at Stony Brook, [7]Anatomy, New York College of Osteopathic Medicine, [8]Anthrotech, Inc., Yellow Springs, OH, [9]Anthropology, Hunter College, CUNY.

Paleoanthropology has always suffered from an incomplete fossil record and the resulting relative paucity of intermediate forms; the fragmentary nature of many fossils compounds this problem. In a visualization approach, we collect surface data on exemplar specimens with a laser scanner and landmark coordinate data with a Microscribe 3D digitizer on larger samples for each taxon of interest. Generalized Procrustes analysis produces average landmark configurations for each taxon, by sex, which are scaled to the same size and can be compared statistically. Given an a priori cladogram relating these taxa, our program (building from Rohlf's TPS tree) visualizes an intermediate landmark configuration at any point along the cladogram. A thin plate spline is then computed between a chosen taxon and the computed intermediate, and the taxon's exemplar surface is then splined to the inferred intermediate. This 3D image can be rotated to any view and compared visually to known fossils, some of which may be too fragmentary or distorted to have been included in the statistical analysis. We demonstrate this program using data on modern and fossil cercopithecid monkeys and on hominids (great apes and humans). While the resulting visualizations are based solely on the morphometric properties of the chosen landmarks, and do not include character or genetic data, the resulting forms are of value for a more complete understanding of the role of shape in phylogenetics and the proximity of various fossils to theoretical inferred intermediate forms.

Funding: NSF (DBI 9602234--NYCEP) and (ACI 9982351--NYCEP Morphometrics Group)

Genetic and environmental correlations between age at adiposity rebound and subsequent changes in childhood BMI.

E.W. Demerath, S. Czerwinski, B. Towne, S.S. Sun, W.C. Chumlea, R.M. Siervogel. Wright State University School of Medicine.

Introduction. The relationship between the timing of the adiposity rebound and obesity in adolescence and adulthood has received considerable attention from obesity researchers, but because of the rarity of familial serial data, little is known of its genetic underpinnings. **Methods.** We applied polynomial models to serial BMI data collected from 368 individuals aged 2-25 years in the Fels Longitudinal Study. Parameters obtained from each individual's BMI curve include 1) age at BMI rebound (AGE-REBOUND), 2) BMI at age at rebound (BMI-REBOUND), 3) BMI at maximum pubertal BMI velocity (BMI-PUBERTY), and 4) maximum post-adolescent BMI (BMI-POSTADOL). These four parameters were then examined in a series of bivariate maximum-likelihood-based genetic models. The heritabilities and the additive genetic (ρ_G) and random environmental (ρ_E) correlations between these parameters were then estimated. **Results.** From the best models, AGE-REBOUND, BMI-REBOUND, BMI-PUBERTY, and BMI-POSTADOL had heritabilities ranging from 0.63 to 0.68 (all $p<0.0001$). The estimated ρ_G between AGE-REBOUND and BMI-REBOUND, BMI-PUBERTY, and BMI-POSTADOL were -0.55 ± 0.07, -0.60 ± 0.08, and -0.54 ± 0.08, respectively. The ρ_E between AGE-REBOUND and the other three BMI parameters was not significantly different from zero. **Conclusions.** Thus, we found high heritabilities for all parameters, and incomplete pleiotropy between the timing of the adiposity rebound and BMI during childhood and adolescence. That is, some, but not all, of the genes that influence the age at adiposity rebound also influence BMI from early childhood to post-adolescence. There is no evidence, however, of a correlated response of these parameters to shared environmental factors.

The functional significance of the primate fibula.

B. Demes, K. Metzger, S. Larson. Dept. of Anatomical Sciences, State University of New York, Stony Brook.

Almost all primates have complete and separate fibulae, whereas most mammals either partially or completely fuse the fibula with the tibia or reduce it to a bone spur. The functional significance of the primate condition (which is also shared by cats and bears) is poorly understood. We conducted a series of *in vitro* experiments to address the role of the fibula in weight-bearing and force transmission between the two leg bones. Muscles were removed from the legs of one human, two baboon, and two chimpanzee cadavers and three rosette strain gauges were attached to the midshafts of each bone. Legs were loaded in bending by applying force through the intact knee and ankle joints, and reloaded after sequentially cutting the interosseous membrane, tibiofibular ligaments, and the fibula itself. Severing the interosseous membrane does not cause significant changes in strains in the two bones. Disconnecting the ligaments subtly effects the direction of bending in some specimens. Cutting the fibula leads to a moderate increase of tibial strains and a more marked shift of the bending axis. This change is most pronounced in the chimpanzee legs that have robust fibulae. It is concluded that the contribution of the fibula in weight-bearing of the leg is minor, and the interosseous membrane has no bearing on force transfer between the two bones. The two-bone arrangement with a membrane in between is more likely being driven by the demand for muscle attachment area in animals with large deep flexors rather than by weight-bearing demands.

Dental topographic analysis of molar wear in *Alouatta palliate*.

J.C. Dennis[1], P.S. Ungar[1], M.F. Teaford[2], K.E. Glander[3]. [1]Dept. of Anthropology, University of Arkansas, [2]Center for Functional Anatomy and Evolution, Johns Hopkins University, [3]Dept. of Biological Anthropology and Anatomy, Duke University.

Studies of dental biomechanics have demonstrated that tooth shape reflects the mechanical properties of foods that primates eat. Most studies have focused on unworn teeth, thus begging the question "how does tooth wear affect dental functional morphology"? This presentation reports on a longitudinal study of wear-related changes in tooth form in *Alouatta palloata*.

Dental impressions were taken of lower M2s of 14 howling monkeys at Hacienda La Pacifica, Costa Rica between 1989 and 1999. Each monkey was darted a number of times during that period and dental impressions were taken each time. Resulting tooth replicas were digitized to a resolution of 0.0254 mm using a laser scanner, and 3D models of occlusal surfaces were interpolated using GIS software. Data for average surface slope, relief, and angularity were generated for each sampling of each individual. Changes in values were calculated over 2, 4, and 7-year intervals, and tested for normality. These data were then assessed for significance using Student's t and Signed Rank tests.

Results indicate that the howling monkeys generally showed decreased molar surface slopes and relief over time. However, consistent changes were *not* evident for molar surface angularity. The lack of change in angularity between most intervals suggests maintenance of some func-