theoretical pathways between environment and porotic cranial lesions by expanding our sample of CT scans to 775 individuals and linking these scans to 15 years of longitudinal health data.

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Bioarchaeological Signatures of Health and Inequality at the Middle Bronze Age Rural Site Kaman-Kalehöyük

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This research study focuses on the bioarchaeology of Kaman-Kalehöyük and seeks to provide baseline data, investigating the effects of socioeconomic inequalities on rural communities during the Middle Bronze Age (MBA) (ca. 2000-1750 years Before Current Era) in central Anatolia (present-day Turkey). In particular, this project addresses the impact of the political landscape during the MBA on population health at the small rural settlement Kaman-Kalehöyük using multiple lines of evidence. This is accomplished through comprehensive documentation and analyses of human skeletal remains. More specifically, health indicators of biological stress and activity patterns are discussed in order to assess whether a biological signature of health is present at this MBA rural community.

The results show a minimum of 64 individuals and include all age categories and both sexes. Some aspects of the health profile, such as the demographic profile, fertility rates and prevalence of dental caries, are consistent with an agricultural lifestyle. The demographic patterns appear to be relatively normal for an agrarian rural community and fertility is high (0.3774). Based on the evidence for overall nutritional quality and general stress, we argue that occupants of the MBA Kaman-Kalehöyük show health profiles similar to low socio-economic individuals at the MBA urban site of Kültepe-Kanesh.

The taxonomic status of the large-bodied colobine specimen KNM-WT 16827

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KNM-WT 16827 is an associated partial skeleton of a large-bodied colobine monkey from the Lomekwi Member of the Nachukui Formation, West Turkana dated to approximately 2.6 Ma. This specimen includes associated cranial, maxillary, and mandibular fragments along with several postcranial elements with well-preserved articular surfaces from the forelimb, hindlimb, and ankle. It was initially classified as *Paracolobus mutiwa* based on craniodental similarities with specimens from Koobi Fora and Omo and is the only specimen with associated postcrania attributed to this taxon. The inclusion of *P. mutiwa* within *Paracolobus* has since been questioned due to craniodental and postcranial morphologies distinct from the *P. chemeroni* specimen KNM-BC 3.

Postcranially KNM-WT 16827 is distinct not only from *P. chemeroni,* but also compared to contemporaneous fossil colobines such as *Rhinocolobus turkanensis* and *Cercopithecoides williamsi*. The scapula and humerus are shorter and more robust than *P. chemeroni*, and although it is not as extremely terrestrial as *C. williamsi*, appears more terrestrial than the arboreally adapted *R. turkanensis*. The hindlimb is smaller with more robust muscle attachments compared to *P. chemeroni* with morphologies more consistent with terrestrial locomotion at the hip. The calcaneus and astragalus, although distinctly colobine, also differ morphologically from *P. chemeroni* and the other large-bodied colobines suggesting differences in locomotor adaptations of the ankle joint. KNM-WT 16827's unique postcranial morphology calls into question its inclusion within *Paracolobus* and in combination with its unusual cranial morphology may warrant generic distinction.

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Application of Synchrotron micro-Computed Tomography and Confocal Laser Scanning Microscopy to evaluate sex-related differences in the human osteocyte lacunar-canalicular network across the lifespan

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Osteocytes are believed to play a central role in the sustained health of bone, thus a decline in their numbers is detrimental and alterations in the lacunar-canalicular network (LCN) may be linked to accelerated bone remodeling and subsequent bone loss. Due to the preferential bias of particular bone diseases in females, such as osteoporosis, the exploration of age-associated sex differences in the LCN is warranted. This study addresses two hypotheses: (1) there will be a decline in lacunar volume in the female middle-age group, indicating that the onset of changes may be associated with menopause, and (2) the LCNs of young women will have a greater surface area. Cortical bone samples were sourced from the femora of modern American males (n=20) and females (n=20) between the ages of 20 and 100. Synchrotron micro-Computed Tomography (SRμCT) and Confocal Laser Scanning Microscopy (CLSM) techniques were used to image samples from males and females across the lifespan. Parameters include osteocyte lacunar density, LCN area, and canalicular area. SRμCT results indicate that lacunar density is reduced in older individuals of both sexes (60+). CLSM data reveals that LCN area is 26.8% greater in younger females (<40) and declined in older females (50+) by ~44.5%. Canalicular area was further reduced in aged females. Lower LCN areas in older females may contribute to impaired communication between osteocytes due to fewer canalicular connections and impair their mechanotransduction functions. Overall, this work has implications for selecting possible targets for intervention during menopause linked to the bone remodeling process.

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The Role of Broca's Area in Stone Toolmaking Action Perception

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The possible co-evolution of stone tool manufacturing and language has long been a subject of speculation, partly driven by the recognition that key aspects of language are left-lateralized in the brain, and that most people are also left-lateralized for manual motor behavior by being right-handed. Neurocognitive studies of stone tool manufacturing, however, have not reported clear evidence of activation in Broca's area in the left hemisphere, though they have reported activation in the right hemisphere in BA44/45 for Acheulian stone tool technology. Using fMRI, we scanned an expert stone toolmaker watching a naturalistic video of himself making different kinds of stone tools, while also imagining himself performing these actions. Our analysis shows a strong correlation of activation for BA44/45 in both hemispheres. Positive and negative peaks of activation in BA44/45 that were independent of changes in overall activation occurred mostly during periods of observation, when the subject was assessing the current intermediate state of the tool, suggesting that BA44/45 in both hemispheres aid in action planning. In addition, exposures to new behaviors during the ~23 minutes of video yielded the highest positive peaks in BA44/45; this activation decreased over time, suggesting that BA44/45 may aid in monitoring new steps in toolmaking sequences and have less to do with processing familiar behaviors. The outcome of this analysis offers a greater understanding of Broca's area in coordination

with its right analogue, providing further support for how stone toolmaking studies can offer insight into the evolutionary expansion of Broca's area.

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Evolutionary genomic patterns of recent natural selection on body size sexual dimorphism in *Homo sapiens*

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It has been hypothesized that human body size sexual dimorphism was reduced via positive selection following the transition from hunting and gathering to agriculture due to a more equal division of labor, shifts in technology, and/or nutritional changes. Alternatively, any recent changes in the degree of human sexual dimorphism could instead reflect genetic drift. Here we apply a genome wide association study (GWAS) approach to study the recent evolutionary history of sexual dimorphism in human body size phenotypes. GWAS can identify genetic loci associated with phenotypic variation; the identified variants can then be analyzed to infer recent evolutionary histories of the corresponding traits. Using GWAS data from the UKBiobank, we identified 147 single nucleotide polymorphisms that are both significantly associated with height variation in either males or females or in both sexes ($P<1x10^{-13}$) and have a significant sex difference for height ($P<0.0001$). Using the singleton density score statistic, which quantifies recent changes in the frequencies of alleles underlying polygenic traits, we observed evidence of recent (within ~3,000yr) positive selection ($P<0.0001$) at these loci, specifically on alleles associated with less sexual dimorphism. This effect was predominantly driven by increases in the frequencies of alleles associated with shorter male stature. In stark contrast, for loci associated with height but not sexual dimorphism there is evidence of recent positive selection on alleles associated with taller height. Our results support the hypothesis of recent positive selection for reduced human body size sexual dimorphism and demonstrate the value of GWAS approaches for testing anthropological hypotheses.

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Moving through time: Intermediate phalanges from East African early and middle Miocene catarrhines reveal locomotor changes

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A survey of early and middle Miocene East African catarrhine collections indicates intermediate phalanges are one of the most well-preserved yet understudied elements across localities. Here we provide qualitative and quantitative descriptions of several catarrhine intermediate phalanges from the early and middle Miocene. Robusticity indices (RI=base width x 100/maximum length) indicate manual intermediate phalanges of *Afropithecus, Ekembo heseloni,* and *Equatorius* are moderately robust with index values between 29-37, as in *Colobus, Cebus*, and *Nasalis*. Phalanges from Songhor (~19-20 Ma), are more gracile (RI 27-31) than similar sized *E. heseloni.* Curvature indicates two morphs at Songhor. SO 35514 is very curved (included angle=51º), resembling phalanges from suspensory taxa; while SO 974, 986, and 1966 are less curved (30º-39º), like *Ekembo* and arboreal colobines. SO 35514 could belong to a different taxon than SO 974, 986, and 1966.

At Maboko (15 Ma), a large hominoid manual phalanx (MB 28393), similar in size to *Pan* and RU 15100I (*Ekembo nyanzae*), is attributed to *Kenyapithecus africanus*. It is robust (RI=37) like RU 15100I (RI=38), *Pan* and *Mandrillus* phalanges, yet the shaft is straight (21º) like terrestrial *Papio*. Additional small catarrhine phalanges, morphologically distinct from robust, straight *Victoriapithecus* phalanges, can be attributed to *Simiolus* or *Mabokopithecus*. These phalanges are gracile (RI=24-28) and curved (43º-50º), resembling morphology of brachiating/semi-brachiating taxa.

Results indicate adaptations for more agile forelimb arboreality to at least one taxon at Songhor. Even more derived forelimb agility was present in middle Miocene small-medium apes along with terrestrial adaptations in *Kenyapithecus* and *Victoriapithecus.*

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Maternal position within the dominance hierarchy in *Macaca mulatta*: Associations with offspring 2D:4D ratio and growth

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The second to fourth digit length (2D:4D) ratio is a sexually dimorphic trait, associated with prenatal exposure to androgens and dominance-rank in several species. Higher-ranking female rhesus macaques have been reported to have lower 2D:4D ratios than lower-ranking females. In this study we assessed if maternal dominance-rank (MDR), maternal received-aggression (RAG) and maternal received-affiliation (RAF) are associated with offspring 2D:4D ratio and growth. Data were collected on dyadic-agonistic and dyadic-affiliative interactions between adult females. Offspring (neonates to 2.5-year-olds) morphometric-weight data were collected twice, 5 months apart. Offspring of high-ranking mothers had higher left-hand 2D:4D (LH-2D:4D) ratios than offspring of middle and low-ranking mothers. MDR was positively associated with LH-2D:4D in males ($p=0.022$), and both-hand 2D:4D average in males ($p=0.036$) and females ($p=0.038$). MDR correlated with increased 5-month BMI change in males ($p=0.046$), and lower finger trauma ($p=0.026$) in males and females. RAG correlated with reduced weight-gain in males ($p=0.046$), and reduced CR-L growth ($p=0.035$) and higher finger trauma in females ($p=0.011$). The higher the RAF, the lower the weight ($p=0.023$) and CR-L ($p=0.015$) in females. RAF correlated with lower BMI in both males ($p=0.029$) and females ($p=0.024$); with lower weight ($p=0.033$) but higher 5-month weight-gain ($p=0.006$) and BMI change ($p=0.004$) in males. RAF correlated with higher right-hand 2D:4D (RH-2D:4D) ratio in females ($p=0.007$), and a higher RH-2D:4D to LH-2D:4D difference in males ($p=0.035$). A positive MDR and offspring 2D:4D association is unexpected. Male growth appears to be more susceptible to the effects of MDR, RAG and RAF.

Testing factors influencing the lemur gut microbiome: host genetics or diet?

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