brain size can only be as biologically and statistically sound as is this procedure of residualization, and many have argued that changes in absolute brain size itself, or brain size scaled at 2/3-3/4, are in fact associated with increases in cognitive capacities, calling into question the meaning of the slope used as the criterion of subtraction. Here I combine published data on brain/body scaling with that on the cognitive capabilities of the much-studied extant hominoids (minus the hyperspecialized *H. sapiens*) to address this fundamental issue of functional equivalence in brain evolution within primates. Trajectories comparing grouped hominoids to grouped cercopithecoids, large-bodied hominoids to hylobatids, and the three species of large-bodied hominoids are combined with observed cognitive performance criteria. Results indicate a better fit with observed behavioral data when the lower slope is used than when the traditional slopes of 2/3 or 3/4 are applied. This slope is then applied to comparisons across extant hominoids, and also to previous discussions of relative brain size in both *Proconsul* and *Dryopithecus*. I conclude that the lower slope used in the appropriate phylogenetic context is the most appropriate baseline for recognizing increases or decreases in EQs.

The behavioral role modeling hypothesis and the ontogeny of behavior in wild male chimpanzees

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Chimpanzees have very long periods of juvenility and adolescence. Previous work on immature primates has suggested that association with older conspecifics may be important to their behavioral development. However, questions remain about how maturing male chimpanzees choose social partners and how much of an impact behavioral role modeling may have on the behavioral development of young chimpanzees. Here, I introduce and test the Behavioral Role Modeling Hypothesis for adolescent and maturing male chimpanzees. The BRMH states that maturing males use adult males as role models for behavioral development and are strategic in their choices of social partners.

I conducted research at Ngogo, Kibale National Park, Uganda. The Ngogo chimpanzee community is the largest on record, with a total of about 140 animals. During my study I focused on twenty-three males, including all of the adolescents in the community, six young adult males and two, apparently, orphaned juvenile males. I collected data during all day follows of mixed age-sex parties. I used focal, scan and *ad libitum* methods to collect data on affiliative, agonistic and dominance behaviors. Results support the BRMH for both adolescent and other maturing males. Maturing male chimpanzees were strategic in their choices of social partners, favoring adult males over all other age/sex classes, and high-ranking males over other adult males. Adolescent and maturing males competed over access to preferred social partners and relative rank of maturing males was positively correlated with ranks of top adult male social partners. These results indicate that behavioral role modeling is important in the ontogeny of behavior in wild male chimpanzees.

Phyletic valence of craniofacial traits: clues from quantitative genetics.

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The anatomy and biology of the craniofacial complex has long played a central role in phylogenetic interpretations of the hominin fossil record. Despite acknowledging the integrated nature of the functional and developmental components of the craniofacial complex, these traits are often treated as individual, independent characters of equal phyletic value in phylogenetic analyses. Recent critiques of phylogenetic analyses based on craniodental evidence indicate that a refined evaluation of the traits used in those analyses may be necessary.

Recent evidence from quantitative genetic analyses of complex traits in the craniofacial complex has prompted discussions regarding the valence of traits for phylogenetic reconstruction. Specific hypotheses predict higher heritabilities in traits found in endochondral versus intramembranous bone, in vertical versus horizontal traits, and in dental versus skeletal traits. To test these hypotheses, thirteen craniofacial measures were taken from lateral cephalograms of participants in the Fels Longitudinal Study and heritabilities (h^2) were estimated using a maximum likelihood method for pedigree data.

Heritability estimates of endochondral versus intramembranous traits are generally equivalent and of moderate to high magnitude (>0.60). Similarly, heritability estimates for traits of different orientation do not differ systematically; heritabilities for skeletal traits are similar to those published for dental traits. It is clear that the simple relationships hypothesized above are not accurate predictors of heritability. Trait-specific estimates of quantitative genetic parameters may provide a means to objectively evaluate the phyletic valence of traits and improve the accuracy of phylogenetic analyses based on these traits.

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History of modern human population structure inferred from the world-wide survey on Xp11.22 sequences.

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For study of human evolution, using DNA sequence data, long lengths are required because of low mutation rates. However long sequences have a higher probability that recombination has occurred in the region in the evolutionary history. On the other hand, microsatellite data have a high mutation rate but tend to have too much homoplasy. The limitations of different types of data are one reason why different studies have different conclusions regarding human evolutionary history.

We sequenced a 10.1-kilobase pair region of the X chromosome, from 650 individuals from 50 populations. The sequenced region includes two microsatellites. The conjunction of sequence variation with tightly linked microsatellite variation allows each type of data to overcome the limitations of the other.

We found very little evidence of recombination within the region. Most sequences are quite similar to one another, however three sequences differed from the others at an average of 28.6 substitutions. Assuming a molecular clock, and a human/chimpanzee divergence time of 6 million years, the estimated age of the base of the human sequences is 1.1 million years ago, whereas the estimated base of the tree excluding these divergent human sequences is 290,000 years ago. These divergent sequences were found in samples from the Middle East (Druze and Bedouin populations) and North Africa (Mozabite population). The pattern is suggestive of admixture between non-African Archaic humans and Modern Humans.

Microevolutionary trends in the temporal muscle structure in Japanese populations.

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This study examined secular changes in the development of the temporal muscle in Japanese populations. We measured insertion area and cross-sectional area of male skulls from Neolithic Jomon, Bronze Age Yayoi, Medieval Kamakura, early modern Edo and modern periods and estimated the development of the temporal muscle. By and large, results suggest the development of the temporal muscle has been decreasing through time. Specifically, the Jomon sample showed a trend toward large cross-sectional areas relative to insertion areas. On the contrary, samples dating from the Yayoi period and after had a large insertion area relative to the cross-sectional area. It is generally accepted that modern Japanese populations derive from prehistoric admixture between Japanese native Jomon populations and immigrants from the Asian continent during the Yayoi period, with the Yayoi immigrants being dominant to Jomon natives. Therefore, we suggested the possibility that the phyletic difference in Japanese populations might have a differential affect on the morphology of the temporal muscle in Jomon samples and samples after the Yayoi period. Further research on the morphology of the temporal area might contribute to the understanding of modern Japanese origins.

Prehistoric change and continuity in the Illinois and Ohio Valleys.

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In both the Illinois and Ohio Valleys, the archaeological record documents a series of sociocultural changes over the past 3000 years. During this time, elaborate mortuary rituals and long-distance trade networks developed and then declined. Additionally, populations became increasingly sedentary as they shifted from hunter-gatherer subsistence economies to ones supplemented by garden horticulture and then large-scale maize agriculture. Population growth is thought to have accompanied these changes, but it is still debated whether biological changes like migration, population replacement, and/or increased gene flow are associated with the sociocultural developments.

To help reconstruct the biological prehistory of these regions, we examined mitochondrial DNA variation in seven prehistoric cemetery populations. Illinois Valley populations come from the Morse (3000bp, n=9), Klunk (1800bp, n=39), Orendorf (800bp, n=13), and Norris Farms (700bp, n=108; Stone and Stoneking 1998) sites, and Ohio Valley populations come from the Wright (1900bp, n=18), Hopewell (1700bp, n=34; Mills 2003), and Hardin Village (450bp, n=12) sites. Haplogroups based on restriction fragment length polymorphisms and haplotypes based on HVS I sequences were analyzed. Our results suggest that haplogroup frequencies do not change significantly over time in either area despite major modifications to cultural practices. Haplotype networks further indicate minimal genetic change over time. Thus, the prehistory of both regions appears to be characterized by sociocultural change but biological continuity, with populations affected only by genetic drift and regional patterns of gene flow. Significant amounts of gene flow seem to have occurred throughout the last 3000 years, perhaps in association with early trade networks.

The experience of menopause in Paraguay.

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This study examines the experience of menopause in Paraguay and factors associated with variation in age at menopause and symptom frequencies. Between July 2003 and February 2004, 505 participants were recruited from city streets and parks in the city of Asunción. A small number were also drawn from the waiting room of a city hospital and from among female staff at a number of schools. In addition, participants were recruited from two indigenous communities. Almost universal samples were recruited from women aged 35 and older in one Maká settlement on the outskirts of Asunción (n=138) and in two Aché settlements in the Mbaracayu Reserve (n=38). Median age at menopause, by probit analysis, was latest in Asunción at 51.0 years, compared to 48.3 years among the Maká, and 47.7 years among the Aché. Similar symptom frequencies were reported during the two weeks prior to interview among women of Asunción and the Maká. In Asunción, the most frequent symptoms were headaches (79%), nervous tension (76%), lack of energy (73%), and muscle or joint pain (71%). Among the Maká, the most frequent symptoms were lack of energy (88%), headaches (79%), dizziness (72%), and feelings of sadness (73%). Women in Asunción were much more likely to report having experienced hot flashes (43%) compared to the Maká participants (7%). The Aché were asked what symptoms they had ever experienced and these included nervous tension (85%), muscle and joint

pain (85%), headaches (85%), hot flashes (85%), and lack of energy (77%).

The effect of migration on the dental and skeletal health of protohistoric and early historic Susquehannock Indians (AD 1575-1675).

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Historic records indicate that in AD 1674 a group of Susquehannocks from the Susquehanna Valley of Pennsylvania, fleeing conflicts with other Iroquoian tribes, were invited by the Maryland government to settle along the Potomac River (Jennings 1968; Stephenson 1959). The Susquehannocks migrated to the Piscataway Indian reservation in that same year and established a stockaded European-style fort on the south bank of the Piscataway Creek in Maryland. The Susquehannocks resided there until AD 1675 when escalating conflicts with Virginia settlers and Piscataways resulted in their abandonment of the fort and return to Pennsylvania.

This study examines the health status of two skeletal samples of Susquehannock Indians, one that predates migration from the Susquehanna Valley (n = 45), and the other excavated from the fort on Piscataway Creek (n = 57). Rates of porotic hyperostosis were 9% higher and cribra orbitalia 25% higher among the Susquehannocks prior to migration. The prevalence of carious lesions decreased by 3% and that of linear enamel hypoplasia by 30% among the post-migration fort group. While antemortem tooth loss remained constant for both groups, the rates for abscesses increased post-migration at the Susquehannock fort from 1.1% to 4.8%. With the exception of dental abscessing, these data indicate that the migration of the Susquehannocks from Pennsylvania to Maryland was advantageous for the health of the group.

A comparative geometric analysis of cranial ontogeny in genus *Macaca*.

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Many non-homologous similarities between members of the Old World monkey tribe Papionini result from dissociations of regional ontogenetic allometries, but the evolutionary significance of these differences is unclear. Heterogeneity of ontogenetic scaling within *Macaca* is thought to hinder characterization of ontogenetic shifts within the papionin clade; however, results of comparative ontogenetic studies including multiple *Macaca* species are contradictory. Most recently, the geometric analysis of Collard and O'Higgins (2002) found no significant differences between ontogenetic vectors for *M. mulatta* and either *M. sylvanus* or *M. fascicularis*. Their conclusion that species sampling may not influence intergeneric comparisons among papionins is contradicted by most prior studies, but differences in sample composition and methodology preclude firm conclusions concerning macaque ontogenetic variation.

To explore cranial ontogenetic diversity within *Macaca* and establish a comparative basis for geometric analyses of papionin facial scaling, a comparative study of macaque craniofacial ontogeny was undertaken. Procrustes-based geometric analysis of 3D landmark data was used to characterize patterns of growth-associated shape change in cross-sectional ontogenetic samples of macaque species including *M. fascicularis*, *M. mulatta*, and *M. nemestrina* (total n = 152). Differences in ontogenetic scaling were tested by analysis of covariance. As expected, PSC1 summarizes ontogenetic shape change ($r = 0.93$, $p < 0.001$), while PSC2 summarizes inter-taxic shape differences, separating *M. assamensis* and members of the *fascicularis* group from *M. nemestrina* subspecies. Results concur with distance-based studies in finding significant ($p < 0.001$) displacement of the *M. fascicularis* ontogenetic trajectory relative to other species, including *M. mulatta*. Implications for the evolution of papionin facial form are discussed.

Assessing gene flow and population subdivision in chacma baboons (*Papio hamadryas ursinus*) using mitochondrial and nuclear DNA markers.

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Osmand Hill, one of the great taxonomic splitters of our time, recognized 11 forms (subspecies) of chacma baboons, distinguished mainly by differences in pelage, habitat and range. Recent molecular and morphometric data suggest that chacma baboons represent the oldest, most divergent lineage within *Papio*. New data, presented separately at this meeting, indicate two major mitochondrial lineages within chacma, divided geographically along a southwest to northeast transect through South Africa. Using the same dataset (representing seven geographic locations), we assess population subdivision and gene flow within and between the Northern and Southern clades using mitochondrial D-loop sequence, a panel of six microsatellite loci and two functional nuclear loci (MAOA, 5-HTTLPR). D-loop sequences confirm the major North/South lineage split, but further subdivide the southern clade, delineating Western and Eastern Cape populations. Northern clade samples from central and northwest South Africa reveal substantial sequence variation but ambiguous phylogenetic resolution, perhaps due to sample size or mutation saturation. Microsatellite variation exhibits extensive, significant allele frequency differences between most, but not all, pairwise population comparisons. MAOA allele frequency variation between the Northern clade and the Western and Eastern Cape subclades is significant, with three unique alleles present in the samples collected south of the Limpopo near Zimbabwe. 5-HTTLPR genotypes were invariant. Conclusions: 1) We found extensive mtDNA subdivision among, but limited evidence for nuclear gene flow between, chacma populations; 2) Unique MAOA alleles in the northern samples may represent local selection, or gene flow from non-chacma populations; and 3) Hill may have been right.

An evaluation of microCT for assessing in 3D the concordance of dental trait expression between the dentin-enamel junction and the outer enamel surface of modern human molars.

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The capability to image the dentin-enamel junction (DEJ) in 3D would facilitate the assessment of the taxonomic, phylogenetic and functional signal present in DEJ morphology, the characterization of the growth of the inner enamel epithelium (which dictates the shape of the DEJ) in fully formed teeth, and improve our understanding of the contribution of the inner enamel epithelium to occlusal crown morphology.

This paper presents the results of a preliminary research project assessing the

precision and accuracy of micro tomography to image and digitally separate the enamel cap from the underlying dentin surface. Ten human upper molars and ten lower molars were selected based on their collective variation in occlusal morphology, particularly in regard to relative cusp size and the presence and size of accessory cusps (e.g. Carabelli's trait and tuberculum sextum). Each tooth was microCT scanned using a SCANCO CT40 scanner. 2D slice images were stacked into a 3D reconstruction using VG Studio Max. Wireframe models of both the outer enamel surface (OES) and the DEJ were constructed for comparative analysis. Variability in dental traits (e.g. crown size, relative cusp size and presence of accessory cusps and crests) was assessed for each surface using both geometric morphometrics and topographic reconstructions (ArcView 3.2).

Results confirm that microCT is capable of providing non-destructive 3D images of both the OES and DEJ with sufficient resolution to assess morphological concordance between these two tissues. The manifestation of dental trait expression on the inner enamel epithelium and the influence of relative enamel thickness on the expression of these traits at the OES are discussed.

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Changes in mobility patterns from the European Upper Paleolithic through Bronze Age as reflected in femoral and tibial cross-sectional geometry.

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European populations went through a series of subsistence strategy transitions from the Early and Late Upper Paleolithic through the Mesolithic, Neolithic and Bronze Age. The consequences of these transitions on behavior, in particular population mobility, have been traditionally investigated through the analysis of material cultural remains. Here we explore these issues directly from the skeletal remains of these populations, using biomechanical analysis of lower limb bone cross sections.

A total of 225 femora and 197 tibiae were included in the study. Biomechanical cross-sectional properties of femoral and tibial midshafts were determined through external molding and radiography or computed tomography. Body size was calculated as the product of body mass and bone length, with body mass determined from femoral head breadth and/or stature and bi-iliac (maximum pelvic) breadth.

Overall bending/torsional rigidity relative to body size declines across all five temporal periods in a fairly linear manner in the femur, but declines more rapidly in the tibia following the Mesolithic. A-P/M-L bending rigidity declines more rapidly in the femur between the EUP and Mesolithic, but between the Mesolithic and Neolithic in the tibia (especially in males). Other comparisons within this sample indicate that femoral cross-sectional shape is more heavily influenced by body shape than tibial cross-sectional shape. Since body shape was changing systematically in these populations, this may account for the somewhat divergent trends in the femur and tibia. Our results are consistent with continuing reductions in mobility throughout this entire time range in Europe, but especially between the Mesolithic and Neolithic.

Modeling age-related changes in human rib cage geometry

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Local mechanical characteristics of bone, such as density and elasticity, all decline with age. In addition, size and shape play a role in determining the strength and resilience of whole bones and complex skeletal elements such as the rib cage. Changes in size and shape of the rib cage with age have been documented using only simple distance and angular measurements, and how mechanical versus architectural properties of the rib cage contribute to its overall strength is still an unanswered question.

To address these issues, we used geometric morphometrics to model age-related changes in rib cage geometry. Three-dimensional coordinates of five landmarks on each of the first seven right ribs were recorded from clinical CT scans. Subjects were males ranging from twenty to eighty years of age. Preliminary examination of the data suggested two patterns of age-related effects, with one occurring prior to and the other occurring after age fifty. Modeling these separately, we were able to explain a significant amount of shape variation and generate models of rib cage geometry at different ages. Of special interest is the predicted geometry of older males that suggests the characteristic barrel chest well known to clinicians.

These results illustrate the potential for geometric morphometrics to provide age-related models of rib cage geometry that exceed the detail of previous analyses. When combined with models of individual bones and their mechanical properties, these methods can provide biofidelic models of the human rib cage that will contribute to clinical, safety, functional, ecological, and evolutionary research.

Cladistic analysis of early *Homo* crania from Sterkfontein and Swartkrans, South Africa.

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The systematic affinities of Early Pleistocene *Homo* crania from the South African sites of Swartkrans and Sterkfontein were investigated through cladistic analyses of 38 morphological characters. The Swartkrans Member 1 specimens (SK 847 and SK 27), and the Stw 53 cranium from Sterkfontein Member 5A were treated as separate operational taxonomic units (OTUs), distinct from the three species of early *Homo* - *H. erectus*, *H. habilis*, and *H. rudolfensis* -that are recognized from the Plio-Pleistocene deposits of East Africa. The cladistic analyses differed in the treatment of characters (ordered *vs.* unordered), and the differential treatment of the South African OTUs (separate Swartkrans [SK] and Sterkfontein [Stw] OTUs *vs.* a single SK + Stw OTU). PAUP 3.0s and MacClade 3.0 were used to construct cladograms and address hypotheses about relationships. In the majority of most parsimonious trees, the SK and Stw OTUs were positioned between *H. rudolfensis* and *H. habilis*, with the SK OTU occupying a more derived position. In no case was an exclusive sister relationship between either South African OTU and a particular species of *Homo* indicated, although they differ from *H. habilis* in the fewest number of characters. Moreover, in no case was an exclusive sister relationship between the SK and Stw OTUs indicated; they differ from one another in the states for 10 characters. These results appear to support suggestions that the South African fossils may be taxonomically distinct from the species represented in East Africa.

Facial development in marsupials: functional requirements and developmental constraints.

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Marsupial mammals are born at a highly altricial state; most systems are at a level of development seen in a 12 day mouse embryo or 10 week human embryo. Yet the neonate must independently reach the teat and must have a sufficiently mature feeding apparatus to attach and suckle. The functional requirements associated with these adaptations are met by many changes in the developmental trajectory. Certain systems, such as the forelimbs, cervical region, and facial region are accelerated in development and others, including the posterior part of the body axis, and the forebrain are delayed. In this talk I discuss patterns of acceleration and deceleration (heterochrony) at the organ, tissue, cell and molecular level in the development grey tailed opossum, *Monodelphis domestica*. I show that the acceleration of structures that will contribute to the feeding apparatus may be traced back to some of the earliest events in cranial differentiation, namely the differentiation of the neural tube and neural crest. I discuss these results in the context of allocation of cellular and energetic resources. These concepts of allocation of resources to functional demands during embryonic development are related to the concepts of allocation of resources to the skeleton, so eloquently discussed by Hylander over many years of research.

A longitudinal analysis of adolescent long bone growth.

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Despite the abundance of adolescent growth studies, comparatively little is known about sequential development of limb components and variation in this process. Radiographic measurements of long bones (humerus, radius, femur, and tibia) are available from the Child Research Council (Denver, Colorado) to address this issue. Multilevel modeling (MLwiN statistical program) of longitudinal data from 36 girls (10-16 years) and 33 boys (10-17 years) is conducted to produce estimates of variation, covariation, and polynomial parameters for growth curves. Due to earlier maturation of girls, the length of each of their long bones exceeds that of boys to some degree during some period of adolescence; the difference is least for the radius (maximum of 2.6 mm, 12.1 years) and most for the tibia (7.8 mm, 11.1 years). Peak velocities for leg bones occur earlier than those for arm bones, with the latter more closely coinciding with peak height velocity (peak velocities (years) females, males: humerus, 11.2, 13.8; radius, 10.7, 13.9; femur, 10.3, 12.7; tibia, indeterminate (linear), 12.4; height, 11.2, 14.0). Correlations (estimated at age 13) among lengths and among velocities are strong to moderate, ranging from 0.67 (humerus-tibia growth velocity, boys) to 0.98 (humerus-radius, growth velocity, girls). Girls consistently display higher variation than boys, and tibial growth variation exceeds that of other long bones. Early peak velocities for leg bones may be related to selection for bipedalism, and the high degree of tibial growth variation is consistent with hypothesized environmental plasticity of this bone.

Molar cusp formation in common chimpanzees (*Pan troglodytes*).

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Recent studies of chimpanzee molar development have suggested that there is little or no time between age at crown completion and age at molar eruption, which is unlikely given the amount of root present at eruption. Here we address this discrepancy, including a re-evaluation of previously examined histological sections. We also examine the variation of incremental features, including Retzius line periodicity and number, and daily secretion rate in the largest known sample of sectioned captive and wild-shot nonhuman hominoid molars. Retzius line periodicity generally ranges from six to seven days within individuals. Retzius line number and cuspal enamel thickness both vary within a cusp type, among cusps, and among molars, resulting in formation time variation. Daily secretion rate appears to be consistent within analogous zones (inner, middle, and outer enamel) within cusp types, among cusp types, and among molar types. Significant increasing trends are found from inner to outer cuspal enamel, ranging from approximately 3-5 microns/day. These rates are similar to published data on anterior tooth formation, and suggest that average cuspal secretion rate may be a fixed developmental variable within a primate species.

Cusp formation time ranges from approximately two to three years, increasing from first to second molars, and often decreasing from second to third molars. These times are congruent with previously reported data on molar eruption ages, suggesting a delay between crown completion and molar eruption. However, formation time within cusps varies considerably, which has implications for the taxonomic interpretation of small samples of fossil hominoids.

Infant dependency and perinatal morphology of olfactory and accessory olfactory organs in lorisoids and lemuroids.

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For chemosensory functions at birth (e.g. food localization and familial bonding), the relative importance of the main and accessory (vomeronasal) olfactory systems has been hypothesized to differ between altricial and precocial mammals. This study examines morphological and maturational characteristics of vomeronasal (VNNE) and olfactory (OE) neuroepithelia using primates that differ in relative body size at birth. Serially sectioned heads from infant cadavers of 4 galagonids, 3 cheirogaleids, 4 lemurids, and 1 indriid were examined microscopically for neuroepithelial distribution. OE surface area was measured using Scion Image and immunohistochemistry (IHC) was used to identify cells in the VNNE and OE that express neuron-specific beta tubulin (BT) and olfactory marker protein (OMP). The VNNE was relatively thick in all species but *Lemur catta*. OE had a relatively more extensive distribution in galagonids/cheirogaleids compared to lemurids/indriids. The VNNE and OE of all species showed reactivity to OMP, a

marker of mature olfactory neurons. The highest reactive-cell density was observed in the VNNE and OE of *Microcebus murinus* and *Galagoides demidovii*. Few such cells occurred in either neuroepithelium of *L. catta*. Overall, IHC findings indicated a large proportion of VNNE/OE neurons were mature in the smallest strepsirrhines, which also have the highest relative neonatal mass. Further study is required to relate the extensive distribution of OE in galagonids and cheirogaleids to neonatal behavior, species ecology (e.g. activity patterns), or simply characteristics of facial architecture.

Total energy expenditure in the Yakut (Sakha) of Siberia as determined by the doubly labeled water technique.

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Economic modernization is typically associated with an increased prevalence of obesity and hypertension, and an elevated risk for various chronic diseases. Reduced physical activity and a dietary shift to market foods have been implicated in this health decline but the mechanisms responsible remain incompletely understood. An energetics approach provides insights into health changes associated with economic modernization because lifestyle transitions often involve shifts in energy intake and expenditure; however, few studies have accurately quantified energy expenditure in subsistence-level populations. This study used doubly labeled water, which is generally accepted as the most accurate method for measuring free-living energy costs, to assess energy expenditure in the Yakut (Sakha), an indigenous high-latitude pastoral population from the Sakha Republic of Russia.

Total energy expenditure (TEE) was measured over a 10-day period in 28 Yakut adults (14 women, 14 men) from the rural Siberian village of Berdygestiakh. Physical activity levels (PALs) in the Yakut were lower than most other subsistence populations and more similar to individuals in industrialized nations with sedentary occupations. PALs were substantially higher in men (1.7 x BMR) than women (1.5 x BMR); low energy expenditure likely plays a prime role in the development of obesity in women. Those individuals who participated in more subsistence activities and ate less market food had significantly higher PALs. However, activity levels for both men and women are generally permissive of excess weight gain in the presence of other factors (e.g. dietary, genetic, and developmental).

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Child anthropometry and cultural variation in four Mayan refugee communities.

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This poster addresses the question of comparability between four Mayan cultural groups through an anthropometric assessment of Mayan refugee children in Mexico. A total of seven measures were collected on approximately 200 children, including height, weight, head circumference, chest circumference, triceps and biceps skinfolds, and mid-arm circumference. Mam, Q'eqchi', K'iche', and K'anjobal children assessed in the study ranged in age from one month to five years of age. A central goal of the research involved a comparison of the anthropometric measures by age, culture, and sex. The comparison was aimed at determining if the four groups constituted one population or if the four cultural groups in fact represented discreet populations. When significant anthropometric differences were found between the cultural groups, we then determined if differential rates of malnutrition was a possible causative factor in the discrepancy. We hypothesized that if rates of malnutrition were comparable by cultural group and anthropometric measures differed significantly, that the four cultural groups also represent four distinct populations and therefore cannot be collapsed into one "Mayan" population.

Dietary reconstruction of the Albany County Almshouse skeletal sample through the analysis of dental calculus.

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Dental calculus has become a useful resource for the reconstruction of paleodiet in bioarchaeological samples. Plant microfossils that can be recovered from dental calculus include phytoliths, pollen, vascular bundles, starch granules, and other botanical structures. In the Albany County Almshouse skeletal collection (N=1205), sixty-seven individuals possessed dental calculus sufficient for microscopic analysis.

A preliminary analysis of nine samples was examined for plant residues. Most of samples exhibited an abundance of plant vascular tissue, two samples had charcoal, and a single individual had the remains of saprophytic mites. However, contrary to many other archaeological samples, the Almshouse remains exhibit a paucity of starch granules; four individuals had a low number of starch granules, three of which are identified as maize.

The Albany County Almshouse cemetery served as a burial ground for the poor, unidentified, and homeless of Albany. A third of the deceased were residents of the Almshouse at the time of death. The determination of poor diet in this sample is supported by historic documents indicating chronic illness and poverty among those buried at the cemetery. The Almshouse was intended to be a self-sufficient farm that grew crops and livestock for consumption by the Almshouse residents, although food production at the Almshouse was probably an inadequate source of nutrition for the inmates residing there. On a larger scale, economic depressions and crop failures in the region during the late nineteenth century may have contributed to the poor quality of nutrition, particularly among the lowest socioeconomic strata of this early urban industrial population.

Primate ancestral body mass revisited.

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A general consensus sees grasping hands and feet with nails rather than claws and enhanced stereoscopic vision as key characteristics of the last common ancestors of living primates. In contrast, the adaptive significance of these features remains controversial. In the main hypotheses, they have been interpreted as evidence that ancestral primates were visual predators, adapted for stalking and grasping insects and other prey, or as indicating that the first primates evolved in parallel with the angiosperms, exploiting their fruits, flowers, and nectar. Sig-

nificantly, these and other interpretations of the adaptive origin of primates all share an uncritical acceptance of the premise that the first primates were very small.

Here we suggest that the paradigm of small ancestral size has unduly constrained past interpretations of primate origins. We show that neither the fossil record nor modern species provide evidence that ancestral primates were small. Instead, analyses of the weight distribution of arboreal mammals and phylogenetic reconstruction of ancestral primate body mass point to the last common ancestor of living primates having weighed in excess of 1kg, more than twice any previous estimate. We re-interpret primate adaptive origins in this light and conclude that the defining step towards evolution of the characteristic set of primate adaptations was marked by a significant increase in body mass in the primate stem lineage. The associated shift towards a largely vegetarian diet and a strong dependency on fleshy fruit coincided with increased angiosperm diversity and the evolution of larger fruit size during the Late Cretaceous.

Siamang and orangutan limb anatomy: possible functional convergence?

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Siamangs and orangutans are Asian apes that belong to different families within the Hominoidea, the hylobatidae and pongidae, respectively. Compared to other apes, AH Schultz recognized interesting similarities between these species; for instance, they have exceptionally long forelimbs and therefore the highest intermembral indices (148 and 144 respectively). Drawing on laboratory research from siamangs (n=4) and orangutans (n=5), we report quantitative data on soft and hard tissue from whole body dissections to explore these questions: To what extent is the siamang-orangutan correspondence in intermembral indices mirrored in the distribution of mass to limb segments? What is the relationship to posture and motor behavior?

Our results show that siamang and orangutan forelimbs are *heavier* than hindlimbs (117.3% and 111.4%, respectively), in contrast to the typical ape pattern of *lighter* forelimbs than hindlimbs. Siamangs and orangutans also have more massive distal limb segments (e.g. forearms, hands and feet). Despite their distinct phylogenetic histories, these apes have converged in pattern of linear proportions and mass distribution. Field observations reveal parallels in the use of limbs in posture, feeding, and locomotion, leading us to consider that functional convergence may partially explain siamang and orangutan similarities. The evolution of the Asian apes will be discussed in light of their relationships and divergence times derived from molecular data.

Spatial and temporal dynamics of respiratory disease in Orkney, Scotland 1855-1940.

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The integration of spatial information with biological and social phenomena has come to the forefront in much of biodemographic and epidemiological research. In the current analysis, we examine the spatial and temporal patterns of deaths caused by respiratory illnesses in Westray and Sanday, two islands in Orkney, Scotland. The geographic and ecological setting of Orkney, off the Northeast coast of Scotland at nearly 60□ North latitude, is such that the archipelago experiences year-round wet and windy conditions. These conditions also vary within the islands with respect to elevation, aspect, and slope of the surrounding terrain. In addition to the climatic situation, the traditional housing circumstances, dominated by densely occupied stone crofts simultaneously occupied by humans and livestock, provide unsanitary living conditions that place the population at increased risk of developing chronic respiratory illnesses, including bronchitis and tuberculosis. Preliminary analyses from Westray indicate there exists considerable spatial heterogeneity in cause specific mortality, specifically from respiratory illness. We use newly developed spatial analyses for detecting spatial clusters of disease deaths and spatial kriging methods to test whether nonrandom patterns of respiratory deaths reflect the known environmental heterogeneity within and between islands. Additionally, we examine whether the spatial patterns of respiratory illnesses shift in response to the declining importance of infectious diseases during the early to mid 20th century.

Comparative muscle activity and temporomandibular joint loading in strepsirrhine and haplorhine primates.

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An understanding of masticatory force production is central to attempts to link dietary and morphological evolution. Efforts to build this understanding benefit from the contrast in skull form and function found between strepsirrhine and haplorhine primates. One key observation is that, compared to haplorhines, strepsirrhines recruit higher peak working side muscle forces relative to balancing side forces during mastication. Commonly linked to the lack of symphyseal fusion, this difference must also influence bite forces, temporomandibular joint (TMJ) loads, and global stresses in the skull. To examine this influence, this study compares muscle activity and inferred TMJ loading in baboons, humans, and brown lemurs.

Electromyographic data were recorded bilaterally from the anterior temporalis and superficial masseter muscles in *Eulemur* and analyzed using custom software. This software estimates muscle resultant force position and TMJ loads at 1ms intervals throughout chewing sequences. Observed patterns were compared to those reported previously for humans and baboons. All species exhibit patterned change in working/balancing muscle force ratios throughout a chewing cycle that leads to fluctuating TMJ loads. The high peak working/balancing ratios reported for strepsirrhines are supported, but do not characterize the entire chewing cycle. The highest magnitude estimated TMJ loads occur in the balancing side TMJ in haplorhines, but in the working side TMJ in strepsirrhines. This difference in joint loading may have an important influence on patterns of global stress distribution and may underlie morphological differences between these groups.

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A comparative analysis of the KNM-ER 42700 hominin calvaria from Ileret (Kenya).

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Renewed fieldwork at Ileret, east of Lake Turkana, resulted in the discovery of a well-preserved calvaria KNM-ER 42700 (Leakey et al, *Am. J. Phys. Anthrop*. Suppl 36: 136, 2003). The specimen derives from strata dated to an age between 1.5 and 1.6 Ma. The state of closure of the sutures, and of the spheno-occipital synchondrosis in particular, suggests that the individual was a subadult or young adult at death. Initial assessment of KNM-ER 42700 indicates affinities with *Homo erectus* (including *H. ergaster*). However, in its absolute vault dimensions it is closer to specimens assigned to *H. habilis* than to the traditional hypodigm of *H. erectus*. It also lacks some characteristic *H. erectus* features, including well-developed supraorbital tori and supratoral hollowing. To examine the affinities of KNM-ER 42700 in more detail we initiated a comprehensive comparative study. Given the small size and potentially immature age of the specimen there is a focus on both ontogenetic and adult intraspecific scaling relationships.

Metric data were collected for all currently known, and sufficiently preserved cranial specimens assigned to *H. erectus*, *H. habilis* and *H. rudolfensis*. Regression analyses demonstrate that aspects of vault morphology scale allometrically among adult *H. erectus*, including midline occipital curvature, vault thickness and postorbital constriction. It therefore proves difficult to distinguish the overall vault shape of this species from that of the other two hominin taxa, when size is taken into account. It is largely its temporal bone morphology, midline keeling and supralambdoid flattening that affiliates KNM-ER 42700 with *H. erectus*.

Craniometric variation in the Providence Baptist Church, Shelby County, Tennessee.

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Craniometric data in conjunction with DNA analysis has been used to trace the geographic origin of individuals from the New York African Burial Ground (Blakey 1998, 2001). Analysis of craniometric data has also helped identify the oldest known Africans (initially considered Native American) living in colonial Jamestown (Rensberger 1997). This paper attempts to further support the use of craniometric data in providing information regarding geographic origin in more recent, historic burial grounds. Craniometric data from the Providence Baptist Church is used to explore variation within the sample and the geographic origins of this historic Black community.

The Providence Baptist Church is located in Shelby County, Tennessee. Artifact analysis suggests that the area excavated is from the middle to latter part of the cemetery's use with the last identified interment occurring in 1932. The context of these burials and the morphological non-metric features are suggestive of African ancestry. However, due to the time period of these burials, European and Native American admixture is possible. Therefore African, European, Native American, American Black and White samples were used as reference groups in *DISPOP*, a multivariate statistics program written by Richard L. Jantz. Out of a total of 16 complete crania, 8 individuals classify as African, 5 as 20th century American Black, and 3 as 19th century American Black. These results suggest that the use of craniometric data with appropriate samples can help trace geographic origins of individuals from historic cemeteries and add to the larger scope of bioarchaeological analyses.

Coexistence and exclusion between humans and monkeys in Japan: Is either really possible?

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The Japanese people are under the strong impression that the Japanese macaque (*Macaca fuscata*) is increasingly harmful to humans. Farmers demand restitution for damaged crops. Tourists complain of monkeys stealing snacks out of open cars. Geographic analysis shows that, on the ground, humans and monkeys interact along a long, complex, dynamic interface weaving through the landscape, rising or falling with changes in land use or rural practice. Even in mountainous areas, a large proportion of monkey habitat lies within a short distance from fields and villages, and vice versa. Historically, rural grasslands and pine woodlands restricted monkey distribution. Today, the once rural landscape is semi-suburban or tourist attraction. The Japanese people face a cultural and ecological challenge in seeking a new relationship between themselves and monkeys.

The two idealized solutions are coexistence and exclusion. Coexistence implies that humans and monkeys can somehow negotiate a harmonious compromise. Exclusion implies that humans can dominate the land with the force of technology or powerful wildlife management policies. In practice, both are difficult, as envisioned by its advocates. Humans disagree on what they want from the interaction, if any, with monkeys. Monkeys refuse to negotiate. Applying technology effectively needs large organizations and funding, and a clean split between the two species is precluded by the inter-mingled geographies of human and monkey habitats. Humans will need to closely examine their own behavior in detail to weed out activities that attract monkeys (don't feed the monkeys), and maintain a tense, largely non-harmonious coexistence.

Sexual dimorphism in the anthropoid os coxae.

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Sexual dimorphism in the pelvis has been documented in a range of primate and other mammalian taxa. However, there is disagreement over whether the human pattern of sexual dimorphism is more similar to that of hominoids, or to other anthropoids with similar pelvic inlet to neonatal head size ratios. This study uses twelve measurements intrinsic to a single os coxae to investigate patterns of sexual dimorphism in the pelves of ten genera of anthropoids (*Homo,* n=25; *Gorilla,* n=20; *Pan,* n=23; *Colobus,* n=16; *Cercopithecus,* n=17; *Cercocebus* n=16; *Lophocebus* n=16; *Alouatta* n=17; *Cebus*, n=16; *Saimiri,* n=20). With the exception of *Cercopithecus,* all genera were represented by single species. Indices of dimorphism for each measurement were calculated (female mean/ male mean). Rank order correlation coefficients (Spearman's rho) were calculated between all possible pairs of taxa. The indices of dimorphism were found to be significantly correlated between all pairs of genera in this study with the exception of those including *Alouatta*. Spearman's rho values for significant correlations ranged from 0.650 ($p < 0.05$) for the pair *Cebus*/ *Homo*, to 0.965 ($p < 0.001$) for the pair *Lophocebus*/ *Cercocebus*. Indices of dimorphism in *Alouatta* were not significantly correlated with those of any other taxon (Spearman's rho values 0.147–0.538). In contrast to a previous study (Tague, 1991) which found a hominoid and a non-hominoid pattern using measurements of inlet space on articulated pelves, this study suggests a common anthropoid pattern of dimorphism in the os coxae. In this sample, only *Alouatta* appears to show a

divergent pattern of pelvic dimorphism.

GIS analysis of range use by sympatric mountain gorillas and chimpanzees.

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In this paper we demonstrate the ability of GIS analysis to elucidate aspects of behavioral ecology of sympatric primates in ways previously unavailable. In Bwindi Impenetrable National Park, Uganda, a semi-habituated community of 26 chimpanzees (*Pan troglodytes schweinfurthii*) and a group of 13 mountain gorillas (*Gorilla gorilla beringei*) occupying the same 20 km^2 tract of forest have been studied since 1997. Handheld GPS units were used to map the locations of all feeding and nesting sites for both species and were mapped onto a digitized landsat image of the study site,. These data show movements, nesting sites and feeding sites of the gorillas and chimpanzees in relation to one another.

Basabose and Yamagiwa (2002) suggested that chimpanzees gain feeding advantages over sympatric gorillas by forming larger parties that control fruiting trees. In our study group, gorilla movements are extensive during periods of low productivity but their fruit intake drops to almost zero. We investigated whether, during periods of reduced fruit abundance, gorillas actively move away from fruit-feeding opportunities in response to chimpanzee party movements.

We also examined the relationship between fruit availability and proximity of the two species. For example, during 2000, while chimpanzee fruit intake was reduced for periods of approximately two months (while they ate predominantly the fruits of *Ficus sp*.), the gorillas fed almost entirely on fibrous foods for a period of four months of the year. Chimpanzees fed on fruits throughout the year, travelling further to find fruit during fruit-poor periods.

The effect of tissue depth variation on craniofacial reconstructions.

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We examined the effect of tissue depth variation on the reconstruction of facial form through the application of the American method using published tissue depth measurements for emaciated, normal, and obese faces. Three reconstructions were created on reproductions of the same skull for each set of tissue depth measurements. The resulting morphological variation was measured using the anthropometric craniofacial variability index (CVI). This method utilizes sixteen standard craniofacial anthropometric measurements and the resultant index reflects "pattern variation" or facial harmony. We report appreciable variation in the CVI's obtained from the three different sets of tissue depths. These differences may affect recognition and identification negatively. This project is significant because it illustrates the likely confounding effect that normal human variation contributes in the creation of a representational 3-dimensional facial reconstruction. This research suggests that successful identification could be increased if multiple reconstructions were created which reflect a wide range of possible outcomes. In the future this will likely be done more often with computer assisted modeling as technological advances ensue.

Genomic data support the hominoid slowdown and an Early Oligocene estimate for the hominoid-cercopithecoid divergence.

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Several lines of indirect evidence suggest hominoids and cercopithecoids diverged around 23-25 Ma. Importantly, while this range of dates has been used as both an initial assumption and as a confirmation of results in many molecular-clock analyses, it has not been critically assessed on its own merits. Here we test the robusticity of the 23-25 Ma estimate with ~150,000 base pairs of orthologous DNA sequence data from two cercopithecoids and two hominoids using quartet analysis. This method is an improvement over other estimates of the hominoid-cercopithecoid divergence because it incorporates two calibration points, one each within cercopithecoids (*Papio-Macaca*: 5 or 7 Ma) and hominoids (*Pan-Homo*: 6 or 7 Ma), and tests for a statistically appropriate model of molecular evolution. Most comparisons reject rate constancy in favor of a model incorporating two rates of evolution, supporting the 'hominoid slowdown' hypothesis. Using this model of molecular evolution, the hominoid-cercopithecoid divergence is estimated to range from 29.2-34.5 Ma, significantly older than most previous analyses. Hominoid-cercopithecoid divergence dates of 23-25 Ma fall outside of the confidence intervals estimated, suggesting that as much as one third of ape evolution remains paleontologically unsampled. Identifying stem cercopithecoids or hominoids from this period will be difficult because derived features which define crown catarrhines need not be present in early members of these lineages. More sites that sample primate habitats from the Oligocene of Africa are needed in order to better understand early ape and Old World monkey evolution.

Did the short hindlimbs of many ancestral hominids result in lower energetic efficiency in running?

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Many ancestral hominids, particularly *Australopithecus* and Neanderthals, had much shorter hindlimbs than are characteristic of anatomically modern humans. It has recently been shown (Steudel-Numbers and Tilkens, 2004) that shorter hindlimbs have a substantial effect on the energetic cost of walking which, when combined with the effect of their larger size, results in an estimated 30% increased cost in Neanderthals as compared to anatomically modern humans. Here we report the results on a similar study for human running.

In the present study thirteen human subjects ran on a treadmill at 6.0 mph, while their expired gases were collected and analyzed. Subjects were chosen for particularly long or short legs based on the subjects in Steudel-Numbers and Tilkens (2004). The subjects ran for 12 minutes and their rates of oxygen consumption (VO2) over the last four minutes were averaged to estimate VO2. We also measured each subject's height, weight and hindlimb length. Lean body mass and %fat were determined using DEXA.

ANCOVA with total VO2 as the dependent variable, lean mass and percent fat as covariates, and long or short legs as a fixed factor resulted in both lean mass and leg length category having a significant effect on VO2 ($p = 0.006$ for lean

mass and p = 0.016 for leg length). Percent fat was not significant (p = 0.123). Subjects with relatively longer legs had lower locomotor costs in running. Thus the short hindlimbs of various fossil hominids would have resulted in an increased cost of both walking and running.

Sherwood Washburn and "The New Physical Anthropology".

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The history of science provides a number of examples of what Kuhn called "paradigm shifts". These are the fundamental changes in the conceptual framework of a science following theoretical or methodological breakthroughs. One such shift foreshadowed the ascendancy of molecular biology following confirmation that the DNA molecule was the archive of heredity. When such shifts occur, new academic disciplines arise and traditional ones must address new research questions or decline in importance.

Physical anthropology's 19th century origins were the outgrowth of interest in human variation. Research during the discipline's formative years reflected a desire to describe and measure racial and regional variation. These studies often formed the basis for typological classification schemes. When widespread acceptance of evolutionary theory reshaped the biological sciences, human paleontology emerged as area of interest within physical anthropology. Somewhat later, the anatomy, physiology, and behavior of living, non-human primates were also recognized as significant areas of. Research.

These areas of emphasis were already producing important insights into the origins and relationships of contemporary *Homo sapiens* when Sherwood Washburn began graduate study in Physical Anthropology. Although his first academic appointment was in the Medical School where he taught human anatomy, his association with geneticists and evolutionary biologists convinced him that physical anthropology participate in advances occurring throughout biology to create a more dynamic and productive synthesis that he called "The New Physical Anthropology".

Human variation in the *American Journal of Physical Anthropology*.

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The purpose of this study is to investigate physical anthropologists' treatment of human variation by examining articles published in the *American Journal of Physical Anthropology* between 1975 and 2003. For the purposes of this study, human variation articles were defined as articles that presented data collected on living humans, with the exception of articles whose main purpose was to compare the characteristics of living humans to those of living non-human primates or fossils. A total of 992 human variation articles was published in the journal during the time period; the number of articles published annually ranged from a high of 59 articles in 1983 to a low of 15 articles in 1994. The greatest number of articles dealt with either growth and development or genetics, each with about 25% of articles. Articles on dental variation and dermatoglyphics each comprised about 10% of the total. Climate, health, demography, behavior, and morphology each made up about 5% of total articles, and a smaller percentage of articles dealt with a combination of topics. Articles on genetics and behavior increased in frequency over time, while articles on dental variation and dermatoglyphics decreased in frequency over time. There has been both constancy and change in the topics in human biological variation that have been the subject of physical anthropology research.

Mechanical loading and functional adaptation in the masticatory apparatus.

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The evolutionary morphology of the masticatory apparatus requires a detailed knowledge of the in vivo function, adaptive plasticity and, ultimately, performance of individual musculo-skeletal elements and tissues. The goal of this project is to integrate morphological and biomechanical data on the mandibular symphysis and TMJ from a sample of growing rabbits raised on different foods of specific material properties: under-use diet of powdered rabbit pellets, normal diet of pellets, and over-use diet of pellets and hay blocks. Such items are known in rabbits to induce different jaw-muscle activity, jaw-loading and jaw-kinematic patterns during one-sided molar biting and chewing. Anatomical data are derived from morphometric, microCT, histological and immunohistochemical analyses. Mechanical evidence on symphyseal strength in simulated loading regimes (DV shear and 'wishboning') is from an Instron Universal Tester.

Results indicate that rabbits on an over-use diet exhibit significantly larger mandibular proportions, greater biomineralization and more robust jaw joints. Soft-tissue components of both the TMJ and symphysis also develop anatomical changes related to postweaning variation in masticatory loading patterns. Biomechanical tests indicate that the symphysis of normal-diet rabbits is equally strong at resisting DV shear as in countering wishboning, with over-use rabbits having the strongest joints and under-use rabbits the weakest. This latter set of findings supports the hypothesis that symphyseal fusion occurs to strengthen the symphysis during mastication. Our analyses underscore the importance of integrating myriad sources of data so as to provide a complete rendering of the cascade of developmental changes in response to mechanical loads.

Health in the prehistoric Southwest: looking for the big picture.

A.L.W. Stodder. The Field Museum.

This study presents a meta-analysis of osteological data including life expectancy at birth and at age 15, the frequency of cranial lesions attributed to anemia in children, frequency of skeletal infection, and adult stature. Approximately 4000 individuals from ca. 150 prehistoric sites, localities or projects are included. This is a compilation of small data sets: standard deviations are large; all the problems of bioarchaeological sampling are represented. But combined into culturally significant periods identified in regional syntheses, the biological trends fit the cultural trends remarkably well.

Health and demographic status improved with the adoption of horticulture, and throughout the period of geographic expansion and cultural differentiation of the Anasazi, Hohokam and Mogollon, until about AD 1150. Between 1150 and 1350 life expectancy was shorter, anemia and infection more common, female stature declined markedly. This was the era of the Great Drought and abandonment of the Colorado Plateau, of social upheaval, demographic reorganization, and population decline. Recovery is evident between 1350 and Spanish contact (1540). More people lived in large aggregated communities than ever before in the Southwest, but anemia and infection declined, life expectancy and stature increased. After contact,

anemia and infection - including tuberculosis and treponematosis - increased and again life expectancy and female stature declined.

These combined data show that we can effectively use small data sets instead of just complaining about them. And we can create a body of data that portrays large-scale biocultural trends as they are recorded in the remains of the small-scale societies.

Male-female relationships in multi-male groups of Mountain Gorillas.

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Male-female relationships in multi-male mountain gorilla groups have been observed to vary as a function of male age and rank, the number of females, and female residence histories. Given considerable demographic changes in the research population of mountain gorillas that have occurred since these earlier studies (a two-fold increase in average group size and a three-fold increase in the average number of adolescent/adult males), new descriptions of male-female social relationships are needed. This study describes intersexual interactions in three research groups of mountain gorillas living in the Volcanos National Park, Rwanda. Subjects included 27 adolescent and adult males; focal animal sampling was used to record proximity patterns and social interactions between these individuals and all adult females in the groups. We found considerable variation in male-female relationships, with male age and rank and levels of intragroup reproductive competition as primary influences. There was also substantial variation within particular age- and rank-classes. For example, some subordinate adult or adolescent males formed affiliative relationships with adult females, characterized by frequent proximity and grooming, whereas others rarely interacted with females. Despite such variation, all males were observed to copulate, and approximately 50% of copulations with cycling females involved subordinate males. Our results are consistent with earlier studies of mountain gorillas but also suggest greater behavioral flexibility in the subspecies than previously reported. The relevance of these behavior patterns to current socioecological theories on social organization and reproductive strategies will be discussed.

Analysis of the reputed remains of Fray Pedro de Corpa/Fray Francisco de Verascola: an anthropological contribution to the Cause of the Georgia Martyrs.

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This paper applies forensic anthropology to assess whether cranial remains excavated from a 16th century Guale trash pit are those of Fray Pedro de Corpa, or fellow Franciscans, who were martyred in 1597 in Georgia. This consultation was performed in light of current negotiations for the beatification of the five Franciscans martyred that year. Treatment and patrimony of the remains is dependent on their attribution as those of Corpa or colleagues based on their archaeological recovery context and ethnohistoric accounts of their death and burial.

Sex and age assessments are consistent with expectations, a middle-aged male. The specimen demonstrates fracturing similar to a LeFort 3 and longitudinal midline fracturing of the basicranium, not inconsistent with impalement. Differentiating the timing and mechanism of cranial fracturing is difficult. Mild unilateral coronal craniosynostosis and partial squamosal synostosis (an extremely rare condition) indicate cautious application of craniometry. Comparisons with FORDISC and the Howells dataset indicate a low probability the cranium is Native American. Direct comparison to Guale craniometric data are also definitive and mitigate concerns with typological assessments. There is almost 0 probability this skull is that of a Guale individual. Temporally later British soldiers are also distinct from the specimen. Although positive identification of the cranium is exceedingly difficult, there is little data to suggest this cranium is not one of the friars. How a well preserved, yet isolated, non-Gualean cranium was buried in a 16th century Guale trash pit is a mystery. As my goal was exclusionary, further research is suggested.

Population structure and history in Peru.

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This research characterizes genetic variation in native populations in Peru as a tool to test hypotheses about population relationships and patterns of diversity. Despite a long history of complex societies and extensive present-day linguistic and ethnic diversity, few populations in Peru have been sampled for population genetic investigations. For this study, the sampling strategy focused on Quechua and Aymara (or Aru) speakers which represent the two largest native linguistic groups in Peru. We collected DNA samples from six populations including two samples from Central Quechua speakers in the department of Ancash, two samples of Peripheral Quechua speakers from the departments of Cusco and Puno, Aymara speakers from the department of Puno, and Jacaru speakers from Tupe in the department of Lima. Mitochondrial DNA haplogroup markers and hypervariable region sequences as well as Y chromosome microsatellites and SNPs were examined. We use computer simulation modeling to infer population history within the specific demographic, historic, and geographic contexts of highland Peru paying particular attention to sex-specific differences in gene flow. We demonstrate three simulated scenarios: 1) geographic distance, taking into account local topography and pre-modern road systems, 2) short-range gene flow as mediated through local marriage customs, and 3) the role of shared ancestry. In all cases we vary population sizes and number of generations. Finally, we demonstrate the range of conditions under which the observed data fit the simulated conditions in the case of highland Peru.

A preliminary investigation of occupational stress, health and disease, grave goods, and burial context, as determinants of social status at Umm-el Jimal (c. 300 – 400 A.D.), Jordan.

P.K. Stone, M.A. Traina. Western Michigan University.

The determination of social status for individuals in a funerary context has traditionally relied upon funerary objects and body placement within the grave. Though position of the individual denotes certain cultural identities it is too often that the physical remains are divorced from the material culture and studied alone, out of their funerary context. However in the last couple decades, bioarchaeology has been working to connect the material culture with the remains creating a more holistic analysis of funerary context and life history, revealing much about the

intersection of social identity in life and in death. This preliminary study examines skeletal remains (MNI =150), funerary objects, and cemetery placement for individual excavated from Umm-el Jimal a late Roman, early Byzantine, (c. 300-400 A.D.) cemetery from Northern Jordan. The demographics suggest that this cemetery represents a cross section of the local population, including both sexes and all age categories. Focus here is on empirical data collected on sex, age at death, occupational stress, and health and disease, connected with grave goods, and burial context offering a unique opportunity to explore the social identity of the adults buried within this cemetery. In addition, initial comparisons with a temporally related Byzantine monastery suggest that these individuals most likely represent local inhabitants that led rigorous lives within an agriculturally based community.

Morphology and molecules: a study of diversity and dispersal in the island populations of South Asia.

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This study forms part of an extensive multidisciplinary project combining molecular, morphological and palaeoclimatic data to examine evolution and migration of *Homo sapiens* along the Indian Ocean Rim. Here we present work on population diversity and migration routes amongst the island populations of South Asia.

The coastal and island regions of South Asia are of great importance in the Southern Route Hypothesis of modern human evolution, which postulates that after evolving in Africa around 200,000 years ago, *Homo sapiens* migrated to the Old World via a coastal route, which presented less climatic disturbance and habitat disruption than an equivalent overland migration. The present study examines variation in craniofacial morphology and ancient DNA to establish how the island populations of South Asia fit into this hypothesis of human migration.

Three-dimensional craniofacial coordinates and ancient DNA were collected from museum specimens from South India, Sri Lanka (3 groups), the Andaman and Nicobar Islands, as well as comparative material from Indonesia and Malaysia. These were analysed in conjunction with modern DNA distribution. It was found that although genetic variation did not always show identical distribution to morphological variation, the evidence could be used in conjunction to build a picture of migration history and local evolution. It illustrates a local evolution of the Jarrawa group within the Andaman Islands from a South Asian founder population, and the disparity of craniofacial variation within the Andaman-Nicobar island group. Internal variation within Sri Lanka is analysed to reveal near identical morphology for relatively disparate cultural groups.

In Dogon families, who helps and who harms children's nutritional status?

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In a longitudinal study of human biology in Mali, West Africa, we followed 1700 Dogon children prospectively from 1998 through 2001. We tested two main hypotheses: 1) Polygyny adversely impacts the nutritional status of children, and 2) Grandmothers enhance the nutritional status of children. We also examined the effects of other aspects of kinship relations and family structure. Nutritional status was measured as height for age and weight for age Z scores (N = 881 children). We used a linear mixed model in SAS 9.1 with the mother of the child as a random effect, which allowed us to take into account the correlation among maternal siblings. Our statistical models also took into account the presence of repeated measures as children in our data set were measured multiple times. In contrast with previous results on a much smaller sample (N = 77) of Dogon children (Strassmann 1997), we found that children in polygynous families were less well nourished than children in monogamous families. This result held up regardless of whether polygyny was measured as mother's marital rank (sole wife, first wife, second wife) or as the ratio of married women to married men in the functional family unit. No category of grandparent was a significant predictor of nutritional status in this patrilineal society. Our models controlled for wealth, the survival (or residence status) of parents, whether the child was a twin, village, year of study, age, month of birth, sex, and breastfeeding status.

Human dimensions of muriqui conservation efforts.

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The northern muriqui (*Brachyteles hypoxanthus*) is one of the world's 25 most critically-endangered primates. Only about 500 individuals survive in a few dozen remants of the Atlantic forest in the Brazilian states of Minas Gerais (MG) and Espirito Santos (ES). Roughly 40% of northern muriquis inhabit the 900 hectare Estação Biológica de Caratinga (EBC/RPPN-FMA), MG, but even this expanding population is still well below a minimum viable size. Much smaller populations occur in smaller forest fragments, where their future depends on implementing management programs in time.

International conservation efforts over the last quarter century have been effective at raising public awareness about the northern muriqui's plight. Intensive research efforts, initiated at the EBC in 1982 and now also underway at other sites, are yielding necessary behavioral, ecological, and biological data and simultaneously providing essential training for future generations of Brazilian conservationists. The Brazilian government has also made significant commitments, most recently by establishing a national committee for muriqui conservation and funding three major projects that collectively will lead to an integrated conservation plan. In addition to strengthening the enforcement of existing laws protecting muriquis and their habitats, current efforts include establishing connectivity between forest patches to extend the available habitat for the EBC muriquis, and to facilitate dispersal by natal females for the maintenance of gene flow among fragmented populations in ES. The challenges of creating these forest corridors go beyond the boundaries of protected areas into the surrounding farming communities, where new human dimensions of conservation must be addressed.

The ancient human occupation of Britain.

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The Ancient Human Occupation of Britain project (AHOB) is a five-year programme investigating the timing and nature of human occupation of the British

Isles during the Quaternary. The project brings together a range of specialists such as archaeologists, palaeontologists, geologists, sedimentologists and isotope analysts from British universities and national museums.

AHOB arises from the unique palaeogeographic and palaeoclimatic situation of the British Isles. During interglacial periods, Britain potentially provided a highly desirable environment for Palaeolithic hunter-gatherers, but at such times sea level was high, and access from continental Europe may have been restricted, or perhaps impossible without sea-crossings. Conversely at times of low sea level, there was a wide land bridge from continental Europe, but much of Britain was probably uninhabitable because of glaciation. This interplay of changing climate and geography has provided the main control over early human settlement.

Ongoing research suggests that the human occupation recorded at Boxgrove (c. 500 ka) was not the earliest in Britain, that early Neanderthal populations suffered population decline during successive later Middle Pleistocene interglacials, and that this culminated in their complete absence during the last interglacial.

The pattern of early human settlement in Britain was one of repeated colonisations and local extinctions, and this will be discussed with reference to the fossil human and archaeological records.

Patterns of dimorphism of the hominoid forelimb and the relationship of phylogeny, allometry, and function with interspecific pattern similarity.

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Patterns of sexual dimorphism describe magnitudes of dimorphism of skeletal dimensions relative to one another. Postcranial patterns of dimorphism in hominoids have implications for the assessment of taxonomic heterogeneity and estimation of body mass in fossil hominin samples. However, pattern similarity (statistical correlation among patterns across taxa) has not been consistently reported within hominoids. Therefore, is the use of dimorphism patterns among extant hominoids to assess taxonomic heterogeneity and estimate body mass in hominins justified?

Without a unifying hominoid pattern, one must choose comparative taxa based on alternative criteria. An understanding of the mechanisms producing patterns of dimorphism can thus address this choice. This study asks: 1) Does pattern similarity in dimorphism of hominoid postcranial dimensions exist? 2) Is pattern similarity related to body size, body mass dimorphism (BMD), phylogeny, function, or some combination of these factors?

The ranked dimorphism patterns of 44 forelimb dimensions in seven anthropoid species were examined. Interspecific pattern similarity was assessed using Spearman rank correlation, and Mantel's randomization test was used to determine strength of association between pattern similarity and the above factors.

Results suggest that hominoids lack a common pattern of dimorphism in the forelimb. Furthermore, degree of similarity in locomotor function and magnitude of BMD is associated with strength of pattern correlation, although multifactorial causation cannot be discounted. As the comparative taxa chosen to evaluate variation or body mass in fossil samples will differ depending on the cause of pattern similarity, these factors should be considered in this assessment.

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New statistical methods for estimating age-at-death distributions from skeletal data: A validation study.

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Over the past decade, new statistical methods have been developed in order to enhance the predictive value of paleodemographic parameters derived from small non-random skeletal samples. Specifically, these new methods include the use of probability based regression models and hazard models of mortality as a means for estimating age-at-death distributions from skeletal data. While numerous validation studies have been conducted, this paper presents the results of the first validation study of these new statistical methods using multiple adult age indicator information, as well as reference and target datasets drawn from separate known-age skeletal collections.

Statistical analyses in this study are based on stage data for the pubic symphysis and auricular surface, and dichotomous data (open vs. closed) for ectocranial suture closure. Indicator information collected from 508 known-age individuals derived from the 18-19th century European cemetery collections from Spitalfields and St. Brides Church are combined to form a single target dataset. Indicator information collected from 802 known-age individuals from the Terry collection forms the reference dataset. This information is fit with a cumulative probit regression model in order to generate unbiased parameters. A Gompertz-Makeham hazard model of adult mortality is then used to estimate the age-at-death distribution of the target sample (known ages are treated as unknown in this instance). A relatively high degree of similarity between the age-at-death distributions for the estimated and actual target samples is found, while the reference and estimated target sample age-at-death distributions are unrelated.

A model for promotion of science education through physical anthropology.

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Anthropology departments with skeletal biology faculty can utilize Forensic Science Education to improve the visibility of the department, strengthen and increase relationships with other departments and institutional administration, possibly improve relationships between faculty in the four fields, increase enrollment in anthropology courses, and potentially increase funding to the department. This model also provides opportunities for service to the general public, which together with the teaching component, makes it a useful tool for increasing enrollment in science education in the United States.

The model, based on an existing academic program, consists of curricular and administrative organization necessary for an anthropology department to host or participate in an undergraduate forensic science program. Interdisciplinary forensic science education complements the holistic nature of anthropology and facilitates contribution from all types of anthropology faculty. The benefits to physical anthropology faculty and by association the anthropology department as well, are numerous, especially for small anthropology departments. Current events affecting forensic science education and training and other leading concerns regarding installation of a forensic science program are integrated into the model. More importantly, participation in this model draws students normally inclined to follow a humanities curriculum into scientific courses and majors. Therefore science education is improved in the student population most inclined to meet the minimal general education requirements for science.

Female sexual and social preferences

in wild West African chimpanzees: one and the same?

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Female primates favor and eschew different males as social and sexual partners. In the past, female affiliative behaviors in social contexts (such as approaches and proximity) have been used to infer female mating preferences. However, the correspondence of such social and sexual preferences remains untested in many species. In this study, we test the hypothesis that female chimpanzees prefer the same males in social and sexual situations. Data were collected during 2600 hours of focal animal follows of 14 female chimpanzees in the Taï National Park. Four measures of social preference were used: groom duration, female-initiated approaches, female joining a party, and a general measure of affiliation. Sexual preferences were determined by variation in rates of female proceptivity and resistance to male solicitations. Data were analyzed by estrous stage and the likelihood of conception. Overall correspondence between female social and sexual preferences was quite low, and the relationship depended upon the females' estrous state. Outside of the periovulatory period, when conception is unlikely, there was no correspondence between social and sexual preferences. When females were most fertile (during the periovulatory period), two of the four measures of social preferences corresponded with female sexual preferences (groom duration, female proximity). These results suggest that the use of female social preferences as proxies for sexual preferences requires validation, and that particular attention should be given to changes in female social preferences across estrous phases.

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Effects of group size and season on the ranging behavior of Phayre's leaf monkeys (*Trachypithecus phayrei*)

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For frugivorous primates day range and home range have been shown to increase with group size, while no clear relationship seems to exist for folivores. However, because primates tend to demonstrate varying degrees of folivory (across groups, seasons, years, species), it is unclear what degree of frugivory produces the expected increase of day range with group size. Here, we investigate the impact of group size on home range and day range of folivorous Phayre's leaf monkeys (*Trachypithecus phayrei*). Three groups of different sizes were studied at Phu Khieo Wildlife Sanctuary (Northeast Thailand). Each group was followed from dawn to dusk for five to seven consecutive days per month, for a period of 12 months. The group's location was recorded every 30 minutes taking a GPS point at the approximate center of a group. Location data were analyzed using the Animal Movement package of ArcView GIS. The analysis suggests some effect of group size on day range with the smallest group having the shortest range. Similarly, home range was smallest in the smallest group, but only if occasional excursions to a saltlick were excluded. Thus, contrary to the expectations, we found a group size effect on day range and home range in this folivorous primate. The fact that this effect is weak may be explained by differences in home range quality. We are currently collecting the relevant data to include this factor in future analyses.

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Dispersal by force: residence patterns of wild female hamadryas baboons.

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Unlike most papionins, hamadryas baboons have traditionally been thought to be a female-dispersing taxon. The issue of female dispersal in hamadryas baboons is complex, however, because (1) females do not disperse voluntarily but are forcibly taken over by males and (2) dispersal can occur at multiple levels: between OMUs, between bands, or between troops. Here I present behavioral data from a band of wild hamadryas baboons in central Ethiopia in an attempt to elucidate patterns of dispersal among hamadryas females. Between October 1996 and September 1998, 2 of 10 known females were taken over by other males in the same band and 8 remained in the same OMU. Between September 1998 and July 2000, 2 of 16 known females were taken over by males in the same band and 14 remained in the same OMU. Between July 2000 and July 2002, 2 of 14 known females disappeared (either died or were taken over by a male in another band) and 12 remained in the same OMU. Finally, between January 2003 and July 2004, 7 of 47 known females were taken over by other males in the same band, 6 disappeared (either died or were taken over by a male in another band), 2 were known to have been taken over by a male in another band, and 33 remained in the same OMU. Results from this study confirm that hamadryas females are transferred between social units by males and that this most often occurs within rather than between bands.

Decoupling the shoulders from above-substrate locomotion: a new idea for the origin of hominid bipedalism.

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Despite decades of research, understanding the origin of bipedalism remains an elusive goal for paleoanthropology. A new proposition, the Decoupling Hypothesis, posits that primates that need to excel at both suspension and above-substrate locomotion (quadrupedalism) face a dilemma: suspension requires a highly mobile shoulder while effective quadrupedalism necessitates a stable one. Bipedalism circumvents this problem by decoupling the shoulder from non-suspensory locomotion. This project is a preliminary test of the Decoupling Hypothesis.

Activity budgets and locomotor and postural behaviors of 18 primate groups, derived from published literature, were used to calculate hours spent in various locomotor and postural modes. Bipedalism, as a proportion of all above-substrate locomotion, was predicted using logistic regression from time spent in five locomotor and postural behaviors and two-way interaction terms. All possible regressions, using R^2 and Mallow's Cp as criteria, and stepwise procedures were used to determine significant variables (α=0.05).

The model with the highest R^2 (0.88) and the lowest Cp (5.3) contained the following predictors: shoulder-abducting locomotion ($p < 0.01$), shoulder-abducting posture ($p < 0.01$), and two interaction terms, shoulder-abducting locomotion X above-substrate locomotion ($p = 0.01$) and shoulder-abducting posture X above-substrate locomotion ($p = 0.13$, not significant). This indicates that the more important suspension is to the primates studied, the more likely they are to use bipedalism. These results are compatible with the

hypothesis and suggest that further consideration of the Decoupling Hypothesis is warranted.

Bone biomechanical considerations in perimortem vs. postmortem thermal bone fractures: fracture analyses on victims of suspicious fire scenes.

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While burned bone fractures have been a curiosity to anthropologists for decades, researchers have achieved no consensus regarding their visual assessment and interpretation. Recent interest in bone trauma analyses resulting from almost two decades of actualistic research facilitates a renewed interest in thermal destruction to bone as a taphonomical influence. Distinguishing between taphonomic effects of fire and potential perimortem trauma is critical in both bioarchaeological and medicolegal settings.

Correct identification of fracture causation in burned or partially burned bone requires an understanding of fracture biomechanics and how fracture patterns change from wet, unburned bone to dry, burned bone. Here we propose a methodology for differentiation of these two fracture patterns based on biomechanical and biochemical principles, experimental research, and forensic case examples. Key characteristics that distinguish and sequence traumatic and taphonomic events include fracture shape, surface, and location. With low-powered magnification, smooth, shear fractures from fresh bone are distinguished from blocky fractures occurring in brittle burned bone.

Two case studies illustrate the application of this methodology in separating perimortem trauma from thermal taphonomic events. These cases demonstrate how knowledge of normal burn patterns combined with a background in bone fracture biomechanics assist in the identification of fractures that occurred before and after burning. The intent of this methodology is to intensify burned bone analyses in order to simplify complicated interpretations of cause and manner of death.

The founding of the American Association of Physical Anthropologists (AAPA): 1930.

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Currently the website of the American Association of Physical Anthropologists (AAPA) describes physical anthropology as both a biological and a social science. Whether this perspective of the discipline would be shared by the founding members of the AAPA is open to some debate.

Until the founding of the AAPA by Aleš Hrdlicka in 1930, there was no anglophone organization that focussed exclusively on issues that mattered to physical anthropologists. Fewer than 11% of doctoral theses completed in the period 1900-1925 in the four American departments that offered graduate study in Anthropology focussed on topics in physical anthropology, and no such theses were completed at either University of California Berkeley or at Columbia University during that time. The absence of a disciplinary identity that could lead to the establishment of a recognized research tradition, with appropriate funding support, contributed greatly to the formation of the AAPA. The first meeting of the association was held at Chartlottesville, Virgina, with 84 charter members recorded. However, of these only 21% described themselves as anthropologists, and fewer than 10% of the membership was made up of full-time professional physical anthropologists. On the other hand, more than half the membership was comprised of anatomists.

It is arguable that most members of the AAPA at the organization's inception were not interested in promoting education in physical anthropology, and most would not have regarded Anthropology departments as providing suitable training for practitioners. The impact of such perspectives on the discipline of physical anthropology will be discussed.

Evolutionary developmental biology of sexual dimorphism: contrasting pelvic and nonpelvic anatomy.

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I present a model on the evolutionary developmental biology of pelvic sexual dimorphism using two sets of results with 14 species of anthropoids and several species of nonprimate mammals. I demonstrate that the sexes are nonsignificantly different in pelvic and nonpelvic variability (Levene's test; intraspecific analysis; measurements include 12 of the pelvis, femoral head diameter, lengths of four long bones and clavicle, and lengths and midshaft diameters of metapodials). I also demonstrate that pelvic sexual dimorphism is inversely associated with nonpelvic sexual dimorphism; obstetrical difficulty does not explain this result (chi-square test, interspecific analysis; comparison of species in which the sexes are monomorphic in femoral length and head diameter with species in which males are larger than females in these measures). I explain this dual set of results that female skeletal anatomy is the default anatomy. Androgens redirect growth from the default type to that of the male. The magnitude of redirected growth is dependent on the number of cellular receptors and/or titers of androgens. Intraspecifically, the sexes are comparable in pelvic and nonpelvic variability as the distribution curve for females is shifted *en masse* to that for males. Interspecifically, pelvic sexual dimorphism is inversely related to nonpelvic sexual dimorphism because: (1) species differ in the number of receptors and/or titers of androgens; (2) some aspects of the pelvis respond to androgens with enhanced growth, whereas others respond with repressed growth; and (3) nonpelvic bones uniformly respond to androgens with enhanced growth.

The color vision of muriquis (*Brachyteles arachnoides*).

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The subfamily Atelinae (Platyrrhini) is composed of four genera with the following phylogenetic relationships: {*Alouatta* [*Ateles* (*Brachyteles*, and *Lagothrix*)]}. The basal genus *Alouatta* is unusual among platyrrhines for possessing a duplicated M/L opsin gene on the X chromosome. Consequently, routine trichromatic color vision is present in all individuals, both male and female. For *Ateles* and *Lagothrix*, color perception varies. Like other platyrrhines, they possess a single X-chromosome locus for the opsin gene. Accordingly most individuals lack the potential for trichromatic vision. However, allelism of the M/L opsin gene results in polymorphic variation. Three dichromatic and trichromatic phenotypes are possible, with the latter condition existing only in heterozygous females.

Here we report on the color vision of *Brachyteles*. Although close phylogenetic affinity between *Lagothrix* and *Brachyteles* implies a shared visual system, the dietary adaptations of *Brachyteles* raise the possibility that its color vision resembles that of *Alouatta*.

Both genera possess similar dental, digestive, and gnathic adaptations to seasonal folivory. In fact, some long-term field studies of *Brachyteles* report that young leaves comprise 50% of feeding observations. Accordingly, if seasonal folivory is a strong selective pressure on the retention of a duplicated M/L opsin gene, it is theoretically possible that *Brachyteles* enjoys routine trichromatic vision. Our results may be an important step in understanding the adaptive significance of routine trichromatic vision in primates.

Quantifying cross-sectional geometry in modern human long bones using Elliptic Fourier Analysis for the purposes of ancestry attribution.

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The majority of osteological studies on human ancestry have focused on the cranium alone. There has been considerably less research involving postcranial elements. Of these studies, most have concentrated on long-bone diaphyseal shape, and have used indices derived from simple caliper measurements taken at standard postcranial landmarks. However, with technological advances, it is now possible to get finer resolution than caliper measurements can provide, over a greater area of the bone. This study tests whether femoral and/or tibial cross-sectional geometry is significantly different over both modern and archaeological human populations.

The sample consists of fifty adult, modern humans, representing five populations: two modern American (African American and Caucasian), two Native American (one Arctic and one desert Southwest), and one ancient Egyptian. These were scanned using a Cyberware 3030 Laser Surface Scanner, and subsequently cross-sectioned at five landmarks using in-house software. These cross sections were analyzed using Elliptic Fourier Analysis (EFA). Unlike linear caliper measurements which give an index, EFA quantifies the entire outline of a shape by decomposing it into a series of coefficients which can then be analyzed using standard multivariate statistics.

Modest support was found for using cross-sectional geometry in ancestry attribution. At the subtrochantral level, there was separation between three of the five groups tested relating to degree of platymeria. However, there were no significant group differences for the tibia, or for the other four femoral cross sections. Therefore, caution must be exercised when using postcranial elements to determine ancestry.

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Geographical height variation in Ohio convicts born 1780-1849.

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To more completely answer questions regarding health in the past, anthropologists are utilizing previously untapped data sources. This study utilizes one such source: penitentiary records. Few other studies (Riggs, 1994; Johnson & Nicholas, 1997 and Sunder, 2004) have explored these type of data. Historical sources frequently recorded height, thus allowing modern researchers to use height data as a proxy for health and a net growth measure in populations.

The current study examines geographical variation in height from a sample of 2553 male Caucasian convicts aged 23 to 45 years incarcerated in the Ohio Penitentiary between 1834 and mid-1865. Data collected includes height, age, ancestry, nationality, and year and place of birth. These data are a subset of a larger dataset consisting of 6380 individuals including females, African-American and foreign born males.. Birth places were divided into five geographical areas roughly corresponding to the US census geography divisions.

Average stature for this sample is 68.4 ± 2.5 inches (173.7 ± 6.4cm). Regression analyses and ANOVA on height, birth cohort, ancestry, nationality, and place of birth indicate significant but small differences in height across geographical areas but no significant difference due to birth cohort. The relatively homogeneous nature of height during this time may be due to a nation not yet greatly undifferentiated by regional cultural patterns and still existing in lifeways influenced by the early colonizers of the United States. Results from this study correlate well with other Ohio samples such as data from Ohio National Guardsmen (Steckel & Haurin, 1994).

Diet and jaw form in *Pongo*.

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This study examines the functional link between jaw form and diet in *Pongo*. Although primarily frugivorous, Bornean and Sumatran orangutans differ in the extent to which they feed on leaves and the cambium layer of trees. Previous work suggests that regional morphological variation amongst Bornean populations equals, or exceeds, that observed between island populations, complicating interpretations of the functional significance of morphological divergence. To determine whether orangutans differ systematically in jaw form as a function of dietary preference, I tested the hypothesis that all Bornean orangutans (*Pongo pygmaeus pygmaeus*, *P.p. wurmbii*, and *P.p. morio*) exhibit a relatively more robust mandibular corpus and symphysis as compared to Sumatran orangutans. I generated biomechanical shape variables of the corpus and symphysis. Parametric and nonparametric ANOVAs were used to test for significant differences in mandibular shapes between and within island orangutan populations. Differences in jaw form are clearly and distinctly reflected between Island populations. Compared to Sumatran orangutans, Bornean orangutans have significantly ($p < 0.01$) deeper mandibular corpora, and deeper and wider symphyses, relative to jaw length. Post-hoc tests confirm that all Bornean populations differ significantly from Sumatran orangutans in the predicted direction. Regional variation amongst Bornean populations is reflected only in relative width of the mandibular corpus. These results demonstrate that orangutans differ systematically and predictably in some jaw morphologies as a function of processing tough foods. In contrast to craniodental variation, findings from this study further indicate that intra-island variation in jaw form is minimal.

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Late prehistoric infectious disease on the upper Texas coast: Caplen Mound (41GV1).

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The Caplen Mound site (41GV1) is a cemetery located on the Bolivar Peninsula in Galveston County, Texas. The burial site was likely used by the Akokisa, a native hunting, gathering, and fishing people that were extirpated in the early 19th century. University of Texas archeologists excavated the site in 1932. A total of 66 burials were excavated but only 28 were curated (these were examined for this study). Action by looters and the nature of the excavation resulted in a loss

of provenience for many of the remains. Later radiocarbon assays dated the site between AD 1380 and 1570. Quantitative and qualitative osteological analysis of the sample revealed a very high rate of infectious lesions. Evidence of periostitis and osteomyletis were most common in the lower long bones, but were found secondarily in the lower arm bones and axial skeleton (ribs and skull). Over 30% of the tibiae and 22% of the fibulae in the sample showed active or healing infectious lesions; all other long bones show a considerable lower frequency. Possible infectious pathogens responsible for the lesions include treponematosis, staph or strep infections, introduced Old World bacterium, or an unknown native bacterial disease. Given the specific disease pattern observed on the skeletal remains, paleodemography of the sample, historical records, and the geography of southeast Texas, it is suggested that the skeletal lesions are the result of native bacterial infectious disease.

Insights from life's little abrasions: dental microwear at middle-age.

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Fifty years ago, investigators realized they could gain insights into jaw movement and tooth-use through light-microscope analyses of wear patterns on teeth. Subsequent work rekindled interest in the topic, as many workers shifted to using the scanning electron microscope. Since then, numerous analyses of modern and fossil material have yielded insights into dietary variations within and between species, and new perspectives on the evolution of tooth use and diet in animals ranging from dinosaurs to human ancestors.

However, these analyses are not without their problems. Specifically, SEM images are so complicated that analyses are difficult, time-consuming, and often subjective. As a result, two methods are beginning to catch attention as possible "next steps" in the evolution of dental microwear analyses.

Solounias and Semprebon have advocated a return to lower magnification analyses, using qualitative assessments of microwear patterns viewed under a light microscope. The advantages of these analyses are that they're cheap and fast, and may easily distinguish animals with extremely different diets. The disadvantages are that they're also subjective and may not be able to detect artifacts on tooth surfaces.

Ungar et al. have begun work with a confocal microscope and scale-sensitive fractal analyses. Advantages include the ability to quickly and objectively characterize wear surfaces over entire wear facets, at a wide range of magnifications. The main disadvantage lies in the newness of the technique and pushing the limits of its technology.

For now, many basic questions remain to be answered. Maybe we finally have the tools to do so!

Biodistance analysis of postmarital residence and social structure in Jomon period Japan: migration patterns and status determinants in a dynamic setting

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This study documents postmarital residence and social structure determinants in a Jomon period (3400 - 2300 yBP) skeletal series from Yoshigo Shell Mounds, Japan. Previous studies subdivided Yoshigo individuals into migrants and locals. Locals were defined on the basis of elaborate grave artifacts and presence of mandibular incisor ablation, while migrants were defined by presence of mandibular canine ablation and less elaborate graves artifacts. Because ablation pattern ratios were equally distributed among males and females, past researchers concluded that Yoshigo residents practiced bilocal postmarital residence. These conclusions and definitions are tested here using biodistance analysis.

Seven cranial measurements were recorded for 17 males and 13 females. Male and female craniometric traits were separately subjected to clustering and discriminant function with cross-validation analyses. Size-standardized within-sex minimum genetic relationships were calculated to explain the amount of variation within sex groups. Simple correspondence analysis was applied to age-at-death and tooth extraction groups (n = 90) to illustrate the association between age-at-death and groups.

Females have greater between-group genetic variation than males. Greater female variation can be characteristic of matrilocal or patrilocal postmarital residence. Discriminant analyses of cranial measurements did not distinguish residence groups. Simple correspondence analysis, however, reveals a close association between age and status groups. Four incisor ablation and burials of greater prestige correspond with older age. This finding suggests elevated social status was determined by age and that status markers (e.g. tooth ablation) do not indicate biological relationships or patterns of residence.

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Noninvasive methods for steroid measurement during infancy.

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Although the activation of the infant hypothalamic-pituitary-gonadal (HPG) axis and the existence of a postnatal gonadotrophin surge were first documented in the early 1970's, the evidence to date of postnatal hormonal levels are derived from studies of the gonadal contents of autopsied infants, small clinical samples, or infrequent longitudinal serum assessment. These studies suggest a trend characterized by high neonatal gonadal hormone levels followed by gradual decline across the first year of life. Notable inter-individual variability has been reported, but the cross-sectional or infrequent longitudinal protocols used in the previous studies have not permitted assessment of developmental trends or intra-individual patterns in hormone concentrations. The present study aim was to further expand the scope of investigations of hormonal activity in infancy by developing a noninvasive method for repeated measures assessment of steroid hormones.

Fecal samples were collected in cotton diaper liners and extracted using a solid phase method. Extracts were analyzed using radioimmunoassay (RIA) methods modified from those developed for noninvasive analysis of primate hormones. Method validity was supported by a steroid recovery rate of at least 80%, a sensitivity of 0.4 pg/ml, and inter- and intra-assay coefficients of variations of less than 10%. Samples provided evidence for inter- vs. intra-daily variation in steroid hormone levels.

The use of fecal samples for measurement of hormonal status, validated in the study of non-human primates, is a powerful noninvasive tool for exploring the development and function of steroid hormones in human infancy as well.

A regressional analysis of sex differences in the cost of human walking.

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It has recently been suggested that, among early hominids, the adoption of bipedal locomotion would have conferred a greater energy savings on females than on males. A large majority of existing studies comparing the energetics of bipedal walking in modern humans have reported no sex differences in the cost of human walking, contradicting that suggestion. Yet most of these earlier studies used methodological protocols containing serious flaws. In addition, the question of sex differences in past studies was determined using a ratio, rather than a regression, approach. Here we reassess the question of gender differences in the energetic cost of walking using a more careful experimental design and regression analysis.

Cost was measured at four comfortable walking speeds on 13 male and 13 female subjects. Each walking trial lasted 12 minutes and their rates of oxygen consumption over the last four minutes were averaged to estimate cost. The data used in this report were collected from at least three separate sessions for each subject at each speed.

ANCOVA with total cost as the dependent variable, total mass as a covariate, and sex as a fixed factor resulted in mass having a significant effect ($p < .01$), while sex was not statistically significant ($p > .60$ for each walking speed). All regression equations for cost walking values and total mass expressed nonzero y-intercepts. Thus, we were not able to detect a difference between the total cost of walking in males and females.

The phylogenetic position of the simakobu monkey (*Simias concolor*) based on mitochondrial DNA sequence data.

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The phylogenetic relationships among the colobines have been controversial and are still in dispute. Although recent molecular studies have been able to shed some light on this issue, the simakobu monkey, or pig-tailed snub-nosed monkey (*Simias concolor*), has never been included in these works, and thus its phylogenetic affinities remain unclear. Previous hypotheses have suggested the simakobu as 1) the sister taxon to the proboscis monkey (*Nasalis larvatus)* within an Asian colobine clade, 2) the sister taxon to the proboscis monkey forming a clade basal to all other colobines, and 3) a primitive colobine with a long and independent course of evolution, possessing no particular affinities to the rest of the odd-nosed monkeys.

To test these hypotheses, we sequenced approximately 420 base pairs of mitochondrial DNA, encompassing the $tRNA^{Thr}$ and part of the cytochrome b genes, from the hair of a wild-caught simakobu individual. Comparative sequences from colobines and various catarrhines were obtained from Genbank, and phylogenetic trees were produced using maximum parsimony and likelihood analyses.

The results show a close sister taxon relationship between the simakobu and proboscis monkeys nested within a monophyletic Asian colobine clade. Bootstrap values strongly support this arrangement, but the relationships among the major Asian colobine lineages remain unresolved. The results have implications for Asian colobine taxonomy and biogeography, as the status of *Simias* as a genus separate from *Nasalis* has been disputed, and a large geographical discontinuity exists between the distributions of the simakobu and proboscis monkeys.

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Demographic history of African populations inferred from mtDNA analysis.

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The continent of Africa is thought to be the homeland of all modern humans; it contains the largest amount of human genetic variation, both within and between populations, and the oldest genetic lineages. We have collected an unparalleled resource of genomic DNA samples from >4000 individuals originating from ethnically defined populations across Africa. At the same time, extensive pedigree, linguistic, ethnic, geographic and physiological data was also recorded for many of these individuals. Here we describe our analysis of mtDNA variation obtained from sequencing 1200bp of the control region and genotyping 6 coding-region SNPs mtDNA analysis of a subset of coding-region SNPs in 650 ethnically diverse Tanzanians and from sequencing 40 whole mtDNA genomes (~16,000 bp/genome). We have used coalescence based maximum likelihood simulations to estimate multiple demographic parameters including historic population size, bi-directional migration, time of population divergence, and time of most recent common ancestry of DNA lineages from these data. We observe recent gene flow between populations and phylogenetic analyses show that Tanzanian mtDNA lineages form the most basal branches of the global mitochondrial tree, suggesting that the range expansion of modern humans may have originated in East Africa. Additionally, we find common ancestry of the Hadza and Sandawe Khoisan (click)-speaking populations of Tanzania and that the Sandawe have had historical gene flow and/or common ancestry with southern African !Kung San, supporting the hypothesis that Khoisan speakers may have originated in East Africa.

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Reassessing trauma: bilateral hyoid fracture in an adult male from Arroyo Hondo Pueblo, New Mexico.

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This case study examines a male individual from the Arroyo Hondo collection (~110 individuals) that exhibits a bilaterally fractured and healed hyoid bone. This individual was recovered from the Arroyo Hondo Pueblo site, located 4.5 miles south of Santa Fe, New Mexico, during excavations between 1971 and 1974.

The male specimen (burial 12-16-36-4-1), aged 40-50 years, was recovered from Component 1, dated to the early 14th century. The fractured hyoid was discovered during re-analysis of the Arroyo Hondo skeletal material. The left and right greater horns of the hyoid are not fused to the body, and there are defects midway on both shafts that are well healed. The right and left anterior portions of the horns are displaced postero-inferiorly, and the anterior portions appear to be displaced laterally. The individual survived the injury based on evidence for complete healing. The mechanism of injury is unknown, although strangulation is an often cited cause of hyoid fractures. An injury of this kind may have caused airway obstruction, nerve damage, and altered speaking and swallowing capabilities.

This individual is also unique in several aspects of his burial and skeletal morphology. The individual is one of only two to exhibit paint on the body and, in his case; his face was decorated just prior to internment. In addition, he is significantly taller and more robust than the rest of the Arroyo Hondo population, including craniofacial morphology. This case study highlights the importance of understanding the functional effects of pathology in a prehistoric cultural context.

A Monte Carlo simulation method for estimating interspecific scaling relationships in the absence of specimen-specific body mass data.

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Determining how variables are scaled to body mass is a fundamental concern in evolutionary biology. Ideally, scaling relationships should be determined using actual body mass data for the individuals from which the measurements of interest were derived, but such data are rarely available. Consequently, interspecific scaling relationships are often estimated by regressing species averages for the variable of interest against published body mass averages. Unfortunately, this procedure results in a loss of statistical confidence in the regression parameters due to reduced degrees of freedom. In this study, we report and evaluate a Monte Carlo simulation method for overcoming this methodological challenge.

We generate sets of simulated body mass values using published species- and sex-specific body mass averages and standard deviations. Each individual is assigned a randomly-generated body mass, and regression analyses are performed. After 10,000 iterations, the mean and its 95% confidence limits of the regression slopes are calculated. Using published morphometric data with associated body masses, we test whether the regression slopes calculated using actual versus simulated body mass data are significantly different. In addition, we also test whether published unassociated body mass averages can reasonably approximate the slopes of the body-mass-associated data set. The results indicate that differences between the slopes derived from these data sets are not statistically significant. Our simulation method enables estimation of scaling relationships without loss of degrees of freedom. The resulting narrower confidence intervals of the mean slopes facilitate the comparison of regression slopes for testing scaling hypotheses, whether or not associated body mass data are available.

Changing patterns of violence: an analysis of cranial trauma in prehistoric San Pedro de Atacama.

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San Pedro de Atacama is located in the Atacama Desert of northern Chile. The prehistoric population of this area endured periods of prosperity and interregional interaction, as well as severe droughts, social stresses, and widespread poverty. A sample of 682 crania was analyzed for evidence of trauma in order to assess changing patterns of interpersonal violence during the occupation of the oases. It was hypothesized that levels of traumatic injuries in this population would parallel the changes in the social environment. Low fracture levels would be expected in the periods of affluence and peaceful interactions with nearby states, while periods characterized by environmental extremes and state collapse would result in elevated rates of traumatic injury.

This analysis found that the rates of trauma escalated from 5.05% (5/99) in the earliest period (AD 300–600), through 10.90% (10/92) in the Middle Horizon (AD 600–900). This increase is surprising given that the early period witnessed the shift to permanent settlements and the middle period was one of prosperity and environmental stability. Trauma rates reach a high of 35.56% (16/45) in one Late Intermediate (AD 900-1400) cemetery, with all contemporary cemeteries revealing similar rates; this is significantly different from all other periods. The archaeological record from this time demonstrates agglutinated settlements, fortifications, and material poverty that parallel the elevated violence levels. As the Late Intermediate waned and environmental conditions improved, there is a concomitant decrease in trauma (3.36%; 8/238) that held through the Inka occupation. This indicates that while the Atacama was not peaceful, it is only during great social change and resource stress that violence becomes commonplace.

Sex chromosomal markers suitable for non-invasive studies of guenon hybridization.

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To date, sympatric hybridization is known to naturally occur between at least four pairs of guenon taxa: *Cercopithecus mona* x *C. pogonias*, *C. nictitans* x *C. cephus*, *C. mitis* x *C. ascanius*, *C. mitis* x *C. pogonias*. However, if the incidence of such hybridization is driven higher in heavily logged areas – as a result of decreased access to conspecific mates – local populations may interbreed to a point where the genetic integrity of one or both taxa is damaged. Unfortunately, molecular studies of both "natural" and "exacerbated" introgression have not yet been performed for guenons due to (1) a general paucity of diagnostic genetic markers (besides those of mtDNA), and (2) the difficulty of amplifying nuclear loci for samples collected by non-invasive techniques. Here, I address both issues. First, from a review of recent phylogenetic analyses, I argue that since most sympatric guenon taxa do not cluster as sister-species, the synapomorphic mutations they share with *true* sister-species (or other closely-related taxa) can be used as diagnostic markers differentiating the genetic lineages of hybridizing taxa. Second, using recent X- and Y-chromosomal datasets, I identify small (400 to 700 base), informative windows of sequence that can be amplified from non-invasively collected biomaterials (e.g. feces), which are likely to be collected for population-level studies. Finally, I demonstrate the results of this technique in the form of diagnostic DNA fragments amplified and sequenced from guenon feces. The method outlined here is applicable to any speciose group of hybridizing mammals.

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Quantitative genetic architecture of adiposity and associated Metabolic Syndrome risks.

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Adiposity has been demonstrated to be an essential element of the Metabolic Syndrome. Because measures of fat and fat distribution are significantly heritable, as are other risk factors for non-insulin dependent diabetes (NIDDM) and cardiovascular disease (CVD), there is particular interest in elucidating the nature of shared genetic influences on the constitu-

ent components of the Metabolic Syndrome. In this initial examination of the genetic architecture of adiposity and related Metabolic Syndrome risks, we examined data from 375 white and 104 black men and women, aged 18 to 88 years, from 100 families. Body mass index (BMI), subcutaneous abdominal fat (SAT) and visceral abdominal fat (VAT) measured by MRI, and assay measures of high-density lipoprotein cholesterol (HDL-C), triglyceride (TG) and glucose (GLU) concentrations were analyzed. The heritability of each trait was significant and of moderate to high magnitude: BMI = 0.68, SAT = 0.59, VAT = 0.45, HDL-C = 0.57, TG = 0.65, GLU = 0.34. Phenotypic correlations between the three adiposity measures and the three assay measures were all significant and of moderate magnitude, ranging from 0.19 to 0.39. The phenotypic correlation between VAT and TG was twice that observed between either BMI and TG or SAT and TG. Additive genetic correlations between SAT and VAT and the assay measures were somewhat higher than those observed between BMI and the assay measures. Different measures of adiposity will contribute to our increasing understanding of the genetic architecture of the Metabolic Syndrome.

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Lemur genital anatomy and clitoris length.

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This project reports new data and analyses of the genitalia of thirteen lemur species based on living wild and captive lemurs. The sample of wild lemurs included males and females of *Propithecus edwardsi, Eulemur fulvus rufus, Hapalemur aureus, Hapalemur griseus, Microcebus rufus, and Avahi laniger* from Ranomafana National Park. In addition, two males and two females of *Varecia variegata variegata, Propithecus verreauxi coquerelli, Cheirogaleus medius, Daubentonia madagascariensis, Eulemur macaco, Eulemur mongoz, Eulemur fulvus collaris* were examined at the Duke Primate Center. Each individual was photographed and measured for evaluation of twelve metric and eighteen qualitative characters. These characters were used to test functional hypotheses for the elaboration of female genitalia, in particular, the notable elongation of the clitoris observed in some lemur species.

A preliminary analysis of clitoral length was conducted for twelve species in which adequate measurements were available. Phylogenetically independent contrasts were generated using the program CAIC and analyzed in the statistical package SPSS. Clitoris length does not correlate with body mass or with penile length in males of the same species. We then tested for associations between behavior and clitoral elongation. There is a tendency for increasing clitoral length to be associated with the deposition of urine trails, but the association is not significant in the pilot study ($p = .1$). There is a significant correlation between relative clitoral length and mating system ($r = .7058$, $p = .03$). Longer clitorises are associated with multi-male mating systems, either dispersed or in groups, while shorter clitorises are found in species characterized by monogamous groups. These results could support the hypotheses of increasing clitoral length for disease prevention or sexual selection.

Linear enamel hypoplasias in early Medieval population of Great Moravia (Czech Republic).

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Enamel hypoplasia represents the disruption of the enamel matrix secretion during the growth of the tooth crown, which is related to a generalized growth disturbance. The aim of the study was to assess the frequency and timing of the linear enamel hypoplasias (LEH) in two early medieval Great Moravian population samples (9th-10th century A.D.) with different socioeconomic statuses. Permanent dentitions of 90 individuals from the cemeteries in the Mikul□ice site and 47 individuals from the rural cemeteries in the surrounding area were examined. Only unworn, largely unerupted teeth were included in the study. The age of examined individuals ranged from approximately 5 to 12 years. The timing of LEH was estimated in upper and lower canines by measuring the distance of the LEH from the cemento-enamel junction (CEJ). The sequence of the upper and lower canine crowns formation was determined by matching the unerupted canine crowns of the one individual according to the LEH. The LEH-CEJ distance was converted to age using the mean crown heights of the upper and lower canines in the examined samples and the sequence and timing of canine crowns formation in the recent Czech population. We observed no differences between the groups in the prevalence of the LEH which was found to be relatively high compared to the reported frequencies in historical samples. In addition, no significant diferences were found in both the susceptibility to stress within the dentition and the peak age of LEH formation.

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Correlates of frontal sinus evolution in strepsirrhines.

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Despite intensive research efforts, hypotheses seeking to explain the function of the paranasal sinuses found in some but not all species of primates have remained largely speculative. Here we present a comprehensive summary of frontal sinus occurrence across primates and test current hypotheses of frontal sinus function within the strepsirrhines using traditional and phylogenetic comparative methods. We specifically test for associations between frontal sinus occurrence and size and variables relating to hypothesized architectural, phonetic, olfactory, and physiological functions. Our survey illustrates that frontal sinuses are widely distributed across the primate order but are also completely absent from several groups. Ancestral state reconstructions indicate that the last common ancestor of living primates lacked frontal sinuses and that frontal sinuses evolved independently at least twice in the course of modern primate evolution. Comparative analyses within the strepsirrhines show that neither occurrence nor size of frontal sinuses can be related to any single factor. A relationship between skull architecture in relation to diet and body size emerges as the most likely determinant of frontal sinus development. The hypothesis that frontal sinuses are involved in optimizing low frequency emission during vocalization also receives some intriguing support. Whether the functions postulated for the frontal sinuses of strepsirrhines can be extrapolated to all primates is doubtful. The high incidence of homoplasy and past difficulties in establishing a theory of sinus function make it likely that frontal and by extrapolation all paranasal sinuses serve different purposes in different taxonomic groups.

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A river with parasites runs through it: porotic lesions as evidence for iron loss and anemia among three prehispanic populations in the Andes of Peru.

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Three skeletal populations (AD 650 – 850) are observed for cribra orbitalia and porotic hyperostosis to evaluate how their frequency and distribution correlate with sex, social class, and environmental context. The first sample (N=242) is an elite population from a Wari imperial site in the highland Andes. The other two populations are from the lowland Majes valley, in the periphery of the Wari empire; one skeletal series represents commoners (N=151) while the other represents elites (N=145). Cribra orbitalia and porotic hyperostosis appear to be indicative of iron deficiency anemia among ancient Andean populations; thus, these socially diverse yet contemporaneous populations are ideal for testing hypotheses regarding causal factors. If sex or social status are factors in susceptibility to iron deficiency anemia, then there should be significant differences in porotic lesion frequencies between the sexes and between status groups.

Results show no sex-based differences at any site, suggesting that girls and boys at these prehispanic sites experienced similar childhood health inasmuch as anemia was concerned. In contrast, there are significant differences between the imperial, highland community and those in the Majes valley (Fisher's exact, p=0.001; N=192), suggesting that environment and social position in the imperial structure contributed to one's developmental health status. Notably, in the Majes valley, elites and commoners show similar frequencies of porotic lesions, suggesting that social status was not a significant factor for anemia in the periphery of the Wari empire. Rather, it appears that environmental context—availability (and consumption) of contaminated river resources—contributed to the equally high levels of cribra orbitalia and porotic hyperostosis.

Taste, learning and food choice: expanded, multidisciplinary frameworks.

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The drive to eat is an uncontested human universal. As ubiquitous as the need is the diversity in what exactly humans eat. A relative gap in an otherwise rich body of anthropological literature is one that concerns how individuals and groups arrive cognitively at their decision-making frameworks regarding what they eat and why, what tastes good versus what tastes bad, indeed what counts and does not count as food. Moreover, studies of taste preferences and appetitive behavior typically center on pathological eating, taboos or food choices in contexts of poverty, malnutrition or disease.

This paper reviews recent multidisciplinary studies of ingestive behavior and discusses important new directions in understanding human food choice, focusing on the variety of ways in which humans develop preferences that inform their dietary choices in everyday life. I document how key determinants of taste preferences, influential to later dietary choices, are physiologically learned during prenatal, perinatal, and early childhood periods. Studies of appetitive behaviors and underlying preferences and aversions should pay closer attention to the very young, as adult tendencies are linked to those formed early in life. Since the assessment of what is good or bad to eat is vital to the maintenance of normal physiological and emotional states, and reflective of cultural background, the study of biological bases of food choice in non-clinical, non-pathological contexts is highly salient to the study of nutrition and health. An understanding of early influences on appetitive preferences and behavior has broad-reaching implications for future research in nutritional anthropology.

The effects of the Civil War on the health of the United States population: evidence from secular trends in stature.

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Previous research shows that warfare can negatively affect the health of a population by increasing social stress, decreasing food production and distribution, and disrupting the general economy. This study expands our current knowledge of this relationship by testing whether the American Civil War impacted the health of the U.S. population. Changes in health are assessed by examining secular trends in stature among U.S. army recruits. A 5% random sample taken from all army enlistees from 1866-1900 is employed, resulting in a data set of 23,705 recruits born between 1836 and 1879. Height comparisons using ANOVA statistical tests are made between birth cohorts while controlling for place of birth and socioeconomic status.

It is hypothesized that the Civil War had a detrimental impact on the health of the U.S., particularly those born in the Confederacy and the lower socioeconomic classes. Contrary to expectations, this study reveals that the war did not cause a significant decrease in stature among any group, indicating that the conflict had little to no effect on the health of the population. Several explanations are offered to account for these results. First, the declining economy during the mid-19th century may have mitigated the effects of the war by already reducing the overall health of the U.S. population. Second, the stress experienced by newborns during the war may have stimulated hormonal changes resulting in normal adult stature even though they may have been affected by other stressors. Lastly, biases inherent in using military enlistment records may have confounded the identification of any negative effects; especially considering only healthy individuals were allowed to join active duty.

Tracking the emergence of childhood fatness and obesity in a rural Papua New Guinea population using historical data.

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While fatness and obesity among adults in rural Papua New Guinea has only recently been reported, childhood fatness and obesity has not. The comparison of childhood and adult body size data for one population, the Purari of the Papuan Gulf, located in the archive of A.C. Haddon (1897-14), and collected by Hipsley and Clements in 1947, Eng and Leonard (1978) and by Ulijaszek in 1980, 1995 and 1997, has allowed the emergence of body fatness to be located historically and in relation to economic change for this group. The secular trend towards increasing body size appears to have started after the 1970s for females, and 1980s for males, despite the introduction of primary health care and the control of infectious disease from the 1950s onwards. The secular trend is associated with greater weight relative to height among male children aged seven years and above, and among females from around the age of thirteen years.

While there was a total absence of obesity in 1947 and 1980, obesity rates

among adults in 1995-97, as determined by body mass index above 30, were 1% in males, and 5% in females. Among adults in 1995-97, body mass index was significantly associated with income, educational level and urban connectedness. However, the strongest predictor of fatness and obesity was the extent to which villages have been involved with indigenous (as opposed to externally motivated) modernisation processes from 1946 onward.

Metatarsal articular modifications and kneeling in Byzantine monks.

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The nature of lower limb activity has been extensively studied in skeletal remains from Byzantine St. Stephen's monastery in Jerusalem. Previous studies have shown markers of repetitive kneeling on the lower limb bones of these monks. The hip, knee and ankle all exhibit modification suggesting repetitive activity consistent with daily prayer, as noted by ancient sources. Alterations of the foot were examined to flesh out the lower limb activity markers. As defined by Ubelaker (1979), these "kneeling" facets are found on all metatarsals (first through fifth), although they are primarily located on the second, third, and fourth metatarsals.

For this monastic collection, there was no significant difference between right and left metatarsals ($\chi^2=0$, p=1). Twenty-three of 227 (10.1%) total right metatarsals demonstrated "kneeling" facets; approximately 20% of the second and third metatarsals had them. Many of the metatarsals also exhibited osteoarthritis on the first metatarsophalangeal joint. Lipping, surface porosity, osteophytic growth and eburnation were examined on the distal joint of the first metatarsals. Many of the toes exhibited some modification, including 20.8% (11/53) of right first metatarsals with eburnation. The eburnation, porosity, and osteophytic growth occurred on the plantar surface of the foot, while the "kneeling" facets were located on the dorsal surface.

These findings suggest that at least some of the monks were engaging in sustained, repetitive hyperdorsiflexion of the foot. This, combined with the presence of facets and imprints on the femur, tibia, and talus, lead to a better understanding of the daily postures of this monastic community.

Dental topographic analysis: tooth wear and function.

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Quantitative analyses of primate tooth shape usually describe occlusal form using linear distances between identified landmarks. Most such studies have been limited to unworn teeth because surface features are obliterated by wear. Dental topographic analysis provides an alternative, landmark-free approach to characterizing and comparing variably worn teeth. A high resolution laser scanner is used to model surfaces in 3D, and geographic information systems software allows measurements such as occlusal slope, relief and surface angularity.

Here we compare results for variably worn molars of *Pan troglodytes troglodytes* (n = 54) and *Gorilla gorilla gorilla* (n = 47) with data for the thicker enameled, crenulated molars of *Pongo pygmaeus pygmaeus* (n = 51). While all three taxa show decreasing occlusal slope and relief values with wear, differences among the great apes are significant and consistent at given wear stages. Occlusal slope and relief values are greatest in gorillas, intermediate in orangutans, and lowest in chimpanzees. These results are similar to those reported for shearing crest length studies on unworn teeth, and are consistent with dietary differences between taxa reported in the literature.

Studies of how tooth form changes with wear allow us to better understand dental adaptations. Orangutan occlusal slope and relief values, for example, are affected by changes in both cusp and crenulation morphology with wear. Such analyses provide new insights into form-function relationships that will hopefully improve the resolution with which we infer diets of fossil primates from their teeth.

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A survey of primate populations in northeastern Venezuelan Guayana.

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The Guianas represent a region of one of the highest biodiversity in the Neotropics. However, little is know concerning the biogeography and conservation status of its diverse primate taxa. Therefore, the main goal of this research is to survey primate populations in the northeastern-most part of Bolívar state, Venezuela, near the international border with Guyana. A previous study indicated that white-faced sakis (*Pithecia pithecia*), wedged-capped capuchins (*Cebus olivaceus*) and red howler monkeys (*Alouatta seniculus*) were present in this area. It also was suggested that black spider monkeys (*Ateles paniscus*), golden-handed tamarins (*Saguinus midas*) and *Aotus* spp. maybe present in this part of Venezuela. Forty nine sites of the Río Cuyuní basin were surveyed. Pre-existing forest trails were walked and the Río Cuyuní was navigated by boat for censuses purposes. Interviews with local people were conducted at each site. The results indicate that the only primate species identified as inhabiting this region are *A. seniculus*, *C. olivaceus* and *P. pithecia*. *S. midas* is not present at the northeastern part of Bolívar state, or if it exists it is extremely rare. References to the existence of *Aotus* spp. might reflect confusion with other nocturnal mammals such as *Potos flavus*. The presence of a rare and isolated population of *A. belzebuth* rather than *A. paniscus* remains unclear. Finally, cattle ranching, mining, hunting and pet trade represent major threats to the primates in this part of Venezuela.

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Identifying kinship clusters: SatScan for genetic spatial analysis.

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Previous work has shown that the patterns of shared mitochondrial and Y chromosome lineages in cemeteries are influenced by the post-marital residence patterns of the culture. However, finding valid methods for identifying statistically significant clustering of genetic markers has proved difficult. In cemeteries, related individuals can be grouped in a variety of patterns, such as in rows or sections. The method needs to be easy to apply, so that it can be widely used, and deal with variable clustering. SatScan version 3 (www.satscan.org), a freely available program originally written to interpret epidemiological data, uses the spatial scan statistic to identify clustering. In this poster, we use SatScan to identify clusters of genetic markers in simulated cemetery populations. Using algorithms that replicate the spatial patterning of burials seen in small, endogamous com-

munities with patrilocal, matrilocal, or avunculocal residence, we created 30 model cemeteries. Although the program is restricted to only searching circular areas, we show that SatScan can identify irregularly-shaped clusters by applying overlapping circles of different radii. We have established criteria for discriminating between different spatial patterning of genetic markers in patrilocal, matrilocal, and avunculocal cemeteries, and the method worked with 100% accuracy on the simulated cemeteries. We also discuss future applications of SatScan to Amish cemeteries with known genetic relationship, and to an ancient DNA analysis of an archaeological cemetery population.

Introducing a new three-dimensional technique (curve matching) to study of the midfacial region in European Mid-Upper Pleistocene hominids.

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Facial morphology plays a prominent role in explanations of human evolutionary history. The mid-face – including the nasal, maxillary, and zygomatic regions – has been studied intensively because of their importance in mastication. Neanderthals demonstrate a unique facial morphology, which differentiates them from the general face of hominids (Rak 1986, Churchill 1998). Although modern computerized techniques are beginning to be employed on the different parts of the hominid cranium (Harvati 2003a, 2003b, Zollikofer 2002, Zollikofer et al 1998, Zollikofer et al 1995), the mid-facial region in general, and Neanderthal midfacial prognathism in particular, have not been explored metrically using three-dimensional analysis.

The main question of this research is: does comparing the mid-face region of Neanderthals to European Middle Pleistocene hominids (*Homo heidelbergensis*) and the mid-face region Neanderthals to early modern Europeans produce a quantifiably consistent morphological pattern?

This research produces geometric and morphometric three-dimensional analyses of the surface data. The data are collected from the mid-face of modern humans and fossil hominids using a computer scanner. An original software (designed for this purpose), which inputs laser-scanned data from the surface of the skulls, has been employed to transform the raw facial data to the comparable curves to investigate degrees of similarity and matching between the mid facial curves of different hominids. Our initial study (samples including modern humans and fossil hominids) provides us with significant divergent between European Neanderthals and modern humans for the zygomatic and infraorbital regions; however, data suggests that in the case of alveolar prognathism European Neanderthals were not very different from modern humans. Surprisingly, it is Archaic *Homo sapiens* who are most different from both Neanderthals and modern humans.

Intraspecific variation in sexual dimorphism.

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Estimates of sexual dimorphism are used in fossil studies for questions on several, interrelated topics; direct discussions of the amount of sexual dimorphism in a fossil sample and its implications, accurate sexual classification, and accurate taxonomic classification. Previous work by the authors has shown that human populations in different areas of the world vary significantly in the degree to which they display sexual dimorphism and in the craniometric traits which such dimorphism is expressed. Population and regional level variation in the expression of sexual dimorphism is not necessarily surprising, but it has important consequences both for how we understand sexual dimorphism in extant species, and how we deal with sexual dimorphism in the fossil record.

In this paper, the authors explore the consequences of intraspecific variation in the degree and pattern of sexual dimorphism as it pertains to these topics. Special attention is paid to the quantitative consequence of failing to account for intraspecific variation in dimorphism, the sample size necessary to accurately estimate sexual dimorphism for a given trait, the appropriate use of comparative samples, and the importance of intrasexual variation in determining levels of sexual dimorphism.

Troop structure of the Mesoamerican black howler monkey (*Alouatta pigra)* and consequences of habitat fragmentation.

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Dynamics within and between troops of the black howler monkey (*Alouatta pigra*) has been documented for populations in fragmented landscapes. It has been hypothesized that adult males protect immatures in their troops, and that adult females of a troop compete for breeding positions and food. No such information exists for *A. pigra* populations living in extensive undisturbed forests, and only recently demographic data became available for such populations (8 populations; 120 troops). In this paper, we provide information to further our understanding of howler intratroop dynamics by focusing on *A. pigra*'s troop productivity, adult female competition, and adult male protection hypothesis. This will be achieved by investigating the correlations among troop size, number of adult of both sexes, number of immatures, adult sex ratio, and immature to adult female ratios in troops. Additionally, patterns will be compared for the eight populations in extensive forests with those for populations living in fragmented landscapes (2 populations; 61 troops).

In extensive forests, larger troops have more immatures per adult female, suggesting a higher reproductive success. The relative reproductive success (immatures/adult female) lowers with every adult female added to the troop, supporting the hypothesis that adult females compete for limited sources. Number of infants per adult female is positively associated to the number of adult males in a troop, supporting the adult male protection hypothesis.

In fragmented landscapes, however, results do not support the hypothesis of adult female competition and adult male protection hypothesis, indicating disruption of social dynamics and possibly reproductive success.

On the origins of strong polygyny and socially imposed monogamy in humans.

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Because humans show pair-bonding, the environmental potential for despotism is reflected in social polgyny. We first show that increased despotism is expected

under a general primate model of male-male coalitions, where the egalitarian system of mobile hunter-gatherers, maintained by large-scale leveling coalitions, is replaced by a despotic system with violent, revolutionary coalitionary takeovers of top ranks. Humans also differ from the other primates in that groups are spatially subdivided, which can produce cliques or class structure. Historically, however, some societies have shown a return to more egalitarian social relationships among males. We present a concession model, in which high-ranking males recruit support from lower-ranking males by granting them more reproductive success. A critical prediction is that transitions to social monogamy or dissolution of castes are found in societies under enemy occupation or involved in a desperate war.

In this paper we investigate the importance of predators in limiting primate populations by testing the following predictions using data taken from the primate literature. First, we predict that habituated primate populations experiencing reduced predation risk due to continuous human presence increase in numbers, at least during the initial years of human presence, whereas unhabituated populations do not. Second, we predict that population densities of primate species in otherwise similar forests in which carnivore predators have disappeared should be lower than those in forests with predators. The results allow us to estimate the relative magnitude of the effect of carnivore predators on primate populations. We discuss the implications of these results for primate population ecology and conservation biology.

Antioxidants and pollution among the young and elderly in México.

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One of the classical problems in physical anthropology is assessing the relationship between nature and nurture. In our case we are also interested in searching for factors that influence the health status of the elderly. Our research interests have taken us to study oxidative stress in several samples of the Mexican population, and evaluate if the levels of antioxidants are related to air pollution and ageing.

We conducted a cross-sectional study among 37 young persons and 88 elderly persons living in Actopan, a small town far from the areas with high air pollution and that still has rural patterns of life, and compared them with 75 young persons and 112 elder persons from México City, a place with very high air pollution and an stressful life-style.

Our findings show that oxidative stress is definitively higher among the inhabitants of México City than those living in Actopan, young and old. There is also a stressful effect of age in both of the places studied, but they are much smaller than the environmental effects.

There seems to be no relation of oxidative stress with the severity of chronic diseases in the elderly, but we found that sleeping less than six hours per day is a risk factor for having higher oxidative stress.

The paleobiology of *Pachylemur*.

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We surveyed newly recovered as well as museum-held specimens of *Pachylemur*, one of the least studied subfossil lemurs. *Pachylemur* resembles extant ruffed lemurs (*Varecia*) in details of its dental morphology. Its body mass exceeded that of *Varecia* by about threefold, but it was nevertheless one of the smallest of the extinct lemur genera. Like *Archaeolemur*, *Pachylemur* is known from practically all of Madagascar's primate subfossil sites, from the extreme southeast (Andrahomana) to the extreme southwest (e.g. Anavoha) to the west (Belo-sur-mer) to the central highlands (Ampasambazimba) to the northwest (Anjohibe/Anjohikely) to the extreme north (Ankarana). However, unlike *Archaeolemur* (which is one of the most common subfossil lemurs at numerous sites), *Pachylemur* is well represented only at stream sites in the southwest, especially Tsirave. Dental remains from Tsirave and from the central highlands confirm the existence of at least two species (*Pachylemur insignis* at Tsirave and *Pachylemur jullyi* at Ampasambazimba); these dental morphologies are quite distinct. The postcrania demonstrate a large amount of variation, with no clear geographic distinctions other than a tendency (often not statistically significant) for elements from Ampasambazimba to surpass the size of those from Tsirave. *Pachylemur* survived the advent of humans in Madagascar by over 1000 years, and there is evidence of butchery by humans at Tsirave. Analyses of dental microwear and macrowear, and the pattern of antemortem tooth loss are permitting reconstruction of its dietary adaptations.

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The digital graphic analysis of the facial skeleton of Upper Palaeolithic skulls from P□edmostí near P□erov (Czech Republic).

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Although one of the largest collections of skeletons from the Upper Palaeolithic population from P□edmostí was irreversibly damaged during the Second World War, the study of and research into this population has continued to this day. In addition to earlier publications, the excellent documentation, which includes high quality glass-plate negatives of the bones, was rescued.

This presentation, based on the papers by Velemínská et al. (2003) and Katina et al. (2003), presents a detailed craniometric analysis of the splanchocranium, including a morphological and dimensional comparison with the recent Central European norm. The study is based on the analysis of digitized images of four skulls in the lateral projections, which were suitable for the measurement using specialised Craniometrics software. We focussed mainly on the size and shape of the mandible and the maxillomandibular relations.

The heights of the faces of the Palaeolithic skulls are similar to those in the recent Central European population. The face has a markedly longer mandibular body (3-4SD) while the female mandibular branches are even shorter. The skulls are further characterised by the smaller gonial angle, the increased steepness of the

mandibular ramus and the greater angle of the chin. These changes in the size and shape as compared to the norm, associated with anteriorotation of the face, produce a strong protrusion of both jaws, but the sagittal intermaxillary relationships remain unchanged. The observed facial morphology is comparable to the Czech Upper Paleolithic skulls from Dolní V□stonice.

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Locomotory apparatus and health status of the early Medieval population in Great Moravia (the Czech Republic).

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The focus of this research is the comparative assessment of characteristics attributed to the development and health status of the locomotory apparatus of the early medieval Slavonic population in Central Europe (the Great Moravian Empire, 9th – 10th century AD). The population samples with different socioeconomic statuses were compared. We evaluated about 1200 skeletons from (1) the Mikulcice castle cemeteries and (2) the cemeteries around the castle and (3) two cemeteries located in the surrounding area of Mikul□ice site - the poor rural village of Josefov and the fortified settlement of Prušánky. Our results were compared to findings in the modern population (e.g the Pachner clinic's collection).

The following characteristics were examined: ontogenesis, sexual dimorphism, robusticity and bilateral asymmetry of limb long bones, degenerative joint disease of the spine and appendicular skeleton, osteoporosis (double energy roentgen absorptiometry; e.g. Mays et al., 1998), enthesopathies, and additional articular facets, the strength of the cortex with respect to the marrow cavity of femur (e.g. Stirland 1998), the degree of flattening of the diaphysis femur and tibia, femoral neck-shaft angle, Harris lines, and injuries. Some of these characteristics are related to mechanical loading and are considered to "the occupation stress markers".

The results more or less confirm the presumption that the socially superior members of society were buried at the castle (better living conditions), while we may assume that the cemeteries around the castle and the hinterland were the burial places for the socially lower classes.

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Stature estimation from the calcaneus as tested using the William M. Bass Collection.

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Stature estimation from the long bones is generally the most widely used method for determining the height of an individual. However, new methods using other skeletal elements are continually being developed and tested in order to provide a wider array of options, especially for fragmented remains. In a 1995 study, Holland estimated stature from the calcaneus using the Haman-Todd Collection, resulting in accuracy comparable to previous studies on partial long bones. Bidmos and Asala (2004) also recently published a similar study using the calcaneus of South African Blacks from the Raymond Dart Collection. The calcaneus is resilient and is frequently found intact; therefore it has great potential in its applicability to estimate stature in a forensic context.

The current study seeks to test the equations derived by Holland, as well as those by Bidmos and Asala, in an effort to test the effects of population specificity and secular trends on their equations. Measurements were taken on the adult calcaneus of 75 white males and 30 white females from the William M. Bass Donated collection housed at the University of Tennessee, Knoxville. Results indicate success rates comparable to those derived by Holland with an RMSE ranging from 6.29 to 6.7, and bias from 1.92 to 2.57, suggesting that Holland's equations were efficient estimators with little bias. Differences in the success rates were expected due to secular trends between the Haman-Todd and Bass skeletal collections. Comparisons using the Bidmos and Asala data were not successful, likely due to the population-specificity of the formulae.

Opportunistic hunting and occasional consumption of prey items by chimpanzees (*Pan troglodytes*) at the Primate Foundation of Arizona.

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Hunting in wild chimpanzees (*Pan troglodytes*) has been well documented for over 30 years. However, to date, no studies have reported observing this behavior in captive chimpanzees. The Primate Foundation of Arizona (PFA) is a biomedical research facility and although every effort is made to insure rodents and other indigenous animals do not enter the cage, an occasional small mammal or bird does enter the outside cage area. This study documents thirteen known successful 'hunts' over a 2-3 year period by four captive chimpanzees presently housed at PFA. The most common prey items were rock squirrels (*Cittallus variegatus*) at 61.5%, followed by mourning doves (*Zenaida macroura*) at 15.5%. The most common method of kill was a bite to the head (76.9%), indicating the deaths were deliberate and not accidental. Two adult males, one wild-born and one captive-born, accounted for over 75% of the hunting episodes. Prey were captured and killed while the chimpanzees were in their outdoor enclosures. In all but two episodes, prey was left in the outdoor enclosure or was carried inside and deposited into bedding material. The remaining two episodes involved mourning doves captured by the captive-born male. In both of these episodes, the male carried the prey inside and proceeded to consume the meat and bones. These results have implications for the surveillance of outdoor areas in other facilities and the potential for disease or introduction of parasitic vectors, as well as serve as an interesting comparison to wild chimpanzee behavior.

Contrasting patterns of male and female-mediated gene flow in wild bonobo populations.

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Observations suggest that for wild chimpanzees (*Pan troglodytes*) and bonobos (*P. paniscus*), it is largely just females that transfer between social groups at maturity, while males remain in their natal groups for their entire lives. This dispersal pattern is highly unusual among mammals and leads to the prediction that most of the gene flow among populations is female-mediated, and that some males within communities are paternally related. We used DNA from noninvasively

collected fecal samples from multiple communities from four localities across the bonobo species range to contrast the population genetic structure inferred from a female-transmitted marker, the mitochondrial DNA, with that obtained from male-transmitted Y-chromosome microsatellites. Results from mtDNA analysis reveal haplotype sharing among nearly all sampled localities and show little geographic patterning of the variation observed. In contrast, the Y-chromosome variants are highly location-specific. These findings can be interpreted as evidence for substantial female-mediated dispersal but little or no male-mediated dispersal. Within communities, unbalanced proportions of just a few Y-chromosome haplotypes are found, which likely reflects the combined effects of male patrilocality, unequal reproductive success among males and genetic drift. These results are reminiscent of those found in studies of traditionally patrilocal human communities. Finally, although the Y-chromosome results suggest a limited number of patrilines are present within social groups, analysis of biparentally inherited autosomal markers is necessary to estimate precise family relationships among males in order to evaluate the importance of male kin bonds in the social evolution of our closest living relatives.

Geometric morphometric data of the hominoid infraorbital region as discrete phylogenetic characters.

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This study proposes a method by which discrete characters might be derived from complex geometric morphometric data, for use in parsimony analysis. In order that it can be used in the cladistic algorithm, data must be in the form of discrete characters. For morphology, this normally means character states that are derived from subjective descriptions of anatomy, or univariate metric characters that can be difficult to parse into discrete states. Following on the methods of Lockwood et. al (2002), a technique is here proposed by which high-resolution geometric morphometric data can be reduced to qualitative states for use in parsimony analysis.

For this study, a dense set of landmarks was collected from the infraorbital region of great apes and modern humans. Subsets of the landmark data that represent the traditional morphological characters of the hominoid infraorbital region were drawn from the overall data set and, using Morphologika software package, subjected to procrustes analysis and principal components analysis. For each landmark subset, shared character states were determined by plotting principal component scores, identifying clusters of component scores, and using Morphologika's axis-exploration tool to evaluate the morphology represented by the components.

Results show great similarity between the traditional character descriptions of the infraorbital region and the character states identified by geometric morphometrics, suggesting that this method may prove useful in identifying character state data appropriate for parsimony analysis.

Patterns of relatedness and the population genetic effects of male-biased dispersal in savannah baboons at Gombe National Park and Mikumi National Park, Tanzania.

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Noninvasive sampling for use in genetic analyses is a powerful tool for advancing knowledge in population biology, behavioral ecology, and conservation. Using fecal DNA extraction and genotyping methods, we genotyped 124 olive baboons (*Papio hamadryas anubis*) from Gombe National Park, Tanzania at 16 unlinked microsatellite loci. Additionally, 122 yellow baboons (*Papio hamadryas cynocephalus*) from Mikumi National Park, Tanzania were genotyped at the same 16 markers from blood-derived DNA using standard methodology. Mean observed heterozygosity across markers was 0.71 in Gombe and 0.76 in Mikumi, with a mean of 6.4 and 8.0 alleles observed in Gombe and Mikumi, respectively. Exclusion methods were used to assign paternity to 13 offspring at Gombe and 7 offspring at Mikumi. We examined patterns of mean pairwise relatedness within known relationship categories and within demographic classes. Relatedness within known relationship categories was consistent with expectation. Within Gombe, mean pairwise relatedness among mothers/offspring was 0.461, among fathers/offspring 0.423; 0.307 among minimum half-sibships, 0.223 among grandparental, and 0.211 among avuncular relationships. Within Mikumi, mean pairwise relatedness among mothers/offspring was 0.482, among fathers/offspring 0.469, and 0.256 among minimum half-sibships. However, mean pairwise relatedness within demographic classes differed between locations for adult females, adult males, and juveniles. We discuss differences in patterns of relatedness in both populations under the predictions of age-structured paternal half-sibships, and high variance in male reproductive success. Additionally, we discuss relatedness within and between age-class, sex, and social groups, under the hypothesis of inbreeding avoidance as an adaptive behavior promoting sex-biased dispersal in these two subspecies.

Integration and evolution of covariance structure in the masticatory apparatus of galagos and lorises.

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Morphological variation in the masticatory apparatus among lorisoids correlates with size and diet. For example, larger, more frugivorous lorisid species have relatively more robust jaws than smaller, more insectivorous lorisids. Galagids exhibit size-correlated changes in jaw morphology that appear to be associated with the high degree of frugivory in the larger, greater galagos. These functional and/or size-related changes in lorisoid jaw form present an opportunity to examine whether and how variance-covariance (VCV) structure has diverged with changes in trait means.

I compared VCV structure among 5 lorisid (*Arctocebus calabarensis, Loris tardigradus, Nycticebus coucang, N.pygmaeus*, *Perodictucus potto*) and 7 galagid species (*Galago senegalensis, G.moholi, Euoticus elegantulus, Galagoides demidoff, G.alleni, Otolemur crassicaudatus, O.garnetti*) (n=306). I examined 10 masticatory apparatus dimensions related to jaw leverage or resisting internal loads. A combined-sample PCA demonstrates species differences in these dimensions. I compared the magnitude of morphological integration among species using the eigenvalue variance from the trait correlation matrix. I examined interspecific changes in covariances by comparing a disparity matrix (Steppan, 1997) to interspecific Mahalanobis distances for raw trait means and trait shapes. I evaluated correlations among distance matrices using Mantel's test.

The magnitude of morphological integration does not differ between lorisid and galagids. Galagids show some tendency toward increasing integration with larger

head sizes. Lorisids do not. Covariance structure is correlated with divergence in trait means, but not trait shapes. These results suggest VCV structure of lorisoid masticatory apparatus has changed in accord with size-correlated evolution of jaw form.

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Variance dimorphism and the evolution of sexual dimorphism in the hominoid postcrania.

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Extant hominoids, from gibbons to gorillas, differ in sexual dimorphism (SD). Accurately describing hominoid SD evolution using comparative approaches is limited by the paucity of living species. We might, however, reconstruct key components of hominoid SD evolution using quantitative genetic models. The Luetenegger and Cheverud model incorporates variance dimorphism by hypothesizing that conspecific males and females differ in variation levels. Here, I examine postcranial variance dimorphism in extant hominoids and discuss how variance dimorphism may have affected hominoid SD evolution.

To address the association between SD and postcranial variation, males (m) and females (f) of *H.lar* (m=53;f=50), *P.pygmaeus* (m=27;f=28), *P.troglodytes* (m=39;f=73), *G.gorilla* (m=74;f=64) and *H.sapiens* (m=53;f=50) were studied. Variation was quantified by the standard deviation (STDEV) and coefficient of variation (CV) for humeral, radial, ulnar, femoral and tibial dimensions. Variables were divided into regional and functional categories for analyses. Mann-Whitney U-tests were performed on STDEVs and CVs for these postcranial dimensions to assess whether conspecific males are more variable than females. The amount of phenotypic variation (STDEV and/or CV) for the sexes were then incorporated into the quantitative genetic model to see how these differences might affect SD evolution in postcranial characters.

Results demonstrate that males tend to have increased postcranial variation than females, especially in the more dimorphic species. A positive correlation exists between SD and variance dimorphism across hominoid species. These findings suggest that variance dimorphism could have played a significant role in character and SD evolution among extant hominoids.

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Late Pleistocene teeth from the Altai: a reappraisal.

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In the course of the 1980's excavations carried out by the Institute for Archaeology and Ethnography of the SB RAS, the earliest human remains in northern Asia were discovered in the Altai mountains of Russia. The sample includes seven isolated teeth from two different caves, both associated with the so-called "Altai Mousterian", the easternmost variant of the Mousterian. They date to oxygen isotopic stages 5 (Denisova cave dm_2), 4 (Denisova cave I^1) and 3 (Okladnikov cave dm_2, M_1, P_4, left and right M_3).

Previous studies by Turner (1987, 1990) and Shpakova (2001) have yielded very different results regarding possible Neanderthal affinities of the teeth, as well as regarding similarities with recent Asian populations. The number and age of the individuals present, as well as the anatomical position of the teeth are also in disagreement.

Here we present the results of our reanalysis of the Altai teeth. The results of our metric and nonmetric comparisons suggest that the specimens from Okladnikov cave are most similar to anatomically modern humans, while the I^1 from Denisova cave is rather archaic. The high degree of abrasion of the Denisova dm_2 does not allow any conclusions.

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Progesterone levels during conception and implantation do not predict subsequent fetal loss.

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In Bolivian women, conceptions leading to full-term birth typically occur at progesterone levels only about 70% those of U.S. women (Vitzthum *et al.* 2004 PNAS 101:1443-1448). Thus interpopulational variation in progesterone does not necessarily indicate differences in fecundity. Within a population, however, relatively lower progesterone may reduce fertility by failing to stimulate adequate development of the endometrium, necessary for successful implantation. This may subsequently lead to fetal loss. We tested this hypothesis with longitudinal data from Project REPA, a study of reproductive functioning in Bolivian women.

Serial salivary samples, assayed for progesterone, were collected from women from before conceiving through to either birth or fetal loss. Serial urine samples were tested for hCG, evidence of implantation. Indices summarized progesterone levels during the pre-conception and periconception periods, and each of 4 subsequent weeks. Analyses included only those conceptions persisting >14 days after conception (thus encompassing implantation) with □25 mIU/ml hCG for □3 days.

In these Bolivian women, none of the indices differed significantly between the samples of conceptions ending in fetal loss and those that went to term. That is, progesterone levels during conception and implantation do **not** predict pregnancy outcome in those conceptions persisting for >14 days and characterized by a rise in hCG of at least 25 mIU/ml for at least 3 days. It remains to be determined if conceptions in which hCG failed to reach this level and/or ended sooner are associated with lower progesterone levels during conception and/or implantation.

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Ecological and social correlates of coalition formation in white-faced capuchin monkeys, *Cebus capucinus*: why escalate?

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Escalations in aggression can take several forms. One of the most costly forms aggression can take in non-human primates is polyadic aggression, also referred to as coalitions. Most studies on coalition behavior in primates have examined the evolutionary significance of this behavior without taking into account the effect of present ecological conditions on rates of coalition formation. To date, no studies have analyzed whether ecological conditions influence the occurrence of within-group polyadic aggression in non-human primates. By controlling for "proximate" social variables, I test if "ultimate" ecological variables can be used to

predict escalations from dyadic to polyadic aggression in wild white-faced capuchin monkeys. If the latter is not significant holding the former constant, this result implies that the total number of individuals in the tree at the time of interaction alone can be used to predict the switch from dyadic to polyadic aggression and that ecological variables are not as important in influencing decisions in coalition formation.

Overall, the results of the study indicate that both ecological and social variables are affecting coalition formation in *C. capucinus*. Three of the ecological variables predicted the transition from dyadic to polyadic aggression: Feeding bout length, Minutes Lost Feeding and Distance Traveled after an aggressive interaction. The latter two variables are measures of the opportunity cost of contesting access to a given food patch. In conclusion, ecological differences between populations of *Cebus capucinus* may help to explain differences in the relative frequency of coalitional aggression found.

Hip bone trabecular structure/architecture in African *Homo erectus*.

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Notably in "sandwich-like" bones, the inner cancellous network site-specifically adapts during growth to the functionally-related dynamic relationships between external bony shape and biomechanical environment(s). While the postural/locomotion-related ontogenetic patterning of the extant human hip bone trabecular architecture has been investigated, scarce information is currently available about the structural cancellous condition in fossil *Homo*.

By means of conventional radiography assisted by advanced techniques of digital image processing, we quantitatively detailed the topographic variation of the trabecular architecture in six African *H. erectus* ilia (or iliac fragments) from East Rudolf (KMN-ER 3228, ER 1808), West Turkana (KNM-WT 15000), and Olduvai Gorge (OH 28). Despite the diffuse effects of taphonomic factors (notably evident on ER 3228 and 1808), wide spots of cancellous network suitable for reliable comparative analyses are preserved in most of the investigated specimens.

Trabecular anisotropy, bone fraction, and mean strut thickness were measured on site-specific homologous sub-areas identified on calibrated x-ray films transformed into high-resolution digital images. Line Fraction Deviation index maps were also calculated.

A one by one topographic comparison shows that the *H. erectus* cancellous pattern (structural organization in bundles) and site-specific textural anisotropy do not significantly differ from the modern human condition. Whenever present, the acetabulocristal buttress is highlighted by a pronounced inner density. OH 28 presents an uncorformity between the orientation of the buttress and the direction of the underlying trabeculae. In terms of general shape, trabecular thickness distribution, anisotropy, bone fraction, WT 15000 shows a morphostructural dissymmetry unlikely resulting from taphonomic dynamics.

Nighttime parenting behavior among first-time adolescent and adult mothers: implications for child development.

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While research has explored the developmental implications of different patterns of infant care, relatively little is known about how parents care for infants at night. Nighttime parenting has become a topic of inquiry only within the last decade, and substantial data is needed to address the implications of nighttime parenting for child development. Existing data indicate a significant relationship between different sleeping arrangements and the form and frequency of particular behaviors, including breastfeeding, sleeping position, and presence of risk factors in the sleep environment (McKenna *et al*, 1999). The present study explores sleeping and feeding patterns of 24 adolescent (mean age 17.4 years) and 15 ethnically-matched adult (mean age 25.4 years) primiparas. The sample was drawn from a larger longitudinal study on transition to parenting across the first three years. Mothers were interviewed during their last trimester of pregnancy about knowledge of infant development and parenting beliefs. When infants were four months of age, overnight infrared video recordings of nighttime parenting behavior were obtained at the Mother-Baby Behavioral Sleep Laboratory. Participants were allowed to maintain typical sleeping arrangements and routines, and performed all caregiver interventions at will. Videotapes were coded for infant feeding method, sleep location, presence of sleep-related risk factors, amount of physical contact between mother-infant dyads, and potential neglect issues. Sleep lab data were analyzed for group differences and were related to prenatal cognitive readiness to parent, daytime measures of parenting behavior and child outcomes at one year of age. Implications for prevention and intervention were discussed.

Cognition and electroencephalography across the lifespan among the Ache.

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Electroencephalography (EEG) is a powerful method for documenting cognitive parameters and particularly useful to anthropologists because it can be applied in remote field conditions. Investigating traditional groups is desirable given their unique dietary and lifestyle factors, which intimately interact with cognitive function, and that human cognition emerged in the context of hunter-gatherer socioecology. Examining cognitive function across populations experiencing variable ecological conditions may ultimately provide a key for assessing determinants of human (cognitive) evolution.

This study recorded EEG and visual evoked potentials (VEP) among a representative sample of the Ache of eastern Paraguay. VEP assess the integrity of the visual system by recording EEG activity over the occipital cortex in response to visual stimuli. EEG spectral power, frequency, amplitude, coherence, and alpha-theta ratio show characteristic changes across the lifespan, while VEP peak latencies follow a typical U-shaped pattern over the lifespan. Cognitive development and senescence, as indicated by various EEG and VEP parameters, indicate the Ache experience variable timing patterns. How these patterns interact with ecological exigencies is considered.

Urban trauma: female injury recidivism in medieval London.

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Clinical studies of injury have identified a high-risk group of male individuals, known as injury recidivists, who have a history of trauma and a higher risk of death. Female recidivism is neglected within the clinical and palaeopathological literature, however analysis of the St

Mary Spital sample has identified a relatively high number of female recidivists. Their study is important as this group has not been intensively investigated in the medieval period and information about the injuries sustained can only be gained through palaeopathological study. This paper aims to explore the relationship between female life and recidivism within medieval London, employing a biocultural approach and gender theory.

Bone and tooth fractures, joint dislocations and indications of soft tissue trauma were recorded in a sample of 1509 individuals of 18 years of age and over (605 identified as female, 813 as male). The number of injuries on each individual and the trauma mechanisms involved were identified in order to elucidate injury patterns, after Judd 2002 & 2004. Evidence of healing and treatment were also recorded.

This study found that male trauma increased at a relatively even rate throughout life, whereas the female rate peaked within the 26-35 year age category; where similar levels of trauma for females (27%) and males (28%) were found. In other age groups the male rate approached twice that of the females. The prevalence of female multiple trauma (7.4%) actually exceeds that of the males (5.3%) in the 26-35 year category.

Time, temperature, and oxygen availability: an experimental study of the effects of environmental conditions on the color and organic content of cremated bone.

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Although the color of bone is often used in forensic and archaeological studies as an index of the conditions of burning, little systematic research has been done to determine the types of cremation environments that are likely to result in specific bone colors. Experiments were conducted to determine the effects that the availability of oxygen during cremation, the duration of cremation, and the temperature of cremation had on bone color. The results show that oxygen availability has a profound effect on the color of cremated bones exposed to the same cremation temperatures. Black bones and white "calcined" bones were produced under the same temperature regimens. However, as the duration of cremation increases, the influence of oxygen availability on bone color gradually diminishes.

Chemical analysis of the experimental bones shows that collagen persists in bones exposed to a temperature as high as 600 degrees C and that bone color provides a useful index of the presence of collagen and perhaps other biomolecules. We are currently studying the samples used in our experiments to determine the correlation between the presence of collagen and DNA preservation.

Cementum Luminance Analysis (CLA): a new approach to dental cementum studies.

C.M. Wall. Department of Biological Anthropology, University of Cambridge, UK.

This study utilises luminance profiles of dental cement to gain a better understanding of cementum formation and its usefulness to studies of seasonality. Three control populations of Artiodactyla species were utilised, *Ovis aries*, *Ammotragus lervia*, and *Capra ibex*, to assess the usefulness of CLA in determining what relationship the banding patterns of cementum have with age, sex, reproduction, temperature and precipitation. It was determined that changes in cementum luminance significantly correlate with changes in both the temperature and the degree of seasonality in a region. These finds were then applied to the site of Haua Fteah, Cyrenaica and Gorham's Cave, Gibraltar. *A. lervia* remains from Haua Fteah (N=160) show signs of increased summer temperatures and seasonality from the late Pleistocene through to the Holocene; this conforms with other palaeoclimatic studies from the northeast African region. *C. ibex* from Gorham's Cave assemblages (N=20) show an overall trend towards decreasing winter temperatures through Marine Oxygen Isotope Stage 3, also confirmed by other data. It was not found, however, that the luminance data interfered with the gathering of a correct assessment of age and season of death of any of the species and in fact contributed to an understanding of seasonal patterns in these two regions. The pattern at Gorham's Cave indicates multiseasonal use by the Neanderthal populations; Haua Fteah further shows multiseasonal patterns, but shows variation in the age profiles of animals killed during winter periods versus those killed during the summer periods.

Functional heterogeneity of the temporalis muscle of male and female baboons.

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Little is known about functional heterogeneity in the primate temporalis muscle even though it is the largest of the jaw adductors. We studied the EMG activity in the deep and superficial parts of anterior temporalis (DAT and SAT), and the posterior temporalis (PT) in 3 male and 3 female baboons.

We tested the hypothesis that during mastication the relative proportion of fast-twitch fibers is correlated with the production of large bite forces. In baboons, SAT and PT have significantly more fast-twitch fibers than DAT. It is generally known that fast-twitch fibers generate higher tension and do so more rapidly than slow-twitch fibers. This hypothesis predicts that SAT and PT have activity of shorter duration than DAT, confined mainly to the power stroke with little activity during fast closing. It also predicts that increased activity during mastication of resistant food compared to soft food should be greater in SAT and PT.

Results indicate a high level of functional heterogeneity and confirm both predictions. In both males and females, the duration of activity is shortest in PT, intermediate in SAT, and longest in DAT. In both SAT and PT, the rise and fall times of the rms-EMG are faster and the onset is later. Most striking is that SAT and PT are relatively inactive during soft-food mastication. These data suggest that the role of SAT and PT in both sexes is to produce high levels of force during the power stroke of forceful chewing and biting.

Supported by NIH and NSF.

Testing models of ancient admixture using sequence polymorphism data.

J.D. Wall. Molecular and Computational Biology, University of Southern California.

I describe a simple demographic model that incorporates the potential admixture between "archaic" humans (e.g. Neanderthals or Asian *Homo erectus*) and modern humans over the last 100 thousand years. Given sequence polymorphism data from multiple unlinked nuclear loci, I show how to rigorously test the null model of no admixture and to estimate the amount of admixture if the null model is rejected. In

collaboration with Mike Hammer's laboratory we are gathering DNA resequencing data from a world-wide sample of humans to address this question. I will describe the motivation for the study design and highlight future directions for our project.

Competition between chimpanzees and humans over *Saba senegalensis*.

M.T. Waller. Department of Anthropology, Iowa State University.

The fruit of the *Saba senegalensis* vine is important to chimpanzees and humans inhabiting the Tomboronkoto region of southeastern Senegal. For chimpanzees, the fruit is a primary food source from May through July. For humans, the fruit represents a much needed source of income at a time when crop stores are depleted and new crops have yet to produce.

This study examines the level of competition over the fruit of *Saba senegalensis*. near three villages that border the Fongoli Research Site. A total of 15 transects, one kilometer each and five at each village, were monitored from May through July, 2004. Each vine was marked and the fruit counted. Direct or indirect (feces, nests, fruit remains, and tools) evidence of presence near *Saba senegalensis* vines was evaluated and the number of fruit extracted by humans and chimpanzees was measured.

The results give a more complete view of chimpanzee and human behavior pertaining to the fruit of the *Saba senegalensis*. Chimpanzee activity focused on the area of highest fruit density and lowest human extraction during this time period. While these results are not surprising, they may play a role in future conservation decisions.

***In vitro* strain of monkey facial sutures.**

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Knowledge of how sutures behave under mechanical load and how suture fusion influences patterns of bone stress and strain is likely to be important for understanding craniofacial biomechanics and bone adaptation. However, *in vivo* bone strain experiments in primate faces usually do not consider the status of sutures. In this study, we measured *in situ* strains on some patent and fused facial sutures and their adjacent cortical bone surfaces with rosette strain gages in the skull of a subadult male *Macaque fascicularis* cadaver. Loadings comparable to physiological biting forces were placed on teeth with a DDL-RT200 loading machine while the skull was fixed posteriorly. The reliability of strain measurements was assessed by repeated tests indicating a method error of less than 8%. Results showed that average strain values in patent sutures were an order of magnitude higher than in adjacent regions of cortical bone. Strain magnitudes and orientations were often considerably different on cortical bones found on adjacent sides of patent sutures. These phenomena generally were not observed on and adjacent to fused sutures. Both patent and fused sutures showed different patterns of strain relative to loading conditions. These findings demonstrate the role of patent sutures in dampening cortical bone strain and suggest changes in patterns of stress and strain in the midface following suture fusion. Without correctly assessing whether sutures are fused or unfused, interpretations of the results of strain gage studies are problematic and extension of these results in finite element modeling is inappropriate.

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Reading between the lines, an assessment of stress from HK-43 tibiae.

A.J. Ward. Department of Anthropology, University of Arkansas.

Excavations at Hierakonpolis, home of the Narmer Palette, have been underway for over a century and have yielded a wealth of both archaeological and osteological data for anthropological research. Recent excavations have been conducted at the worker's cemetery (HK-43), and to date have yielded well over 400 individual burials. These skeletons offer a vast potential for knowledge pertaining to the pre-dynastic life of working class Egyptians and can provide valuable insight regarding quality of life. One of many techniques to assess the quality of life is examining Harris lines, which are thought to represent periods of stress in the individual's childhood (Larsen 1999). Harris lines are radio opaque lines, or horizontally oriented trabecullae that appear opaque due to increased density, and can be seen in long bone shafts. In field seasons 2002 and 2003, x-rays were taken of 45 tibiae from an anterior/posterior perspective. Scoring of Harris lines is based on either presence or absence. 93.3% (43:45) of these adult tibiae have one or more observable Harris lines. This suggests that although individuals from HK-43 did indeed experience periodic episodes of childhood stress, they still enjoyed a nutritionally adequate diet.

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Upright posture and vertebral anatomy in *Australopithecus*.

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The human vertebral column has undergone dramatic reorganization to accommodate kinematic and kinetic consequences of force transmission during habitually upright posture and locomotion. Humans are unique among mammals in having a series of sinusoidal spinal curves that serve to position the torso's center of mass over the hip joints. The structural and mechanical correlates of these curvatures are marked and numerous, and differentiate humans from other mammals. The lack of these morphologies in trained bipedal macaques implies strong genetic influence on their development.

Only in fully upright posture are human spinal curvatures present. Forward inclination of the torso, as during bipedal gait with hips and knees bent, would necessarily reduce the magnitude of these curvatures and obviate their structural correlates. If the earliest bipeds, *Australopithecus*, had not been selected to walk with fully erect posture, characteristic human spinal curvatures and their osteologic sequelae would not be evident.

We previously demonstrated the presence of human-like spinal curvatures in *Homo erectus*. Here we re-evaluate vertebrae of *Australopithecus afarensis* (AL 288-1) and *A. africanus* (STS 14), and analyze those of the *A. africanus* skeleton STW 431.

Our analyses identify the presence of a full lumbar lordosis and thoracic kyphosis in all three *Australopithecus* specimens. Each demonstrates human-like vertebral wedging, facet orientations, transverse and spinous process form. Our findings are consistent with other indicators of upright posture in *Australopithecus*, such

as the femoral valgus angle that is only present when the knee is extended. This suite of morphologies demonstrates fully upright posture in *Australopithecus*.

Primary tissue type variability in primate bone microstructure.

J. Warshaw. Anthropology Department, The Graduate Center of the City University of New York, New York Consortium in Evolutionary Primatology.

Bone microstructure varies greatly among vertebrates, with potential adaptive, behavioral and systematic significance. As part of an ongoing effort to characterize and interpret variability for several microstructural properties in primate bone, I present results from data on primary bone tissue type. Tissue type patterns are examined in light of the hypothesis that these vary as a function of bone deposition rates, and therefore reflect life history patterns. The sample includes histological sections from the midshaft femur, humerus, tibia, radius and ulna of a selection of adult strepsirhines, platyrrhines, and *Tarsius*. Sections were imaged in conventional transmitted and circularly polarized light microscopy, and images were processed for identification and quantification of bone tissue types.

Tissue type proportions vary among specimens, and this variation is nonrandom in its distribution. Taxa display consistent intraspecific patterns, and patterns vary among taxa. Often, these differences are in accord with expectations based on known taxon life history (e.g. larger strepsirhines display more fast-growing bone; haplorhines have more slow-growing bone), while other results contradict expectation (e.g. *Tarsius* displays more fast-growing bone than anticipated). Surprisingly, inter-element comparisons appear to track positional behavior. For example, specialized leapers display at least twice as much slow-growing bone in the humerus than the femur, whereas in quadrupedal generalists the values for the two bones are similar. Further consideration of postcranial proportions, element-specific growth trajectories, and potential tradeoffs between bone tissue growth rate and mechanical requirements are needed to better understand these patterns.

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Lethal intergroup coalitionary aggression by chimpanzees at Ngogo, Kibale National Park, Uganda.

D. Watts. Department of Anthropology, Yale University.

Researchers have documented lethal intergroup aggression by coalitions of male chimpanzees at several field sites. These include killings of infants, juveniles, adolescent males, and adults of both sexes. Controversy about the causes, consequences, and function of such behavior persists, partly because it is uncommon in mammals (although known in several social carnivores and in white-faced capuchins) also because we have few well-documented cases and the slow life histories of chimpanzees makes testing functional hypothesis about their behavior difficult.

Researchers have observed chimpanzees at Ngogo, Kibale National Park, Uganda, since 1995. The unusually large Ngogo community has included 36-38 adult and adolescent males. The chimpanzees were habituated without provisioning and have no contact with the human population outside the park. Researchers have seen eight between-community killings -- four of infants, one of a juvenile, and three of adult males -- and severe attacks on adult females whose fates were unknown. The most recent killing of an adult male occurred in August, 2004. Most of these attacks occurred during boundary patrols; others occurred when large male parties hear members of neighboring communities while foraging. I describe the lethal attacks on weaned individuals and provide contextual information on these and other between-community attacks at Ngogo. I do this within a comparative framework that draws on data from other nonhuman primates and from social carnivores. Ngogo data support the "imbalance of power" hypothesis and indicate that lethal coalitionary aggression is part of the natural behavioral repertoire of chimpanzees.

A methodological quandary: aging juvenile human remains

E.B. Waxenbaum. C.A. Pound Human Identification Lab, Department of Anthropology, University of Florida.

Numerous studies have highlighted the inconsistencies in methods related to the study of skeletal remains. This research addresses the methodology used in aging juvenile skeletal remains. Skeletal biologists have recognized the necessity of utilizing genetically appropriate populations for skeletal comparison. This is noted in the works of Merchant and Ubelaker (1977) and Sundick (1978) who present separate juvenile aging standards of Arikara and Indian Knoll Native American populations respectively. Recent analyses by this author utilizing both of these methods produced contradictory age ranges. This study addresses the issue of methodological selection.

The sample (n=66) consists of geographically and temporally related Southwest Native American populations (ca. 1100-1500 BP) from the National Museum of Natural History, Smithsonian Institution, Washington, DC. Maximum diaphyseal long bones lengths were obtained from seven elements for each individual. An age estimation was then obtained for each individual utilizing both Merchant and Ubelaker (1977) and Sundick's (1978) standards. Preliminary statistical results indicate a significant discrepancy in age assignment between these two methods. Due to the different methods employed by these authors the contradictions noted in this study are more likely methodological, highlighting the need for further discourse. Based on these results, this study hopes to draw attention to the importance of, and necessity for, prudent methodological selection in research preparation.

Does femoral head size reflect the magnitude of hip joint reaction force in adult humans?

T.D. Weaver. Department of Human Evolution, Max Planck Institute for Evolutionary Anthropology.

Paleoanthropologists commonly use the femoral head to estimate body masses and to reconstruct the gaits of fossil hominins, because its size is thought to reflect the magnitude of joint reaction force at the hip. The characteristically small heads of australopith femora are of particular interest for their possible implications for the body mass and the gait of these early hominins.

This study uses quasi-static equilibrium modeling of gait on males and females from two known-sex recent human skeletal samples — African-Americans from the Terry collection (M=15, F=15) and British from the Spitalfields collection (M=15, F=14) — to examine the assumption that femoral head size reflects the magnitude of hip joint reaction force. For each individual, the sacrum, one innominate, and one femur were rearticulated and oriented in anatomical position using manual marking of anatomical landmarks, 3-D digitizing, and computer manipulation; the lines of action of the hip

abductors were approximated by digitizing muscle origin and insertion locations; and body mass was estimated using reconstructed stature and bi-iliac breadth. From these data it was possible to use Newtonian principles to estimate for each individual the magnitude of joint reaction force at the hip during one-legged stance. Contrary to expectations, femoral head size does not appear to be strongly related to the magnitude of hip joint reaction force. In particular, females have femoral heads that are too small. Possible explanations for these and further results, as well as implications for inferring the life ways of fossil hominins, will be discussed in a developmental context.

Metric traces of a phenotypic link between Neanderthals and anatomically modern *Homo sapiens*.

G.W. Weber, P. Gunz, P. Mitteroecker, A. Stadlmayr, H. Seidler, F.L. Bookstein. Institute for Anthropology, University of Vienna, Austria.

The crux of the debate between the complete replacement model of modern human origin and the multiregional evolution model is not so much about whether Neanderthals were likely ancestors of modern Eurasians but about the evidence for gene flow, however limited, between those ancient populations. We introduce new neurocranial morphometric data from Mid/Late Pleistocene archaic *Homo* (AH) and anatomically modern *Homo sapiens* (AMHS) at unusually high geometrical resolution. The sample comprises 60 fossil specimens and 50 modern humans covering the widest possible range of recent variation. Our work differs from other traditions in having recourse to several hundred geometrically homologous landmarks, many from hitherto unquantified cranial regions.

The analysis, based on a highly composite measure of distance in a very high-dimensional shape space, confirms many of the known classifications of the 60 fossils that were based on cladistic characters, and the two groups AH and AMHS are separated quite well. However, the analysis also highlights the formally intermediate role of certain Late Pleistocene specimens. This distinct group is positioned at the fringes of AMHS variation and around the only "bridge" from AMHS to AH in a minimum spanning tree based on full Procrustes distance. Their specific morphology is also supported by an analysis following a decomposition into frontal and occipital regions. Our results cannot be regarded as evidence for a hybridization model (nor do rigorous conclusions follow from direct genetic studies or classic qualitative comparative morphology), but do not rule out this possibility.

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A mesio-buccal mandibular molar trait in ancient populations of Ireland.

J.D. Weets. Department of Anthropology, State University of New York, College at Potsdam.

In this poster, previously unpublished variation of a human dental trait in permanent mandibular molars is described. The character, presently labeled IMMP (the Irish Mandibular Molar Pit), is situated anterior to the position occupied by the protostylid on the buccal aspect of cusp 1, and is most commonly found on third molars. IMMP occurred in 32.6% of 126 lower right third molars and 28.3% of 131 lower left third molars from archaeological specimens dating to the Neolithic (c. 4000-1800 BC) through the Early Christian era (c. AD 400-1170) in Ireland. The character was tested for variation in its geographic and temporal distribution across the island. No significant differences were found in its occurrence between time periods, nor between regions of Ireland. But, a lack of significant variation between the island's ancient populations in other dental traits has been noted by the author in further research. Interestingly, an individual Viking specimen from Ireland exhibited IMMP. Personal correspondence with another dental anthropologist suggests the trait is present, at a much lower rate of expression, in East Asian populations (approximately 1-2% of his sample). These two findings indicate a widespread geographic occurrence that prompts more investigation of IMMP in other populations. Furthermore, marked difference of expression between populations from Ireland and East Asia suggest the trait will distinguish, at the very least, distant geographical populations and may make IMMP a useful addition to the suite of morphological traits utilized by dental anthropologists in biodistancing studies.

Reassessing sex in the Pecos Pueblo skeletal sample.

K. Weisensee. Department of Anthropology, University of Tennessee.

The sex estimations of the Pecos skeletal sample have been the subject of much debate and discussion. Analyses by researchers examining the Pecos series after E.A. Hooton have commented on his overestimation of males in the sample. The purpose of this paper is to examine the sex ratio at Pecos from two perspectives. First, using the metric data that Hooton collected, we re-assess the sex estimations for the Pecos sample using discriminant function analysis. These results show that as predicted by earlier research, there is a strong male-bias in Hooton's sex estimations.

Secondly, we test the hypothesis that Hooton used European standards to determine sex in the Pecos skeletons. In order to test this theory, we evaluated the sex of the Pecos skeletons using a discriminant function constructed from the Terry and Todd skeletal collections. When the Terry and Todd collections are used as the reference sample, the sex ratio of the Pecos sample is very similar to the one reported by Hooton. Finally, we attempt to determine that despite his comments to the contrary, Hooton weighted cranial features over pelvic feature to determine the sex of individuals. By re-constructing the ways in which early researchers determined the sex of skeletal samples, we can gain a cautionary perspective on the early reports from these samples. In addition, a more accurate picture of sex estimation can be used in the analysis of other aspects of population structure, such as postmartial migration patterns or comparisons of stature among regional populations.

Out of joint: what patterns of osteoarthritis might tell us about activity.

E. Weiss, R. Jurmain. Department of Anthropology, San Jose State University.

This study compares osteoarthritis pattern findings by Jurmain (1990, 1997, 2000) with new data (N = 93) to improve lifestyle reconstructions. Jurmain found spines are less useful than peripheral joints for reconstructing activities. Age is the main factor influencing onset and severity of osteoarthritis. Spines have the highest age correlations; ball-and-socket joints next highest; and, elbows lowest. Symmetry correlations among large joints (most to least) are shoulder, hip, knee, and elbow.

New composite osteoarthritis data correlate with age ($r = 0.61$, $P < 0.001$). Spines have the highest age correlations, then lower limbs, and then upper limbs ($rs = 0.64, 0.45, 0.37$, $Ps < 0.05$, respectively). Asymmetry is higher in upper

limbs (7%) than lower limbs (3%). With age controls, osteoarthritis and body size correlate ($r = -0.26$, $P < 0.05$), affecting weight-bearing joints (upper limb, $r = -0.08$, n.s.; lower limb, $r = -0.27$, $P < 0.05$). Males have more upper limb osteoarthritis; females more lower limb (Wilcox sign tests, Ps < 0.01). Significant correlations between joints exist (spine with: upper limb, $r = 0.47$; lower limb, $r = 0.33$, Ps < 0.01).

These new data corroborate previous findings and adds information. To reconstruct activities using osteoarthritis spines are not effective, age and body size controls are needed, and upper limbs are most useful. Osteoarthritis etiology is multi-factorial; thus, finding osteoarthritis and specific activity correlations proves difficult. Given age and sex influences, samples must be stratified; controls are most crucial when undertaking systematic paleoepidemiological comparisons, making large samples necessary.

The modern synthesis, modern genetics, and the worldview of physical anthropology.

K.M. Weiss. Department of Anthropology, Penn State University.

In the 1930s the 'modern evolutionary synthesis' combined Darwinian evolution and population genetics into a unified theory of evolution. By thirty years later, the nature and protein-coding function of DNA were known, adding a more specific kind of mechanism to an integrated genetic theory of life. This theory was thoroughly adopted by physical anthropology. Although some of the best existing data (e.g. sickle cell) were from humans, this gene-centered theory was more one of principle than actual fact because few relevant genes were then known. Nonetheless, human and primate traits of all sorts, from morphology to behavior were assumed to be genetic and the result of adaptive selection for unspecified genes. In the last 40 years, we have obtained detailed data on many aspects of human genetics, human history, and gene function. For many purposes, all human genes have been identified and their global variation is actively being characterized. However, most traits of interest to anthropology, especially behavioral traits, are still not well understood in specific genetic terms. Major conceptual advances have been made in understanding how genes are used and how genes relate to complex traits. Immense progress is occurring, but a largely unchanged nearly century-old theory is regularly extended beyond, and sometimes in the face of, what we actually know. The theory helps organize research and thinking in the field, but sometimes at the cost of over-specified interpretation. The future will see a working out of a better understanding of gene function, and a more nuanced application of genetics to complex human traits.

Replication experiments as a method for understanding cremation.

M. Weitzel. Department of Anthropology, University of Alberta.

Although methods have been developed to assess the effects of heat on bone, the majority of these involve laboratory tests in which bone is burned under controlled temperatures in ovens and have little relevance in reconstructing how bone was burned in open-air cremations. Previous analysis of cremated bone at a Late Neolithic/Early Bronze Age cemetery in the Lake Baikal region of Siberia compared to six experimental replication burials using domestic pigs as human analogues has shown that fire can be a very important cultural taphonomic agent influencing color, completeness, articulation, and fragmentation of skeletal remains. Further correlation of visual characteristics of bone to cremation technology is necessary in the interpretation of both prehistoric cremations and bodies burned in contemporary contexts. More recent replication experiments examine the effects of longer durations of burning on fleshed remains, burning of pit versus surface burials, and stirring of the burial fire. Results from these experiments help to further explain the skeletal condition of remains from prehistoric cremations in Lake Baikal and can be applied to other cremation sites both in antiquity and in forensic analysis.

An explanation for WLH 50's robusticity using computerized tomography.

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The large fossil calvarium, Willandra Lakes Hominid 50 (WLH 50) from South Eastern Australia, most likely dates to very soon after the Glacial Maximum (Simpson and Gr□n 1998) and has featured prominently in debates on modern human origins in the Australasian region. Some scholars have argued that it represents a transitional fossil between the Solo specimens and later Pleistocene/Holocene boundary fossils from the Murray River region of Australia (Hawks *et al* 2000). Others have argued that WLH 50's phylogenetic position is closer to specimens from Skhul and Qafzeh than it is to the Indonesian fossils (Stringer 1999). It has also been suggested that the morphology of WLH 50 has been affected by pathology. Some scholars have therefore proposed that the specimen should no longer feature prominently in arguments for the emergence of modern humans in the Australasian region (Cameron and Groves 2004).

In this study CT scans of the calvarium have failed to identify any evidence of 'hair on end' bone formation. What the scans do indicate is that the bone formation is abnormal and that sclerotic bone formation appears within the diploë. The evidence leans toward a differential diagnosis of Paget's disease although we note that Paget's disease is rare in the modern Aboriginal population. Paget's disease and subsequent thickening of the vault has the potential to distort characters that are often used in taxonomic assignments. These findings need to be taken into consideration by researchers wishing to employ WLH 50 in models of modern human evolution in the Australasian region.

Quality and consistency of infant care in daytime and nighttime parenting of first-time adolescent and adult mothers.

W.A. Wetherall, J.J. McKenna. Department of Anthropology, University of Notre Dame.

While anthropological inquiry on parenting behaviors has contributed a cross-cultural perspective on the diverse approaches to childrearing, fewer studies have focused on nighttime caretaking practices and their effects on child development.

Research shows that sensitive and responsive nighttime parenting may be as important as daytime care when it comes to the healthy physiological development of infants (McKenna, 1993). Further research has shown that maintaining close proximity to infants at night may reduce the occurrence of Sudden Infant Death Syndrome (Blair, 1999).

A study conducted at The University of Notre Dame Mother-Baby Behavioral Sleep Laboratory analyzed the nighttime parenting behavior and interactions of first-time adolescent and adult mothers and their infants. Using overnight infrared video recordings, questionnaires, and

direct observations during in-home assessments, data were collected from a sample of 24 adolescent (mean 18.9 years) and 15 ethnically-matched adult (mean 25.2 years) mother-infant dyads when the infants were four months old. During overnight sleep studies participants were allowed to maintain normal nighttime caregiving routines and sleeping arrangements, and performed all caregiver interventions at will.

This paper examines group differences between solitary sleeping, bed-sharing, and room-sharing dyads in the form and frequency of particular behaviors, including nocturnal awakenings, physical proximity, responsiveness and affectionate interaction. Nighttime data was compared to in-home assessments using the Landry Naturalistic Observation Rating Scale to determine continuity between daytime and nighttime caregiving behavior.

Functional implications of variation in lumbar vertebral count within Hominini.

K.K. Whitcome. Department of Anthropology, University of Texas at Austin.

A central uncertainty of hominin evolution is whether australopithecines had a modal number of five lumbar vertebrae as do modern humans or a longer sequence of six lumbar vertebrae, a variant in modern human populations. As debate over vertebral numbers in Sts14 and Stw 431 continues, the question explored in this study is whether or not differences in lumbar vertebral numbers inherently signal dissimilarity of spinal function. Lumbar spinal loading patterns were assessed from vertebral dimensions (ventral centrum length, dorsal centrum length, superior centrum width, and prezygapophyseal facet angle) in 60 adult males with five lumbar vertebrae and 21 males with six lumbar vertebrae. Angle of vertebral wedging was calculated trigonometrically from linear dimensions.

T-tests show no significant difference between the two column types in rate of change in either vertebral wedging or zygapophyseal obliquity through lumbar levels L1-L3. The more caudad lumbar region differs. While vertebral bodies are dorsally wedged at the penultimate and last lumbar levels of both column types, summed dorsal wedging is significantly greater in the 6-lumbar column (p<0.03). Lordosis therefore is more acute in the L6 variant group. Coronal obliquity of the zygapophyses strongly increases at the L5 level in both groups, and the L6 variant repeats this oblique progression at its last lumbar level. Because coronal facets are well positioned to resist anterior displacement of vertebral bodies, the more lordotic six-lumbar variant is stabilized by added facet obliquity. The L6 variant appears functionally equivalent to the modal lumbar column in morphological features under study.

Isotopic evidence of peripatetic behaviour at Pacatnamu, Peru.

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Stable carbon- and nitrogen-isotope ratios were analysed in bone collagen and in segments along the shafts of hair from eight individuals from the site of Pacatnamu, located in the Jequetepeque Valley on the north coast of Peru. All are from known grave contexts dating from Moche (ca. 450-750 A.D.) to Lambayeque periods (ca. 900-1100 A.D.). The mean $\delta^{13}C$ and $\delta^{15}N$ values of hair segments from individuals are comparable to those of bone and demonstrate increased consumption of marine resources in the Lambayeque period relative to the Moche.

Sequential analyses of the hair, however, reveals that intra-individual dietary variation occurring over periods of months is even greater than long term shifts associated with cultural change. The frequency, timing, and amplitude of intra-individual shifts are not very consistent with seasonal changes. Instead, they more likely indicate geographic relocations resulting from short term travel between regions with different food resources, for example, coast and highlands. Adult males appear to exhibit more dramatic shifts than either the single female or the children and there is no evident patterning in the residence place of individuals close to the time of death. There are several possible reasons for this variability. First, Pacatnamu may have been a pilgrimage site. Second, there may have been coastal-highland movement, indicating the verticality thought to characterize many ancient Peruvian exchange systems. Thus, the reason for these geographic relocations could have been either religious or economic.

Anthropogenic change in and around Beza-Mahafaly Reserve: methodology and results.

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Anthropogenic habitat disturbance has been an important issue in primate conservation. Most tropical forests, where primate diversity and abundance is at its highest, have been affected by this potent threat. Furthermore, primate conservation literature discusses this particular threat as the most severe to the viability of primate populations. While anthropogenic habitat disturbance has been discussed at length in the literature, it is rare to see actual measures and quantification of how disturbed forests differ from pristine forests. Here we test the hypothesis that unprotected forest tracts outside of the protected Beza-Mahafaly reserve show significantly more anthropogenic habitat disturbance at several levels. Moreover, we developed several key methods to quantify anthropogenic habitat disturbance variables.

In order to test the hypothesis, we performed three transects in seven different habitats in and around Beza-Mahafaly Reserve, southwestern Madagascar. Students' t-tests show that unprotected forest tracts outside of the reserve exhibit significantly more grazing, soil compaction, tree cutting and scarring, livestock manure, livestock paths, presence of humans, among other variables. These data quantify the obvious lemur habitat destruction that has occurred in this area in the recent past. Moreover, the results pinpoint some of the major disturbance variables that differ between pristine and unprotected forests. It is critical to both identify and understand the mechanisms behind the disturbance in these forests in order to mitigate the effects of these disturbances on the endangered lemurs of this area.

Molecular systematics of the lar group of gibbons (*Hylobates*).

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The gibbons (Hylobatidae) are divided into four genera or subgenera: *Bunopithecus*, *Symphalangus*, *Nomascus*, and the lar group, *Hylobates*. The lar group includes six species (*H. agilis*, *H. klossii*, *H. lar*, *H. moloch*, *H. muelleri*, *H. pileatus*) characterized by a diploid chromosome

number of 44. The relationships within this group remain unresolved, particularly regarding the Kloss's gibbon (*H. klossii*). This study tests two competing hypotheses: 1) *H. klossii* is basal to the lar group, as suggested by its unvarying black pelage and lack of duetting; and 2) *H. klossii* is a recently derived taxon within the lar group, as suggested by more recent studies based on vocalizations and mitochondrial DNA. Previous molecular studies of the gibbons have relied on a single *H. klossii* sample from a zoo animal of unknown provenance, and conflicting results have been produced concerning its placement. These studies chose slowly mutating loci such as cytochrome *b*, which may be inappropriate for a group that speciated so rapidly.

The hypervariable region I of the mitochondrial control region was amplified and sequenced for all members of the lar group, including 20 wild *H. klossii* individuals, and trees were generated using maximum parsimony, maximum likelihood, and neighbor-joining phylogenetic analyses. According to these analyses, *H. klossii* appears to be recently derived within the lar group, and clusters with *H. moloch* and *H. agilis*. The results are not consistent with the hypothesis that *H. klossii* is basal to the lar group.

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Questioning the relationship of cranial deformation to ossicle formation: results from Hawikku.

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Several studies have reported that cultural cranial deformation affects sutural ossicle expression. The relationship is far from conclusive given the contrasting results in comparisons across studies and the single report of differences between deformed and undeformed crania at $p < 0.01$. O'Loughlin (2004) asserted mechanical influences on ossicle formation through comparisons of variously deformed, undeformed, and prematurely craniosyntotic crania. Unfortunately, her conclusions are problematic due to an undeformed sample that is geographically, and likely genetically, unrelated to the deformed sample. It is well known that nonmetric traits vary among different populations.

The present study measured the effects of posterior deformation on ossicle development within the Hawikku site (1300-1680 AD). Using up to 42 deformed and 91 undeformed crania, the presence and number of ossicles (1 mm) were assessed along five sutures and at four cranial landmarks. Sample sizes for each location vary due to differential preservation and suture closure. Cranial deformation was of the occipital or lambdoidal form, resulting from the practice of cradleboarding during infancy. In contrast to several previous studies, we found that only apical bones showed a significant difference between samples at $p = 0.03$, with a decreased incidence in deformed crania. We also tested asymmetrically deformed crania and found no differences between the more and less affected sides. Cradleboarding in the Southwestern Native populations was not limited to a cultural elite. Thus, it is unlikely that within-population genetic stratification has confounded our results. Genetic-environmental interactions may provide the best explanation for a history of disparate results.

What can plants tell us about fossil oxygen isotopes? Laying the groundwork for dietary interpretation.

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Stable isotopes provide valuable information regarding diet, seasonality, and spatial patterning among hominids, and theories regarding speciation among early hominids frequently invoke dietary differences. The potential for stable oxygen isotopes in herbivore fossils to reflect the functional portion of browsed plants makes it a particularly useful isotope to study. To this end, I examined oxygen isotopes in different plant parts: root, stem, leaves, and fruit of the edible plant species *Chenopodium capitatum*, as differences among such values purportedly underlie herbivore tooth and bone oxygen isotope values.

The experiment tested the hypothesis that oxygen isotope values of functional plant parts (root, stem, leaf, and fruit) are significantly different. Twenty individual plants were grown to florescence in a controlled environment during summertime 2004. Water from harvested functional plant parts were extracted using cryogenic vacuum extraction for mass spectrometry isotopic determination. Results indicate that roots, stems, leaves, and fruit have statistically distinct mean oxygen isotope values (enriched 3.8, 1.5, 25.1, and 11.6‰ over source water respectively, $p<0.0001$). However, the difference between root and stem values (2.2‰) is small enough that both root and stem material in the diet will have a very similar contribution to the total fossil oxygen isotope value. Based on these data, there is a sound empirical basis for limited dietary inferences based on oxygen isotopes. However, due to the small difference in mean root and stem values, the use of oxygen isotope data to test certain dietary hypotheses regarding our earliest ancestors may not be supported by these findings.

Craniofacial growth and development in *Parapapio* and other Plio-Pleistocene southern African cercopithecines.

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Parapapio (*P. whitei*, *P. broomi*, *P. jonesi* and *P. antiquus*) can be distinguished from extant and fossil *Papio* by its reduced muzzle, lack of an ante-orbital drop, limited degree of sexual dimorphism and smaller overall cranial size. Although the differences between *Parapapio* and *Papio* are unequivocal, differences within *Parapapio* are less distinct. Species of *Parapapio* have previously been identified on the basis of molar size; *P. jonesi* has the smallest and *P. whitei* has the largest molars, with *P. broomi* and *P. antiquus* between these extremes. However, craniofacial differences within *Parapapio*, and the ontogenetic patterns that underlie distinct adult morphologies, have only rarely been explored. Here we examine 29 craniofacial dimensions, derived from 3-D landmarks, for ontogenetic series of *Parapapio* species, *Dinopithecus ingens*, *Papio izodi* and *Theropithecus darti*. Patterns of growth show that *P. whitei* tends to exhibit larger craniofacial dimensions than other species of *Parapapio*. *P. whitei* from Bolt's Farm differs in its uniquely tall snout from *Parapapio* from other sites as well as from *Dinopithecus ingens*, *Papio izodi* and *Theropithecus darti*. *P. broomi* in many ways is a scaled-down version of *P. whitei*. Isolated palates attributed to *Parapapio* tend to fall within the range of combined *P. whitei* and *P. broomi* growth trajectories. *P. jonesi*, primarily represented here by the type specimen, STS 565, differs substantially in some of its facial morphology from other specimens

attributed to *Parapapio*.

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A reanalysis of Tijeras Pueblo: another look at developmental defects in the Prehispanic Southwest.

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The current study is a reanalysis of the skeletal collection from Tijeras Pueblo, an Ancestral Pueblo site in New Mexico, occupied between AD 1300 and AD 1425. The analysis examines the types of developmental defects and the biocultural factors that may have influenced the incidence of these defects at the site. Specifically, this study focuses on the spatial patterning of developmental defects among individuals recovered at the site, and the potential relationship between the incidence of defects and lead mining activities. Barnes' (1994) morphogenetic approach is used to identify and classify developmental defects in the axial skeleton.

The reanalysis of the skeletal materials indicates that defects originally identified as neural tube defects are cases of neural arch clefting. Additionally, several other minor defects in the axial skeleton, not previously described, have been identified in the sample. These new data indicate a pattern of developmental defects different than the one originally reported. The distinction between a cleft neural arch and a neural tube defect in this sample also adds new insight to the incidence of neural tube defects at Tijeras Pueblo, and possibly throughout the Prehispanic Southwest. Ultimately, this type of study may lend to our understanding of the environmental and social factors that influenced population dynamics at Tijeras Pueblo, and other Ancestral Pueblo populations

A geo-spatial perspective on behavior and activity in late prehistoric eastern North America.

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Variation in bone distribution and degenerative joint disease provides important perspective on the interaction between subsistence and activity in past human societies. This study documents and interprets the consequences of living in more heterogeneous (variable terrain and elevation) versus less heterogeneous terrain for behavior and activity in a large sample of late prehistoric agriculturalists from 20 sites.

We use GIS methods to analyze geographic patterning in skeletal robusticity (total subperiosteal area and femoral midshaft index) and degenerative joint disease in a spatially referenced skeletal database from the Eastern Woodland Native American component of the History of Health and Nutrition in the Western Hemisphere database and data collected from additional samples. In reference to terrain and paleoenvironment, the analysis of the dataset reveals that individuals living in more heterogeneous terrain have more robust femora and a specific patterning and greater severity of degenerative joint disease than individuals living in less heterogeneous terrain.

Taking into account the variation in terrain and elevation, mobility is almost certainly a key factor in explaining these differences. However, other factors—such as intensity of agricultural production and specific type of habitat—suggest that activity results from a complex set of behaviors and lifestyles across this large region. This study demonstrates the utility of using GIS-based models for exploring large-scale geographic variation in parameters of lifestyle and interaction with terrain using skeletal remains.

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Allelic variation at alpha-synuclein and alcohol dependence in two American Indian populations.

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The study of complex disease presents an interesting genetic challenge due to the presence of multiple genes and gene interactions that contribute to development of the disorder, as well as the effects of environment. Currently, there is no operational, systematic protocol for the identification of genes associated with complex disease phenotypes. In this study, four single nucleotide polymorphisms (SNPs) at the alpha-synuclein locus were assayed and analyzed for possible association with diagnoses of alcoholism and alcohol related disorders. Alpha-synuclein has been implicated in Parkinson's disease because the protein accumulates in the Lewy inclusion bodies that characterize the disease. More recently, it was found that alpha-synuclein is expressed at higher levels (mRNA and protein) in alcohol-preferring rats relative to nonpreferring rats (Liang et al. 2003), implicating the protein in development of alcoholism and also providing a candidate gene for this research.

Four SNPs were assayed in DNA extracts collected at the National Institute on Alcohol Abuse and Alcoholism. The extracts were obtained from individuals in populations that show a high prevalence of alcoholism, a Southwestern Native American population (n = 466) and a Plains Native American population (n = 406). Each subject underwent a clinical interview for diagnosis of alcohol dependence and other psychiatric conditions, such as antisocial personality disorder, as well as evaluation of symptoms related to physiological response to alcohol, such as facial flushing. Haplotypes were constructed from the typed variants using an expectation-maximization algorithm and the data tested against alcohol dependence and related diagnoses using both nested cladistic analysis and standard association analysis.

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***In vivo* data provide insights into alternative explanations of symphyseal fusion in mammals: the case of the selenodont artiodactyls.**

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Although the relative importance of increased strength versus stiffness resulting from symphyseal fusion in mammals is debated, most current biomechanical explanations emphasize the importance of transverse masticatory forces, particularly from the balancing-side deep masseter, for the evolution of this morphology. We investigated patterns of *in vivo* bone strain along the mandibular symphysis of alpacas (*Lama pacos*, Camelidae) to examine the functional significance of symphyseal fusion in selenodont artiodactyls and further explore the relationship between symphyseal fusion and transverse forces. Like all selenodont artiodactyls, alpacas have a large transverse movement component to their masticatory cycle, and like all camelids, alpacas fuse their mandibular symphyses early during ontogeny. Furthermore, unlike goats which have an

unfused symphysis, alpacas have a late firing-pattern of their balancing-side deep masseter.

Symphyseal strain patterns were recorded from four adult alpacas during mastication of hay using rosette strain gages. The magnitude and direction of principal strains were quantified throughout the power stroke.

Peak symphyseal strains during the power stroke in alpacas are most congruent with twisting of the symphysis about a transverse axis. Strains associated with transverse masticatory forces, particularly those from the late-acting balancing-side deep masseter, appear to be small. In light of comparative observations of symphyseal and incisor morphology in selenodont artiodactyls with fused and unfused symphyses, these strain data support a "strength" hypothesis for symphyseal fusion focusing on twisting rather than transversely-directed forces. This hypothesis posits that increased symphyseal strength via fusion is necessary in selenodont artiodactyls that have large, deeply-rooted mandibular incisors.

Congruence between canalization and developmental stability in *Macaca mulatta* crania.

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The developmental mechanisms used to modulate variance among and within individuals are poorly understood. Understanding these processes is of importance to the evolutionary biologist as the variability of a trait is an indicator of the evolvability of a trait. Canalization is a measure of the effectiveness of the processes that reduce variation among individuals, whereas developmental stability estimates the effectiveness of the processes that lessen the amount of variation within individuals. Traditionally, the underlying mechanisms involved in canalization and developmental stability have been argued to be distinct, however, the empirical evidence for this claim is contradictory. We suggest that natural selection would favour mechanisms that are effective in buffering phenotypic variation both within and among individuals over processes that target a specific type of variation. Therefore we hypothesize that there will be a positive correlation between environmental variation among individuals and variation within individuals. A battery of univariate and multivariate analyses were used to compare among individual variance and within individual variance calculated from three dimensional landmark data from the skulls of 228 adult macaques from Cayo Santiago. Among individual variance was further divided into its genetic and environmental components using matriline information. We found positive and significant correlations between among individual variance of environmental origin and within individual variation however, these correspondences were low. In macaques, therefore, we find that within individual variation and among individual variation of environmental origin are correlated both in magnitude and direction. These results suggest that the underlying processes that determine canalization and developmental stability are at least partly overlapping.

The morphology of the lower mid-face in three American skeletal populations.

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The non-metric trait of alveolar prognathism has often been used to distinguish between population groups. In the interest of forensic anthropology and general knowledge of variation in morphology of the lower mid-face, an attempt has been made to metrically quantify this trait in three modern American skeletal populations. The null hypothesis of no difference between population groups was tested with multivariate statistics, which related the measurement set as a whole to the population groups. Furthermore, the measurements' relationship to alveolar prognathism was examined and discriminant function analysis related the combined measurements to the population groups.

The traditionally non-metric trait of alveolar prognathism was quantified with a novel technique utilizing measurements from three cranial base points for the modern American populations of Whites, Blacks, and Amerindians. Measurements were taken from porion, zygomaxillare, and the canine fossa, and the projection was measured to the intersection of the nasal sutures and the nasal aperture, to the deepest margin of the nasal aperture, to subspinalae, and to prosthion. A technique was developed for the assessment of ancestry from the lower mid-face, and canonical discriminant function analysis of 13 variables correctly classified 151 of 171 of the crania (88.3%). A simplified form of the technique using 9 variables placed 149 of 171 crania in the correct group (87.1%). Finally, the implications of maxillary morphology being a regional marker were discussed in terms of modern human variation.

The quality of health of early 20th century historic blacks from the Providence Baptist Church Cemetery.

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Paleopathological and bioarchaeological investigations of health are an important component in the construction of a population history. Such studies make possible analyses regarding historic Black health in the late 19th and early 20th centuries, a time period where the availability of relevant and objective literature is limited. These paleopathological and bioarchaeological investigations permit a comparison of similar populations to assess the impact of demographic, social, economic, and political conditions on a specific population.

This study compares the Providence Baptist Church cemetery in Shelby County, Tennessee to two contemporary historic Black cemeteries in order to address an urban versus rural dichotomy suggested by Davidson et al. (2002). The Cedar Grove cemetery, located in rural Arkansas, and the late-period Freedman's cemetery, located in Dallas, Texas, represent these populations. Comparisons of the skeletal and dental health indicators across these samples, using data from the Western Hemisphere Database (Steckel et al. 2002) and the original pathological data reported from these localities, place the Providence Baptist Church skeletal series in relation to the other sites.

The Providence Baptist Church cemetery demonstrates a high incidence of degenerative joint disease, while having little infectious, dietary, or trauma-related lesions. When compared to the other populations the pathology frequencies indicate a population that is not clearly associated with either the rural or urban condition. This suggests that other factors, such as a direct church affiliation, an association with Masonic organizations, or the proximity to the Memphis metropolitan area affected the population's health.

Ethnoprimatology of the rhesus macaques of India.

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The lives of many alloprimates are linked to the culture and belief systems of the people impacted by their activities. This fact is particularly true of the macaques of Asia, including India. For some alloprimate populations, more so in the past than today, the linkage to humans meant only that a hunter might occasionally kill a monkey. Unfortunately, increases in the size of the human population and habitat destruction have resulted in alloprimates and indigenous people living in closer proximity than in the past. Many problems can arise when alloprimates and people interact. These problems can be disease exchange, crop damage, over-hunting, and the extinction of local populations of alloprimates. Solutions to these problems, where solutions have been sought, have ranged from removing indigenous people from their lands to trapping and removing the alloprimates. To remove or tamper with the lives of the alloprimates where they are a part of the creation myths and other legends of the people can be tantamount to cultural genocide and are likely to fail. This paper will discuss the position of rhesus monkeys in the culture and belief system of the Hindus of India and the impact these belief systems have on the lives of both the monkeys and people of India.

Patterns of hard tissue sexual dimorphism within the hominin clade.

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A sound alpha taxonomy generated from a hard-tissue bound fossil record requires that we are able to discriminate between intraspecific and interspecific variation. Clearly, we can never verify patterns of variation within extinct taxa. However, potentially we can use closely related extant taxa, the comparative method and the principle of parsimony to generate hypotheses about the primitive condition of intra- and interspecific variation within the hominin clade.

We know from comparative studies that for several members of the great ape clade secondary sexual differences form a substantial component of the hard tissue variation we observe within species. But neither of the two extant taxa, chimpanzees and modern humans, in the *Pan/Homo* clade manifests high levels of sexual dimorphism. Does this mean that we should discount substantial hard tissue sexual dimorphism as a cause of the intraspecific variation researchers observe in the fossil record of the hominin clade?

This presentation will review the challenges facing those who A) attempt to identify the sex-related component of the intraspecific variation within museum samples of extant members of the great ape clade; B) then use those observations to help sort the variation observed in the hominin fossil record, with all its taphonomic biases and additional sources of variation such as geological time and geography, into that which is probably intraspecific and that which is probably interspecific.

Within the extant members of the great ape clade we will examine the degree and pattern of sexual dimorphism in variables related to the hard tissue morphology that is relatively well represented in the hominin fossil record. We will then investigate whether it is possible to predict the primitive condition of any sexually dimorphic variables with respect to the hominin clade.

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Fine-scale patterns of LD across a recombinational hotspot and the recent origin of the HbC □-globin allele.

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Recent human genetic studies have identified a heterogeneous pattern of haplotype blocks interspersed with recombinational hotspots. This broad-scale characterization of patterns of linkage disequilibrium (LD) has aided in mapping genes associated with disease phenotypes, contributed to our knowledge of the recombinational process, and deepened our understanding of the evolutionary forces shaping human variation. Less is known about how recombinational hotspots affect fine-scale patterns of LD at loci that are under strong selective pressure. Malaria is one of the leading causes of death worldwide and a strong selective force in humans. The hemoglobin C allele (HbC) at the beta-globin locus is associated with a reduction of risk of malaria in both heterozygous and homozygous individuals. To better understand how selection affects LD across a recombinational hotspot, we determined chromosomal linkage phase for 5.2-kb spanning the beta-globin gene and a region that recombines at a rate >50 times the genome average.

LD analysis shows that levels of recombination are extremely low in the gene region but very high ~2500-550 bp 5' to the gene. Our analysis also reveals that LD extends much further on the HbC alleles than expected given their frequency, consistent with a model of positive directional selection. Additionally, the HbC allele likely arose less than 5,500 years ago. This inferred age, in combination with estimates of the strength of selection, suggest that the HbC allele is poised to rapidly increase in frequency in West Africa.

Methods for inferring population size change from genetic data.

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Changes in population size leave signatures in genetic variation that can be extracted using a variety of algorithms. Methods are currently available for the analysis of DNA sequences, single-nucleotide polymorphisms (SNPs), and simple tandem repeat polymorphisms (STRPs), each of which has advantages and disadvantages. These methods can be used to estimate a number of demographic parameters, including ancient effective population size and magnitude of population expansion. However, they are also susceptible to confounding effects from factors like population subdivision. The general strengths and weaknesses of these methods are illustrated by a likelihood-based analysis of the site frequency spectrum. This method exploits information from multiple, independently segregating loci to provide estimates of the timing and magnitude of population size changes, as well as confidence intervals around estimated parameters. Inferences obtained using these methods are useful for a variety of purposes, including the identification signatures of natural selection.

Status of the Hatinh langur in Phong Nha-Ke Bang National Park

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Vietnam's Phong Nha-Ke Bang National Park contains the world's largest population of Hatinh langurs (*Trachypithecus laotum hatinhensis*), listed as Endangered in Vietnam and as Data Defi-

cient by the IUCN Data Book. During May-June 2004, fieldwork was conducted by scientists from the Forestry University of Vietnam and from the University of Colorado, Boulder to improve knowledge on the current status of the park's Hatinh langurs. Daily surveys were made along pre-existing transects in four separate park areas, using Global Positioning Systems and digital cameras to mark Hatinh sleeping caves, hunting activities (snares and camps), and locations where any primate species was encountered. Group composition and activity were recorded, and feeding samples were taken to the Forestry University for identification.

Results indicate that the Hatinh population within the park is healthy, despite continued pressures from illegal hunting, cutting, and extraction of non-timber forest products. Conversely, we suggest that other diurnal primate species in the park (*Nomascus leucogenys*, *Pygathrix nemaeus*) are not faring as well. Further, due to infrequent spotting of the park's two macaque species (*Macaca assamensis* and *M. arctoides*), especially in the park's more remote areas, these species, which have been assumed to be numerous, might be in fact more rare and the target of the lion's share of hunting activities. Finally, we suggest that long-term field studies of Phong Nha-Ke Bang's primate fauna should be initiated, to serve both scientific and conservation purposes.

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Novel variation in diurnal rhythms of salivary testosterone in rural Bolivian men.

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Testosterone (T) is generally reported to be highest upon awakening, falling by about 50% during the day and doubling during sleep. But study participants from industrialized populations do not invariably exhibit this idealized pattern. Whether the classic diurnal cycle in T is universal among human males or the result of entrainment, perhaps by lifestyle or other factors, is unclear, in part because little is known of diurnal variation in T for non-industrialized populations. Therefore, in 2 independent studies we have evaluated $T_{salivary}$ in Bolivian men from rural populations principally reliant upon agropastoralism.

Study A. 115 men gave samples shortly before retiring and upon awakening the next morning. Classic diurnal change (D_c; AM>110% PM) occurred in 51%. Reverse diurnal patterns (D_r; AM<90%PM) were observed in 39%. In 10%, AM approximated PM.

Study B. 65 men gave AM and PM samples on 3 days. Of 184 person-days, D_c occurred in 55%, D_r was observed in 33%, and 12% exhibited little AM-PM difference.

In each study, only about half of the observed diurnal variation in $T_{salivary}$ conformed to the idealized rhythm. Similar variation in diurnal cycles may exist in other non-industrialized populations and may be more common in industrialized populations than generally recognized. Apparent differences in $T_{salivary}$ among individuals and populations based on a single morning sample may reflect variation in chronobiology in addition to, or rather than, variation in maximum (unstimulated) $T_{salivary}$.

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Cooking, time-budgets, and the sexual division of labor.

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An important feature of the sexual division of labor among hunter-gatherers is that females and males search for different kinds of food. Males obtain higher-quality food, but unlike females, on any given day they may fail to obtain enough to satisfy themselves or their families. Accordingly, they are sometimes fed by females. We propose that this unique human arrangement, by which the male fallback strategy is to be provisioned by females, depends on both sexes being able to consume their daily caloric requirements in a short time. Our logic is that a female requires a short eating time in order to be free to gather and prepare food for herself and her male, while a male requires a short eating time in order to be able to ingest sufficient food after a day of failed food-search.

Accordingly we test the following hypotheses. (1) Controlling for body mass, humans eat for a shorter time than expected. (2) Reduction in eating time is due to consumption of (a) raw plant foods not eaten by other primates, (b) raw meat, (c) food prepared without heat, (d) cooked food. Hypothesis (1) is supported. Humans spend about 1 hour eating per day, compared to an expected 5 or more hours for a great ape of our body mass. Hypotheses 2 (a) and 2 (b) are rejected. Hypotheses 2 (c) and 2 (d) are plausible, but only 2 (d) has direct empirical support. We conclude that a low amount of time spent eating is likely a consequence of the adoption of cooking. We show that until the daily time spent eating approached modern human levels, the sexual division of labor could not have taken its contemporary form.

Dietary demand and niche breadth among six primates in Guyana, South America

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This study identifies relationships between the mechanical demands of processed plant tissues and niche breadth among a community of six sympatric primates, in Guyana, South America. Dietary demand was defined as the ranked frequency with which plant tissues of a given toughness were processed with either the anterior dentition or cheek teeth. Feeding frequency and toughness data were collected for *Alouatta seniculus*, *Ateles paniscus*, *Cebus apella*, *C. olivaceus*, *Chiropotes satanas* and *Pithecia pithecia*. Toughness data were collected on plant tissues with a portable tester designed by Lucas et al. (2001).

The relationship between dietary demand and niche breadth differed for each of the six species. Occasional anterior biting and chewing of extremely tough tissues during periods of ripe fruit scarcity correlated with a much larger geographic range in *C. apella* than in *C. olivaceus*. Plant tissue toughness was most variable for *C. apella*, *A. seniculus*, and *P. pithecia*. When coupled with decreased activity and increased gut transit times, the ability to exploit a diet that varies in toughness permits *A. seniculus* and *P. pithecia* to exploit a broader range of habitats than more closely related species. In the case of *A. seniculus*, the ability to masticate leaf laminae and to occasionally breach tough seed coats correlated with the exploitation of drier and more disturbed habitats than exploited by *A. paniscus*. In the case of *Pithecia*, extraction of tough endocarp from seeds, coupled with an energy minimizing strategy similar to *Alouatta* correlated with a larger geographic range than found for *Chiropotes*.

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The relationship between limb morphology and locomotor behavior in brown and weeper capuchins.

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Previous studies of the primate postcranial skeleton have demonstrated what appear to be clear relationships between frequencies of locomotor behaviors such as leaping, climbing and quadrupedalism and skeletal form. For example, within anthropoids, species that exhibit high frequencies of leaping tend have lower intermembral indices, higher crural indices, and longer limbs. This study combines morphometric data from adult specimens of *Cebus apella* (N=42) and *C. olivaceus* (N=14) with field observations of their locomotor behavior in order to evaluate the relationship between limb lengths and indices and exhibited frequencies of quadrupedal, leaping and climbing behaviors.

The results of non-parametric randomized *t*-tests comparing upper and lower limb lengths indicate that the two species do not differ significantly in upper limb length, but that *C. apella* has significantly shorter hindlimbs ($p<0.01$). Both the tibia ($p<0.01$) and the femur ($p<0.01$) are significantly shorter in *C. apella*. *C. apella* also exhibits a higher intermembral index ($p=0.01$) and a lower crural index ($p=0.02$), compared to *C. olivaceus*. The results of an analysis of patterns of locomotor behavior indicate that *C. olivaceus* leaps ($p=0.02$) and runs ($p<0.01$) more than *C. apella*, which exhibits higher frequencies of slower quadrupedal behaviors such as walking ($p<0.01$). The two species show similar frequencies of climbing. These findings help to further refine our understanding of the relationship between postcranial morphology and locomotor behavior in closely related primates of the same body size.

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Non-metric dental variation among the ancient Maya of Northern Belize.

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Nonmetric dental variability was examined in groups of northern Belize Maya from the sites of Chau Hiix, Altun Ha, and Lamanai dating to the Late Preclassic through the end of the Postclassic period (300 B.C. – 1500 A.D.). The northern Belize skeletal samples represent a relatively large and temporally diverse sample, which are used to explore the extent of morphological diversity within geographically discrete groups of Maya over time. In addition, data from other more distant groups, including both Maya and non-Maya populations, were used in the comparisons. These investigations help to establish a Maya Dental Complex and to determine the extent to which Mesoamerican groups are distinguished morphologically from one another.

In general, distance values derived from nonmetric dental data increased with greater geographic and temporal distance between the groups being compared. As a group, the Maya were distinguished from other Mesoamerican populations. Dental trait frequencies in the prehistoric individuals were very similar to those reported by Jacobi (2000) from the Colonial Tipu Maya and thus suggest that the Maya Dental Complex is geographically and temporally consistent. Comparisons among Maya groups support a general distinction between geographic regions that corresponds to ancient political/linguistic divisions. Despite differences in sample sizes and inconsistent burial dates, comparisons of temporal groups composed of the pooled northern Belize sites appeared to show increasing genetic distance over time.

Perfect congruence of molecular-phylogenetic and fossil-record divergence age estimates for the Lorisiformes.

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Until recently, the primate fossil record seemed clearly to indicate that the age of the initial lorisiform divergence into ancestral galagos and slow lorises was about 20 million years old. This assumption was radically altered with the publication of a recent paper by Seiffert and colleagues (2003) in which the authors describe fossil evidence for a much older split of the ancestral lorisiform lineages. These remarkable fossils indicate that the ancestral divergence of galagos and slow lorises was actually on the order of 40 million years ago. Ironically, molecular phylogenetic analysis by Yang and Yoder (2003) had independently, and without knowledge of the fossil data, also estimated a lorisiform divergence date of 40 million years before present. Subsequently, Yoder and Yang (2004) integrated the new fossil information as a calibration point in a Bayesian analysis of divergence dates within the strepsirrhine primates. That study employed a number of unlinked gene data sets and multiple fossil calibrations outside of the strepsirrhing clade. Two mitochondrial genes (cytochrome oxidase II and cytochrome *b*), two nuclear introns (transthyretin intron 1 and von Willebrand factor gene intron 11), and one nuclear exon (interphotoreceptor retinoid binding protein, exon 1) were analyzed in a variety of individual and combined analyses that account for heterogeneity in molecular evolutionary parameters by data partition. The results further confirm the antiquity of the Lorisiformes and other strepsirrhine clades, and present a remarkable example of congruence between divergence time estimates from fossil and molecular data.

Health effects of the Black Death and late medieval agrarian crisis in medieval Denmark.

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The medieval period was witness to two of the most devastating crises in human history: the Black Death of the mid-14th century and the Late Medieval Agrarian Crisis that began in AD 1300. The result of these crises was catastrophic population loss and a possible shift in subsistence from primarily grain agriculture to a more pastoral diet. This paper reports paleopathological data on health and stature to examine the health consequences of these crises. The indicators used in this analysis are cribra orbitalia, porotic hyperostosis, scurvy, dental caries, and periostitis. The study sample is composed of three medieval Danish cemeteries spanning a diverse cross-section of Danish society: a lower class cemetery from the large trade city of Ribe, the very poor, lower class, urban cemetery of St. Mikkel and, Øm Kloster, a monastery containing monastic individuals, and both lower class and elite lay individuals. Preliminary statistical analysis indicates that health was worse in the poor lower class urban sample of St. Mikkel before the two crises than in the other two samples (porotic hyperostosis, $\chi^2 = 10.561$, $p=0.005$). Individuals at Øm Kloster enjoyed better health than did the individuals from the urban samples (cribra orbitalia, $\chi^2 = 5.650$, $p=0.059$) and health was significantly better for the monks and elite individuals than for the lower class of any sample (stature, $t = -2.382$, $p=0.020$ and $t= -2.381$, $p=.020$). Overall, these

results suggest that diet was poorer for the urban lower class, especially before the crises, and that health improved through time.

Locomotion, postures, and habitat use by pygmy marmosets (*Cebuella pygmaea*).

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Pygmy marmosets (*Cebuella pygmaea*) are the smallest representatives of the Callitrichidae and are characterized by morphological correlates to extensive gummivory and to high proportions of claw climbing, clinging, and leaping on vertical supports. This morpho-behavioral complex is unique in its adaptive significance and crucial in understanding the evolutionary history of the family. In this context, I studied the positional behavior and ecology of a group of pygmy marmosets in a wet rainforest in Amazonian Ecuador. During the study period, pygmy marmosets confined their movements in the understory of a dense liana forest, where they largely utilized lianas (54.9%) and tree trunks (43.6%). In addition, 36.8% of all used supports were >10cm and 61.9% were vertical. Feeding bouts (exclusively exudates) occurred at similar mean heights to foraging (5.2m and 4.7m respectively) but lasted less time (112.2sec and 173.6 sec respectively). The dominant feeding posture was claw clinging (97.7%). Inversely, the dominant foraging postures were stand (39.3%) and cantilever (34.4%). Locomotion was dominated by claw climbing (42.4%) and terminal/vertical leaping (24.4%). The former was mainly used within trees (78%) while the latter for crossings (46.1%). Thirty-six percent of all leaps were vertical leaps and covered distances equally <1m and >1m. Field observations show that pygmy marmosets use claw climbing, claw clinging, and vertical supports more than any other callitrichid, but they use less leaping and vertical leaping than *Callimico*. Overall, these positional data confirm morphological predictions for pygmy marmosets but reveal that they are related to different behavioral contexts.

The development of muscle lever arms in primates: a longitudinal study of *Cebus albifrons* and *Cebus apella*.

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The ability of locomotor muscles to produce movement and maintain postural stability against substrate reaction forces (SRFs) is a function of the length of the lever arms upon which they act. Relatively little is known about the development of muscle lever arms during primate ontogeny. Based on previous work in other mammals, it is hypothesized here that the growth of locomotor muscle lever arms should reflect 1) changes in body mass/bodily proportions (which determine the magnitude of SRFs) and 2) the functional role of the muscles.

This study tested this by examining patterns of relative lever arm growth in *Cebus albifrons* and *Cebus apella*, two capuchin monkeys known to differ in body dimensions and locomotor behavior. *C. albifrons* is gracile and long-limbed while *C. apella* is robust with shorter limbs. While both are committed arboreal quadrupeds, *C. albifrons* is more cursorial and *C. apella* engages in more climbing behaviors. Relatively longer limbs and increased cursoriality in *C. albifrons* should increase joint flexion moments and require relatively longer antigravity extensor muscle lever arms. The greater reliance on climbing behaviors in *C. apella* should require relatively longer flexor muscle lever arms. Lengths of elbow flexor and extensor muscle lever arms were measured in a mixed longitudinal sample of radiographs. When scaled to body weight, extensor lever arm lengths increased at a faster rate in *C. albifrons* while *C. apella* had longer flexor lever arms throughout development. These findings suggest that functional pressures can determine the developmental trajectory of muscle leverage in primates.

Proximal limb muscle attachments and work levels of a Predynastic Egyptian population.

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Muscle attachment locations have been used as markers of occupational stress (MOS) in the study of past human populations. MOS can shed light on the type and extent of activities being conducted in the past. Use and abuse of certain muscle groups can be observed and scored on skeletal elements, thereby providing means of demonstrating how individuals may have led diverse lives. Material culture may give us ideas about daily life, but it is the actual individuals that can reflect living conditions. This study considers differences in activity patterns as reflected in proximal limb musculoskeletal markers (MSM) of a sample of Upper Egyptian Predynastic workers at Hierakonpolis.

A sample of individuals (n=220) were scored for up to 14 different proximal limb MSM. Male-female differences were noted with males showing higher scores. These expected results support previous findings, from biomechanical studies, that males and females were responsible for different types of activities. Though this cemetery represents the working class, very few individuals display signs of having endured heavy workloads with muscle markings. These results are very different than were originally predicted. It was thought that a workers' cemetery should display more evidence of hard work. These unexpected results may explain how the leaders of these workers ultimately united Upper and Lower Egypt. With healthy workers with a modest workload these leaders had a surplus capacity to exploit in their expansionist scheme.

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Cranial robusticity, teeth and diet in ancient Egypt.

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Skeletal material has rarely been used within Egyptian contexts for more than simple analyses of palaeopathology and assessments of health or occupation. The current study elucidates patterns of social organisation and population composition, through assessment of morphological variability and changing patterns of sexual dimorphism in cranial robusticity, tooth size and dental wear.

The data consist of cranio-facial and dental variables from 418 adult Egyptian individuals, from six periods, ranging in date from the Badarian period (*c.* 5000 BC) through to the Middle Kingdom (*c.* 2000 BC).

Significant sexual dimorphism was found in 6 maxillary and 3 mandibular buccal-lingual tooth diameters. Significant changes in dental wear patterning within the mouth over time were also found. Significant sexual dimorphism and change through time was found in most cranial robusticity grades, and positive associations were found between measurements of dental wear, tooth size and cranial robusticity. These patterns have been compared with archaeological evidence of dietary change (from stable-isotopic analyses and documentary and artistic

sources). The results suggest a complex interaction with diet and male-female ranking differences being mediated through changes in social organisation and the formation of the Egyptian state.

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Sex, age, and life history differences in the utilization of enrichment in captive lowland gorillas.

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Environmental enrichment plays an important role in maintaining the psychological well being of captive primates. Better understanding of how different categories of individuals (i.e. age, sex and life history) within a particular species utilize enrichment in diverse ways will help researchers better understand primate behavior. This research will also make possible enrichment that is more appropriate for individuals in a given group and assist in improving the psychological well-being of primates specifically, and all captive animals in general. This study examined possible differences in the utilization of enrichment between captive lowland gorillas in different categories of age, sex and life history variables.

Data were collected on 13 gorillas (4 males, 9 females, with an age range of 3-43) at Brookfield Zoo in Chicago, IL and Fort Worth Zoo in Fort Worth, TX during the summer and fall of 2004. Enrichment was categorized as structural, object, sensory, and food/forage. Observations were taken using instantaneous scans both at the zoos and on videotapes made by the author. Chi square tests show there is a substantial difference in the utilization of enrichment between the life history categories of wild versus captive born as well as hand reared versus non hand reared. There are also important differences between age categories, both in amount and type of enrichment choices.

This study broadens the database of information of species- specific enrichment projects. It suggests that enrichment activities for captive gorillas should be tailored to the needs and interests of the individual group members.

Metacarpal head biomechanics: a comparative backscattered electron image analysis of trabecular bone mineral density in *Pan troglodytes* and *Homo sapiens*.

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As an alternative to gross morphological analysis of the hand, this study takes a micro-architectural approach as a means of better understanding how functional use effects bone remodeling within metacarpal heads. The third metacarpal heads of *Pan troglodytes* and *Homo sapiens* were sectioned in a sagittal plane and scanned using a scanning electron microscope (SEM). For each individual, seventy-two areas of trabecular bone were sampled from within twelve consecutive regions of the backscattered SEM images. In each area, gray levels (representing degree of mineralization and remodeling) were quantified using Scion Image.

As a result of functional differences between the two species, the chimpanzee and human metacarpal heads experienced different patterns of loading between the palmar and dorsal aspects of the joint. Average weighted mean gray levels in the chimpanzee showed a distinct pattern in which the 'knuckle walking' regions (dorsal most) and 'climbing regions' (palmar most) were less mineralized and therefore more highly remodeled than the distal regions. The dorsal regions of the chimpanzee metacarpal were less highly mineralized than the palmar regions, most likely due to relatively stereotypical loading on the dorsal region during knuckle walking. In humans, whose hands are used for manipulation but not locomotion, there was a slightly higher degree of remodeling palmarly than dorsally. Differences among regions within metacarpal heads are significant (Kruskal-Wallis, $p<0.001$). This micro-structural approach offers a means of investigating joint loading patterns in primates.

Mitochondrial DNA Variation in Northern Altaians: affinities with Siberian and Turkic populations.

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Altaian peoples are the descendants of ancient (non-Turkic) inhabitants of this mountainous area who mixed with various waves of Turkic speaking nomads, beginning about 2,000 years ago. They are divided into northern and southern groups that are known to be physically, culturally and linguistically distinctive. Morphologically, the Southern Altai-kizhi generally exhibit stronger affinities with Mongolian and East Asian groups, whereas Northern Altaians, including Tubalars, Chelkans and Kumandinians, show some affinities with West Eurasian and Uralic groups. Initial genetic studies involving Altai-kizhi tribes have also revealed them to have considerable genetic diversity with influences from both West and East Eurasian populations. However, Northern Altaian groups as a whole are less well genetically characterized. To clarify this pattern of biological diversity in the Altai region, we surveyed mtDNA variation in several Northern Altaians population from the Altai Republic, and compared the resulting data with the Altai-kizhi and other Siberian and Turkic speaking groups from the region. In addition, we combined the extensive genealogical and demographic data with the mtDNA data from these populations to more accurately reconstruct the prehistory of the Altai Mountain region, including the assessment of Altaian population structure as reckoned by oral histories and tribal clan (seok) membership.

Skeletal pathologies in wild chimpanzees from Taï National Forest, Côte d'Ivoire.

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Wild primates contract injuries and diseases throughout life, yet often recover and survive, as AH Schultz documented in his research on adult wild apes. We report on pathologies reflected in the skeletons of immature and adult chimpanzees from the Taï National Forest, where individuals were known during life. Pathologies were found more frequently in females than in males, and in some cases can be ruled out as the cause of death. For example, a 26-year-old female who had died of ebola had an extremely remodeled and shortened femur; her deformed limb affected the shape and orientation of the hip and knee joints, though the affected lower limb was similar in overall length to the unaffected side. During life, she was able to accommodate her quadrupedal gait and retain effective climbing skills. A 10-year-old female right upper limb and sternoclavicular joints were substantially altered; the epiphysis of the distal humerus was fused whereas the normal side was not. These and other examples from Taï,

along with examples from Gombe chimpanzees, add to our understanding of the connections between injuries during life, subsequent growth and remodeling, and the reflection of life events in the skeleton after death.

A variety of morbid symptoms: subadult death and ill health from a turn of the century potter's field (MCIG I).

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The Milwaukee County Institutional Grounds cemetery was the final resting place for the impoverished of late 19th century Milwaukee County. Residents of the asylum, sanitarium, poorhouse, and orphanage were interred here, as were the residents of the city who could not afford a private burial. Excavated in 1992 through 1994, 588 subadult burials were found. Dental enamel defects are present in 74% of observable dentitions, whereas osseous lesions are less prevalent. The lack of observable post-cranial pathology, in light of the high rates of mortality among the young, institutional population, alludes to the presence of acute illness and poor conditions within the institutions. This suggests that while the institutions attempted to buffer the children from the ill effects of poverty, they instead often served to buffer the children from good health.