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Human bone collagen is routinely analyzed for radiocarbon dating and paleodietary studies using stable isotope analysis, but its utility is contingent upon preservation. In addition to numerous taphonomic factors that affect diagenesis post-deposition, curation and display of human skeletal remains post-excavation may also influence collagen preservation or degradation. Here, we present an assessment of diagenetic alteration of human bone collagen from the archaeological site of Ban Pong Manao, an Iron Age settlement and cemetery in central Thailand. Following excavations in the early 2000s, most excavated human skeletal remains were housed at the on-site research and storage center, while a subset were chosen to remain *in situ* under covered open-air excavation units for public display and community tourism. We analyzed samples from both post-excavation contexts (*in situ*, n=12; museum storage, n=21), and assessed whether different curation techniques affected the degree of diagenetic alteration. We measured collagen yield, carbon and nitrogen wt%, and atomic C:N ratios. Results show that while collagen yields varied, ranging from 0.6 to 9.3 wt% (n=33), differences between contexts were not significant (p=0.2), and all samples fell within accepted ranges for each criteria. Contrary to initial hypotheses, the *in situ* display of human skeletal remains in covered open-air excavation units has had little if any effect on collagen preservation at Ban Pong Manao. These preliminary findings highlight how community stewardship upholds aspects of bioarchaeological preservation ethics, protecting collagen, despite outdoor exposure in a tropical monsoon climate.

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Variation in the Platyrhine Pterygoid Process using Linear and Angle Measurements

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Studies have found variation in the osteological correlates of masticatory musculature that are related to masticatory biomechanics, diet, and socioecology; however, analyses of the basicranium, specifically the origin of the pterygoid muscles, and how they may also relate to these factors has not been thoroughly explored.

Here, we examined variation in the morphology of pterygoid plates and basicranium in a dietarily diverse sample of platyrhines: *Sapajus apella* (n=44), *Cebus capucinus* (n= 53), *Alouatta seniculus*

(n=53), and *Ateles geoffroyi* (n=41). Linear measurements of the length and angle of the pterygoid plates relative to the basicranium were taken on surface scans using Checkpoint software and scaled by skull length. Results of statistical analyses show the lateral pterygoid plate lengths differ between *Alouatta* and all other species, but in no other species pairs. Sex differences in lateral plate length were found within *Alouatta* and *Cebus* but not *Ateles* and *Sapajus*. Lateral pterygoid angles differed between all species pairs except between *Alouatta* and *Ateles* and differed between males and females within *Sapajus*.

These data demonstrate variation in pterygoid morphology among genera and between sexes. While the driving force for this variation is unclear, these results show that it is worthwhile to consider this region when discussing variation and evolution of the masticatory system and basicranium. Future work will expand upon the taxa sampled, will quantify variation of the lateral pterygoid plate and fossa, and will address covariation of the lateral plate morphology with the entire skull through geometric morphometric methods.

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Cleaning is the hardest part: best practices for chemically defleshing fixed, irregular human bones

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Accurate sex determination of human skeletal remains is highest when the pelvis and skull are present, but these are not always available. Small and irregular bones are more often present so developing techniques to establish sex of human skeletal remains using these bones is important. Accurate measurements of these bones depend on clear visualization of landmarks, so cleaning these bones must be done completely but not so aggressively that they are damaged. The present study focused on assessing the best cleaning methods for select human irregular and small bones using chemical defleshing techniques. We gathered the hyoid, the medial and intermediate cuneiforms, and other select small bones from 30 human cadavers. We tested four cleaning methods for each bone using sodium carbonate solution: 1) chemical defleshing with bones being immersed prior to the solution reaching boiling point, with no prior manual cleaning, 2) chemical defleshing with bones being immersed after the solution reached boiling with no prior manual cleaning, 3) and 4) options 1 and 2 but with prior

manual cleaning of the bones. Results indicated that immersing the hyoid bone in the solution prior to the boiling point sometimes resulted in them becoming overly porous with 25% of them becoming too damaged to measure. All bones without prior manual cleaning were successfully cleaned. Results revealed that chemical defleshing cleaning techniques for these bones should be tailored to the individual bone and that prior manual cleaning of the bones is not necessary.

A virtual repository of Lower Siwalik Miocene fossils from Ramnagar (Udhampur District, Jammu & Kashmir), India

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Vertebrate fossils have been known from Lower Siwalik Miocene deposits surrounding the town of Ramnagar (Udhampur District, Jammu & Kashmir) in northwest India since Barnum Brown's American Museum of Natural History (AMNH) expedition in 1922. These fossils included dentognathic specimens of *Sivapithecus* and other Chini Formation-aged mammals. Paleontological fieldwork has continued sporadically in the Ramnagar region ever since, and in that time, a large number of vertebrate fossils have been recovered by many different researchers and institutions, including the recently discovered primates *Kapi* and *Ramadapis*. Ramnagar fossils are currently housed in several institutions across India and the United States, thereby making it challenging to comprehensively study the entire collection. Consequently, a full understanding of important questions related to the taxonomy, paleobiology, paleoecology, and biochronology of the Ramnagar fauna cannot be readily obtained. Moreover, without answers to these questions, correlations and comparisons cannot be accurately made to other similar aged fossil localities in the Siwaliks (i.e., Potwar Plateau, Pakistan) and elsewhere in Eurasia. Therefore, the goal of this collaborative project is to establish and grow a 3D

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digital repository of all fossil specimens from the Ramnagar region for continued comprehensive study. We employ μ CT, surface scanning, and photogrammetry to virtually bring together specimens from the AMNH, Panjab University, Wadia Institute of Himalayan Geology, and Yale Peabody Museum. Thus far, >100 specimens have been digitized and made openly accessible on the MorphoSource web platform. Here we highlight some of the best-preserved specimens, including recovered primates and micromammals, and discuss their scientific importance.

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Infant baboons reduce costly social behaviors but grunt more during challenging times

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Experiences during early development can shape phenotypes into adulthood. Among female baboons, early life adversity negatively affects the extent of social connectedness and interaction style in adulthood. Some of the negative effects of early adversity on social development might be mitigated if infants are able to increase low-cost social behaviors or if partners initiate more interactions with them. Here, we investigate the influence of environmental challenges on sociality in wild olive baboon infants (*Papio anubis*) from Laikipia, Kenya. We collected behavioral data from 51 infants to quantify frequency of play, degree of independence, and rates of social interactions and vocalizations. We paired these behavioral data with ad libitum data on environmental challenges (i.e., encounters with humans, domestic dogs, and unfamiliar male baboons). As the number of environmental challenges increase, infants are less independent ($\beta = -0.27$), approach others less ($\beta = -0.04$), groom others less ($\beta = -0.20$), and play less ($\beta = -0.22$). However, as the number of environmental challenges increase, infants grunt to others more ($\beta = 0.10$). We suggest that grunts, which function as signals of benign intent, might be used by infants to develop and maintain social relations when other forms of sociality are too costly or risky. These results demonstrate that there are immediate consequences of early life

adversity for infants that may affect their social development, but also reveal that infants may make behavioral adjustments to reduce negative impacts of early life adversity.

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Subadult dental variation and biological structure at precolonial Tlatelolco

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During the height of the Aztec empire (1300-1521 CE), the twin urban centers of Tlatelolco and Tenochtitlan were characterized by a high degree of social complexity and population density. Tlatelolco boasted one of the largest interregional marketplaces in Mesoamerica, which made it a central point of migration and—presumably—biological exchange. While Tlatelolco has been the focus of intensive bioarchaeological research, few studies have considered *intrasite* patterns of biological affinity. Additionally, most biodistance studies have excluded subadult individuals, yet infants, children, and adolescents make up an appreciable portion of Tlatelolco's bioarchaeological record. Here, we present a reconstruction of Tlatelolco's biological structure with a focus on the subadult population. After pre-analysis data treatment, 25 deciduous dental measurements (crown and cervical) representing 79 individuals were subjected to principal components analysis and hierarchical clustering. UPGA agglomeration of Euclidean distances resulted in eight distinct groupings. Groups 1 and 2 contained 92% of the sample, while the other six groups contained only a single individual. Spatial, contextual, paleopathology, and dismemberment/defleshing patterns did not clearly map onto the biodistance output, with one exception: approximately half of the individuals in Group 1 were recovered from Patio Sur—a context thought to represent a sacrificial or ceremonial event. The results suggest that a) the Patio Sur mortuary event disproportionately impacted individuals of a specific (sub)population affinity, and b) subadult biological variation explains a limited amount of the broader contextual structure of Tlatelolco. Future work will explore these patterns using morphology of the deciduous and mixed dentitions.

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Cross-sectional geometry and bilateral asymmetry of Omo I humeri

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As one of the earliest anatomically modern humans, Omo I's humeral cross-sectional geometry is of interest. Computed tomography scans of Omo I were made in Addis Ababa and compared to data from the literature on other Middle-Late Pleistocene hominins, Holocene humans, and data on professional baseball pitchers collected by Warden. Analyses focus on J and %CA and I_{max}/I_{min} for the 35% and 50% levels, measured from the distal end. We used 368 mm as the estimated length of Omo I's humeri. Results show Omo I has comparatively low asymmetry for all of the variables at both levels, unlike the highly lateralized male humeri of Neandertals, Gravettians, and baseball pitchers, but resembling Late Pleistocene females and recent, sedentary people. Omo I has remarkably thick cortical bone (50% level %CA: 91.3%, 85% [R,L]; 35% level: 89.2%, 80% [R,L]), exceeding the of Neandertal males' values but matched by the highest values among the professional pitchers. Omo I's I_{max}/I_{min} values show only moderate AP flattening of the shaft (50% level: 1.2103, 1.3088 [R,L]; 35% level: 1.3260, 1.3141 [R,L]). Raw values for J (mm⁴) (50% level: 16061.8, 13764.5 [R,L]) reflect Omo I's large size; but values for J standardized for bone length and body mass resemble those of the dominant arm of Neandertal males. Both of Omo I's humeri feature an expanded area for the attachment of the brachioradialis and brachialis muscles. In sum, Omo I's humeri show low asymmetry and suggest vigorous, bilateral activity.

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Title: Evolutionary déjà-vus: Why did size reduction evolve multiple times within primates?

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