

relationships supported by DNA evidence. There were more unambiguous evolutionary steps [NS] from the base of the inferred tree to modern humans (N=75) than to any other taxon included in the study, including chimpanzees (N=70). However, modern humans have fewer head, neck, pectoral region and upper limb muscles (N=123) than most other mammals and fewer than most primates (e.g., chimpanzees have 126 muscles). So despite accumulating more evolutionary transitions than other primates, since the *Pan/Homo* split modern humans have actually secondarily lost muscles (e.g., levator claviculae and dorsoepitrochlearis) that are present in most other primates. The same data set was used to generate hypotheses about the head, neck, pectoral region and upper limb musculature of the hypothetical common ancestor of modern humans and chimpanzees/bonobos, and the hypothetical common ancestor of the clade that includes modern humans. Notably, modern humans accumulated more evolutionary transitions than other primates, but these transitions did not result in more muscles/bundles per muscle; in fact, since the *Pan/Homo* split humans have secondarily lost various muscles that are present in most other primates, including extant chimps.

*We thank funding from NSF BioAnth grant number 1440624 to RD.*

#### **Forensic Taphonomy: Research Wanted!**

DENNIS C. DIRKMAAT and LUIS L. CABO.  
Department of Applied Forensic Sciences,  
Mercyhurst University.

The foci, principles and practice of forensic anthropology have changed dramatically along the past decades. It evolved from a laboratory-based field targeting only victim identification, to a full-fledged scientific discipline with lab and field components, concerned with the understanding and interpretation of natural processes to reconstruct past events. Whether we consider methods or scope, virtually all elements of this transformation refer directly to the key questions in classic taphonomy. Modern forensic anthropology could be defined indeed as the combination of osteology and taphonomy to address forensic questions.

The initial development of forensic taphonomy has been based primarily on drawing from the existing body of knowledge of vertebrate taphonomy, with maybe the honorable exception of trauma analysis. Forensic archaeology has also drawn its main principles from taphonomy as applied in conventional archaeology.

However, forensic taphonomy departs from classic taphonomy in at least two key aspects demanding specific research: (1) the processes of degradation of soft tissues become relevant by themselves, instead of only for their potential role in the preservation of some structures; and (2) feature boundaries expand to encompass

current environmental conditions, rather than just past ones recorded in the geological medium.

We propose that, for its success, future research in forensic taphonomy must also expand beyond the boundaries and scope of its classic parent disciplines to incorporate (1) field and functional ecology techniques and perspectives, (2) fully experimental designs, and (3) standardized field protocols allowing for scene-comparisons and actualistic research akin to multicenter clinical trials.

#### **Determining Ancestry of Unprovenienced Human Remains from the Grenadines, Southern Caribbean: Dental Morphology and Craniometric Analyses**

TAYLOR N. DODRILL, GREG C. NELSON,  
JESSICA H. STONE and SCOTT M.  
FITZPATRICK. Anthropology, University of  
Oregon.

The bioarchaeological record of the southern Caribbean reflects a diverse population history due to the replacement of founding indigenous groups by European and African populations as a result of colonial incursion and processes surrounding the Transatlantic Slave Trade that occurred over a period of centuries. This complex history can present problems for proper dispensation of archaeological material and human skeletal remains, particularly those recovered outside the strictures of controlled excavation. In this case study we examined a collection of unprovenienced skeletal material comprising four individuals of unknown ancestry deriving from a private collection on the island of Mustique in the southern Grenadines that supposedly originated on the smaller nearby island of Petite Mustique. Ancestry has been estimated using a combination of craniometrics and dental morphology, the latter assessed by scoring a suite of 23 Arizona State University Dental Anthropology System (ASUDAS) traits for comparison against existing population data from Africa, Europe, and the Americas. Standard craniometric measurements were also assessed using the FORDISC database. We find that these data do not support an Amerindian ancestry for these individuals, and instead suggest the remains are of European and/or African descent that date to the historic period. These and other ongoing analyses, including possible mtDNA extraction and stable isotope analyses, should help in efforts to repatriate the remains to the appropriate governing body and location.

#### **Injury-Related Morbidity and Mortality in Neolithic Syria**

SEAN P. DOUGHERTY<sup>1</sup> and AKIRA  
TSUNEKI<sup>2</sup>. <sup>1</sup>Dept. of Natural Sciences,  
Milwaukee Area Technical College, <sup>2</sup>Dept. of  
Archaeology, University of Tsukuba.

The injurious effects of the agricultural transition on health have been well documented.

In addition to a general increase in indicators of illness, researchers have observed higher frequencies of skeletal trauma among early agricultural populations. This trend is often considered indicative of an increased level of interpersonal conflict, perhaps related to resource availability or the enforcement of social hierarchies. While much of this research is derived from New World contexts, contributions from the Near East are relatively uncommon. Excavations at the Potttery Neolithic cemetery at Tell el-Kerkh in northwest Syria provide an opportunity to study the frequency of skeletal trauma in this less examined region. The cemetery sample consists of 237 individuals. Of these, 127 individuals (male=48; female=41) were adults. Thirty-seven fractures were observed among thirteen individuals (male=11; female=3). Most individuals (54%) suffered multiple injuries. Fractures to the hands, feet, and thorax were most common. Four individuals exhibited cranial or facial fractures, including one young adult male with an unhealed, penetrating fracture of the frontal bone. In general, the observed frequency and pattern of fractures is similar to other sites within the Near East, with limited evidence for interpersonal violence. However, the divergent constellation of fractures among males and females suggests that, while interpersonal violence may have been uncommon, females were at greater risk of intentional injury. In contrast, males were primarily at risk of minor skeletal injuries, perhaps due to environmental dangers, or the hazards of manual labor.

#### **Sealed osteons do not increase in the human femur with aging or in association with a total hip replacement**

MADISON S. DOUTRE<sup>1</sup>, MICHEAL G.  
ADONDAKIS<sup>2</sup>, ROY D. BLOEBAUM<sup>3</sup> and  
JOHN G. SKEDROS<sup>3</sup>. <sup>1</sup>Biology, University of  
Utah, <sup>2</sup>School of Medicine, Tufts University,  
<sup>3</sup>Department of Orthopaedic Surgery, University  
of Utah.

Age-related degradation in cortical bone quality is detected histologically as empty osteocyte lacunae, increased porosity, and hyper-mineralization of osteocyte lacunae, osteon canals, and interstitial bone. Increased prevalence of sealed osteons (SO) might reflect age-related degradation. They might result from ischemia, as suggested by Congiu and Pazzaglia who showed that 4-5% of all secondary osteons from modern human tibiae were sealed (amputated legs; ages 25, 28, 52; all males). We performed microscopic analyses on transverse sections of proximal regions of bilateral femora (10 patients; 52-94 years; mean 82) with non-cemented unilateral hip replacements (HRs) (implanted vs. contralateral non-implanted side). Hypotheses: SOs would increase with (1) patient age, (2) the presence of a femoral component, and (3) the amount of time since HR. We also re-evaluated images from normal human femora without HRs (ages 35-71; male:female=8:2) to measure areas of SOs vs.

random non-SOs. Results: (1) SOs tend to decrease with age ( $r = -0.234$ ;  $p = 0.04$ ) but do not increase with HR implant (3.4% SOs vs. 3.4% SOs;  $p = 0.9$ ) or with duration of HR implantation ( $r = 0.09$ ;  $p = 0.6$ ); (2) SOs occur in significantly smaller osteons when compared to normal osteons (mean diameters: 146 vs. 320 microns;  $p < 0.005$ ). The theory that SOs result from ischemia is not supported by the negative correlation of SOs with age or the lack of correlation of SOs with HR. Although we hypothesize that SOs represent the narrowed tip of osteon "closing cones", a reduction in prevalence of closing cones with age seems unlikely. Additional 3D studies are needed.

*This project was funded by the Department of Veterans Affairs, Salt Lake City, Utah.*

### Re-evaluating the co-occurrence and age of formation of Harris lines and linear enamel hypoplasia

ELEANOR R. DOVE, JOEL D. IRISH, CONSTANTINE ELIOPOULOS and ISABELLE DE GROOTE. Research Centre in Evolutionary Anthropology and Palaeoecology, Department of Natural Sciences and Psychology, Liverpool John Moores University.

The use of indicators of systemic stresses, such as Harris lines (HL) and linear enamel hypoplasia (LEH), as a means of assessing past population health has been called into question in recent years. This study examines the ages of formation and co-occurrence of HL and LEH in a medieval British sample from the site of Poulton, which includes both adults and juveniles. A population-specific method of aging HL formation was developed for this study because our previous research revealed a different center of ossification estimation for all populations analyzed, and notable differences in growth rates among British populations across time and socioeconomic environments. As such, it is clear that standardized methods would not yield accurate ages of HL formation. The population-specific method is based on diaphyseal long bone lengths in the tibia, the element in which HL most commonly occur. Ninety Poulton individuals with dentition and complete tibiae were radiographed. Of these, 63 (70%) were found to have HL. The ages at which these lines formed were clustered into two ranges – between 2-3 and 7-11 years. LEH on the maxillary and mandibular canines was also recorded and 45 (50%) individuals presented both LEH and HL. The LEH formed mainly between the ages of 2-4 years. It is concluded that although the same stress factors may not result in the simultaneous occurrence of these two indicators, some individuals may be predisposed to both arrested growth and enamel disturbances.

### Temporal variation in the neural canal among southern African foragers: implications for dynamic foraging strategies and social conditions in the later Holocene

L. ELIZABETH DOYLE. Department of Anthropology, University of Toronto.

The terminal Later Stone Age on the southwestern African Cape features a short period of intense land use, more limited home ranges, and occasional lethal violence. Mean body sizes are smallest during this period, suggesting that some foragers experienced statural stunting. This study compares temporal variation in the size of the neural canal (NC) with that in body size ( $N = 105$ ;  $M = 56$ ;  $F = 49$ ). Z-transformed mediolateral (ML) and anteroposterior (AP) NC diameters, maximum femur lengths (FXL) and femur head diameters (FXH) are regressed on radiocarbon date using polynomial regression. Mean sizes are compared before, during, and after the intensification period with one-way ANOVA. FXL, FXH, and ML-NC exhibit similar quadratic curves with a nadir between 2000 and 3000bp. Mean values are greatest after the intensification period ( $p < 0.05$ ). However, regression models are markedly stronger for FXL and FXH than for NC (FXL  $\beta_1 = -1.60$ ,  $\beta_2 = 1.43$ ,  $R^2 = 0.20$ ,  $p < 0.05$ ; FXH  $\beta_1 = -1.64$ ,  $\beta_2 = 1.49$ ,  $R^2 = 0.20$ ,  $p < 0.05$ ; NC-ML  $\beta_1 = -0.83$ ,  $\beta_2 = 0.68$ ,  $R^2 = 0.06$ ,  $p < 0.05$ ). The attenuated change in NC size, in contrast with the apparent decrease in body size suggests that the intensification period did not strongly affect early childhood growth among those who survived to adulthood. The terminal Holocene increase in average size coincides with a possible population contraction and with the earliest regional appearance of livestock. Subsistence and demographic changes, accompanied by the shift in average body and neuroskeletal size, may signal that social conditions were shifting away from an earlier Holocene status quo.

*This research was financially supported by the Social Sciences and Humanities Research Council of Canada.*

### Anthropological studies of past societies from the Hualfin valley in northern Argentina: A preliminary report

HILTON DRUBE<sup>1,3</sup>, BÁRBARA DESÁNTOLO<sup>2</sup>, GUILLERMO LAMENZA<sup>2,4</sup>, ELINA SILVERA<sup>3</sup>, SUSANA MARTÍNEZ<sup>3</sup> and SUSANA SALCEDA<sup>2,4</sup>. <sup>1</sup>Laboratorio de Antropología, Universidad Nacional de Santiago del Estero, <sup>2</sup>Departamento de Antropología, Universidad Nacional de La Plata, <sup>3</sup>Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Catamarca, <sup>4</sup>CONICET, Consejo Nacional de Investigaciones Científicas y Tecnológicas.

The Hualfin valley is located in the province of Catamarca in northwestern

Argentina. The valley has been characterized by a significant sequence of prehistoric occupation of different societies during Pre-Columbian times. The earliest agro-pastoralist societies in the area emerged in the valley between BC III and AD IV during the Formative Period. Unlike other Pre-Hispanic societies of northern Argentina, little information has been recorded about their funerary practices and the anthropological characteristics of the populations involved.

The aim of this paper is to present the preliminary results of the anthropological study of different burials recovered in the Hualfin valley corresponding to the earlier agro-pastoralist societies of the Formative Period. The skeletal sample consists of 19 individuals and was exhumed from burials in an archaeological site in the vicinities of Azampay, located in the western piedmont of the valley. The sample comprises 10 adults, including 6 females and 4 males, and 9 subadults. Dental and skeletal morphology and paleopathology are recorded, along with nonmetric and metric traits. Diverse patterns of burials are noted which may suggest social differences in these past societies. Individuals do not exhibit cranial modification as it was common in the area in later periods. The anthropological data collected in this study provide more information about the ancient peoples of the region and are a major contribution to the human biology of the area. Further studies in the Hualfin valley will allow increasing current knowledge about biocultural aspects of human populations of the Formative Period in northwestern Argentina.

*This study was funded by Agencia Nacional de Promoción Científica y Tecnológica (ANPCyT).*

### The mental eminence as a marker of sexual dimorphism in dentate and edentulous individuals: An analysis using geometric morphometry

BEATRIX DUDZIK<sup>1</sup>, HELI MAIJANEN<sup>2</sup> and KATHLEEN HAUTHER<sup>3</sup>. <sup>1</sup>Anatomy, Lincoln Memorial University, <sup>2</sup>Archaeology, University of Oulu, <sup>3</sup>Anthropology, University of Tennessee.

The mandible is often used for sex estimation as many mandibular studies have identified morphological differences among males and females. Sexual dimorphism of the mandible has also been shown to vary in relation to population samples. Specifically, the shape of the mental eminence is commonly utilized to estimate if an individual is male or female. However, mental eminence shape is not typically quantified and accuracy of traditional and often subjective non-metric methods can be poor.

Further confounding sex estimation from bony elements of the skull is the biomechanical implications of antemortem tooth loss. Several studies highlight changes in morphology of edentulous mandibles in comparison to dentate samples. Thus inquiry of quantification of the