

# ABSTRACTS

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Is the magnitude of size and shape variability of the adult modern human masticatory apparatus a reflection of early developmental variation, or does variability gradually increase as a result of masticatory loading? Addressing this question is key to understanding the extent to which the masticatory morphology is a reflection of functional vs. non-functional influences. Currently, we lack data regarding the ontogeny of masticatory variability in modern humans. Using a geometric morphometric approach, we tested the null hypothesis that there is no difference in the magnitude of size and shape variation in the developing masticatory apparatus using the Iowa Facial Growth Study. We collected a series of maxillary and mandibular landmarks from longitudinal lateral cephalograms of  $n=63$  subjects at age 4yrs, 11yrs, and adulthood. To account for the increasing effects of sexual dimorphism, we corrected for within age group allometry. First, we tested for homogeneity of variances in centroid size across age groups. Next, to assess the magnitude of shape variation, we tested for significant differences using the trace of variance-covariance matrices for each group. There was no significant difference in the magnitude of shape variation from 4yrs–11yrs ( $p=0.97$ ); however, shape variation significantly increased from 11yrs–adulthood ( $p<0.01$ ). With regard to size variation, there was greater variability in the adult sample; however, there was no significant difference among age groups ( $p=0.08$ ). Thus, our results indicate that variability in mandibular shape increases during ontogeny, while the magnitude of size variation is maintained during development.

## Pre-contact and historic era *Mycobacterium tuberculosis* complex genomes from the Americas

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Tuberculosis (TB) is one of the oldest human diseases and is caused by bacteria belonging to the *Mycobacterium tuberculosis* complex (MTBC). While TB is thought to have originated in Africa and spread across the Old World due to human population movements, how it was introduced to the New World has been a matter of debate. Skeletal evidence suggests that TB was present in the Americas prior to the arrival

of Europeans; however, the pre-contact era MTBC strains were completely replaced by more virulent European-origin MTBC strains during the Age of Exploration. Previous research from our group found that pre-contact era human populations from the Osmore River Valley in coastal Peru were infected with MTBC strains similar to those currently found in pinnipeds such as seals and sea lions. Thus, consumption and/or handling of infected pinnipeds served as an avenue for transmission of TB in the past. In the current study, we screened 70 individuals from various archaeological contexts in the Americas. We recovered MTBC genomes from three pre-contact era individuals residing in non-coastal locations in Peru and Colombia as well as from a mid-19<sup>th</sup> century individual from New York, USA. The presence of strains belonging to the pinniped-derived MTBC lineage in non-coastal populations suggests that these strains were not limited to coastal populations but also spread to human populations residing in other parts of the Americas. We also show that European-origin H37Rv-like strains were present in the USA by the mid-19<sup>th</sup> century.

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## Associations between sexually dimorphic skeletal traits and body size: An exploratory multivariate analysis

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Sexual dimorphism in the human skeleton has been studied by identifying associations between morphological trait expression and sex, yet how these traits associate with each other has largely been ignored. A previous study testing whether individual morphological trait expression is linked to body size parameters found significant, yet weak, associations, with stature explaining more relative variance in trait expression than body mass. Here, a multivariate approach is taken to simultaneously explore associations among sexually dimorphic traits and body size. Sex-specific multiple correspondence analyses (MCA) were conducted on morphological sex estimation trait scores and body size parameter quartiles for a sample of 209 white adult skeletons ( $n$  female = 100;  $n$  male = 109). MCA results show only weak associations within the dataset, with the first two dimensions only explaining between 5.87% and 7.19% of the data's variance for both sexes. Nonetheless, some relevant patterns were observed: Stature in both sexes, and body mass for females, have their extreme values separated on the plot with low trait scores clustering near the shortest quartile and high scores near the tallest quartile, reinforcing patterns described in the previous study. However, body mass is not logically organized for males, with

both the extreme quartiles clustering together, suggesting nonlinear relationships. In combination with the previous univariate analyses, the multivariate analyses permit the identification of more complex patterns of association between variables, highlighting the complex nature of the biological variation tied to sexual dimorphism in the human skeleton.

## Nutrition and diet of a Late Medieval Prussian population: What the analysis of dental microwear can tell us

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This study utilized dental microwear to analyze dietary patterns of individuals from the Late Medieval (mid 14th–15th century) Old Prussian cemetery in Beżławki, Poland. Data were gathered in conjunction with the 2017 Beżławki Bioarchaeology Field School and included 53 individuals (19 subadults, 15 adult females, 19 adult males) excavated between 2010–2017. For each individual, dental impressions were made of mandibular and/or maxillary first and second molars on-site, which were later used to make epoxy casts. Dental microwear analysis of the casts was accomplished using two types of microscopes: a scanning electron microscope (for a more traditional microwear analysis) and a Sensofar Plu white-light scanning confocal microscope (to accomplish dental microwear texture analysis). The microscopes yielded similar results, with benefits of the scanning electron microscope analysis including that it was cost-effective and the equipment was readily available. The confocal microscope, on the other hand, yielded a different level of detail and was more objective. Overall, the results indicated that the individuals at Beżławki were eating a somewhat varied diet likely including substantial quantities of meats and grains, with some variation across individuals. This study contributes to a more nuanced picture of how diet, nutrition, and metabolic stress may have differentially affected regional populations and demographic groups in Medieval Europe and how the dentition may be analyzed using multiple methods of dental microwear analysis.

## Evolutionary implications of primate skeletal DNA methylation patterns and their relationship to skeletal phenotypes

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