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Archaeological use-trace analyses of stone tools from South Africa

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C H A P T E R T W O

THE STRUCTURE OF THIS THESIS

2.1 A short overview

In accordance with the guidelines for submission of a PhD thesis by publication, this thesis contains a series of papers written during the period of registration (2004/07/01 – 2006/12/31). The eleven papers submitted for the thesis are in various stages of publication i.e., published (n = 5), in press (n = 2), accepted (n = 2) or submitted (n = 2). Submission of the thesis by papers was favoured because of the range of interrelated research projects that could be accommodated, and to ensure the rapid dissemination of information in a fast-moving field of interest. The papers are presented in chronological order of submission so there is not necessarily an obvious flow in the 'story line'. Nevertheless, I do believe that the chosen sequence truthfully reflects developments and progress in my research, as well as the accumulation of data, during the period when it was conducted.

The formatting of the papers varies to suit the house styles of the journals to which they were submitted. Each paper has its own reference list; therefore the final reference list applies only to the accompanying, unpublished chapters (Chapters One, Two and Fourteen).

Hunting and hafting were probably practised throughout the Middle and Later Stone Age in South Africa. This study explores the role of pointed tools from the Still Bay and backed tools from the Howiesons Poort as components in Middle Stone Age hunting strategies and hafting technologies trough use-trace analyses. If the tools were indeed used as components in hafted hunting technologies, and if we wish to understand their appearance, disappearance and significance, we need to know what type of hunting strategies are best accomplished with these tools, and under what conditions these technologies were favoured. The papers presented in this thesis begin to accumulate comparable data, and develop hypotheses and interpretations for the use and hafting technologies of Middle Stone Age hunting weapons. The results can be slotted into datasets from other

multi-disciplinary environmental, faunal, technological and behavioural studies in order to build reliable reconstructions of life during the Middle Stone Age in South Africa.

Most analytical work was conducted on stone tools from Sibudu Cave, KwaZulu-Natal. This site has a unique, deep sequence with many Middle Stone Age phases represented (Wadley 2006a; Wadley & Jacobs 2006) so that the excavated material is conducive to comparative analytical work between the phases. It also has excellent organic preservation, providing stone tools ideal for micro-residue analysis. The tools from Sibudu Cave that were earmarked for micro-residue studies were excavated, packaged, transported and curated by me. This ensured that there are no caveats in their curational history that might compromise the integrity of the analyses and results. In order to facilitate inter-site comparison of some data, selected tools from Umhlatuzana Rock Shelter, Klasies River Cave 2 and Blombos Cave were also analysed, mostly for macrofractures that require no specialised curation. Short site descriptions are provided in the respective chapters. Below I provide an overview of the papers as chapters within the thesis, their abstracts and, where appropriate, I provide the context or the scope of my contribution to papers.

2.2 Presentation of the papers as chapters

Chapter Three:

Lombard, M. 2005. The Howiesons Poort of South Africa: what we know, what we think we know, what we need to know. Southern African Humanities 17: 33-55.

This provides a concise review of Howiesons Poort research conducted over the past eight decades since the industry was first identified. A review is considered useful in the light of current interest in the industry and what it means in terms of technological and cognitive evolution. It is also true that far-reaching behavioural hypotheses have been built around the Howiesons Poort, some with very little supporting evidence. Recent developments in stone tool analysis, environmental

reconstruction and dating methodology are providing us with new tools to measure the time depth and limits of the Howiesons Poort. Such methods may also provide detailed empirical data to build onto or re-assess hypotheses regarding human behaviour associated with this stone tool industry. Few comprehensive syntheses exist of the Howiesons Poort, and it serves as 'entrée' and rationale for the functional work on Howiesons Poort tools that is to follow.

Chapter Four:

Lombard, M. 2005. A method for identifying Stone Age hunting tools. South African Archaeological Bulletin 60: 115-120.

This short paper introduces macrofracture analysis of stone tools and its potential to answer behavioural questions in the Stone Age context. It currently represents a line of enquiry mostly used in Middle Stone Age research in South Africa, but it may also provide a means for invigorating Later Stone Age project design and laboratory research. The key results from a Howiesons Poort sample from Klasies River Cave 2 are used to illustrate the issues that could be addressed, and the potential information that could be derived from such studies. It is shown that, based on the results of macrofracture analysis, backed tools from the Howiesons Poort at Klasies River Cave 2 were probably used as components in hunting weapons. Thus, new data have been generated for the function of backed tools starting to clarify some uncertainties about their use. The comparative value of the approach is briefly illustrated by weighing the Klasies River results against those of similar studies conducted in Eurasia.

Chapter Five:

Lombard, M. and Wadley, L. 2007. The morphological identification of micro-residues on stone tools using light microscopy: progress and difficulties based on blind tests. Journal of Archaeological Science 34: 155-165.

Fifty-three stone flakes were knapped for a series of four blind tests on replicated flakes with residues derived from the processing of plant and animal products.

Some flakes were hafted before use. Tests 1 and 2 were pioneering efforts published in 2004; lessons learned from these early studies shaped the new research reported here and lead to improved methodology and interpretative skills. A high level of accuracy was obtained for Test 4. Test 3 showed that the rock type of a stone tool could influence the ability of the analyst to recognise and interpret residues. Test 4 in the series resulted in the most accurate interpretations because, prior to Test 4, identification difficulties experienced during the first three blind test sessions were addressed by examining many stone tools that had been used for various replicated tasks. The preparatory exercise was particularly useful for resolving issues that had previously caused problems for correctly identifying animal residues. The new work reported here highlights some of the difficulties that can be experienced in the morphological identification of microscopic organic residues, particularly the distinction between animal and plant residues. Some solutions for these problems are suggested. It is particularly recommended that multi-stranded evidence be used for the identification of animal and plant residues.

This is a co-authored paper with my supervisor, Lyn Wadley, who set the tests, provided their protocols and assisted in the editing of the paper. I conducted the tests, produced much of the comparative material, developed the micro-residue identification methods and drafted the paper.

Chapter Six:
Lombard, M. 2006. 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.

Microscopy was performed on tools obtained from the Middle Stone Age deposits of Sibudu Cave because previous observations suggested that there might be a possible functional role for ochre at the site. Analyses of the distribution patterns of ochre residues conducted on post-Howiesons Poort points and Howiesons Poort segments from Sibudu Cave show that ochre was an integral part of the hafting

technologies for the duration of these technocomplexes. Close associations between ochre and resin on these tools strengthen the hypothesis that ground ochre was probably mixed into adhesives that were used to glue the tools to hafts. The evidence presented here shows that the toolmakers had considerable skill and that they understood the properties of the ingredients that are suitable for the manufacture of adhesives. Instead of presenting an alternative or replacement hypothesis for its possible symbolic role, the study expands our understanding of the versatility and value of pigmentatious material in prehistory.

Chapter Seven:

Lombard, M. 2006. First impressions of the functions and hafting technology of Still Bay pointed artefacts from Sibudu Cave. Southern African Humanities 18(1): 27-41.

The exceptional preservation of organic material at Sibudu Cave has made residue analysis feasible on newly discovered Still Bay bifacial stone tools. A glimpse into the livelihoods and skills of people living at the site during the Still Bay is provided by use-traces that suggest a wood-based hafting technology as well as butchery and hunting activities. Because the sample size is small, raw data are discussed for single tools. A hypothetical reconstruction of a Still Bay butchery knife could be generated based on the recorded use-traces. Although I am not prepared to make generalised interpretations for the Still Bay of South Africa from these results, they provide a solid base for formulating working hypotheses that can be evaluated with more extensive samples, both from Sibudu Cave and other sites. This study also proved useful for assessing existing hypotheses based on typological and technological analyses of pointed Still Bay artefacts.

Chapter Eight:

Wadley, L. and Lombard, M. In press. Small things in perspective: the contribution of our blind tests to micro-residue studies on archaeological stone tools. Journal of Archaeological Science. doi:10.1016/j.jas.2006.09.016.

Our blind tests are distinctive for they were conducted on replicated stone tools used for a variety of tasks that included the processing of animal remains and plants. The analyst was required to differentiate an array of residues from microscopic morphological characteristics, using light microscopy. The original aim of our first tests was to assess the analyst's ability to identify a variety of plant and animal residues, but issues and problems that arose during the testing process made it clear that greater value might be gained from the lessons that we learnt about methodology and the direction for future micro-residue research. We show that problems identified during our first tests stimulated research. Amongst other things, we learnt to distinguish plant and animal remains more confidently than previously. Our residue analyses are firmly embedded in wider archaeological research and our tests help to explain why there are sometimes contradictions between the evidence from archaeologically recovered remains and residues on stone tools. A further outcome of the tests is that we have adopted a multi-stranded approach that provides a cautious, but secure strategy for identifying and interpreting use-residues. Our studies of replicated contaminants have also been invaluable for distinguishing incidental residues from use-related residues.

As so often happens in research, a curved ball has to be dealt with. This article is in response to a critique we received on the previously published blind tests. Wadley is first author, as she was on the original paper. She established the tone of the paper and wrote the introduction and general discussions. I was responsible for methodological input and the presentation of data, as well as the illustrations. Although this was an unplanned paper in the context of this thesis, its formulation greatly contributed to the explicit articulation of new ideas, approaches and solutions in the discipline of micro-residue analysis.

Chapter Nine:

Lombard, M. and Wadley, L. In press. Micro-residues on stone tools: the bigger picture from a South African Middle Stone Age perspective. In: Eerkens, J. & Barnard, H. (eds) Theory and practice of archaeological residue analysis: proceedings of the Salt Lake City Symposium. BAR International Series.

Our stone tool micro-residue analysis was developed within the bigger framework of Middle Stone Age research in South Africa. Progress in our methodology was partly influenced by addressing the problems encountered during a series of four blind tests, two of which were entirely field-based. This resulted in a more secure strategy for distinguishing plant and animal residues, and we have made advances in the identification of incidental as opposed to use-related residues. A multi-stranded approach improved our chances of correctly identifying and interpreting residues on archaeological stone tools. Focused micro-residue analyses and the interpretation of results can now be used to gain detailed knowledge of Middle Stone Age human behaviour regarding hunting and butchery activities, as well as variations in hafting technologies and the functional application of ochre. Micro-residue analyses applied to tools from the post-Howiesons Poort, Howiesons Poort and Still Bay technocomplexes contribute towards global research that investigates human behavioural evolution. This chapter aims to contextualise the development of our micro-residue research.

The formulation of our response to the critique on the first two blind tests (Chapter Eight) helped us to explicitly place our micro-residue studies in perspective. That response also provided the impetus for this paper; where we ‘zoom out’ even further to include its place in Middle Stone Age research. We also provide further comment on methodology and ‘zoom in’ to give new micro-residue ‘data bites’.

Chapter Ten:

Lombard, M. Submitted June 2006; referee reports still awaited. The gripping nature of ochre: the association of ochre with Howiesons Poort adhesives and Later Stone Age mastics from South Africa. Journal of Human Evolution.

The theme introduced in Chapter Six is elaborated and discussed in detail only in terms of the Howiesons Poort. The chapter provides evidence for the use of ochre in adhesive recipes during the Howiesons Poort of South Africa. Stone segments from two KwaZulu-Natal sites, Sibudu Cave and Umhlatuzana Rock Shelter, were microscopically analysed to document ochre and resin occurrences. These micro-residues show a clear distribution pattern on the tool portions that are associated with hafting. Results from a separate quartz and crystal quartz sample may indicate that different adhesive recipes were applied to different raw materials during the Howiesons Poort. Previous studies showed that adhesive recipes containing ochre were also applied during the pre- and post-Howiesons Poort at Sibudu Cave. Three unique Later Stone Age objects with mastic are also discussed, and the reasons for the presence or absence of ochre on them are explored. The Later Stone Age function for ochre associated with mastics was probably different from the Middle Stone Age application, and these differences could imply developments or changes in adhesive recipes and a shift in the use of ochre over time. Evidence for the complex hafting technology during the Howiesons Poort informs on cognitive and technological skills and planning abilities. It shows that, more than 60 ka ago, people understood the characteristics of various raw materials and adapted their adhesive technologies accordingly. Rather than viewing the evidence as an alternative or replacement hypothesis for the possible symbolic role of ochre during the Late Pleistocene it is considered as providing further insight in the versatility, use and value of pigmentatious materials in prehistory, contributing to a more comprehensive understanding of past complexities in human behaviour.

Chapter Eleven:

Lombard, M. Submitted August 2006; referee reports still awaited. Broken stones breaking ground: comparable data for Middle Stone Age hunting based on macrofracture analysis. Antiquity.

Macrofracture analysis is discussed as a method that can be used to create comparable data sets to aid in the interpretation of Middle Stone Age hunting behaviour. New data from two sites in KwaZulu-Natal, South Africa, are presented and compared to data from experimental and other archaeological analyses. The results are used to formulate the following working hypotheses for Stone Age hunting technologies in South Africa; a) some pre-Howiesons Poort pointed tools were probably used as hafted butchery knives, while others could have been used to tip hunting weapons, b) Howiesons Poort backed tools were probably used as interchangeable pieces in hafted hunting weapons, c) post-Howiesons Poort points were mostly used to tip hunting weapons, d) late Later Stone Age hunting technologies were different from those practiced during the Middle Stone Age. This study provides a broad initial framework to be fleshed out with additional data from multi-analytical and multidisciplinary studies. It is suggested that increased resolution of Middle Stone Age hunting technology has the potential to imply complex associated behaviours.

Chapter Twelve:

Lombard, M. Accepted with minor changes; December 2006. Finding resolution for the Howiesons Poort through the microscope: micro-residue analysis of segments from Sibudu Cave, South Africa. Journal of Archaeological Science.

In this paper I present the results of a micro-residue analysis of stone segments, the type fossils of the Howiesons Poort technocomplex in South Africa, with an age of more than 60 ka. Fifty-three segments from Sibudu Cave, KwaZulu-Natal were analysed. The micro-residue distribution patterns and other use-traces are interpreted in terms of hafting and function. It is shown that most of the tools were indeed hafted, used to process animal material and most were probably hafted as

inserts in hunting weapons. There is evidence for differences and changes over time in haft materials and hafting configurations of the segments. For example, the oldest segments could have been hafted to bone and the youngest ones to wood, and there might have been differences in preferred hafting configurations during different phases of the Howiesons Poort. The study demonstrates how functional studies might help to interpret change and variability in human behaviour during the Middle Stone Age, which is often portrayed as static or slow changing.

Chapter Thirteen:
Lombard, M. Accepted with minor changes; December 2006. Evidence for change in Middle Stone Age hunting behaviour at Blombos Cave: results of a macro-fracture analysis. South African Archaeological Bulletin.

Research projects aimed at finding resolution for certain aspects of human behaviour during the Middle Stone Age are providing increasing evidence for change and complexity. Here I present the results of a macrofracture analysis conducted on pointed artefacts from the three identified Middle Stone Age phases at Blombos Cave that include the Still Bay Industry. The preliminary interpretations indicate comprehensive changes in hunting technologies and strategies over time. The Blombos macrofracture data are compared with experimental results and results obtained for other Middle Stone Age sites in South Africa. I conclude that instead of being a monotonous, unchanging period, there were dynamic changes taking place at Blombos Cave during the Middle Stone Age. This is true at least for the meat procurement technologies and strategies, and probably for site function and the use of space in and around the cave. Although Blombos Cave will remain renowned for its uniquely modern artefacts from the Still Bay phase, it also has a significant contribution to make in the study of behavioural change throughout the Middle Stone Age.

Chapter Fourteen

In the last chapter I summarise the main methodological and empirical outcomes of the study and then proceed to show how a reflective process between replication, experimentation, testing and examination of archaeological material can enrich existing behavioural models. I assess the results of the analyses within the framework of the three questions about hunting, hafting and change in the Middle Stone Age asked in the first chapter and show that it is time to discard the characterisation of the Middle Stone Age as a period of technological stasis. The glimpses into work processes provided by use-trace analyses on Middle Stone Age tools cannot yet be placed within the same contexts that explain the archaeology of more recent hunter-gatherer periods, but the deliberate actions of groups and individuals in the deep past can be viewed in a more detailed and nuanced way than before. The relatively plausible accounts that are outcomes of use-trace methods provide valuable tools with which to evaluate, corroborate or revise behavioural models derived from other sources. I conclude that use-trace analyses provide a robust strand of evidence to the multi-stranded interpretive approach, and that the closer we get to looking at the world of opportunity and risk during the Middle Stone Age, the more it seems that these ancient hunter-gatherers may have thought much like their more recent counterparts.