

0112. <sup>2</sup>University of New England, Armidale NSW, 2351, Australia.

The relationship of frontal sinus size to sex differences (Hanson and Owsley, 1980) and climatic influences (Koertvelyessy, 1972) have been noted but not fully investigated. We assessed the correlation of frontal sinus features between sexes and among selected population groups including a re-assessment of frontal sinus size associated with metopism.

A complete survey of the Terry collection resulted in the identification of 78 individuals (4.5%) with metopism, similar to metopism frequencies in European populations. Radiographic examination indicated bilateral presence of sinuses in 83.3% of the metopic crania. A comparative random non-metopic control sample (N=77) was collected. All Greenland Eskimo crania in the NMNH collections (N=90) and a series (N=52) of crania from the Peruvian collections were also radiographically investigated. The latter two samples are not random representations of their respective populations; thus no metopic expression frequencies were quantified.

Results from the Terry Collection indicate that metopism does not infer the absence of frontal sinuses. There are observable differences in frontal sinus size between individuals with and without metopism, but these differences are statistically weak. There are size differences between Blacks and Whites in the Terry Collection, Black males being larger than White males, but White females being bigger than Black females. Sinus size differences by sex are seen in all population groups studied, the Peruvians having the greatest difference, followed by the Greenland Eskimo. This variation may be influenced by the complexity of the internal sinus structures, females having these features to a greater degree. The results of this study show that the Greenland population possesses the smallest frontal sinuses, the mid-altitude Peruvian sample possesses a lower end intermediate sinus size, and the Terry Collection individuals have the greatest range in size, shape and asymmetry.

#### An assessment of method in the study of developmental integration using the adult human cranial base.

J.H. HUNT<sup>1</sup>, L.R. GODFREY<sup>2</sup>. <sup>1</sup>Department of Anthropology, Yale University, New Haven, CT 06520, <sup>2</sup>Department of Anthropology, University of Massachusetts, Amherst, MA 01003.

Alterations in the rate or timing of developmental events that may cause phylogenetic changes when acted upon by natural selection are constrained or allowed by the integration, or covariation of characters. Studies of morphological and developmental integration are increasing in number

but are inconsistent in method and experimental objectives. Some investigators identify integrated characters in an *a posteriori* fashion, seeking to delimit independent phenotypic characters for use in systematics. Using a deductive approach, others test *a priori* functional and developmental hypotheses of a given structure. With landmark data from a sample of adult human basicrania, this study will compare analytical methods to characterize appropriate experimental objectives.

The most prominent methods found in the literature are matrix similarity tests, confirmatory and exploratory factor analysis and graphical modelling. Methods will be compared to discern the following: 1) Are the results method-driven? 2) What experimental schemes and objectives are most appropriate for the examined method? 3) Which methods might best address hierarchical patterns of integration? 4) Which methods allow for indices of integration?

Debate concerning the functional meaning of basicranial form has a long and important tenure within paleoanthropology. Invested in the debate are several well-developed functional and developmental hypotheses. Proposed functional complexes overlap and observed integration is hierarchical, making the basicranium an excellent structure to examine competing or complimentary methods.

By answering the above questions, methods may be placed in experimental contexts. In doing so, this study will allow a better understanding of the appropriate methodological definition of morphological integration.

#### 46. The role of osteocyte lacunae populations in interpreting loading history of bone.

K.J. HUNT, J.G. SKEDROS. Department of Orthopaedics, University of Utah.

Introduction: Regional variation in osteocyte lacuna population density (OLPD) has been proposed as a useful characteristic for interpreting loading history and metabolic state in limb bone cortices. However, this important hypothesis has not been rigorously examined in the context of *in vivo* strain data. We tested this hypothesis in a comparative context in five mammalian long bones, each with well established *in vivo* strain distributions: deer, sheep and horse calcanei (n=13), horse radii (n=10) and horse third metacarpals (MCH, n=9). These bones experience habitual bending in a manner similar to what has been inferred for many anthropoid long bones. Two diaphyseal sections (50% and 65% of length) were examined using backscattered electron images (100X), and OLPDs (no./mm<sup>2</sup>), the fractional area of secondary bone, and porosity were quantified. Predominant col-

lagen fiber orientation (CFO) was determined using circularly polarized images of ultramilled sections of horse bones.

Results: Regional variations in OLPDs did not consistently correlate with the habitual strain distributions. Although all calcanei demonstrated significantly higher OLPD in compression vs. tension cortices (Horse: 650+/-71 vs. 599+/-110, Elk: 732+/-55 vs. 644+/-62, Sheep: 710+/-65 vs. 609+/-64; p<0.05 for all comparisons), MCH demonstrated greater OLPD in tension versus compression (533+/-91 vs. 425+/-77). The horse radius showed greater OLPD in compression versus tension (522+/-128 vs. 478+/-138), though these variations were not statistically significant. Additionally, OLPDs did not correlate with trans-cortical strain magnitudes. Regression analyses between OLPD and other microstructural parameters revealed that the only R value exceeding 0.400 was with CFO in the horse MCHs (R=0.408, p<0.0001).

Conclusion: These data demonstrate that OLPD is not a useful characteristic for interpreting loading histories that involve strain magnitude, mode and distribution. However, this and previously published studies demonstrate that predominant CFO may be a useful characteristic for interpreting strain-mode-specific (i.e., tension vs. compression vs. shear) loading history. This warrants further study since the limb bones of many anthropoids may receive such loading but are not amenable to *in vivo* strain measurements.

#### Natal dispersal in the monogamous owl monkey, (*Aotus azarai*) of Formosa Argentina.

C. HUNTINGTON<sup>1</sup>, E. FERNANDEZ-DUQUE<sup>2</sup>. <sup>1</sup>Actuarial Analyst, Massachusetts Workers' Compensation Bureau, <sup>2</sup>Millennium Postdoctoral Fellow, Zoological Society of San Diego & Research Associate, Department of Anthropology, Harvard University.

Monogamous primates are widely reported as living in small groups of an adult pair and one to three juveniles who are assumed to disperse soon after sexual maturity. Given the scarcity of long-term demographic data on monogamous primates, the ultimate causes of dispersal, as well as the age at which dispersal occurs, have not been systematically examined. This study investigated age of juvenile dispersal in ten groups of *Aotus azarai* in Formosa, Argentina. Survival analysis techniques for censored data were applied to 42 months of observations to construct age-specific probabilities of remaining in the natal group. Our results show that approximately 50% of the young dispersed around 24 months of age while the other half remained in the natal territory with the natal group for more than 36 months. Dispersal in *Aotus* has previously been