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Paleogenomics interpretation of admixture between polar bears and brown bears

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A number of recent studies have revealed significant admixture between polar bears (*Ursus maritimus*) and brown bears (*Ursus arctos*). These closely related but ecologically divergent species, provide a potentially powerful model system for investigating how climate and ecological niche divergence mediate admixture. Using both modern and paleo-genomic analysis we will investigate the asymmetric impact of hybridization on these species gene pools. We will examine the temporal signature of admixture events, to show how genetically intermediate populations may arise in zones of admixture, and then once admixture ends in an area, return to relatively low levels of introgressed ancestry. Finally, we will explore the role of the rapid climate warming after the Last Glacial Maximum in promoting admixture between polar bears and brown bears.

Bone-years: Accounting for differences in preservation and age distribution when comparing lesion prevalence between skeletal collections

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Populations are routinely characterized and compared through their prevalence of skeletal lesions. Prevalence is generally calculated by counting the number of lesions over the number of elements present, which controls for intergroup differences in preservation, but not age. Conversely, using a denominator of person-years and testing with the Z-statistic controls for differences in age composition, but not preservation.

To investigate the effects of both age structure and differential bone preservation on intergroup prevalence comparisons, counts of

healed nasal trauma were compared between individuals from two populations with different age compositions and nasal preservations: the Grant collection (n=172) and the Lopes collection (n=161). The Grant collection displayed significantly more left and right nasal fractures than the Lopes collection when complete elements was used as denominator ($\chi^2=10.44$, $p=0.01$; $\chi^2=6.41$, $p=0.011$) as well as when bone-years was used ($Z=2.71$, $p=0.007$; $Z=0.03318$, $p=0.033$), but not when person-years was used ($Z=1.4174$, $p=0.16$; 1.3536 , $p=0.18$). Bone-years is a newly devised variable for this study and is the sum of the ages of each element analyzed. It is therefore affected by both age composition and preservation. Similar to the chi-square results, the Z-statistic using bone-years displayed statistically significant differences between nasal fracture rates of the two populations, but can be considered a more robust and accurate representation of differences as it inherently controls for both differences in population age structure and element preservation. Before bone-years can be suitably applied to prevalence comparisons involving multiple elements, however, issues of fracture independence and partial element preservation must be addressed.

Metastatic Carcinoma... and other Differential Diagnoses

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The aim of study is to provide a differential diagnosis of pathologic lesions on a prehistoric cranium (AD1160-1260) based on both macroscopic and radiological analyses, as well as the bio-cultural profile of the individual. Dubbed "Individual A," the cranium pertains to an adult male between the ages of 30 and 60 at the time of death. Notable pathological alterations include a perforated, destructive lesion of the frontal bone. Three other lesions, on the left and right parietal bones, are in the beginning stages of destruction.

Given the locality of and proliferative nature of lytic lesions, metastatic carcinoma, syphilis, multiple myeloma, specific infectious diseases such as tuberculosis, and histiocytosis X, are all considered in this differential diagnosis. However, the irregularity of the margins and extensive bone reaction surrounding the destructive lesion on the cranium of the adult male points to metastatic carcinoma, metastasis of prostate cancer to the bone, as a probable etiology.

Physical activity, sedentary behavior and pubertal maturation among the Tsimane'

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Understanding the factors that underlie physical activity behavior can have important implications for public health. Several epidemiological studies have noted that physical activity decreases through adolescence in modern, Western contexts. We examined physical activity patterns among Tsimane' adolescents from a life history perspective to test the hypothesis that physical activity trades-off against investments in reproductive maturation and is sensitive to individual condition. Physical activity was measured with accelerometers among a cross-section of Tsimane' children, adolescents and young adults ($N = 110$; age 8-22). Minutes of the day spent being sedentary significantly increased with Tanner stage of pubertal maturation ($\beta = -28.66$, $t = 3.47$, $p < 0.001$) when controlling for age (ns) and sex. Overall, knowing an individual's Tanner stage, sex, and age accounted for over half of all the variation in sedentary time ($R^2 = 0.51$). Meanwhile, minutes of the day spent in moderate to vigorous physical activity significantly decreased with Tanner stage, again controlling for the effects of age (ns) and sex ($\beta = -9.00$, $t = -2.00$, $p < 0.05$). We also report how behavior was related to testosterone (as a proxy for pubertal maturation), and current individual condition, measured by urinary C-peptide and cortisol. Results are interpreted from a life history framework and considered in light of implications for public health in modern contexts.

In the Wake of War: Population Health and Ottoman-Occupation in 14th - 16th Century Croatia

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The effects of endemic warfare are far-reaching and crippling. Slavery, civil war, and invasions can have a dire effect on the well-being of the people subjected to these influences. Croatia from the 14th to the 16th century faced these forces head on in the form of repeated attacks by the Ottoman Turks. Over the course of 200 years there were at least 10 historically documented invasions by the Ottomans that led to massive refugee exodi, increasing severity of civil wars, and development of a slave trade with Istanbul. This flood of Ottoman invaders served to scatter the existing population and create disorder; a goal which was readily achieved. It is hypothesized that these incursions would have left markers on the skeleton in the form of

changes at enthesal points, specifically in the spinal column, as well as indications of violent injuries and non-specific indicators of disease and nutritional deficits. The effect of violence and warfare on degenerative skeletal changes is well documented in the bioarchaeological record. Through the multifaceted lens of bioarchaeology this pilot project served to examine the effects of this violence on the health of a collection of Croatian individuals curated at the Croatian Academy of Sciences and Arts in Zagreb. Our preliminary findings indicate that the consequences of incursions by the Ottoman Turks into Croatian territory were severe enough to reveal changes at musculoskeletal attachment sites and increased incidence of arthritis on the spinal column.

High terrestrial mobility is geographically widespread among southern African Later Stone Age populations

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Southern African Later Stone Age (LSA) forager skeletons from the southern and western Cape coasts have very high biomechanical indicators of terrestrial mobility based on lower limb cross-sectional geometric properties (CSGP). A previous study by Cameron and Pfeiffer investigated the geographic distribution of lower limb CSGPs by examining LSA skeletons from the central interior of contemporary South Africa. This study found that individuals from the central interior shared lower limb CSGPs with coastal individuals. However, sample sizes were small ($n=15$), and tibiae were not examined. In the present study, the central interior sample size was increased ($n=51$), and tibial CSGPs were also examined to clarify if high terrestrial mobility signatures extend beyond the Cape coast. Torsional strength (J), total subperiosteal area (TA), and diaphyseal shape indicators (I_{max}/I_{min} and I_y/I_x) of femora and tibiae were compared between coastal and central interior males and females. CSGPs were calculated from periosteal contours obtained from the midshaft (50%) location of femora and tibiae using periosteal molds and 3D laser surface scans.

There are no significant differences in J or TA for femora or tibiae among coastal and central interior males and females. I_y/I_x and I_{max}/I_{min} however are significantly higher among coastal femora, while I_y/I_x was significantly higher among coastal male tibiae. These results suggest that a high degree of terrestrial mobility was geographically widespread among LSA individuals. In the southern African LSA context, diaphyseal shape indices may reflect differences in terrain relief between the mountainous coastal and flat central interior regions.

Eating oneself? Stable isotopic enrichment during weight loss and tissue turnover in humans

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In recent years, it has been demonstrated that different metabolic states can have a noticeable effect on the isotopic signatures of body tissues. Specifically, the metabolism of bodily tissues for energy (catabolism) has been shown to affect isotope ratios through the recycling of carbon- and nitrogen- containing compounds. This has significant implications for the field of paleonutrition, as our interpretations of past diets are often based on stable isotope analysis, but rarely take the potential effects of dietary insufficiency into account. We present carbon and nitrogen stable isotope ratios of hair samples taken from three subjects who experienced tissue loss. Two of these subjects had recently undergone gastric band surgery, while the third had experienced muscle wasting as the result of a vehicle accident. We monitored isotope ratio changes over time prior to and following these metabolic milestones in a longitudinal and minimally invasive manner. All subjects displayed a marked enrichment in their $\delta^{15}N$ values corresponding to their period of metabolic stress, consistent with tissue recycling during this time. However, all subjects also showed a noticeable enrichment in $\delta^{13}C$ corresponding to the stress event, implying that lipid catabolism did not provide most carbon for hair synthesis.

The preauricular sulcus and its link to sex and parturition: a test on a British Medieval collection

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The aim of the research was to examine the effects of sex and parity status on the preauricular sulcus. Physical anthropologists, anatomists and clinicians have long suggested that pregnancy and parturition may leave 'scars' on the skeleton, especially the *os coxae*. However there has been much debate on these marks and no clear method for examination has been established. The collection used in this

research was a British Medieval collection ($n=116$), 56 females and 60 males. A grading system was constructed to examine the different types of sulcus, ranging from Grade 0-4. Grade 0 was given when no preauricular sulcus was present and Grade 4 for a large, well-defined sulcus that was characteristic of pregnancy 'scars'. The age and sex of the individual was also recorded as well as the maximum length and width of the sulcus.

The results showed a significant difference in the occurrence rates of the preauricular sulcus in males and females. A preauricular sulcus was present in 78.6% and not present in 21.4% of females while for males preauricular sulci were present only in 20% of cases and not present in the majority, 80%. The research not only indicates that the preauricular sulcus is a sexually dimorphic trait that can be scored, but also suggests the parity status could affect its morphology. This conclusion is supported by the absence of Grades 3 and 4 in male subjects as they were only found in females.

An examination of early stress, longevity, growth and childhood socioeconomic circumstances in a modern juvenile skeletal sample from Portugal

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Collections of documented juvenile skeletons provide the unique opportunity to elucidate in more detail how early-life stress events place constraints on future investments in growth and longevity. In this study a sample ($n=30$) of juvenile skeletons between the ages of 1 and 6 years was assessed for presence of macroscopic enamel surface defects on the deciduous dentition. These were used as proxies for stress events occurring up to 6 months of age. About a third of the individuals showed at least one defect. Age at death and z-scores for femur length were used as measures of longevity and growth status and compared between individuals with and without enamel defects. Although differences between the groups were not statistically significant, the two groups seem to differ more noticeably in growth status (one defect=-1.6 mean z-score, no defect=-1.1 mean z-score). These differences seem to increase from childhood (one defect=-0.9, no defect=-0.5) to the juvenile period (one defect=-2.9, no defect=-1.6). Findings suggest that early life stress events are associated with socioeconomic circumstances and that surviving these events seem to be placing constraints on future growth, particularly further in the future. Although these results point to consequences of early stress to reproduction and longevity, sample size and methodology are also discussed as important constraints in the analysis.