poorly preserved skeleton was of an adult and probably male individual, and the skull was reconstructed and studied by Brothwell (Brothwell and Shaw, 1971, *Man* 6: 221-227). He linked the skull to recent West African populations, but recognized that its lower vault and frontal profile were unusual. He also supplied cranial data for a Principal Components Analysis performed by Peter Andrews, and noted that this placed the specimen apart from recent African samples. Stringer included the Iwo Eleru cranium in univariate and multivariate (Canonical Variates, Generalised Distance) analyses for his doctoral thesis, completed in 1974. His results highlighted apparent archaic aspects in the specimen in its long and rather low cranial shape, and although modern overall, it also resembled fossils such as Omo Kibish 2 and Ngandong in certain respects. New studies using a primary replica of Brothwell's reconstruction have now been carried out by Harvati, employing geometric morphometrics to generate PCA, CVA, Procrustes Distance and Minimum Spanning Tree analyses of the specimen, and further dating of the skeleton is also underway. The new morphometric studies confirm the relatively archaic shape of the vault, suggesting that this Late Stone Age West African was markedly different from succeeding populations. This research is supported by the Max Planck Gesellschaft and the "EVAN" Marie Curie Research Training Network MRTN-CT-019564.

Stature estimation from cranial measurements in archaeological and modern populations of Switzerland.

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Stature estimation from skeletal remains is of primary interest to a broad field of scientists e.g. anthropologists, forensics. However many of the existing stature estimation formulas are not applicable to poorly or partially preserved skeletal material. The aim of the present study was to investigate the possibility of estimating stature from craniometric data of 637 skulls found on a Swiss alpine ossuary (Poschiavo, 17th-19th c. AD). For this purpose we applied existing regression equations for stature estimation from craniometrics (Chiba and Terazawa, 1998; Ryan and Bidmos, 2007; Krishan, 2008; Kalia et.al., 2008) to completely preserved skeletal material geographically and chronologically similar to the investigated skulls. The results were poor and they mostly reflected the mean stature of the reference samples, significantly reducing the intrapopulation variability. A better approach was developed by systematically selecting similar reference series to the target sample by the sum of Euclidean distance of the cranial measurements. The individual stature is then estimated as a mean based on the ratios between stature and cranial measurements (seven variables) of the reference sample. The results show less attraction to the mean of the reference population and plausible intrapopulation variability. We tested the specific method on a large scale of complete preserved skeletal remains (ca. 1500 individuals) with positive outcomes. Although stature estimation from cranial measurements cannot be so accurate to that obtained from intact long bones, we propose a new method applicable on partially preserved skeletal material useful within a bioarchaeological or a medico-legal context.

Comparative primate vaginal microbial ecology.

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Host-microbe interactions profoundly affect primate physiology, reproduction, health, survival and ultimately, evolution. Because females are central to population viability and because the reproductive tract microbiome has the potential to influence female health, fecundity and pregnancy outcomes, understanding of both the variation in primate vaginal microbial ecologies and the factors (e.g. socio-ecological, sexual, morphological, or genetic) which influence microbial variation is crucial to understanding patterns of primate host-microbe relations. To gain a preliminary understanding of vaginal microbial community compositions, we analyzed vaginal swab samples from four primate species: yellow baboons (*Papio cynocephalus*), olive baboons (*P. anubis*), sifakas (*Propithecus diadema*), and red colobus monkeys (*Piliocolobus badius*), using direct sequencing analysis of 16S rDNA clone libraries. Sample pyrosequencing outputs were run through RDP classifier (70% bootstrap threshold) to assess the distribution of phylotypes across primates and obtain an initial picture of microbial community structure and diversity. Results indicate that *Firmicutes* and *Bacteroidetes* are the most common genera across all four species, though a substantially greater proportion of unclassified microbes (36% vs 0-13%) and a more diverse microbial community composition were found among the sifakas than any of the Old World monkeys. The inclusion of additional species will help to test hypotheses for the significance of phylogenetic, reproductive and morphological factors in explaining patterns of microbial community composition and interactions with their primate hosts. The authors wish to thank the University of Illinois, the UIUC Institute for Genomic Biology, and the National Science Foundation.

Quantitative analysis and functional significance of subchondral and cancellous bone micro-architecture in the hominid hind foot.

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Differences in patterns of subchondral bone density and in cancellous bone architecture quantified from computed tomography images have been independently hypothesized to reflect differences in habitual joint loading among animals. This study assesses the mutual consistency of these two morphological indicators of bone strength in the hominid hind foot and their potential utility in inferring locomotor behavior from isolated skeletal elements. Associated sets of distal tibia, talus, and calcaneus from museum specimens of modern *Homo*, *Gorilla*, *Pan*, *Pongo*, and *Papio* were μCT scanned at 46μm isometric resolution. The subchondral bone layer of each articular surface was isolated from the cancellous bone, segmented into anatomical regions, and the distribution of high-attenuating (radiodense) voxels within each region was quantified using *Amira* software. The bone volume fraction and trabecular structure of the cancellous bone underlying each articular region were quantified using *Quant3D* software. The results from the modern human sample show high subchondral bone radiodensity in articular regions that are consistent with those found by experimental studies to have high contact stress during bipedal walking. The cancellous bone underlying these regions are also found to display high bone volume fraction and trabecular thickness, supporting the hypothesis that both subchondral bone density and cancellous bone morphology are congruent indicators of compressive bone strength. Comparisons among the extant hominid samples reveal species-specific patterns of subchondral and cancellous bone properties consistent with differences in locomotor behavior. This study is supported by NSF DDIG (BCS-0824571), the Wenner-Gren Foundation, and the Leakey Foundation.

3D automatic methods to segment "virtual" endocasts: state of the art and future directions.

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Computer Tomography (CT) is now widely used to analyze the cranial inner features. A crucial step consists in delineating precisely the endocranial surface in 3D images. This procedure, called segmentation, can be performed manually but it is tedious in the case of accurate CT acquisitions (hundreds of slices) and it remains very dependent to the operator's experience and expertise. Several image processing methods as thresholding or region-growing (Schoenemann et al., 2006) have been proposed to assist the operator but they require a

manual interaction to be initialized or to tune parameters. Biomedical software as Mimics (Falk et al., 2007) or Amira (Specht et al., 2007) is currently used but it is not well adapted to fossil images where the contrast of the fossilized bone or the filling matrix may be low or variable. Recently, some researchers (Neubauer et al., 2004) propose to "warp" a reference endocranium surface to fossil data but this requires locating landmarks which is a complex and operator-dependent task. We propose a new method which is also based on such a template. The reference endocranium surface is automatically deformed to fit the interface of the bony parts in the 3D image, while keeping its initial and smooth shape. We performed preliminary experiments on 3D images of chimpanzee and Modern Man skulls and compared the results with segmentations obtained under the supervision of an anatomist. We also applied the method on STS5 (Australophitecus africanus) and analyzed the accuracy of the result. Research supported by the French Center for Scientific Research (PEPS-ODENT Project), the French Institute for Research in Computer Science and Control (3D-MORPHINE Concerted Research Action) and the HOPE (Human Origins and Past Environments) International Programme funded by the French Embassy in South Africa and the National Research Foundation (South Africa).

The lumbar vertebrae of the Middle Miocene stem great ape *Pierolapithecus catalaunicus* (Primates: Hominidae).

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We provide a description and functional interpretation of the two lumbar vertebrae of the stem hominid *Pierolapithecus catalaunicus* from Barranc de Can Vila 1 (BCV1; Catalonia, Spain; ca. 11.9 Ma), which belong to the holotype (a partial skeleton) of this taxon. The most complete specimen (IPS21350-64) is a lower middle vertebra, while the other one (more incompletely preserved; IPS 21350-65) corresponds to a last lumbar vertebra. A body mass of ca. 30 kg can be estimated for this individual on the basis of published allometric equations and several measurements taken in IPS21350-64. The morphological and morphometric study of these vertebral specimens shows that, despite the retention of some plesiomorphic features (shared with stem hominoids from the Early and Middle Miocene), *Pierolapithecus* shares a set of derived features with extant great apes: neural process caudally oriented; robust pedicle; dorso- and ventromedially oriented zygapophyses; lack of styloid processes (at least, functional ones); lack of vertebral wedging; lack of ventral keel; vertebral body relatively wide mediolaterally and shallow dorsoventrally; quite dorsal origin of the root of transverse processes; and coplanar and dorsal orientation of the transverse processes. Preliminary allometric studies further suggest quite modern vertebral proportions. To sum up, the lumbar vertebral morphology of *Pierolapithecus* agrees with other skeletal elements, indicating that it is one of the earliest orthograde hominoids. Further research is required in order to decipher whether orthogrady is a crown-group hominoid synapomorphy or a convergent bodyplan independently acquired by lesser and great apes. This work has been supported by the Spanish Ministerio de Ciencia e Innovación (CGL2008-00325/BTE), the Generalitat de Catalunya (Grup de Paleoprimatologia i Paleontologia Humana, 2009 SGR 754, GRC; predoctoral fellowship 2006 FI 00065), and the National Science Foundation (NSF Award #BCS-0321893).

Asymmetry in *Saguinus oedipus* limb bone dimensions.

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Human limb bone articulation sizes are thought to be more symmetric between sides than bone lengths or diaphyseal breadths. It remains unclear, however, if this pattern is unique to humans or if it characterizes primates in general. Here the non-directional asymmetry of articular dimensions, maximum lengths and diaphyseal breadths are assessed in a sample of cotton-top tamarins (*Saguinus oedipus*) upper and lower limb bones. Twenty-four dimensions were measured on the left and right femora, tibiae, humeri and radii of 20 *S. oedipus* skeletons curated at the University of Tennessee, Department of Anthropology. All dimensions were measured a second time to estimate measurement error. A mixed-model ANOVA (with 'individual' as the random effect and 'side' as the fixed effect) was used to partition out the contribution of measurement error to the total non-directional asymmetry for each measurement. Only those dimensions with significant ANOVA for the interaction of 'side' and 'individual' were retained for further analysis. Variance attributed to measurement error was subtracted from total asymmetry variance for each dimension. The square root of the remaining variance was then divided by the sample mean of that dimension to create a coefficient of variation of asymmetry. A consistent ranking of dimension types was found within each of the four limb bones. Lengths had the lowest coefficient of variation of asymmetry, followed by articulations and diaphyseal breadths. These results suggest that lengths, not articular dimensions, may be the most symmetric in non-human primate limb bones, which is distinct from the human pattern.

Shape correlation within and across Plio-Pleistocene hominin lower limb elements.

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Inferences about locomotor patterns of Plio-Pleistocene early hominins rely entirely upon evidence collected from postcranial fossils. Many of these fossils are fragmentary and unassociated and are therefore excluded from analyses. Additionally, there are sometimes conflicting results from studies using different postcranial elements to make inferences about locomotor patterns. This study uses three dimensional geometric morphometrics to investigate how inferences about locomotor patterns can change based on the bone(s) analyzed, by examining the femur and tibia. Additionally, when possible, data from the femur and tibia are combined to look at patterns of covariance in the hindlimb. Three dimensional data were collected on a modern sample consisting of 78 *Gorilla*, 16 *Pongo*, 88 *Pan*, and 86 *Homo* specimens and a fossil sample consisting of 17 proximal femora, 17 distal femora, 17 proximal tibiae and 14 distal tibiae spanning the interval from 3.8-1.0 Ma. These data were subjected to a generalized procrustes analysis and standard multivariate analyses. The different anatomical areas analyzed yielded markedly different results. The proximal tibia was the least useful in these functional analyses and was only moderately able to recover the differences between modern taxa. The distal tibia and proximal femur both show a fully bipedal pattern emerging very early in the hominin lineage, whereas some of these fossils retain a more primitive pattern for the distal femur. A two-block partial least squares analysis indicates that some of the earliest fossils have a unique pattern of shape covariation in the lower limb.
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Jaw-muscle fiber architecture in tufted capuchins favors generating relatively large muscle forces without compromising jaw gape.

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Cebus apella differs from other capuchins in displaying craniodental features that have been functionally and adaptively linked to their dietary flexibility and capacity to exploit hard and tough foods. We compared masseter and temporalis fiber architecture between *C. apella* (n=12) and two "untufted" capuchin species (*C. capucinus*, n=3; *C. albifrons*, n=5). We tested the hypothesis that tufted capuchins exhibit architectural properties of their jaw muscles, including relatively greater physiologic cross-sectional areas (PCSA) and more pinnate fibers, that facilitate relatively large muscle forces. *C. apella* has relatively greater superficial masseter and temporalis PCSAs, significantly so only for the temporalis. Capuchins do not differ significantly in pinnation angle. As an architectural trade-off between maximizing muscle force and excursion, we also predicted that *C. apella* exhibits relatively shorter muscle