Addressing the Inertness of Bones and Teeth in Isotopic Studies of Stress and Disease: A review of Advances and Future Prospects

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Isotopic studies of stress and disease in past populations are possible because disease states affect the uptake, fractionation, and excretion of stable isotopes in the body. A major limitation of isotopic approaches to bioarchaeological studies of stress is the relatively inert nature of bones and teeth. Bone collagen represents time periods averaging upwards of 30 years and tooth enamel and primary dentine only represent periods in childhood and early adulthood. This synthesis reviews progress and future prospects of dealing with the issue of bone's inertness when studying disease states using isotopic evidence from mineralized tissues. Life history approaches, the bone density fractionation method, and incremental sampling of teeth hold particular promise for lending greater temporal resolution to the skeletal record in isotopic studies of stress and disease. In addition to reviewing the literature, we describe the application of these different approaches in a study of medieval Polish subadults, comparing bulk collagen stable carbon and nitrogen isotope ratios, ratios of collagen sub-fractions of differing density reflecting different temporal snapshots, and ratios of incrementally sampled dentinal collagen in comparison to Wilson Bands (internal enamel defects associated with stress). Our results indicate that further time resolution is possible in stable isotope studies of stress and disease through innovative sampling strategies, which opens new avenues for a biocultural approach in bioarchaeology.

Growth and opportunities in graduate education: A student's perspective

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Due to its diversity, bioanthropology is at the forefront of many of the most interesting and exciting scientific questions, and the variety of skills and fields that bioanthropology students master create some of the most talented young researchers. The ability to think about the implications of research across many fields leads students to more completely address scientific questions, rather than provide a one-sided viewpoint. These skills also allow scientists to address the most challenging and exciting questions. However, even with these strengths in the training of students, there is still room for growth. Two areas in which we can continue to grow are the education of students in the perpetually changing discussion of ethical practices and in computational methods of research. With science advancing at a rapid pace, especially in fields such as genetics, it is vital that students are part of the discussions of ethics and that they are trained to think about the most ethical approaches to research questions. Additionally, students need to be trained in computational methods due to their relevance in every field of science. A lack of training has the potential to limit students in their future research. With these strengths and areas of growth in mind, bioanthropology can continue to train incredibly talented scientists.

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Title: *Homo naledi* posterior endocasts and their significance for understanding brain reorganization

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Abstract text: Of the more than 1550 *Homo naledi* fossil fragments discovered in the Dinaledi chamber of the Rising Star cave system, South Africa, seven fragments yield unusually well preserved endocranial morphology that permits identification of likely gyral and sulcal details. Here we describe and interpret the positive relief posterior endocranial features of these fragments as they relate to both the functional and taxonomic aspects of *H. naledi*. Endocranial descriptions are based on physical models as well as digital models and their curvature maps. These models were compared to early hominid endocranial casts, as well as human and chimpanzee endocranial casts, brain casts, and formalin fixed brains. Measurements and morphological features of these endocrania suggest that *Homo naledi* retained a lunate sulcus that was considerably smaller in extent than in chimpanzees, and that the dorsal remnant of the lunate was significantly reduced comparatively. The degree of occipital lobe asymmetry was pronounced on the left side of the preserved fragments, which in modern *Homo sapiens* is suggestive of right-handedness. Thus, while *H. naledi* had a small brain and some primitive retention of the pongid pattern of a lateral and anteriorly placed lunate sulcus, it nevertheless shows suggestions of the derived pattern of occipital lobe neural organization seen in modern *Homo*.

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Disentangling Fecundability and Fetal Loss: Implications for Age-specific Fertility

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Wood and his colleagues made numerous contributions to the understanding of completed fertility and fertility variation among natural fertility populations. Much of this work focused on disentangling and estimating levels of pregnancy loss and fecundability. Measurement of total fecundability proved elusive to scholars because an unknown fraction of pregnancies terminate before a pregnancy can be detected. For the same reason, the total probability of pregnancy loss couldn't be measured directly. Wood developed a model that, with plausible biological assumptions, could indirectly estimate total pregnancy loss. This work was extended by one of his former graduate students to a new method using the total pregnancy loss model as the basis to estimate total fecundability. Estimation used observations of menstrual cycles along with sensitive assay-based detection of early pregnancies. Data were collected in a 9-month prospective study of about 500 women in rural Bangladesh. Twice-weekly urine specimens were assayed by a sensitive human chorionic gonadotropin assay.

The results suggest that the probability of pregnancy loss is high (~50%) at age 18 and monotonically increases to >95% by age 48. Total fecundability was high and remained high for most of the reproductive span, contradicting the prevailing idea that female fecundability declines with age. Rather, an increased frequency of early pregnancy loss appears to be the primary driver for the age-specific decline of apparent fecundability, and is likely and important determinant of the cessation of fertility prior to menopause that is observed in natural fertility populations.

Morphological Integration and Function in the Platyrrhine Mandible

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Functional integration within bone is thought to occur due to a coordinated response from shared mechanical stress. Experimental models demonstrated increased masticatory loads are correlated with increased integration. Capuchin monkeys provide an excellent natural experiment to test whether dietary demands influence mandibular integration. Tufted capuchins (*Sapajus* spp.) orally process mechanically resistant foods while non-tufted capuchins