This work was support by the Yale Peabody Museum of Natural History and by the Yale University Department of Anthropology.

Exploring potential risk factors of fetal origins of diabetes: Maternal stressors during pregnancy and birth outcomes among women in a hospital in the municipality of Caguas, Puerto Rico.

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Puerto Rico exhibits the highest prevalence of diabetes, low birth-weight, and the second highest prevalence of preterm-birth in U.S. and its non-incorporated territories. Maternal psychosocial stressors during pregnancy have been associated with low birth-weight, preterm-birth, type 2 diabetes and immune-inflammatory dysregulations. Current evidence points toward epigenetic fetal metabolic-programming as the mechanism underlying the increased risk for these. However, psychosocial stressors involved in adverse birth outcomes and clinical complications have not been well studied. The present study seeks to identify stressors that may contribute to the high prevalence of low birth-weight and preterm-birth in the population of Puerto Rico. Participant mothers (n = 68) answered a questionnaire composed of five validated scales for measuring maternal stress during pregnancy. Data on birth outcomes and clinical complications were collected from the medical records of mothers and babies. Correlations were found between birth-weight and maternal weight before giving birth (p = 0.010), weight gain (p = 0.038), and BMI before giving birth (p = 0.020). Birth-term was found to be correlated with maternal weight gain (p = 0.022), and BMI before giving birth (p = 0.023). None of the scores from the stress scales was significantly correlated with any birth outcome. Preliminary analyses of continuous data suggest that maternal weight, BMI, and weight gain during pregnancy may have a more significant influence on birth outcomes than maternal stress. Future research should evaluate biological markers of stress, and the possibility of stress having an effect on maternal body composition during pregnancy.

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A morphometric analysis of the frontal squama in fossil and recent humans.

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Most studies of frontal bone morphology have focused on the browridge or have analyzed the entire bone, thus mixing information from the neurocranium and facial skeleton. Yet, the frontal squama is considered to be diagnostic for modern *H. sapiens* who are described as having vertical or bulging frontals. The morphology of the frontal squama is influenced by its position and orientation relative to other cranial components. Hence, in this study we analyzed the shape of the frontal squama alone, independent of its orientation relative to other cranial components, and quantified its variation in Pleistocene and recent humans. We examined 37 Middle and Late Pleistocene fossils from throughout Eurasia and Africa as well as 83 recent humans from 10 different populations. We analyzed frontal squama outlines taken from the supratoral sulcus to bregma using coordinates superimpositions and multivariate statistics. Our results demonstrate that modern and archaic humans are clearly separated on the basis of frontal curvature and bulging. However, there is some overlap among modern and non-modern groups, making it difficult to use this trait when diagnosing the taxonomic affinity of individual specimens. There is no separation of fossil and recent modern humans. Among modern humans, the majority of populations are distributed along a continuum characterized by frontal flattening at one end and frontal bulging at the other. However, according to this preliminary survey the Khoisan display a different morphology from the rest of the modern sample because of their marked frontal curvature.

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The genetic architecture and evolution of brain folding and neural network in a pedigreed *Papio* population.

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Elevated cognition is a hallmark of the primate clade. Cognitive capacity is determined both by number of neurons in the brain and the network of information exchange between brain regions. Increased folding (gyrification) of cerebral cortex allows more neurons to fit within the skull with minimal overall volume increase. The arrangement of folds (sulci) across cerebral cortex indicates the connectivity network; due to selection for the most efficient information-processing strategy, regions experiencing the highest level of crosstalk tend to be anatomically co-located along a gyrus and those least connected functionally tend to be separated anatomically by a sulcus. Despite its importance, the genetic and evolutionary underpinnings of primate brain gyrification remain unknown.

In this project, we answer pivotal questions about the genetic architecture of baboon cortical gyrification, differing cognitive strategies across the primate clade, and the evolutionary mechanisms responsible for their formation. We use a pedigreed baboon population (N=980) to assess the genetic basis, modularity, and morphological integration of cortical folding in primates and identify the chromosomal regions and candidate genes affecting these traits. Heritability of 25 brain traits has been quantified (average h^2= 31.1%) in the population, asymmetry assessed (Pearson's T-test p=0.0345) and phenotypic variation mapped to the genome using QTL analysis (highest peak: trait Left acruate rectus spur; baboon chromosome 4, 628Mb-707Mb). Four genes of interest are present in this region, including brain-specific angiogenesis inhibitor 3.

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Evolving biological anthropology in twelve acts.

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As biological anthropology has progressed in the sixty years since Washburn's call for a paradigm shift in the field, researchers have generally embraced the hypothesis-driven evolutionary approach advocated in the New Physical Anthropology. Along with the growth in the breadth of specialties within biological anthropology since 1951, researchers expanded collaborations with individuals in related fields. Yet, as we find ourselves increasingly relying on method and theory developed by other disciplinary researchers, a resultant anxiety is that we have had little novel theory of our own to offer, and therefore find ourselves at the margins of those collaborations. Even more problematic, researchers in other fields may address questions in the name of biological anthropology while not working with biological anthropologists. Our collective concern is exacerbated by the fact that we tend to have access to fewer financial resources along with greater teaching responsibilities relative to related fields.

This paper and accompanying symposium explore the sources for these impressions and work to prescribe solutions by showcasing productive approaches undertaken by researchers in specialties within biological anthropology. We demonstrate that biological anthropologists have a shared, unique perspective and methodology that are in fact integral to these multi-field partnerships. A key component of this vision is an emphasis on long-term cultural effects on biology. Moreover, we conclude that rather than constantly evaluating ourselves against sixty year-old measurements of progress, biological anthropologists should focus on these strengths to seek a more enterprising and goal-setting perspective as we forge an interdisciplinary future.

ABSTRACTS - AAPA PRESENTATIONS

Crossing disciplines to challenge the adaptationist paradigm.

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In the wake of the Modern Synthesis, Sherwood Washburn's appeal for a new physical anthropology explicitly called for a shift towards a process-oriented view of evolution. Like others at the time, Washburn overwhelmingly emphasized the role that selection plays in shaping diversity, and biological anthropologists soon began to embrace the idea of interpreting human variation and evolution in terms of underlying selective processes. Today, explanations for phenotypic variation in human evolution remain largely functional/adaptive, despite the strong challenges to the adaptationist paradigm mounted outside of biological anthropology in the past few decades. In this paper, I will discuss our current understanding of the important role that random genetic drift and gene flow have played in shaping phenotypic diversity in hominins. This fuller understanding of the underlying processes responsible for variation has necessitated engaging with other disciplines (e.g. evolutionary biology, quantitative genetics). We have much to gain from modifying the methodological approaches and theoretical developments within those disciplines to our own ends, including a more sophisticated interpretation of the fossil record. As one example, the emerging genomic evidence for gene flow among archaic human populations (e.g. Neanderthals, Denisovans) might have been less surprising (to those for whom it was a surprise) were it not for methodological approaches couched within a lingering adaptationist perspective that has failed to provide a sufficiently nuanced understanding of the evolutionary prevalence and phenotypic consequences of the 'other' evolutionary forces.

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Effects of predator presence on the behavior of bald-faced saki monkeys (*Pithecia irrorata*) in the Peruvian Amazon.

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Predation is an important selective pressure on prey populations but its influence on primate evolution remains hotly debated. While some researchers argue predation has little effect on group-living in primates, others maintain that constant threats of death strongly impact behavior. Here, we explore the effects of predator presence on saki monkey (*Pithecia irrorata*) behavior. We hypothesized that saki monkey behavior would differ in high and low use predator areas.

Data were collected from June to July 2012 at Centro de Investigación y Capacitación Río Los Amigos in Peru. Over 78 hours of scan and focal sampling were collected on 8 saki monkeys. During 10-minute focal follows, we recorded activity, canopy height, intragroup spacing, vigilance, and number of alarm calls emitted. To determine high and low use predator areas, we conducted a 30-day camera trap survey within the focal group's home range.

During 30 trap nights, we documented four felid species (jaguar, puma, ocelot, and margay) on 11 separate occasions. Camera trap data indicates a pattern of higher predator densities within parts of the sakis' home range. Analyses of behavioral data suggest that sakis maintain closer associations and engage in less rest and social behavior in high predator areas (Chi-square: $P<0.05$). However, alarm calling and canopy height are not associated with predator presence (Chi-square: $P>0.05$). Surprisingly, individuals seem to exhibit less vigilance in high predator areas, which may be related to habitat differences. Our future research will include an assessment of factors such as habitat quality and seasonality on antipredator behavior.

Predicting impact stiffness and rate of loading during human walking and heel-strike running.

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Heel-striking during human walking and running generates impacts beneath the foot. These impacts produce large forces over short time periods and occur millions of times per foot per year. In order to understand how the human body evolved to cope with these repetitive impacts, we must first understand how impact force parameters are generated beneath the foot in walking and running. Therefore, we used mass-spring models to predict stiffness and the rate of loading during the impact phase of gait. These models were tested on 20 human subjects walking and running on a rigid surface and four substrates of varying stiffnesses. All subjects walked and ran at Froude numbers of 0.28 and 1.2, respectively. Three-dimensional kinematic and kinetic data were collected using Qualysis motion capture software and an instrumented treadmill. Results indicate that impact stiffness on various substrates can be predicted accurately using knowledge of substrate stiffness and impact stiffness measured a rigid surface. Results also indicate that rate of loading scales predictably with impact stiffness. Importantly, declines in substrate stiffness of 94% produce only 17% declines in impact stiffness during walking compared to 55% declines in impact stiffness during running. This finding suggests that the human foot plays a greater role than substrate in governing impact forces during walking compared to heel-strike running. The performance differences in walking versus running provide a biomechanical context for interpreting morphological changes thought to be related to resisting impact forces, including variations in hominin calcaneal morphology.

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Microfractures in elderly ribs: Contributions to bone quality.

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Rib fractures can affect morbidity and mortality in elderly individuals and the risk of their occurrence increases significantly with age. Clinical diagnoses of bone fragility often fail to measure the contribution of poor bone quality. An inefficient remodeling process in aging individuals results in disrepair of microfractures, allowing their accumulation to reach harmful levels. While it is established that microfractures contribute to catastrophic bone failure, it is unknown to what extent they exist in human ribs and their role in determining bone quality. Additionally, the loads habitually applied to the rib during respiration are difficult to determine and therefore absent from many discussions on adaptive responses to loading. The objective of this research is to explore individual variation in microfractures which accumulate *in vivo* in elderly ribs. Samples from sixth rib pairs were removed from ten elderly cadavers, stained *en bloc* in Basic Fuchsin Hydrochloride, and transverse thin-sections prepared. A two-way mixed model analysis of variance (ANOVA) reveals significant differences in microfracture accumulation between individuals, but not within (left vs right rib). Only insignificant differences were found in crack location, with slightly more microfractures accumulating in the cutaneous cortex. These findings suggest that microfracture accumulation in the elderly has the potential to contribute to differential fragility. Additionally, based on crack distribution, the priority may be to preferentially maintain a higher bone quality in the pleural cortex. Knowledge of the mechanisms involved in bone quality deterioration is vitally important to establish methods to combat fragility fractures in the high-risk elderly population.

The evidence for modern human origins in Central Europe: 30 years since Smith's seminal review.

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Fred Smith's seminal review of the late hominin fossil record of Central Europe was published nearly thirty years ago (1984). This work helped highlight the importance of this region at a time when much of the debate about modern human origins was focused on the Western European record. The present paper reassesses Smith's interpretation of the evidence in light of recent research and discoveries. New

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