

Date: 23rd October 2019

To: Ragna Redelstorf (SAHRA)

From: T.R. Pickering, M. Caruana (Swartkrans permit holders)

RE: Report on activities at Swartkrans, 2017 – 2019 seasons

Annual Swartkrans Permit Report for Activities Between 2017 - 2019

I. Site Information:

Permit #: 2598

Case ID: 9624

Authors: Prof. Travis R. Pickering & Dr. Matthew V. Caruana

SAHRA Permit Officer: Ragna Redelstorf

Permit Issue Date: 8th September, 2017

Permit Expiry Date: 30th November, 2019

Permit Holder: Dr. Morris B. Sutton (University of the Witwatersrand).

Collaborators: Profs. Travis Pickering (University of Wisconsin, Madison, USA and University of the Witwatersrand), C.K. Brian (Ditsong National Museum of Natural History, RSA) and Dr. Matthew V. Caruana (University of Johannesburg).

Expert Consultants: Profs. Kathleen Kuman and Ronald Clarke (University of the Witwatersrand), Drs. Dominic Stratford (University of the Witwatersrand), and Laurent Bruxelles (INRAP, France), Charles Egeland (University of North Carolina-Greensboro, USA), Darryl Granger (Purdue University, USA), Jason Heaton (Birmingham-Southern College, USA), Andrea Heile (University of Wisconsin-Madison).

Site: Swartkrans Palaeontological Site, Swartkrans 172, Krugersdorp District (9/2/233/0012) (Fig. 1).

GPS Coordinates:

1) SWT Main Site: 26° 1'2.44"S; 27°43'25.06"E

2) APS (Swartkrans II): 26° 1'1.70"S; 27°43'29.03"E

Geological Location: Malmani Group, Transvaal Supergroup (Fig 2).

II. Executive Summary:

The primary activities at Swartkrans during 2017 – 2019 were targeted excavations (1) of a block of the Hanging Remnant (HR, Member 1) that had fallen decades (or more) before the SPRP began its work at the site, (2) in a newly recognized deposit earlier than the Member 1 Lower Bank, informally designated as Pre-Member 1 (PM1), and (3) at the Andrew Phaswana Site (APS) (Fig. 3). In addition, we completed the analysis of the Oldowan stone tool assemblage excavated by the SPRP from the Lower Bank of Member 1, have re-dated the archaeology-bearing Lower Bank unit of Member 1 using the cosmogenic nuclide isochron technique, and have begun analyses of the SPRP-excavated macro- and microfaunas from throughout the Swartkrans Formation.

III. Funding:

The 2018 – 2019 season at Swartkrans was funded in part by two grants awarded to Pickering, one from the **LSB Leakey Foundation** for US\$20,000.00 and the other from the **University of Wisconsin-Madison** (renewal of Kellet Grant, originally awarded in 2014).

IV. Location Maps:

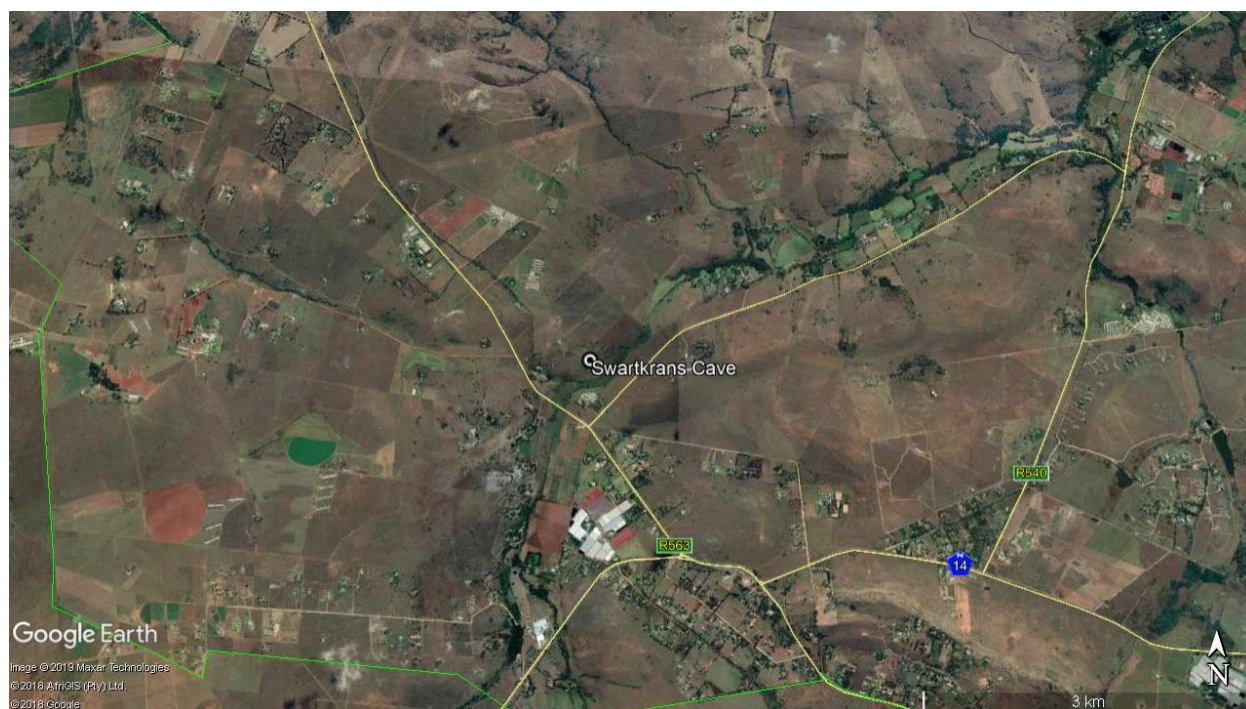


Figure 1. Geographical Map showing the relative position of the Swartkrans Palaeontological Site near the intersection of R563 and Kromdraai Rd.

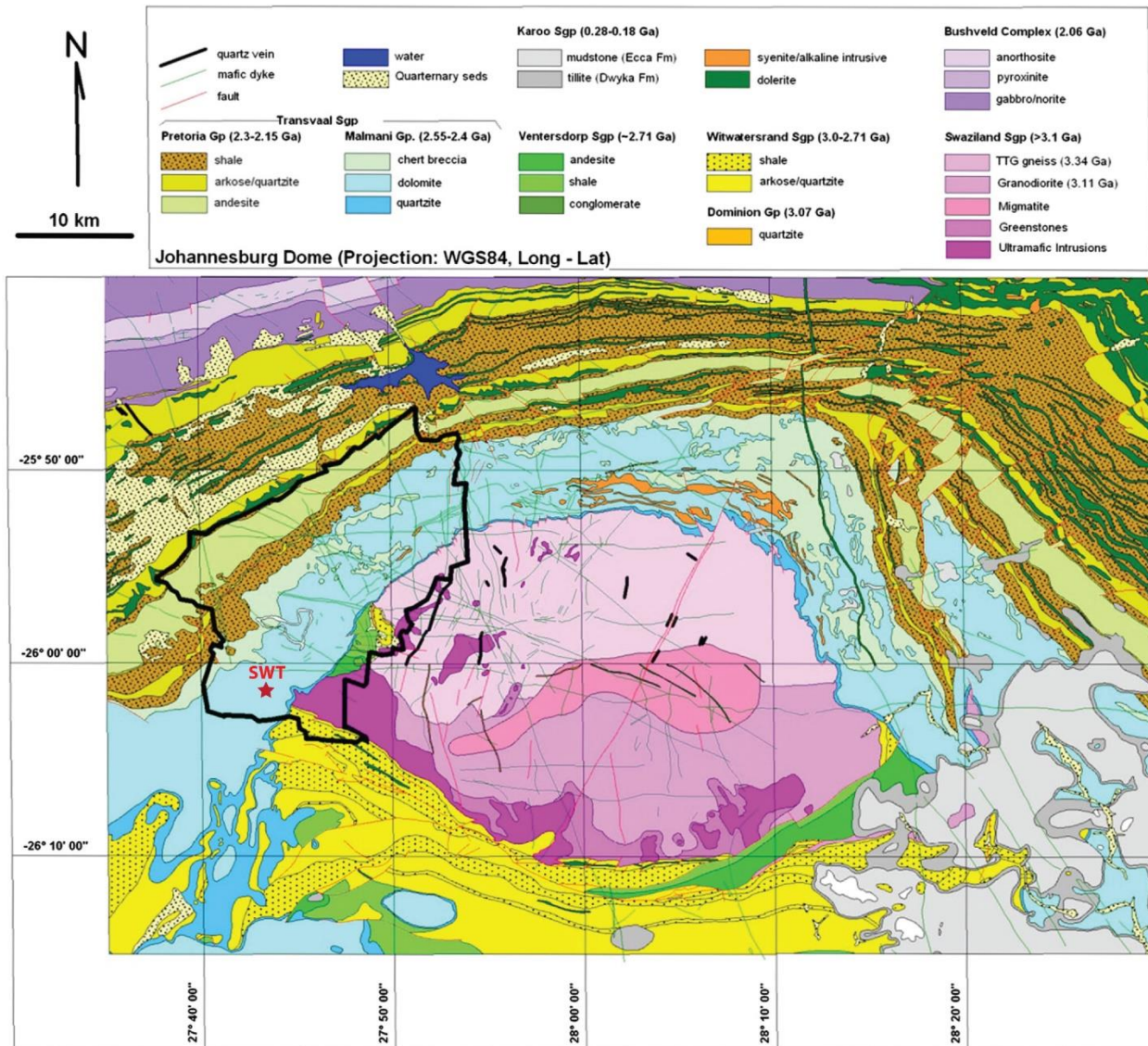


Figure 2. Geological Map showing the relative position of the Swartkrans Palaeontological Site within the Malmani Group (Transvaal Supergroup). Image taken from Dirks & Berger (2018). Hominin-bearing caves and landscape dynamics in the Cradle of Humankind, South Africa. *Journal of African Earth Sciences* 78 (2013) 109–131.

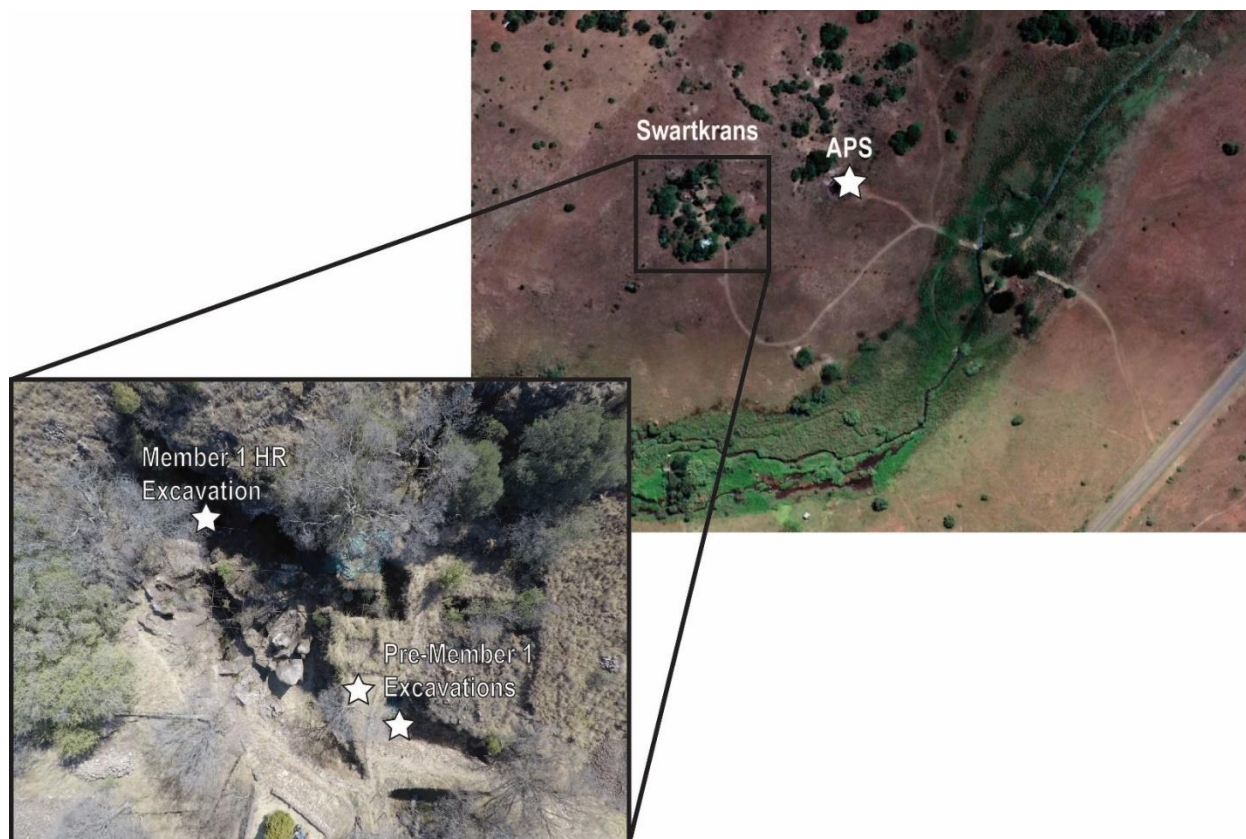


Figure 3. Map of Active Excavation Areas. Stars indicating the active excavation areas during the 2017 – 2019 field seasons (note the bottom insert is an aerial photograph of the Swartkrans fossil site).

IV. Detailed Reports on Current Activities:

Hanging Remnant (HR)

The HR is one of the oldest recognized units of the Swartkrans Formation, dated to ca. 2.0 – 1.7 Ma, and has been a rich source of bones, including some of the most iconic hominin fossils known from the site, such as the *Paranthropus* cranium SK 48. Much of the HR was worked in the early days of excavation at Swartkrans by Robert Broom and John Robinson. The HR partially overhangs the Swartkrans tourist path in the north-central portion of the site, so for safety reasons, a thin skin of the breccia was removed by the SPRP in 2005. The removed blocks were processed but yielded very few fossils and no artifacts. Intrigued by this disparity in the Broom-Robinson and SPRP results, we decided to excavate a detached block of the HR immediately below the main Broom-Robinson work area, at the western end of the unit (Figs. 3 and 4).

Excavation of the HR block has proved extremely successful. The block is rich in fossils, including two particularly unique specimens that are currently under preparation in anticipation of curation and publication. The first is a rare, nearly complete caracal skull and the other relates to the posture and locomotion of *Paranthropus robustus*. The renewal of our permit for Swartkrans will be critical to our continued investigation of this part of the site and for the ongoing analyses of these materials. To that end, Pickering has secured a sabbatical from his

university for the Spring 2020 semester in order to come to South Africa to work the new fossil materials with Clarke and other collaborators.

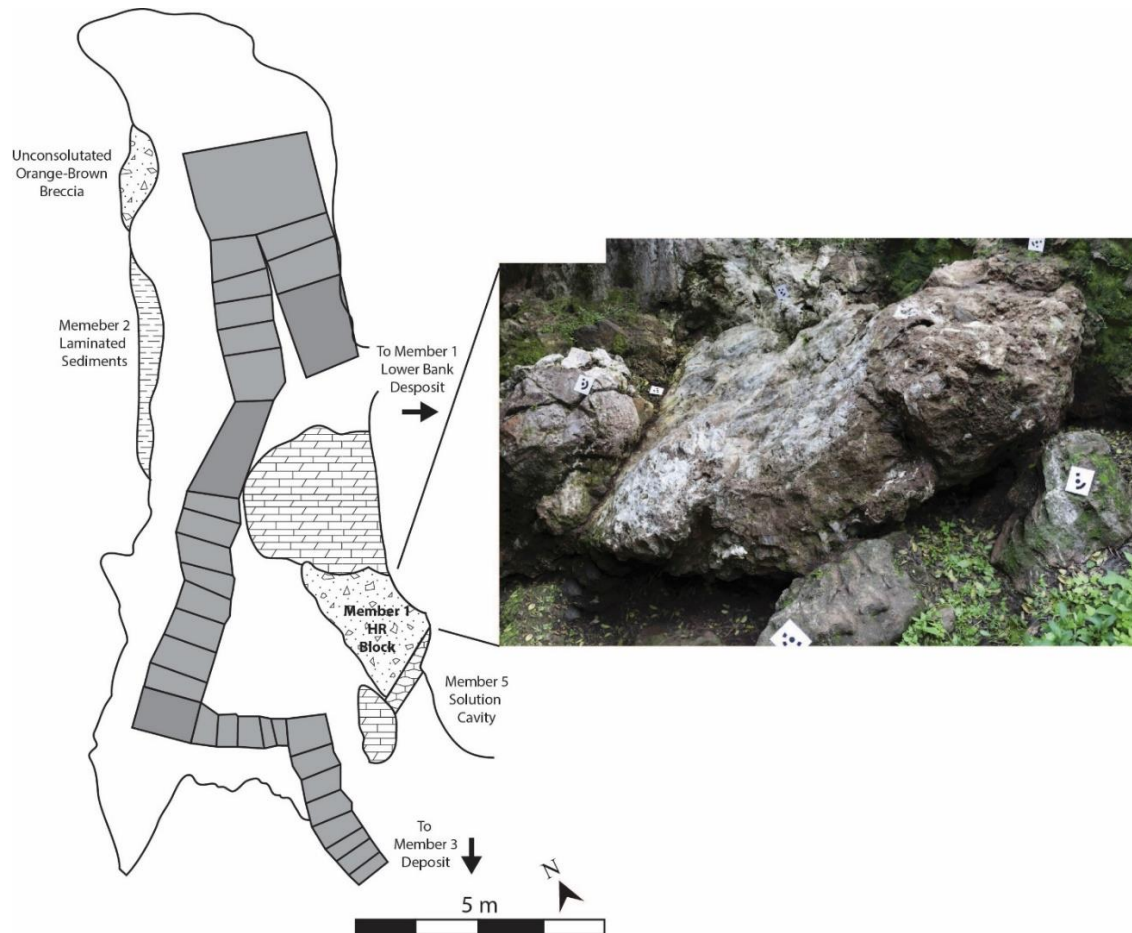


Figure 4. Member 1 Hanging Remnant Block Excavation. Illustration showing the relative positioning of the M1 HR block in the northwestern most portion of the site. Insert shows the block before excavations.

Pre-Member 1

Bruxelles, Caruana, and Stratford identified a previously unrecognized unit of the Swartkrans Formation during their work to provide a comprehensive re-analysis of the site's early Pleistocene (and perhaps late Pliocene) stratigraphy (Figs. 5 and 6). We are currently engaging specialists for absolute dating of the unit, designated informally as PM1. But, given that it underlies Member 1 it is necessarily, based on superposition, well in excess of 2.0 Ma—rendering any potential archaeological materials in it the oldest in southern Africa. This realization prompted our excavations in PM1.

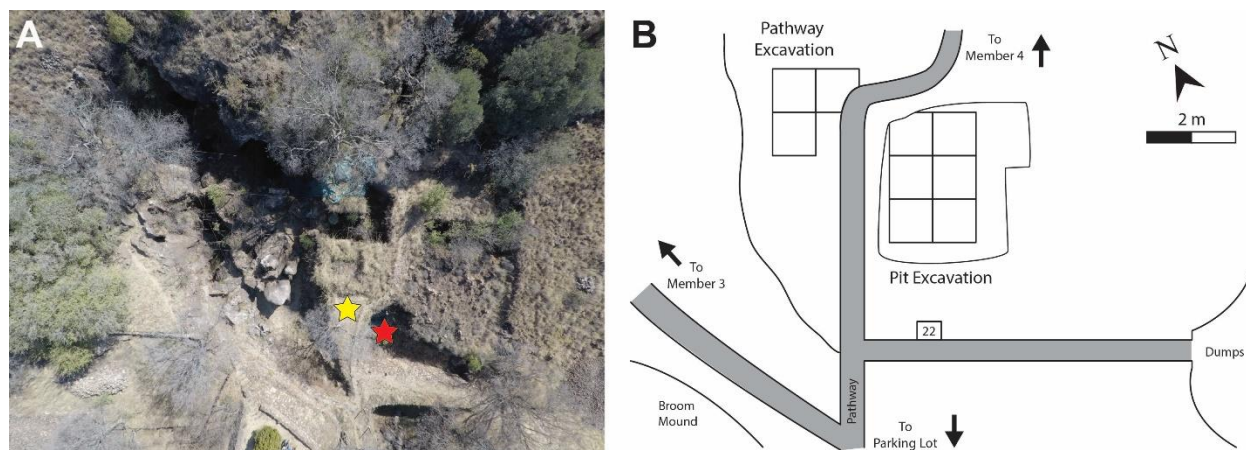


Figure 5. A. Aerial photograph showing the relative positions of the two Pre-Member 1 excavations (Yellow = Pathway and Red = Pit). B. A line drawing illustrating the positions of the excavations.

The PM1 deposit was excavated in two areas where it is exposed at surface level: (1) to the west of the cemented path leading to Member 4 (the ‘Pathway Excavation’), and (2) in a pit to the east of the path (the ‘Pit Excavation’) (Figs. 5 and 6). The PM1 Pit Excavation consisted of a 2 x 3 m grid and took place in June/July and October of 2017, which removed $\sim 400 \text{ cm}^3$ of sediment and recovered 303 artifactual finds that were later sorted in Kuman’s lab. The PM1 Pathway Excavation consisted of a 1 x 3 m grid and took place in October of 2019, which removed $\sim 110 \text{ cm}^3$ of sediment and recovered 87 artefacts (Table 1).

This deposit is characterized by poorly-sorted, silty-to-sandy, dark brown (2.5YR 3/2) sediments with degrading and weathered chert clasts and flowstone fragments inclusions ranging from $<1 \text{ cm}$ to $>10 \text{ cm}$ in size, including large, chert blocks (i.e. $>50 \text{ cm}$). There are only a few fragmented macrofaunal fossils ($N=37$) and some microfauna ($N < 20$) recovered to date from these excavations. Most of the geological inclusions are heavily stained by manganese and some of the smaller chert clasts ($<5 \text{ cm}$) have been rounded, which suggests that the infill is composed of surface weathered materials that were incorporated into a talus deposit through colluvial processes. The artifacts, mostly composed of chert and quartz are also weathered, suggesting they were made on the surface, near cave entrances and later washed into the cave through colluvial deposition.

Excavations and artifact analysis are ongoing, but the analysis of the PM1 Pit Excavation materials by Caruana and Kuman has identified approximately 60 confirmed stone tools so far, which will be compared with Oldowan assemblages from Swartkrans and Sterkfontein in 2020. The PM1 Pathway Excavation material has yet to be sorted and analyzed, which is currently underway.

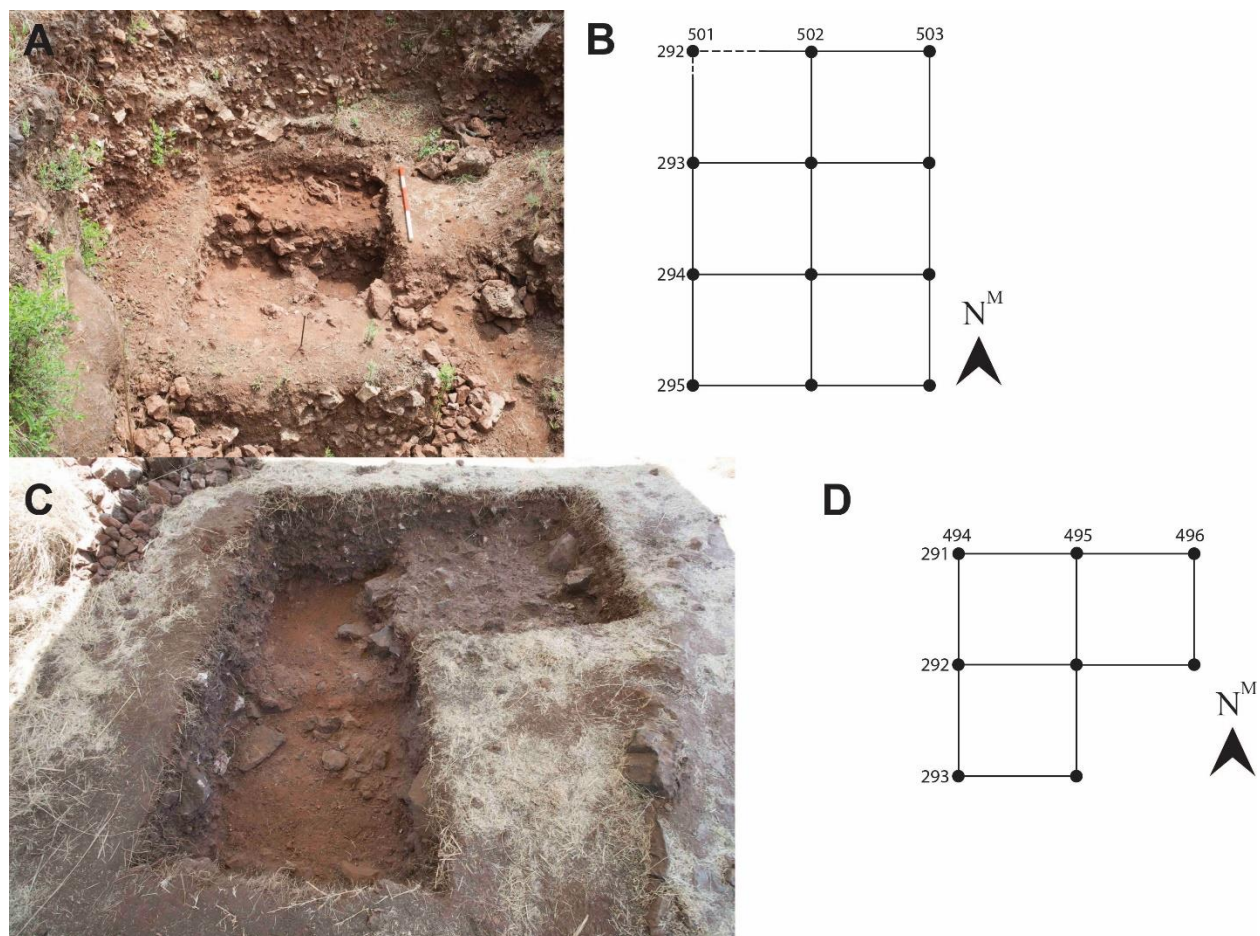


Figure 6. The Pre-Member 1 Excavations. A-B. The Pit Excavation, illustrating the survey grid (note the dotted line indicates a portion of the northern square that extends into the wall). C-D. The Pathway Excavation, illustrating the survey grid. *N^M = magnetic North.

Andrew Phaswana Site

Less well-known than the main Swartkrans site is Swartkrans II (SW II), a complex of breccia-bearing caves and fissures ~115.5 m to the northeast of the main site (Figs. 3 and 6). C.K. Brain noted long ago that the cave sites of the SW II locality are known to be rich in bone. But it was not until the survey efforts of Andrew Phaswana that the paleoanthropological potential of one of these SW II caves was fully appreciated. The APS site thus far is yielding a rich MSA archaeological assemblage.

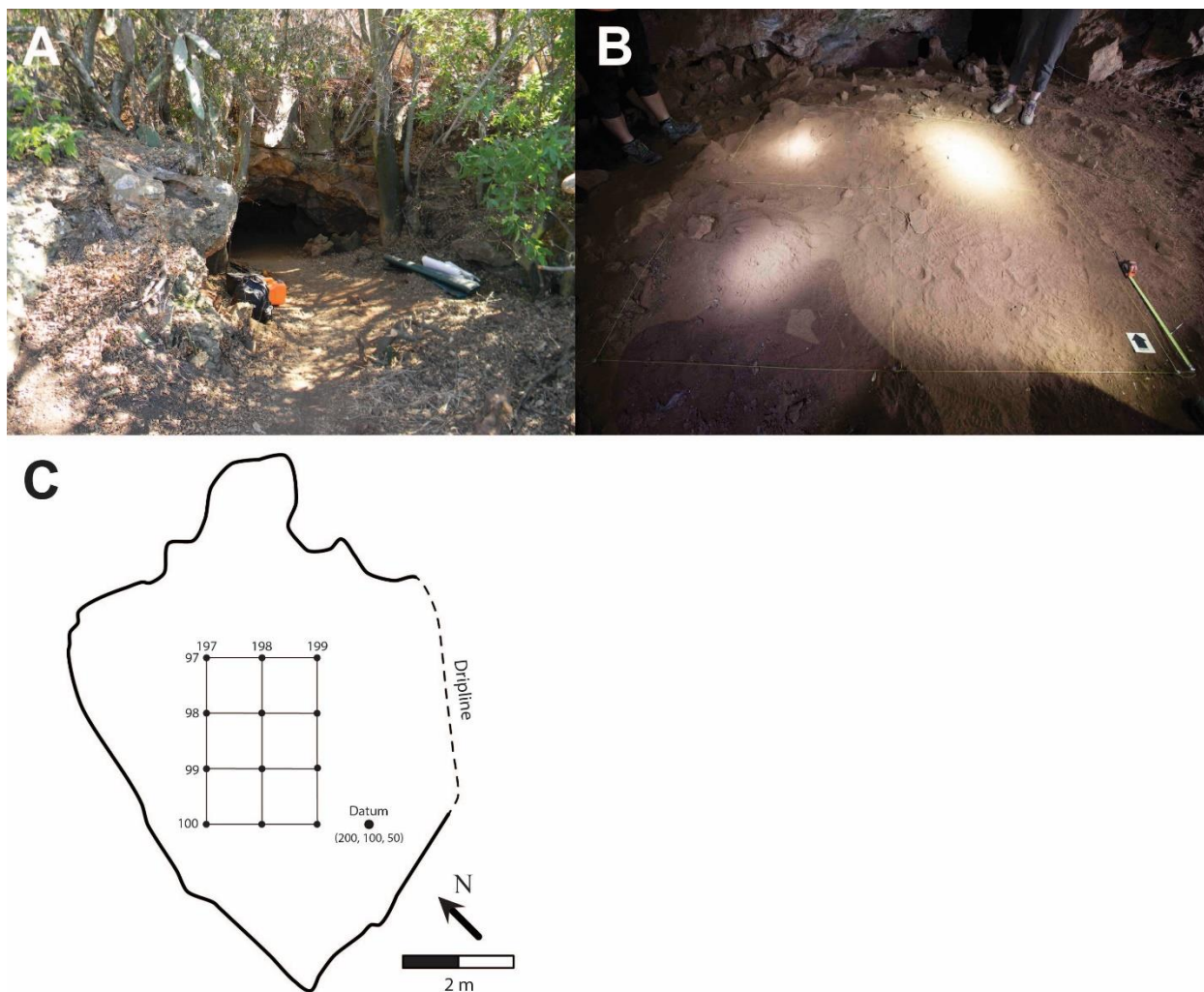


Figure 6. Andrew Phaswana Site (APS). A. Photograph of the entrance to the APS cave. B. A Photograph of the excavation set up at APS in 2018. C. An illustration of the survey grid at APS inside the cave. *N = true North.

At APS, we constructed a 2 x 3 m grid and removed $\sim 160 \text{ cm}^3$ of sediment to date (Fig. 6). We have recovered 1242 fossil, 1118 lithic, 27 ochre, 11 ostrich egg shell artefacts to date, which are currently under study by Pickering, Caruana, and Kuman (Table 2). Thus far the finds reveal a rich MSA assemblage that includes percussed bone, ochre and ostrich eggshell, with the latter to be studied isotopically for environmental information. Furthermore, some of the fossil materials show signs of burning and charcoal pieces (N= 9) have been recovered, albeit no hearths have been positively identified within APS so far.

The APS deposit is characterized by poorly-sorted, silty-to-sandy, brown (7.5YR 4/4) sediments with chert clasts inclusions ranging from $<1 \text{ cm}$ to $>10 \text{ cm}$ in size, including large roof blocks ($>50 \text{ cm}$). No stratigraphic layering has been detected yet. Preliminarily, the cave seems to have formed due to erosion along a large chert vein, which forms the current roof. The infill sequence is comprised of several breccia masses bounded by flowstones, located at the top of the cave entrance and within caverns below the excavation, which are under study by Bruxelles

and Stratford. Currently, the excavation seems to be positioned on the top of a large talus deposit that extends approximately 15 m down into the cave, suggesting that this locality could preserve a range of chronologically-sequenced depositional events.

Oldowan stone tools

Kuman led the analysis and publication of the large assemblage of stone artifacts excavated from the Lower Bank by the SPRP. The following results were published as Kuman et al. (2018). "The Oldowan industry from Swartkrans Cave, South Africa, and its relevance for the African Oldowan." *Journal of Human Evolution* **123**, 52-69. The affinities of the original LB industry, published by in 1993 by J.D. Clark, have been debated due to small sample size. The SPRP sample is now large enough to confirm its affinity with the Oldowan industrial complex. The assemblage is highly expedient and core reduction strategies are largely casual. Although freehand flaking is present, the bipolar technique is most significant, even in non-quartz raw materials. The Swartkrans assemblage shows some significant contrasts with the Sterkfontein Oldowan, ca. 2.18 Ma, which can be explained by its closer proximity to raw material sources, its somewhat different geographic context, and its more expedient nature. The Swartkrans Oldowan now provides us with the first good indication of Oldowan variability in southern Africa, where only two sizeable assemblages have thus far been discovered. Comparisons were made with other sites across Africa that help to place this variability within our overall understanding of the Oldowan industrial complex.

Cosmogenic nuclide isochron dating of Member 1 Lower Bank

Granger led the analysis and Kuman is helping the publication of our cosmogenic nuclide dating of the sedimentary unit that yielded the artifacts referenced above. Kuman has prepared a preliminary collaborative publication on the results from Granger's analysis of eight geological samples from the Lower Bank of Member 1. We currently await the final results before submission. Previous dating results for the Lower Bank published by Gibbon et al. in 2014 were based on simple burial ages and provided two non-overlapping dates of 2.19 and 1.8 Ma. For this new dating effort, six new samples were selected and sent to Purdue University under a SAHRA permit for isochron dating. This method is intended to resolve the dating of the Lower Bank. The isochron approach improves on simple burial dating because the latter requires certain assumptions to be made about burial history and depth that could influence the rate of decay. Multiple samples from the same burial depth in a deposit are selected in the expectation that they are likely to share a common history of post-burial nuclide production. In this way, any outliers that are re-worked or problematic in other ways can be identified and explained. Chert was used because it has produced successful results with isochron dating at Sterkfontein, and care was taken to select clasts that showed they were exposed at surface and did not derive from the internal cave system.

Faunal analyses from Swartkrans Members 1, 2 and 3

Pickering's former graduate student, Jess Senjem (UW-Madison), was tasked originally with the analyses of the macrofaunas excavated by the SPRP. It is unfortunate that Senjem is suffering with a major illness that has forced her to leave the project and the field of paleoanthropology. In her absence, Charles Egeland was recruited by the SPRP to lead work anew on the

macrofaunas. He will continue this work through 2021 in collaboration with Pickering and other team members. In addition, Ruan Brand, an archaeology graduate student from the University of Cape Town (UCT) supervised by Thalassa Matthews (Iziko Museum) and Deino Styrder (UCT), has begun work on the Swartkrans microfaunas.