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The fossil evidence for human evolution has expanded dramatically over the past 30 years and the rapid growth of this record has challenged the traditional approaches of a classroom lecture and hands-on laboratory. In order to provide current information to students, we have built a robust collaborative website, eFossils.org. This website incorporates various data from human evolution (e.g., anatomy, geology, geography, geochronology) within a multimedia learning environment (e.g., color images, 3D animations, video) and offers a series of online tools to visually represent these data and permit their study. The eFossils catalog uses the Darwin Core schema and permits the display and mapping of data sets from any project. The website also includes a "collaboratorium," a web tool built on a generic template that permits the research community to collaborate on large-scale problems. Collecting all the information for human evolution into a single database is now too large an undertaking for any one group; instead, eFossils is constructed for the collaborative participation of subject-matter experts. We have populated eFossils with several site reports about key hominin fossil localities in order to seed the process of providing a data-rich online presentation. Additional localities can be populated through a collaborative expansion of the database by registered users. Consequently, the organic nature of eFossils reflects the dynamic nature of the field, and as users expand the database with their own research, the "ownership" of the site will transfer to the user community in a manner that mirrors the online expert wikis.

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Occlusal microwear texture analysis of Croatian Neandertals.

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Aspects of Neandertal diet have been examined using a variety of techniques. Recently, dental microwear texture analysis has been used to make inferences about diet in Neandertals. Previous research by el Zaatari found that there was ecogeographic variation in Neandertal diet, with texture values being higher for Neandertals living in woodland areas than for those living in dryer steppe regions. We examined 24 molars (preferably the lower M2) from Krapina (n=20) and Vindija (n=4) using white light confocal microscopy. Three variables

were assessed using Toothfrax and Sfrax software to describe molar occlusal surfaces via scale-sensitive fractal geometry. The variables used were complexity (Asfc), anisotropy (epLsar), and textural fill volume (tfv). We hypothesized that the molars from Krapina and Vindija would have higher texture values than those reported for Neandertals from more open environments. Our results indicate that Vindija had complexity and anisotropy values (0.84 and 0.0027, respectively) that are comparable to woodland Neandertals and Pre-Neandertals. Likewise, Krapina had complexity that is similar to woodland Neandertals (1.11), but its anisotropy is far higher (0.0042), indicating a more fibrous diet. Tfv was higher for Vindija (46,367) than Krapina (35,518) indicating that its diet was harder. Dates for Krapina place it at approximately 130,000 years ago, which is far older than Vindija (about 42,000 years ago for level G3). The higher anisotropy at Krapina might relate to its earlier age, slight ecological differences, or depositional environment.

Correlations between nitrogen isotope levels and stature in three Northern California prehistoric groups.

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This study examines the correlations between dietary isotope levels and adult human stature. Physical anthropologists have long recognized the association of health status and nutrition with stature. Bioarchaeological studies of health and nutrition in prehistoric groups attribute temporal variation in stature to changing subsistence strategies over time, with the animal protein content of diet considered positively correlated with among-group variation in stature. Further, within-group differences in protein intake have been found to be positively correlated with nitrogen isotope values ($\delta^{15}\text{N}$) in modern human groups. These positive correlations, one between stature and dietary protein, and the other between dietary protein and ^{15}N levels, imply that may ^{15}N may be a useful predictor of stature.

This study tests the hypothesis that within-group variation in ^{15}N levels and stature are positively correlated in prehistoric California groups. Skeletal remains from Marsh Creek (CCO-548), Pleasanton (ALA-554), and Ryan Mound (ALA-329) were studied, providing data for groups with an intensive marine resource subsistence strategy and an intensive acorn-processing subsistence strategy. Based on preliminary analysis of the Marsh Creek sample, a linear model of stature regressed on both sex (a consistently useful within-group predictor of stature) and ^{15}N levels (AIC = 344; adjusted R^2 = 0.51) outperforms the model in which stature is predicted based on sex alone (AIC = 349; adjusted R^2 = 0.45). These results suggest further potential utility to integrating dietary isotope and morphological data in bioarchaeology.

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Identification of historic individuals: the unknown sailor from the HMAS Sydney II.

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The ability of physical anthropologists to identify historic individuals through a range of analytical techniques has assisted investigations and engaged the public in our discipline. Stable isotope analysis of a range of elements along with osteological, dental, historical and DNA evidence have all been carried out in an attempt to identify an unknown sailor from the 1940s. On November 19, 1941, the naval vessel, HMAS Sydney II sank off the western coast of Australia following a battle with a German ship. The loss of all 645 crew members of the HMAS Sydney II was the largest single naval loss in Australian military history. In February of 1942, an unidentified dead sailor was recovered from a life raft near Christmas Island, where he was buried following a post mortem examination. As the only potential link with the HMAS Sydney II, there has been tremendous public interest in the identification of this individual, who was exhumed in 2006. Osteological analysis indicates that the individual was a young male of European ancestry who suffered a shrapnel wound to the head. Isotopic analyses were carried out on a rib fragment and one tooth. Results for carbon, nitrogen, sulfur and strontium isotopes are consistent in identifying a diet very high in marine foods and oxygen isotopes indicate a place of residence in the tropics. These analyses highlight both the potential and the limitations of the various analytical methods employed. While the exact identification remains uncertain, the range of possibilities has been reduced considerably.

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Unexpected regional differences in collagen fiber orientation heterogeneity (CFO-Het) between chimpanzee and human proximal femoral shafts: is CFO-Het still a useful characteristic for corroborating load history data?

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Gray levels (GLs) in circularly polarized light (CPL) images reflect predominant collagen fiber orientation (CFO) (Skedros et al. 2011 J. Anatomy). CFO-Het, measured as the full-width at half-maximum (FWHM) of a GL/CFO profile, has been shown to corroborate the bending load history in the chimpanzee proximal femoral shaft (Keenan et al. 2011 AAPA). Based on this previous chimpanzee study, greater CFO-Het in compression "cortices" was also expected in the human femur. Twenty-four sections from 12 adult human proximal femoral shafts were

embedded in methacrylate, ultramilled, and imaged in CPL. FWHM was measured from CFO profiles (larger FWHM = greater CFO-Het). Statistical analysis was based on the: 1) left peak (LP), 2) right peak (RP), and 3) average of both peaks (AvgP) of the CFO profile of each image. Results show highest CFO-Het in the medial "compression" cortex when considering the LP ($p < 0.05$), but is unexpectedly highest in the lateral "tension" cortex when considering the RP and AvgP ($p < 0.05$). Although CFO-Het correlates moderately with CFO for the RP and LP (RP: $r = 0.5$, $p < 0.001$, LP: $r = -0.6$, $p < 0.001$), there is no correlation with AvgP data ($r = -0.1$). While CFO-Het clearly corroborates CFO-based load history data in chimpanzee femora (greater CFO-Het in "compression" cortices), CFO-Het does not clearly reflect this load history in human proximal femora. This may reflect difficulties in quantifying CFO-Het based on the presence of two CFO peaks in human femora (chimpanzees = one peak). Consequently, CFO-Het does not appear to be useful for predicting a history of bending in these bones.

Genome-wide Complex Trait Analysis (GCTA) as a method to quantify missing heritability in Parkinson's disease.

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Genome-wide association studies have been successful at identifying SNPs highly associated with common traits, however a great deal of the heritable variation associated with common traits remains unaccounted for within the genome. Genome-wide Complex Trait Analysis (GCTA) is a statistical method developed by Peter Visscher used to estimate phenotypic variance of complex traits explained by genome-wide SNPs, including those not associated with the trait in a Genome Wide Association Study (GWAS). We applied this method to 8 cohorts containing 6,057 case and 17,471 control individuals of European ancestry, in order to examine the missing heritability present in Parkinson's disease, a neurodegenerative disorder affecting between 1-2% of individuals over the age of 65. We meta-analyzed our initial results to produce more robust and generalizable heritability estimates for PD types. Our results identify 36% ($p = 6.47E-06$) of phenotypic variance associated with all types of PD, 51% ($p = 3.91E-04$) phenotypic variance associated with early onset PD, and 39% ($p = 2.55E-05$) phenotypic variance associated with late onset PD. This is a substantial increase from the genetic variance identified by GWAS alone (between 1-3%). Our results suggest that while GWAS is a useful tool in identifying some of the most common variants associated with complex disease, a large portion of the heritability associated with disease traits remains unattributed.

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The social organization of *Lemur catta* in the region of Cap Sainte-Marie, Madagascar.

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Perceptions of "typical" *Lemur catta* behavior are based primarily on captive and gallery forest studies. The objective of this study is to compare assumed species-typical behaviors with data collected during a long term study on this species in a completely different environment: the semi-desert conditions of Cap Sainte-Marie (CSM), Madagascar. The specific behaviors that are investigated include 1) activity budgets, 2) agonism trends, 3) group cohesion patterns, 4) dyadic bonds, and 5) adult to immature relationships. Data have been collected on two different troops through all day follows using focal animal and scan sampling methods. Over 1,019 hours of behavioral data are included in the analyses.

Relative to other populations, CSM *Lemur catta* are highly social, and immatures are central to troop dynamics. In fact, a major form of agonism in one troop especially seems akin to socialization. Conversely, while female targeted aggression is not a primary agonistic form with these troops, there is also an absence of strong female dyads. Last, there are consistent affiliative interactions between resident males and troop immatures, and no males dispersed from one troop during the 15 months of observations. Based on these findings, I conclude that the social organization of CSM *L. catta* is largely shaped by two factors: 1) a lack of multigenerational matrilineal and 2) a near absence of inter-troop contact. I also propose that *L. catta* may be predisposed for behaviors such as paternal care, but that these behaviors are typically suppressed in other studied troops because of these factors.

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Bioarchaeological analysis of unlooted tombs from Cocahuischo in Nasca, Peru (AD 650-750) reveals disease and trauma patterns during the period leading up to Wari Imperial incursion.

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The latter portion of the Early Intermediate Period in Nasca, Peru (AD 650-750) was characterized by burgeoning social and trade networks before the expansion of the Wari and Tiwanaku states. The Nasca were important to the Wari state, as evidenced by similarities in ceramic technology and iconography. Even with these associations, recent archaeological and bioarchaeological studies have revealed variation in the Nasca response to Wari incursion.

Ten individuals from nine unlooted tombs from Cocahuischo, one of the largest sites in the region during this time period and located near the later Wari outpost of Pataraya, were excavated and analyzed. Almost all individuals

exhibit the Nasca fronto-occipital style of cranial vault modification and are seated flexed facing south. The most common pathology is antemortem tooth loss, but few individuals show evidence of osteoperiosteal reactions. Osteoarthritis, spondylolysis, Schmorl's nodes, and postcranial fractures attest to the hard physical activity characteristic of Nasca lives. One tomb also contained a rare headless burial of a young male and may clarify the practice of Nasca "trophy" head taking. These bioarchaeological analyses contribute new data on Nasca individuals during a period of great social change.

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Low, sexually-monomorphic digit ratios in a wild strepsirrhine primate (*Microcebus rufus*).

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The relative lengths of the second and fourth digits (2D:4D) are considered a marker for prenatal androgen exposure. Lower ratios are generally characteristic of males in humans and anthropoid primates, and have been correlated with a wide range of presumably androgen dependent behavioral and morphological traits within species (increased aggression, dominance and physical size) as well as between species (increased intrasexual competition, reduced pair bonding). 2D:4D sexual dimorphism is well characterized in humans and reported for several anthropoids, however the data presented here represent the first assessment of digit ratios in a strepsirrhine, the brown mouse lemur (*Microcebus rufus*). Due to the female dominance and overall sexual monomorphism typical of lemurs, and the comparable levels of fecal testosterone in this species' males and females, we expected to find no evidence of dimorphism. Digital measurements of rays were taken and all potential ratio combinations analyzed for male ($n=28$) and female ($n=21$) brown mouse lemurs in a wild population in Ranomafana National Park, Madagascar. No sexual dimorphisms were found (p values between 0.38 and 0.82). However, the low 2D:4D (0.75) of these polygynous lemurs fits well with the negative correlation established between intrasexual competition and 2D:4D in anthropoid species, despite the typically strepsirrhine manual ectaxy of *M. rufus* and the mesaxony of the anthropoid species. Implications for comparisons of a full range of digit ratios within and between groups with mesaxonic and ectaxonic hands will be discussed.

Sex estimation using pubic bone morphology in a modern South African sample: a test of the Kales et al. method.

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