**Samples For Export**

From the 2023 field season at Kathu Pan, we will need to export geological samples, and lithic samples that have undergone diagenetic alteration, in addition to a few faunal specimens from Peter Beaumont’s previous excavation at Kathu Pan 1.

1. Geological Samples

The geological samples include bulk sediment samples collected from 12 augers, hard rock calcrete and dolomite samples from around the Kathu Pan site, bulk sediment samples from profiles exposed in the 2023 excavation of Kathu Pan 6 (KP6), and micromorphological blocks also collected from profiles exposed by the 2023 excavation of KP 6. These geological samples will be used as part of a geoarchaeological analysis of the Kathu Pan site whose aims are to reconstruct site formation processes, and the palaeoenvironments experienced at the site. Kathu Pan is a site with a complex depositional history, affected by fluvial action, aeolian deposition, and post-depositional geochemical processes, and its setting within an irregular karstic bedrock topography further complicates the interpretation of its sediments and the archaeological units contained within. As such, a comprehensive understanding of the geomorphic setting and site formation processes of Kathu Pan is integral to providing accurate context for the archaeological units, to developing a sound chronostratigraphic sequence for the site, and to understanding site taphonomy. Furthermore, due to the lack of more conventional environmental proxies, such as lake cores, in the semi-arid regions of the interior of southern Africa, geoproxies, which are climatic and environmental proxies based on geomorphological and sedimentological research, are the most common source of palaeoenvironmental data in southern Africa. As such the analysis of the sediments at Kathu Pan, will not only add to our understanding of the Kathu Pan site itself, but will also add important palaeoenvironmental data to the southern African region. This data can then be used to help us better understand hominin evolution in the southern African context.

The bulk sediment samples from the augers and KP6 will be analyzed using the following methods: particle-size analysis (PSA), sediment pH, loss-on-ignition (LOI) for an estimate of organic and carbonate content, and X-ray diffraction (XRD). PSA, pH, and LOI are all standard analyses performed on bulk soil and sediment samples, and XRD is often used to characterize the mineralogy of samples. These analyses will require access to a laser particle sizer, a soil/sediment probe, a muffle furnace, and an XRD machine respectively, all of which are available at the University of Toronto. The hard rock samples of calcrete and dolomite that were collected will be analyzed for their mineralogy and geochemical properties, which will similarly require the use of XRD, with the potential to use additional analytical techniques such as Fourier-transform Infrared spectroscopy (FTIR), and Scanning Electron Microscopy (SEM) with electron microprobe attachments (SEM-EPMA). The micromorphological blocks collected from KP6 will be sent to Spectrum Petrographics in Vancouver, Washington State, US, to be impregnated with a polyester resin and made into thin sections for analysis. The resulting thin sections will be analyzed using a petrographic microscope, and SEM-EPMA at the University of Toronto.

Subsamples of Auger 27 were also taken in sealed vials for assessment of the potential for pollen and phytolith analysis. This analysis will be undertaken in the Paleoecology Lab, University of Toronto (directed by Prof. Sarah Finkelstein).

1. Samples for dating

A program of dating the archaeological sequence at KP1 was launched in 2004 (Porat et al. 2004) and is ongoing (Lukich et al. 2019). Four samples were collected from new exposures at KP6. OSL dating will be carried out at the Israel Geological Survey by Dr. Naomi Porat. One sample from the base of Auger 28 is suspected to beyond the range of OSL and has therefore been sent to Prof. Ari Matmon, Hebrew University Jerusalem, for cosmogenic burial age dating.

1. Lithic and Faunal Samples

Both the lithic and faunal samples to be exported will be part of a geochemical analysis of the Kathu Pan site, to understand the diagenetic processes affecting the appearance and preservation of artifacts. Some of the fauna and lithics recovered from the Kathu Pan site exhibit a rare phenomenon whereby a glossy silica rind has developed on them. Additionally, some of the lithics appear to have undergone intense chemical dissolution and mineral replacement of their silicate component. These phenomena are likely linked to the water chemistry and changing environmental conditions of the Kathu Pan site through time. The geochemical analysis of the selected specimens will be used to investigate these phenomena in an effort to understand the conditions required for their occurrence. This will also tie into the sedimentological and palaeoenvironmental analysis of the site as it will give us an indication of water chemistry and will add to our understanding of post-depositional processes occurring on site.

 The faunal and lithic specimens selected for analysis will be analyzed using an SEM and electron microprobe (SEM-EPMA), as well as FTIR. With the SEM and SEM-EPMA, we will be able to both visually and quantitatively assess the morphology of the silica in the lithics and the silica rinds coating both the fauna and the lithics, as well as investigate the sites where the silica rind binds to the lithics and fauna. FTIR will be used to investigate any amorphous silica in the specimens as SEM-EPMA works best on crystalline structures.

All geological, faunal, and lithic specimen analyses will be completed over the next two years after which the faunal and lithic specimens will be returned to South Africa to be stored at the McGregor Museum in Kimberley. The sediment analysis is destructive, and the samples will not be returned, with the exception of micromorphology for which a representative portion of each block will be returned to the MMK.