Short title: EXPORT OF BACKED TOOLS FROM SIBHUDU FOR CHEMICAL ANALYSIS

Long title: Export to Tübingen, Germany, of backed tools from Sibhudu's Howiesons Poort layers for chemical analysis using FTIR, SEM-EDS, Raman and GC-MS

MOTIVATION FOR THE CHEMICAL ANALYSIS

The 8 backed tools from Sibhudu, listed in the table below, were originally analysed by Dr Marlize Lombard using microscopy. They have also been analysed for their mineral components, using FTIR and Raman analyses (and some SEM-EDS), by Drs Luc Bordes and Linda Prinsloo in Wollongong, Australia. Mineral components such as hematite, goethite, graphite and several minor elements were identified, in addition to a few organic components like bone. The Australian study provided useful data on the loading agents mixed into products that we interpreted as adhesives for hafting the stone tools to handles or shafts. Unfortunately, the organic resins or gums that were probably the main original components of the adhesives have not yet been characterised. Dr Guilhem Mauran was employed at Wits to carry out GC-MS on the tools in 2020, but his arrival from France as a post-doctoral fellow coincided with the start of Covid-19 and all the university laboratories were closed for the duration of his South African stay, so the work was not done.

Dr Patrick Schmidt of Tübingen University, Germany, has started a project to characterise *Podocarpus* (yellowwood) resin. This would seem to be the most likely resin used for hafting adhesives on many of the Sibhudu tools as well as on tools from other sites where *Podocarpus* is known to have grown. *Podocarpus* is part of the vegetation record at Sibhudu until the end of the Howiesons Poort at this site, around 62,000 years ago, but the resin has not yet been securely identified on the tools. Two backed tools from Sibhudu that were studied in Pisa by Dr Ilaria Degana were found to have coniferous resin, but no further identification was made. The tools listed in this application have mineral residues visible on their hafting edges and these imply that mineral components were part of compound adhesives used at the site. The minerals would have needed a moist component to bind them and create a fixative. We think the most likely component is yellowwood resin. Although the most urgent need is to characterise the organic (specifically plant resins if they preserve) component of the adhesives using GC-MS, the other chemical analyses will also be undertaken. While these tests have been conducted elsewhere, one must point out that the instrument probes are tiny and small points on the tools have been chemically identified. It will therefore be valuable to repeat some of the FTIR, Raman and SEM-EDS procedures.

ADDRESS WHERE SAMPLES WILL BE ANALYSED

Dr Schmidt will travel to Germany with the 8 tools in his hand luggage so that the tools do not have to be sent by courier.

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LOCATION DETAILS

Sibhudu Cave

29° 31' 21.2736" S, 31° 5' 8.2608" E

PORTION 10 OF THE FARM SINEMBE NO 16902-FU

Site ID: 10487 Sibhudu-001

Map: 2931CA Verulum

Nearest town: Verulum

District: KwaDukuza Municipality, Kwazulu-Natal

Age of materials: 65,000 – 60,000 years old

PARTICIPATING RESEARCHERS

L. Wadley (PhD) – excavator of Sibhudu to 2011. (Wits University)

P. Schmidt (PhD) – (University of Tuebingen).

CURATION OF MATERIALS

University of the Witwatersrand, Archaeology

Curator: Dr Thembi Russell

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The material is temporarily stored at Wits University.

SPECIFIC INFORMATION SIBHUDU BACKED TOOLS

Square	Layer	Date excavated	New catal. #	Old catal. #s	Rock type	Tool type
C5a	GR2	02.03.07	MLG001	PV 100	D	Obliquely backed
C4a	H1 in PGS3	21.11.09	MLG003	-	D	segment
C6c	GR under rock	06.03.07	MLG014	PV 96 CM-019	D	Backed tool
B4c	GR2	10.02.09	MLG015	PV 98 CM-not sampled	H	segment
C5c	PGS	07.03.07	MLG018	PV 167 CM-018	D	segment
C5d	PGS	08.03.07	MLG019	PV 168 CM-021	H	segment
C4b	PGS3	23.11.09	MLG022	CM-	D	segment
B4a	RGS	15.11.09	MLG024	CM-023	H	Backed tool

Sibhudu backed tools from Howiesons Poort layers selected for chemical analysis because they show adhesive residues for hafting. D= dolerite, H = hornfels, catal. # = catalogue number.