Swartkrans Paleoanthropology Research Project

Progress Report 2009-2012

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Swartkrans holds a special place in the Cradle of Humankind World Heritage sites, because hominid behavior is more definitively documented in the early Pleistocene assemblages here than at any other penecontemporaneous site in the valley. The Swartkrans Formation includes three early Pleistocene deposits that have faunal age estimates of c. 1.8/1.7 Ma (Member 1 Lower Bank [LB] and Hanging Remnant [HR]), 1.5 Ma (Member 2), and 1.0 Ma (Member 3).

The initial focus of our previous excavations at Swartkrans was on the stratigraphically complex northeastern portion of the cave, where some of the site's oldest and youngest known deposits are situated. These are the early Pleistocene LB and HR units and the Middle Stone Age (MSA) unit of Member 4. The LB and Member 4 in this area lie in contact with each other in an underground cavern. Previously, the age of the talus within this cavern was not known, as it had never been excavated. Designated as the Talus Cone Deposit (TCD), this talus is itself overlying a second previously unknown underground deposit that has also yielded *Paranthropus robustus* fossils (Sutton et al., 2009). This lowest deposit has been identified as a distal portion of the LB of Member 1. These two deposits are capped by a flowstone which has a uranium-series date of 110,000 years, and over this lie deposits in an aven that connects with the surface. At the surface, Sutton (2012; Sutton *et al*., in preparation) has excavated a rich MSA stone artifact assemblage. Our work also added substantially to the hominid fossil sample of the site, including the especially significant recovery a rare *P. robustus* proximal femur (Pickering *et al*., 2012). In addition, we are wrapping-up phase one of the SPRP with forthcoming papers on: (1) the technology of the newly excavated MSA artifacts (Sutton *et al*., in prep); (2) *Homo habilis* associated

with an Oldowan stone tool artifact assemblage from Member 1 Lower Bank (Sutton *et al*., 2012); (3) new zooarchaeological and taphonomic interpretations of the TCD and Lower Bank of Member 1 faunas (Pickering *et al*., in prep); (4) a large experimental study to determine the function of the abundant bone tools recovered from Swartkrans Cave (Heaton *et al*., in prep).

The problem we must now address in this area of the site is a stratigraphic one, as there is an excavated sterile zone, which underlies the colluvial deposit with MSA. If we are granted our permit renewal, in the next three years we will attempt Optical Stimulated Luminescence (OSL) dating of the MSA-bearing colluvium and determine if the underlying sterile sediment can also be dated with OSL. Currently, we can only say that the MSA is <110,000 years, but this proposed work can provide us with better age resolution. The MSA assemblage appears to reflect some specific activities carried out at the site as it is dominated by steep-edged scrapers and points are absent. The material is in fresh condition and must derive from occupations on the slope around the cave's entrance, as this area is not far from the top of the Swartkrans hill. While the MSA is known at other sites in the Cradle (Sterkfontein, Goldsmith's, and Plovers Lake), the Swartkrans assemblage is the only large collection of MSA stone artefacts (>4,000 pieces) and represents the first substantial MSA in the area that has been found in good context.

Recovery and analysis of these MSA artefacts over the next three can give us insight into the technological behavior of some of the earliest modern humans (*Homo sapiens*) to occupy the Cradle of Humankind area.

Member 1

While no artifacts have yet been found in the newly discovered extension of the LB of Member 1, our excavations have greatly enlarged the assemblage from the central area of the site. With improved dating and a much larger sample, we are now certain that this material belongs to the Oldowan Industry. Ron Clarke (our team hominin specialist) has also reviewed his 1977 identification of an early *Homo* juvenile cranium from Member 1, SK 27, and now classifies it as *H. habilis*. The dating of Member 1 is thus of much importance, particularly as the HR of Member 1 produced the hominin cranium SK 847, which is *H. ergaster*, and the deposit completely lacks artefacts. Work published on U-Pb dating and our stratigraphic analysis (Sutton et al., 2009; Pickering et al., 2012) have shown that both of the Member 1 deposits (LB and HR) are bracketed by dates of >1.7 and <2.4 Ma. The faunal age of Member 1 has been published as 1.7/1.8 Ma, but this age is influenced by the content of the HR, which Brain has always maintained is stratigraphically younger than the LB. With the detailed stratigraphic studies we have planned for the next three years, we should be able to provide an even stronger argument for the relationship of the two sub-members. Preliminary results of cosmogenic nuclide burial dating by our collaborators D. Granger and R. Gibbon have already provided an age of close to 2.0 Ma for the LB, which fits with the maximum U-Pb age of the underlying flowstone of 2.4 Ma. Our current focus is now on publishing the dates and refining the stratigraphic analysis, and on publishing the Oldowan assemblage and the new interpretation of SK 27 as *H. habilis*.

Primary research publications

1. Pickering, T.R., Heaton, J.L., Clarke, R.J. Sutton, M.B., Brain, C.K. and Kuman, K. (2012). New hominid fossils from Member 1 of the Swartkrans Formation, South Africa. *Journal of Human Evolution* **62,** 618-628.

2. Pickering, T.R. and Brain, C.K. (2010). What taphonomically oriented research at Swartkrans Cave reveals about early hominid behavior. *Journal of Taphonomy* **8,** 215-232.

3. Sutton, M.B., Pickering, T.R., Pickering, R., Brain, C.K., Clarke, R.J., Heaton, J.L. and Kuman, K. (2009). Newly discovered fossil- and artifact-bearing deposits, uranium-series ages and Plio-Pleistocene hominids at Swartkrans Cave, South Africa. *Journal of Human Evolution* **57,** 688-696.

Relevant review publications

1. Pickering, T.R. and Bunn, H.T. "Another take on meat-foraging by Pleistocene African hominins: Tracking behavioral evolution beyond baseline inferences of early access to carcasses," In (M. Domínguez-Rodrigo, Ed.) *Stone Tools and Fossil Bones: Debates in the Archaeology of Human Origins*, pp. 152-173. Cambridge: Cambridge University Press.

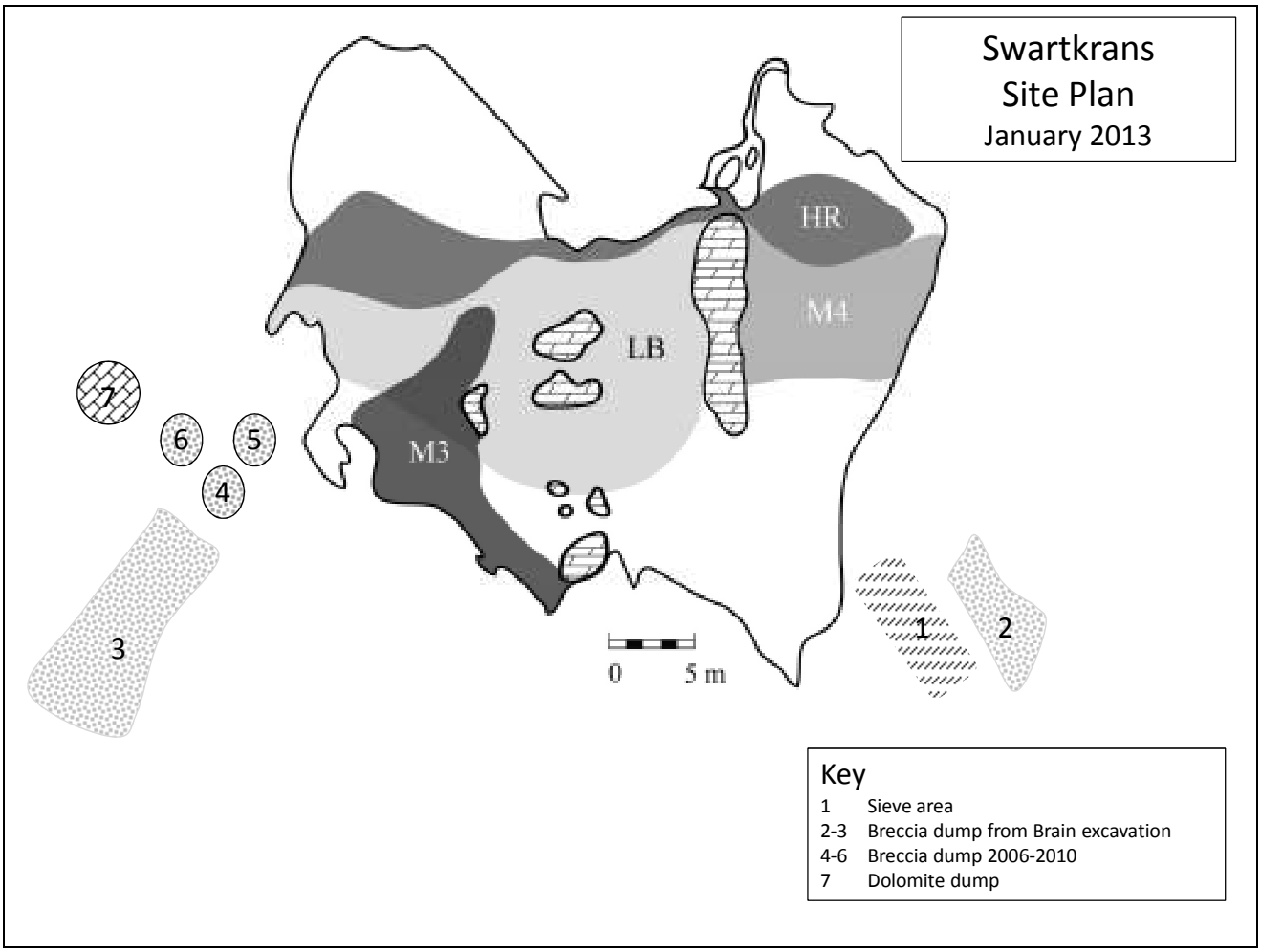
2. Pickering, T.R. "*African Genesis* revisited: Reflections on Raymond Dart and the 'predatory transition from ape(-man) to man'," In (S. Reynolds and A. Gallagher, Eds.) *African Genesis: Perspectives on Hominin Evolution*, pp. 487-505. Cambridge: Cambridge University Press.

Invited Publications

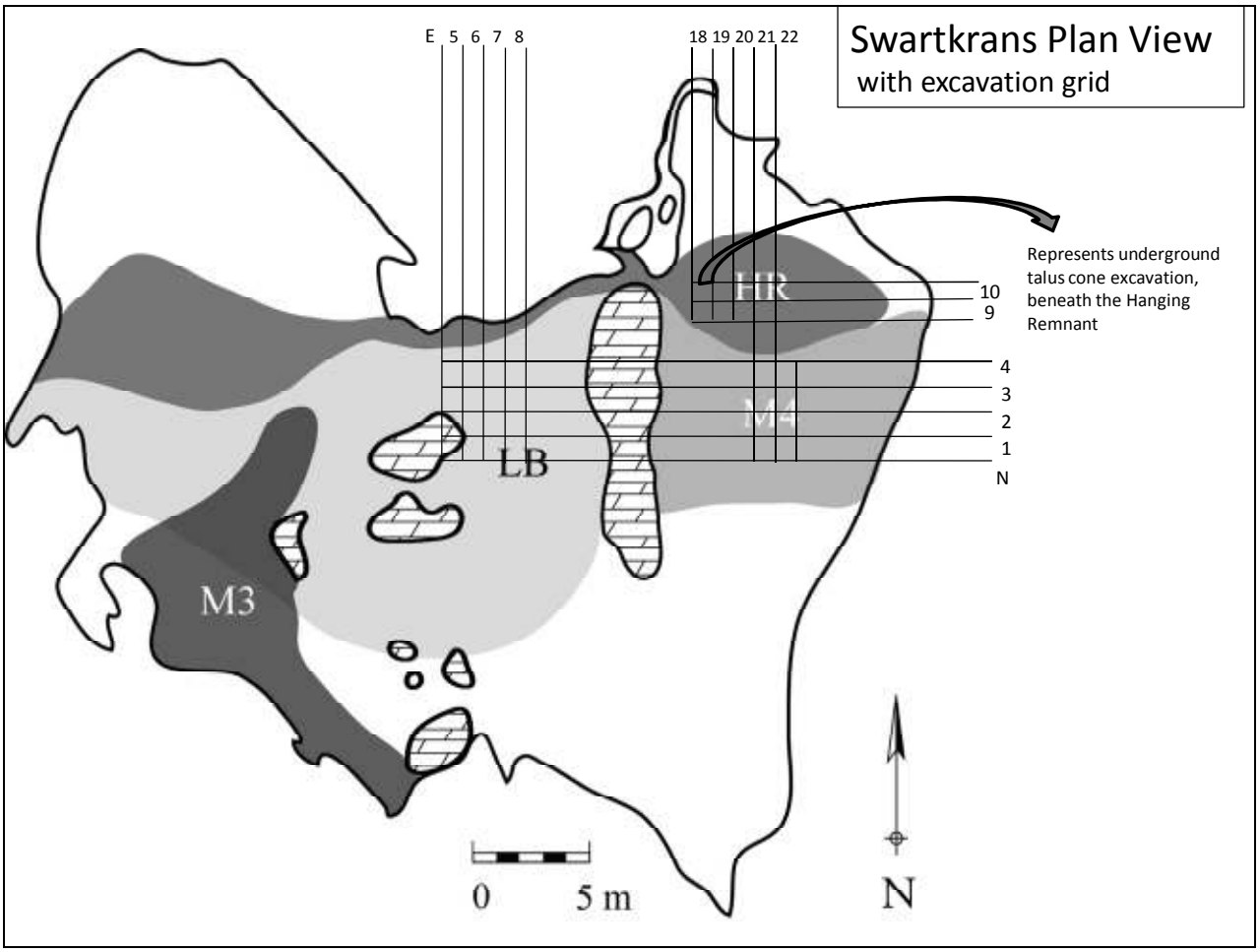
1. Pickering, T.R. and Heaton, J.L. (2009). Roots, bugs and venison: prehistoric cuisine at Swartkrans Cave. *Quest: Science for Africa*, **6** (2), 3-9.

2. Sutton, M. B. (2009). Uncovering early human behavior. *Quest: Science for Africa*, **6** (2), 10-14.

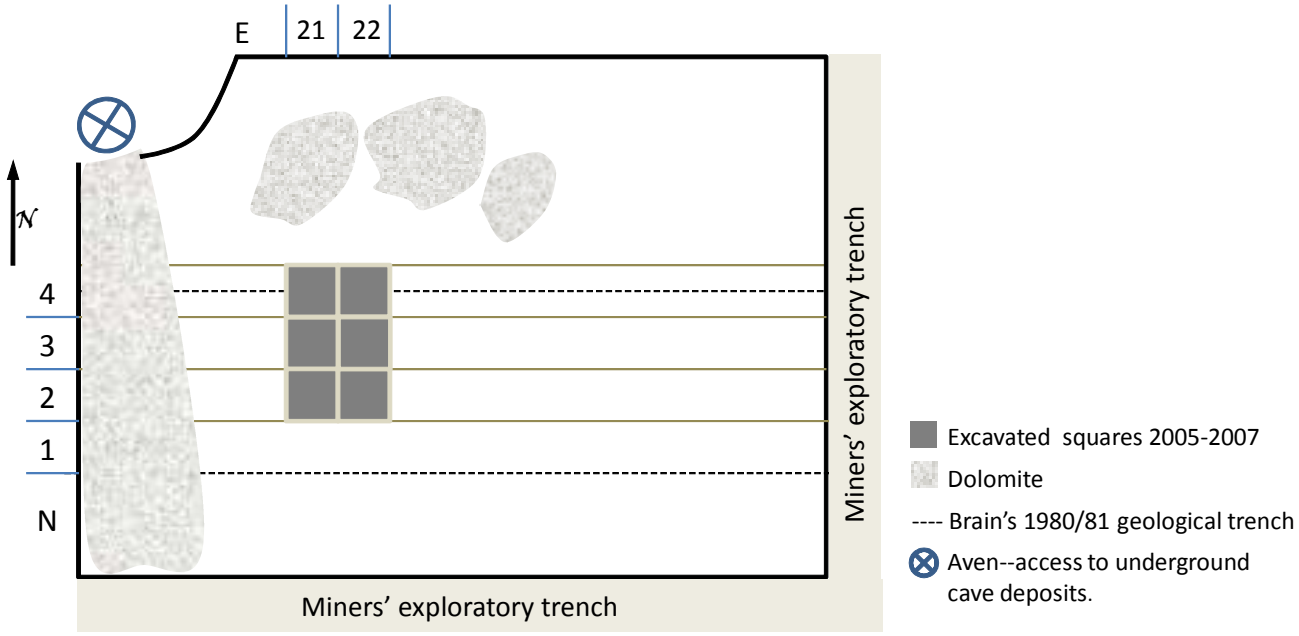
3. Brain, C. K. (2009). Were our early ancestors murders and head-hunters? A prehistoric detective story. *Quest: Science for Africa*, **6** (2), 15-19.



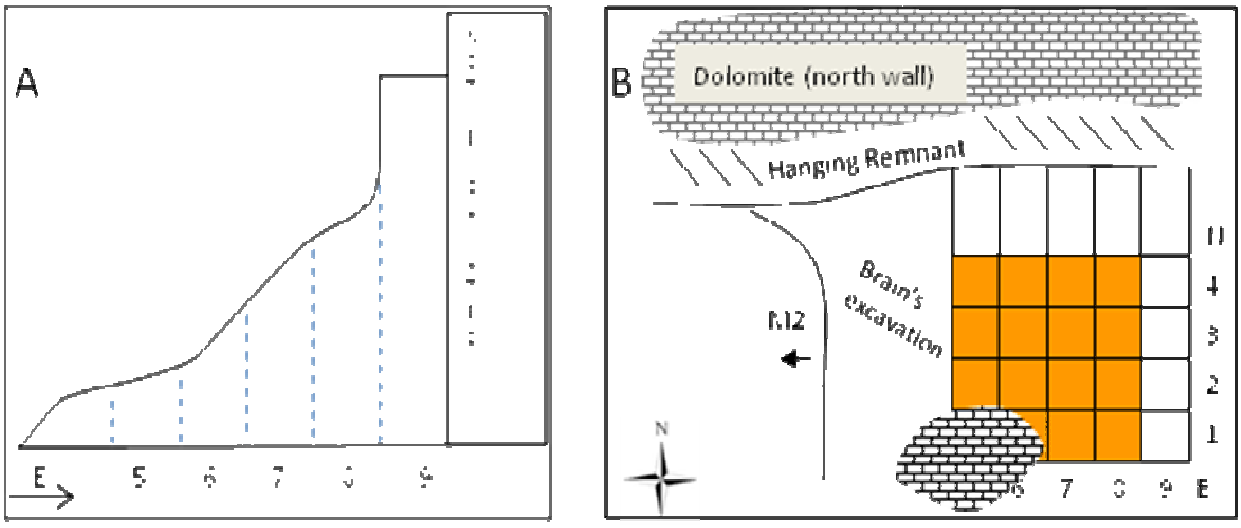
Site plan of Swartkrans Cave with breccia, sieve and dolomite dumps identified. Material from current project work (dumps 4, 5 and 6) are being sorted and will eventually be reduced to one dump containing material with no visible and low potential fossil bearing blocks.



Plan view of excavation areas. The M1 Lower Bank (LB) excavation includes 16 meter squares (1-4N, 5-8E). Squares 7-8N, 1-4E were excavated during the first phase from 2006-2008. Squares 5-6N, 1-4E were excavated during the second phase 2009-2011. M4 surface excavations include 6 squares (2-4N, 21-22E) excavated during the first phase 2006-2008. M4 underground excavations include 6 squares (9N, 18-19E and 10N, 18-21E) excavated during the second phase 2009-2011.



Plan view of the Member 4 surface excavation area in the north east portion of the cave system.



(A) Profile of Member 1 Lower Bank excavation slope. Of the original excavations by Brain, only row 9E was still clearly stepped down to row 8E. 9E had been excavated ~1.5m below the surface. The remaining East rows had eroded to such an extent that they were no longer stepped. Because of the steepness of the infill the squares were excavated to varying depths. (B) Plan view of Lower Bank excavation area. Sixteen one meter squares have been excavated to either 1.5m to 2m each along the slope of the deposit.