LITHIC TECHNOLOGY AND INTRODUCTION OF POTTERY IN SOUTHERN AFRICA

Baatlhodi MODIKWA

LITHIC TECHNOLOGY AND INTRODUCTION OF POTTERY IN SOUTHERN AFRICA

Baatlhodi MODIKWA

A dissertation submitted to the Faculty of science at the University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Master of Science.

Johannesburg 2008

Abstract

Pottery and livestock reached lithic using people in southern Africa some 2000 years ago. It has been suggested that early ceramics were introduced from further north then spread to the southernmost tip of Africa by an immigrant Khoekhoe herder population. How pottery and small livestock spread in southern Africa is debated. Some scholars believe that migrating Khoekhoe herders were responsible while others state that networks of local hunter-gatherer groups gained livestock and pottery by exchange and diffusion. Some think that both migration and diffusion played a part. The aim of this study is to contribute to this debate by comparing lithic technology in pre-pottery and pottery assemblages in the Central Limpopo Basin and northern Botswana. An abrupt change in lithic technology across the 2000 BP boundary would favour the migration model while gradual or no change would favour the diffusion model. This study focuses on two contemporary sites with Bambata pottery. Assemblages from Toteng 1 and Mphekwane Rock shelter in northern Botswana and the Central Limpopo Basin are analysed. For lithic analysis at both sites, the chaînes opératoires approach is employed. Although the method is not commonly applied to southern African Later Stone Age assemblages, it has broad appeal and potential in other parts of the world. The essential difference between this approach and the commonly applied typological approach in southern Africa is that it encompasses the whole life history of lithic material, from the basic nodule to finished tools. The study focuses much on the technological analysis and this dominates the analytical part. However, typological analysis was also performed in the study in classifying different categories of formal tools.

Keywords: *chaînes opératoires*; Later Stone Age; Bambata pottery; Lithic technology; Lithic typology; Toteng 1; Mphekwane Rock Shelter.

Declaration

I declare that this dissertation is my own, unaided work. It is being submitted for the degree of Master of Science in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other university.

____

Candidate's signature

……………day of …………… 2008

Table of contents

Acknowledgements i

CHAPTER 1..1
1.0 Introduction..1

CHAPTER 2..6
2.0 Literature review 6
2.1 Introduction..6
2.2 The history of lithic technological studies and *chaîne opératoire*.................................6
2.3 Lithic analysis in the Later Stone Age archaeology of southern Africa 10
2.4 Models and ideas surrounding origins of herding and ceramics in the LSA 15
2.5 Lithic technological studies and the idea of cultural continuity and change 18
2.6 The Archaeology of Toteng and Mphekwane 19
2.7 Debates concerning the origin and spread of Bambata pottery 21

CHAPTER 3..24
3.0 Presentation of sites studied: context and lithic corpus 24
3.1 Introduction..24
3.2 Toteng 1 25
3.3 The Mphekwane shelter..29
3.4 *Chaîne opératoire* 31
3.4.1 Attributes of Focus..33
3.5 Limitations 34
3.6 Summary 35

CHAPTER 4..36
4.0 Toteng 1 lithic analysis 36
4.1 Introduction..36
4.2 Toteng 1 36

4. 3 Sorting and sampling procedures......37
4.4 Raw Materials frequencies at Toteng 1......38
4.5 Lithic Technology in Toteng 1......42
4. 6 Blade/bladelet productions in Toteng 1......44
4. 7 Technical classifications......44
4. 8 Striking platform preparations on the Toteng 1 blades......47
4. 9 Flake debitage analyses from the Toteng 1 site......49
4. 10 Formal tools from Toteng 1......50
4. 11 *Chaînes Opératoires* in the Toteng 1 assemblage......52

CHAPTER 5......56
5.0 The Mphekwane Shelter lithic analysis......56
5.1 Introduction......56
5.2 Sorting and sampling procedures......57
5.3 Raw Materials frequencies in Mphekwane Shelter......58
5.4 Lithic Technology in Mphekwane Shelter......61
5.5 Blade/bladelet production in Mphekwane Shelter......62
5.6 The Mphekwane Shelter blades/bladelets classification strategy......62
5.7 The Mphekwane Shelter blade platform preparations......64
5.8 The Mphekwane Shelter flake debitage analyses......66
5.9 The Mphekwane Shelter formal tools......67
5.10 *Chaînes Opératoires* in the Mphekwane Shelter assemblage......68
5.11 Conclusion......69

CHAPTER 6......70
6.0 Interpretation......70
6.1 Introduction......70
6.2 Toteng 1......71
6.2.1 The Toteng 1 cores......71
6.2.2 Toteng 1 debitage......72
6.2.4 Knapping techniques at the Toteng 1 site......74

6.2.5 Blade technology at the Toteng 1 site *75*
6.2.6 Blade platform preparations at Toteng 1 .... *75*
6.2.7 Blade platform morphology at Toteng 1 .... *77*
6.2.8 Formal tools *77*
6.3 The Mphekwane Shelter 78
6.3.1 Raw material frequencies at the Mphekwane Shelter *79*
6.3.2 The Mphekwane Shelter cores and debitage *80*
6.3.3 Knapping technique at Mphekwane *81*
5.3.5 Mphekwane platform preparation *82*
6.3.6 The Mphekwane Shelter platform morphologies *83*
6.3.7 The Mphekwane Shelter formal tool category *84*
6.4 Summary 84

CHAPTER 7 87
7.0 Early ceramic sites in southern Africa – a comparative study 87
7.1 Introduction 88
7.2 Namibia 89
7.2.1 Geduld *89*
7.2.2 The Big Elephant Shelter *89*
7.2.3 Oruwanje *91*
7.3 Zimbabwe 91
7.3.1 Bambata Cave *91*
7.4 Botswana 92
7.4.1 Tuli Lodge *93*
7.4.2 Mantenge *93*
7.5 South Africa 94
7.5.1 Boomplaas *94*
7.5.2 Clarke's Shelter *94*
7. 5.3 The Collingham Shelter *96*
7.5.4 The iNkolimahashi Shelter *97*
7.6 Conclusion 97

CHAPTER 8 .... **99**
Conclusion **99**

REFERENCES **104**
APPENDIX **117**

List of tables

Chapter 4

Table 4.1 Chronology of the layers at Toteng (Campbell 1992) 37
Table 4.2 lithic artefacts from selected layers of the Toteng 1 site used in present study. ... 38
Table 4.3 40
Table 4.4 Raw material frequencies for the Toteng 1 cores 41
Table 4.5 Raw material frequencies for the Toteng 1 flakes 41
Table 4.6 Raw material frequencies for the Toteng 1 blades 42
Table 4.7 Raw material frequencies for the Toteng 1 formal tools 42
Table 4.8 Toteng 1 core classification 43
Table 4.9 Legend for core classes 43
Table 4.10 Toteng 1 blades technical classification based knapping stage 45
Table 4.11 45
Table 4.12 Measurements for Toteng 1 complete blades 46
Table 4.13 47
Table 4.14 Toteng 1 blades platform preparation 48
Table 4.15 Measurements for the Toteng 1 complete blades 49
Table 4.16 Toteng 1 blades platform morphological metric attributes 50
Table 4.17 Toteng 1 Flakes technical classification 50
Table 4.18 Toteng 1 flake technical classification 51
Table 4.19 Toteng 1 formal tools 52

Chapter 5

Table 5.1 Chronology of layers in Mphekwane Shelter......57
Table 5.2 Summary of the Mphekwane assemblage understudy from squares 3 & 6. 58
Table 5.3 Raw material frequencies for the Mphekwane shelter cores 59
Table 5.4 Raw material frequencies for the Mphekwane Shelter blades......60
Table 5.5 Raw material frequencies for the Mphekwane Shelter flakes......61
Table 5.6 Raw material frequencies for the Mphekwane Shelter formal tools......61
Table 5.7 The Mphekwane Shelter core legend and descriptions......62
Table 5.8 Classification of the Mphekwane Shelter cores......63
Table 5.9 The Mphekwane Shelter blade technical classification based on knapping stage 63
Table 5.10 Mphekwane blades technical classification 64
Table 5.11 Mphekwane blade measurements 65
Table 5.12 Mphekwane blade classification 65
Table 5.13 Mphekwane blade platform preparations......66
Table 5.14 Mphekwane blades platform morphology 67
Table 5.15 Mphekwane blade platform measurements......67
Table 5.16 Mphekwane flakes technical classification - legend......68
Table 5.17 Mphekwane flakes technical classification......68
Table 5.18 Mphekwane formal tool classifications 69

Chapter 6

Table 6.1 Toteng 1 cores classification......71
Table 6.2 blades and flakes from the pre-pottery and pottery layers at Toteng 1......72
Table 6.3 Toteng 1 raw material categories......73
Table 6.4 knapping techniques at the Toteng 1 site......74
Table 6.5 blades frequency from Toteng 1 74
Table 6.6 Raw material frequencies for the Mphekwane shelter cores 79
Table 6.7 blades and flakes at the Mphekwane Shelter 80
Table 6.8 Mphekwane cores......81
Table 6.9 blades frequencies (%) in the Mphekwane Shelter assemblage......82
Table 6.10 Mphekwane formal tools......83

Table 6.11 Summary of changes and continuity in Mphekwane Shelter..............................84

Table 6.12 Summary of changes and continuity at Toteng..85

Chapter 7

Table 7.1 Mphekwane scraping and *backed tools..87

Table 7.2 Toteng 1 scraping and backed tools..88

Table 7.3 Geduld scraping and backed tools (Smith and Jacobson 1991:7).........................89

Table 7.4 The Big Elephant Shelter scraping and backed tools (Wadley 1979:68).............90

Table 7.5 Oruwanje backed and scraping tools (Albrecht et al. 2001:7).............................91

Table 7.6 Bambata Cave trench N backed and scraping tools (Walker 1995:157) 92

Table 7.7 Bambata Cave trench Q backed and scraping tools (Walker 1995:158) 92

Table 7.8 Tuli Lodge backed and scraping tools (Walker 1994:30)....................................93

Table 7.9 Mantenge backed and scraping tools (Walker 1994:27)......................................94

Table 7.10 The Big Elephant Shelter scraping and backed tools (Wadley 1979:68)...........94

Table 7.11 Clarke's Shelter scraping and backed tools (Mazel 1984:51)............................95

Table 7.12 The Collingham Shelter scraping and backed tools (Mazel 1992:21)................95

Table 7.13 the iNkolimahashi Shelter Backed and scarping tools (Mazel 1999) **97**

Chapter 8

Table 8.1 Description of different models of the Neolithisation process (Barnett 2000; Zvelebil & Lillie 2000; Forenbaher and Miracle 2005)…………………………………...98

List of figures

Chapter 3

Figure 3.1 Map of southern Africa showing Mphekwane and Toteng 1(map from Microsoft Encarta)..25

Figure 3.2 Location of Toteng 1 in relation with the Okavango Delta and Lake Ngami 26

Figure 3.3 Toteng 1 site plan showing square ABC (Campbell 1992:35)............................27

Figure 3.4 profile from Campbell's (1992:36) excavations...28
Figure 3.5 Mphekwane in relation to the Limpopo River (Background map from Microsoft Encarta)..29
Figure 3.6 Mphekwane Shelter site plan...30
Figure 3.7 Mphekwane profiles from square 1 to 6..31

Chapter 4

Figure 4.1 the Toteng 1 formal tool frequencies...52
Figure 4.2 Representation of the Chaînes opératoires at the Toteng 1 site..........................54

Chapter 5

Figure 5.1 Raw material frequencies for the Mphekwane shelter cores...............................60
Figure 5.2 The Mphekwane Shelter Chaînes opératoires 70

Chapter 6

Figure 6.1 a representation of the Toteng 1 core classes 72
Figure 6.2 blades and flakes at Toteng 1 73
Figure 6.3 Toteng 1 raw material categories..74
Figure 6.4 Knapping techniques at the Toteng 1 site...74
Figure 6.5 the blade platform preparation variation in the Pottery phase.............................76
Figure 6.6 the blade platform preparation in the Pre-Pottery phase 76
Figure 6.7 Toteng 1 blade platform morphological variations 77
Figure 6.8 Raw material frequencies at the Mphekwane Shelter 79
Figure 6.9 Mphekwane debitage..80
Figure 6.10 the Mphekwane blade platform preparation...82
Figure 6.11 the Mphekwane blade platform preparation...82
Figure 6.12 the Mphekwane blade platform morphologies 83

Chapter 7

Figure 7.1 southern Africa showing selected regions (map from Microsoft Encarta)..........88

Acknowledgements

I would like to acknowledge financial assistance from the Wenner-Gren Foundation, National Research Foundation and Palaeo-Anthropology Scientific Trust. To IFAS and CNRS for funding all the travelling and staying in France during my training on lithic technology and *chaînes opératoires*, thank you very much. Samples, which were well kept, from Botswana National Museum and University of the Witwatersrand, Johannesburg, provided useful information for this research.

There are a number of people I would like to thank for their help towards completing this research. To Cheryl Chamberlain for language assistance, thanks for the hours we spent together and for the superb meetings. Other people who helped me through this study include: Feldrik Rivat, François Bon, Vincent Mourre, Karim Gernigon, Nicholas Veldyron, Bruno Bosc-Zanardo, Thabiso Phadi, Piece Motlogelwa, Morongwa Mosothwane, Abel Mabuse, GAO Tshekiso, Leatile Jame Modikwa and many others.

I owe many thanks to my supervisor, Prof Karim Sadr. I would not have done without you. I hope this study will bring a contribution to the issues that have dominated the herders archaeology and neolithisation of southern Africa.

Chapter 1

INTRODUCTION

Pottery and livestock reached lithic using people in southern Africa some 2000 years ago (e.g. Deacon 1984; Smith *et al.* 1991; Kinahan 1991; Sadr & Sampson 2006). It has been suggested that early ceramics were introduced from further north then spread to the southernmost tip of Africa by an immigrant Khoekhoe herder population (e.g. Elphick 1985; Ehret 1998; Smith 2005).

How pottery and small livestock spread in southern Africa is debated. Some scholars (e.g. Westphal 1963; Ehret 1998; Smith 2006) believe that migrating Khoekhoe herders were responsible while others state that networks of local hunter-gatherer groups gained livestock and pottery by exchange and diffusion (Deacon *et al.* 1978; Schrire 1992; Sadr 1998; Kinahan 2001). Some think that both migration and diffusion played a part (Barnard 1992).

The aim of this study is to contribute to this debate by comparing lithic technology in pre-pottery and pottery assemblages in the Central Limpopo Basin and northern Botswana. An abrupt change in lithic technology across the 2000 BP boundary would favour the migration model while gradual or no change would favour the diffusion model. An examination of the technological style (Gosselain 1992) is favoured because it captures the whole process of lithic exploitation from raw material procurement to the artefacts' disposal. Change and continuity in this aspect might reflect change and continuity in other cultural components. The idea is that technological style is stable within a cultural group; if there is abrupt change in lithic technology then the arrival of a new population by migration can be suggested.

Similar debates concerning the introduction of livestock and ceramics exist in other parts of the world. In Europe for example, Forenbaher and Miracle (2005) argue that the Mesolithic to Neolithic transition can no longer be considered in terms of a simple dichotomy between indigenous adoption and foreign migration. However, much of the European literature, just like the southern African literature, still tends to see population change, or migration, lurking behind the introduction of earliest pottery (e.g. Chapman *et al.* 1996; Biagi 2003). Most recently, Zvelebil and Lillie (2000) have listed six different forms of population transfer that may have been important in the transition to food production in Europe: demic diffusion, folk migration, elite dominance, infiltration, leapfrog colonisation and individual frontier mobility. These processes need to be examined in southern Africa as well to see if they apply in this region.

The question is whether change in lithic technological style across the 2000 BP boundary can reflect that introduction of pottery is attributed to the arrival of immigrant Khoekhoe herders in southern Africa or did the idea of pottery making diffuse from one to another of the local hunter-gatherer groups? In Namibia (Kinahan 1984), northern Botswana (Campbell 1992) and western Zimbabwe (Walker 1983) sheep and pottery date in the range of 2150-1800 BP, which is as old as at the Cape (Sealy & Yates 1994; Smith & Jacobson 1995; Reid *et al.* 1998). These reflect the rapidity in the spread of ceramics and/or livestock which some scholars regard as a sure sign of migration (e.g. Ehret 1982; Walker 1983). However, given the error (±) of the radiocarbon dates, it is difficult to tell how rapid the spread was and this still remain a debatable issue (Sadr 1998). The debate remains whether migrating populations were responsible for the spread of these across southern Africa or local hunter-gather groups gained these through diffusion and exchange. The idea is to look at lithic technological style to see if there is any reflection of either migration or diffusion.

As some example of this debate elsewhere, in east Africa for instance, Lane (2004) argues that the archaeological evidence for the transition to food production suggests that various agents were involved, and that the mechanisms by which such transitions were initiated and accomplished varied. In this region many of the earliest dated occurrences of domesticated animals come from sites and contexts closely associated with Later Stone Age hunter-gatherers along with the assemblages of pastoral Neolithic pottery (e.g. Ambrose 1984; Barthelme 1985; Marean 1992), which could be regarded as indicative of exchange and interaction between autochthonous hunter-gatherers and immigrant herding communities. Alternatively, the southwards spread of limited number of stock could equally have resulted from diffusion (Lane 2004).

In West Africa there is a similar debate surrounding the spread of the Kintampo culture. Davies (1966, 1980) views the spread of the Kintampo culture as a result of migrating population. The same view is supported by Watson (2005) whose argument is based on excavation and archaeological data from the Sahara, Sahel and southern West Africa. He proposes a migration model as an explanation for the discontinuity signaled by the appearance of the Kintampo tradition and the origin of food production in the region. Alternatively, Stahl (1985) has argued that not all features considered diagnostic of the Kintampo culture appeared simultaneously and change across the range of material culture was not synchronous. These and the bulk of identifiable faunal remains from hunted wild species were interpreted as a sign of cultural continuity.

Technological style, where style refers to a consistence preoccupation that would be present whenever there is a possibility of choice between equally viable options, is thought to be stable within a cultural group (Gosselain 1992). Style is linked with technology, the process whereby natural materials are transformed into cultural objects (Schlanger 2005), therefore it can play a leading role in reconstruction of past societies. Diffusion might take a variety of forms but one would expect certain continuity in material culture (Ammerman & Cavalli-Sforza 1984). If there is a sudden change in lithic technology then a new population would be suggested.

This study focuses on two contemporary sites with Bambata pottery. Assemblages from Toteng 1 and Mphekwane Rock shelter in northern Botswana and the Central Limpopo Basin are analysed. The Toteng 1 site was chosen for this study because it produced a large amount of thin walled pottery and early dates for domesticated animals (Huffman 1994; Robbins *et al.* 2005). The Mphekwane Shelter site is also in the region which provides evidence for the on going migration debate and I have been involved in the 2006/2007excavation of the shelter. Mr. Jayson Orton conducted the typological analysis for the lithics from square 3 of the Mphekwane Shelter excavation. Both sites have produced pre-pottery and pottery levels with lithic artifacts.

For lithic analysis at both sites, the *chaîne opératoire* approach is employed. *Chaîne opératoire* refers to a chain of processes through which a naturally occurring material is selected and transformed into usable cultural products (Schlanger 2005). Although the method is not commonly applied to southern African assemblages, it has broad appeal and potential in other parts of the world. It is evident that processes of manufacture must be incorporated in artifact analysis and interpretation (Schlanger 2005). The analysis for this study was modeled after Soriano's (*et al.* 2007) study of the bladelet technology at the Rose Cottage site.

The essential difference between this approach and the commonly applied typological approach in southern Africa (e.g. Deacon 1984) is that it encompasses the whole life history of lithic material, from the basic nodule to finished tools. As Stringer and Gamble (1993:143) comment "the typology of stone tools has been largely superseded by models of behavior that concentrate more on the 'biography' of the implement, how it was made, used, reshaped and finally thrown away".

In Europe, the *chaîne opératoire* approach is incorporated in stone tool studies, especially Paleolithic assemblages (Inizan *et al.* 1999). It is argued that stone tools are products of technical system of societies; therefore the *chaîne opératoire* approach relies on a time order arrangement of different steps used to manufacture them (Stringer & Gamble 1993).

The study focuses much on the technological analysis and this dominates the analytical part. However, typological analysis was also performed in the study in classifying different categories of formal tools. The structure of the study is as follows:

- *Chapter* 1: introduction
- *Chapter* 2: is the literature review chapter which, amongst other things includes a review of the history of lithic technological studies, including

chaînes opératoires; a review of lithic analysis in Later Stone Age archaeology of southern Africa; a review of the models and ideas surrounding the origins of herding and ceramics in the Later Stone Age; a review of how lithic technological studies can help answer questions about cultural continuity or change. Included also is the review of the archaeology to date in the Makgabeng Plateau and at Toteng, and also a review of the debate surrounding Bambata ceramics.

- *Chapter 3*: The methodology used in the study is presented in this chapter.
- *Chapter 4 and 5*: Materials analysed from the Toteng 1 site are presented in this chapter.
- *Chapter 5*: Materials analysed from the Mphekwane Shelter are presented in this Chapter.
- *Chapter 6*: The data presented in chapter 4 and 5 is interpreted in this chapter.
- *Chapter 7*: Formal tools, specifically scrapers and backed bladelet tools, from Mphekwane and Toteng 1 are compared with the same categories from different sites across southern Africa. The sites are selected geographically and all have pottery and pre-pottery phases.
- *Chapter 8*: The study is concluded in this chapter and similarities to debates in West Africa, East Africa and Europe are highlighted. Future research potential is also indicated.

The data will be interpreted based on the patterns observed in the analysis chapter. It is at this juncture that one will be able to determine whether there is enough evidence to support the migration model for the initial spread of pottery in southern Africa or the diffusion alternative. Furthermore, lithics from different excavations selected geographically across southern African is briefly compared to the lithics from Toteng 1 and Mphekwane. This however, will be limited to formal tools only, specifically scraping and backed artefacts. The main interest is to see whether observations made at Toteng 1 and the Mphekwane correspond to other parts of the sub-continent.

Chapter 2

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter summarises studies from southern Africa and beyond that are related to this research. It includes: a review of the history of lithic technological studies, including *chaînes opératoires*; a review of lithic analysis in the Later Stone Age archaeology of southern Africa; a review of the models and ideas surrounding the origins of herding and ceramics in the Later Stone Age and a review of how lithic technological studies can help answer questions about cultural continuity or change. Included also is the review of the archaeology to date in the Mphekwane Shelter and Toteng, and also a review of the debate surrounding the Bambata ceramics.

2.2 The history of lithic technological studies and *chaîne opératoire*

For some time now, it has been accepted that the study of stone tools is synonymous with the study of technology (Andrefsky 1998). Commonly made and used in the execution of practical task, stone tools seem amenable to the form of analysis and explanation favoured in technological studies. While lithic technological studies' significance may have changed in keeping with broader shifts in human perspectives, the technological realm has long been granted a pre-eminent position in our accounts of the past. Dating back to the inception of the Three Age system through to more recent studies, stone tools have often been cast in a major role: as marker of cultures, as indicators of evolutionary development and as systems that determine the character of society and stimulate change (Edmonds 1995).

The cultural approach to technological systems has largely been developed by French anthropologists (Leroi-Gourhan 1943, 1945; Creswell 1982; Digrad 1979; Lemonnier 1976, 1983, 1992). Leroi-Gourham (1945) developed an ethnographic classification of elementary means of action on matter, as well as a distinction between generic or universal technical tendencies and specific degrees of fact, which occur in a particular ethnic group. He then drew on biological models and metaphors to reach the dynamics of techniques. Besides addressing the functions that different techniques serve, Leroi-Gourhan sought to grasp how techniques themselves functioned, how they were structured, how their different components and phases were integrated and brought to play in course of action. By the 1950s Leroi-Gourhan had coined the term *chaîne opératoire* to describe these processes (Leroi-Gourhan 1964). He argued that techniques involved both gestures and tools, organised in a chain that simultaneously grants to the operational series, their stability and flexibility (Leroi-Gourhan 1964). Building on these terminological and conceptual inputs, the *chaîne opératoire* approach has mainly developed along two interconnected directions, anthropological and archaeological (Schlanger 2005).

The *chaîne opératoire approach* builds on the basis of these two intersecting French intellectual traditions: on the one hand the replication work of archaeologists like François Bordes and Jacques Tixier, and on the other hand the interest by many French anthropologists, such as André Leroi-Gourhan and Marcel Mauss (Schlanger 1994). It has been suggested that the birth of the *chaîne opératoire* concept was further affected by André Leroi-Gourhan's meeting with the well known experimental flintknapper François Bordes (Audouze 2002) The *chaîne opératoire* concept has been described as "a series of operations which brings primary material from the natural state to a fabricated state" (Boëda 1995: 43; also Cresswell in Lemonnier 1986). The idea that technologies are socially emphasised actions is important. Through technologies, various culturally and socially structured mental templates and actions are transferred, consciously or unconsciously, into the objects shaped by an individual. By studying these *chaînes opératoires*, that is chains of technological gestures, it is possible to examine intensively the culturally bound strategies (Lemonnier 1992; Julien & Julien 1994; Bleed 2001).

The first systematic lithic technological studies were carried out by Francois Bordes, Jacques Tixier and Don Crabtree (Inizan *et al.* 1999). Since then the technological approach to studies of lithic assemblages has acquired a recognised scientific status within prehistory in studying archaeology. An understanding of the concept of the technical system of lithics has now become a necessary part of any research which involves studies of the production activities of paleolithic past societies (Audouze 1999). The success of this approach became clear in the 1980s when important studies were carried out on European Paleolithic industries (e.g. Boëda 1986; Geneste 1988) which made it possible to unravel the complexity of the lithic assemblages by taking into account the influence of environment, biological and social factors on lithic production as well as the role played by post depositional processes. The technological study of lithic assemblages has therefore acquired a wider sense than that strictly implied by the term itself (Milliken & Peresani 1989).

While in Europe the technological studies were mostly used by ethnographers (e.g. Lemonnier 1983) in the United States a similar approach was developed by processual archaeologists. They have tended to rely on more statistical studies of core/blank metrical and attribute data (e.g. Jelinek 1977; Sackett 1982). Henry (1989) agued that a metrical analyses can be used to complement conventional approaches in reduction sequences studies. A metrical analysis allows for the detection of an alternative economising measure that may have been used in prehistory lithic reduction strategies.

In archaeology, the *chaîne opératoire* approach was first developed around the study of stone artifacts because their physical properties make them particularly suitable for process oriented reconstructions. Experimental flint knapping and refitting of archaeological artefacts play a significant role in the *chaîne opératoire* approach. Experimental archaeology is "within the context of a controllable imitative experiment to replicate past phenomena in order to generate and test hypotheses to provide or enhance analogies for archaeological interpretation" (Mathieu 2002: 12). The work of flintknappers in experimental archaeology have been to learn about the different types of flint tools through the hands-on approach of actually making them (Jelinek 1977). Mathieu (2002) contested that experimental archaeology employs a number of different methods, techniques, analyses, and approaches in order to generate and test hypotheses or an interpretation, based upon archaeological source material, like ancient structures or artifacts.

It is further argued that the aim of experimental knapping is to try and reconstruct the *chaînes opératoires* that result in the production of the technological traits which characterise different industries (Milliken *et al.* 1998). In identifying different reduction in archaeological assemblages researchers have tended to rely upon either the presence of specific core forms and/or the presence of distinct form of debitage. For example Barham (1987) argues that bipolar reduction produces a characteristic set of flakes that "…tend to be broad and irregular in plane view with crushed butts and sheared bulbs of percussion". Therefore flake morphology is variable since it is a combination of several variables but not necessarily all of the possible attributes that define a certain form of flake (Ahler 1989). Experimentation is used to see if different reduction techniques can be identifiable by documeting debitage patterning from different reduction modes. The experimental debitage and archaeological assemblage from the site can then be classiefied based on variables such as breakage related characteristics, amount of cortex and fragment types.

The refitting technique also contributes significantly to understanding of the processes that affect the lithic assemblages (Bellelli & Carballido 1996). Concentrating on production processes, the refitting technique is argued to offer an understanding of some aspects of the sequences of operations that a lithic tool assemblage underwent (Schiffer 1976). The archaeological assemblage consists of cores, products and sub-products that may show distinctive characteristics and through the refitting process it is possible to identify knapping processes related to each one and their stages of knapping (Bellelli & Carballido 1996). Refitting and experimental techniques are very important for the technological analysis. To include refitting materials in the various processes in the *chaînes opératoires* enables researchers to gain more information on lithic production activities from the idea based on the reasoning that the more successful refitting is obtained from the archaeological assemblage the more information obtained regarding the production sequences.

Recently, the *chaîne opératoire* approach to lithic analysis has become firmly established in many parts of Europe (Boëda 1994; Delagnes 1995; Audouze 1999). The concept carries both epistemological and methodological connotation. In the epistemological quality, it refers to a dynamic conception of lithic technology in which an item is viewed as part of and defined by its entire production sequence. For a number of authors the *chaîne opératoire* as an analytical tool of a conceptual scheme should be identified at the level of assemblage (e.g. Lemonnier 1986; Boëda 1995; Delagnes 1995, Audouze 1999, 2002). The *chaîne opératoire* approach's advocates consider it a method of technological analysis that is capable of bringing us in contact with the intentions of prehistoric artisans and their decisions about technical actions (Inizan *et al.* 1999; Lemonnier 1992; Julien & Julien 1994; Bleed 2001).

2.3 Lithic analysis in the Later Stone Age archaeology of southern Africa

Several Stone Age syntheses were published at the turn of the ninteenth century in South Africa (e.g. Gooch 1881; Balfour 1912). Being themselves Europeans, these writers were greatly influenced by European archaelogy which was the only existing at those times. Syntheses of the local archaeological data consisted almost entirely of miscellaneous surface collection. European terminology was adopted for better comparison and this contributed to the idea of southern Africa ans been a "cultural *cul-de-sac*" (Walker 1995:17). Such terminology reflected the lithocentrism or obsession with stone tool typology that dominated research in southern Africa at least until the 1970s. Since then, interest has shifted towards studying prehistotric human behaviour.

Janette Deacon (1984) has characterised the Later Stone Age as a time when the tool makers began experimenting with small or microlithic blade tools, abandoning the prepared-core technique, producing more standardised retouched artefacts such as convex-edge scrapers, borers and segments. The period is also characterised by a large variety of formal organic artefacts, especially of bone and shell, and the production of large quantities of ornaments and art. Orchestrating changes in artefacts assemblges, among other things such as environmental changes and subsistence strategies, has been a major theme of the Later Stone Age of southern Africa since the 1970s.

The Later Stone Age of southern Africa is made up of several technological traditions. The Robberg Industry dates from about 20 000 - 12000BP and is found spread over a wider area across southern Africa but notably in the southern Cape (Mitchell 2002).

This industry also continued in the south-eastern part of southern Africa after 12 000BP. At Rose Cottage for example the Robberg Industry dates to 9560+/-70 BP (Wadley 1996). The other Later Stone Age industry is the terminal Pleistocene/early Holocene non-microlithic assemblages (Deacon 1984). In different region this industries has different names, for example Oakhurst (Sampson 1974). One of the most striking features of the Oakhurst occurrences, compared to their Robberg predecessors, is the rarity of bladelet production. The Oakhust Industry was found in the southern Cape (Deacon 1984), the Drankensberg Mountains and south of Limpopo River (Mitchell 1997) and at the Nelson Bay Cave (Deacon 1984). In Zimbabwe Walker (1995) reported the occurrence of the similar industry to the Oakhust Industry termed the Pomongwe Industry and in north-western Botswana at Depression and Gchwihaba Caves (Robbins 1990; Robbins *et al.* 1996).

Following the macrolithic industries of the terminal Pleistocene/Early Holocene, the Holocene microliths assemblages were in use across southern Africa (Deacon 1984) or the Wilton Complex (Sampson 1974). The early Wilton assemblages in southern Africa, predating 8000 years ago, only occur to the north of the Limpopo and Gariep Rivers (Deacon 1972; Deacon *et al.* 1978; Humphreys &Thackeray 1983). The dates suggest a north-to-south diffusion of microlithic technology, with Diana’s Vow, Zimbabwe (Cooke 1979) and Apollo 11 (Wendt 1976) among the earliest sites. South of the Limpopo River a further diffusionary movement is evident from east to west within the Cape Fold Belt (Deacon 1976).

Shifts in scraper morphology and the relative frequencies of different kinds of backed microlith tools define successive phases within the Wilton Industry in Zimbabwe (Walker 1995) and south of the Limpopo River (Deacon 1972; Sampson 1974).The early stage of of the Wilton Industry is characterised by high numbers of segments at 7000-4000 years ago. Thereafter the Post-Classic Wilton Industry saw a greater use of backed bladelets and points and in many areas there was a proliferation of adzes prior to the introduction of ceramics c. 2000 BP (Mitchell 2002).

It is being argued that the Wilton Industry should be regarded as a technological tradition manifested in the production of certain kinds of stone tools (J. Deacon 1972, 1974 & 1984; H. Deacon 1976). The formally patterned tools during the Wilton Industry include scrapers, backed pieces, adzes and drills. All of these tools are of microlithic proportions and many often retain traces of the mastic with which they were hafted (presumably to wooden or bone handles) (Mitchell 2002). Deacon (1972) defines these tool types in the report of Wilton Large Rock Shelter and this appears to be often used in the Later Stone Age research in southern Africa as a standard typology. Some sub-classes such as backed scrapers, small convex scrapers, segments and backed points are also recognized in the Later Stone Age assemblages (Mazel & Parkington 1981).

Numerous researchers have conducted studies across southern Africa and documented diversified information on the Later Stone Age assemblages (Mitchell 2002). Still with the technological changes in southern Africa, Humphrey & Thackeray (1983) argued that the major changes occurred during the Oakhurst and Wilton Complexes. They attested that Wilton Complex is a microlithic bladelet based technology which originated in Zambia. Sampson (1974) had earlier suggested that the Wilton Complex had diffused from the same place and spread southward with occupants of each region imposing their own style on the new technology. The following few paragraphs capture brief descriptions of lithic analyses that were also undertaken in southern Africa, mostly dating to about ceramic period.

Of all southern African Later Stone Age sites, it is those on the seaward slopes of the Cape Fold Mountains that offer the richest and best preserved records. Sustained Later Stone Age research here is almost a century old and provides some of the best evidence for social and economic intensification during the late Holocene (e.g. Deacon 1976; Leslie 1989; Hall 1990). Along with further documentation of plant food collection strategies, one important inference drawn here from spatial variability is that Later Stone Age people used stone tools and their raw material and the artifacts made from them to signal social identities (Inskeep 1987; Binneman 1996). Wilton Large Rock shelter, type site of the Wilton Industry (Deacon 1972) and Melkhoutboom (Deacon 1976) are among the key sequences in the eastern part of the Cape Fold Mountains. Comparable patterning is observable along the inland coast of the Tsitsikamma Coast. Binneman (1996) interprets the diversity among the Wilton

Industry microlithic and macrolithic assemblages that occur after 4700 BP in terms of two distinct populations who in part structured their interactions by making quite different kinds of artefacts.

Moreover, other Later Stone Age sites were studied across southern Africa. In the savanna biomes, for example, Yellen and Brooks (1989) reported lithic occurrences rich in segments, particularly steep and biconvexly retouched double segments. These are also termed backed scrapers and they occur over most parts of Botswana and Namibia. However, Walker (1995) reports their absence in the assemblages from Zimbabwean sites and the Shashe-Limpopo basin.

Little research on the Later Stone Age has been done in Botswana compared to other parts of southern Africa. The first detailed description of Later Stone Age artifacts was published by Malan in 1950 and these were collected in western Ngamiland. More formal archaeological research took place after the 1960s in Botswana with important results (Brooks 1978; Brooks and Yellen 1987; Yellen 1971, 1977; Wilmsen 1978, 1989; Hitchcock 1982; Denbow, 1984; Kent 1993). Brooks and Yellen began systematic excavations in the north of the country with an ecological emphasis on their approach (e.g. Yellen 1971; Yellen and Brooks 1989).

Among other researchers, Robbins (1984; 1985) continued the research on the Stone Age of Botswana and later concentrated on the Tsodilo Hills (Robbins 1990). Phaladi (1992) conducted his lithic analysis on the Tsodilo Hills concentrating on stone tool technology and trade. Further work was done by Weedman (1993).

In other sites across Botswana, Walker (1994) suggests that it would be important to study the technological style of Later Stone Age assemblages in order to better understand cultural diversity. He explained the stone tools at several sites, including the Tsodilo Shelter, the Mantenge Shelter, Tuli Lodge and others. In most cases the Later Stone Age lithics are found in association with pottery. In the Tsodilo sites the favoured raw material is chalcedony. Preference for chalcedony also occurs in farmer sites (Phaladi 1992; Weedman 1993).The Tsodilo site sample arguably shows some chronological development. Blades are reported to be relatively sparse in the lowest levels where scrapers are common (Walker 1994). In the Mantenge Shelter, the assemblage is similar to observation made on some Zimbabwe sites. There is a progression from backed tool domination to scraper domination comparable with sequences in adjacent Zimbabwe about 2000 years ago. This is also the case in the Tuli Lodge site (Walker 1994).

In the Matopos Hills, in Zimbabwe, the paucity of palaeo-environmental data hampers understanding of settlement subsistence patterns. However, early backed microlithic assemblages (referred to as the Nswatugi industry) dating to about 4800 BP, were overlaying others in which chalcedony was more commonly employed. The source of the chalcedony raw material is not in the vicinity of the Matopos. Other innovations include ornaments, ostrich egg shell containers with neatly bored apertures and bone link shafts suggesting hunting with poisoned arrows designed to detach themselves into the animals (Mitchell 2002). Unfortunately, the lack of excavated assemblages dating 3800-2200 BP leaves us ignorant of the centuries immediately preceding the local appearance of pottery and domesticates. Elsewhere far less is known about Zimbabwe's Holocene prehistory. Numerous microlithic surface collections in Hwange National Park are undated (Klimowicz & Haynes 1996), as are those from excavations at Pfuni and a nearby shelter in Mashonaland. Walker and Thorp (1997) concluded that supposedly distinctive features such as backed scrapers also occur in the south-western Zimbabwe.

Stone tool assemblages in Namibian sites, the Falls Rock Shelter and the Snake Rock Shelter, three phases of occupation could be discerned from the stratigraphy and these were corroborated by the sediments characteristics, dating of organic material and presence of key association. The sequence is ordered as follows: the pre-pottery phase dated to 4500 and 2500 BP; pottery was introduced the second phase which dated from 2100 to 1600 BP and the final phase of occupation characterised by animal dung at the Falls Rock Shelter dated to 730 BP (Kinahan 1995). Stone tool assemblages from these two sites include: a small range of formal tools dominated by *en écaille*, which is made from mainly crystalline quartz, a variety of points and other projectile components with abrupt normal retouch. The relative number of tool types did not vary to any marked degree throughout the sequence, suggesting that stone tool technology remained practically the same through out the sequence (Kinahan 1995).

Kinahan (1984) performed a detailed attribute analysis to test the observations made on assemblages from the Snake Rock Shelter and the Falls Rock Shelter using the Frequency Modulated Homogeneity Function of Beavon and attribute analysis. Kinahan (1984) summaries these results and indicates that Falls Rock Shelter assemblage, like that of Snake Rock Shelter, shows continuity between phases. He argued that the assemblages from the pre-pottery and pottery phases are so much alike that if the innovation of pottery is related to the change in the stone tool of the pastoral phase, the delay alone suggests that a more complex process took place than just a shift in the composition of the tool kit.

Generally there have been few attempts at doing *chaînes opératoires* type studies in southern Africa (e.g. Conard *et al*. 2004; Rivat 2006; Soriano *et al.* 2007). Most of these works have pointed out the usefulness of the *chaîne opératoire* approach to lithic analysis more especially in unified taxonomy of lithic reduction sequences in Europe and southern Africa.

In conclusion, basic tool making techniques in southern Africa began to undergo significant changes about 40,000 years ago. Small finely worked stone implements known as microliths became more common, while the heavier scrapers and points of the Middle Stone Age appeared less frequently. Archaeologists refer to this technological stage as the Later Stone Age. The numerous collections of stone tools from southern African archaeological sites show a great degree of variation through time and across the subcontinent. Across southern Africa about 2000 BP, lithic assemblages are found in association with early ceramics and/or domesticated sheep bones in numerous sites (Walker 1994; Sadr 1997; Robbins *et al.* 2005). Typological analysis (e.g. Deacon 1984) has been the major scheme for analysis of lithic artefacts as opposed to technological studies.

2.4 Models and ideas surrounding origins of herding and ceramics in the LSA

There is little doubt that small livestock and pottery appeared in most parts of southern Africa about 2000 years ago (Smith *et al*. 1991; Kinahan 1991; Sadr & Sampson 2006). It has long been thought that small stock herding spread throughout southern Africa from the north by migrating groups of Khoekhoe (Stow 1905; Schapera1930). Elphick (1977, 1985) proposed routes of migration (see also Ehret 1998) where one group of Khoekhoe herders migrated along eastern Botswana into the Orange and Vaal River valley systems. The other group migrated westwards into present day Namibia across the well-watered area north of the Kalahari. A third group is believed to have given rise to the 'Limpopo Khoekhoe' (Ehret 1998:219).

According to this model, ancestral Khoekhoe adopted a herding economy during contact with Bantu speaking agro-pastoralists in south-central Africa. Ehret (1998) argued that these early herders were forced to adopt a migratory way of life by the expansion of their livestock. By the last century BC early herders are believed to have already settled around the Limpopo area. Eastwood and Smith (2005) state that geometric art in the central Limpopo basin belongs to Khoekhoe herders and their arrival in the area from south-central Africa dates to about 2000 years ago.

Some linguists argue for the early arrival of Khoekhoe in South Africa but largely on the basis of archaeological evidence (Elphick 1985; Ehret 1982). Sadr (1998), however, argued that the archaeological evidence is open to more than one reading. It depends on whether one links the Khoekhoe with the appearance of sheep in the archaeological record some 2000 years ago or with the arrival of a distinctive ceramic tradition that was still in use by the Khoekhoe speaking groups at the time of colonial contact. Eastwood and Smith (2005) argue that in the central Limpopo basin material culture is not open to multiple reading. Geometric Art Tradition is posited as a means of detecting Khoekhoe presence and as providing evidence of migration of population from one area to another, carrying with them the lifestyle of herding (Smith & Ouzman 2004; Eastwood & Smith 2005).

The other route of Khoekhoe migration, besides the one proposed by Elphick (1977) was the one earlier proposed by Cooke (1965). According to him early herders moved west across northern Botswana and then southwards through Namibia. The early herders eventually reached the Cape. The proposed movement was mainly based on distribution of sheep paintings (Mitchell 2002).

Diffusion has been suggested as a possible mechanism for this initial introduction of pottery and domestic stock in southern Africa (Deacon *et al.* 1978; Kinahan 1995; Sadr 1998). Walker (1983) argued against this idea and suggested a number of problems. These include great distances involved, apparent rapidity of movement and scale of change necessary in economic terms in respect to adding herding to an existing hunter-gatherer way of life. Walker (1983) then concluded that diffusion seems unlikely and suggested that an immigrant group, the vanguard of Iron Age people (essentially pastoralists), settled in western Zimbabwe and adjacent eastern Botswana. He mentions that hunter-gatherers may have learnt the art of pot making and may have acquired livestock from these people. However, Sadr (1998) favours the diffusion model based on the clear regional diversity in the early ceramic styles and the unsynchronized appearance of livestock and pottery.

The diffusion theory has received added support from evidence which suggests that the Khoekhoe may have arrived at the Cape around the end of first millennium AD, long after sheep and pottery had reached the southern tip of Africa (Sadr 1998). Wilson (1986) pointed out that the sudden and wide spread dispersal of sheep and pottery in different regions might indicate an expansion of pastoralism rather than migration. Wilson’s ideas can directly be liked to the idea that sheep and pottery reached southern Africa about 2000 years ago by southward diffusion among various forager groups and that it was only later that the herder groups entered the region.

Sampson (1985) indicated that pastoralists have proven archaeologically elusive and the migration routes remain unsubstantiated. To carry this argument further, Sadr (1998) suggested that to clarify whether there was a migration of Khoekhoe to the southern tip of Africa one will first need to present the stylistic chain linking all the early pottery from the Cape to Botswana and Namibia. Moreover, he argues that the archaeological remains of that age show no sign of such migration, while the evidence points to the arrival of the Khoekhoe in the south-western Cape toward the end of the first millennium.

Archaeological evidence for herders in the Central Limpopo Basin and eastern Botswana is scanty and controversial (Eastwood & Smith 2005; Reid *et al.* 1998). Nonetheless, Hall and Smith (2000) suggest that the geometric tradition art appeared in the first millennium AD and associate it to early herders. This was correlated with the dating of Later Stone Age material culture in the ground deposit at two sites in the Central Limpopo Basin (Hall & Smith 2000). In support of the migration theory, Smith and Ouzman (2004) introduced some ideas based on the Khoe rock art.

Similar to the migration routes proposed by linguists for the movement of the Khoe languages (Westphal 1963; Ehret 1982, 1998) the Khoe rock art proponents link the movement of Khoe herders with the distribution of the geometric rock art from northern Botswana and northern South Africa through the central interior to the Western Cape (Eastwood & Smith 2005). Smith and Ouzman (2004) argue that if the herders were responsible for the geometric rock art then it can shed light on the ongoing migration debate. Moreover, they support the notion that herders made this art by demonstrating the link between the art and the distribution of Khoe speaking groups.

In conclusion, there are two arguments for the spread of small livestock and ceramics in southern Africa. The dominant opinion favours the migratory way (Walker 1983; Parkington 1984; Smith 1992; Huffman 2005) while others (Deacon 1984; Klein 1986; Kinahan 1995) argue that at least some of the livestock and pottery diffused southwards from one group of local hunter-gatherers to another.

2.5 Lithic technological studies and the idea of cultural continuity and change

The term technology is reserved here for a conceptual approach to prehistoric material culture. This study is concerned only with the technology of knapped stones, but one should bear in mind that technology encompasses the entire technical system used in a culture. Inizan *et al.* (1999) argue that the study of techniques does not lead to an understanding of technology alone. Indeed, when establishing chronologies, archaeologists have always been concerned about the invention of techniques, their complexity and their ability to identify cultures. The study of knapped stone was important in that it gave prominence to prehistoric studies because lithics offer the earliest evidence of a well preserved technology. However, other studies soon followed, devoted among others to organic material culture and to later inventions involving the use of fire such as ceramics, metal and glass (Mauss 1947).

The study of lithic technologies has aided in the studies of cultural continuity and change, especially in the European Mesolithic to Neolithic transition. One of the problems in attempting to identify ‘transition’ is that foraging continued as a subsistence activity well into Neolithic times (Ammerman 1989). Variation in specific tool types is therefore difficult to identify. One major difference between both periods is the increase in the numbers of scrapers during the Early Neolithic and Stafford (1999) suggests that this might be related to the increase in demand for more tangible goods such as hides or furs. The shape of the scraper also changed and while this is undoubtedly related to the shift from the use of blades to flakes it is also possible that the demand for trade goods such as hides may have necessitated the need for a scraper with a broader working area. It is also proposed that the appearance of the polished stone axe may not necessarily be connected to the appearance of agriculture and the need for forest clearance (Stafford 1999).

New evidence from the Belgian coastal lowlands presented by Crombé *et al*. (2002) indicates that key changes in microlithic armature technology coincided with the adoption of early ceramics by final Mesolithic hunter-gatherers at the site of Doel in the lower Schelde valley. These lithic changes are sufficiently diagnostic to differentiate the Doel assemblage from previous Late Mesolithic assemblages. No indications of economic activity, such as domestication or cultivation, other than that of hunter-gatherer type were associated with these finds. The final Mesolithic data from Doel was interpreted as evidence of indigenous late hunter-gatherers changing in response to contact with the earliest elements of neolithicization, well before the arrival of the fully Neolithic local Michelsberg culture. Crombé *et al*. (2002) compare the changes in the lithic tradition with similar final Mesolithic lithic changes elsewhere along the north-west European seaboard and consider them, together with early ceramic use, to be part of the first influence of Neolithic culture and the beginning of the Mesolithic-Neolithic transition in this part of north-west Europe.

2.6 The Archaeology of Toteng and Mphekwane

The Toteng site was discovered near Lake Ngami in 1988 by Alex Campbell while undertaking a pre-development archaeological survey of riverine areas at that time programmed for a dam and reservoir (Campbell 1992). Excavations at the site commenced in 1991 and a stratigraphy was uncovered spanning the period when early livestock and thin walled ceramics appeared in the area (Robbins *et al.* 2005). These discoveries later attracted many reseachers to the site. Toteng is situated in northern Botswana, an area considered as the homeland of the early herders prior to migrating into southern Africa (Westphal 1963; Elphick 1977; Marshall 1998).

Huffman (1994) analysed the thin walled ceramics, Bambata ware, from Toteng and argued that since Toteng appears to be a village, there is a possibility of recovering a full assemblage. Nonetheless, to date the Toteng sites have produced a small sample. Despite this Huffman (1994) contested that Bambata pottery clarifies the Early Iron Age in southern Africa. He viewed Bambata ware as coming from Angola to such places as Toteng in Botswana. However, his views have slightly changed in his recent paper (Huffman 2005). According to Huffman (2005) Bambata pottery requires two explanations for two different archaeological contexts. He argued that the style originates among the farming communities in Angola and first spread into south-eastern Africa with hunter-gatherers. He further attests that Bambata ware in eastern Botswana and western Zimbabwe was made by the Bantu speaking communities (Huffman 2005).

Because of the great interest in the initial discoveries several additional projects were carried out at Toteng (Sadr 1997; Reid *et al.* 1998; Robbins *et al.* 1996). The most recent was primarily intended to obtain AMS dates directly on livestock bones and also to obtain OSL ages on sediments and learning about the palaeoenvironmental context of the site. The new dates resulting from this recent study of the Toteng sites have shown that cattle and sheep were present here at approximately 2000 years ago and that cattle and sheep were present in the Toteng area for a long period (Robbins *et al*. 2005)

The archaeology of the Makgabeng Plateau covers the time period from about the Stone Age era to the beginning of the historical and colonial period in the area at about 1840**.** The area is rich in archaeology, including some of the most spectacular and diverse rock art found in South Africa and important Iron Age cultures in Makgabeng. The history of European settlement and influence over the past two centuries is extremely interesting and important within the South African political context. Due to the remoteness of the area, indigenous culture and technology are well preserved.

The rock art of the Makgabeng plateau is not as well known as the rock art from other areas, and consequently was never researched professionally until 1991 (Eastwood & Eastwood 2002; Eastwood 2003). The majority of known sites are found in the western part of the mountains, but this disparity may be a result of the limited research done to date in the eastern sector. Moving outside the quartzitic mountain ranges into the north-eastern part of the area, where the sandstone sedimentary hills and ridges occur, there is an increase in rock art sites (Hall & Smith 2000). The preliminary surveys that have been done in the western and central mountains have documented rock art that displays a surprising range of imagery whose authorship is attributed to San hunter-gatherers, Khoekhoe herders and Northern Sotho artists (Blundell & Eastwood 2001).

2.7 Debates concerning the origin and spread of Bambata pottery

Bambata ceramics were first discovered at the Bambata Cave site in Zimbabwe in 1919 and were first analysed in the 1930s (Jones 1940; Schofield 1940). Various cultural, economic or technological groups have been proposed as makers, users or depositors of the Bambata pottery (Schofield 1940; Cooke 1963; Summers 1961; Robinson 1966; Huffman 1994, 2005). Cooke (1963) explained that Bambata ware was made by Earlier Iron Age agriculturalists. Later Stone Age hunter-gatherer groups later picked it up and took it to their rock shelters. Robinson (1966) claimed that early agricultural groups made it. Denbow (1984) suggested that Bambata pottery was associated with semi-sedentary stone tool using hunter-gatherer groups, while Wadley (1987) suggested it was passed to hunter-gatherer groups from early agricultural communities.

According to Huffman (2005) Bambata pottery requires two explanations for two different archaeological contexts. He argues that the style originates among the farming communities, probably Benfica in Angola, but it first spread into south-eastern Africa with hunter-gatherer groups about AD200. Bambata ware in eastern Botswana and western Zimbabwe arrived about AD350 and was made by the Bantu speaking communities (Huffman 2005). Contrary to this, Smith and Ouzman (2004) argue that even though Bambata ceramics are found in older layers the cultural origins for the ware still remain uncertain.

The debates surrounding Bambata ceramics are significant because the ceramics are associated with early evidence for domesticated sheep (Robbins *et al.* 2005). Some researchers tend to see both as part of a package introduced at the same time (Deacon *et al.* 1978: Deacon 1984; Klein 1986; Smith 1992). The assumption is challenged by Kinahan (1995) whose analysis of material from the Falls Rock Shelter and the Snake Rock Shelter indicated that pottery, at least in Namibia, was present more than 1000 years before domestic animals. In northern Namibia, Smith and Jacobson (1995) identified an occurrence of domestic stock in levels dating to c. 1800 years ago with ceramics in earlier levels. Further south in the Cape, Sealy and Yates (1994) dated sheep bones at Kasteelberg A and obtained younger dates than the radiocarbon dates from pottery-bearing layers.

Alec Campbell (1992) conducted the pioneering excavation at Toteng in northern Botswana. It was established that the Toteng site contained refuse middens with Bambata pottery and early evidence for domestic stock, in the form of bones of sheep and/or goats (Campbell 1992). Huffman (1994) concluded that Toteng 1 was an Iron Age agricultural village. Robbins *et al.* (2005) associate the charcoal and AMS dates with Bambata ceramics. However, Huffman (2005) has argued that these dates are ambiguous. Given that the origin of the Khoekhoe lie there, northern Botswana is given paramount attention in the investigation of early herders (Smith 1992; Elphick 1985; Boonzaier *et al.* 1996).

Further south, at Kasteelberg A and B, as well as other sites on the Cape coast, Cape Coastal ware had been found. These types of ceramics have also been found in several other sites postdating 2000 years ago in the western and southern Cape. Interestingly, these ceramics include the pottery style believed to be of the historic Khoe (Rudner 1968; Klein &Cruz-Uribe 1989).

In a nutshell, this chapter is a survey of literature on the ceramics Stone Age archaeology of southern Africa. It also touches upon the history and development of *chaînes opératoires* in Europe as well as reduction sequence in America. Included also is the review of the history of lithic analysis in the Later Stone Age archaeology of southern Africa. Furthermore, models and idea surrounding the origin and spread of ceramics are highlighted. The archaeology of the study areas and the debate surrounding the Bambata ceramics are also reviewed. The next chapter is the presentation of how the study was undertaken. The methods of how data were captured and analysed are discussed in this chapter. Moreover, limitations of this study are discussed and maps that show study areas locations in southern Africa are included.

Chapter 3

3.0 PRESENTATION OF SITES STUDIED: CONTEXT AND LITHIC CORPUS

3.1 Introduction

In this study lithic artefacts are approached from a technological viewpoint. The Classic division in lithic studies has been between typology and technology. In practice dividing these two is problematic. Lithic reduction is a continuous process through the lifetime of a flaked stone (Sellet 1993). The typological approach traditionally classifies not only the end-products of the manufacturing process, formal tools, but also the flaking waste and cores (Andrefsky 2001; Dibble & Rolland 1992). For this study, the material from the Mphekwane shelter was typologically classified by Mr. Jayson Orton of University of Cape Town and material from Toteng was typologically classified by Mr. Alec Campbell.

The technological approach classifies the varying methods of lithic manufacture, which are the human actions that created the tools. The basics of technological terminology are described after Inizan *et al.* (1999). This Analysis follows the concept of *chaînes opératoires* (operational sequences). As mentioned in the previous Chapter, the *chaînes opératoires* approach builds on the basis of two intersecting French intellectual traditions: on the one hand the work of archaeologists and on the other anthropologists who engaged explicitly with the cognitive aspects of behaviour (Schlanger 1994).

Using the concept of *chaîne opératoire*, this study focuses mainly on two contemporary Bambata pottery sites. Assemblages from two different phases, Pottery and pre-Pottery, are compared: one from the Toteng 1 site in northern Botswana and the other from the Mphekwane Rock shelter in the Central Limpopo Basin of South Africa (Figure 3.1). Excavations from both sites have produced pre-pottery and pottery levels with lithic artifacts. Below the two sites and the *chaîne opératoire* approach are described in detail.

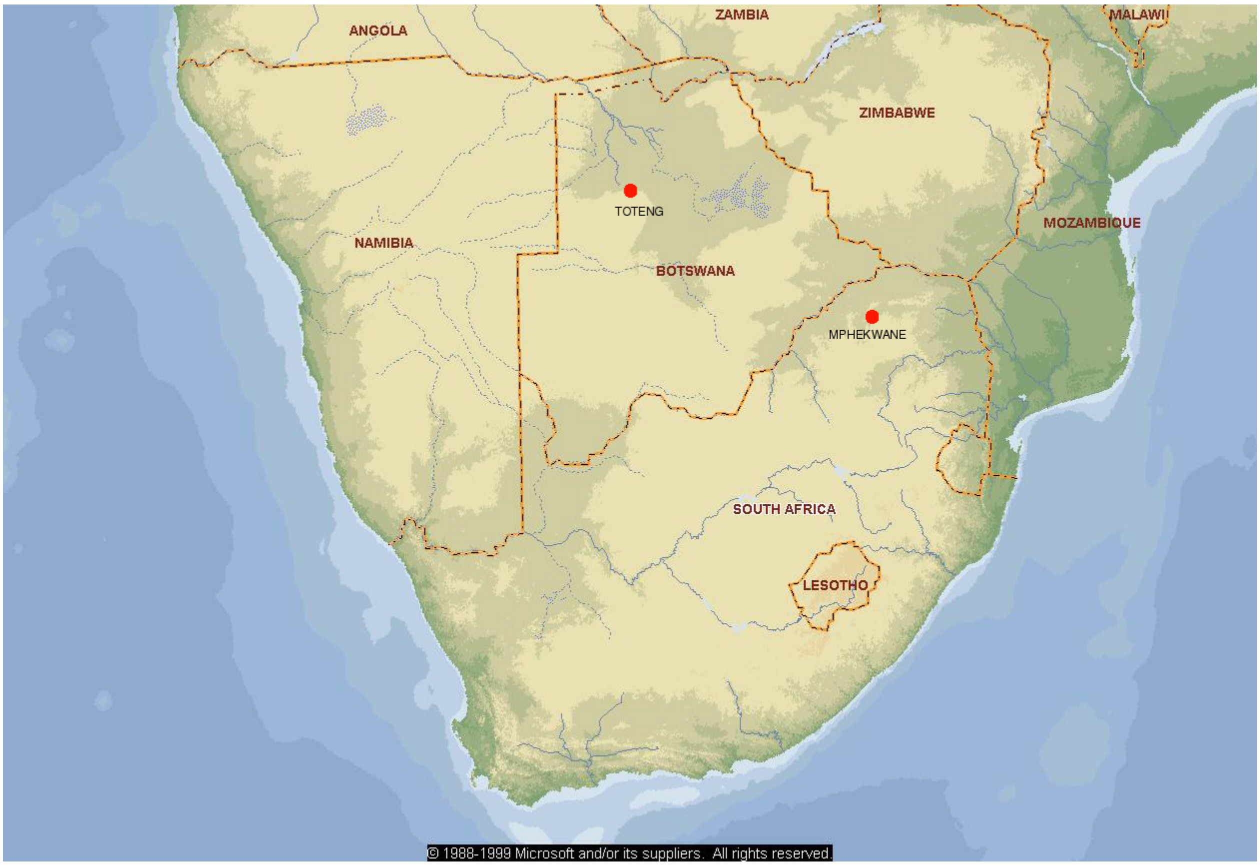


Figure 3.1 Map of southern Africa showing Mphekwane and Toteng 1(map from Microsoft Encarta)

3.2 Toteng 1

The Toteng 1 site is situated in sandy deposits at the confluence of the Nchabe and Kunyere Rivers in the northern part of Botswana. The water from the Nchabe and Kunyere Rivers flows to Lake Ngami which is located at the end of Okavango Delta. The eastern side of Lake Ngami is confined by the Magotlwanen Ridge, a pronounced feature at 936 m (Robbins *et al.* 2005). Lake Ngami stood between 928m and 930m in 1850s (Anderson 1888; Livingstone 1857). Shaw (1985) suggests that Lake Ngami became a closed lake in the 1880s. The lake is essentially in the Kalahari sands which cover a large portion of southern Africa.

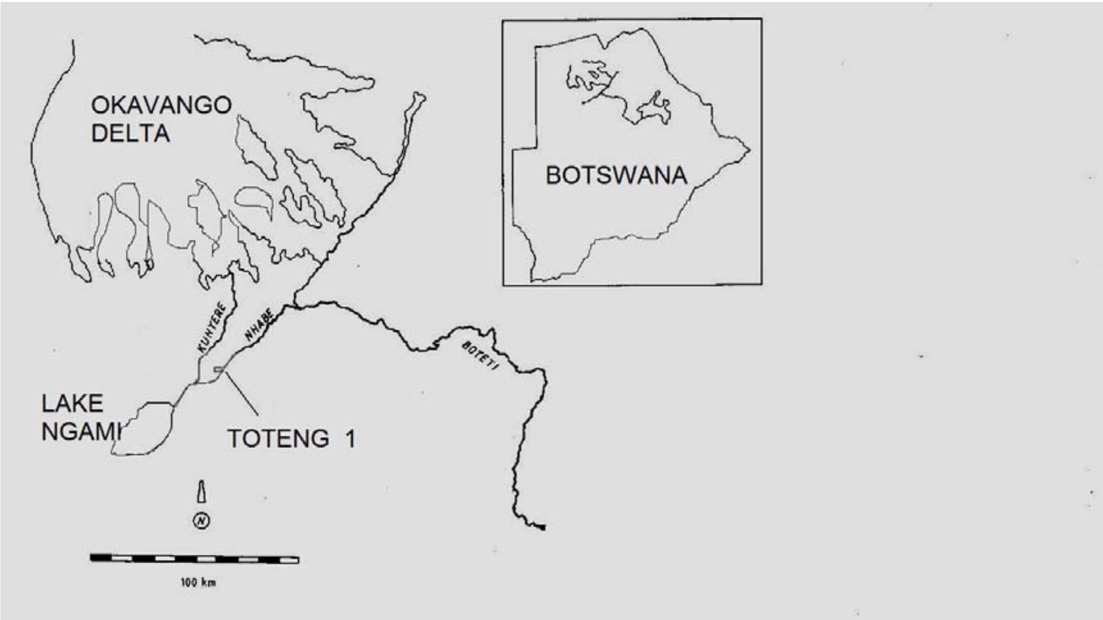


Figure 3.2 Location of Toteng 1 in relation with the Okavango Delta and Lake Ngami (From Reid *et al.* 1998:90)

The initial survey for the Toteng 1 site was undertaken in July 1988 by Alec Campbell. At the time there was no surface water in the Nchabe River and only a series of disconnected pools in the Thamalakane and Boteti Rivers. However, there was a reasonable rainy season and a considerably undergrowth. Numerous archaeological remains were found in the river beds and along the slopes of their banks. About 30 sites were reported and recommendations made according to the requirements of the Botswana National Museum. Among the sites which were included in the report submitted to the museum, the Toteng 1 site was recommended for excavation (Campbell 1992).

Alec Campbell first excavated the Toteng 1 site in 1991 during the archaeological impact assessment for the Maun reservoir project. The finds from the excavation were subsequently published the next year (Campbell 1992). The Toteng 1 site excavation involved the digging of six test pits in 20cm levels (Figure 3.3). A white band about a centimetre thick was found at a depth of 65 cm in all the test pits from Toteng 1. This band appeared to consist of sand mixed with calcrete dust. The band probably represents the land surface and the 65 cm of deposit on top were dumped on the site during the construction of the road (Campbell 1992)

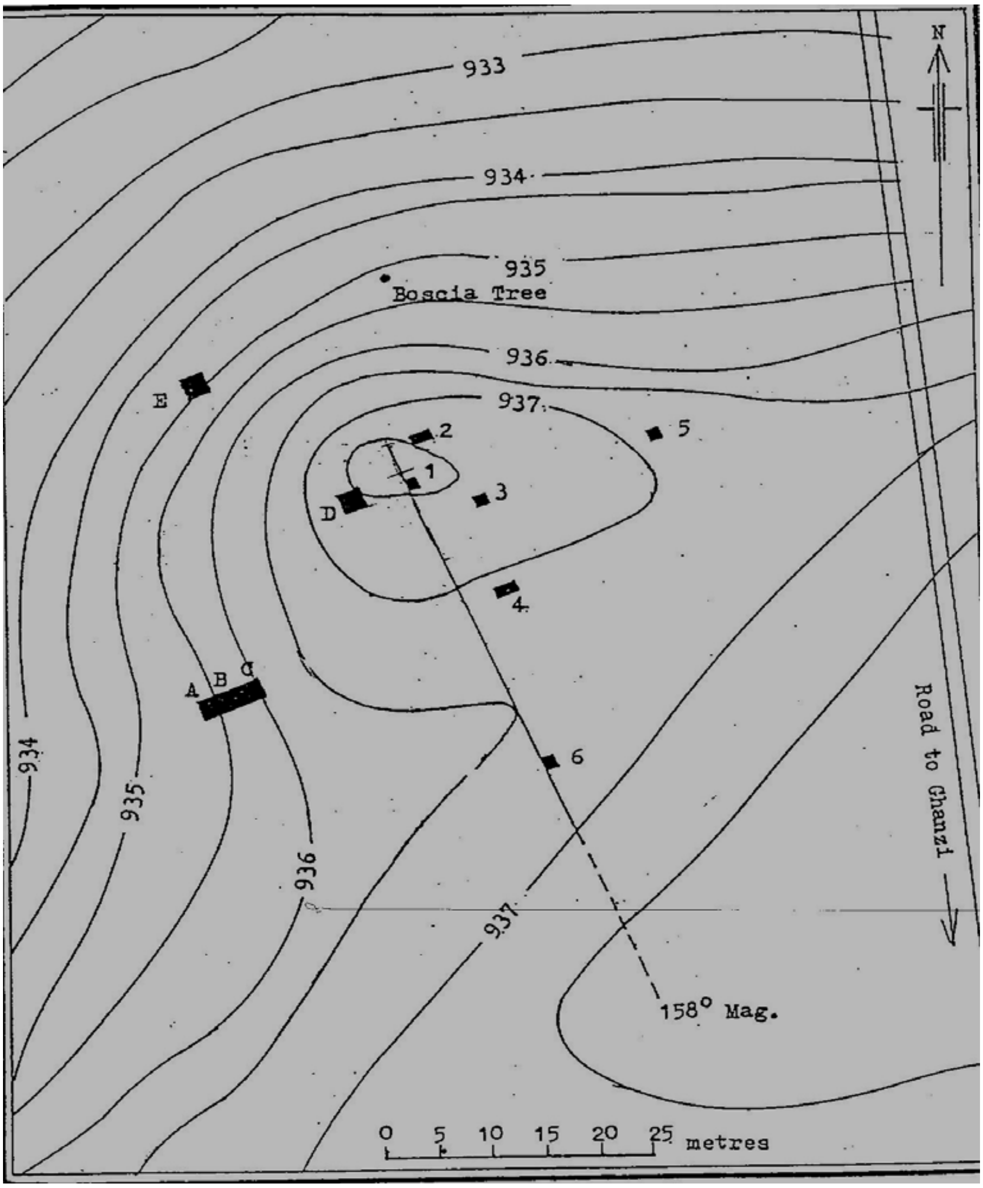


Figure 3.3 Toteng 1 site plan showing square ABC (Campbell 1992:35)

Test pits A, B and C, each 2m by 2m, were dug by Alec Campbell down to a level approximately two metres below the surface. The stratification in these squares was similar. A midden was disclosed from these squares and commenced from about 60-70 cm level. These squares yielded much faunal remains, stone tools and Bambata ware in addition to other kinds of pottery, as well as historic material. The context of the Bambata ware was in the midden, about 50cm in thickness (Campbell 1992, see also Huffman 1994). Figure 3.4 below shows the stratigraphy from Campbell's (1992) report.

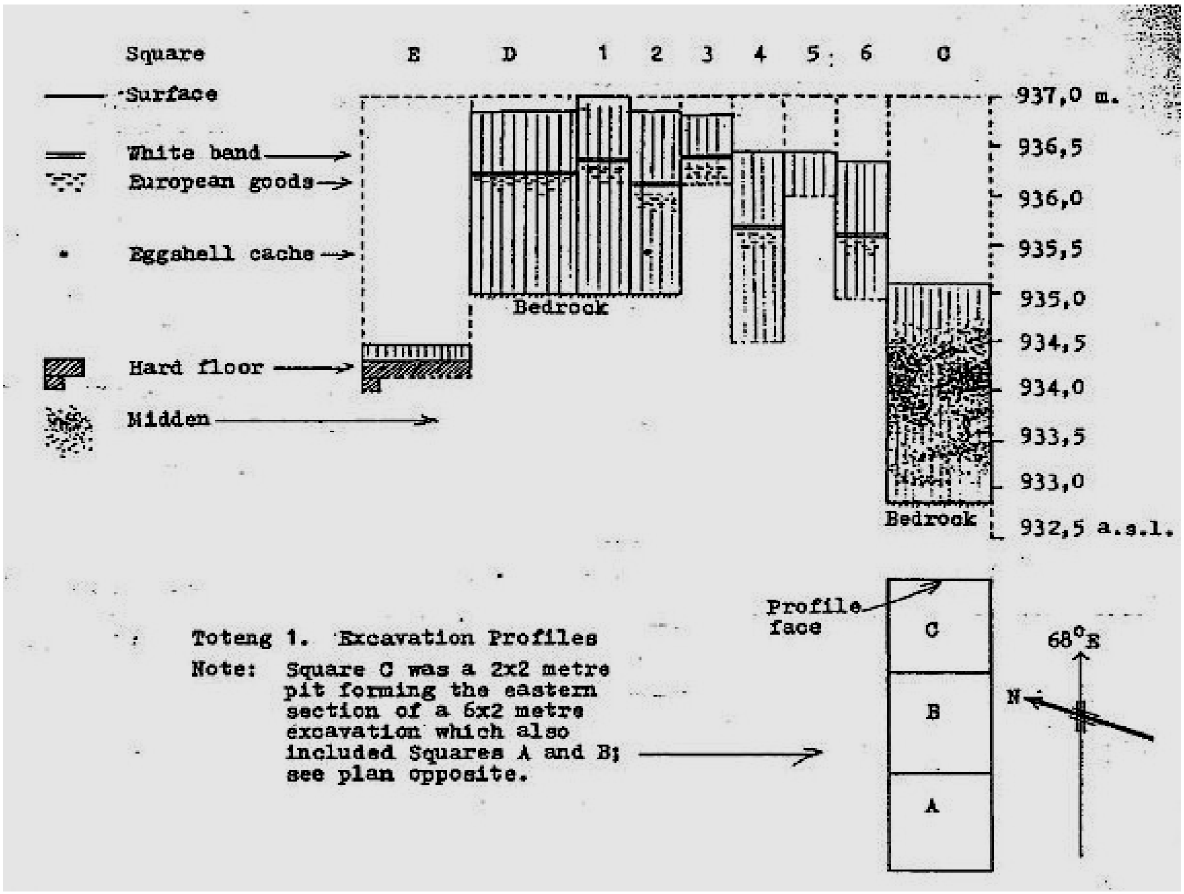


Figure 3.4 profile from Campbell's (1992:36) excavations

Dates obtained from Toteng range from AD 10 to AD 410 (Campbell 1992). An average age of approximately AD 240 was suggested for the Bambata pottery and livestock at Toteng, while the Later Stone Age deposit, underlying the Bambata midden was dated to about 700 BC (Campbell 1992). The new AMS dates have shown that domesticated livestock were present at Toteng 1 by approximately 2000 years ago (Robbins *et al.* 2005).

A sample of 775 lithics was analysed from the Toteng 1 site. These include all the cores, flakes, blades and formal tools from the pre-Pottery and Pottery phases. There were some problems encountered with this sample. Some pieces which are documented in Campbell (1992) are missing from the collection in the National Museum of Botswana.

3.3 The Mphekwane shelter

The Mphekwane shelter is located on the Makgabeng plateau in the Limpopo Province of South Africa at 23˚16’20”S, 28˚49’50”E. The site was brought to the attention of the excavator, Dr Karim Sadr, by Mr. E. B. Eastwood who conducted a survey of the plateau looking for Rock Art (Eastwood & Smith 2005).

Figure 3.5 Mphekwane in relation to the Limpopo River (Background map from Microsoft Encarta)

There are many rock painting in the Mphekwane shelter which includes a procession of four fat tailed sheep. In addition, thin-walled potsherds of a type known as Bambata ware are found on the floor of the shelter (Schofield 1940; Walker 1983). This ware is believed to date to the first half of the first millennium AD (Walker 1983; Huffman 1994, 2005; Sadr 1998; Robbins *et al.* 2005; Sadr & Sampson 2006). Amongst other finds are the masses of stone tools on quartz and other stones. All these finds might help shed light on how livestock and pottery technology were introduced to southern Africa. The debate is whether migrating populations were responsible for the spread of livestock and pottery across southern Africa or whether local hunter-gather groups gained these through diffusion and exchange. The idea is to look at lithic technological style to see if there is more change or continuity across the ceramic and livestock boundary.

In 2005, 2006 and 2007, a team composed of local residents and archaeologists from Wits University excavated a total of nine square meters in the Mphekwane rock shelter. The excavation was placed at the edge of a large ashy patch which occupies the northwest corner of the cave (Figure 3.6).

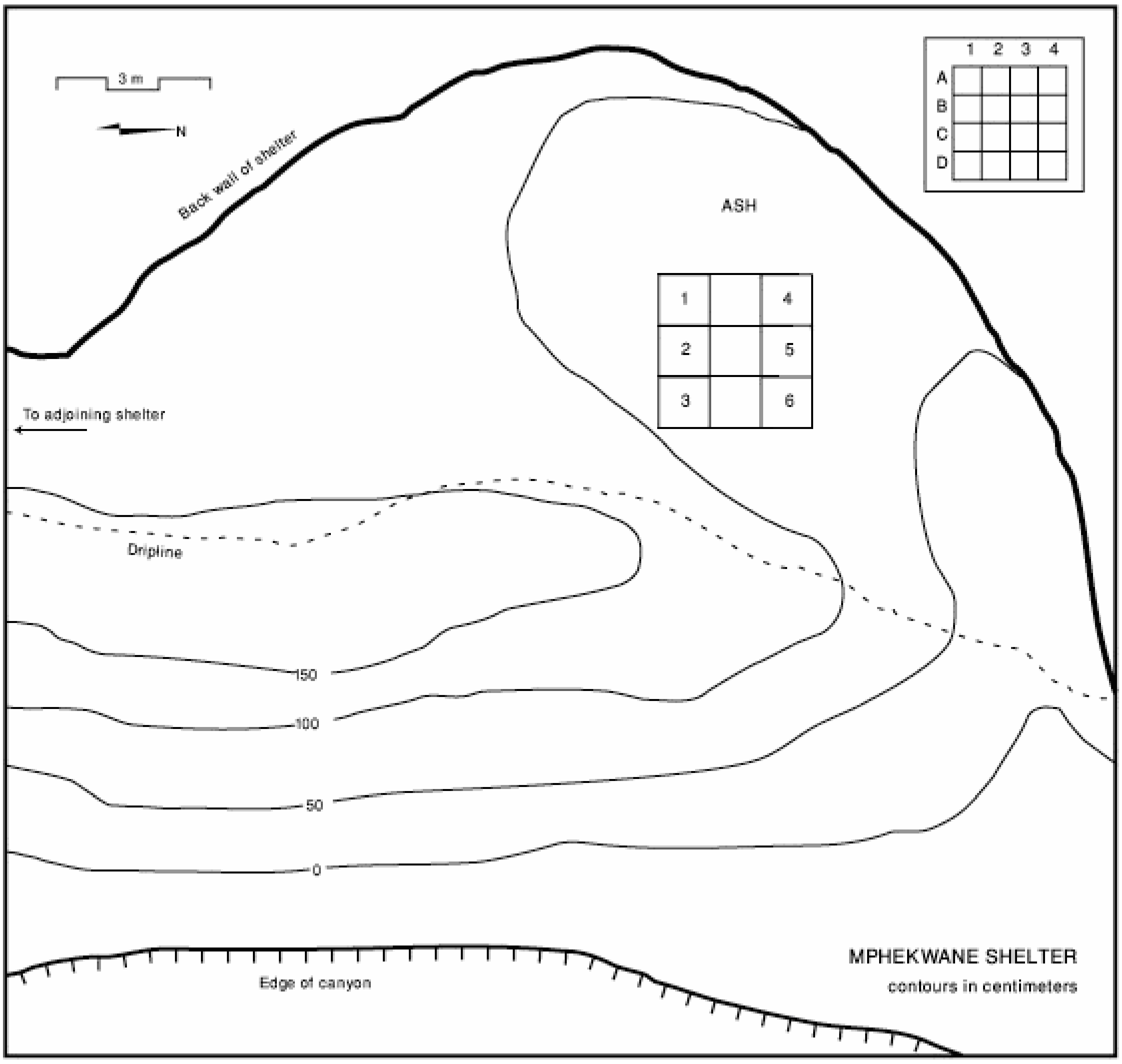


Figure 3.6 Mphekwane Shelter site plan

The numbering system of the square meters is chronological, with square 1 being the first and square 9 the most recently excavated. The technique of excavation was similar to the technique used by Sampson *et al.* (1989) in the Seacow Valley Rock Shelter. Each square meter was dug in 16 quads of 25 cm by 25 cm in area and each quad in spits on average 3 cm thick. The method allows individual finds to be plotted to within 25cm horizontally and within 2.5cm to 5cm vertically, and thus a high resolution reconstruction on paper of the cultural stratigraphy, independent of the visible natural strata.

The natural stratigraphy in the Mphekwane excavations was limited. In some squares different strata could be distinguished. For example, in the north profile of square 1, a grey upper stratum could be easily distinguished from the gravelly orange lower one. The same is true for square 2. Nonetheless, the grey and gravely orange layer in square 2 gradually merged to grey. Square 3 had no distinct strata and only undifferentiated grey sediments could be observed from top to bottom. In squares 4, 5 and 6 an upper light grey and a lower darker grey stratum could be identified on the south facing profile (Figure 3.7)

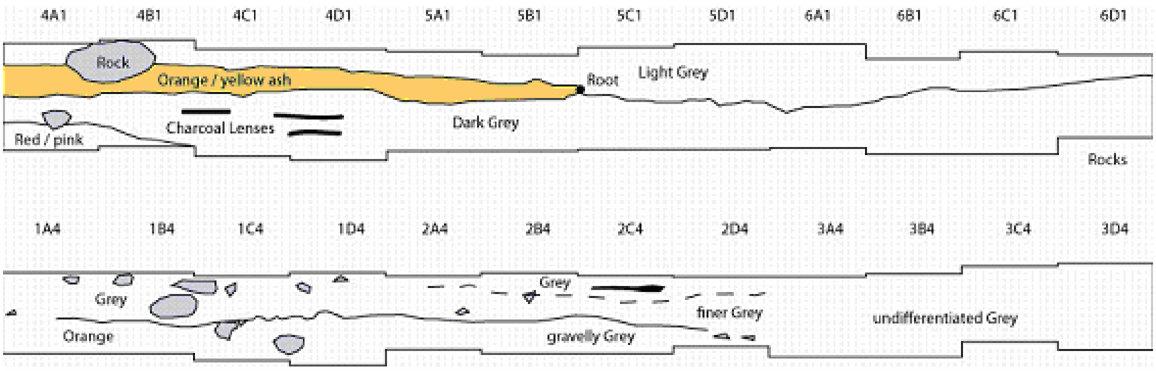


Figure 3.7 Mphekwane profiles from square 1 to 6 (Dates: 160±40 BP obtained from M1.A4.5; 360±40BP from M3.C4.3; 2320±40 from M3.D2.3; 14380±70 from M6.A1.7; 15250±80 from M5.D1.8)

Several samples were recently dated from the Mphekwane Shelter and the dates range from 160 to 15, 250 years ago. The pottery phase may date to as much as 2300 years ago, which would mean it is among the oldest dates in southern Africa (cf. Sadr & Sampson 2006). Some significant problem with the Mphekwane assemblage is the date difference from the pottery and pre-pottery phases. The difference is more than 10,000 years which is a long gap for this study. The lithic sequence however suggests a smaller gap. However, more dates are on the way.

3.4 *Chaîne opératoire*

For artefact analysis in both sites, the *chaîne opératoire* approach was used. As already mentioned, on the comparison of traditional typologies and technological ones, typological approach traditionally classifies only the end-products of the manufacturing process, the tools, but also the flaking waste and cores can be classified typologically (e.g. Andrefsky 2001) while technological approach classifies varying methods of lithic manufacture, i.e. human actions that created the tools, instead of just doing tool typology the tools. One important point on the *chaîne opératoire* approach is the importance of isolating the ʻprimary intention' of the knapper. This is because there are differences in the use of raw material for manufacturing different tools. Quartz has been the predominant material for most of the tool types. This is well understood on the basis of the local abundant of quartz sources. However, based on the excavated assemblage, the analysed materials were exclusively made of non-Quartz. This could be explained by the mechanical processes behind the fracturing of differing raw materials: it is difficult to get long and thin blanks needed for the point production from quartz. For artefact analysis in the Mphekwane shelter and the Toteng 1 sites, the *chaîne opératoire* approach was used and encompassed four steps:

1. The first step was to separate the artifacts by raw material. This is because the type of raw material influences the knapping process. Within each raw material class, cores were separated from by-products. These were then separated into classes with or without cortex. These give a preliminary idea about the sequence of production of each artifact. As cortex rate diminishes so does the artifact size through the knapping process (Dibble *et al.* 2005)

2. The second step was to understand the technique and method used to produce the assemblages. Within each category in step one, artefacts would be separated according to the technique used to produce them following criteria used by Soressi (2004: 343-346). By observing the organisation of removal of each piece it is possible to reconstruct a short sequence for each piece, and by putting these in sequential order one would be able to reconstruct the main operational chain used to produce the assemblage.

3. The third step is aimed at reconstructing the morphological characteristics of the products of the operational chain, which are controlled by the technique and method used to produce them.

4. The last step consists of determining if each step of the operational sequence is present for each raw material within the assemblage.

In addition, attribute combinations judged relevant during classification of artifacts, such as platform preparation and platform morphology, are quantified to allow the use of descriptive and comparative statistical tests.

Raw material plays an important role in stone tool technological analysis. As Andrefsky (1994) has argued, availability of raw material may be the most important issue in the organisation of technology. Abundance and quality of lithic raw material condition the production of tool types and technique used to produce them. Therefore, in both the studied sites, sourcing for the raw materials used in tool production was attempted to see which raw materials are available locally and which are not.

3.4.1 Attributes of Focus

As will be seen in the next chapter, four major categories from both sites were studied and these are cores, flakes, blades and formal tools. This meant selecting all cores, core fragments, flakes, blades and tools. All chunks, broken flakes without platforms and chips were excluded from this research's technological analysis. For the Mphekwane shelter, all artefacts from quartz raw material were excluded in the analysis because quartz raw material is not suitable for this type of analysis and the available non-quartz raw materials formed a large enough sample. The four classes were compared from the Pottery and pre-Pottery layers at each site. The idea is to look at technological change across the pottery boundary.

a. Cores

These are blocks of raw material from which flakes, blades and bladelets have been struck in order to produce blanks for tools (Inizan et al. 1999). Cores were classified according to their raw materials. Morphological details, such as direction of removals, were then used to categorise cores according to specific classes (such as bidirectional bladelet cores). The techniques such as bipolar or direct percussion were examined and where possible hammer mode, whether hard or soft, was identified. For reconstruction of *chaînes opératoires*, cores were classified into blade production cores (bladelets cores) and flake production cores (irregular cores). Cores are illustrated in the appendix.

b. Flakes

Flake is a general term referring to a fragment of stone that is removed either from a core during preparation (preliminary flakes) or from a prepared core (knapping or debitage flake. As will be seen in the following chapter, flakes were analysed by the amount and location of cortex.

c. Blades

A blade is a flake that has a length at least twice its width, while a bladelet is a small blade less than 2.5 cm (Inizan *et al.* 1999). For this research, the analysis of blades is modelled on Soriano's approach on the Rose Cottage Cave blades (Soriano *et al.* 2007). Blade classification was based on its position on the core production surface and amount of cortex on them. Other criteria used to determine or diagnose percussion technique are morphological metric attributes, platform preparation and measurements. For measuring the blades platform thicknesses and width, a digital calliper was used while for length a graph paper was used. All these were later used to reconstruct the *chaînes opératoires* of blades at both sites.

d. Tools

Formal tools refer to any artefacts that show traces of retouch. These include pieces made on knapped blanks (e.g. end scraper on blade) or on natural blanks (e.g. Scraper made on a slab). Formal tools from both sites were classified following Deacon's (1984) typology and by using the existing typologies for both the Mphekwane Shelter (Orton 2006) and the Toteng 1 site (Campbell 1992). In the final chapter formal tools are compared to other assemblages from southern African to get the bigger picture.

3.5 Limitations

There were some problems encountered during this research. At Toteng 1 there are numerous limiting factors. Among others is the fact that the excavation took place about two decades ago. There are a lot of artefacts missing in the assemblage stored in the Botswana National Museum. However, the numbers from Alec Campbell's (1992) report were cautiously used for reference.

The Mphekwane shelter collection posed fewer limitations. All the artefacts came from recent excavations. Many, however, were coated by a tough layer of ashy substance which required quite an effort to clean. The Mphekwane assemblage is dominated by quartz. For *chaînes opératoires,* this raw material is very difficult to analyse because of its flaking properties (Bracco 1997; Collina-Girard 1997; Cornelissen 2003). Quartz was therefore excluded in this research. However, the sample size for the Mphekwane Shelter remains large.

3.6 Summary

In summary, the research is focused mainly on two contemporary sites with Bambata pottery. Assemblages from Toteng 1 and the Mphekwane Rock shelter in northern Botswana and the central Limpopo basin are analysed technologically. Excavations from both sites have produced pre-Pottery and Pottery levels with lithic artefacts. The debate is whether migrating populations were responsible for the spread of early pottery across southern Africa or whether local hunter-gather groups gained these through diffusion and exchange. The idea is to look at lithic technological style to measure change and continuity across the ceramic boundary. The next 2 chapters are a detailed analysis of lithics from the pottery phases and the pre-pottery phases of the two sites.

Chapter 4

4.0 THE TOTENG 1 LITHIC ANALYSIS

4.1 Introduction

This chapter is a presentation of the technological analysis of lithic assemblages from the Toteng 1 site. It has been argued by Inizan *et al.* (1999) that a stone artefact, be it a tool or a waste product, is part of a technical operation, all elements of which are interdependent. The main focus will be on four categories: cores, flakes, blades and formal tools. Each category is closely analysed and then observed within the assemblage to understand the different *chaînes opératoires*.

The questions that have been raised in the analysis of the data include: the variability of the raw material; in what form was the raw material introduced into the sites (as nodules, prepared or exploited cores or as products) and what are the different *chaînes opératoires* in the assemblages?

An emphasis on blade or bladelet technology is observed at both sites. Different aspects of blades are measured and discussed in this chapter. Tool typology will also be presented and the degree of homogeneity in the assemblages will be examined. For the formal tools, further comparisons with other southern African sites are performed in Chapter 7.

4.2 Toteng 1

Material from A.C. Campbell’s 1991 excavation of Toteng 1 is analysed. The site is open air and located at the eastern end of the Lake Ngami near the confluence of the Nchabe and Kunyere Rivers (Campbell 1992). Toteng 1 is particularly important because of the stratigraphic sequence in which Later Stone Age material was found associated with wild fauna. These materials were found below the Bambata midden which consisted of, among other things, the Bambata pottery, Later Stone Age lithic artefacts and domestic cattle and sheep (Campbell 1992; Huffman 1994).

Table 4.1 Chronology of the layers at Toteng (Campbell 1992)

Phase	Layer	Date
Pottery	70cm	1820+/-50 BP
	80-100cm	1990+/-60 BP
Pre-pottery	170-180cm	2640+/-70 BP

Other dates from charcoal and AMS on livestock that are associated with Bambata pottery, or obtained from beneath the main concentration of the thin-walled sherds include four that form a coeval set. These range from 1820 to 2070 BP and have a weighted mean of 1990 years ago (Campbell 1992; Robbins *et al.* 2005). Lying in an area that is believed to be the gateway for the entrance and dispersal of livestock into southern Africa, Toteng 1 holds a significant value to archaeologists because domestic stock and Bambata pottery were discovered here (Robbins *et al.* 2005)

4. 3 Sorting and sampling procedures

The study required sorting of artefacts from selected layers of the Toteng 1 site. This meant selecting all flakes (complete or broken but with a platform) greater than 1 cm. All cores, core fragments, tools, tool fragments and all blade and blade fragments are selected regardless of size. Chunks, chips and flake fragments (broken flakes without platform) of any size are excluded from technological analysis, but consist of large categories and remain available if specific analyses are desired. Sampling procedures are based on the principle of studying widely separated layers in order to make sure that the layers are not mixed.

The Toteng 1 material was obtained from the Botswana National Museum. These are lithic artifacts from Campbell’s (1992) excavations. Artefacts from the top, middle and bottom levels of squares A, B and C were analysed. A sample of 775 artefacts studied was taken from a total of 2,496 lithic artifacts.

Table 4.2 the lithic artefacts from selected layers of Toteng 1 used in present study.

Classes/ Phase	Cores	Flakes	Blades	Tools	Total
Pottery	8	63	48	19	**138**
%	*5.8*	*45.7*	*34.8*	*13.8*	***100***
Middle	8	121	60	8	**197**
%	*4.1*	*61.4*	*30.5*	*4.1*	***100***
pre-pottery	28	165	216	31	**440**
%	*6.4*	*37.5*	*49.1*	*7.0*	***100***
Total	**44**	**349**	**324**	**58**	**775**
%	***5.7***	***45.0***	***41.8***	***7.5***	***100***

Some pieces were missing in the collection and these are counted under the "other" classes and sketch drawings from Campbell (1992) were cautiously used to diagnose them whenever possible. Within each phase, Pottery, Middle and pre-Pottery, all identified classes of cores, flakes, blades and formal tools were studied. A general observation made on this assemblage is that flake production dominates the pottery phase while the pre-pottery phase is dominated by blade/bladelet production. Formal tools increase in frequency during the pottery phase.

4.4 Raw Materials frequencies at Toteng 1

The Toteng 1 lithic assemblage is characterized by a wide range of raw materials. A summary of each raw material and their quality in lithic reduction is as follows:

Quartzite is a tough stone composed almost entirely of quartz grains, derived from sandstone. Sandstones turn into quartzite in two different processes. In the first process, under the high pressures and temperatures of deep burial, the mineral grains recrystallize and all traces of the original sediments are erased. The result is called metaquartzite. The second process involves low pressure and temperature, where circulating fluids fill the spaces between sand grains with silica cement. This kind of quartzite, orthoquartzite, is not strictly speaking a metamorphic rock because the original mineral grains are still there, and bedding planes and other sedimentary structures still evident (Heaney 1994). It is argued that quartzitic raw material is not necessarily difficult to work with in terms of knapping (Inizan *et al.* 1999), however, analysis may be made difficult by the fact that ripple and hackle marks are far less evident as compared to ripple and hackle marks in homogenous fine-grained raw materials (Soressi 2004). A wide range of quartzite occurs in varying colour and texture and can take the form of river cobble and pebbles, as well as natural outcrops (Rapp & Hill 1998).

Chalcedony is a cryptocrystalline form of silica, composed of very fine intergrowths of the minerals quartz and moganite (Heaney 1994). These are both silica minerals, but they differ in that quartz has a trigonal crystal structure, whilst moganite is monoclinic. Chalcedony has a waxy lustre, and may be semitransparent or translucent. Its color is usually white to gray, grayish-blue or a shade of brown ranging from pale to nearly black. Other shades have been given specific names. A clear red chalcedony is known as carnelian or sard. A green variety colored by nickel oxide is called chrysoprase. Prase is a dull green. Onyx has flat black and white bands. Plasma is a bright to emerald-green chalcedony that is sometimes found with small yellow spots of jasper. Heliotrope is similar to plasma, but with red spots of jasper, hence its alternative name of bloodstone. Chalcedony occurs as river cobbles and pebbles. Chalcedony with concentric banding is known as agate (Heaney 1994). Chalcedony, chert and flint rocks are similar. Experimental replications have shown that flint has as high a knapping quality as chalcedony (Soriano *et al.* 2007; Mourre pers. comm. 2007).

Silcretes come from very hard layers of silica-enriched materials formed beneath the surface in soils, unconsolidated sediments, and permeable rocks. These materials range from silica-cemented sand and gravel to an amorphous matrix enriched with small silica particles (Heaney 1994). Although not restricted to arid regions, silcrete zones are found in many deserts. In the Kalahari Desert of southern Africa, they occur widely as layers within sandy surface deposits, and they are also found along old, dry river courses such as the Molopo River (Summerfield 1983). These buried silcrete layers can be virtually impenetrable (Heaney 1994).

Chert is a fine-grained silica-rich cryptocrystalline sedimentary rock that may contain small fossils. It varies greatly in color from white to black, but most often manifests as gray, brown, grayish brown and light green to rusty red; its color is an expression of trace elements present in the rock, and both red and green are most often related to traces of iron (in its oxidized and reduced forms respectively). Jasper is basically chert which owes its red color to iron inclusions. Chert outcrops as oval to irregular nodules in greensand, limestone, chalk, and Dolerite stone formations as a replacement mineral, where it is formed as a result of diagenesis. It also occurs in thin beds, when it is a primary deposit. Chert is generally considered to be less attractive to flint-knappers, but it is more common than flint, although the two materials are closely related. In geological terms flint and chert are the same, with the term flint referring to chert found in chalk (Heaney 1994). Knapping quality for flint and chert raw materials are high (Soriano *et al.* 2007). In Toteng 1, this raw material occurs locally in Nchabe riverbed adjacent to the site (Robbins *et al*. 2005).

Other raw materials in this category include pieces that occur in small numbers such as sandstone, shale and pieces of unknown type. It also includes pieces that are documented in the Campbell (1992) report, but are not found in the collection at the Botswana National Museum.

Table 4.3 Raw Materials frequencies at Toteng 1

Phase	Quartzite	Chalcedony	Silcrete	Chert	Other	TOTAL
Pottery	34	62	13	12	17	**138**
%	*24.6*	*44.9*	*9.4*	*8.7*	*12.3*	***100***
Middle	19	135	21	9	12	**196**
%	*9.7*	*68.9*	*10.7*	*4.6*	*6.1*	***100***
Pre-pottery	68	173	68	53	79	**436**
%	*15.6*	*39.7*	*15.6*	*12.2*	*18.1*	***100***
TOTAL	**121**	**370**	**102**	**74**	**108**	**775**
%	***15.6***	***47.7***	***13.7***	***9.5***	***13.5***	***100***

As mentioned, one characteristic of the Toteng 1 lithic assemblage is the use of many different raw materials, and these also occur across the classes that were examined. In the cores all the raw materials are represented except for chert in the middle layer. Generally, chalcedony is the most preferred raw material in all phases as can be observed in table 4.3. The other notable thing is that raw materials vary quite a bit between phases.

Table 4.4 Raw material frequencies for the Toteng 1 cores

Phase	**Quartzite**	**Chalcedony**	**Silcrete**	**Chert**	**Other**	TOTAL
Pottery	1	3	2	1	1	8
%	*12.5*	*37.5*	*25*	*12.5*	*12.5*	*100*
middle	2	4	1		1	8
%	*25*	*50*	*12.5*	*0*	*12.5*	*100*
Pre-pottery	8	12	4	2	2	28
%	*28.6*	*42.9*	*14.3*	*7.1*	*7.1*	*100.0*
Total	**11**	**19**	**7**	**3**	**4**	44
%	***25.0***	***43.2***	***15.9***	***6.8***	***9.1***	***100***

The sample size for Toteng 1 is too small. However, looking at the percentages, raw material frequencies for the Toteng 1 cores (Table 4.4) show that there was a shift away from quartzitic material while the silcrete and chert became more popular in the pottery phase. Chalcedony dropped slightly in frequency from the pre-Pottery phase to the Pottery phase. A different trend can be observed for the Toteng 1 flake categories (Table 4.5). All the raw materials remain relatively stable in all the phases.

Table 4.5 Raw material frequencies for the Toteng 1 flakes

Phase	**Quartzite**	**Chalcedony**	**Silcrete**	**Chert**	**Other**	**TOTAL**
Pottery	11	23	9	6	14	**63**
%	*17.5*	*36.5*	*14.3*	*9.5*	*22.2*	***100***
middle	21	48	18	13	21	**121**
%	*17.4*	*39.7*	*14.9*	*10.7*	*17.4*	***100***
Pre-pottery	30	62	20	19	34	**165**
%	*18.2*	*37.6*	*12.1*	*11.5*	*20.6*	***100***
Total	**62**	**133**	**47**	**38**	**69**	**349**
%	***17.8***	***38.1***	***13.5***	***10.9***	***19.8***	***100***

Raw material frequencies show a different observation for the flakes compared to blades. Blades from quartzitic raw material decrease from the pre-pottery phase to the pottery phase similar to the cores. However, there is a shift towards more fine grained raw materials, such as chalcedony and silcrete, from the pre-Pottery phase to the Pottery phase (Table 4.6).

Table 4.6 Raw material frequencies for the Toteng 1 blades

Phase	Quartzite	Chalcedony	Silcrete	Chert	Other	TOTAL
Pottery	7	19	9	5	8	**48**
%	*14.6*	*39.6*	*18.8*	*10.4*	*16.7*	***100***
middle	13	23	8	5	11	**60**
%	*21.7*	*38.3*	*13.3*	*8.3*	*18.3*	***100***
Pre-pottery	56	62	30	25	43	**216**
%	*25.9*	*28.7*	*13.9*	*11.6*	*19.9*	***100***
Total	**62**	**133**	**47**	**38**	**69**	**324**
%	***19.1***	***41.0***	***14.5***	***11.7***	***21.3***	***100***

Similar observations to raw material frequencies for cores and blades are also observable in formal tools (Table 4.7). Generally, there is a shift away from quartzitic raw material towards the fine grained raw materials (Chalcedony, chert and silcrete) from the pre-Pottery phase to the Pottery phase at the Toteng 1 site.

Table 4.7 Raw material frequencies for the Toteng 1 formal tools

Phase	Quartzite	Chalcedony	Silcrete	Chert	Other	TOTAL
Pottery	3	8	5	2	1	**19**
%	*15.8*	*42.1*	*26.3*	*10.5*	*5.3*	***100***
middle	1	4	3			**8**
%	*12.5*	*50*	*37.5*	*0*	*0*	***100***
Pre-pottery	7	11	6	3	4	**31**
%	*22.6*	*35.5*	*19.4*	*9.7*	*12.9*	***100***
Total	**11**	**23**	**14**	**5**	**5**	**58**
%	*19.0*	*39.7*	*24.1*	*8.6*	*8.6*	***100***

4.5 Lithic Technology in Toteng 1

Analysis of all material, cores and debitage (blades and flakes) from selected layers follow the principle of *chaîne opératoire*. Blades classification is modeled on the work by Soriano *et al.* (2007) and is adapted to blades present in the assemblage. This is designed to provide information on the stage of each blade in the knapping sequence on the degree of preparation and the position of the blade on the core production surface.

Table 4.8 Toteng 1 core classification

classes/level	DC	BC1	BC2	FC	BP	1-P/T	OT	Total
Pottery	1		1	2	2	1	1	**8**
%	*12.5*		*12.5*	*25*	*25*	*12.5*	*12.5*	***100***
Middle			1	2	1	1	3	**8**
%			*12.5*	*25*	*12.5*	*12.5*	*37.5*	***100***
Pre-pottery		2	3	6	8	4	5	**28**
%		*7.1*	*10.7*	*21.4*	*28.6*	*14.3*	*17.9*	***100***
Total	**1**	**2**	**5**	**10**	**11**	**6**	**9**	**44**
%	***2.3***	***4.5***	***11.4***	***22.7***	***25.0***	***13.6***	***20.5***	***100***

Table 4.9 Legend for core classes

symbol	Core type	Description
1-P/T	Single platform	
DC	Discoid	
BC1	Bladelet cores	Unidirectional removals
BC2	Bladelet cores	Bidirectional removals
FC	Flake Cores	Multidirectional flake removals
BP	Bipolar Cores	
OT	Others	

Toteng 1 Core typology

Bipolar Cores: These seem to have been knapped on an anvil, judging by the crushed edges on both ends. These cores are for the production of both flakes and blades. It is also possible that these pieces could have been used as small wedges after their use as core was over (Seitsonen 2005).

Flake Cores: These are for the production of flakes. They are pieces from which at least three flakes have been removed, but without any regular shape, sometimes referred to as irregular cores (Humphrey & Thackeray 1983).

Bladelet Cores: are pieces from which a series of small blades have been systematically removed from one or more striking platforms (Humphrey & Thackeray 1983).

Single platform Core*:* A core having at least one clear striking platform. The core can be for the production of flakes while a simple platform for the production of blades is referred to as a bladelet core.

Discoid Core: A core where flakes were removed from both sides. Usually the flake scares are concaved giving rise to flakes been wider and having converging dorsal scars.

Campbell (1992) presented two classes of cores, discoid and Later Stone Age cores. The Later Stone Age cores were further classified in this study and six categories were identified (1-P/T, B1, B2, FC, BP and OT). A considerable number of cores are typical blades/bladelets cores (BC1, BC2 and 1-P/T) and represent a blade production strategy. The pre-Pottery phase has proportionally nearly twice as many blade/bladelet production cores than the Pottery phase. Flake cores (FC) represent a specific reduction sequence of flakes. The Flake cores show a slight increase in frequency from the pre-Pottery phase to the Pottery phase. The other prominent technique observed on core classes is the bipolar. The bipolar cores show a slight decrease in frequency from the pre-Pottery phase to the Pottery phase.

In summary the blade/bladelet production dominates the pre-pottery phase while the pottery phase is dominated by flake production. The bipolar technique shows a slightly higher frequency in the pre-pottery phase than the pottery phase. However, the small sample size of cores suggests that the difference in flake and bipolar cores may not be significant. The layer differences in blade cores seem more significant.

4. 6 Blade/bladelet productions in Toteng 1

The presence of bladelets cores in the assemblage throughout the phases indicates that there was blade production during all the phases at Toteng 1. However, cores abandoned after a long exploitation indicate very little about core preparation, whereas their products, such as flakes and blades, give several indicators. For blades, the classes below reflect the core reduction sequence procedure.

4. 7 Technical classifications

The presences of cortical blades indicate the initial removals for the cores and core preparations. The cortical blades are represented by class B1.This class of blades increases from the pre-Pottery phase to the Pottery phase; however, the middle layer has the highest frequency of the cortical blades.

Table 4.10 Toteng 1 blades technical classification based on knapping stage (***see appendix for illustration)**

Initial Stage	B1	Cortical
	B2	Crested
Main production stage	B3	Cortical Platform
	B4	Cortical Edge
	B5	Cortical Distal Edge
	B6	Non-cortex
	B7	Split Blades (Knapping accident)
	B8	Broken (proximal part only)
Others	B9	Not in above descriptions

Table 4.11 Toteng 1 blade technical classification

	Initial stage		Production phase							
Phase/class	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**B8**	**B9**	**Total**
Pottery	6	2	6	4	5	3	6	2	14	**48**
%	*12.5*	*4.2*	*12.5*	*8.3*	*10.4*	*6.3*	*12.5*	*4.2*	*29.2*	***100***
Middle	10	7	6	6	4	5	4	4	14	**60**
%	*16.7*	*11.7*	*10.0*	*10.0*	*6.7*	*8.3*	*6.7*	*6.7*	*23.3*	***100***
Pre-pottery	21	13	13	20	17	23	19	15	75	**216**
%	*9.7*	*6.0*	*6.0*	*9.3*	*7.9*	*10.6*	*8.8*	*6.9*	*34.7*	***100***
Total	**24**	**22**	**16**	**30**	**26**	**31**	**29**	**21**	**125**	**324**
%	***7.4***	***6.8***	***4.9***	***9.3***	***8.0***	***9.6***	***9.0***	***6.5***	***38.6***	***100***

In general, the cortical blades indicate that some of the cores were not significantly prepared when they were brought to the site. This is because the surfaces exploited during blade production remain cortical regardless of their position in core reduction sequence (e.g. Singer 1984; Hood 1994; Soriano *et al.* 2007). Similarly, the crested blades dominate the Middle phase; however, they decrease from the pre-Pottery phase to the Pottery phase unlike the cortical blades. Crested blades indicate an elaborate preparation on cores. The other classes make up the production phase in the core reduction process. Some of these classes increase from the pre-Pottery phase to the Pottery phase (e.g. B3) while others decrease (e.g. B6). Some production phase classes dominate in the Middle phase at the Toteng 1 site (e.g. B4).

In summary, there are some patterns of change and continuity in the Toteng 1 blades classes. The non-cortical blades recorded a higher frequency during the Pottery phase. The same is observed for the crested blades and cortical edge. Other classes show different phenomena, for example the cortical blades, cortical platform and cortical distal edge. All in all the changes are not linear and in most cases gradual, except for classes B3 and B6. It is argued here that these observations are attributed to production phase more than they can be with cultural issues. However, this argument is more productional than cultural. It means cortical platform and completely cortical dorsal face blades/ flakes were removed from pebbles. On the evenly smooth pebbles, this was usually a quite thick, decapitation flake, removing one end of the pebble and thus creating the platform. On the uneven pebbles, the first flake was a thinner flake that was removed from one side of the pebble; that side then became the flaking-surface, adjacent to a cortical striking-platform.

The other characteristic that is recorded for blades studies is size class and range. This is obtained measuring the length of blades on a graph paper. For the Toteng 1 blades, there are some interesting trends. The small blades (10 mm to 20 mm classes) dominate the Pottery phase while the larger blades (more than 30 mm) dominate the pre-Pottery phase (Table 4.12). This reflects a diminution in blades size from the pre-Pottery to the Pottery phase.

Table 4.12 Measurements for Toteng 1 complete blades

Phase/category	<10mm	11-20mm	21-30mm	31-40mm	>40mm	Not measured	Total
pottery	2	5	3	1	2	3	**16**
%	*12.5*	*31.3*	*18.8*	*6.3*	*12.5*	*18.8*	***100***
Middle	2	4	6	2	3	4	**21**
%	*9.5*	*19.0*	*28.6*	*9.5*	*14.3*	*19.0*	***100***
Pre-pottery	6	10	12	18	14	8	**68**

%	*8.8*	*14.7*	*17.6*	*26.5*	*20.6*	*11.8*	***100***
Total	**10**	**19**	**21**	**21**	**19**	**15**	**105**
%	***9.5***	***18.1***	***20.0***	***20.0***	***18.1***	***14.3***	***100***

Table 4.13 Toteng 1 blades classification

Phase/class	Complete	Proximal blade frag.	Medial &distal blades frag.	Bipolar	Other	Total
Pottery	16	11	8	7	6	**48**
%	*33.3*	*22.9*	*16.7*	*14.6*	*12.5*	***100***
Middle	21	13	13	5	8	**60**
%	*35.0*	*21.7*	*21.7*	*8.3*	*13.3*	***100***
Pre-pottery	68	31	45	28	44	**216**
%	*31.5*	*14.4*	*20.8*	*13.0*	*20.4*	***100***
Total	**105**	**55**	**66**	**40**	**58**	**324**
%	***32.4***	***17.0***	***20.4***	***12.3***	***17.9***	***100***

Complete blades dominate the collection in all the phases and show slight shift from the pre-Pottery to Pottery phase. The class *"other"* here refers to the category that can not be included in any of the identified classes and to the blades that are missing in the collection but are recorded in Campbell (1992). The bipolar class is not included in the complete category because they show distinct characteristics like crushed ends and bulbs in both ends. This class is slightly higher in frequency during the Pottery phase than the pre-Pottery phase, which is an inverse of what is observed for the complete blades. However, the differences are so slight that homogeneity is advocated for.

4. 8 Striking platform preparations on the Toteng 1 blades

The striking platforms on Toteng 1 blades have been examined and measured in several ways. For platform preparation (Table 4.14), which reflects the shaping of the core prior to blade production, different forms were identified from the assemblage (Appendix). Blades with cortical platform occur on both blades with cortical and non-cortical dorsal facet or side. This indicates that the striking platform on the core was cortical, which suggests that the core was not prepared. Furthermore, cortical platforms indicate the initial removals from the core (Andrefsky 1998). Cortical platform constitute 26.3% of the total blades and proximal blades fragments and they occur in similar frequencies through the phases. Like the cortical platforms, plain or no preparation platforms do not show major changes in frequency through the phases.

Plain platforms are also flat and show no preparation which indicate that there was no faceting on cores before their removals.

Table 4.5 Toteng 1 blades platform preparation

Phase/preparation	Cortical	Plain(none)	Hinged	Along the ridge	Lateral	Total
Pottery	7	3	5	9	3	**27**
%	*25.9*	*11.1*	*18.5*	*33.3*	*11.1*	***100***
Middle	9	4	8	7	6	**34**
%	*26.5*	*11.8*	*23.5*	*20.6*	*17.6*	***100***
Pre-pottery	26	12	15	30	16	**99**
%	*26.3*	*12.1*	*15.2*	*30.3*	*16.2*	***100***
Total	**42**	**19**	**28**	**46**	**25**	**160**
%	***26.3***	***11.9***	***17.5***	***28.8***	***15.6***	***100***

Three kinds of preparations are recognizable in the collection and these are: short scale micro removals referred to as hinged, long removal along the dorsal ridge and lateral removals (appendix B). All pieces that show preparation make up 61.9% of the blades with platforms. This is a high occurrence as compared to non-prepared platforms. Of these, preparations along the ridge dominate both the Pottery and pre-Pottery phases; however there is an increase of the technique in the Pottery phase (occurrences also noted for the hinge technique). Lateral preparation drops slightly in the Pottery period. Generally there is a bit of continuity in the Toteng 1 platform preparation techniques.

Table 4.15 Measurements for the Toteng 1 complete blades

Phase/ Type	Crushed	Cortical	Plain/flat	Facetted	Curved	Absent	Other	Total
Pottery	7	2	10	8	5	14	2	48
%	*14.6*	*4.2*	*20.8*	*16.7*	*10.4*	*29.2*	*4.2*	*100*
Middle	5	6	11	7	2	21	8	60
%	*8.3*	*10.0*	*18.3*	*11.7*	*3.3*	*35.0*	*13.3*	*100*
Pre-pottery	28	19	34	29	6	89	11	216

%	*13.0*	*8.8*	*15.7*	*13.4*	*2.8*	*41.2*	*5.1*	*100*
Total	**40**	**27**	**55**	**44**	**13**	**124**	**21**	**324**

There are several kinds of platform identified in the Toteng 1 collection (Table 4.15). This category shows some discontinuity in certain classes. Most classes increase in frequency from the pre-Pottery phase to the Pottery phase except for the cortical class. In other words, platform morphology shows some significant changes across the phases. Cortical platforms in the pre-Pottery phase are twice as much as is in the Pottery phase. The other significant change is observed on the curved platform which changes drastically in frequency in the pre-Pottery phase as compared to Pottery phase.

Other than platform types some variables that are useful for tracing change and continuity in lithic technology are striking platform width and thickness. The width is measure by first locating the striking platform. This contacts the ventral surface, dorsal surface and each lateral margin of a blade. The striking platform width is the distance across the platform from one lateral margin to the other. The striking platform thickness is defined by a line perpendicular to the striking platform width. It is the greatest distance from the dorsal to the ventral surface following that line. Both width and thickness are easy to measure.

Table 4.16 Toteng 1 blades platform morphological metric attributes

	Width			**Thickness**			
	1-2mm	2-4mm	>4mm	1-2mm	2-4mm	>4mm	**Total**
Pottery	9	12	6	11	8	8	**27**
%	*33.3*	*44.4*	*22.2*	*40.7*	*29.6*	*29.6*	
Middle	13	12	9	10	13	11	**34**
%	*38.2*	*35.3*	*26.5*	*29.4*	*38.2*	*32.4*	
Pre-pottery	27	29	43	25	32	42	**99**
%	*27.27*	*29.29*	*43.43*	*25.25*	*32.32*	*42.42*	
Total	**49**	**53**	**58**	**46**	**53**	**61**	**160**

The pre-Pottery phase has the highest width and thickness measurement. This is reflecting the fact that the pre-Pottery phase has more large blades than the Pottery phase (see also table 4.12). Conclusively, blades platform measurements are getting thinner and narrower in the Pottery phase which reflects a significant change in blade technology.

4. 9 Flake debitage analyses from the Toteng 1 site

Typological and technological analyses were also performed for flake debitage. Classification for this category is similar to blades.

Table 4.6 Toteng 1 Flakes technical classification

Initial stage	F1	Cortical
	F2	25-50% cortex
Main production	F3	Cortical Platform
	F4	Cortical Edge
	F5	Cortical Distal Edge
	F6	Non-cortex
	F7	Split Flakes (Knapping accident)
	F8	Broken (proximal part only)
	F9	Hinged (knapping accident)
Others	F10	

Table 4.18 Toteng 1 flake technical classification

	Initial stage		Main production								
Phase/classes	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**	**F10**	**Total**
Pottery	5	7	6	7	5	2	6	4	8	13	**63**
%	*7.9*	*11.1*	*9.5*	*11.1*	*7.9*	*3.2*	*9.5*	*6.3*	*12.7*	*20.6*	***100***
middle	17	9	13	18	12	8	9	7	5	23	**121**
%	*14.0*	*7.4*	*10.7*	*14.9*	*9.9*	*6.6*	*7.4*	*5.8*	*4.1*	*19.0*	***100***
Pre-pottery	23	12	15	23	19	13	11	7	4	38	**165**
%	*13.9*	*7.3*	*9.1*	*13.9*	*11.5*	*7.9*	*6.7*	*4.2*	*2.4*	*23.0*	***100***
Total	**45**	**28**	**34**	**48**	**36**	**23**	**26**	**18**	**17**	**74**	**349**

The cortical flakes occur in a higher frequency in the pre-pottery phase than in the Pottery phase. However, the reverse is true for the F2 class which is higher in the

Pottery phase. Some classes are higher in the pre-pottery (e.g. F 9, F8 & F7) while some are higher in the Pottery phase (e.g. F3 & F4) during the production stage in flake production. In other classes the middle layer records the highest frequency (e.g. F1, F3 &F4). The changes in flake frequencies are not linear across phases at Toteng 1, which indicate that during one phase the knapping activities started on the site while at some stage knapping started elsewhere and progressed on the site. All in all, little can be said as no clear patterns emerge in the table.

4. 10 Formal tools from Toteng 1

The formal tools in Toteng 1 are classified in Table 4.19. There are some interesting observations across the phases at Toteng 1. The Scraping tool dominates the Pottery phase (total 37% in the Pottery phase and 6% in the pre-Pottery phase) while the backed tools dominate the pre-Pottery phase (total 87% the pre-Pottery phase and 21% in the Pottery phase). This parallels a similar shift observed for flakes and blades in the Toteng 1 collection, with flakes dominating the Pottery phase and blades dominating the pre-Pottery phase (see table 4.2)

Table 4.7 Toteng 1 formal tools

Classes/Level	**Retouched flakes**	**Backed Blades**	**End Scrapers**	**Side Scrapers**	**Oval Scrapers**	**Thumbnail Scrapers**	**Grinding stones**	**Segments**	**Backed segments**	**Quadrants**	**Backed pieces**	**Broken tools**	**Total**
Pottery	1	5	2		3	2	2	1		1	2		19
%	*5.3*	*26.3*	*10.5*	*0.0*	*15.8*	*10.5*	*10.5*	*5.3*	*0.0*	*5.3*	*10.5*	*0.0*	*100*
Middle	1		1	1		1		1		1	2		8
%	*12.5*	*0*	*12.5*	*12.5*	*0*	*12.5*	*0*	*12.5*	*0*	*12.5*	*25*	*0*	*100*
Pre-pottery			1		1		1	13	2	2	10	1	31
%	*0.0*	*0.0*	*3.2*	*0.0*	*3.2*	*0.0*	*3.2*	*41.9*	*6.5*	*6.5*	*32.3*	*3.2*	*100*
Total	**2**	**5**	**4**	**1**	**4**	**3**	**3**	**15**	**2**	**4**	**14**	**1**	**58**
	3.4	**8.6**	**6.9**	**1.7**	**6.9**	**5.2**	**5.2**	**25.9**	**3.4**	**6.9**	**24.1**	**1.7**	**100**

67% of the tools have backed retouch and they are concentrated in the pre-Pottery phase. These are probably hunting and game processing tools (Deacon 1984) as compared to scraping tools which are more common during the Pottery layer. Backed tools, such as segments and backed pieces, dominate the Pre-Pottery layers.

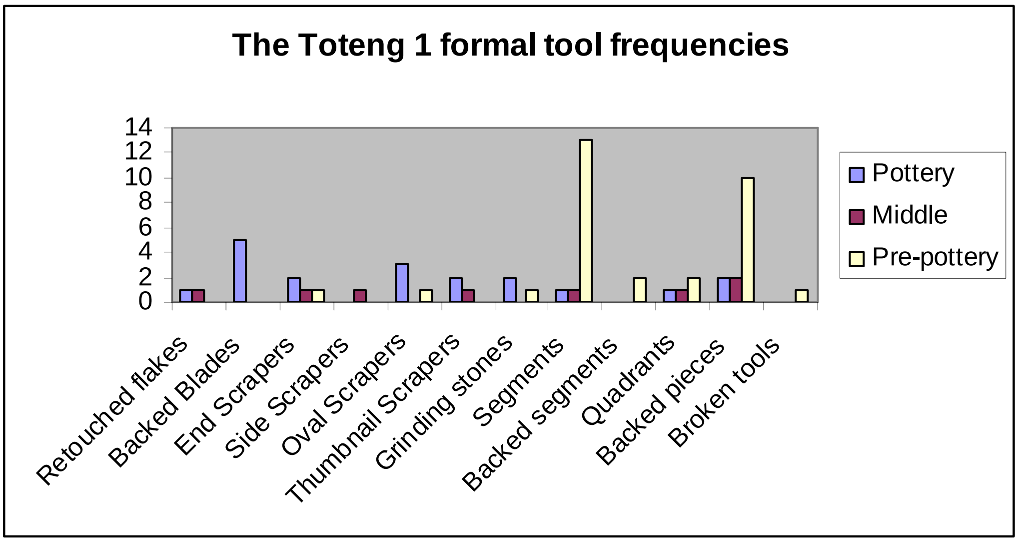


Figure 4.1 the Toteng 1 formal tool frequencies

Toteng 1 formal tools typology

Backed blades: these were produced by means of technological reduction process and refer to blades, with a central dorsal ridge, backed from distal to the proximal end on one or both side (Humphrey & Thackeray 1983).

Backed pieces: have one edge blunted by vertical retouch (backing) opposite a sharp retouched edge.

Grinding stones: are abrasive stones with signs of smoothing resulting from the use of stone as a grinding surface.

Scrapers:

a) *End:* A scraper whose convex retouched edges truncate either or both ends of the artefact.
b) *Side;* A piece with scraper retouch on one or both of its lateral margins.
c) *End-side:* Combination of above defined classes.

Segments: have backing along an arc as opposed to the straight backed edge of backed blades. The term crescent is often used to refer to such artefacts.

Quadrants: These are half segments, making a quarter of a circle.

4. 11 *Chaînes opératoires* in the Toteng 1 assemblage

Chaîne opératoire refers to ordered chain of actions, gestures, and processes in a production sequence which led to the transformation of a given material towards the finished product. As already pointed out in Chapter 2, the approach was introduced by Andre Leroi-Gourhan, in the mid 1970s (Schlanger 1994). The approach is significant in that allows the archaeologist to infer back from the finished artefact to the procedures, the intentions inherent in the production sequence and ultimately to the conceptual model of the maker.

Raw material acquisition at the Toteng 1 site and the predominance of chalcedony, chert and silcrete reflects local availability. Chalcedony and chert were probably collected from the two nearby rivers and Lake Ngami (Robbins *et al*. 2005), while silcrete is a common raw material in the surrounding Kalahari (Summerfield 1983). Quartzite occurs as river cobbles and pebbles as well as natural outcrops (Rapp & Hill 1998), therefore there is a possibility that is found also in the two rivers at Toteng 1. However, some raw material may have been transported from outside through trade and exchange (Denbow 1984). Figure 4.2 below shows a representation of c*haînes opératoires* at the Toteng one site.

Chaînes opératoires in Toteng 1

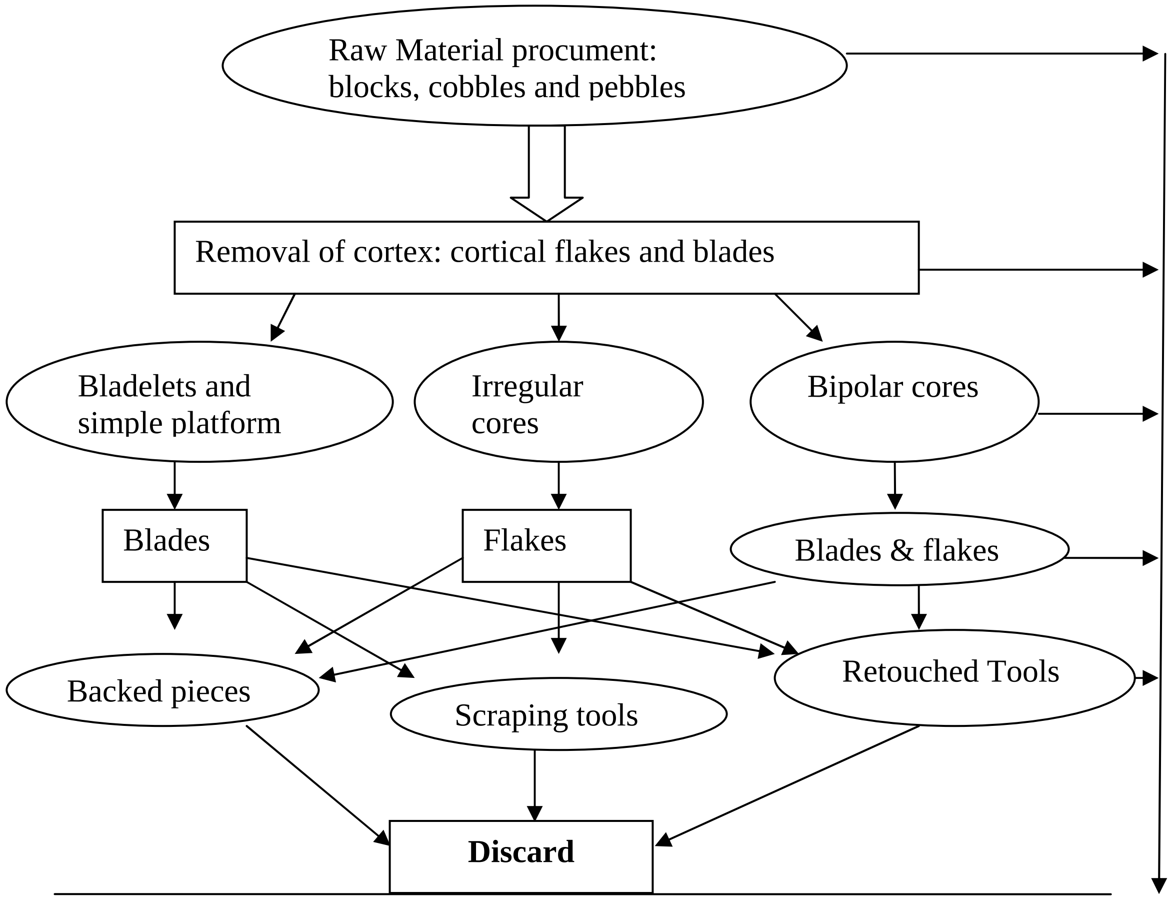


Figure 4.2 Representation of the *Chaînes opératoires* at the Toteng 1 site

For chalcedony and quartzite, similar chains can be observed with all stages present in the assemblage through time while cores and formal tools for chert are absent. However, this might be due to the sampling strategy. Due to the presence of cortical and crested blades, it can be argued those raw materials were brought to sites as both prepared cores and as cobbles. For some artefacts knapping began on the site while other pieces were brought as finished tools from out of the site. There are generally two *chaînes opératoires* observed, flake production and blades/bladelets production.

Blades/bladelets have been principally produced from bladelets cores (uni-and bidirectional production), simple platform cores and bipolar cores. For bipolar production an anvil technique was used while the others involved direct percussion technique. The Bipolar technique has been described as a technique that maximises the use of raw materials (Inizan *et al*.. 1999). For some of the blades in the Toteng 1 collection, cores were exploited from the natural platform which is evident from the blades with cortical platform whereas other cores were prepared to produce a multi-facetted platform. Reduction may have proceeded by using both the direct and indirect technique; however this is based on the subjective observation of debitage morphology. In addition, both soft and hard hammer modes seem to have been used on the basis of crushed platforms and split blades (Mourre, pers. comm. 2007). Backing retouch (backed blades and other backed retouched pieces) is applied mostly to blades. This technique occurs in both the pottery and pre-pottery period.

Irregular cores were essentially for the production of flakes which indicate that the reduction began with removal of cortical flakes. Both cortical and non-cortical flakes were further retouched to produce cortical and non-cortical retouched tools (scrapers). Scraping tools are common in the pottery phase of Toteng 1.

In conclusion, the most significant changes in the Toteng 1 collection are observed in the flakes and blades categories. Blades dominate the pre-Pottery phase whereas later during the pottery phase it is the flakes that dominate. This reflects in the formal tool category. Scraping tools on flakes dominate the pottery phase while the pre-pottery is dominated by backed pieces on bladelets. In general, the Toteng 1 lithics show continuity in blade/bladelets production but they do get smaller through the phases. In most cases, artefacts from the Middle layer in the Toteng 1 assemblage look neither like the pre-Pottery phase nor like the Pottery phase. This may mean several things which include mixing of layers.

Chapter 5

5.0 THE MHEKWANE SHELTER LITHIC ANALYSIS

5.1 Introduction

This chapter is a presentation of the technological analysis of lithic assemblages from the Mphekwane Shelter. From the Mphekwane Shelter in the Limpopo province, material from excavations conducted by Karim Sadr in 2004 and 2006 has been used. Two square meters (3 & 6) have been examined. A total of 2299 lithics from both squares has been studied. One striking feature at the Mphekwane Shelter is that the strata consist of very compacted lower deposits and the fines have been washed out or winnowed out by water and/or wind. However, dates obtained from material excavated at the Mphekwane Shelter are as follows;

Table 5.1 Chronology of layers in Mphekwane Shelter

Phase	Layer	date
Pottery	M3.C4.3	360+/-40 BP
	M3.D2.3	2320+/-40 BP
	M1.A4.5	160+/-40 BP
Pre-pottery	M6.A1.7	14380+/-70 BP
	M5.D1.8	15250+/-80 BP

The two younger dates may not be associated with the lithics but some Iron Age potsherds which are also present in the shelter. Another point worth mentioning is the wide temporal gap between the Pottery phase and the pre-Pottery phase dates.

5.2 Sorting and sampling procedures

Lithics from both squares were sorted and sampled. A typological analysis of the lithics from square 3 was performed by J. Orton in 2006 (pers. comm.). Here, for both squares all the cores, flakes, blades and the formal tools from the pre-Pottery phase (consisting of spit 7), the Middle phase (spit 4) and the Pottery phase (spits 1 & 2) were analysed separately. These are the classes in which a technological study was performed, following the same procedures as in the Toteng 1 collection. However, all quartz artefacts were excluded from this study because non-quartz raw material made a large enough sample for the study and also because quartz is not suitable for this kind of analysis. Nonetheless in square 3 a brief examination of blades and formal tools made from quartz was carried out. (The full raw material table is presented in the Appendix). Table 5.2 below summarises all the non-quartz pieces that were analysed..

The dates (Table 5.1) were obtained from the spits on both the pre-Pottery phase and the Pottery phase and the dates confirm that the lower layers are older than the upper layers

Table 5.1 Summary of the Mphekwane Shelter assemblage under study from squares 3 & 6.

Phase/category	Cores	Blades	Flakes	Tools	Total
Pottery	45	59	629	32	775
%	*7.1*	*7.6*	*81.2*	*4.1*	*100*
Middle	17	45	470	26	558
%	*3.0*	*8.1*	*84.2*	*4.7*	*100*
Pre-pottery	16	52	891	7	966
%	*1.7*	*5.4*	*92.2*	*0.7*	*100*
Total	**78**	**156**	**1990**	**74**	2299

The flake and blade ratios from the middle and the pottery phase look relatively stable. Blade frequency is lower in the pre-Pottery phase while the flake frequency is higher. This might be attributed to the apparently large age gap between the pre-pottery phase and the pottery phase or even to differences in site activities. Generally, the blade frequency increases in the Pottery phase while the flake frequency drops.

5.3 Raw Materials frequencies in the Mphekwane Shelter assemblage

With the Quartz excluded there are two main materials for the Mphekwane Shelter: quartzite and the crypto-crystalline silicates (CCS).

Quartzite has been previously defined in the previous chapter and can occur in varying colours and textures. Quartzites are available in the form of river cobble and pebbles, as well as natural outcrops (Shick & Toth 1994). At the Mphekwane shelter quartzite pebbles are available locally within walking distance from the shelter.

Crypto-crystalline Silicates (CCS) includes a range of materials that are fine grained such as chalcedony and chert, which only occur as river cobbles and pebble. These seem to have been brought away from elsewhere as they are not locally available. However, there is a possibility that the crypto-crystalline material could have occurred in conglomerates within the sandstone of Makgabeng.

Other categories refer to pieces that occur in small numbers, such as sandstone and pieces that are unidentified.

Table 5.3 Raw material frequencies for the Mphekwane shelter cores

Phase/category	CCS	Quartzite	Other	Total
Pottery	22	20	2	**45**
%	*50.0*	*45.5*	*4.5*	***100***
Middle	8	9	1	**18**
%	*44.4*	*50.0*	*5.6*	***100***
Pre-pottery	**1**	15		**16**
%	***6.3***	*93.8*	*0.0*	***100***
Total	**31**	**44**	**3**	**78**
	39.7	***56.4***	***3.8***	***100***

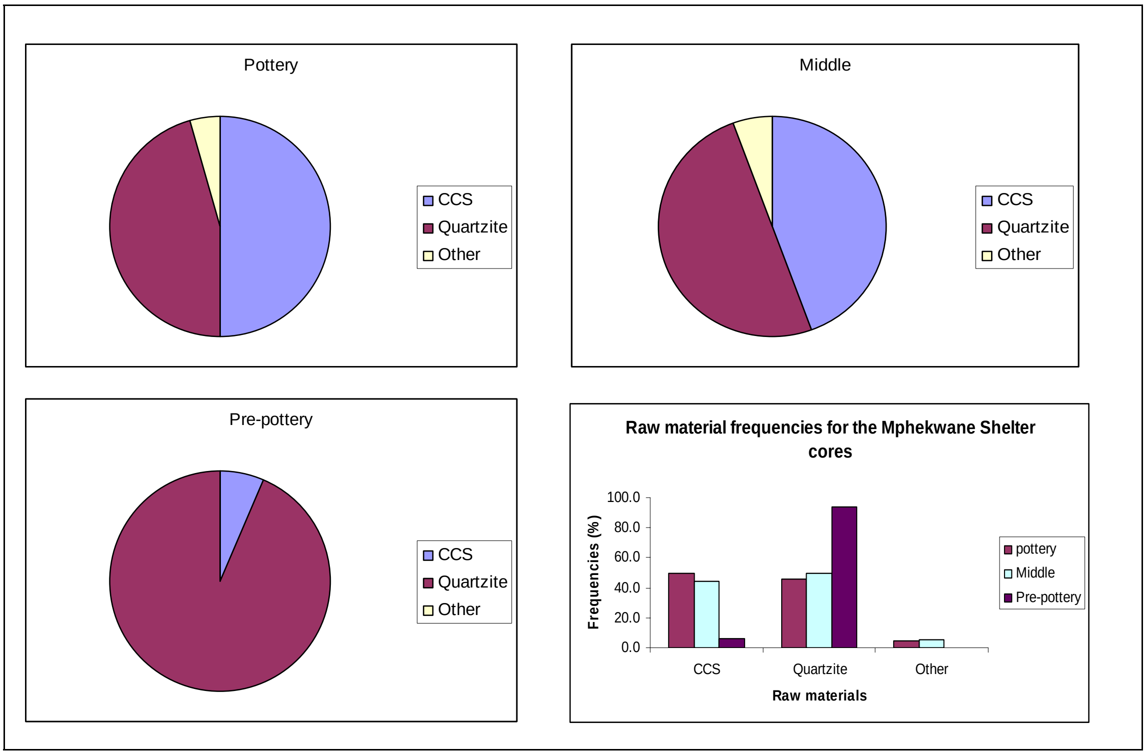


Figure 5.1 Raw material frequencies for the Mphekwane shelter cores

There is a shift to the fine grained CCS material in the pottery phase while quartzite cores were more exploited during the pre-Pottery layers. For the blades, the middle and the Pottery phase frequencies seem related for both the CCS and the quartzitic raw material (Table 5.4). These raw materials increase slightly from the middle to the pottery phase while the "other" class decreases. The CCS frequency in the pre-Pottery phase in lower than in the pottery phase and the middle phase while the quartzitic raw material is higher in the pre-Pottery phase than the other phases. In total, quartzite dominates the Mphekwane Shelter non-quartz raw materials collection.

Table 5.4 Raw material frequencies for Mphekwane blades

Phase/category	CCS	Quartzite	Other	Total
Pottery	26	26	7	**59**
%	*44.1*	*44.1*	*11.9*	***100***
Middle	18	19	8	**45**
%	*40.0*	*42.2*	*17.8*	***100***
Pre-pottery	9	33	12	**52**
%	*17.3*	*63.5*	*19.2*	***100***
Total	**57**	**88**	**31**	**176**
%	***32.4***	***50.0***	***17.6***	***100***

Not surprisingly, the Mphekwane Shelter flakes also show a shift towards the fined grained CCS raw material during the Pottery phase (Table 5.5). But quartzite dominates flake raw material frequencies in all phases. CCS decreases from the Middle phase to the Pottery phase while quartzite increases.

Table 5.2 Raw material frequencies for Mphekwane flakes

Phase/category	CCS	Quartzite	Other	Total
Pottery	132	395	113	**629**
%	*21.0*	*62.8*	*18.0*	***100***
Middle	128	276	68	**470**
%	*27.2*	*58.7*	*14.5*	***100***
Pre-pottery	118	657	116	**891**
%	*13.2*	*73.7*	*13.0*	***100***
Total	**378**	**1328**	**295**	**1990**
%	***19.0***	***66.7***	***14.8***	***100***

For the Mphekwane Shelter formal tools, there is a shift away from quartzitic raw material to fined grained CCS from the pre-Pottery phase through the middle phase to the Pottery phase. However, quartzite still dominates overall. Significantly, there are hardly any formal tools in the pre-Pottery phase of Mphekwane Shelter.

Table 5.3 Raw material frequencies for Mphekwane formal tools

Phase/category	CCS	Quartzite	Other	Total
Pottery	22	12	3	37
%	*59.5*	*32.4*	*8.1*	*100*
Middle	6	22	3	31
%	*19.4*	*71.0*	*9.7*	*100*
Pre-pottery	1	5		6
%	*16.7*	*83.3*	*0*	*100*
Total	**29**	**39**	**6**	**74**
%	***39.2***	***52.7***	***8.1***	***100***

In a summary, there are significant changes in the Mphekwane Shelter raw material frequencies. The Middle and the Pottery phases are similar in this aspect and very different from the pre-Pottery phase. This might be attributed to the apparently large age gap. There was a significant shift towards more fine grained raw materials and more formal tools. The general dominance of quartzitic raw material in Mphekwane collection may be attributed to the fact that it is locally available.

5.4 Lithic Technology in Mphekwane Shelter

Table 5.4 The Mphekwane Shelter core legend and descriptions

symbol	Core type	Description
BC1	Bladelet cores	Unidirectional
BC2	Bladelet cores	Bidirectional removals
FC	Flake Cores	Multidirectional removals
BP	Bipolar Cores	Bipolar technique core exploitation
OT	Others	

Core typology: these are defined in Chapter 4

In the Mphekwane Shelter the bipolar technique was commonly used for core exploitation. This technique is used in both the Pottery and pre-Pottery phases. In the Middle phase, however, the bipolar technique occurs in slightly higher frequency than in the Pottery phase and the pre-Pottery phase but given the sample size is probably not significant. The Pottery phase has the lowest proportion of bipolar cores. Bladelets cores in the Mphekwane Shelter are both bidirectional and unidirectional production. These two classes are more common in the pottery phase. Irregular cores are more prominent in the pre-Pottery. The other class essentially refers to those cores that could not be identified with the mentioned classes.

Table 5.5 Classification of the Mphekwane Shelter cores

Phase/category	BP	IR	BC1	BC2	OT	Total
Pottery	20	10	9	4	2	45
%	*44.4*	*22.2*	*20.0*	*8.9*	*4.4*	*100*
Middle	9	5	2		2	18
%	*50.0*	*27.8*	*11.1*		*11.1*	*100*
Pre-pottery	7	6	1	1		15
%	*46.7*	*40.0*	*6.7*	*6.7*		*100*
Total	**36**	**21**	**12**	**5**	**4**	**78**
%	*46.2*	*26.9*	*15.4*	*6.4*	*5.1*	*100*

5.5 Blade/bladelet production in Mphekwane Shelter

The same classification strategy applied to the Toteng 1 blades was also used for the Mphekwane shelter blade assemblage. As mentioned blade analysis can inform us on core reduction sequences much better than the core itself.

5.6 The Mphekwane Shelter blades/bladelets classification strategy

The classes were determined following the same categories as in Toteng 1. The same issue of cortex placement and *chaînes opératoires* are the basis for this classification. The sample from both squares 3 and 6 were classified together even though there were some spatial differences observed.

Table 5.6 Mphekwane blade technical classification based on knapping stage

Initial Stage	B1	Cortical
	B2	Crested
Main production stage	B3	Cortical Platform
	B4	Cortical Edge
	B5	Cortical Distal Edge
	B6	Non-cortex
	B7	Split Blades (Knapping accident)
	B8	Broken (proximal part only)
Others	B9	Not in above descriptions

Table 5.7 Mphekwane blades technical classification

	Initial phase		Main production phase							
Phase/class	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**B8**	**B9**	**Total**
Pottery	7	8	6	3	6	8	7	6	8	**59**
	11.9	*13.6*	*10.2*	*5.1*	*10.2*	*13.6*	*11.9*	*10.2*	*13.6*	***100***
Middle	10	7	4	1	4	5	3	4	7	**45**
	22.2	*15.6*	*8.9*	*2.2*	*8.9*	*11.1*	*6.7*	*8.9*	*15.6*	***100***
Pre-pottery	6	7	5	3	5	6	5	5	10	**52**
	11.5	*13.5*	*9.6*	*5.8*	*9.6*	*11.5*	*9.6*	*9.6*	*19.2*	***100***
Total	**23**	**22**	**15**	**7**	**15**	**19**	**15**	**15**	**25**	**156**
	14.7	*14.1*	*9.6*	*4.5*	*9.6*	*12.2*	*9.6*	*9.6*	*16.0*	*100*

The initial phase of knapping is indicated by the presence of cortical blades which make up 14.7% of the total blades. This occurs in a relatively similar frequency for pre-Pottery and Pottery phase but shows a higher frequency in the Middle phase. Cortical blades indicate that raw materials were brought to the shelter as unprepared nodules or cobbles. On the other hand a more elaborate preparation suggested by the crested blades, in this case making up a 14.1% of the blades assemblage.

Other forms of cortical blades (i.e. B3-5) indicate that blades production proceeded with the cores still partially cortical. These classes add up to a high portion of the sample. In the production phase of blades, the Pottery phase shows slightly higher percentages than in the pre-Pottery phase.

In the Mphekwane shelter there is a shift in blade length across the periods. Smaller blades are more common during the pottery period when compared to the pre-Pottery phase (less than 10 mm and 11-20 mm classes). The reverse is true for larger blades (32-40 mm and blades more than 40 mm), which dominate the pre-Pottery phase (Table 5.30). The measured categories include only the complete blades from the Mphekwane Shelter blade category. This pattern of diminution of blade measurements was also seen at Toteng.

Table 5.8 Mphekwane blade measurements

Phase/category	<10mm	11-20mm	21-30mm	31-40mm	>40mm	Total
Pottery	7	5	3	2		**17**
%	*41.2*	*29.4*	*17.6*	*11.8*		***100***
Middle	5	4	3	3	1	**16**
%	*31.3*	*25.0*	*18.8*	*18.8*	*6.3*	***100***
Pre-pottery	2	2	3	6	8	**21**
%	*9.5*	*9.5*	*14.3*	*28.6*	*38.1*	***100***
Total	**14**	**11**	**9**	**11**	**9**	**54**
%	***25.9***	***20.4***	***16.7***	***20.4***	***16.7***	***100***

The Blade classification (Table 5.12) from the Mphekwane Shelter indicates several things. Bipolar technique was used throughout the phases. However, the technique is more common in the Pottery phase than in the pre-Pottery phase. Fragments represent knapping accidents and these occur in similar frequencies during the Pottery and Pre-Pottery phase.

Table 5.9 Mphekwane blade classification

Phase/class	Complete	Proximal blade frag.	Medial &distal blades frag.	Bipolar	Other	Total
Pottery	17	11	13	7		**48**
%	*35.4*	*22.9*	*27.1*	*14.6*	*0.0*	***100***
Middle	16	9	11	5	3	**44**
%	*36.4*	*20.5*	*25.0*	*11.4*	*6.8*	***100***
Pre-pottery	21	13	19	7	4	**64**
%	*32.8*	*20.3*	*29.7*	*10.9*	*6.3*	***100***
Total	**54**	**33**	**43**	**19**	**7**	**156**
%	***34.6***	***21.2***	***27.6***	***12.2***	***4.5***	***100***

5.7 The Mphekwane Shelter blade platform preparations

Several platform preparations can be observed in the Mphekwane shelter collection. For cortical platforms there is a decrease in frequency from the pre-Pottery phase to the Pottery phase. This is similar to blades with plain platforms or no preparations. Preparation along the dorsal ridge of the blades is more evident during the Pottery phase than it is in the pre-Pottery phase. The preparation along the dorsal ridge of blades dominates blade platform preparations at the Mphekwane shelter site. The other important platform preparation is the lateral technique. The lateral preparation is more common during the pre-Pottery phase than in the Pottery phase. The least common blade platform preparation is the short hinge. This technique dominates the pre-pottery phase and drops off during the pottery phase.

Table 5.10 Mphekwane blade platform preparations

Phase/preparation	Cortical	Plain(none)	Hinged	Along the ridge	Lateral	Total
Pottery	5	10	5	13	3	**36**
%	*13.9*	*27.8*	*13.9*	*36.1*	*8.3*	***100***
Middle	6	8	4	8	4	**30**
%	*20.0*	*26.7*	*13.3*	*26.7*	*13.3*	***100***
Pre-pottery	9	13	4	6	8	**40**
%	*22.5*	*32.5*	*10*	*15*	*20*	***100***
Total	**20**	**31**	**13**	**27**	**15**	**106**
%	***18.9***	***29.2***	***12.3***	***25.5***	***14.2***	***100***

During the Pottery phase more platforms seem to be crushed, which may indicate the use of the hard hammer or a bipolar technique (Table 5.14). However, the assemblage is dominated by the flat platforms which indicate that the core was not prepared before blade removals. On the other hand, the faceted platforms reveal a more complex preparation. While flat platforms are more dominant during the pre-pottery phase, the faceted platforms dominate the Pottery phase. The same is true for the curved platforms which are more common during the pottery layer than in the pre-pottery. Generally there are some significant patterns in the Mphekwane blades platform morphologies: while the Plain decreases in the Pottery phase the Facetted platform increases. A different pattern is seen at Toteng where both categories slightly increase during the Pottery phase.

Table 5.11 Mphekwane blades platform morphology

Phase/ Type	Crushed	Cortical	Plain/flat	Facetted	Curved	Absent	Other	Total
Pottery	9	1	9	7	3	17		**46**
%	*19.6*	*2.2*	*19.6*	*15.2*	*6.5*	*37.0*	*0*	***100***
Middle	4	2	10	5	2	21	4	**48**
%	*8.3*	*4.2*	*20.8*	*10.4*	*4.2*	*43.8*	*8.3*	***100***
Pre-pottery	2	6	20	6	2	18	8	**62**
%	*3.2*	*9.7*	*32.3*	*9.7*	*3.2*	*29.0*	*12.9*	***100***
Total	**15**	**9**	**39**	**18**	**7**	**46**	**12**	**156**
%	***9.6***	***5.8***	***25***	***11.5***	***4.5***	***29.5***	***7.7***	***100***

Table 5.15 Mphekwane blade platform measurements

	Width			Thickness			
	1-2mm	2-4mm	>4mm	1-2mm	2-4mm	>4mm	Total
Pottery	9	6	8	8	13	2	**23**
%	*39.1*	*26.1*	*34.8*	*34.8*	*56.5*	*8.7*	
Middle	5	9	8	8	4	10	**22**
%	*22.7*	*40.9*	*36.4*	*36.4*	*18.2*	*45.5*	
Pre-pottery	5	12	24	4	10	27	**41**
%	*12.2*	*29.3*	*58.5*	*9.8*	*24.4*	*65.9*	
Total	**19**	**27**	**40**	**20**	**27**	**39**	**86**

The width and thickness of the Mphekwane Shelter blades show that in the pottery phase blades are thinner and flatter compared to the pre-Pottery layer. This is also true for the length which showed diminution as one move from the pre-Pottery phase to the Pottery phase. A similar pattern was observed at Toteng.

5.8 The Mphekwane Shelter flake debitage analyses

As with the Toteng on flakes category, the technical classification for the Mphekwane Shelter flakes follow a core reduction sequence. It is evident that all stages are represented starting with cortex removal to a class that has no cortex altogether. Cortical flakes are the highest in both the pottery phase and the pre-pottery phase. This shows that knapping began at the shelter. Knapping accidents are represented by the step and split breakage. These categories reveal considerable frequencies. Flake debitage dominates the total Mphekwane assemblage.

Table 5.12 Mphekwane flakes technical classification - legend

Initial stage	F1	Cortical
	F2	25-50% cortex
Main production	F3	Cortical Platform
	F4	Cortical Edge
	F5	Cortical Distal Edge
	F6	Non-cortex
	F7	Split Flakes (Knapping accident)
	F8	Broken (proximal part only)
	F9	Hinged (knapping accident)
Others	F10	

Table 5.13 Mphekwane flakes technical classification

Initial stage			Main production								
Phase/classes	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**	**F10**	**Total**
Pottery	90	58	60	85	52	55	51	73	66	44	**634**
%	*14.2*	*9.1*	*9.5*	*13.4*	*8.2*	*8.7*	*8.0*	*11.5*	*10.4*	*6.9*	***100***
Middle	53	31	56	82	49	34	36	50	43	36	**470**
%	*11.3*	*6.6*	*11.9*	*17.4*	*10.4*	*7.2*	*7.7*	*10.6*	*9.1*	*7.7*	***100***
Pre-pottery	159	78	88	84	91	79	79	74	83	82	**897**
%	*17.7*	*8.7*	*9.8*	*9.4*	*10.1*	*8.8*	*8.8*	*8.2*	*9.3*	*9.1*	***100***
Total	**327**	**183**	**225**	**282**	**211**	**184**	**182**	**219**	**212**	**177**	**1990**

5.9 The Mphekwane Shelter formal tools

In the Mphekwane Shelter formal tool assemblage there is a shift from backed tools towards scraping tools from the pre-Pottery to the Pottery phase. This was also observed at the Toteng 1 site. Formal tools will be further discussed in chapter 7.

Table 5.14 Mphekwane formal tool classifications

Classes/Level	**Retouched pieces**	**Backed Blades**	**End Scrapers**	**Side Scrapers**	**Grinding stone**	**Thumbnail Scrapers**	**Anvil**	**Segments**	**MRP**	**points**	**Backed pieces**	**Other**	**Total**
Pottery	11	1	5	11	1	7			2			2	**40**
%	*28*	*2.5*	*13*	*28*	*2.5*	*18*			*5*			*5*	***100***
Middle	4		2	3	1		1	1		1	2		**15**
%	*22*		*11*	*17*	*5.6*		*5.6*	*5.6*		*5.6*	*11*		***100***
Pre-pottery	2	3						5		4	6		**20**
%	*10*	*15*						*25*		*20*	*30*		**100**
Total	**16**	**4**	**7**	**14**	**2**	**7**	**1**	**6**	**2**	**5**	**8**	**2**	**74**

Mphekwane tool typology: some of these are defined in Chapter 4.

MRP: miscellaneous retouched pieces- are artefacts with systematic secondary retouch but which do not conform to any standardized pattern and hence are not readily classified.

5.10 *Chaînes opératoires* in the Mphekwane Shelter assemblage

Excluding quartz, there two major raw material classes are identified in Mphekwane shelter: fine grained CC and Quartzite. Quartzite pebbles occur in abundance in the vicinity of the shelter while the CC may be exotic. Quartzite was probably brought to the site as nodules and/or pebbles as indicated by the presence of cortical debitage on the site. Nodules were probably first-sized judging by the length of blades and flakes together with cores. The *chaînes opératoires* are represented as follows:

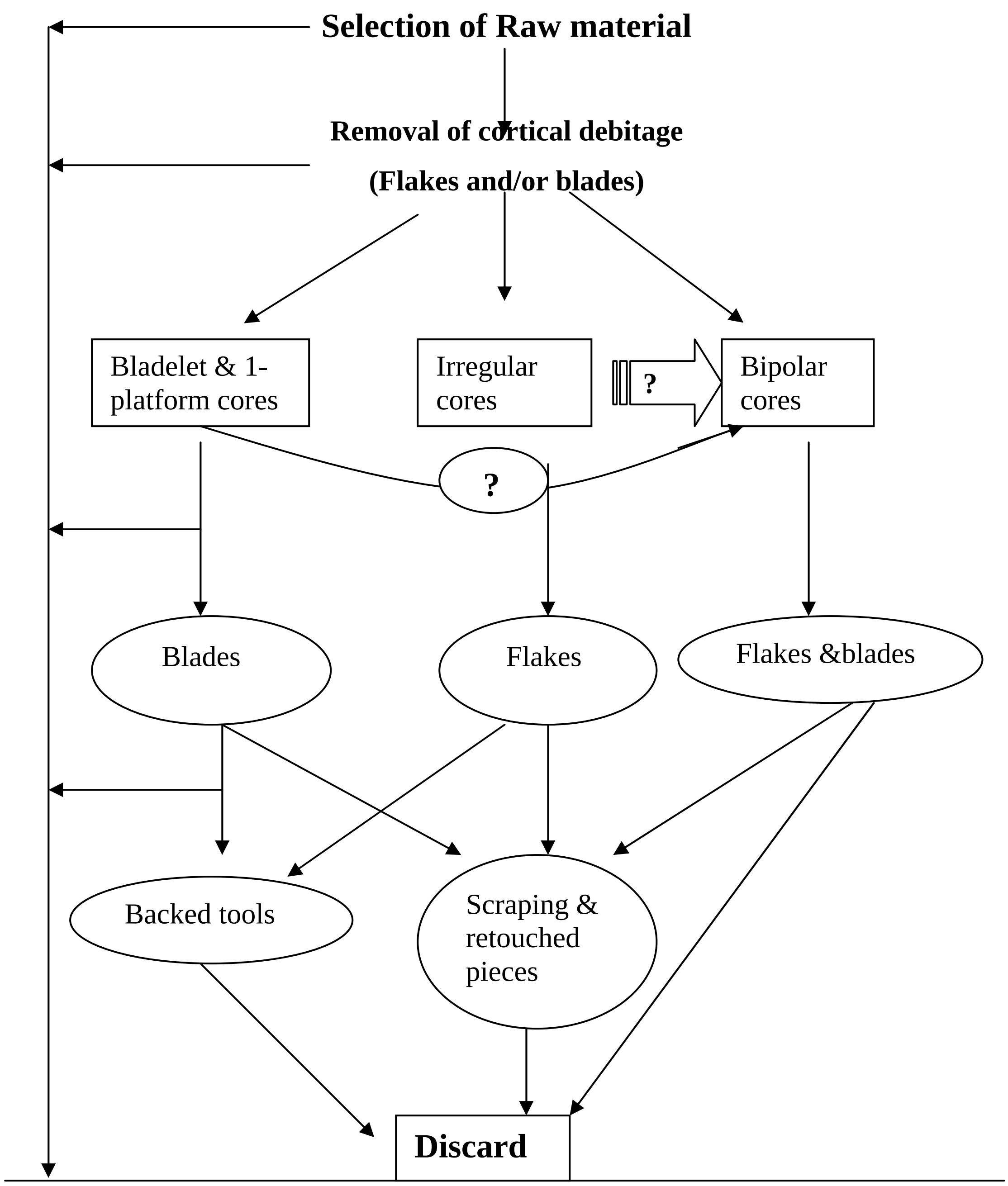


Figure 5.2 The Mphekwane Shelter *chaînes opératoires*

For blades/bladelets production knapping began by removal of cortical flakes and blades. Crested blades were then removed to allow for the main production. However, cores were still cortical which is evident by cortex on distal edge, platform and lateral edge of some blades. For blade production, bladelets and bipolar cores were the main nucleus pieces. Flakes were produced mainly from the irregular cores and some from bipolar cores. However, some flakes may be a product of core preparation for blade production. Recognised chains for Mphekwane are blades and flakes.

In summary there are both changes and continuity observed in the Mphekwane Shelter collection. In the formal tools for example there is a shift towards scraping tools in the Pottery phase while backed tools dominates the pre-pottery phase. While the middle phase in the Toteng 1 was different to both the Pottery phase and the Pre-Pottery phase, at Mphekwane it is similar to the Pottery phase. The most possible reason may be that the middle layer provides a bridging date between the enormous gap that occurs between the pottery phase and the pre-pottery phase dates.

5.11 Conclusion

Form the analysis it is noted that the whole *chaînes opératoires* have been conducted in the sites from primary reduction of the raw material to discarding of formal tools which have served their use-life. At Toteng 1, the assemblage has been truncated due to years of research and storage conditions in the museum. However, analysis was possible. Based on various technological aspects form the assemblages it can be noted that technology of lithic production shows both change and continuity in different aspects. The following chapters will further discuss change and continuity from the two sites.

Chapter 6

6.0 INTERPRETATION

6.1 Introduction

The transition from foraging to food production represents a major threshold in human prehistory (Henry 1989). This transition resulted in a complex shift in the social and economic life in early communities (Mitchell 2002). The way in which food production spread in southern Africa has the subject of debate among scholars (e.g. Cooke1965; Smith et al. 1991; Sadr 1998, 2003).

Different archaeological remains, fauna (e.g. Robbins *et al.* 2005), pottery (e.g. Huffman 2005) and Rock art (e.g. Smith and Ouzman 2004) have been employed to facilitate this debate. For this study main focus is to measure change and continuity in lithic assemblages from the pre-Pottery to the Pottery phases in Toteng and Mphekwane. The relevant data was presented in Chapters 4 & 5, in this chapter interpretations based on comparisons are made and conclusions are drawn about whether change or continuity characterises the transition in lithics from pre-Pottery and the Pottery phases at these sites.

The technological approach, which examines varying methods of lithic manufacture, is well suited to observe whether there is change or continuity in the stone tool technological style. As Conkey (1990) indicated, stylistic analyses are often used in an attempt to reveal prehistoric social units. From an archaeological perspective style is typically considered to be an indicator of temporal, geographic and ethnic or culturally bounded social units (Conkey 1980, 1990; Sackett 1982, 1985; Wiessner 1983, 1984, 1990).

The typological approach to lithic analysis is useful up to a point, but the technological approach is better suited for this study. This is because the technological approach not only focuses on the whole lithic production sequences from raw material procurement to the final disposal of the artefact, but also the behavioural habits (Gosselain 2000). Moreover, lithic technological approach is important for this study because variation between lithic technologies is understood to be a result of cultural change (Dibble & Bar-Yosef 1995). Since the debate is whether the early ceramics in southern Africa was brought by migrating people (pastoralists) or whether the early ceramics diffused from one group of local hunter-gatherers to another, change and continuity in the pre-Pottery and Pottery phase assemblages at the two sites could help decide these matters.

6.2 Toteng 1

There changes and continuities observed in different artefacts classes across ceramic boundary here. These changes and continuities will be discussed in terms of cores first, secondly blades and flakes and ended with the formal tools.

6.2.1 The Toteng 1 cores

The core technologies do differ across phases at Toteng 1. As shown in Chapter 4, there is a gradual change in cores for blade production technology from pre-pottery phase to pottery phase. Bladelets cores are more common during the pre-pottery phase than in the Pottery and Middle phases. However, the irregular cores, for the flake production, dominate the Pottery phase and decrease gradually through the Middle phase to the pre-Pottery phase. The bipolar cores are more dominant in the pre-Pottery phase than the Pottery phase.

Table 6.1 Toteng 1 cores classification

classes/level	*BC	*IR	*BP	*OT	Total
Pottery (%)	*25*	*27.5*	*25*	*12.5*	***100***
Middle (%)	*25*	*25*	*12.5*	*37.5*	***100***
Pre-pottery (%)	*32.1*	*21.4*	*28.6*	*17.9*	***100***
Total	**5**	**10**	**11**	**9**	**44**
%	***11.4***	***22.7***	***25***	***20.5***	***100***

**BC* – *Bladelet cores* **IR* – *Irregular cores* **BP* – *Bipolar cores* **OT* - *Others*

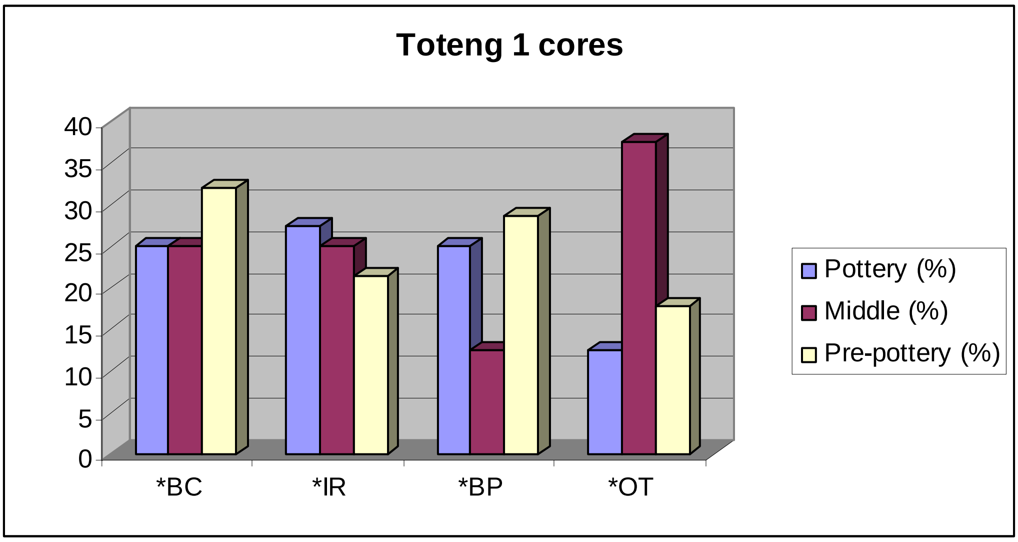


Figure 6.1 A chart of the Toteng 1 core classes

6.2.2 Toteng 1 debitage

The trends observed on the Toteng 1 cores are also reflected in the debitage which indicate that there was a shift towards more flake production than blade production during the Pottery phase.

Table 6.2 blades and flakes from the pre-pottery and pottery layers at Toteng 1

Phase	Flakes	Blades	Total
pottery	63	48	111
%	*56.8*	*43.2*	*100*
Pre-pottery	165	216	381
%	*43.3*	*56.7*	*100*
Total	**228**	**264**	**492**

The Middle phase is left out on the Table 6.2 and Figure 6.2 to emphasis the trends that occur between the Pottery phase and the pre-Pottery phase blades and flakes industries.

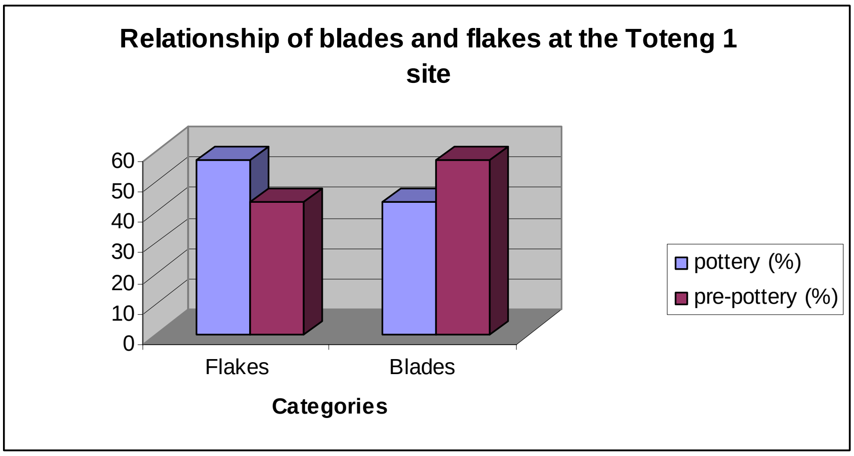


Figure 6.2 blades and flakes at Toteng 1

6.2.3 The Toteng 1 raw material frequencies

Lithics at Toteng 1 are characterised by a variety of raw materials. Most of the raw materials are locally available along the nearby river channels (Robbins *et al.* 2005) and around Lake Ngami (Summerfield 1983). A comparison of raw materials at Toteng 1 suggests that there was a gradual shift towards more use of chalcedony from the pre-Pottery phase to the Pottery phase but chert proportion decreased from pre-pottery to pottery phase. Both these raw materials are of good quality for knapping (Inizan *et al.* 1999). Generally, there are no clear patterns in raw material preference and each phase is somewhat different from the other.

Table 6.3 Toteng 1 raw material categories

Phase	Quartzite	Chalcedony	Silcrete	Chert	Other	TOTAL
Pottery (%)	*24.6*	*44.9*	*9.4*	*8.7*	*12.3*	***100***
Middle (%)	*9.7*	*68.9*	*10.7*	*4.6*	*6.1*	***100***
Pre-pottery (%)	*15.6*	*39.7*	*15.6*	*12.2*	*18.1*	***100***
TOTAL	**121**	**370**	**102**	**74**	**108**	**775**
%	***15.6***	***47.7***	***13.7***	***9.5***	***13.5***	***100***

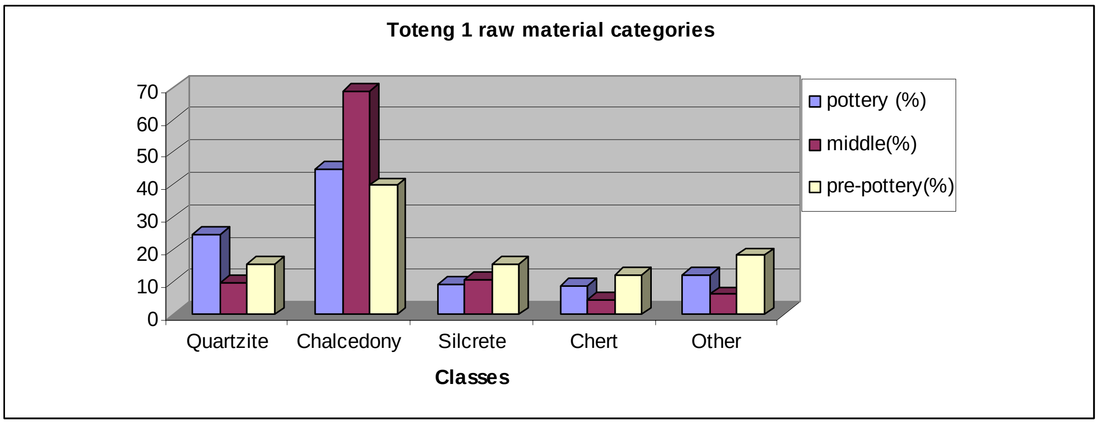


Figure 6.3 Toteng 1 raw material categories

6.2.4 Knapping techniques at the Toteng 1 site

Two modes of percussion are identified in the Toteng1 assemblage. These are direct percussion and bipolar technique. 54.5% of the cores show evidence of direct percussion while 25% were a result of the bipolar technique. The both techniques occur in relatively similar frequency from the pre-Pottery to Pottery period. However, the bipolar technique is lower in the Middle phase.

Table 6.4 knapping techniques at the Toteng 1 site

classes/level	Direct	Bipolar	Unidentified	Total
Pottery (%)	*52.5*	*25*	*12.5*	***100***
Middle (%)	*50*	*12.5*	*37.5*	***100***
Pre-pottery (%)	*53.5*	*28.6*	*17.9*	***100***
Total	**24**	**11**	**9**	**44**
%	***54.5***	***25.0***	***20.5***	***100.0***

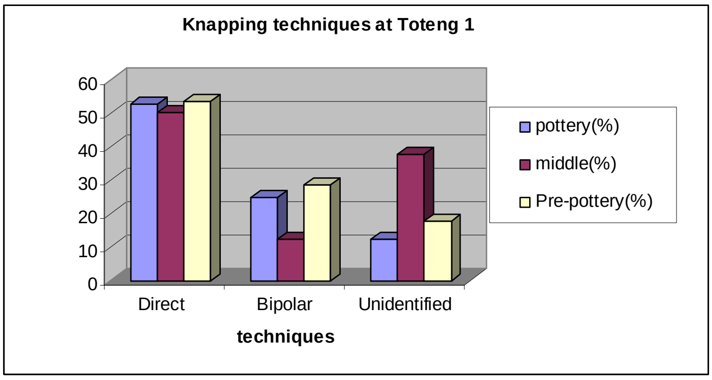


Figure 6.4 Knapping techniques at the Toteng 1 site

Despite the slight differences, this pattern shows that the pre-pottery knappers exploited their material in a similar way to that in the pottery period. As in raw material class, the Middle phases in quite different from the Pre-Pottery and Pottery phases. The higher proportion of chalcedony in the Middle phase (Fig. 6.3) may be directly related to the lower frequency of the Bipolar technique (Fig. 6.4) at that time.

6.2.5 Blade technology at the Toteng 1 site

Blade production occurred in both the Pottery and pre-Pottery phases of Toteng 1.

Table 6.5 blades frequency from Toteng **1**

	Initial stage		Production phase							
Phase/class	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**B8**	**B9**	**Total**
Pottery (%)	*12.5*	*4.2*	*12.5*	*8.3*	*10.4*	*6.3*	*12.5*	*4.2*	*29.2*	***100***
Pre-pottery (%)	*9.7*	*6*	*6*	*9.3*	*7.9*	*10.6*	*8.8*	*6.9*	*34.7*	***100***
Total	**24**	**22**	**16**	**30**	**26**	**31**	**29**	**21**	**125**	**324**
%	*7.4*	*6.8*	*4.9*	*9.3*	*8.0*	*9.6*	*9.0*	*6.5*	*38.6*	***100***

As shown in Table 6.5, except for the B9 class, the range total of blades of all stages occur in nearly equal percentages ranging from 4.9% to 9.6%. This shows that the whole blade *chaîne opératoire* was undertaken at the site. The pre-pottery phase shows similar trends with classes ranging from 6.0 to 10.6%. Basically there is some continuity in blade reduction strategy from the pre-pottery to the pottery phase at Toteng 1.

6.2.6 Blade platform preparations at Toteng 1

The Toteng 1 assemblage shows three kinds of platform preparation observed on the blades. These are the along the dorsal ridge, short hinge and lateral preparation. Besides these three there are the cortical and plain or non-prepared platforms.

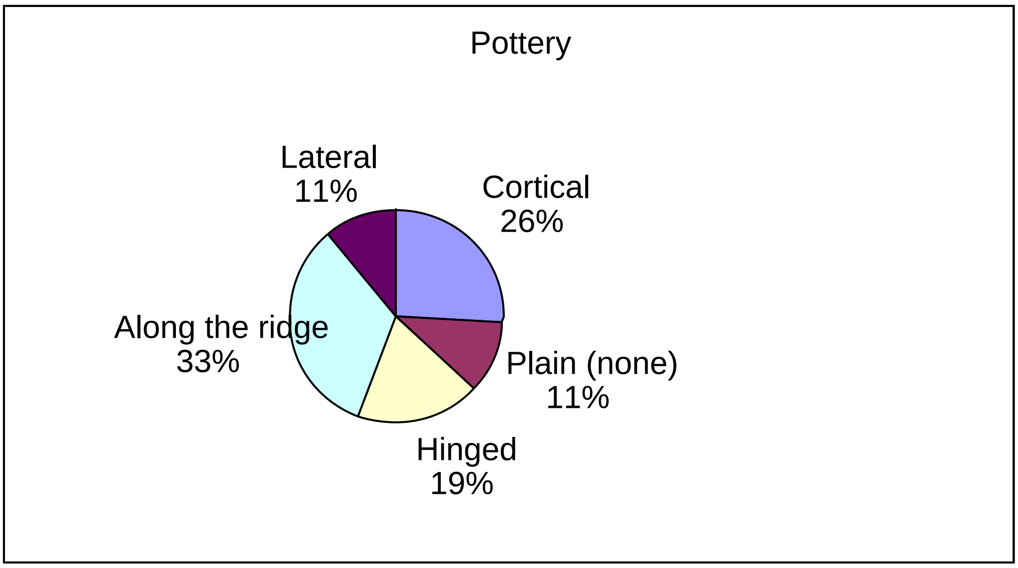


Figure 6.5 the blade platform preparation variation in the Pottery phase

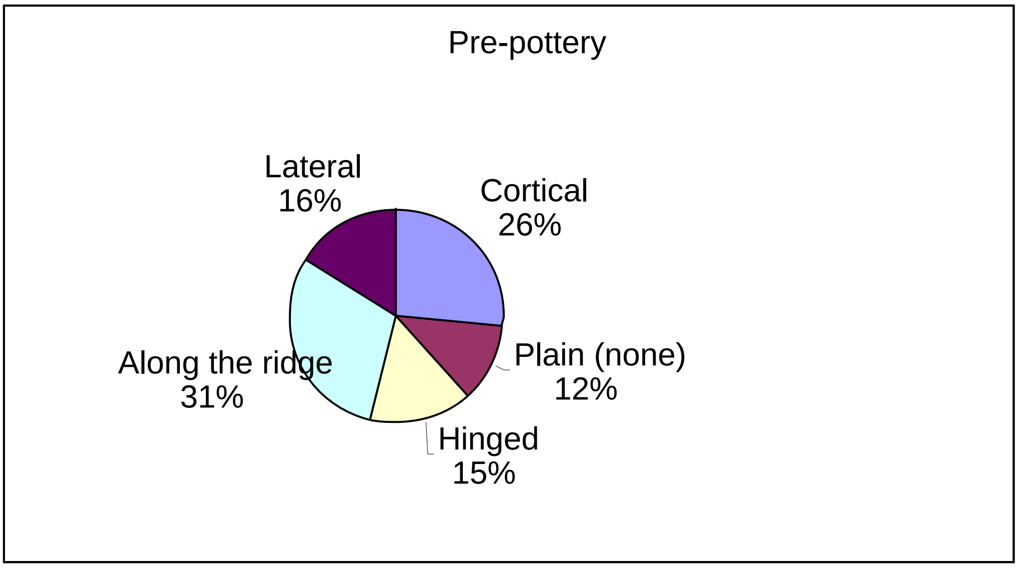


Figure 6.6 the blade platform preparation in the Pre-Pottery phase

There are no major changes in the blade platform preparation techniques in Toteng 1. Small shifts could be observed in some categories. In lateral preparation there is a 5% difference and 4% for hinged preparation. Only a 2% difference is obtained for preparation observed along the dorsal ridge of the blades from pre-Pottery to Pottery phase. These differences are so minimal and continuity is evident in this aspect of lithic technology at Toteng 1.

6.2.7 Blade platform morphology at Toteng 1

There are several platforms morphological variations observed in the Toteng 1 assemblage.

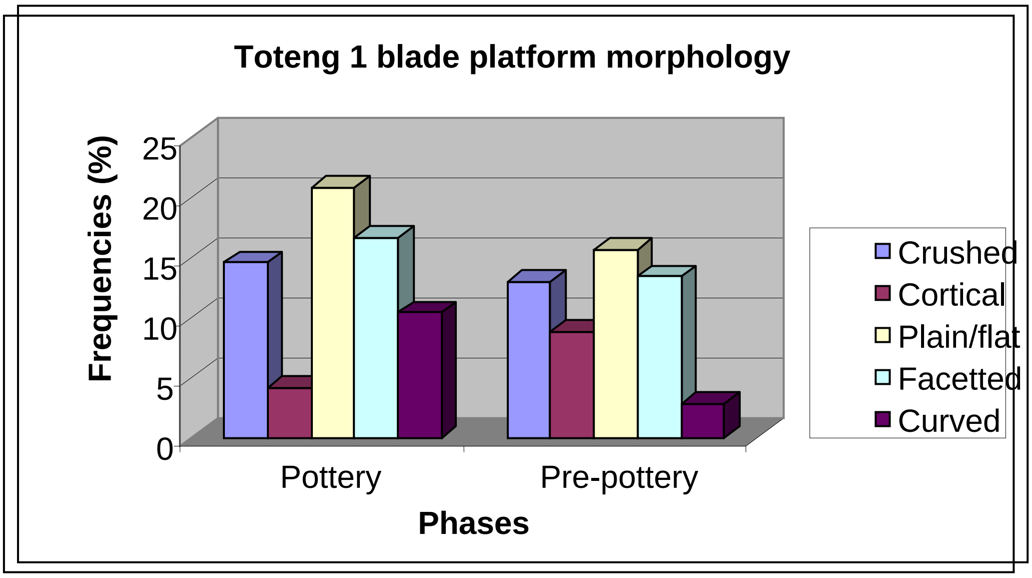


Figure 6.7 Toteng 1 blade platform morphological variations

The pottery phase registers higher percentage frequencies in most classes except in the cortical classes. Platforms on blades can tell about the hammer used (Inizan *et al.* 1999; Soriano *et al.* 2007; Mourre pers. comm. 2007). Crushed platform for example are usually a result of hard hammer mode and/or hard hammer mode on an anvil. Crushed platform in the Toteng 1 assemblage occur at similar frequencies. Therefore, it shows that a hard hammer was used in both Pottery phase and pre-Pottery phase. The difference in cortical platform is more difficult to interpret. It could mean a number of things such as not working on the cores intensively; or that the raw material nodules are smaller, hence more cortex per a kilogram of stone? In summary, there are no major shifts is in the Toteng 1 blade platform morphologies.

6.2.8 Formal tools

The archaeological assemblage at Toteng 1 shows some distinct discontinuities, more especially with formal tool. The pre-Pottery phase contains more tools with backed retouch predominantly on fine grained raw material. The backed tools are probably hunting tools, such as projectile points (Wiessner 1983). During the ceramic phase however, there was a shift towards more scraping tools. The dominance of scraping tools coincides with the higher occurrence of flakes in the pottery phase. Most scrapers are made on flakes, thus flake frequency increases from the pre-Pottery phase to the Pottery phase as do the irregular cores which were for flake production. On the other hand the blade frequencies decreased from the pre-Pottery phase to the Pottery phase as did the bladelets production. The backed tools, which are mostly on blades also decreased. Thus all the changes visible in stone tool technologies at Toteng are related and seem to be the result of the shift from a backed blade dominated formal tool to a scraper dominated one.

Sadr (1997) reported a similar observation in a comparative analysis of stone tools from the Bambata and Later Stone Age deposits which showed a gradual shift away from projectile points towards implements used for scraping. Walker (1995) noted a similar trend in the Matopos, before and after the occurrence of Bambata ware. In Namibia this trend is not visible. In the Snake Rock and the Falls Rock Shelter, for example, assemblages from pre-Pottery and Pottery phases are reported to be more alike (Kinahan 1995). These issues will be discussed further in the Conclusion chapter.

6.3 The Mphekwane Shelter

The Mphekwane Shelter site has a larger lithic sample in comparison with the Toteng 1. But, the idea is not to compare lithic technology between the two sites, rather to compare lithic technology in pre-Pottery and Pottery phase at each separately. In this way, local raw material issues will not skew the comparison. A total of 2299 artefacts were examined at Mphekwane and here too cores, flakes, blades and formal tools were looked at. These came from squares 3 and 6 excavated in 2004 and 2006.

The cultural sequence at the Mphekwane Shelter needs more dates for clarity. However, the two phases that are important for this study can be easily distinguished from each other. As mentioned, cores, blades, flakes and formal tools from the Pottery and pre-Pottery phase were studied. The uppermost layers are of ceramic periods, which include the Bambata ware generally dating to the early 1st millennium AD (Huffman 2005; Sadr & Sampson 2006). The pre-Pottery layers are lower down the stratigraphy. The lithic artefact sample for this analysis, as indicated in chapter 3, excludes all that are made on quartz. However, Quartz dominates the assemblage at Mphekwane.

6.3.1 Raw material frequencies at the Mphekwane Shelter

There are not many different raw materials at Mphekwane. The main raw materials after quartz are quartzite and cryptocrystalline silica. Quartzite cobbles and pebble are locally abundant. The CC materials are exotic to Mphekwane, which is why quartzite constitutes higher frequencies in classes than CC. However, there is a shift towards CC materials from pre-Pottery to Pottery phase. This is evident in the core and formal tools categories. This indicates that during the Pottery phase there was more distant contact with the Mphekwane habitants or they were more mobile during this phase.

Table 6.6 Raw material frequencies for the Mphekwane shelter cores

Phase/category	CC	Quartzite	Other	Total
Pottery (%)	*26.1*	*58.5*	*15.5*	***100***
Middle (%)	*28.7*	*57.0*	*14.3*	***100***
Pre-pottery (%)	***13.4***	*73.5*	*13.1*	***100***
Total	**491**	**1481**	**327**	**2299**
	21.4	***64.4***	***14.2***	***100***

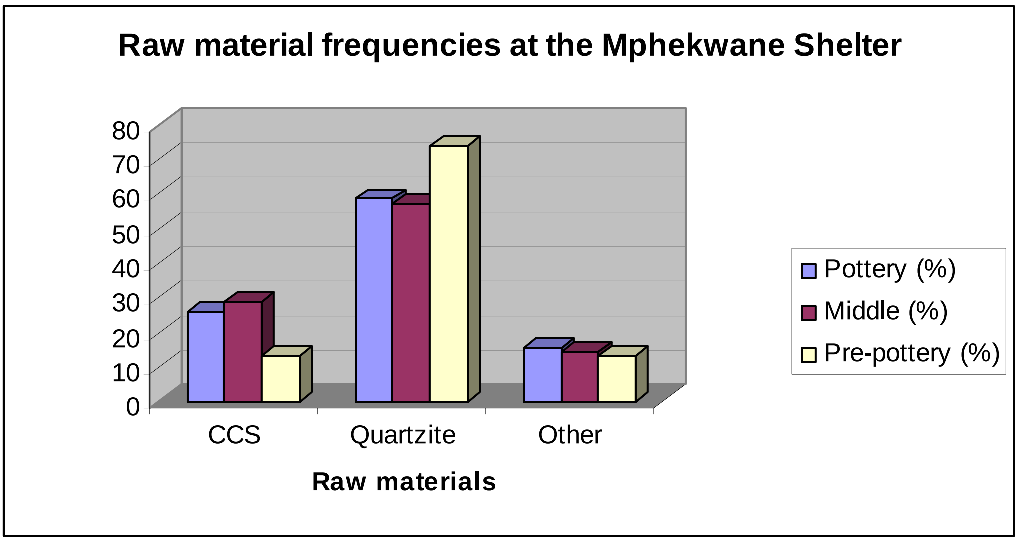


Figure 6.8 Raw material frequencies at the Mphekwane Shelter

6.3.2 The Mphekwane Shelter cores and debitage

The Mphekwane Shelter assemblage is dominated by flake production technique. Even though there is a low number of blades, a particular pattern can be seen in the table below. The Middle layer is left out purposefully to observe the trend of change clearly.

Table 6.7 blades and flakes at the Mphekwane Shelter

Phase/category	Blades	Flakes	Total
Pottery	59	629	688
%	*8.6*	*91.4*	*100*
Pre-pottery	52	891	941
%	*5.5*	*94.7*	*100*
Total*	111	1720	1629

****Excluding blades and flakes from middle layer***

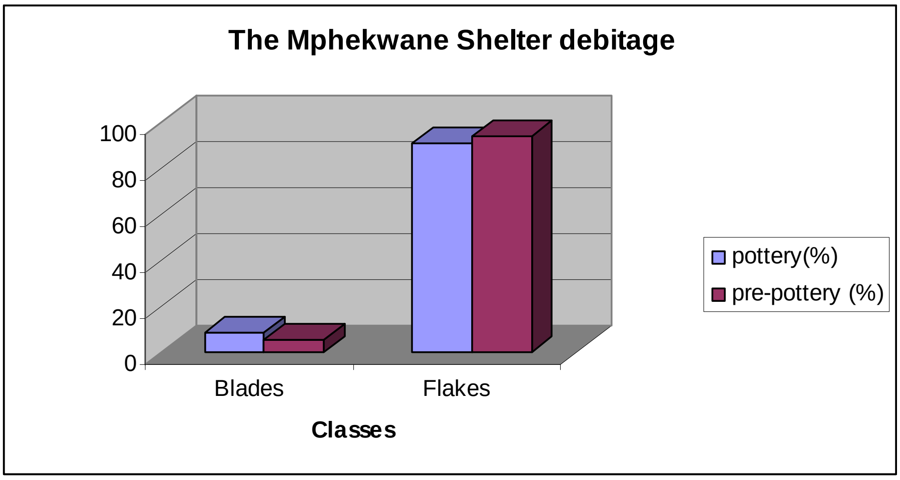


Figure 6.9 Mphekwane debitage

There is a small increase in blade production in the Pottery phase. This correlates with the increase in CC, a finer raw material and suitable for bladelets production. The same can also be seen in the cores. Bladelet cores also increased in the Pottery period while irregular cores for flake production slightly decreased.

Table 6.8 Mphekwane cores

Phase/category	Bipolar	Irregular	Bladelets	Other	Total
Pottery (%)	*44.4*	*22.2*	*28.9*	*4.4*	*100*
Middle (%)	*50*	*27.8*	*11.1*	*11.1*	*100*
Pre-pottery (%)	*46.7*	*40*	*13.4*		*100*
Total	**36**	**21**	**12**	**4**	**78**
%	*46.2*	*26.9*	*15.4*	*5.1*	*100*

This is unusual for Later Stone Age sites in southern Africa; most Later Stone Age sites show a gradual shift from blade to flake technology across the ceramic boundary (Deacon 1984).

6.3.3 Knapping technique at Mphekwane

Two techniques for core exploitation are recognisable in the Mphekwane Shelter assemblage. The bipolar technique is well represented and the most common in both phases. Direct percussion technique, a more formal technique, is represented by core classes such as irregular and bladelet production cores. These are also well represented in both phases suggesting general continuity in lithic technology across the ceramic boundary. These knapping techniques occur in relatively equal frequencies in both layers (see Table 5.8 in Chapter 5).

The other continuity is seen in blade technology at Mphekwane. There are no major changes between frequencies of stages of blade production in the pre-Pottery phase and the Pottery phase.

Table 6.9 blades frequencies (%) in the Mphekwane Shelter assemblage

Initial phase			**Main production phase**							
Phase/class	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**B8**	**B9**	**Total**
Pottery	*11.9*	*13.6*	*10.2*	*5.1*	*10.2*	*13.6*	*11.9*	*10.2*	*13.6*	***100***
Pre-pottery	*11.5*	*13.5*	*9.6*	*5.8*	*9.6*	*11.5*	*9.6*	*9.6*	*19.2*	***100***
Total	**23**	**22**	**15**	**7**	**15**	**19**	**15**	**15**	**25**	**156**
%	*14.7*	*14.1*	*9.6*	*4.5*	*9.6*	*12.2*	*9.6*	*9.6*	*16*	*100*

6.3.4 Mphekwane platform preparation

There are some distinctive differences in preparation observed on the Mphekwane blades. The blades that have preparations along the dorsal ridges and with hinged preparations increased during the pottery phase while other forms decreases.

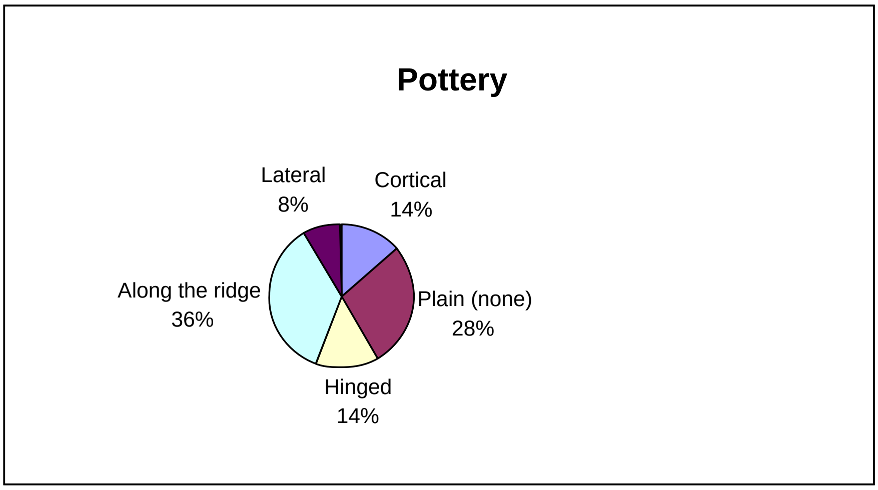


Figure 6.10 the Mphekwane blade platform preparation

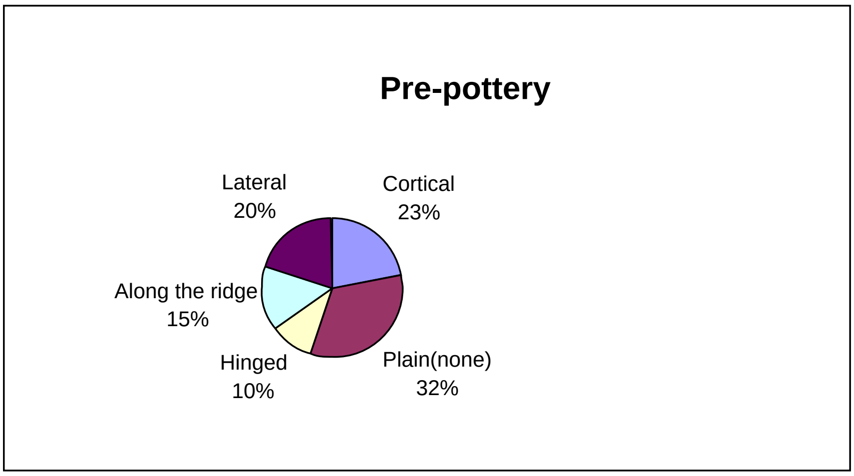


Figure 6.11 the Mphekwane blade platform preparation

Lateral preparation technique is higher in pre-pottery than in pottery phase while preparation along the ridge along is higher in the Pottery phase than in pre-Pottery. The difference in frequency is large and it is tempting to see this as a significant shift in preparation method technique. Therefore, a cultural discontinuity can be proposed for the preparation technique in the Mphekwane Shelter.

6.3.5 The Mphekwane Shelter platform morphologies

Platform morphologies in the Mphekwane Shelter show some distinct differences between the phases. Flat, facetted and crushed categories dominate the pottery phase, while in the pre-Pottery plain/flat dominates. This shift shows a significant change in technique of tool production, as did the platform preparation technique discussed above.

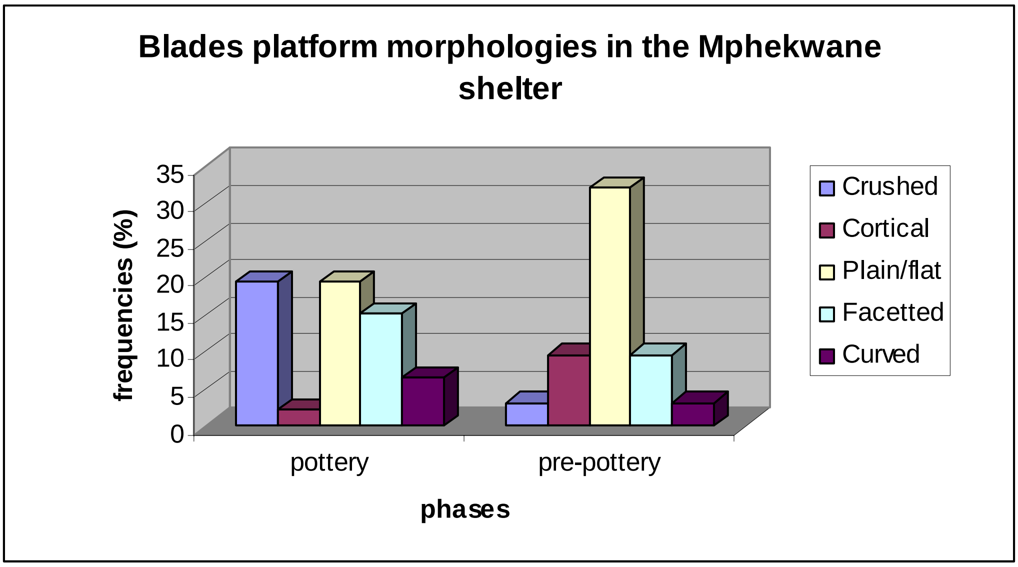


Figure 6.12 the Mphekwane blade platform morphologies

6.3.7 The Mphekwane Shelter formal tool category

Retouched tools occur across both phases. Scraping tools manufactured from fine grained material dominate the pottery phase while the pre-pottery is dominated by backed projectile point tool, presumably. The domination of scraping tools during the pottery phase does not parallel the flake frequency which decreases a bit. However this might be justified by the large number of flakes which dominate all the phases in Mphekwane. However, the same pattern seen in scraping tools and backed tool is true for many of southern African Later Stone Age sites with early ceramics (Smith *et al.* 1991). The next chapter will discuss this.

Table 6.10 Mphekwane formal tools

Classes/Level	**Retouched pieces**	**Backed Blades**	**End Scrapers**	**Side Scrapers**	**Rubbing/smoothing**	**Thumbnail Scrapers**	**Anvil**	**Segments**	**MRP**	**points**	**Backed pieces**	**Other**	**Total**
Pottery (%)	*28*	*2.5*	*13*	*28*	*2.5*	*18*			*5*			*5*	***100***
Middle (%)	*22*		*11*	*17*	*5.6*		*5.6*	*5.6*		*5.6*	*11*		***100***
Pre-Pottery (%)	*10*	*15*						*25*		*20*	*30*		***100***
Total no.	**16**	**4**	**7**	**14**	**2**	**7**	**1**	**6**	**2**	**5**	**8**	**2**	**74**

6.4 Summary

In southern Africa, especially in the Later Stone Ages, the *chaîne opératoire* approach is not commonly applied to lithic analysis. Existing systems of classification used in most of southern African Stone Age sites (Volman 1981; Deacon 1982, 1984) are typologically oriented and rarely aim at addressing complete reduction sequences. The *chaîne opératoire* approach, that has its basis in lithic reduction, is useful in that by following objects through the operational sequences it is possible to see important variations that can not be observed in a typological analysis. The tables (6.11 & 6.12) below summarises changes and continuity from Toteng 1 and Mphekwane:

Table 6.11 Summary of changes and continuity in Mphekwane Shelter

Mphekwane
▪ There is a shift towards CC materials from pre-Pottery to Pottery phase. ▪ There is a small increase in blade production in the Pottery phase ▪ Bladelet cores also increased in the Pottery period while irregular cores for flake production slightly decreased. ▪ These knapping techniques occur in relatively equal frequencies in both layers ▪ The other continuity is seen in Blade technology at Mphekwane ▪ There are some distinctive differences in preparation observed on the Mphekwane blades. ▪ There is a significant change in technique of tool production, as in the platform preparation technique ▪ Scraping tools manufactured from fine grained material dominate the Pottery phase while the pre-Pottery is dominated by backed projectile point.

Table 6.12 Summary of changes and continuity at Toteng

Toteng 1
▪ Gradual change in cores for blade production technology from pre-pottery phase to pottery phase ▪ The bipolar cores are more dominant in the pre-Pottery phase than the Pottery phase. ▪ A shift towards more flake production than blade production during the pottery periods phase ▪ A gradual shift towards more use of chalcedony from the Pre-Pottery phase to the Pottery phase ▪ Techniques occur in relatively similar frequency from the pre-pottery to pottery period ▪ There is some continuity in blade reduction strategy from the pre-pottery to the pottery phase at Toteng 1. ▪ There are no major changes in the blade platform preparation techniques in Toteng ▪ There are no major shifts in the Toteng 1 blade platform morphologies. ▪ The pre-Pottery phase contains more tools with microlithic backed retouched technology predominantly on fine grained raw material, during the ceramic phase however, there was a shift towards more scraping tools. ▪ Thus all the changes visible stone tool technologies at Toteng are related and seem to be the result of the shift from a backed blade dominated formal tool to a scraper dominated one.

Looking at different variables subdivided into stratigraphic units covering the periods between pre-Pottery and Pottery phases, the lithic industries of the Toteng 1 and the Mphekwane Shelter sites show both changes and continuities. These occur differently from raw material frequencies to technological aspect. These different trends do not answer the general question of whether new populations suddenly brought alien cultural traits, ceramics, into the southern Africa or the that the idea diffused from one group of local hunter-gatherers to another, but rather points to how complex the issue is.

It appears that the pre-Pottery phase stone tool industry in Later Stone Age times has generally been characterised by a well developed blade technology in Toteng 1. There is a gradual shift towards flake production during the Pottery phase. It will be useful to recover larger samples from less disturbed contexts to answer this question confidently. The bioturbation that is evident at Toteng complicates issues and thus the judgement regarding lack of change in lithic technology before and after the arrival of livestock and ceramics needs to be examined further.

Since lithic assemblages are in most cases found in association with early ceramics (Walker 1983; Campbell 1992; Sadr 1997), then their characteristics should have some degree of sudden change if new populations brought these ceramics through migration or a degree of continuity if the idea diffused amongst local people. However, the Mphekwane collection shows both significant changes and continuity. In spite of this, there is still need to investigate more data from different early ceramic sites to confidently argue these ideas.

Chapter 7

7.0 EARLY CERAMIC SITES IN SOUTERN AFRICA – A COMPARATIVE STUDY

7.1 Introduction

This chapter compares formal tool categories from Toteng 1 and Mphekwane with pre-pottery and pottery period lithic assemblages from other Later Stone Age sites. An attempt will be made to choose sites from different geographical regions across southern Africa. Later Stone Age ceramics from different regions in southern Africa show some stylistic differences (Sadr 1998). However, the thin walled ceramics are usually considered as a technological tradition, in the sense that the technology of making the pots is similar (and different from the Early Iron Age technological style).

The scraping and backed tools from Mphekwane (Table 7.1) and Toteng 1 (Table 7.2) show a similar shift from a higher number of backed tools in Pre-Pottery while the Pottery phase is dominated by scraping tools.

Table 7.1 Mphekwane scraping and *backed tools

Classes/Level	Scraping tools	Backed tools	Total
Pottery	23	1	24
%	*95.8*	*4.2*	*100*
Pre-pottery	0	14	14
%	*0*	*100*	*100*
Total	**23**	**15**	**38**
%	***60.5***	***39.5***	***100***

sometimes referred to as bladelet tool for this study

Table 7.2 Toteng 1 scraping and backed tools

Classes/Level	Scraping tools	Backed tools	Total
Pottery	7	9	16
%	*43.8*	*56.3*	*100.0*
Pre-pottery	2	27	29
%	*6.9*	*93.1*	*100.0*
Total	**9**	**36**	**45**
%	***20***	***80***	***100***

The question is: to what extent are the patterns at Toteng and Mphekwane specific to the Bambata region? For this study I can not perform a full technological analysis from all the sites because everyone else has been doing typology. The most appropriate thing for this study is to look at formal tools because: a) everyone reports these, and b) they are the end products of *chaînes opératoires* and give information about the blade to flake change as well. The selected sites are from Namibia, Botswana, Zimbabwe and South Africa (Figure 7.1).

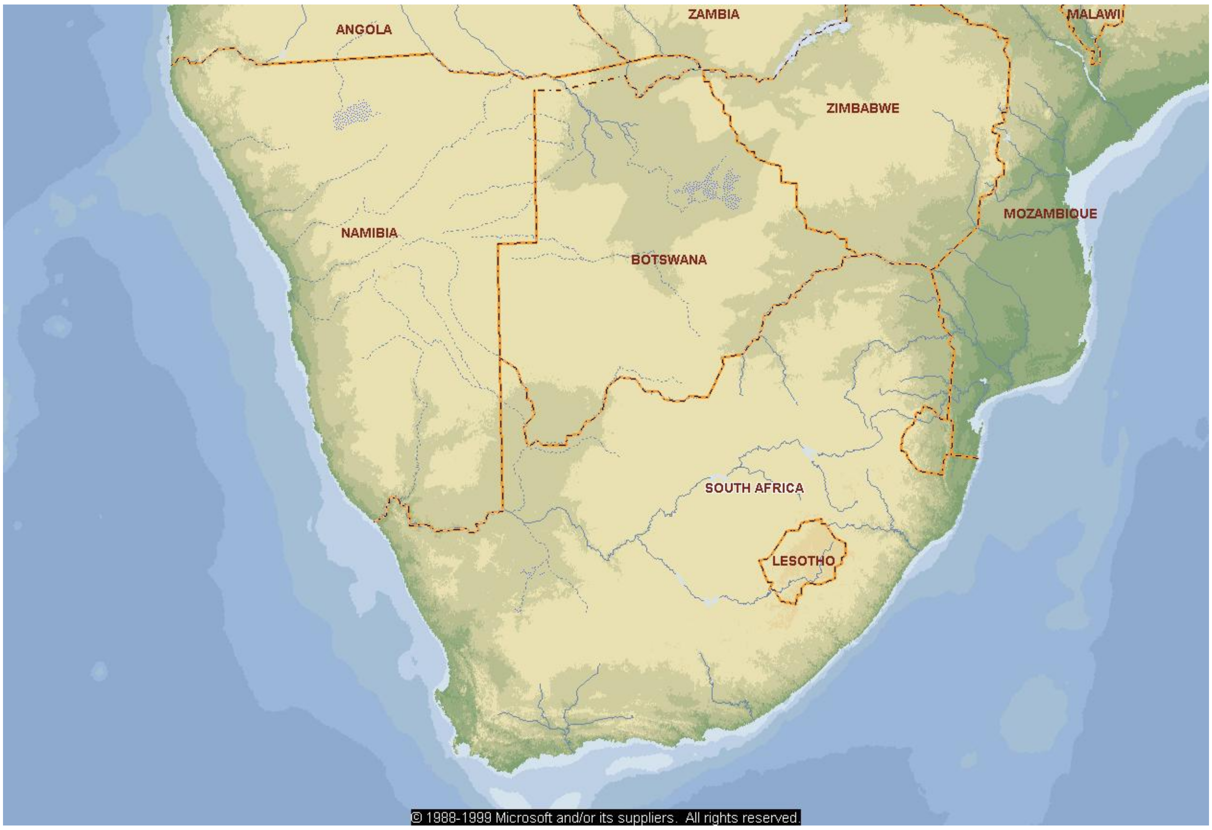


Figure 7.1 southern Africa showing selected regions (map from Microsoft Encarta)

7.2 Namibia

7.2.1 Geduld

Geduld is located at S 20˚17’ and E 15˚50’, found above the north bank of the Outjo River, in North-western Namibia (Smith & Jacobson 1995). The main excavations were conducted by L. Jacobson between years 1978 and 1986. Excavations were conducted by natural stratigraphic levels. The stratigraphic layers at Geduld indicate little mixing of deposits and this was further confirmed by radiocarbon dates from successive layers which were in sequential order (Smith & Jacobson 1995). Dates at Geduld indicate that occupation of the site, for the most part, was between 2250 and 1710 BP. Pottery only appeared in level 7 dated to 1980 BP. The table below shows the distribution of scraping and bladelets tools from the pre-pottery and pottery phases at Geduld.

Table 7.3 Geduld scraping and backed tools (Smith and Jacobson 1995:7)

Phases	Scraping tools	Backed tools	Total
pottery	4	40	**44**
%	*9.1*	*90.9*	***100***
pre-pottery	2	6	**8**
%	*25*	*75*	***100***
Total	**6**	**46**	**52**
%	***11.5***	***88.5***	***100.0***

The table above shows formal tools from four squares (B6, B7, C6 and C7) at Geduld. The frequency of formal tools in the bottom layer are higher than those above level 8 (levels 3-7 have 0.3-0.4%); level 13 has 0.7% formal tools and level 14 has 4.2% formal tools. Although there is no apparent cultural break between Pottery and Pre-Pottery, there is a distinct resurgence of backed tools, which seems to coincide with the appearance of ceramics (Smith & Jacobson 1995). The Pre-Pottery phase generally has small numbers of total formal tools. At Geduld, scraping tools decrease in frequency from the pre-pottery to the pottery phase while the bladelet tools increase. This is opposite of changes observed at Toteng 1 and Mphekwane.

7.2. 2 The Big Elephant Shelter

The Big Elephant Shelter site is situated on the farm Ameib in the southern foothills of the Erongo Mountains in northern Namibia at approximately S 21˚ 41’ and E 15˚40’. Excavations at the Big Elephant Shelter were carried out in 1975 until 1976 following the stratigraphic units (Wadley 1979). In the Big Elephant Shelter site one of Wadley’s aims was to document possible changes in the stone tool kit through time. Since the deposits span the period between the pre-pottery hunter-gatherers and pottery using people with livestock, the lithic analysis was actually aimed at examining the influence of this subsistence change on the lithics manufacturing tradition of the hunter-gatherers (Wadley 1979). She subdivided the formal tools into scrapers, backed tools, borers, *outils écaillées* and ground stone pieces. Only scrapers and backed tools are used here for this comparison and the table below shows the results.

Table 7.4 The Big Elephant Shelter scraping and backed tools (Wadley 1979:68)

Phases	Scraping tools	Backed tools	Total
Pottery	49	26	75
%	*65.3*	*34.7*	*100*
Pre-pottery	102	58	160
%	*63.8*	*36.3*	*100*
Total	151	84	235
%	*64.3*	*35.7*	*100*

The same range of tools appears in all the levels and the tool percentage frequencies are not significantly different form Pre-Pottery to Pottery phase. Wadley (1979) suggests that this implies that the same range and similar proportion of activities were being practised during pottery-using and pre-pottery times. The small difference that can be seen shows that the bladelet tools are slightly higher in the pre-pottery phase and their frequency drops slightly during the ceramic phase. The scraping tools frequencies on the other hand, are slightly higher in the pottery phase. This is similar to the observation at Toteng 1 and Mphekwane, but here the difference is too small to be significant.

7.2.3 Oruwanje

Oruwanje Rock Shelter site is located in western Namibia, in Opuwo district (Albrecht *et al.* 2001). First excavations were conducted by R. Kuper in 1995 and the site was subsequently excavated in 1996 by M. Albrecht and R. Kuper. Altogether seven square meters were excavated to a depth of 1.5 metre in 5cm spits. Bedrock was reached in two locations. The weighted mean dates for the Oruwanje Shelter are 1911, 2228 and 3100 BP. However, Albrecht *et al*. (2001) suggest that the 3100 BP date for ceramics obtained from the lower layer in Oruwanje is questionable.

Table 7.5 Oruwanje backed and scraping tools (Albrecht *et al.* 2001:7)

Phases	Backed tools	Scraping tools	Total
Pottery	10	12	22
%	*45.5*	*54.5*	*100.0*
Pre-pottery	42	30	72
%	*58.3*	*41.7*	*100.0*
Total	**44**	**33**	**77**
%	***57.1***	***42.9***	***100.0***

Pottery was recovered and most of the sherds were concentrated in the upper and middle parts of the sequences, referred to as pottery phase for this study. Formal tools are found throughout the sequence. Just like at Toteng 1, there is a shift towards scraping tools during the pottery phase.

7.3 Zimbabwe

7.3.1 Bambata Cave

Bambata Cave is situated at S 20˚30’10” and E 28˚24’25”E in a prominent granitic outcrop in the north-western part of the Matopos Hills (Walker 1995). The site is characterised by impressive rock-paintings (Cooke 1959) and distinctive pottery which is named after the site (Armstrong 1931; Schofield 1940; Cooke *et al.* 1966). The first excavations were conducted by Arnold and Jones in 1919 and since then it attracted several researchers (e.g. Armstrong 1931; Schofield 1940; Robinson 1966; Walker 1983). For this study, materials from the two trenches excavated by Nicholas Walker are used (Walker 1995). The two tables below capture selected tool categories which are important for comparison in this study.

Table 7.6 Bambata Cave trench N backed and scraping tools (Walker 1995:157)

LEVEL	Backed tools	Scraping tools	Total	Dates
Pottery	17	46	63	**2100BP**
%	*27.0*	*73.0*	*100*	
pre-pottery	92	73	165	**4000BP**
%	*55.8*	*44.2*	*100*	
Total	**110**	**119**	**228**	
%	*48.2*	*52.2*	*100*	

Table 7.7 Bambata Cave trench Q backed and scraping tools (Walker 1995:158)

LEVEL	Backed tools	Scraping tools	Total	Dates
pottery	80	64	144	**2100BP**
%	*55.6*	*44.4*	*100*	
Pre-pottery	60	44	104	**4000BP**
%	*57.7*	*42.3*	*100*	
Total	140	108	248	
%	*56.5*	*43.5*	*100*	

In the Bambata Cave the evidence from the Pottery phase is argued to indicate the contact situation between foragers and farmers some 2000 years ago (Walker 1995). There is a common trend that can be observed on Table 7.6 and 7.7. In both Tables there is a shift from bladelet tools to the scraping tools in the pottery phase. The change in these tool types occur similarly to Toteng 1 and Mphekwane. However, it is interesting to note the different proportion between the two nearby trenches: in Q the trend is hardly significant. This has important implication for the validity of the comparison attempted here. This will be discussed in more detail later.

7.4 Botswana

7.4.1 Tuli Lodge

The Tuli Lodge site is located on the north side of the Limpopo River just west of Pont Drift. There are a few shelters here characterised by rock painting which include human figures. The excavated shelter is north facing and overlooks a small tributary of the Limpopo River. A two square meter trench was excavated to bedrock at a maximum depth of 30 cm and provided exceptionally rich archaeological material. Excavations were in 10 mm spits which were adjusted according to subtle soil changes (Walker 1994). Pottery of several Iron Age phases as well as Bambata ware is present in association with lithic artefacts. Pottery is present throughout the stratigraphy, so no Pre-Pottery phase seems to be represented. However, the lower level contain far fewer sherds, so the strata are here described into Upper and Lower pottery.

Table 7.8 **Tuli Lodge backed and scraping tools (Walker 1994:30)**

LEVEL	Backed tools	Scraping tools	Total
Upper Pottery	61	102	**163**
%	*37.4*	*62.6*	***100***
Lower Pottery	128	116	**244**
%	*52.5*	*47.5*	***100***
Total	**189**	218	**407**
%	***46.43735***	***53.56265***	***100***

The artefacts are argued to be part of a single industry (Walker 1994). The main tools present at the Tuli Lodge site are scrapers and backed pieces. There is a decline in backed tools relative to scrapers from lower to upper levels. Scrapers are quite small at the lower level and get bigger in the upper levels. The assemblage shares affinities with time Mphekwane Shelter and Toteng 1. Walker (1994) has argued that the presence of pottery in this site implies contact with farming people over many years and that the site was probably occupied from about first few centuries AD for about a thousand years. Unfortunately there are no dates from this site.

7.4.2 Mantenge

Mantenge Shelter is situated just west of Domboshabe Hill, a small granite batholiths in the North-eastern District of Botswana (Walker 1994). The shelter is characterised by San Rock Art (van Waarden 1987). The shelter proved to be rich in cultural material and only a meter square was excavated with bedrock reached at 95 cm. the excavation followed the natural stratigraphic layers. Here also, pottery is present throughout the stratigraphy, so no Pre-Pottery phase seems to be represented. However, the lower level contain far fewer sherds, so the strata are here described into Upper and Lower pottery.

Table 7.9 Mantenge backed and scraping tools (Walker 1994:27)

Level	Backed tools	scraping tools	Total
Upper Pottery	55	46	101
%	*54.5*	*45.5*	*100*
Lower Pottery	30	23	53
%	*56.6*	*43.4*	*100*
Total	***95***	***52***	***164***
%	***57.9***	***31.7***	***100***

Walker (1994) indicated that in Mantenge Shelter there is a progression from backed tools domination to scraper domination comparable with sequences in adjacent Zimbabwe about 2000 years ago. The lower levels are similar to the final levels at Bambata Cave in backed tool morphology, but scraper morphology seems to be a continuation of these trends. As at Toteng 1 and Mphekwane, the bladelet tools at Mantenge dominate the lower pottery layer while scraping tools are more frequent in the upper layer. However, the shift is so small that is not significant.

7.5 South Africa

7.5.1 Boomplaas

The Boomplaas Cave is located in the foothills of Swartberg Mountains about 600 meters above sea level at approximately S 33˚23' and E 22˚11' in the southern Cape region (Deacon *et al.* 1978). The upper 30 cm from Boomplaas is characterised by calcite burnt material and yielded no cultural remains. It is the underlying layers that have rich archaeological deposits (Deacon *et al.* 1978). Several radiocarbon dates have been obtained from the Boomplaas Cave. These dates are 1630, 1510 and 1700 BP. Sadr & Sampson (2006) have calculated the weighted mean date for Boomplaas to be 1699 BP.

Table 7.10 The Boomplaas Cave scraping and backed tools (Deacon *et al.* 1978)

LEVEL	Scraping tools	Backed tools	Total
Pottery	11	2	13
%	*84.6*	*15.4*	*100*
Pre-Pottery	177	45	222
%	*79.7*	*20.3*	*100*
TOTAL	**188**	**47**	**235**
%	*80*	*20*	*100*

The majority of the formal tools come from the BLD levels in this cave. Overall scrapers account for more than 80% of the sample. The majority of the potsherds were recovered from the DLG levels and is referred to as Pottery phase and the lower layers, BLD, are the Pre-Pottery phase for this study. In the Pottery phase scraping tools increased in frequency while the bladelet tool frequency decreases. However, it is argued that there are no apparent changes in the stone tool industry which suggest a measure of continuity in the lithic tradition (Deacon *et al.* 1978). The observation from the scrapers and bladelet tools at Boomplaas Cave, however, is similar to observation at the Mphekwane Shelter and Toteng 1 where the backed bladelet decreased during the Pottery phase.

7.5.2 Clarke's Shelter

The Clarke's Shelter is a small, open rock shelter approximately 12 m long, 4 m deep and more than 5 m high situated at S 29˚10'15" and E 29˚18'58" IN KwaZulu-Natal (Mazel 1984). The excavations at this site were conducted by Aron Mazel in the beginning of the 1980s. Ten square meters were excavated in the west of the shelter with only two excavated to the bedrock. The excavations followed the natural stratigraphy with arbitrary spits used when the strata were not discernable (Mazel 1984).

Layers 2 and 3 provide evidence for the first use of pottery at the site and are therefore referred to as pottery phase while layer 4 is the pre-pottery layer. In the total lithic assemblage formal tools make up only a small percentage with the scrapers dominating. Dates obtained from the Pottery phase are 2160 and 2380 BP.

Table 7.11 Clarke's Shelter scraping and backed tools (Mazel 1984:51)

LAYER	Scraping tools	Backed tools	Total
pottery	104	9	113
%	*92.0*	*8.0*	*100*
Pre-pottery	12	1	13
%	*92.3*	*7.7*	*100*
Total	**116**	**13**	**129**
%	***89.9***	***10.1***	***100***

At the Clarke's Shelter the scraping and bladelet tool occur in same frequency from the pre-pottery to the pottery phase. This pattern is different from Mphekwane and Toteng 1 where some changes are observed for the scraping and bladelet tools

7. 5.3 The Collingham Shelter

The Collingham Shelter site is located in KwaZulu-Natal on the tributary of the KwaManzamnyama River which is a tributary of the larger Inzinga River. The shelter faces north western direction at S 29˚27'35" and E 29˚47'45" (Mazel 1992). The excavation was done using natural stratigraphy and a total of 19 different units were identified. The deposit varied in thickness between 10-45 cm and the bedrock was reach at 45 cm. Seven dates have been obtained and these indicate that most of the deposit dates to a 150 year period shortly after 2000 BP.

Table 7.12 The Collingham Shelter scraping and backed tools (Mazel 1992:21)

LAYER	Scraping tools	Backed tools	Total
Pottery	6	2	8
%	*75*	*25*	*100*
Pre-Pottery	21	7	28
%	*75*	*25*	*100*
Total	**27**	**9**	**36**
%	***75***	***25***	***100***

The Collingham Shelter produced a small but very significant pottery assemblage as it provide evidence for the presence of ceramics in Natal before the arrival of farming communities (Mazel 1992). The earliest dates for farming communities along the Natal coast are about 1650 BP (Maggs 1976) whilst ceramics in the Collingham Shelter deposits date to around 1770 and 1880 BP. Lithics were recovered from all they layers at Collingham with similar distribution of formal tool frequency across layers. Unlike at Toteng 1 and Mphekwane, bladelet and scraping tool occur at similar frequency from the lower to the upper phases (Table 6.16).

7.5.4 The iNkolimahashi Shelter

The iNkolimahashi site is located in KwaZulu-Natal on the iNkolimahashi Hill overlooking the Mtshezi River at S 28˚ 47’ 39” and E 30˚ 10’ 50” (Mazel 1999). Six square maters were excavated in 1996 in 5 cm spits were removed and thirty-eight strata were revealed. Eight radiocarbon dates were obtained from iNkolimahashi and these ranges between 360 and 3130 BP.

Table 7.13 the iNkolimahashi Shelter Backed and scarping tools (Mazel 1999)

LAYER	Scraping tools	Backed tools	Total
Pottery	21	7	28
%	*75*	*25*	*100*
Pre-Pottery	13	8	21
%	*61.9*	*28.1*	*100*
Total	34	15	49
%	69.4	30.6	100

Scrapers are the most common formal tools at iNkolimahashi, and occur in almost equal proportions across the layers. Fewer backed pieces are present at the site, but are also recovered in almost all the layers. Observing the frequencies of scraping and bladelet tools show that there is a small increase of scrapers in upper layer while the bladelet frequency slightly drops. This pattern is similar to that observed at Toteng 1 and Mphekwane, but is much less pronounced here.

7.6 Conclusion

Even though the archaeological evidence for the spread of pottery in southern Africa is patchy (Deacon *et al*. 1978: Sadr & Sampson 2006), pottery seems to have been introduced into the subcontinent at about the same time as the earliest sheep, although at some sites the archaeological evidence points to pottery preceding sheep (Kinahan 1991). The earliest pottery is always associated with Later Stone Age stone artefacts (Sadr & Sampson 2006).

This chapter aimed to compare bladelet/backed and scraping tool frequencies from Pre-Pottery and Pottery phases from different part of southern Africa with Toteng 1 and Mphekwane. In general, scraping tools increased in frequency during the Pottery phase while the bladelet tools decreased. The same patterns are observed in some selected sites while other sites show different patterns. The sites form KwaZulu-Natal Province, South Africa, mostly show a different pattern. Here, the studied sites show that the scraping and bladelet/backed tools' frequencies stayed the same from the Pre-Pottery to Pottery phase. However, it is interesting to note the different proportion between the two nearby trenches at the Bambata Cave. As mentioned, in Q the trend is hardly significant. This has important implication for the validity of the comparison attempted here. The issue is if so much difference can be seen from two trenches next to each other, how about a comparison of sites located in different places far from each other.

Chapter 8

CONCLUSION

This study addressed the question of how pottery reached southern Africa. Pottery clearly reached most of the sites in southern Africa some 2000 years ago. How this happened is still debatable: was it migrating herder communities, Khoekhoe, who came with the new technology of ceramics as suggested by some scholars (Elphick 1985; Ehret 1998; Smith 2005)? Or did the idea diffuse from one to another group of hunter-gatherers across the sub-continent as suggested by others (Deacon *et al.* 1978; Sadr 1998; Kinahan 2001)? This study intended to test these two hypotheses by looking at lithics assemblages across the ceramic boundary. The general conclusion of this study is that there are no clear trends to either reject or accept the two hypotheses since there are both changes and continuity in different aspects of lithic technology from the two sites.

In terms of lithic technological style, most of the variables used to detect changes and continuities at Toteng 1 and Mphekwane show both (Chapter 6, Tables 6.11 & 6.12). These trends indicate that the idea that the knowledge of pottery making reached Toteng and Mphekwane through a more complex process than just either diffusion or migration. A typological comparison of changes in Formal tools across many sites in southern Africa (Chapter 7) indicates interesting trends too. Here some sites show similar trends as seen at Toteng and Mphekwane while some are a total opposite of those trends. Other sites such as those from Kwa-Zulu Natal have a totally different trend.

Similar debates concerning the introduction of ceramics (and livestock) occur else where in Africa too. In West Africa evidence for the earliest food production is associated with the Kintampo Tradition around 3600-3200 BP (Watson 2005). The Kintampo is a Later Stone Age tradition, found mostly in Ghana and some parts of Côte d’Ivoire and Togo (Chenorkian 1983; de Barros 1983, 2000). The Kintampo was originally viewed as a product of migration from the Sahel (Davies 1966, 1980), but more recently the adoption of northern traits by the indigenous hunter-gatherers has been postulated (Davies 1966, 1980; Stahl 1985; Watson 2005; Casey 2005).

Chipped stone assemblages from the Kintampo tradition pottery are microlithic and principally based on flake technology (Watson 2005). This is similar to what is seen in the Pottery phase at Toteng and Mphekwane. Moreover, flakes outnumber blades/bladelets, and bladelet tools are rare during this phase. All in all, most of the observed trends are similar to what is observed in southern African assemblages.

In east Africa, models of the transition to food production have tended to derive form historical linguistics concerning the spread of language families through the process of population migration (Lane *et al.* 2007). Recently archaeologists have offered various refinements to the initial models. Seitsonen (2005) asserted that social and economic changes are chronicled through the appearance of a range of pottery types (e.g. *Kansyore, Nderit and Urewe*). Urewe pottery, named after the type site where it was first documented (Leakey *et al.* 1948), has long been regarded as the main indicator of the transition from Later Stone Age to Early Iron Age sedentary farmers (Posnansky 1968; Phillipson 1977). In this region, it is argued that preconceptions of the shift from the pastoral Neolithic to the Urewe-using agriculturalist need to be re-assessed (Lane *et al.* 2007) The evidence from dating, ceramics and lithics from sites such as Wadh Lang'o all argues for the significant and substantial overlap and continuity between the phases. Thus the transition from Stone Age to Iron Age was a rather fluid process.

In Europe, in questioning the spread of early farming communities two explanations have been debated: cultural versus demic diffusion (Ammerman 1989). Cultural diffusion is when cereals and farming techniques passed from one local group to the next without geographic displacement of the people, while demic diffusion is where the spread was due to the movement of the farmers themselves. The question is what was spreading? An integrated Neolithic economy or the knowledge of farming brought about through contacts and exchange (Zvelebil 1989).

More recently, the archaeologists working on the Mesolithic-Neolithic transition in Europe have realised that the migration versus diffusion is not subtle enough (Forenbaher & Miracle 2005). These old models juxtapose a completely autochthonous process where local foragers turn to farming, with a completely exogenous process where foreign farmers migrated into Europe and replace indigenous population (Barker 1985; Price 2000; Perlès 2001).

The new models consider other alternative forms of population transfer that may have been important in the transition and spread of farming such as: elite dominance, infiltration, leapfrog colonisation and individual frontier mobility (Zvelebil & Lillie 2000; Forenbaher & Miracle 2005). The forms' definitions and archaeological signatures are listed in (Table 8.1).

Table 8.1 Description of different models of the Neolithisation process in Europe (Barnett 2000; Zvelebil & Lillie 2000; Forenbaher and Miracle 2005)

PROCESS	DESCRIPTION	ARCHAEOLOGICAL EXPECTATION
Elite dominance	Penetration of area by numerical minority who subsequently seizes control and imposes culture/language on indigenous majority	Piecemeal adoption of Neolithic package by socially central individual, perhaps through feasting; gradual change
Infiltration	Gradual penetration of new area by small groups/individuals who are subordinate or perform specialist task for majority	Piecemeal adoption of Neolithic package by socially peripheral individuals
Leapfrog colonisation	Selective colonisation of areas only marginally exploited by indigenous foragers, creating enclave settlements from which further dispersal of farming proceeds.	Full Neolithic package moves; new settlements separate from Mesolithic; little interaction with indigenous people; abrupt change; rapid spread
individual frontier mobility	Individuals or small groups linked in social/economic exchange between forager and farming communities. Direct and pace of change depends on existing social frameworks and communication routes and/or those established between forager farming communities.	Piecemeal adoption of Neolithic package; innovations adopted within existing Mesolithic settlement; much interaction between indigenous and colonising peoples

I argue that these subtler processes can also be relevant in the spread of early ceramics and ultimately the transition to farming in southern Africa. There is a possibility that several different processes were important to the spread of early ceramics in this region. As this study showed, gradual changes or continuity in lithic technology indicates that diffusion of ideas of pottery making played a major role in the spread of early pottery into southern Africa. But the results are showing both significant shifts and continuity. This may reflect that pottery may have been introduced through other means such as infiltration to other sites in the region, whereby there is a gradual penetration of new area by small groups/individuals that are subordinate or perform specialist tasks for the majority (Table 8.1).

Finally, in tradition, southern African archaeologists have sought to explain the appearances of new technologies in the sub-continent with population migration from the north (Westphal 1963; Ehret 1998; Smith 2006 Neither Westphal nor Ehret are archaeologists). This study has indicated that this issue is more complex. Chapter 7 indicated that there are both changes and continuity that occur in the two sites studied and these further points to the complexity of this issue. In comparison of formal tools across southern Africa with Toteng and Mphekwane, the results show differences and similarities, which is another indication of how complex is this issue. The differences in the two trenches at Bambata cave also add these.

More studies are still needed to resolve this issue. However, as it is evident from the material presented above, this remains a highly complex study. The amount of data is far too small at the moment to draw any far reaching conclusions, but it does provide a bulky model upon which the future studies can be based. There are also some methodological problems which include sample size, especially in cores and formal tools. These categories are represented by small numbers. Moreover, the differences that different excavators can make are other outstanding problems, as is seen at Bambata Cave trenches for example. In conclusion, all the answers are not clear, however, this study has pointed to all the complexities that exists in the issue of how pottery (and small livestock) spread in southern Africa.

References

Ahler, S. 1989. Experimental knapping with KRF and Midcontinent cherts: overview and applications. In: D. Amick & R. Mauldin (eds) *Experiments in lithic technology*. 199-234. Oxford: British Archaeological Reports.

Albrecht, M., Berke, H., Eichhorn, B., Frank T., Kuper, R., Prill, S., Vogelsang, R & Wenzel, S. 2001. Oruwanje 95/1: a late Holocene stratigraphy in northwest Namibia. *Cimbebasia* **17**:1-22.

Ambrose, S.H. 1984. The end of the moving frontier in the Neolithic of north-eastern Africa. In: Krzyzniak, L. & Kobusiewicz, M. (eds) *Origin and early developments of food producing cultures in north-east Africa.* 57-63. Poznan: Polish Academic of Science.

Ammerman, A.J. & Cavalli-Sforza, L.L. 1984. *The Neolithic transition and the genetics of populations in Europe*. Princeton: Princeton University Press.

Ammerman, A.J. 1989. On the Neolithic transition in Europe: a comment on Zvelebil & Zvelebil (1988). *Antiquity* **63**: 162-165.

Anderson, A.A. 1888. *Twenty-five years in a wagon in South Africa*. London: Chapman and Hall.

Andrefsky, W. 1994. Raw-material availability and the organization of technology. *American Antiquity* **59**(1):21-34.

Andrefsky, W. 1998. *Lithics: macroscopic approaches to analysis.* Cambridge: Cambridge University Press.

Andrefsky, W. 2001. Emerging directions in debitage analysis. In: Andrefsky, W. (ed) *Lithic debitage, context, form meaning*. 2-14. Salt Lake City: University of Utah Press.

Armstrong, A.L. 1931. Rhodesian archaeological expedition (1929): excavations in Bambata Cave and researches on prehistoric site in southern Rhodesia. *Journal of the Royal Anthropological Institute* **61**:239-276.

Audouze, F. 1999. New advances in the French prehistory. *Antiquity* **73**:167-175.

Audouze, F. 2002. Leroi-Gourhan, a philosopher of technique and evolution. *Journal of Archaeological Research* **10**(4):277-306.

Balfour, H. 1912. A collection of ancient implements from Ejura, Ashanti. *Journal of the Royal African Society* **12**:1-16.

Barham, L. S. 1987. The bipolar technique in southern Africa: a replication experiment. *South African Archaeological Bulletin* **42**:45-50.

Barker, G.W.W. 1995. *Prehistoric farming in Europe*. Cambridge: Cambridge University Press.

Barnard, A. 1992. *Hunters and herders of southern Africa: a comparative ethnography of the Khoisan people.* Cambridge: Cambridge University Press.

Barnett, W.K. 2000. Cardial pottery and the agricultural transition in Mediterranean Europe. In: Price, T. D. (ed) *Europe's first farmers*. 93-116. Cambridge: Cambridge University Press.

Barthelme, J. 1985. *Fisher-hunter and Neolithic pastoralists in east Turkana, Kenya. (Cambridge monographs in African Archaeology 23).* Oxford: B.A.R International series 254.

Bellelli, C. & Carballido, M. 1996. Refitting stone artefacts: Patagonian hunter-gatherers lithic production. In Milliken, S. & Peresani, M. (eds) *Lithic technology: from raw material procurement to tool production.* 115-121. Italy: Universita di Ferrara.

Biagi, P. 2003. A review of the Late Mesolithic in Italy and its implications for the Neolithic transition. In: Ammerman, A.J. & Biagi, P. (eds) *The widening harvest. The Neolithic transition in Europe: looking back, looking forward.* 133-155. Boston MA: Archaeological Institute of America.

Binneman, J.N.F. 1996. *Symbolic constructions of communities during the Holocene Later Stone Age in the south-eastern Cape*. DPhil thesis: University of the Witwatersrand.

Bleed, P. 2001. Trees or branches, links or chain: archaeological models for the consideration of sequential activities. *Journal of Archaeological Method and Theory* **8** (1): 101–127.

Blundell, G. & Eastwood, E.B. 2001. Identifying Y-shape in the San rock art of the Limpopo-Shashe confluence area: new ethnographic and painted evidence. *South African Journal of Science* **97**:305-308.

Boëda, E. 1986 *Une Approche Technologique du Concept Levallois et l'Évolution de Son Champ d'Application – Une Étude de Trois Gisements Saaliens et Weichseliens du Nord de la France*. Unpublished Ph.D. Thesis: Paris X, Nanterre.

Boëda, E. 1994. *Le concept Levallois: variabilité des methodes.* Monographes du CRA, 9. Paris: Editions CNRS.

Boëda, E. 1995. Levallois: a volumetric construction, methods, a technique. In: Dibble H.L. and Bar-Yosef, O. (eds) *The Definition and Interpretation of Levallois Technology*. 41-68. Madison: Prehistory Press.

Boonzaier, E., Malherbe, C., Smith, A. & Berens, P. 1996. *The Cape herders: a history of the Khoikhoi herders of southern Africa*. Cape Town and Johannesburg: David Philip.

Bracco, J. 1997. Le débitage du Quartz dans Paléolithique supérieur d' Europe occidetale: aspects technologiques et compotemetaux. In Milliken, S. & Peresani, M. (eds) *Lithic technology: from raw material procurement to tool production.* 81-90. Italy: Universita di Ferrara.

Brooks, A.S. 1978. A note on the Late Stone Age feature at ≠Gi: analogies from San hunting practice. *Botswana Notes and Records* **10:**1-3.

Brooks A.S. & Yellen, J. 1987. The preservation of activity areas in the archaeological record: ethnoarchaeological and archaeological work in northwest Ngamiland, Botswana. In Kent, S. (ed) *Method and Theory for Activity area research: An ethnoarchaeological approach*. 63-106. New York: Columbia University Press.

Campbell, A.C. 1992. *Southern Okavango integrated water development study. Archaeological survey of the proposed Maun reservoir.* Gaborone: Department of Water Affairs.

Casey, J. 2005. Holocene occupations of the forest and the savanna. In: Stahl, A.B. (ed) *African archaeology: a critical introduction*. 225-248. Malden: Blackwell Publishing LTD.

Chapman, J., Shiel, R. & Botavić, Š. 1996. *The changing face of Dalmatia*. London: Leicester University Press.

Chernorkian, M. 1983. Ivory Coast prehistory: recent developments. *The African Archaeological Review* **1**:127-142.

Collina-Girard, J. 1997. Les outillages sommaires sur supports naturels tenaces (quartz et quartzites). Technomorphologie et évolution psychique. *Préhistoire Anthropologie Méditerranéennes* **6**: 211–226.

Conard, N.J., Soressi M., Parkington J.E., Wurz S. & Yates R. 2004. A unified lithic taxonomy based on patterns of core reduction. *South African Archaeological Bulletin* **59**: 12-16.

Conkey, M.W. 1980. Context, structure and efficiency in Paleolithic art and design. In: Foster, M.L. & Brandes, S.H. (eds) *Symbol as sense: new approaches to lithic analysis of meaning.* 225-248. New York: Academic Press.

Conkey, M.W. 1990. Experimenting with style in archaeology. In: Conkey, M.W. & Hasttorf, C. (eds) *The use of style in archaeology.* 1-17. Cambridge: Cambridge University Press.

Cooke, C.K. 1959. Rock art of Matebeleland. In: Summers, R. (ed) *Rock art of the federation of Rhodesia and Nyasaland.* 112-162. Glasgow: National Publication Trust.

Cooke, C.K. 1963. Excavations in Pomongwe and Tshangula Cave, Matopo Hills, southern Rhodesia. *South African Archaeological Bulletin* **18:**73-151.

Cooke, C.K. 1965. Evidence of Human migrations from the rock art of southern Rhodesia. *Africa* **35**:263-285.

Cooke, C.K., Summers, R. & Robinson, K. 1966. Pre-history of Rhodesia re-examined: the Stone Age. *Arnoldia* **2**(12): 1-8.

Cooke, C.K. 1979. The Stone Age in Botswana: a preliminary survey. *Arnoldia* **8**:1-32.

Cornelissen, E. 2003. On microlithic quartz industries at the end of the Pleistocene in central Africa: the view from Shum Laka (NW Cameroon*). The African Archaeological Review* **20**: 1-24.

Cresswell, R. 1982. Transferts de technique et chaîne opératoire. *Technique et Culture* **2**:143-163.

Crombé, P., Perdean, Y., Sergant, J., Van Roeyen J-P. & Van Strydonck, M. 2002. The Mesolithic-Neolithic transition in the sandy lowlands of Belgium: new evidence. *Antiquity* **76**: 699-706.

Davies, O. 1966. The invansion of Ghana from the Sahara in the Early Iron Age. In: Cuscoy, L.D. (ed) *Actas del congreso panafricano de prehistoria studio del Cauternario.* 27-42. Santa Cruz de Tenerife: Museo Arqueologico.

Davies, O. 1980. The Ntereso culture in Ghana. In: Swartz, B.K. & Dumett, R.A. (eds) *West African culture dynamics.* 205-225. The Hague: Mouton.

de Barros, P. 1983. A Kintampo rasp fragment from Bassar (Togo). *Nyame Akuma* **23**:35-36.

de Barros, P. 2000. Learning from native evidence: archaeological research in the Oti River valley. http://www.sscnet,ucla.edu/ioa/backdirt/fallwinter00/oti.html.

Deacon, H.J. 1976. *Where the hunters gathered: a study of Holocene Stone Age people in the Eastern Cape*. Claremont: South African Archaeological Society.

Deacon, H.J., Deacon J., Brooker, M. & Wilson M.L. 1978. The evidence for herding at Boomplaas Cave in the southern Cape, South Africa. *South African Archaeological Bulletin* **33**:39-65.

Deacon, J. 1972. Wilton: an assessment after 50 years. *South African Archaeological Bulletin* **27**:10-45.

Deacon, J. 1974. Patterning in the radiocarbon dates for the Wilton/Smithfield complex in southern Africa. *South African Archaeological Bulletin* **29**: 3-18.

Deacon, J. 1984. Later Stone Age people and their descendants in southern Africa. *In*: Klein, R. (ed) *Southern African prehistory and paleoenvironments*. 221-328. Rotterdam: A.A. Balkema.

Deacon, J. 1982. The Later Stone Age in the Southern Cape, South Africa. Unpublished PhD Thesis: University of Cape Town.

Delagnes, A. 1995. Blade production during the Middle Paleolithic in northern Europe. *Acta Athropologica Sinica* **19**:169-176.

Denbow, J. R. 1984. Prehistoric herders and foragers of the Kalahari: the evidence for 1500 years of interaction. In: Schrine, C. (ed) *Past and present in hunter-gatherer studies.* 175-193. Orlando: Academic Press.

Dibble, H. & Rolland, N.1992. On assemblage variability in the Middle Paleolithic of Western Europe: history, perspectives and a new synthesis. In: Dibble, H.L. & Mellars, P. (eds) *The Middle Paleolithic: adaptation, behaviour and variability.*1-28. Philadelphia: University of Pennsylvania Press.

Dibble, H. & Bar-Yosef, O. 1995. (eds*) The definitions and interpretation of Levallois technology.* Madison: Prehistory Press.

Dibble, H., Schurmans, U.A., Iovita, R. & McLaughlin, M.V. 2005. The measurement and interpretation of cortex in lithic assemblages. *American Antiquity* **70**:545-560.

Digard, J.P. 1979. La technologie en anthropologie: un de parcours ou nouveau soufflé? *L'Homme* **19**:73-104.

Eastwood, E.B. 2003. A cross-cultural motif in San, Khoekhoe, and Northern Sotho rock paintings of central Limpopo Basin, southern Africa. *South African Archaeological Bulletin* **58**: 14-26.

Eastwood, E.B. & Eastwood C.J.H. 2002. *The northeastern Venda rock art survey. Volume two: The Tshiungane and Dambale hills*. Unpublished report for the de Beers Fund.

Eastwood, E. B. & Smith, B. W. 2005. Fingerprints of the Khoekhoen: geometric and hand printed rock art in the central Limpopo basin, southern Africa. *South African Archaeological Society Goodwin Series* **9:**63-76.

Edmonds, M. 1995. *Stone Tools and Society*. London: Batsford.

Ehret, C. 1982. The first spread of food production to southern Africa. In: Ehret, C. & Posnansky, M. (eds) *The archaeological and linguistic reconstruction of African history*. 158-182. Berkeley: University of California Press.

Ehret, C. 1998. *An African classical age: eastern and southern Africa in world history, 1000BC to AD 400*. Charlottesville: University of Virginia Press.

Elphick, R. 1977. *Kraal and Castle: Khoikhoi and the founding of white South Africa*. London: Yale University Press.

Elphick, R. 1985. *Khoikhoi and the founding of white South Africa*. Johannesburg: Ravan Press.

Forenbaher, S. & Miracle, P.T. 2005. The spread of farming in the Eastern Adriatic. *Antiqity* **79**: 514-528.

Géneste, J.M. 1988. Systèmes d'approvisionnement en matières premières au Paléolithique moyen et au Paléolithique supérieur en Aquitaine. In Kozlowski, J.K. (ed) *L'Homme de Néanderthal, vol. 8. La Mutation*. 61–70. ERAUL, Liège.

Gooch, W.D. 1881. The Stone Age of South Africa. *Journal of the Royal Anthropological Institute* **11**:124-182.

Gosselain, P.O. 1992. Technology and style: potters and pottery among the Bafia of Cameroon. *Man* **27**(3):559-586.

Gosselain, P.O. 2000. Materializing identities: an African perspective. *Journal of Archaeological Method and Theory* **7**:187-215.

Hall, M. 1990. Hidden history: Iron Age archaeology of southern Africa. In: P.T. Robertshaw (ed.) *A history of African archaeology*. London: James Currey.

Hall, S. & Smith, B.W. 2000. Empowering places: rock shelters and ritual control in farmer-forager interaction in the Northern Province, South Africa. *South African Archaeological Society Goodwin Series* **8**:30-46.

Heaney, P.J. 1994. Structure and Chemistry of the low-pressure silica polymorphs. In: Heaney, P.J., Prewitt, C.T. & Gibbs, G.V. (eds) *Reviews in Mineralogy 29; Silica: Physical Behavior, geochemistry and materials applications*. 1-40. Washington: Mineralogical Society of America.

Henry, D. 1989. Correlations between reduction strategies and settlement patterns. In: Henry, D. & George, O. H. (eds) *Alternative approach to lithic analysis*. 139-155. Washington: Archaeological papers of the American Anthropological Association (1).

Hitchcock, R. 1982. Patterns of sedentism among the Basarwa of eastern Botswana. In: Leacock, E. & Lee, R. (eds) *Politics and History in bands societies*. 223-268. Cambridge: Cambridge University Press.

Hood, B.C. 1994: Lithic procurement and technological organization in the Stone Age of West Finnmark. North Norway. *Norwegian Archaeological Review* **27**(2):65-85.

Huffman, T. 1994. Toteng pottery and the origins of Bambata. *Southern African Field Archaeology* **3**:3-9.

Huffman, T. 2005. The stylistic origin of Bambata and the spread of mixed farming in southern Africa. *Southern African Humanities* **17:**57-79.

Humphreys, A. J. B., and Thackeray, A. I. 1983. *Ghaap and Gariep, Later Stone Age studies in the Northern Cape*. Cape Town: The South African Archaeological Society Monograph Series, 2, South African Archaeological Society.

Inizan, M.L., Reduron-Ballinger, M., Roche, H. & Tixier, J. 1999. *Technology and terminology of knapped stone.* Nanterre: CREP.

Inskeep, R.R. 1987. *Nelson Bay Cave, Cape Province South Africa: the Holocene levels.* Oxford: British Archaeological Reports.

Jelinek, A.J. 1977. A preliminary study of the flakes from Tabun Cave, Mount Carmel. *Eretz-Israel* **13**:87-96.

Jones, N. 1940. Bambata Cave: A reorientation. *Occasional papers of the National Museum of Southern Rhodesia* **9**:11-28.

Julien, C.K. & Julien, M. 1994. Prehistoric Technology: A cognitive science? In: Renfrew, C. & Zubrow, E. (eds) *The ancient mind, elements of cognitive archaeology*. 152-164. Cambridge: Cambridge University Press.

Kent, S. 1993. Variability in faunal assemblages: the influence of hunting skills, sharing, dogs, and mode of cooking on faunal remains at a sedentary Kalahari community. *Journal of Anthropological Archaeology* **12**:323-385.

Kinahan, J. 1984. On the relative homogeneity of a short Holocene sequence of stone tool assemblages from the central Namib Desert. *South African Journal of Science* **80**:273-276.

Kinahan, J. 1991. *Pastoral nomads of the central Namib Desert*. Windhoek: New Namibia Books.

Kinahan, J. 1995. A new archaeological perspective on nomadic pastoralist expansion in south-western Africa**.** *Azania* **30**:211-226.

Kinahan J. 2001. *Pastoral nomads of Namib Desert: The people history forgot*. 2nd edition. Windhoek: Namibia Archaeological Trust.

Klein, R.G. 1986. The prehistory of Stone Age herders in the Cape Province of South Africa*. South African Archaeological Society Goodwin Series* **5**:5-12.

Klein R.G. & Cruz-Uribe K. 1989. Faunal evidence for prehistoric herder-forager activities at Kasteelberg, Western Cape Province, South Africa. *South African Archaeological Bulletin* **44**:82-97.

Klimowicz, J. & Hajnes, G. 1996. The Stone Age archaeologyof Hwange National Park, Zimbabwe. In: Pwiti G. & Sober, R. (eds) *Aspects of African archaeology*. 121-128. Harare: University of Zimbabwe press.

Lane, P. J. 2004. The moving frontier and the transition to food production in Kenya. *Azania* **39**: 243- 264.

Lane, P., Ashely, C., Seitsonen, O., Harvey, P., Mire, S. & Odede F. 2007. The transition to farming in eastern Africa: new faunal and dating evidence from Wadh Lango'o and Usenge, Kenya. *Antiquity* **81**:62-81.

Leakey, M.D., Owen, W.E. & Leakey, L.S.B. 1948. *Dimple-based pottery from central Kavirondo, Kenya.* Nairobi: Coryndon memorial museum occasional paper 2.

Lemonnier, P. 1976**.** La description des chaînes opèratoires:. contribution a l'analyse des systemes techniques. *Techniques et Culture* **1:**1-11.

Lemonnier, P. 1983. L'Étude des systemes techniques, une urgence en technologie culturelle. *Techniques et Culture* **1**: 12-27

Lemonnier, P. 1986. The study of material culture today: towards an anthropology of technical a. systems. *Journal of Anthropological Archaeology*. **5** (2): 147-186.

Lemonnier, P. 1992. *Elements for an Anthropology of Technology*. Michigan: Ann Arbor.

Leroi-Gourhan, A. 1943. *Evolution et techniques I: L'Homme et la Matière*. Paris: Albin Michel.

Leroi-Gourhan, A. 1945. *Evolution et techniques II: Milieu et techniques*. Paris: Albin Michel.

Leroi-Gourhan, A. 1964. *Les religions de la préhistoire.* Paris: Albin Michel.

Leslie, M. 1989. The Holocene sequence from Uniondale Rock Shelter in the Eastern Cape. *South African Archaeological Society Goodwin Series* **6**: 17-32.

Livingstone, D. 1857. *Missionary travels and researches in South Africa*. London: John Murray.

Maggs, T.M.O'C. 1976. *Iron Age communities of the Southern Highveld*. Pietermarizburg: Natal Museum.

Malan, F. 1950. A Wilton site at Kai Kai, Bechuanaland Protectorate. *South African Archaeology Bulletin* 5:140-2.

Mathieu, J.R. 2002. (ed) *Experimental archaeology, replicating past objects, behaviors and processes.* Oxford: BAR International series 1035.

Marean, C. 1992. Hunter to herder: large mammal remains from the hunter-gatherer occupation at Enkapune ya Muto rockshelter. *African Archaeological Review* **10**: 65-127.

Marshall, E. 1998. Early food production in Africa. *The Review of Archaeology* **19**(2): 47-58.

Mauss, M. 1947. Manuel d'ethnographie. Paris: Payot.

Mazel, A. D. & Parkington, J. 1981. Stone tools and resources: A case study from southern Africa. *World Archaeology* **13**(1): 16-30.

Mazel, A.D. 1984. Diamond 1 and Clarke's Shelter: report on the excavation on the Drakensberg, Natal South Africa. *Annals of Natal Museums* **26**(1): 25-70.

Mazel, A.D. 1992. Collingham Shelter: the excavation of late Holocene deposits in the central Thukela Basin, KwaZulu Natal, South Africa. *Natal Museums Journal of Humanities* **5**:1-36.

Mazel, A.D. 1999. iNkolimahashi Shelter: the excavation of Later Stone Age Rock Shelter deposits in the central Thukela Basin, KwaZulu Natal, South Africa. *Natal Museums Journal of Humanities* **11**:1-21.

Milliken, S. & Pereseni, M. 1989. (eds) *Lithic technology: from raw material procurement to tool production.* Italy: Universita di Ferrara.

Milliken, S., la Rosa M. & Peretto, C. 1998. An experimental approach to the reconstruction of the chaînes opératoires in a lower Palaeolithic pebble industry from west-central Italy. *XIII UISPP Congress Proceedings, Forli, 8–14 September 1996, Workshops*, *Lithic Technology: From Raw Material Procurement to Tool Production* **2**: 751–758.

Mitchell, P. 1997. Holocene Later Stone Age hunter-gatherers south of the Limpopo river, ca. 10,000-2000BP. *Journal of World Prehistory* **11**(4):359-424.

Mitchell, P. 2002. *The archaeology of southern Africa.* Cambridge: Cambridge University Press.

Parkington, J.E. 1984. Changing views of the Later Stone Age of South Africa. *Advances in World Archaeology* **3**:89-142

Perlès, C. 2001. *The Neolithic in Greece*. Cambridge: Cambridge University Press.

Phaladi, S. 1992. *Hunter-gatherers and non-hunter-gatherers: A lithic analysis from Nqoma, Tsodilo Hills, Botswana*. Unpublished MA dissertation: Michigan State University.

Phillipson, D.W. 1977. *The later prehistory of eastern and southern Africa*. London: Heinemann.

Phillipson, D.W. 1993. *African archaeology.* Cambridge: Cambridge University Press.

Posnansky, M. 1968. Bantu genesis: archaeological reflexions. *Journal of African History* **9**:1-11.

Price, T.D. 2000. (ed) *Europe's first farmers*. Cambridge: Cambridge University Press.

Rapp, G. & Hill, C.L. 1998. *Geoarchaeology*. New Heaven: Yale University Press.

Reid D.A.M., Sadr, K. & Hanson-James N. 1998. Herding traditions In: Lane, P. J., Reid, D.A.M. and Segobye, A. (eds) *Ditswa Mmung: The archaeology of Botswana.* 81-100. Gaborone: Pula press and the Botswana society.

Rivat, F. 2006. *Les derniers tailleurs de pierre d'Afrique australe : apport de la technologie lithique pour la caractérisation de l'identité socio-économique des groupes de l'extrême fin du Later Stone Age*. Mémoire de master I Mention Archéologie, Arts et Cultures de la Préhistoire Université de Toulouse – le Mirail, France

Robbins, L.H. 1984. Toteng, a Late Stone Age site along the Nhabe River, Ngamiland. *Botswana Notes and Records* **16**: 1-6.

Robbins, L.H. 1985. The Manyana rock painting site. *Botswana Notes and Records* **17**:1-14.

Robbins, L.H. 1990. The Depression site: a Stone Age sequence in the north-west Kalahari Desert, Botswana. *National Geographic Research* **6**: 329-338.

Robbins, L.H., Murphy, M.L., Campbell, A.C. and Brook, G.A. 1996. Excavations at the Tsodilo Hills Rhino Cave. *Botswana Notes and Records* **28**: 23-45.

Robbins, L.H., Campbell, A.C., Murphy, M.L., Brook, G.A., Srivastava, P. & Badenhorst, S. 2005. The advent of herding in southern Africa: Early AMS dates on domestic livestock from the Kalahari Desert. *Current Anthropology* **46**(4):671-677.

Robinson, K.R. 1966. Bambata ware: its position in the Rhodesian Iron Age in the light of recent evidence. *South African Archaeology Bulletin* **21**:81-85.

Rudner, J. 1968. Strandloper pottery from south and southwest Africa. *Annals of the South African Museum* **49**:441-663.

Sackett, J. R. 1982. Approaches to style in lithic archaeology. *Journal of Anthropological Achaeology* **1**(1): 59-112.

Sackett, J. R. 1985. Style and ethnicity in the Kalahari: a reply to Wiessner. *American Antiquity* **50**(1):154-159.

Sadr, K. 1997. Kalahari Archaeology and the Bushman Debate. *Current Anthropology* **38**(1):104-112.

Sadr, K. 1998. The first herders at the Cape of Good Hope. *African Archaeological Review* **15**(2):101-132.

Sadr, K., Smith, A., Plug, I., Orton, J. & Mutti, B. 2003. Herders and foragers on Kasteelberg. *South African Archaeological Bulletin* **58**: 27-32.

Sadr, K. & Sampson C.G. 2006. Through thick and thin: early pottery in southern Africa. *Journal of African Archaeology* **4**(2):235-252.

Sampson, C.G 1974. *The Stone Age archaeology of southern Africa.* New York: Academic Press.

Sampson, C.G. 1985. Review of: Janette Deacon the Later Stone Age of southernmost Africa. *South African Archaeological Bulletin* **40**: 56-58.

Sampson, C.G., Hart, T., Wallsmith, D.L. & Blagg, J.D. 1989. The ceramic sequence in the upper Seacow valley: problems and implications. *South African Archaeological Bulletin* **44**:3-16.

Schapera, I. 1930. The *Khoisan peoples of South Africa: Bushmen and Hottentots*. London: Routledge and Kegan Paul.

Schlanger, N. 1994. Mindful technology: unleashing the chaine operatoire for archaeology of the mind. In: C. Renfrew and E. Zubrow (eds) *The Ancient Mind: Elements of Cognitive Archaeology*. Cambridge: Cambridge University Press.

Schlanger, N. 2005. The Chaine Operatoire. In: Renfrew, C. & Bahn, P. (eds.) *Archaeology: Key concepts*. 31-37. London: Routledge.

Schick, K.D. & Toth, N. 1993. *Making silent stones speak: human evolution in the dawn of technology*. New York: Simon & Schuster.

Schiffer, M. B. 1976. *Behavioral archaeology*. New York: Academic Press.

Schofield, J. F. 1940. A report on the pottery from Bambata Cave. *South African Journal of Science* **37**:361-372.

Schrire, C. 1992. The archaeological identity of hunters and herders at the Cape over the last 2000 years: a critique. *South African Archaeological Bulletin* **47**: 62-64.

Sealy, J. & Yates, R. 1994. The Chronology of the introduction of pastoralism to the Cape, South Africa. *Antiquity* **68**:58-67.

Seitsonen, O. 2005. Stone Age sequence, lithic technology, and ancient lake level changes in the north Tanzanian rift valley area. Unpublished PhD Thesis: University of Helsinki.

Sellet, F. 1993. Chaîne opératoire: the concept and its implication. *Lithic Technology* **1**:106-112.

Shaw, T. 1985. The prehistory of West Africa. In: Ajayi, J.F.A. & Crowder, M. (eds.) *History of West Africa 1*, 3rd edition. 48-86. Harlow: Longman Group.

Singer C.A. 1984. The 63-kilometer fit. In: Erickson, J.E. & Purdy, B.A. (eds): *Prehistoric quarries and lithic production.* 35-47 Cambridge: Cambridge University Press.

Smith, A. B. 1992. *Pastoralism in Africa: origins and developmental ecology.* London: Hurst and Co.

Smith, A.B. 2005. *African herders: emergence of pastoral tradition*. Walnut Creek, CA: AltaMira Press.

Smith, A. B. 2006. Kasteelberg: a pastoralist sealing camp in Western Cape Province, South Africa. *The Journal of Island and Coastal Archeology* **1**:1-12.

Smith, A.B., Sadr, K., Gribble, J. & Yates, R. 1991. Excavation in the south-western Cape, South Africa, and the archaeological identity of the prehistoric hunter-gatherers within the last 2000 years. *South African Archaeological Bulletin* **46**:71-91.

Smith, A.B & Jacobson, L. 1995. Excavations at Geduld and the appearance of early domestic stock in Namibia. *South African Archaeological Bulletin* **50**:3-14.

Smith, B. & Ouzman, S. 2004. Taking stock: identifying Khoekhoe rock art in southern Africa. *Current Anthropology* **45**:499-526.

Soressi, M. 2004. From Mousterian of Acheulian tradition type A to type B: technical tradition, raw material, task, or settlement dynamic changes? In: Conard, N. (ed) *Settlement dynamics of the Middle Paleolithic and Middle Stone Age, volume 2.* 343-346. Tübingen: Tübingen Publications in Prehistory.

Soriano, S. Villa, P. & Wadley, L. 2007. Blade technology and tool forms in the Middle Stone Age of South Africa: the Howiesons Poort and post-Howiesons Poort at Rose Cottage cave. *Journal of Archaeological Science* **34:**681-703.

Stafford, M. 1999. *From forager to farmer in flint: a lithic analysis of the prehistoric transition to agriculture in southern Scandinavia.* Denmark: Aarhus University Press.

Stahl, A.B. 1985. Reinvestigation of Kintampo 6 rock shelter, Ghana: implication for the nature of cultural change. *The African Archaeological Review* **3**: 117-150.

Stow, G.W. 1905. *The native races of South Africa*. London: Swan Sonnenschein.

Stringer, C. & Gamble, C. 1993. *In search of the Neanderthals.* London: Thames and Hudson.

Summerfield, M.A. 1983. Silcrete as a palaeoclimatic indicator: evidence from southern Africa. *Palaeogeograhy, palaeoclimitology, palaeoecology* **41**:64-79.

Summers, R. 1961. The southern Rhodesian Iron Age. *Journal of African History* **2**:1-13.

Van Waarden, C. 1987. *Places of historic and other interest in and around Francistown.* Francistown: Stenographic.

Volman, T.P. 1981.*The Middle Stone Age in the southern Cape*. Unpublished PhD Thesis: University of Chigaco.

Wadley, L. 1979. The Big Elephant Shelter and its role in the Holocene prehistory of central South West Africa. *Cimbebasia* **3**:1-76.

Wadley, L. 1987. *Later Stone Age Hunters and Gatherers of the Southern Transvaal* Oxford: International Series 380, British Archaeological Reports.

Wadley, L. 1996. The Robberg industry of Rose Cottage Cave, east, eastern Free States: The technology, spatial patterning and environment. *South African Archaeological Bulletin* 51:64-74.

Walker, N. J. 1983. The significance of an early date for pottery and sheep in Zimbabwe. *South African Archaeological Bulletin* **38**:8-92.

Walker, N. 1994. Late Stone Age of Botswana: some recent excavations. *Botswana Notes and Records* **26:**1-35

Walker, N. 1995. *Late Pleistocene and Holocene hunter-gatherers of the Matopos.* Uppsala: Societas Archaeologica Upsaliensis.

Walker, N. & Thorp, C. 1997. Stone Age Archaeology in Zimbabwe. In: Pwiti, G. (ed) *Caves, monuments and texts: Zimbabwean archaeology today.* 9-32. Uppsala: Societas Archaeologica Upsaliensis.

Watson, D.J. 2005. Under the rocks: reconsidering the origin of the Kintampo tradition and the development of food production in the savanna-forest/forest of West Africa. *Journal of African Archaeology* **3**(1): 3-55.

Weedman, K. 1993. Foragers, pastoro-foragers and agro-pastoralists: lithic use in Botswana from 2nd millennium BC through the 19th century AD. Unpublished MA Thesis: University of Texas, Austin.

Wendt, E. 1976. Art mobilier from Apollo 11 Cave, South West Africa: Africa's oldest dated works of art. *South African Archaeological Bulletin* **31**:5-11.

Westphal, E.O.J. 1963. The linguistic prehistory of southern Africa: Bush, Kwadi, Hottentot and Bantu linguistic relationship. *Africa* **33**: 237-265.

Wiessner, P. 1983. Style and social information in the Kalahari San projectile points. *American Antiquity* **48**: 253-276.

Wiessner, P. 1984. Reconsidering the behavioral basis for style: a case study from the Kalahari San. *Journal of Anthropological Archaeology* **3**:190-243.

Wiessner, P. 1990. Is there a unity to style? In: Conkey, M.W. & Hasttorf, C. (eds) *The use of style in archaeology*. 105-112. Cambridge: Cambridge University Press.

Wilmsen, E.N. 1978. Prehistoric and historic antecedents of a contemporary Ngamiland community. *Botswana Notes and Records 10:5-18.*

Wilmsen, E.N. 1989. *Land filled with flies: a political economy of the Kalahari*. Chicago: University of Chicago Press.

Wilson, M.L. 1986. Notes of the nomenclature of the Khoisan. *Annals of the South African Museums* **97**: 251-266.

Yellen, J.E. 1971. Archaeological excavations in western Ngamiland. *Botswana Notes and Records **3**:276.*

Yellen, J.E. 1977. *Archaeological approaches to the present*. New York: Academic Press.

Yellen, J.E. & Brooks, A.S. 1989. The Late Stone Age archaeology of the !Kangwa-/Xai/Xai valleys, Ngamiland. *Botswana Notes and Records* **20**: 5-27.

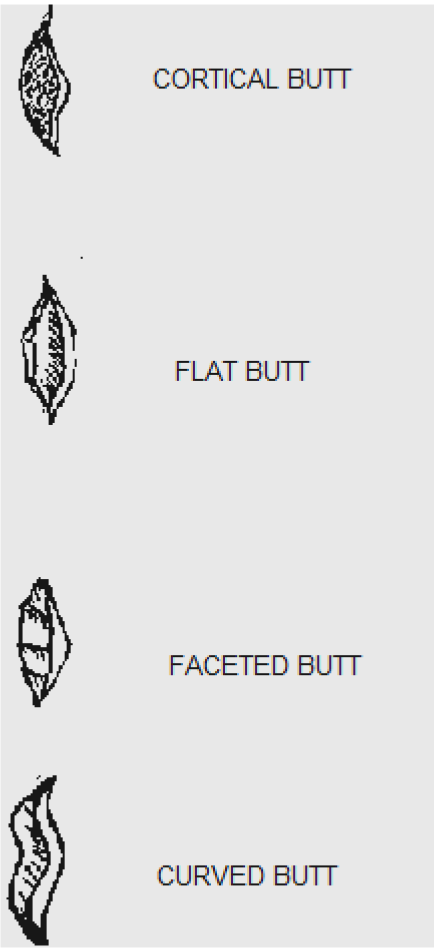
Zvelebil, M. 1989. On the transition to farming in Europe, or what was spreading with the Neolithic: a reply to Ammerman (1989). *Antiquity* **63**:379–83

Zvelebil, M. & Lillie, M. 2000. Transition to agriculture in eastern Europe. In: T.D. Price (ed) *Europe's first farmers*. 57-92. Cambridge: Cambridge University Press.

Appendix 1

Lithic illustrations

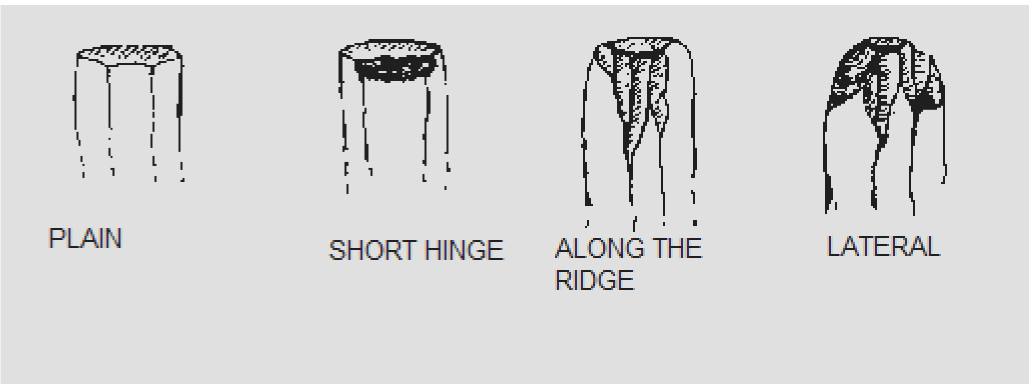
Platform morphologies



A

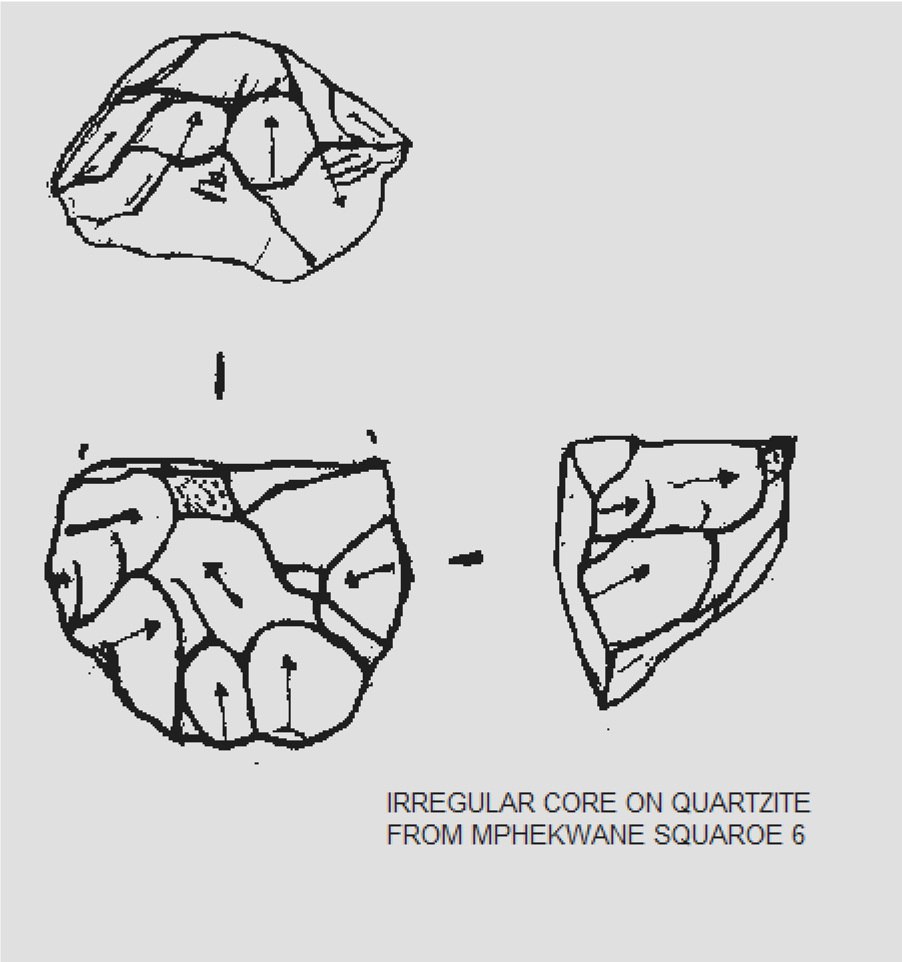
By: B. Modikwa-2007

Platform preparation techniques



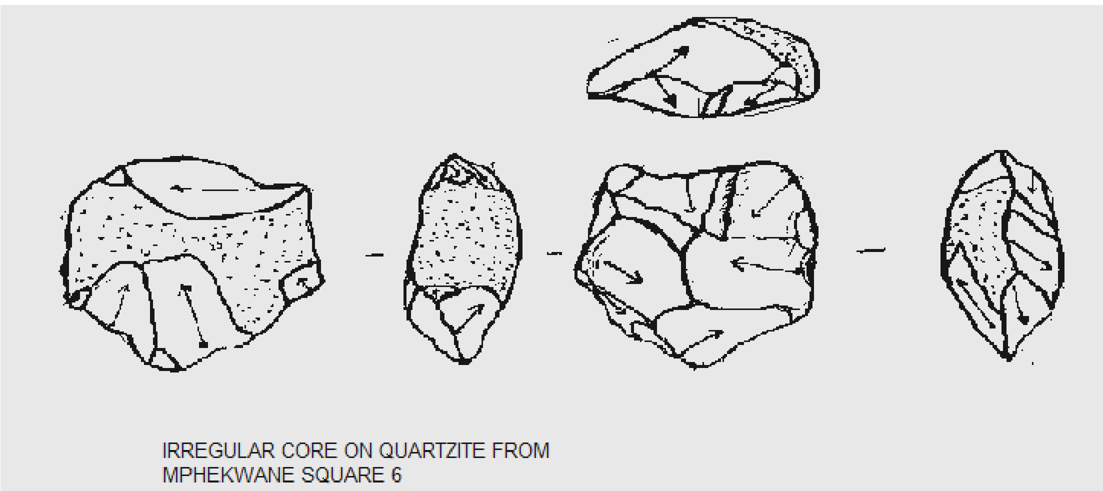
B
By: B. Modikwa-2007

Core classes representations



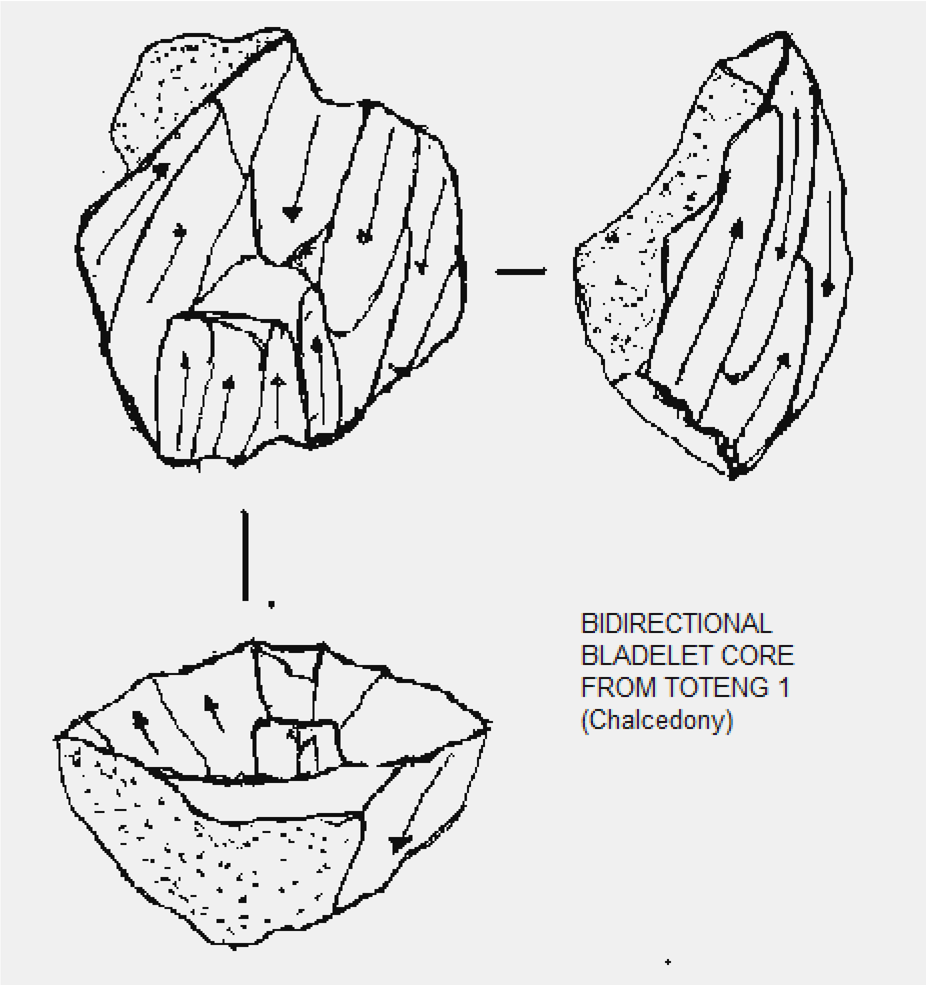
By: B. Modikwa-2007

C Scale 1:1

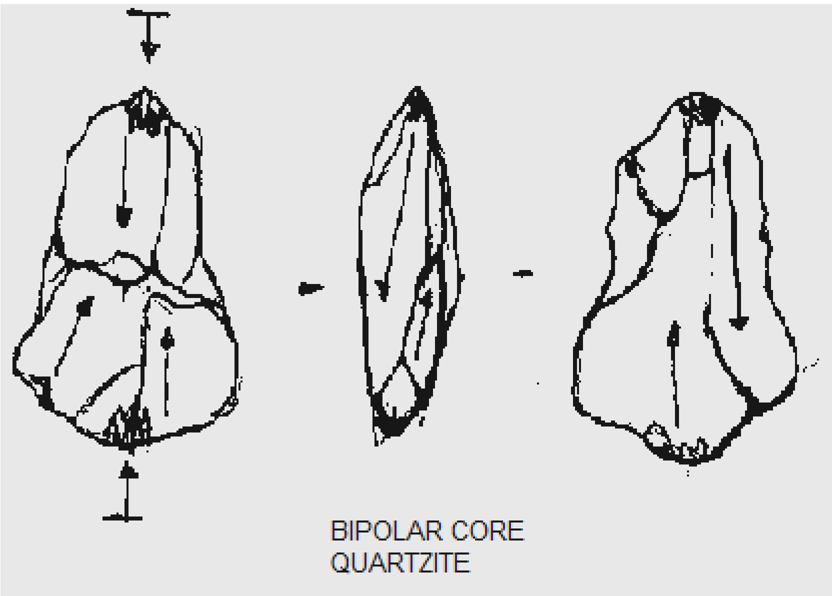


D Scale 1:1

By: B. Modikwa-2007



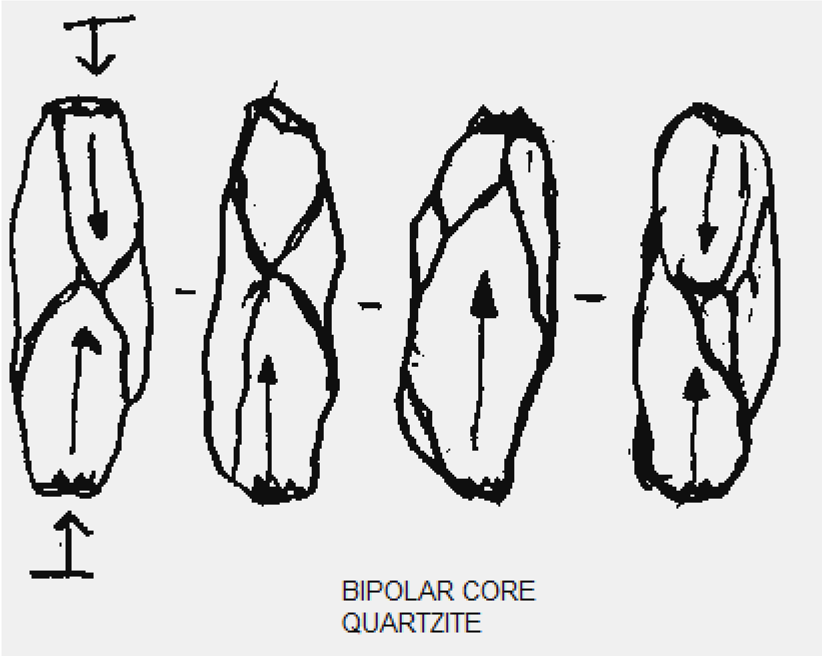
E Scale 1:1



From: Mphekwane

F Scale 1:1

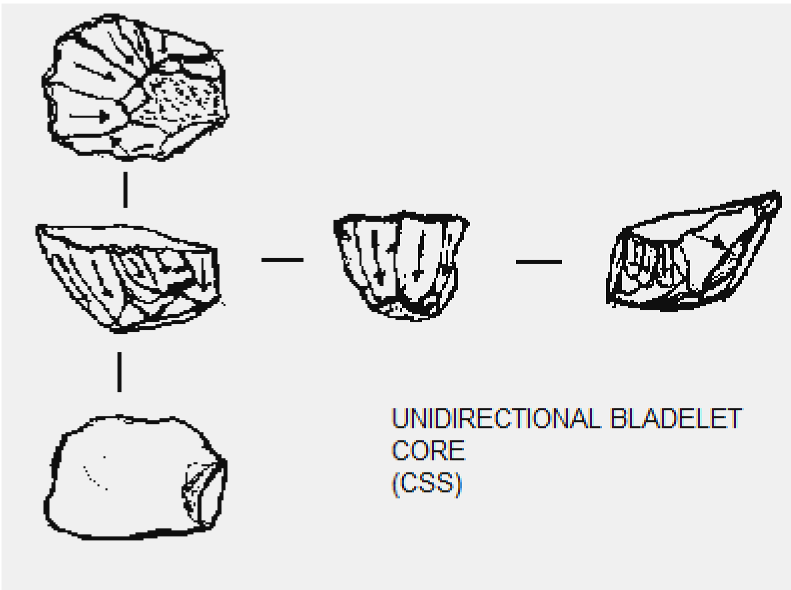
By: B. Modikwa 2007



From: Mphekwane

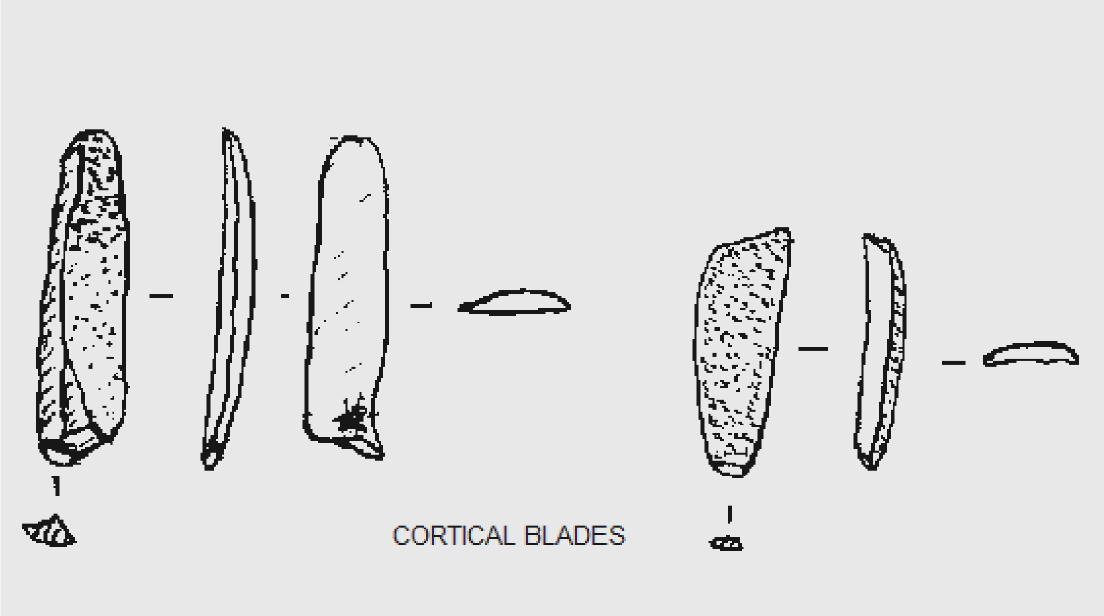
G Scale 1:1

By: B. Modikwa-2007

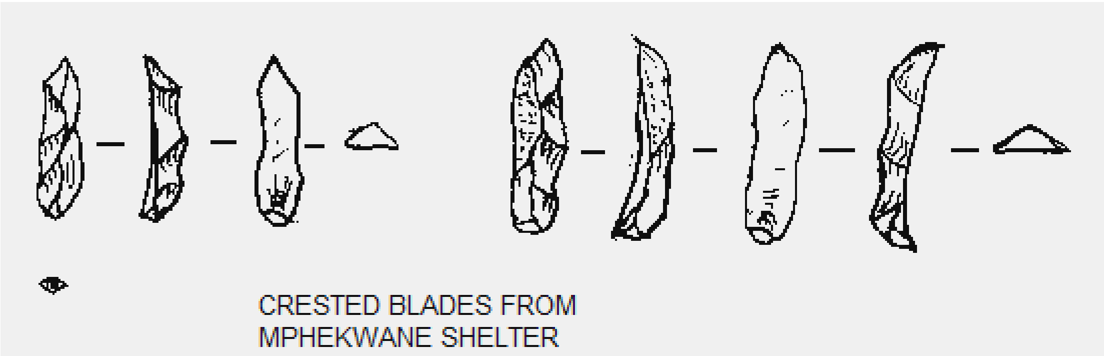


From: Mphekwane

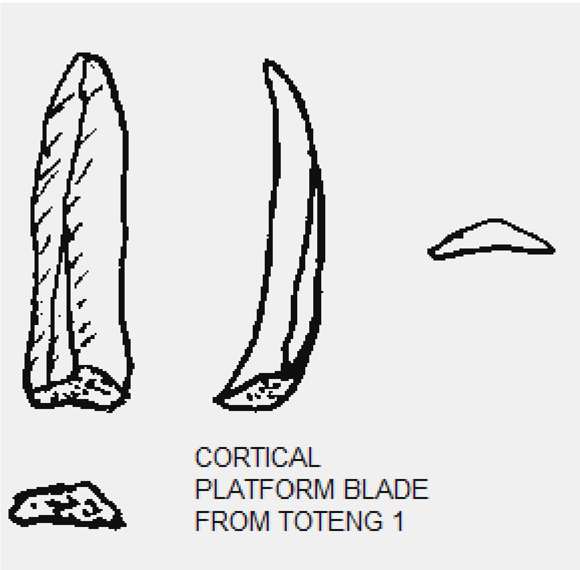
H Scale 1:1

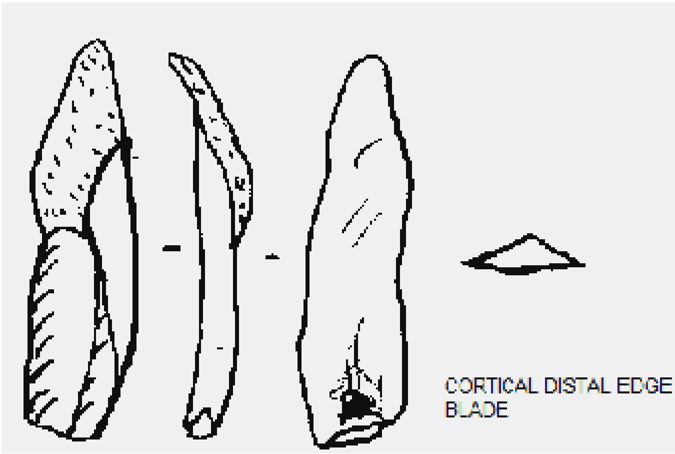


I Scale 1:1



J Scale 1:1



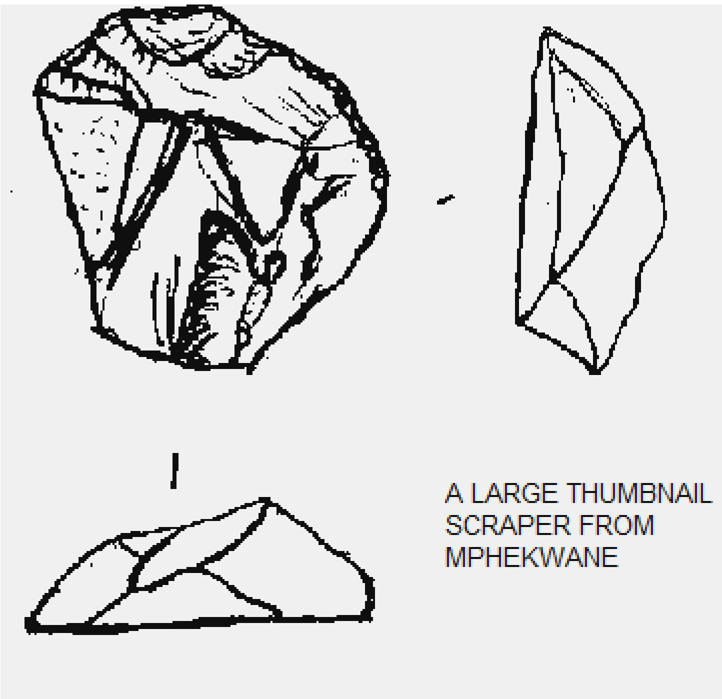


L
Scale 1:1

K

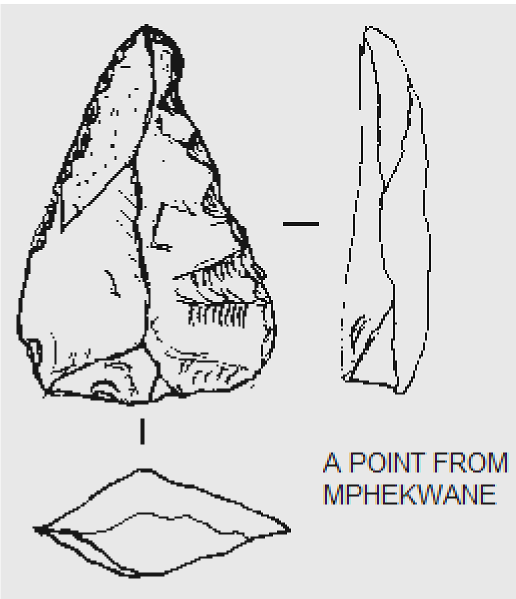
Blade representations

Formal tools



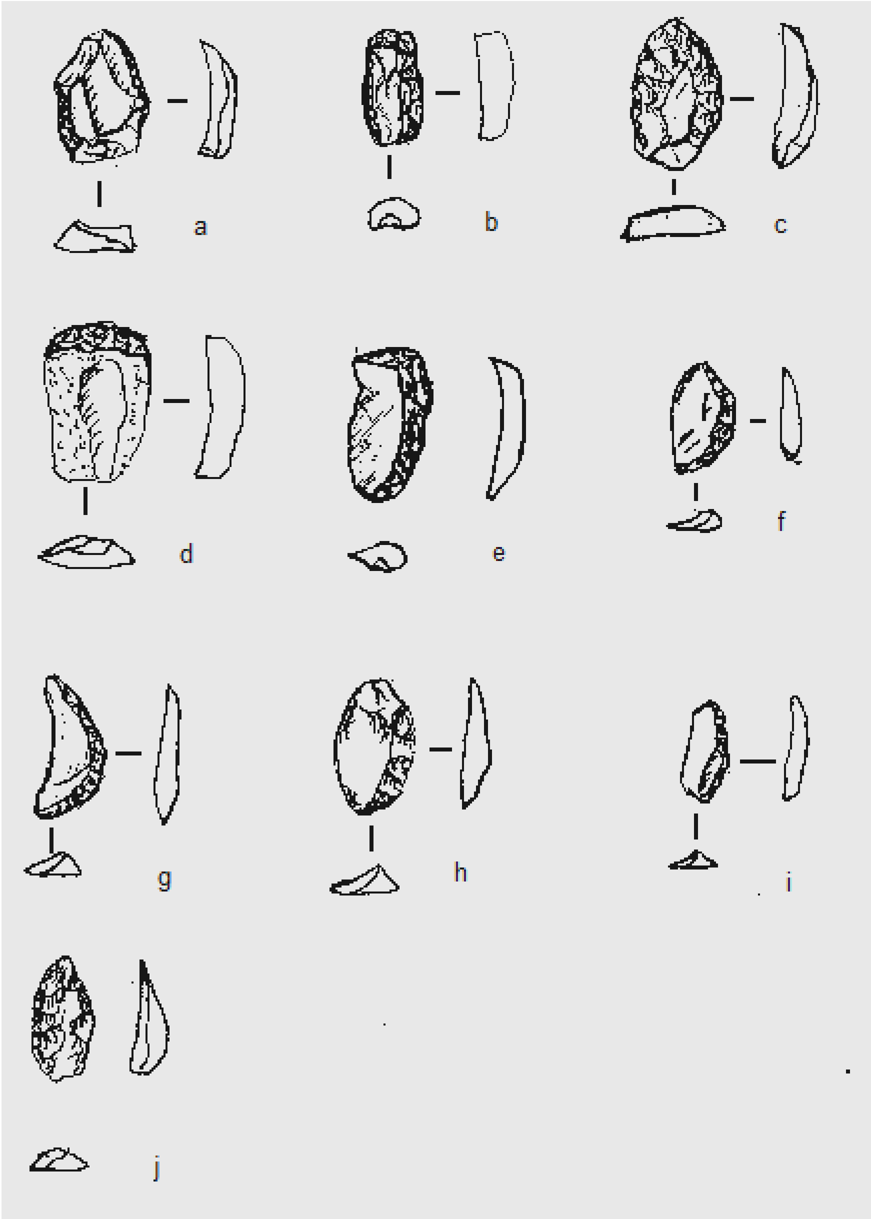
By: B. Modikwa-2007

M Scale1:1



By: B. Modikwa-2007

N Scale 1:1



By: B. Modikwa-2007
O Scale 1:1

a-side scraper; b: side-end scraper; c-retouched piece; d- end scrapers; e-backed piece f-g:-segments; h- backed piece; i backed blade and j-point from Mphekwane Shelter.

Mphekwane assemblage-raw material totals

	Quartz	CCS	Quartzite	Sandstone	Silcrete	Other	Total	
bipolar	628	24	20			3	675	**bipolar**
irreg	39	3	5				47	**irreg**
1-plat	24	1	3			1	29	**1-plat**
1-pl blet	2	1					3	**1-pl blet**
radial			3				3	**radial**
blade	4	0	8				12	**blade**
blet	210	20	30			11	271	**blet**
flake	6259	301	2452	65		385	9462	**flake**
chk	4740	166	1653	23		256	6838	**chk**
chip	4124	153	578			95	4950	**chip**
e-d bip	6						6	**e-d bip**
e-d blade	3		4				7	**e-d blade**
e-d blet	15	1				1	17	**e-d blet**
e-d fl	418	45	89			13	565	**e-d fl**
e-d chk	36	4	3			1	44	**e-d chk**
e-d chip	2	1					3	**e-d chip**
thumbnail	13	2					15	**thumbnail**
endscr	11	2	2				15	**endscr**
sidescr	21	14	1				36	**sidescr**
side-end scr	3	1					4	**side-end scr**
core scr	2						2	**core scr**
bkd scr	11	5					16	**bkd scr**
misc.scr.	31	1	1			1	34	**misc.scr.**
MB scraper	3	2					5	**MB scraper**
scr frag	30	3	2			2	37	**scr frag**
large thumbnail		1					1	**large thumbnail**
large endscr	1						1	**large endscr**
large sidescr	1						1	**large sidescr**
large misc scr	1						1	**large misc scr**
bkd fl	6	2	1				9	**bkd fl**
b blet	4						4	**b blet**
b point	3	1					4	**b point**
b blet frag	2						2	**b blet frag**
curve-b fl	1						1	**curve-b fl**
curve-b blet	4						4	**curve-b blet**
trunc fl	4						4	**trunc fl**
trunc blet	3						3	**trunc blet**
segment	15	6					21	**segment**
bp frag	18		1				19	**bp frag**
MBP	7	2	1			1	11	**MBP**
adze	1				1		2	**adze**
notch	7		1	1			9	**notch**
MRP	73	6	13			5	97	**MRP**
MSA bif pt	2						2	**MSA bif pt**