



Crystal quartz backed tools from the Howiesons Poort at Sibudu Cave

Anne Delagnes, Lyn Wadley, Paola Villa, Marlize Lombard

► To cite this version:

Anne Delagnes, Lyn Wadley, Paola Villa, Marlize Lombard. Crystal quartz backed tools from the Howiesons Poort at Sibudu Cave. Southern African Humanities, 2006, 18 (1), pp.43-56. halshs-00148906

HAL Id: halshs-00148906

<https://shs.hal.science/halshs-00148906>

Submitted on 26 Apr 2008

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Crystal quartz backed tools from the Howiesons Poort at Sibudu Cave

¹Anne Delagnes, ²Lyn Wadley, ³Paola Villa and ⁴Marlize Lombard

¹UMR 5199 - PACEA, Université Bordeaux I, av. des Facultés, 33405 Talence, France; a.delagnes@ipgq.u-bordeaux1.fr

²School of Geography, Archaeology and Environmental Studies, University of the Witwatersrand, P. Bag 3, Wits, 2050 South Africa; wadleyl@geoarc.wits.ac.za

³University of Colorado Museum, UCB 265, Bruce Curtis Building, Boulder, Colorado 80309-0265, United States; villap@buffmail.colorado.edu

⁴Natal Museum, P. Bag 9070, Pietermaritzburg, 3200 & University of KwaZulu-Natal, P. Bag X01, Scottsville, 3209 South Africa; mlombard@nmsa.org.za

ABSTRACT

A technological analysis of crystal quartz backed tools from the Howiesons Poort of Sibudu Cave shows that they are smaller than backed tools made from other rock types. They are not highly standardized and their reduction sequence is straightforward. Raw materials could have been obtained near the shelter. The distribution of organic and inorganic residues on the backed tools suggests that they were hafted. Our results imply that interpretations of Howiesons Poort technology as innovative, based on attributes such as long distance transport of raw materials and size standardization of backed pieces, remain undemonstrated.

KEYWORDS: backed tools, crystal quartz, Howiesons Poort, Sibudu Cave, South Africa.

INTRODUCTION

The Howiesons Poort (HP) is often considered to be a time-restricted component of the southern African Middle Stone Age (MSA), sharing more similarities with some mid-Holocene Later Stone Age (LSA) industries than with other MSA assemblages (Mitchell 2002). This common view stems from the presence in the HP assemblages of a set of attributes which some archaeologists consider to be indicative of a modern type of behaviour. Geometric backed tools, which are present in both the HP and LSA industries, are among those attributes (McBrearty & Brooks 2000; Mellars 2006). The modern character of these tools is said to lie in their standardization, their microlithic dimensions and complex hafting systems suggested by the morphological attributes of the tools and in a marked preference for non-local, fine-grained rock types. However, as pointed out by Minichillo (2006), we lack in-depth understanding of raw material procurement patterns in the HP. We also know little about manufacturing processes and functions of HP tools. Crystal quartz backed tools, which are reported to have been made on non-local rocks in several HP and LSA layers from South Africa, seem particularly relevant to this debate. We present here the analysis of a number of crystal quartz backed tools from the HP layers of Sibudu Cave and we compare this with data from LSA and other HP assemblages. All HP layers from Sibudu are considered, but the emphasis is on layer GS, which has yielded more backed pieces made on crystal quartz than the other HP layers.

ARCHAEOLOGICAL CONTEXT

The HP sequence at Sibudu, excavated in the witness section B5 and B6 over two square metres, includes the following layers (from oldest to youngest):

- PGS (Pinkish Grey Sand);
- GS2 (Grey Sand 2), a spit used to divide an otherwise thick layer;
- GS (Grey Sand);
- DRG (Dark Reddish Grey), a lens of limited extent;
- GR2 (Grey Rocky 2), a spit used to divide an otherwise thick layer;
- GR (Grey Rocky).

For a more detailed description of the stratigraphy and excavated area see Wadley & Jacobs (this volume). Dates are being processed for the HP layers.

The lithic assemblages from GS, GR2 and GR have been sorted and completely analysed (PV & AD); only typological data are currently available for the deepest HP layer, PGS (analysis by LW). The most common raw materials exploited are dolerite, hornfels and quartz. Dolerite is a coarse-grained igneous rock available in the vicinity of the site; it occurs as rounded alluvial cobbles in the banks of the Tongati River and as tabular slabs in sills and dykes (Villa *et al.* 2005; Wadley 2005a). Hornfels is much finer grained than dolerite and it is available today some 20 km south of the site, but it may also have been collected closer to the site, in outcrops that are now covered with dune sand (Cochrane this volume; Wadley 2005a). This observation is equally true for quartz which occurs in granites about 20 km north-west of Sibudu (Wadley 2001). For the three types of raw material a significant proportion of the cortical pieces (17 % in GS) shows alluvial cortex; this suggests that river cobbles were collected in addition to tabular pieces quarried directly from outcrops. It is worth noting that all kinds of raw material used at Sibudu during all phases of the MSA could have originated near the shelter.

Two types of quartz have been distinguished: milky and crystal quartz, which are quite different in terms of knapping and functional qualities. As a result of its internal structure, crystal quartz does not break according to the mechanics of conchoidal fracture like the other hard rocks and its breakage is quite unpredictable when knapping. Nonetheless, its cutting edges are notably smoother and sharper than those of other rock types. Both types of quartz probably come from the same outcrops, because we have observed some pieces with a milky portion adjoining a crystal one. All elements longer than 2.5 cm for dolerite, 2 cm for hornfels and 1 cm for quartz have been recorded by technological, typological and size attributes, with the exception of chunks and flake fragments without platforms.

Although they are derived from a small excavated area, the samples are large enough to be considered as representative, at least for GS, GR2 and GR. Crystal quartz is better represented in GS than in GR2 and GR (8 % in GS, 2.5 % in GR2, 1.2 % in GR: Table 1), and backed tools of crystal quartz are documented exclusively in PGS and GS (Table 2). This change goes together with a slight decrease of hornfels (31 % in GS, 26 % in GR2, 23 % in GR) and a pronounced increase of dolerite (48 % in GS, 63 % in GR2, 65 % in GR). Raw material procurement was clearly more focused on fine-grained raw materials in GS than in the overlying GR2 and GR layers. It is much more difficult to appreciate what happens at the bottom of the HP sequence at this stage of the analysis

TABLE 1

Frequencies of debitage and formal tools by raw material. Formal tool numbers are in parenthesis.

Layer	Crystal quartz	Milky quartz	Hornfels	Dolerite	Indeterminate.	Total
GR	8 (0)	45 (1)	153 (11)	426 (7)	22 (0)	654 (19)
GR2	17 (0)	44 (2)	176 (20)	422 (14)	13 (3)	671 (39)
GS	44 (8)	53 (1)	177 (18)	274 (5)	18 (3)	565 (35)
GS2	0 (0)	2 (2)	37 (15)	42 (4)	1 (1)	82 (22)

TABLE 2

Formal tools and backed pieces by raw material. Numbers of backed pieces are in parenthesis.

Layer	Crystal quartz	Milky quartz	Hornfels	Dolerite	Indeterminate.	Total
GR	0 (0)	1 (0)	11 (8)	7 (5)	0 (0)	19 (13)
GR2	0 (0)	2 (1)	20 (13)	15 (10)	3 (0)	40 (24)
GS	8 (8)	1 (1)	19 (11)	3 (3)	3 (2)	34 (25)
GS2	0 (0)	2 (2)	15 (14)	4 (3)	1 (0)	22 (19)
PGS	5(5)	1(1)	28(21)	9(6)	0(0)	43(33)

insofar as the debitage products from PGS have not been analyzed in detail. It must be stressed that the raw material changes observed in the HP sequence of Sibudu Cave are seemingly equivalent to those evidenced at Klasies River (Wurz 1997, 2000: table 17) where the frequencies of non-quartzite materials (identified as non-local, fine-grained materials) increase significantly in the middle stages of the HP, before falling to low frequencies in the uppermost HP levels. Wurz (1997, 2000) attributes these raw material changes to conscious choices because it seems unlikely that raw material sources changed over time.

MANUFACTURING PROCESSES

We focus here on data from layer GS, where crystal quartz backed tools are most abundant. However, we should point out that no significant changes in manufacturing processes are documented throughout the whole HP sequence. The lithic production of all raw materials in all layers is dedicated to the production of blades. A consistent proportion of the assemblage (41 %; 233 of 565) is made of unmodified blades which could have been used as such. Some 15 % (35 of 233) of the blades have been transformed into backed tools, while the other formal tools, which correspond to non-normalized forms of retouched pieces, are almost exclusively made on flakes. The by-products are poorly represented, especially the cores (only 3 pieces), suggesting that the production has been partly realized elsewhere. This observation is equally true for the other HP layers and also for the ~50 ka layers, for example, layer RSp (Villa *et al.* 2005). Fortunately, some categories of by-products that are present (primary blades, crested blades, rejuvenation flakes and cores) give information on the reduction sequence. The initial preparation of the cores has been minimal insofar as the knappers took advantage of a natural crest, often a cortical ridge of a pebble or the edge of a flake, to extract the first blade. Some partial and mostly unilateral crested blades (Inizan *et al.* 1999) were produced in the course of the reduction sequence to create a straight ridge. The striking platforms were often abraded as observed on the blades' platforms: such preparation is

related to a tangential percussion movement when using a soft hammer (Inizan *et al.* 1999), which is the most efficient technique for extracting thin, elongated blades.

However, the blades are not very long: the mean length is 30.8 ± 9.9 mm for dolerite blades, 29.1 ± 8.9 mm for hornfels blades and 16.8 ± 4.5 mm for quartz blades, and their dimensions are quite heterogeneous, which is illustrated by the high standard deviations of the blade lengths. For each group of raw material these values fit into a unimodal distribution that is consistent with a unique reduction sequence. The smallest blades are not technologically distinct from the rest of the blades and cannot therefore be assigned to a distinctive and systematic bladelet production. This is equally true for the quartz blades whose dimensions are dependent on the small dimensions of the available raw material. No quartz cobbles or cores were recovered from this layer, but it is easy to deduce from the length of the unmodified quartz products (Fig. 1) that they have been extracted from cobbles or fragments no longer than 3–4 cm. By-products from core preparation or rejuvenation are lacking in the quartz component; likewise the small size debitage on hornfels and dolerite does not include core preparation or rejuvenation products. This feature is probably due to a decrease in core maintenance activity because of their small size. A simpler exploitation of the quartz cores might also be a result of the difficulty of controlling quartz breakage when knapping.

BACKED TOOLS

For all raw materials, backed tools are made from whole blades, without any previous stage of blank fragmentation. Various types of backed tools can be distinguished by the

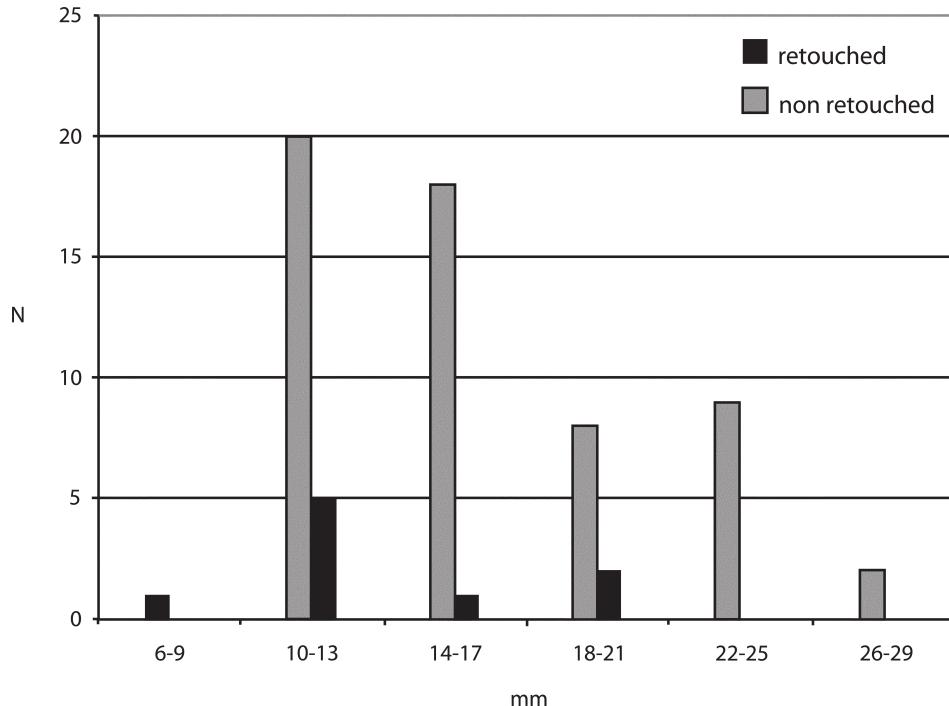


Fig. 1. Sibudu, layer GS. Length of all quartz products.

shape and extension of the backing. These types range from true segments to partially backed pieces and truncated pieces. Such typological diversity goes together with a constant morpho-technical pattern, characterized by a straight or slightly convex sharp cutting edge adjacent and/or opposed to a trapezoidal or convex abrupt edge formed by the backing. The contact between both sides is formed by a pointed end for a small number of backed tools (7 of 27 complete pieces), that are considered to be true segments. The extension and localization of the abrupt retouch on the other backed tools look more related to the initial morphology of the blank than to distinct pre-conceived templates of tools. Only a functional analysis (in progress by ML) is likely to determine whether the different classes of backed tools served similar or different functions.

Backed tools are the most typical formal tools in all HP layers as well as the most abundant, especially in GS (75 % of the tools belong to this category). Hornfels and crystal quartz are the preferred raw materials (78 %) for backed pieces (Table 2), which shows that the high degree of raw material selection evidenced in this layer (see above) is closely related to the backed tool component. The same trend has also been pointed out at Umhlatuzana in KwaZulu-Natal, where backed tools are predominantly in quartz and hornfels (88.4 %), although quartzite is also locally available (Kaplan 1990). Both materials are very fine with smooth surfaces and edges and look particularly efficient for penetrating or cutting soft tissues. As indicated by the high ratio of backed tools among the crystal quartz elements (22 %), the quality of this material was much appreciated by the knappers, regardless of the size constraints that it imposed.

It is necessary to make some comments about the size of the quartz backed tool component. Although the number of pieces we are dealing with here is small, it is not a small sample of a large population, but a large sample of a small population. In other words, even when, as at other HP sites, the lithic assemblages are large, the proportion of quartz pieces is very small. At Klasies River (excavations of Singer and Wymer), layers 10 to 21 of Cave 1A (the HP layers) yielded 1 245 backed pieces of all raw materials (Singer & Wymer 1982). There are only 62 backed pieces of quartz, which represent only 5 % of the HP backed tool sample. Note that Singer and Wymer do not provide separate counts for milky quartz and crystal quartz. Amongst Sibudu's backed pieces the proportions of quartz (milky quartz and crystal quartz) versus other raw materials are higher than those of the HP backed tools at Klasies River:

- 18.2 % (6 of 33) for PGS;
- 25.0 % (11 of 44) for GS2 and GS;
- 8.1 % (3 of 37) for GR2 and GR.

Backed pieces of crystal quartz and milky quartz include the same diversity of forms as hornfels and dolerite backed tools. These quartz tools comprise two segments or crescent-like tools (Figs 2a, f), one tool with a curved back (Fig. 2c), three partially backed pieces (Figs 2e, h, j), four trapeze-like forms created by diverse procedures (two pieces with oblique truncation, Figs 2b, g; one piece with a lateral back, Fig. 2d; one piece formed by two opposed straight backs, Fig. 2i), and one fragment of a backed tool (Fig. 2k). Their shapes are less standardized than hornfels and dolerite backed tools (Figs 2l, m, n). For several specimens, the edge opposed to the backing is formed by an irregular or angular edge instead of the expected regular and sharp cutting edge. The crystal quartz tools also differ from the other backed tools in their much smaller

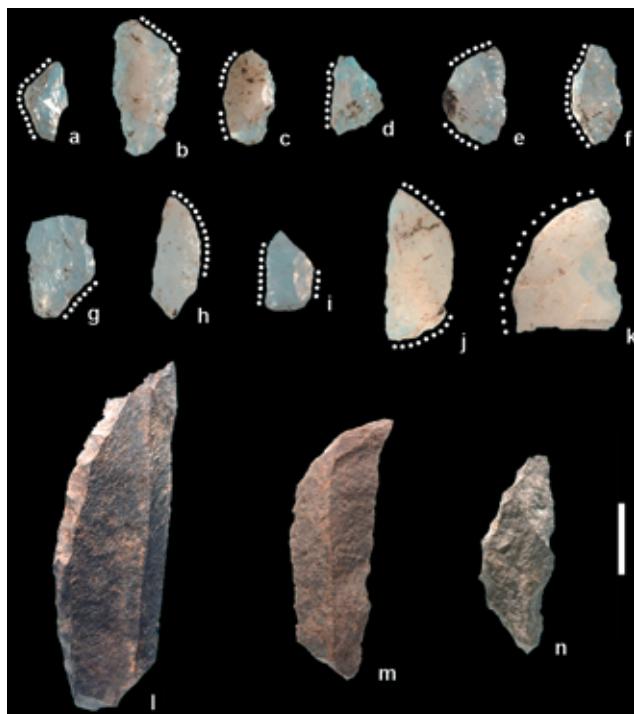


Fig. 2. Sibudu backed tools, layer GS except (j) and (k) from GS2 (the white dotted line corresponds to the retouched back). (a) crystal quartz segment; (b) crystal quartz tool with distal oblique truncation; (c) crystal quartz tool with curved back; (d) crystal quartz trapeze; (e) crystal quartz partially backed tool; (f) crystal quartz segment; (g) crystal quartz tool with proximal oblique truncation; (h) milky quartz partially backed tool; (i) crystal quartz backed tool with two opposite backs; (j) milky quartz partially backed tool; (k) milky quartz backed tool fragment; (l) hornfels segment; (m) dolerite oblique truncation; (n) dolerite segment. Scale bar = 1 cm.

dimensions (their mean length is 13.3 ± 3.6 mm whereas the mean length of hornfels and dolerite backed tools is 35 ± 12.2 mm). Their elongation is also less pronounced (Fig. 3): the mean length/breadth ratio is only 1.8 for crystal quartz backed tools, while it is 2.6 for hornfels and dolerite backed tools.

The coefficients of variation of lengths are 27.1 for crystal quartz and 34.9 for hornfels and dolerite, which seems to be quite high. The dimensions of the crystal quartz artefacts tend to approach the small sizes of the LSA backed artefacts. At Jubilee Shelter in the Magaliesberg, about 60 km north of Johannesburg, there is a Wilton Industry, dated between about 3 000 and 6 000 b.p., containing some exceptionally small quartz segments and longer segments (Wadley 1987) that could fit within the range of the smallest HP backed tools. Segments within this LSA industry are made on chalcedony and occasionally hornfels as well as crystal quartz. The mean length of the 15 Jubilee crystal quartz segments is 9.3 mm, which is below the mean value recorded for crystal quartz backed tools from Sibudu, and the range of length is 7.1–14.1 mm. The mean length/breadth ratio is 2.0 and this is not dissimilar to the length/breadth ratio of the Sibudu crystal quartz backed tools. The range of the length/breadth ratios is 1.8–2.4. The coefficient of variation is 27.7, which indicates that the lengths of these LSA segments

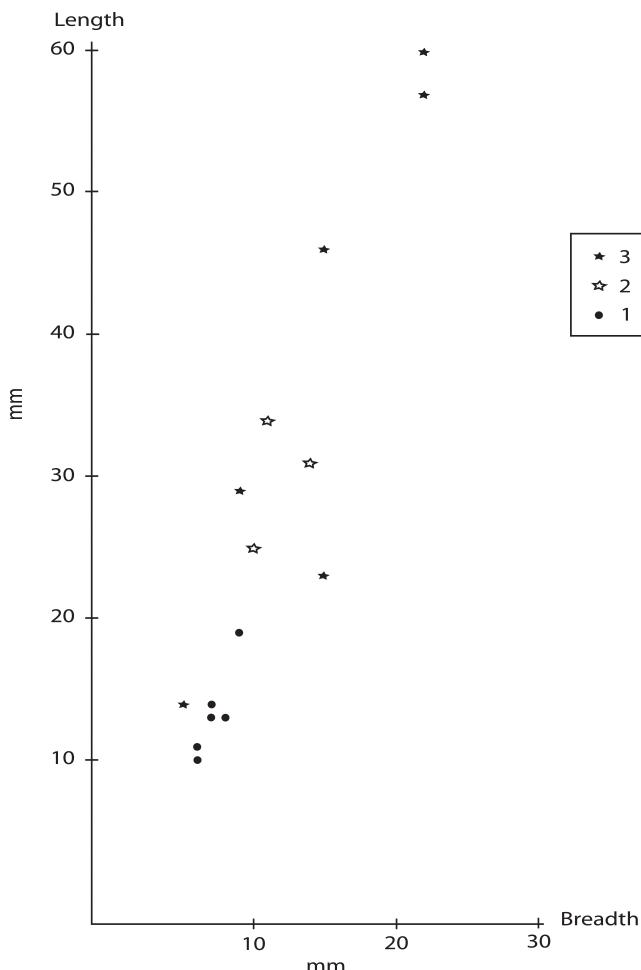


Fig. 3. Sibudu, layer GS. Length/breadth ratio of crystal quartz (1), dolerite (2) and hornfels (3) backed pieces.

are not more standardized than the lengths of the HP backed pieces from Sibudu. This result is in keeping with Walker's (1995) study of quartz and chalcedony geometrics from the LSA site of Nswatugi Cave in the Matopos of Zimbabwe. For example, in level 4 (7 880 b.p.) the mean length of geometrics is 13.4 mm with a coefficient of variation of 32.8; in level 3b (7 610 b.p.) the mean length is 16.6 mm and the coefficient of variation is 28.9; in level 2 (6 490 b.p.) the mean length is 13.9 mm and the coefficient of variation is 24.5. The comparison of LSA and HP measurements shows that their variability, on similar raw materials, is comparable (Thackeray 1992; Wurz 2000).

RESULTS OF A PRELIMINARY MICRO-RESIDUE ANALYSIS

Previous studies have shown that stone tools from Sibudu Cave have exceptional micro-residue preservation, allowing for the generation of detailed functional and hafting information (Lombard 2004, 2005a, this volume *a, b*; Wadley *et al.* 2004; Williamson

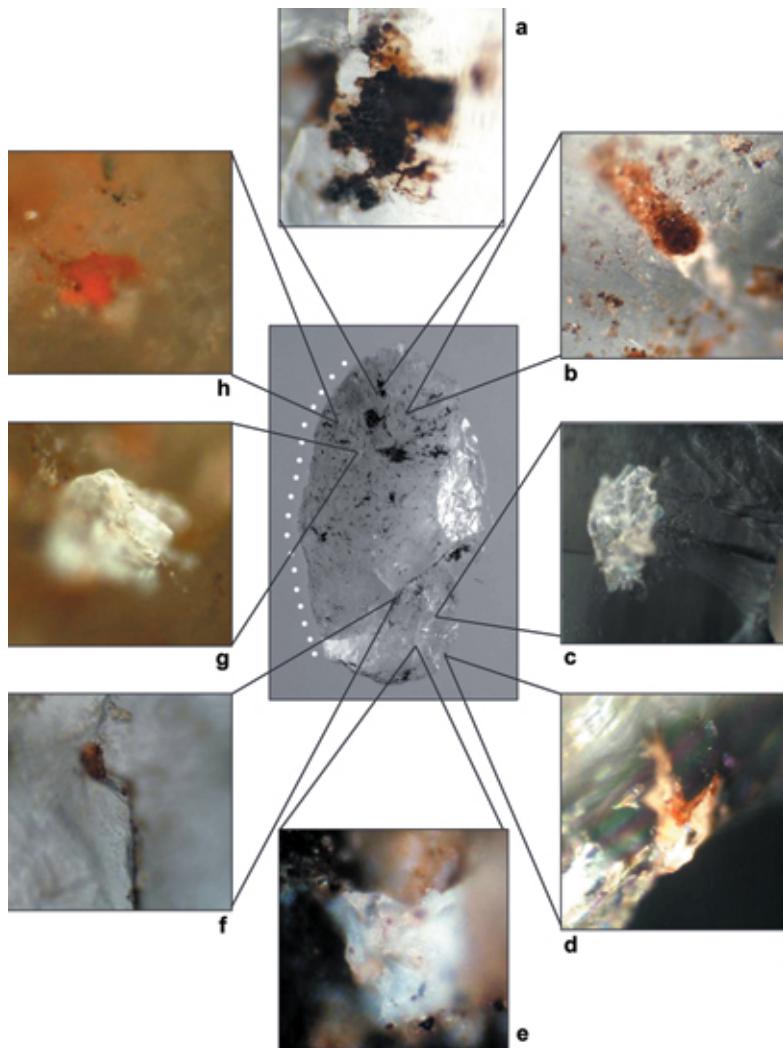


Fig. 4. Sibudu, layer GS. (a) Bone/collagen fragment at 500x enlargement, (b) thin blood film with collagen fragment at 100x, (c) bone/collagen fragment with transverse use damage at 200x, (d) animal tissue and collagen on the edge of the tool at 500x, (e) fatty bone with red spots at 500x, (f) animal tissue concentrated in a crack in the raw material at 100x, (g) thick residue deposit at 100x, (h) thin ochre deposit at 500x.

2004). A small sample of eight crystal quartz backed tools and one milky quartz backed piece from the HP layers at Sibudu Cave was analysed for residues. The method followed is as described in Lombard (2005a), Lombard and Wadley (in press) and Wadley *et al.* (2004). This analysis forms part of a larger ongoing project investigating the function and hafting technologies of more representative samples of HP backed tools. Although ML considers the crystal quartz tool sample too small for statistical or comparative spatial analysis of the micro-residues (see Lombard this volume *a*), 107 residue occurrences were recognised. Based on the nature of these micro-residues some

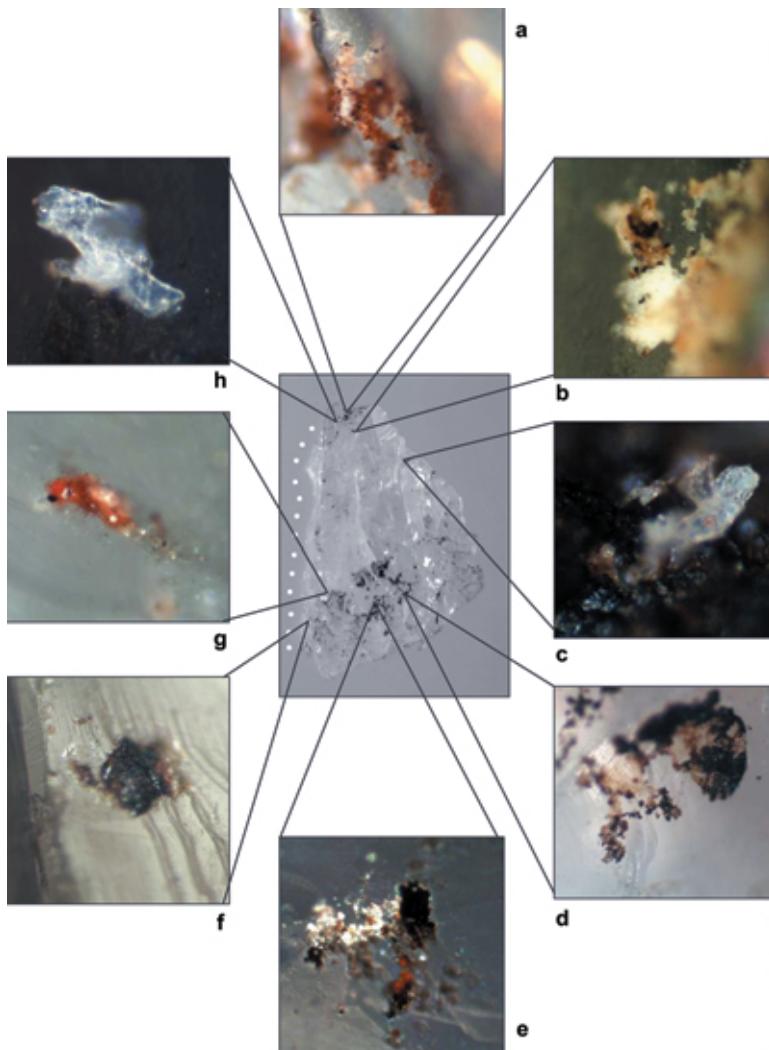


Fig. 5. Sibudu, layer GS. (a) Animal tissue and fatty residue at 100x, (b) fat and animal tissue at 200x, (c) collagen and animal tissue at 500x, (d) thick resinous deposit at 100x, (e) resin, ochre and macerated wood (white residue) at 200x, (f) resin at 100x, (g) ochre and thin resinous deposit at 500x, (h) bone/collagen fragment at 500x.

preliminary inferences can be made regarding the possibilities for hafting and function. Before the results can be discussed, difficulties in working with quartz should be highlighted, as these can skew interpretations. One of a series of blind tests (Lombard & Wadley in press) illustrated that the translucent, reflective and refractive nature of the raw material may cause complications in the visual interpretation of residues. Residues with distinct colouring, such as pigmentitious minerals (ochre), animal tissue, resin and bark are usually clearly visible on quartz, but coloured inclusions or impurities in the rock can be misleading. Detecting whitish, translucent and birefringent residues such as fat, bone, silica skeletons or starch grains can be difficult due to the nature of

the raw material. A further observation is that residues do not adhere easily to the smooth glass-like surfaces, but tend to accumulate in cracks and crevices that may affect interpretations based on residue distribution patterns.

With the above in mind, the preliminary interpretation based on the residue analysis is that the quartz crystal backed tools were hafted with the aid of a resinous substance. The resin deposits (39 of which were documented) are mostly clustered at one end of each tool (Figs 4g, 5d, 5f, 6e), so it is unlikely they are a product of accidental contact. On three of the tools, ochre was associated with resinous deposits (Figs 4h, 5e, 5g). This may indicate the use of ground ochre as an ingredient of the mastic recipe (see also Lombard this volume *a*). Similar observations were documented on post-HP MSA tools from Sibudu Cave (Lombard 2005a; Wadley *et al.* 2004), and HP tools from Rose Cottage Cave (Gibson *et al.* 2004) and Sibudu Cave (Lombard this volume *a*). The possibility of ochre being used in this way was further investigated by way of replication studies (Wadley 2005b), and we now consider that ochre had a functional role in the preparation of hafting mastics during the MSA at these sites. Macerated wood or degraded plant material accompanied by resin was observed on two backed tools (Fig. 5e). However, the tools and preserved residues in this sample are too few to consider this as certain evidence for the use of wooden hafts. Caution must be exercised because experiments showed that wood and plant material are often incorporated in the resin during the collection process (Lombard & Wadley in press; Wadley 2005b). No other plant material was documented on the tools.

All the tools, except for one, have more than one type of animal residue in the form of tissue (15 occurrences), bone (19 occurrences), collagen (6 occurrences), fat (8 occurrences) and blood (8 occurrences) (Figs 4a–f, 5a–c, 5h, 6a–d, 6f). The accumulation of such micro-residue combinations on most of the tools implies that these tools were used to process animal products. Micro-residues cannot provide accurate information about the actual function of the tools, for example, whether they were used as inserts in hunting weapons or cutting instruments. Such information can only be gained from usewear and macro-fracture studies (Lombard 2005a) that will be conducted on more extensive samples of HP backed tools.

DISCUSSION

The presence of crystal quartz backed tools is restricted to the lower and middle part of the HP sequence of Sibudu Cave. They are especially well-represented in layer GS and are totally absent in the uppermost HP layers. The preliminary data presented here suggest that some kind of techno-economical changes occurred during the HP period. Curiously, quartz is the most common rock type in post-HP assemblages directly overlying the HP layers (Cochrane this volume), where no quartz backed pieces have been observed.

Crystal quartz backed tools are recorded in other HP sites in South Africa, for example, Klasies River (Singer & Wymer 1982) and Umhlatuzana Rock Shelter (Kaplan 1990). Quartz is among the materials that are usually reported as ‘non-local’ or ‘exotic’ (Ambrose & Lorenz 1990; Singer & Wymer 1982). However, the notion of ‘non-local’ raw material is too vague to be heuristically useful. Furthermore, the assumption of long-distance transport of raw-material is far from being supported by detailed research and it tends to be contradicted by the available data (Minichillo 2006; Villa *et al.*

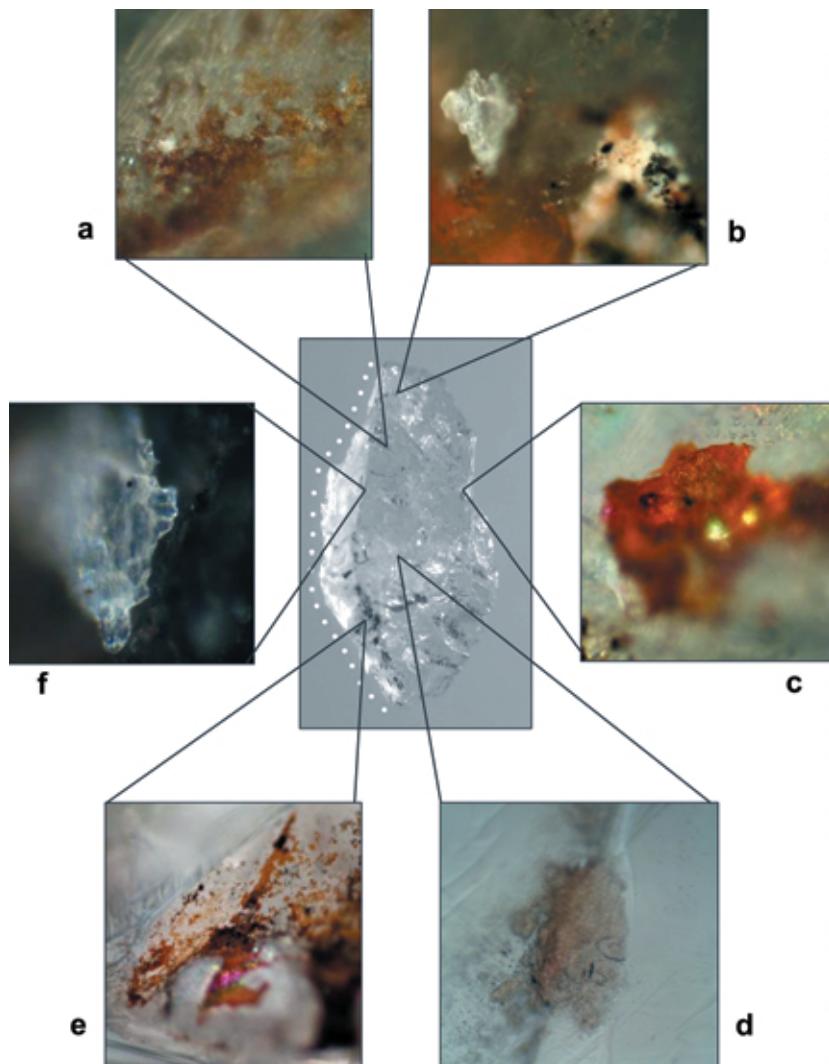


Fig. 6. Sibudu, layer GS. (a) Thin smear of animal tissue at 200x, (b) bone/collagen and fatty deposit at 200x, (c) blood at 200x, (d) fatty deposit at 200x, (e) thin resinous residue at 200x, (f) bone/collagen at 500x.

2005: 416). At Umhlatuzana, quartz most likely comes from a geological vein outcropping in the close vicinity of the site. Quartz occurs at Klasies River ‘as seams and cobble intrusions within the Table Mountain Sandstone quartzite that is the parent material of the Klasies River caves’ (Minichillo 2006). At Sibudu, crystal quartz outcrops occur about 20 km from the site, but quartz river cobbles can be picked up less than a hundred metres from the site. This means that quartz was accessible within a few minutes or, at most, within a one-day walk. The use of crystal quartz is nonetheless related to selective raw material procurement, which is interpreted by some as both a time-consuming and ‘time-dependent’ foraging strategy (Minichillo 2006).

In the HP of Sibudu Cave, crystal quartz tools fit into the technological and morphological variability of backed tools, which are the predominant class of formal tools. The reduction sequence, from the raw material transport to the manufacture and transformation of the blank, is straightforward. The raw materials were not imported from long distances; preparation of cores, which were often on flakes, was not elaborate and the dimensional heterogeneity of the formal tools is in keeping with the size variability of the blades. Investment of time is more likely to occur in the hafting process, whether the tools were used as single or composite implements. The low degree of investment in stone tool production might be contrasted with more time-consuming hafting processes, which allow retooling. Whether this results from specific mobility patterns (Ambrose 2006; Ambrose & Lorenz 1990), social and symbolic interactions (for example, Deacon 1989; Lewis-Williams & Pearce 2004), or as a response to the environmental duress of Oxygen Isotope Stage 4, still remains to be determined. Its translucent and glistening surfaces may have also been aesthetically attractive for the HP people.

The selection of crystal quartz by the Sibudu inhabitants during part of the HP seems first of all functional. The preservation of microscopic residues and their repetitive combination on the tools shows that they were hafted. The dimensions of the dolerite and hornfels backed tools might be considered as consistent with hafting of a segment singly, as suggested by Deacon and Deacon (1999), who think that the HP backed pieces were used for arming spears. On the other hand, the crystal quartz backed tools, given their very small size, could have been used as multiple inserts mounted on one haft. Crystal quartz backed tools are not only smaller than their equivalents on other rock types, but they are also less elongated, that is, with shorter cutting edges, and they exhibit a greater diversity of shapes than backed tools on other rock types. All these attributes suggest a different hafting system for quartz versus other raw materials. However, our available data remain insufficient to give strong support to this suggestion.

Quartz has a hardness of 7 on Moh's scale, making it hard and durable, with a cutting edge that does not easily blunt and require resharpening. This makes quartz different from other raw materials such as hornfels and dolerite. Crystal quartz was probably preferred to milky quartz because of its sharp and smooth edges, suggesting a specific concern for sharpness and tool durability.

The LSA and the HP quartz and crystal quartz backed tools seem to occur in similar size ranges and they are not highly standardized. LSA geometries are assigned to a microlithic production, a notion which does not apply to the HP assemblages of Sibudu, and seemingly to the HP in general. 'Microlithism' should be used only to describe the systematic and intentional production of small implements, regardless of any size constraint due to the raw material. In the HP layers of Sibudu Cave, the length of the crystal quartz backed tools is significantly smaller than the length of the hornfels and dolerite backed tools; this is likely to be a result of the size limits of the crystal quartz cobbles, a hypothesis which should be tested through systematic sampling of the quartz cobbles carried today in the river-bed.

The function of the HP and LSA backed tools could be distinct. Microwear analyses of LSA Wilton segments from Jubilee Shelter led Wadley and Binneman (1995) to the conclusion that they were used as knife components. Macro-fracture analysis conducted on 85 HP backed tools from Klasies River Cave 2 indicates that some of these pieces

were probably used to tip hunting weapons (Lombard 2005b; Wurz & Lombard in press). We anticipate that residue, macro-fracture and microwear analyses, currently being conducted by ML, on more than 60 HP segments from Sibudu Cave and 59 segments from Umhlatuzana Rock Shelter (KwaZulu-Natal) will provide more detailed information on the hafting technology and function of HP backed tools.

The affinities between LSA and HP assemblages are currently only supported by the typological similarity of the backed tools and the purported complexity of both hafting systems. Similarities between both periods in raw material procurement and manufacturing procedures remain to be researched. Furthermore, the function of the tools is still open to debate, although the way that they were hafted could be distinct because of the larger dimensions of the HP backed tools (Gibson *et al.* 2004). Only the crystal quartz backed tools seem appropriate for composite tools with multiple inserts, such as is assumed for some of the LSA geometrics. Comparative technological and functional analyses, such as those undertaken on non-lithic MSA and LSA artefacts (d'Errico *et al.* 2005; Henshilwood *et al.* 2001), need to be conducted on HP and LSA lithics in South Africa. This will, to some extent, involve the development of a new methodology.

ACKNOWLEDGEMENTS

Research by Anne Delagnes and Paola Villa was made possible by grants from the National Science Foundation (BCS 0314371) and the Leakey Foundation to Paola Villa. We thank the graduate and undergraduate students at the University of the Witwatersrand who helped us with the sorting and computer recording of the Sibudu Howiesons Poort lithics. Lyn Wadley's research is funded by the National Research Foundation (NRF). Research conducted by Marlize Lombard is funded by the Palaeontological Scientific Trust. The Department of Archaeology at the University of the Witwatersrand provided space and working facilities for the lithic studies and the microscope and digital imaging system for the residue analyses.

REFERENCES

- AMBROSE, S. H. 2006. Howiesons Poort lithic raw material procurement patterns and the evolution of modern human behavior: a response to Minichillo. *Journal of Human Evolution* **50**: 365–9.
- AMBROSE, S. H. & LORENZ, K. 1990. Social and ecological models for the Middle Stone Age in southern Africa. In: Mellars, P., ed., *The emergence of modern humans, an archaeological perspective*. Ithaca: Cornell University Press, pp. 3–33.
- COCHRANE, G. W. G. 2006. An analysis of lithic artefacts from the ~60 ka layers of Sibudu Cave. *Southern African Humanities* **18** (1): 69–88.
- DEACON, H. J. 1989. Late Pleistocene palaeoecology and archaeology in the southern Cape, South Africa. In: Mellars, P., ed., *The human revolution: behavioural and biological perspectives on the origins of modern humans*. Edinburgh: Edinburgh University Press, pp. 547–64.
- DEACON, H. J. & DEACON, J. 1999. *Human beginnings in South Africa: uncovering the secrets of the Stone Age*. Cape Town: David Philip Publishers.
- D'ERRICO, F., HENSHILWOOD C. S., VAN NIEKERK, K. 2005. *Nassarius kraussianus shell beads* from Blombos Cave: evidence for symbolic behaviour in the Middle Stone Age. *Journal of Human Evolution* **48**: 3–24.
- GIBSON, N. E., WADLEY, L. & WILLIAMSON, B. 2004. Microscopic residues as evidence of hafting on backed tools from the 60 000 to 68 000 year-old Howiesons Poort layers of Rose Cottage Cave, South Africa. *Southern African Humanities* **16**: 1–11.
- HENSHILWOOD, C. S., D'ERRICO, F., MAREAN, C. W., MILO, R. G. & YATES, R. 2001. An early bone tool industry from the Middle Stone Age at Blombos Cave, South Africa: implications for the origins of modern human behaviour, symbolism and language. *Journal of Human Evolution* **41**: 631–78.

- INIZAN, M. L., REDURON-BALLINGER, M., ROCHE, H. & TIXIER, J. 1999. *Technology and terminology of knapped stone*. Nanterre: CREP.
- KAPLAN, J. 1990. The Umhlatuzana Rock Shelter sequence: 100 000 years of Stone Age history. *Natal Museum Journal of Humanities* 2: 1–94.
- LEWIS-WILLIAMS, J. D. & PEARCE, D. G. 2004. *San spirituality: roots, expressions and social consequences*. Cape Town: Double Storey Books.
- LOMBARD, M. 2004. Distribution patterns of organic residues on Middle Stone Age points from Sibudu Cave; KwaZulu-Natal, South-Africa. *South African Archaeological Bulletin* 59: 37–44.
- 2005a. Evidence of hunting and hafting during the Middle Stone Age at Sibudu Cave, KwaZulu-Natal, South Africa: a multianalytical approach. *Journal of Human Evolution* 48: 279–300.
- 2005b. A method for identifying Stone Age hunting tools. *South African Archaeological Bulletin* 60: 115–20.
- 2006a. Direct evidence for the use of ochre in the hafting technology of Middle Stone Age tools from Sibudu Cave. *Southern African Humanities* 18 (1): 57–67.
- 2006b. First impressions of the functions and hafting technology of Still Bay pointed artefacts from Sibudu Cave. *Southern African Humanities* 18 (1): 27–41.
- LOMBARD, M. & WADLEY, L. In press. The morphological identification of residues on stone tools using light microscopy: progress and difficulties based on blind tests. *Journal of Archaeological Science*.
- MCBREARTY, S. & BROOKS, A. S. 2000. The revolution that wasn't: a new interpretation of the origin of modern human behaviour. *Journal of Human Evolution* 39: 453–563.
- MELLARS, P. 2006. Why did modern populations disperse from Africa ca. 60,000 years ago? A new model. *Proceedings of the National Academy of Sciences* 103: 9381–6.
- MINICHLLO, T. 2006. Raw material use and behavioral modernity: Howiesons Poort lithic foraging strategies. *Journal of Human Evolution* 50: 359–64.
- MITCHELL, P. 2002. *The Archaeology of southern Africa*. Cambridge: Cambridge University Press.
- SINGER, R. & WYMER, J. 1982. *The Middle Stone Age at Klasies River Mouth in South Africa*. Chicago: University of Chicago Press.
- THACKERAY, A. I. 1992. The Middle Stone Age south of the Limpopo River. *Journal of World Prehistory* 6 (4): 385–440.
- VILLA, P., DELAGNES, A. & WADLEY, L. 2005. A late Middle Stone Age artifact assemblage from Sibudu (KwaZulu-Natal): comparisons with the European Middle Paleolithic. *Journal of Archaeological Science* 32: 399–422.
- WADLEY, L. 1987. *Later Stone Age hunters and gatherers of the southern Transvaal: social and ecological interpretation*. Cambridge Monographs in African Archaeology 25. International Series 380. Oxford: BAR.
- 2001. Preliminary report on excavations at Sibudu Cave, KwaZulu-Natal. *Southern African Humanities* 13: 1–17.
- 2005a. A typological study of the final Middle Stone Age stone tools from Sibudu Cave, KwaZulu-Natal. *South African Archaeological Bulletin* 60: 51–63.
- 2005b. Putting ochre to the test: replication studies of adhesives that may have been used for hafting tools in the Middle Stone Age. *Journal of Human Evolution* 49: 587–601.
- WADLEY, L. & BINNEMAN, J. N. F. 1995. Arrowheads or penknives? A microwear analysis of mid-Holocene stone segments from Jubilee Shelter, Transvaal. *South African Journal of Science* 91: 153–5.
- WADLEY, L. & JACOBS, Z. 2006. Sibudu Cave: background to the excavations, stratigraphy and dating. *Southern African Humanities* 18 (1): 1–26.
- WADLEY, L., WILLIAMSON, B. S. & LOMBARD, M. 2004. Ochre in hafting in Middle Stone Age southern Africa: a practical role. *Antiquity* 78: 661–75.
- WALKER, N. J. 1995. *Late Pleistocene and Holocene hunter-gatherers of the Matopos*. Uppsala: Societas Archaeologica Upsaliensis.
- WILLIAMSON, B. S. 2004. Middle Stone Age tool function from residue analysis at Sibudu Cave. *South African Journal of Science* 100: 174–8.
- WURZ, S. 1997. *The Howiesons Poort at Klasies River: from artefacts to cognition*. MA dissertation, University of Stellenbosch.
- 2000. *The Middle Stone Age at Klasies River, South Africa*. PhD thesis, University of Stellenbosch.
- WURZ, S. & LOMBARD, M. In press. 70 000-year-old geometric backed tools from the Howiesons Poort at Klasies River, South Africa: were they used for hunting? In: Seetah, K. & Gravina, B., eds, *The links that tie: tools for bones and bones for tools*. McDonald Institute of Archaeological Research Monographs.