

stratigraphic relationships between the KB "hominin site" and the KA "faunal site" are also not fully understood.

In order to reliably integrate the hominin fossil record from Swartkrans and Kromdraai into a pan-African evolutionary scenario, the chronological refinement of their deposits remains a primary, unavoidable task. However, because of the nature itself of the karst deposits and of their complex stratigraphy, rather than the direct application of chronometric methods, biostratigraphic comparisons and inter-sites bio-correlations are likely among the most reliable methods for temporal seriation of the South African paleocaves. In this context, given the density of their remains across most eastern and southern African paleontological sites, their wide geographic distribution and usual association with hominin remains, cercopithecoids are among the best candidates in the search for temporal biomarkers suitable for dating the South African fossiliferous caves.

We investigated selected craniodental remains from ten fossil papionin and colobine taxa from different stratigraphic units at Swartkrans and Kromdraai; in a comparative perspective, we also examined similar material from the sites of Sterkfontein and Makapansgat, as well as from extant representatives. The specimens were systematically detailed by X-ray microCT at a spatial resolution ranging from 20 to 120 μm at the South African Nuclear Energy Corporation (Necsa) and the Palaeosciences Centre of the University of the Witwatersrand, Johannesburg.

Four structures commonly used in paleoanthropological investigations for discriminating among extant hominids and fossil hominins, but not yet extensively reported for their evolutionary variation patterns and site-specific time-related trends in other fossil primate taxa, have been assessed in a comparative perspective: tooth endostructural organization, the bony labyrinth, the maxillary sinus, details of the endocranial morphoarchitecture. By using advanced techniques of 3D imaging and GM methods (semilandmarks and deformation-based models), these structures have been systematically characterized in both fossil assemblages and comparative modern specimens.

The preliminary results of this ongoing study project indicate that, by using different states of these evolving features as chronological markers, the site of Kromdraai could be temporally closer to Makapansgat, thus older than previously thought, and that the deposits of Swartkrans, confirmed to be younger than 2 Ma, are homogeneous, at least within Member 1.

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IDENTIFICATION OF *HOMO*-LIKE FEATURES IN VIRTUALLY RENDERED SOUTH AFRICAN AUSTRALOPITH ENDOCASTS.

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Besides size increase, cortical reorganization is one of the most critical processes having affected human brain evolution. In the hominin fossil record, a virtual "early *Homo* endocranium" is expected to display a characteristic neuroanatomical pattern including, among other features, a distinct Broca's area, the absence or only faint presence of a lunate sulcus positioned posteriorly, a unique orbitofrontal morphology, a relatively complex configuration of the middle meningeal network (Tobias, 1987; Holloway et al., 2004). Tracking the early appearance and full establishment of these derived features in the hominin fossil record should contribute to the assessment and understanding of the inter-species evolutionary relationships within the human lineage and potentially allow the identification of the paleodeme from which early *Homo* emerged.

However, together with an expected degree of intra-species variation having occurred during hominin radiation, the confounding effects of non phylogenetic-based resemblances (homoplasy), and the unpredictable as much as unavoidable impact of taphonomy on the fossilisation process, such research is complicated by the nature itself of the investigated structures. For example, the original description of the *Australopithecus sediba* (spec. MH1) highlights a developmental degree of the frontal lobe closer to the human condition in association with a rather australopith-like cranial capacity and convolutional pattern, thus suggesting a mosaic evolutionary pattern of the neuroanatomical diagnostic features (Carlson et al., 2011). However, a recent publication contests the identification of *Homo*-like features in *A. sediba* and rather suggests a common australopith endocranial organization (Falk, 2014).

Paleoneurology has recently enlarged its traditional investigative toolkit by integrating descriptive morphology with advanced methods of high-resolution 3D imaging and computing suitable for the subtle characterization of the fossil morphoarchitecture (Bruner, 2014). In this perspective, we engaged in the computer-assisted revision of the endocranial structural organization of South African nonhuman hominin endocrania, with special attention to the quantitative assessment of the sulcal variation pattern and architectural asymmetries.

The fossil specimens investigated so far represent three relatively well-preserved *A. africanus* endocrania: the Taung child and the specimens Sts 5 and Sts 60 from Sterkfontein Member 4. Based on virtual reconstructions obtained from high-resolution tomography (Taung, Sts 5) and surface scanning (Sts 60), we combined a method of landmark-free registration (Durrleman et al., 2012; Dumoncel et al., 2014) and a method of 3D endocranial shape asymmetries to investigate topographic differences in morphostructural organization and, more specifically, in lobe conformation, and quantitatively characterize intra- and inter-specific variability. Cerebral petaliole and petaliole patterns were also assessed. Finally, a semi-automatic methodology was developed to automatically detect, extract and compare the sulcal topographic organizations.

Here we compare the evidence extracted from the three South African fossil endocrania to the figures from a representative sample of extant humans, bonobos and chimpanzees, and also discuss the value, limits and perspectives of our experimental analytical protocol.

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NEW EXCAVATIONS REVEAL FIRST DISCOVERIES OF THE EARLIEST HOMININS FROM KROMDRAAI B.

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The Plio-Pleistocene hominins from the site of Kromdraai B (KB) (26°00'41"S, 27°44'60"E) (Gauteng province, South Africa) represent a minimum number of ten individuals, recovered from at least two stratigraphic units representing distinct depositional cycles and separated by major unconformities. The KB *Paranthropus robustus* sample shows important cranial and dental variations that may be of evolutionary significance. In a number of cranial and dental features, the states shown by at least some *P. robustus* hominins from KB are shared with certain specimens from Sterkfontein Member 4 attributed either to *Australopithecus africanus* or to specimens with uncertain affinities, in contrast to the more derived conditions displayed by South African samples so far from the nearby site of Swartkrans, attributed. In this context we discuss the status of the newly discovered KB hominins to assess whether they may lie close to the origin of *Paranthropus* in South Africa. Indeed, as stated by Tobias (1988, p. 305), "the population represented by the Kromdraai hominid may throw light on the nature of the cladogenetic trans-specific change from the postulated "derived *A. africanus*" [as represented by the Taung child] to the earliest "robust" australopithecine sensu stricto."

In April 2014, the Kromdraai Research Project (KRP) opened up a new excavation at KB (100 m²) in an unexplored area situated to the north of the previous excavation undertaken by Broom and Vrba but close to the exploratory excavation by Brain in the 1950's. This new KB area is called KB extension site. It contains the decalcified sediments of a newly identified talus cone deposit and an underlying flowstone. It represents the earliest known infilling of the KB cave system (which has lost its roof through erosion).

Here, we report some newly discovered hominin specimens from the earliest deposits of KB. We discuss whether they display features which may illustrate early evolution of the SA *Paranthropus* clade, or indicate the presence of an *Australopithecus*-like form transitional to *Paranthropus*.

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