populations. Verdu et al. (2009) published a genetic analysis based on neutral microsatellites on the same populations and found that pygmies present a variable admixture proportion with non-pygmies. Comparing this data with our anthropometrical data at the individual level we find a strong correlation between level of admixture and stature, thus strongly supporting the existence of a genetic component in pygmy short stature. We developed a candidate-gene approach to search for such genetic factor and will present current results on various genes located in the GH-IGF1 axis.

83. Predominant collagen fiber orientation data support the multi-domain load hypothesis in the chimpanzee femur.

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Different load 'domains' can exist between regions of the same bone, and these domains correlate with differences in habitual load complexity. Evidence that 'habitual load complexity' defines these domains derives from strain gauge analyses showing general differences in the magnitudes of their neutral axis rotations (Skedros et al., 2009). The hypothesis that multiple domains can exist between regions of the same bone is important because the adaptability of cortical bone between these regions may not be equivalent. We have reported data supporting multiple load domains in the proximal human femur; this conception helps in understanding stress transfer in femoral prostheses and age-related increases in fragility fractures. We tested this multi-domain load hypothesis in the chimpanzee femur. Distributions of habitual strain-modes (e.g., tension, compression, shear/torsion) can be quantified as variations in predominant collagen fiber orientation (CFO) in thin sections. CFO was quantified in eight adult chimpanzee femora at: 1) mid-neck, 2) base neck, 3) sub-trochanteric (80%), 4) proximal shaft (70%), and 5) mid-shaft (50%). Sections were embedded, ultramilled, and imaged under circularly polarized light. Results showed: 1) bending in the neck that was in an unexpected direction (i.e., tension in the inferior cortex and compression in the superior cortex; compare to results of Kalmey and Lovejoy, 2002,BONE), 2) medial-lateral (compression-tension) bending in the proximal diaphysis, and 3) torsion at mid-diaphysis. Therefore, at least three load domains exist. Recognizing the existence of multiple load domains enhances awareness that these regions are likely also subject to differences in developmental constraints and functional adaptability.

Sacral orientation in hominid evolution.

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Sacral orientation has a significant role in the erect posture of humans. Therefore, discovering the nature of sacral orientation is of considerable evolutionary importance. Pelvic incidence (PI) determines sacral orientation within the pelvic girdle, and was found to be highly correlated to lumbar lordosis in humans. Although PI is well established in modern humans it has not been explored in non human primates (NHP) or in extinct hominids. The goals of this study are to establish standard PI for non human primates and to explore the evolution of PI in extinct hominids. Sacral orientation of the pelves of 60 NHP, 60 modern humans and 9 extinct hominids was measured, using PI.
Our preliminary results indicate that PI in NHP (33° ± 10) is significantly lower then the PI in modern humans (54° ± 12). The PI of *australopithecine* (44°) is greater than PI of NHP, but smaller than modern humans. The PI in early *H. sapiens* (55°) is similar to modern humans.
The sacrum in NHP is oriented more parallel to the pelvis while in humans the sacrum is anteriorly (ventrally) tilted. The sacrum of *Australopithecine* is more tilted then in NHP, but is still more parallel to the pelvis then in modern humans. The orientation of the sacrum of early *H. sapiens* resembles that of modern humans. Our results indicate that the evolution of sacral orientation in hominids occured in at least two stages.

Internal phalangeal morphology: Adaptations to loading in primate locomotion.

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Much attention has been paid to bone adaptation on the external and whole-bone level. In order to fully understand the osteo-adaptive response to different forces it is imperative to also consider internal bone structure and material properties. This study analyzes the reliability of using internal geometrics of phalanges to infer primary locomotor behaviors. It would be expected that the regions that must resist the most stress during locomotion will have thicker cortices and/or further placement of bone from the axis of motion.
The proximal and intermediate phalanges of 5 different primate species—all adult male—were scanned with an *in vivo* micro-computed tomography (μCT) system. The species used were chosen based on primary locomotor patterns and to minimize phylogenetic factors. Baboons (n=2) represented palmar walkers. Chimpanzees (n=3) were used for knuckle-walkers. Gibbons (n=3) represented brachiators. Gorillas