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Laterization of brain function has been recognized in humans with the right side of the brain being dominant for producing and perceiving facial expressions associated with emotions, and the left side of the face perceived as being more expressive than the right side. Such laterality in emotions and facial expressions in humans seems to share evolutionary precursors in chimpanzees. Recent studies have identified these similarities and have led to the hypothesis that the neural basis of facial expression is conserved across species.

Skeletal evidence for knapping among prehistoric Zapotec women at the Mita Fortress.

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In the eastern arm of the Valley of Oaxaca (Mexico), during the prehispanic era, women in the region were not only engaged in production of textiles but also utilized the backstrap loom for weaving cloth. This type of work would have been quite demanding due to the nature of the textile production process.

Endocerbral shape asymmetries in hominids, including fossil hominins and extant hominids, assessed via skull based landmark analysis of 3D reconstructions from CT images.

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Asymmetries in brain shape, commonly known as petasites, consist in the expansion of one cerebral hemisphere beyond the other and can be defined by two structural components: a greater lateral extent of one hemisphere relative to the other usually coupled with a larger frontal or caudal projection of one hemisphere relative to the other. A major issue in quantifying these petasites in endocasts is the definition of the endocerebral surface midline because studies of human brain material show that most of the mesial surface of the left occipital lobe is the midline and protrudes to the right side, making the midline difficult to identify and the corresponding left and right reference points definition problematic. We therefore illustrate a new protocol based on unbiased skull landmarks definition in order to accurately quantify and compare brain shape asymmetries. This protocol is performed on 3D reconstructions from CT images. Our current sample is represented by >30 fossil hominins, 42 extant anatomically modern humans and 110 specimens of each sex of extant African great apes. We describe and quantify the positions in 3D of frontal and occipital projections in this large sample. This analysis complements our previous results and allows the grouping of fossil hominins and extant hominid species based on the degree of asymmetry of these projections. The pattern and extent of asymmetry of petasal components in great apes and in fossil hominins show considerable variations. Phylogenetic and possible functional implications of the observed inter-specific variation are discussed. This study was funded by the European Commission, contract number 029023.

Interior versus exterior edges: Their effect on home range, spatial ecology and feeding ecology of Milne-Edwards' Sifakas (Propithecus edwardsi) in Ranomafana National Park, Madagascar.

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Forest edge effects are becoming a more abundant and urgently needed feature in landscape ecology, and anthropogenic disturbances in the Madagascar rainforest are increasing worldwide. Edge effects, measured as changes in vegetation structure and plant species richness from the edge into the forest core, pose potential constraints on primates ranging, dispersal and behavior. Primates can mediate edge effects by adjusting their ranging behavior with respect to both edge proximity and edge type. The effects of edge proximity and type on the ranging behavior and feeding ecology of Propithecus edwardsi in Ranomafana National Park were investigated. Two edge types were distinguished; internal edges, located within continuous forest areas, and external edges, located on forest boundaries. Behavioral and location data were collected May to September 2008, and used with GIS to determine the distribution with respect to edge proximity and type. The highest proportion of range use and ranging events occurred within 250m of the edges; a positive edge response. The strength of the edge response differed between the two sites, with a stronger response in the external edge site. P. edwardsi in the external edge site also had a smaller home range, larger core range, and higher density. P. edwardsi show a positive edge response, however the strength of edge response appears to vary with edge type. Edges are completed and habitat features that reflect in-dwelling behavior with multidimensional characteristics (e.g. intensity, depth, height, location, age, etc). They can have long-term impacts on primate behavior, and consequently...
Petrus bone orientation, foramen magnum position, and the evolution of early hominids.

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The posterior cranial fossa is one of the main structures within the cranial base that have gone through extensive modification during human evolution. Many authors suggest that these adaptations are either the product of our large brain or bipedal locomotion. Early hominids basiocciput may represent either the changing morphology along the ape-human morphcline, or exhibit an in part ususomorphic feature unique to them. Here we present data from the internal part of the posterior cranial fossa, to support the second hypothesis.

We measured the angle of the superior petrosal sinus to the mid-sagittal, the position of the foramen magnum to the bi-porion line and three foramina within the basiocciput. Our results indicate that while in humans and australopiths the carotid canal has migrated to a more lateral position, the intracranial arterial system and foramen ovale remained around the same position as in the primitive ape state. However, the orientation of the inner part of the petrous is the about the same in apes and humans at around 30 degrees, while in early hominids the petrous is oriented more sagittally at around 40 degrees. This may be coupled with the known fact that the foramen magnum orientation to the bi-porion line in early hominids is actually more anterior projecting than in humans.

Our results indicate a distinct basioccipital morphology of australopithecines that sets them apart from both modern humans and apes. The cause for this morphology is unclear and could be due to the biomechanical constraints of early hominids.

Plantar pressure during bipedalism and quadrupedalism in Cebus.

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Cebus predominately walk quadrupedally but use bipedalism to carry objects such as azaleg nuts or stones. Little research has examined foot biomechanics in nonhominoid primates who use bipedalism. Identifying similarities and differences among distantly related primates utilizing bipedalism will further our understanding of the fundamental biomechanical requirements of bipedalism and the evolution of human bipedalism and the modern human foot.

We compared plantar pressure distribution in two captive Cebus apalii walking across a pressure mat quadrupedally and bipedally, center of pressure trajectory, relative peak plantar pressures, and timing of pressure in the midfoot and forefoot were compared during bipedal and quadrupedal walking. Simultaneous video data were used to assess speed.

Pressures are slightly higher during bipedalism than quadrupedalism in all regions of the foot. Peak pressures during bipedalism and quadrupedalism are highest on the lateral midfoot and metatarsals than the medial side, unlike the pattern in apes and modern humans who load the medial side of the foot early in stance. Contact time, however, in the medial forefoot is longer during bipedalism. During bipedalism, both contact area and contact time are higher in all regions except the first metatarsal, a region heavily loaded during toe-off in humans. Peak pressures in the forefoot are not significantly different during quadrupedalism and bipedalism, suggesting a simple propulsive function in both cases. These data show that Cebus increase load only slightly when shifting to bipedalism, and their foot function similar to apes, and does not show a pattern like that of the human foot.

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A comparative stereological analysis of neuron numbers in the human and non-human primate basolateral amygdala.


Though little comparative neuroanatomical data exists for structures comprising the "social brain", volumetric analyses suggest that one such structure, the amygdala, evolves in humans, internal reorganization in hominoids, specifically in its basolateral division, comprised of the lateral, basal, and accessory basal amygdaloid nuclei. Compared with other hominoids, humans possess a uniquely enlarged lateral nucleus. In contrast, the semi-solitary orangutan exhibits reduced basolateral volumes, due predominantly to decreases in accessory basal and basal nuclei. To further investigate trends in amygdala reorganization, we counted neuron numbers for the basolateral division and basal nuclei using unbiased stereological methods (optical fractionator) on tissue-processed, Nissl-stained histological sections. We sampled humans, all ape species, and long-tailed macaques using three to twelve individuals per species. Neurons in the human lateral and basal nucleus, respectively, were proportionately more (p<0.001) and less (p<0.001) numerous than in African apes. Contrasted with other apes, the orangutan basolateral division (p<0.01), basal (p<0.01), and accessory basal nuclei (p<0.01) contained proportionately fewer neurons. In macaques as in humans, neurons were most abundant in the lateral nucleus. Nonetheless, this similarity is likely due to a comparatively smaller representation of neurons in the macaque basal nuclei (p<0.05) and not a larger proportion in the lateral (p>0.05). Given that neuronal and volumetric data agree, amygdala reorganization likely reflects evolutionary increases in specific neuronal populations rather than simply developmental increases in white matter, e.g., amygdala fibers of passage, further supporting the idea that coordinated changes between individual amygdaloid nuclei and highly connected cortical areas are of evolutionary origin. This study was funded by the NSF, Doctoral Dissertation Improvement Grant (40767240), and The Wenner Gren Foundation.

Masticatory mechanics and the production of dentifrice microwear.

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This study explores differences in microwear orientation and length between molars in a sample of primates. It has long been known that the orientation of microwear microtextures indicates jaw movements during mastication. The size of microwear features also seems to reflect jaw size in humans. Therefore, if clear correlations could be established between microwear and masticatory mechanics, these could be extrapolated to fossil hominin studies and add vital information about likely evolutionary grade placement for specimens known only by incomplete or purely dental remains. Dental impressions of first, second, and third mandibular molars from Pan troglodytes (n=11) Gorilla gorilla (n=5) and Papio Anubis (n=8) were obtained. Resin casts were produced, and digital micrographs were taken of facet 9, using a scanning electron microscope. Micrographs were analysed using Microwear 4.02. Results for second molars indicated differences in mean length of striations between the species. The mean striation length was 50.523 µm for Pan, 64.633 µm for Gorilla and 45.25 µm for Papio. Striation orientation was found to be consistent within species, but varied between 118.35 degrees in Pan to 89.97 degrees in Papio. These findings indicate some differences between the species, which may relate to transverse movement experienced by different molars as well as bite force. Ongoing study with a larger sample size will examine microwear correlations with morphometric measurements across a range of primates. Findings should provide information as to whether microwear techniques can be applied in the analysis of fossil hominin taxa.

Encephalization and reproduction in lemurs: Higher metabolic rates in mothers and infants of larger-brain species reflect the cost of brain growth.

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The high cost of brain maintenance in adult primates is strongly suggested by studies that