How three-dimensional surface data can be used to reconstruct fragmentary fossils.

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Semilandmarks make it possible to quantify shape information on curves and surfaces using coordinate-based statistics. They can be used in geometric-morphometric analyses of shape variation as if they were homologous landmarks, and are therefore particularly helpful in regions where osteometric points are sparse (like e.g. the neurocranium). We test whether the additional effort in collecting curve and surface data, rather than traditional landmark points, is warranted. 138 landmark points, 34 curves totaling 299 semilandmarks and four patches (frontal, maxilla, zygomatic and two occipital) totaling 661 semilandmarks were collected from forty-nine surface scans of recent human crania from the collections of the AMNH, obtained with a XYZ surface scanner. Our sample comprises ten widespread populations. Six scans of Pleistocene fossil crania were also included. 3D-coordinates of these points were converted to shape-coordinates using Procrustes superimposition. We then standardized each specimen by thin-plate spline unwarping to the Procrustes average of (1) just the landmarks, and (2) landmarks and semilandmarks on curves. Thereby we can visualize the information gained by measuring the curves, and curves and surfaces respectively.
We show that the surface patches are largely redundant with landmark and curve data, providing little additional morphological information. These findings have important implications for reconstructing fragmentary fossil material; such fossils are often neglected because they contain too few landmark points. Curve and patch data can be collected from fragmentary fossils material thereby increasing the sample size.
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Geometric morphometric analysis of the ontogeny of canine and craniofacial growth in *Colobus guereza*: implications for its lack of canine dimorphism.

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Canine sexual dimorphism in anthropoid primates is largely the product of sexual selection. Intrasexual competition has selected large male canines in many anthropoids, and maxillary canine dimorphism broadly correlates with polygyny. *Colobus guereza* is perplexing in their male-sized female canines despite a social organization of single (or few) males and multiple females with intense inter-male competition. Only hylobatids (and tamarins) present comparably non-dimorphic canines, while other *Colobus* species and all other anthropoids are dimorphic or have small male canines (humans, marmosets). Delson and others have noted this phenomenon in passing, but without formal analysis of factors producing large female canines. Ontogenetic trajectories influence the expression of sexual dimorphism through bimaturism or differential growth rates. Most anthropoid canine dimorphism is the result of earlier eruption and growth termination in females, with male canines developing later and over a longer period of time. Dental eruption patterns indicate that *C. guereza* follows this pattern, so their large female canines are unexpected. Data on canine dimensions and the craniofacial complex in an ontogenetic sample were collected to test whether differentiation in growth patterns is responsible for large female canines and low rates of dimorphism.
Principal components analysis of three-dimensional landmark data from an ontogenetic sample of *C. guereza* allowed an examination of whether maxillary canine and craniofacial growth patterns differed significantly between males and females. Canines do erupt earlier in females, but there is no canine dimorphism in adults or juveniles, and growth trajectories appear similar in both sexes.
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Evidence of eagle predation in fossil cercopithecids from the Humpata Plateau, southern Angola.

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Several recent studies suggest a large raptor was responsible for collecting at least a portion of the primates from the South African fossil site of Taung, including its lone hominin, *Australopithecus africanus*. If raptors have been a strong selective force throughout primate evolution, the activities of large, carnivorous birds should also be detectable at other primate fossil localities in Africa. Over the last sixty years, a collection of extinct cercopithecids has been assembled from several cave breccias on the Humpata Plateau in southern Angola. The material, dated near the Plio-Pleistocene boundary, includes an assortment of cranio-dental and postcranial remains variably assigned to *Papio (Dinopithecus)* cf. *quadratirostris, Parapapio, Cercopithecoides* and/or *Theropithecus* We compare the Angolan and Taung material to remains of extant primates killed by crowned hawk eagles (*Stephanaoetus coronatus*) in the Ivory Coast's Tai National Park. Our analysis indicates that the size distribution and composition of fauna from the localities is quite similar and that there are striking consistencies in damage to the crania from each site. The absence of large bodied (> 20 kg) primates and other mammalian taxa at Taung and Tai and their rarity in Angola, combined with the strong likelihood that raptor nests were positioned near fissure openings at both fossil localities provides additional support for eagle involvement. Based on this evidence, we conclude that some of the Angolan cercopithecids were most likely raptor prey and that raptor predation has been a strong and underappreciated selective force during the course of primate evolution.