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Becoming Human:

Ritualized Behaviour and Middle Stone Age points –

a case study from Rhino Cave, Tsodilo Hills, Botswana

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Front page: the carved panel in Rhino Cave, a natural outcrop covered in man-made grooves. Photo courtesy of Sheila Coulson.

Abstract

The last decade has seen an increased interest in the questions surrounding the origin and composition of the concept of modern human behaviour. While earlier believed to appear in the archaeological material only at the onset of the Upper Palaeolithic of Europe, some researchers have suggested an earlier, more gradual, and African origin (McBrearty and Brooks 2000). One widely accepted criteria of behavioural modernity is the use of rituals and symbols, which are usually not easily identifiable in archaeological assemblages. A possible approach, relying on recent anthropological and neurological theory (Marshall 2002; Boyer and Liénard 2006; Liénard and Boyer 2006), is trying to identify ritualized behaviour through repeated patterns of non-utilitarian, effortful acts. This study comprises an analysis of recently excavated lithic material from the Middle Stone Age (MSA) layers of Rhino Cave, Tsodilo Hills, Botswana. The cave features a large wall panel that has been covered in man-made grooves, presumably in the MSA, as well as a rich lithic assemblage. The lithics are examined through a *chaîne opératoire* approach to determine whether aspects of the aforementioned behaviour patterns were present. Due to the large size of the assemblage, the focus is narrowed to the MSA points. These are examined on technological and morphological grounds, and compared to finds from other MSA sites. The study concludes that patterns of non-utilitarian, effortful behaviour are visible in the life stories of the MSA points, and that this has wide-reaching consequences for the interpretation of the origin of rituals and the Middle Stone Age.

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Sigrid Staurset, November 2008, Oslo

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Abbreviations

MSA Middle Stone Age

LSA Late Stone Age

ESA Early Stone Age

UP Upper Palaeolithic

MP Middle Palaeolithic

TL Thermoluminescence (dating)

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Unless otherwise stated, the illustrations are courtesy of the author.

1. Introduction

Three years ago, a sensational find was reported from Blombos Cave, Southern Cape, South Africa. 41 perforated *Nassarius kraussianus* shells had been excavated from a level dating to 72,000-75,000 years ago, the perforations indicating that they had been strung and worn – they had been used as beads (d'Errico et al. 2005). It was shortly followed by similar finds. In 2006, virtually identical beads were found in Skhul, Israel, and Oued Djebbana, Algeria. The three beads from Skhul came from a layer TL-dated to ~90-100 ka, while the one from Oued Djebbana was believed to be from a layer dating to between 100-135 ka (Vanhaeren et al. 2006). Last year, 13 beads from the same genus were found in a 82,000 year-old layer in Grotte de Piegeons, Morocco (Bouzouggar et al. 2007). All three finds demonstrated that the makers of the beads were aware of concepts like self, personal ornamentation and symbolism. The catch: *Homo sapiens* was not supposed to be capable of modern traits like symbolism that early – in fact, not until c. 40 ka – in Europe. The last three decades has seen an enormous increase in our knowledge of our common ancestor, and placed our origins firmly in Africa, probably in the eastern Rift Valley area (for an overview, see Stringer 2006). Though many questions surrounding human origins are still unanswered, the question of when and where we started behaving human has come to the forefront in the international debate over the last decade. When did we start using symbols? Advanced technology? Did we have rituals? Language? When did modern human behaviour appear?

Until a decade ago, early human prehistory was dominated by an apparent dilemma with regards to the appearance of modern human behaviour: whilst our species originated c. 200,000 years ago - in Africa - no unequivocal evidence of symbolism, language or art was part of the archaeological record before 40,000 years ago - in Europe (Mithen 1998; Gamble 1999; Mellars 2005). The dilemma is evident: why did modern human behaviour first show up 160,000 years after the origin of our species?

The finds from the African Middle Stone Age (c. 200-40 ka) challenged this view, and indicated that behavioural modernity did indeed rise in Africa. Sparked by the discovery of 70,000 years old beads and engraved specimens of ochre from Blombos, South Africa (Henshilwood et al. 2002; d'Errico et al. 2005), additional finds are now supporting an early development of modern human behaviour. However, the issue is far from resolved – the finds indicating symbolism are hitherto sparse, especially when compared to the European Upper Palaeolithic. Whilst many researchers working in Africa now favour an early, gradual development of behavioural modernity (for example McBrearty and Brooks 2000; Henshilwood and d'Errico 2005; Marean and Assefa 2005), certain others still favour a later, more revolutionary development at c. 50 ka (Klein 2000; Wadley 2006).

The latest finds from Rhino Cave, Tsodilo Hills, Botswana, are set against this background. A phenomenon frequently encountered in the archaeology of the Upper Palaeolithic of Europe, but not in the Middle Stone Age, is ritual. Communal ritual is believed to be an unequivocal trademark of modernity, and presupposes use of symbolism and language. Rhino Cave is a small, hidden cave in Tsodilo Hills, northwestern Botswana. It contains a large, natural wall outcrop with a zoomorphic shape, which at some point has been enhanced by man-made grooves to appear more lifelike. Excavations have revealed a grooved section of this outcrop, as well as tools for grooving, in Middle Stone Age (MSA) layers. In itself, this would be the earliest known appearance of rock art – and found in a later context, it would have served a perfect location for ritual acts. However, excavations have also yielded are extensive amount of lithic artefacts, including a large number of points. The cave has seen excavations twice, in 1995-1996 by Larry Robbins, Alec Campbell and team (Robbins, Murphy, Brook et al. 1996; Robbins, Brook et al. 2000), and in 2003-2006 by Sheila Coulson and Nick Walker (Coulson 2004, 2006). This thesis focuses on the lithics of the latter excavations, and on whether they can confirm or refute ritual use of the cave in the MSA.

In an attempt to answer these questions, the lithic material was subjected to a limited *chaîne opératoire* analysis, focusing on the treatment of the points – the choice of raw material, technology, placement within the present production sequences, use, and discard. Using the *chaîne opératoire* to analyze prehistoric behaviour is not common in Middle Stone Age research, but I believe this well-known approach to new material will prove rewarding.
The thesis is divided in seven chapters. Following the introduction, the second chapter treats the debate on modern human behaviour, and gives an overview of the current African evidence. In addition, the importance of ritual is discussed. Chapter three introduces the *chaîne opératoire* and the methodology used in the analysis of the lithic material. The fourth chapter outlines the background of the Rhino Cave finds: the Middle Stone Age of Botswana, Tsodilo Hills, as well as the cave itself. Chapter five, which forms the main part of the thesis, describes the lithic material from the cave – the raw materials, technologies, conditions of the finds, stratigraphy, and relevant production sequences. Chapter six compares the results of the analysis with earlier finds from Rhino Cave; as well as those from the neighbouring sites of White Paintings Shelter and ≠Gi, and examples from the Middle Stone Age of Zimbabwe. In

the final chapter, the results of the study are discussed against the backdrop of the debate on modern human behaviour, summarized and concluded.

2. Rituals and Modern Human Behaviour

The "when, where and what" of modern human behaviour have been subjects of intense international debate. I will here attempt to give an overview of the debate and the supporting archaeological evidence, some current theories, and finally, to link the concept of ritual to that of modern human behaviour.

2.1 The Emergence of Modern Human Behaviour: revolution or evolution?

What exactly constitutes modern human behaviour[1] has been a subject of considerable debate. What makes us human? What differentiates human cultural behaviour from "animal" behaviour? In general, two approaches to this question are presented in the archaeological literature. The first examines the archaeological record for behavioural thresholds, searching for considerable changes or revolutions in behaviour, the idea being that behavioural modernity will manifest itself as markedly more sophisticated expressions in a wide array of the material - for example technology, art and subsistence strategies. The second approach tries first to define modernity, often using more general theories inspired by anthropology or biology, before examining the archaeological record for traces of modern behaviour – often regarding criteria like symbolism, language and art as more important than for example subsistence strategies.

Until about a decade ago, the 'threshold' approach was dominant, exemplified in the theories surrounding the "Upper Palaeolithic revolution" of Europe. While it was becoming increasingly evident that *Homo sapiens* originated in Africa, the earliest evidence of behavioural modernity was European, dating to 30-40 ka. Prior to this, Europe was inhabited by Neanderthals. Following the now widely accepted "Out of Africa II" theory (for an overview see Stringer 2006), the sudden appearance of extensive modern behavioural patterns coincided with the arrival of *Homo sapiens* in Europe. The behavioural threshold of modernity thus came to be defined by the difference between the Neanderthal (Middle Palaeolithic) and anatomically modern human (Upper Palaeolithic) record. This difference consisted mainly of the appearance of varied and sophisticated technology (blades, bone tools), ritual and burial practices, extensive trade networks, exploitation of marine resources and more specialized hunting strategies, as well as a wide array of symbolic expressions like cave art, figurines and burials (see for example Knight et al. 1995; Bahn and Vertut 1997;

[1] Clive Gamble and Martin Porr argues for the use of 'practice' as a term, rather than 'behaviour' because it often carries with it reductionist and deterministic connotations (Gamble and Porr 2005:8-9). While I recognize this argument, I choose here to retain the use of 'behaviour' as it is the most widely used term.

Gamble 1999; Mellars 2001; Bar-Yosef 2002; Mellars 2005). The sudden emergence of the Upper Palaeolithic (UP) was therefore characterized as a 'creative explosion' (Mithen 1998). This approach has been challenged by researchers who claim Neanderthals also were capable of modernity (see for example d'Errico et al. 1998; Zilhão and d'Errico 1999; d'Errico et al. 2003; Wolpoff et al. 2004), and by researchers in the Levant, where Neanderthals and anatomically modern humans appear to have left behind virtually identical archaeological records (Bar-Yosef 1992; Lieberman and Shea 1994; Shea 2001; Hovers 2006). It has also been criticised as Eurocentric; see below.

Several theories has been put forward to explain the apparent paradox of these extensive changes in behaviour taking place so long after the archaeological record displayed modern human skeleton remains. The most prominent theory has probably been that the revolution was triggered by the appearance of language (Chazan et al. 1995; Mithen 1998), which is sometimes argued to be caused by a sudden genetic leap (Klein 2000:17; Corballis 2004). Other theories have favoured social factors, such as larger social networks (Gamble 1998), at times also the contact and or competition with Neanderthals (Shea 2003:185).

A problem made visible especially by this threshold approach, is whether the recovered archaeological material actually reflects the past. Does the absence of evidence expressing modernity indicate that the prehistoric population was not capable of it? This would place unquestionably modern groups in the non-modern category, for example some ancestral Australian Aborigines (d'Errico 2003:192). It is evident that not all hallmarks of modernity leave archaeological traces – for example, symbolic expressions like music or dancing, or even language is not directly visible in archaeological material. One can then claim that though the material evidence may be lacking, the potential for modernity is present – but how do you test for potential?

> *"If it is the case that genetically we today differ rather little from our sapiens ancestors of forty millennia ago, how does that genetic composition which emerged then explain the cultural differences between then and now? The usual answer is that from that time the human animal had the skill, the intelligence, the potential to achieve its later accomplishments. But what kind of explanation is there that lays such weight upon so apparently teleological a concept as potential?"* (Renfrew 1996:11)

Renfrew's sapient behaviour paradox highlights the ever-present problem of prehistoric modernity – we can only use prehistoric populations displaying modernity in their archaeological record as evidence. Though we have to assume that also in prehistory there were behaviourally modern populations whose, say, symbolic expressions did not survive, any speculations on their modernity will remain tentative. On the other hand - proving that past peoples were not *capable* of behavioural modernity is not possible. The absence of archaeologically preserved proof does not mean that it was never there in the first place. Neither can there be said to exist a safe way to detect "non-modernity" in the archaeological record of Homo sapiens.

European cul-de-sac, African highway?

With the appearance of Homo sapiens, the archaeological record of Western Europe changed considerably. The obvious question to ask is this: what behaviour characterized our species before we entered Europe – in Africa? The last decade has seen a significant increase in Middle Stone Age (MSA) research in Africa. This period is usually considered to date from c. 200-20 ka, though probably starting earlier in Eastern Africa (Tryon and McBrearty 2002), and ending later in South Africa (Mitchell 2002:112-119). The MSA is considered an age of anatomically modern humans - the earliest finds of archaic *Homo sapiens* date to ca. 160 ka (White et al. 2003).

In the lithic archaeological record, the onset of the MSA is characterised by the disappearance of handaxes and Acheulan technologies and the appearance of Levallois, discoid and other prepared core-technology, producing specialized tools like points and scrapers. Although there are apparent regional and temporal variations, the lithic technology of the period is largely reminiscent of that utilized in the Eurasian and European Middle Palaeolithic. The lithic technologies of the subsequent Late Stone Age (ca. 40-2 ka) include blade production, a hallmark of the European Upper Palaeolithic. This similarity was part of the reason the interpretation of the European divide between Middle and Upper Palaeolithic was transferred to the African Middle and Late Stone Age. Another reason was the small number of African excavated sites when compared to Europe, and probably also the general predominance of Western archaeology. Until about a decade ago, it was widely accepted that the MSA populations displayed little, if any, examples of modern behaviour - lacking capacity for language, art, symbolism, utilizing a confined ecological niche perhaps restricted to scavenging. In short, they were believed to exhibit the behavioural patterns normally attributed to the Neanderthals of the Middle Palaeolithic. This again sharply contrasts to the LSA, where the aforementioned modern traits are readily found in the archaeological record.

The transfer of a localized, European model of the appearance of modern human behaviour to an African context has been considered Eurocentric by several researchers working in Africa today (see for example Deacon 1998:7; McBrearty and Brooks 2000:534; Clark and Riel-Salvatore 2006:49-50). Christopher Henshilwood and Curtis Marean (2003:632) consider that the appearances of technological complexity in Africa and Europe probably respond to contextual processes, while Sally McBrearty and Alison Brooks (2000:454) point out *that "in terms of developments in world prehistory [...], Western Europe is a remote cul de sac with a somewhat anomalous prehistoric record."*. They summarize the common ingredients thought to characterize modern human behaviour in Africa, and show that these are virtually identical to the ones used to characterize the Upper Palaeolithic in Europe.

The last decade has seen several new finds that challenge the view of the MSA as non-modern as well as a flowering of the international debate regarding modernity (McBrearty and Brooks 2000; Wadley 2001; Henshilwood and Marean 2003). This was perhaps sparked by publications of the 78,000 year-old layers from Blombos, South Africa (see Figure 1), which contained bone tools (Henshilwood et al. 2001), incised ochre (Henshilwood et al. 2002) and the aforementioned shell beads (d'Errico et al. 2005). The inclusion of non-European archaeological materials have removed the focus somewhat from attempting to find "thresholds" to define modern human behaviour as a self-supporting concept. Most researchers now appear to place more value on traits like traits like symbolism and language over more technological and subsistence-oriented traits. The definition employed by McBrearty and Brooks is appealing in the simple way it describes the underlying elements of modern behaviour:

> *"We would argue that modern human behaviour is characterized by:*
>
> - *Abstract thinking, the ability to act with reference to abstract concepts not limited in time or space.*
> - *Planning depth, the ability to formulate strategies based on past experience and to act upon them in a group context.*
> - *Behavioral, economic and technological innovativeness.*
> - *Symbolic behavior, the ability to represent objects, people, and abstract concepts with arbitrary symbols, vocal or visual, and to reify such symbols in cultural practice"* (2000:492).

McBrearty and Brooks further emphasize the ability of abstract thought, planning depth, innovativeness and symbolic behaviour – not unlike their counterpart Lyn Wadley (2001:208), who emphasizes "social organization and relationships expressed, negotiated, legitimized, maintained and transmitted through symbolism".

Figure 1. Map of southern Africa with archaeological sites mentioned in the text. Modified from http://www.eduplace.com/ss/maps/pdf/afr_asia_polnl.pdf.

Revolution, multiple thresholds or gradual change?

To give a full overview of the debate surrounding modern human behaviour is beyond the scope of this thesis. However, I will attempt to summarize the strongest current arguments. Two main models can be discerned – one favouring a sudden, late upper Pleistocene emergence of modern behaviour in Europe, the Levant and Africa, the other arguing a more gradual, mosaic pattern of change emerging in Africa perhaps as early as the Acheulean-MSA transition. One of the main supporters of the late, revolutionary model, is Richard Klein (Klein 1995, 2000, 2001). He argues that a sudden change took place at 40-50 ka in Africa, where after it spread to Asia and Europe. After this change, Homo sapiens displayed a *"fully modern capacity for Culture"* (1995:190), including language, advanced technology, symbolism etc. He proposes that this change was the result of a selectively advantageous mutation, possibly related to symbolism or language. He argues that finding some art objects or bone artefacts at MSA sites is to be expected due to the likelihood of intrusions from LSA layers, or that they alternatively are products of spectacular individuals in the MSA, and not representative of the population as such (Klein in Mayell 2004). In his view, *"credible claims for art or other modern human behavioural marker before 50 ka must involve relatively large numbers of highly patterned objects from deeply stratified, sealed contexts."* (2000:218). Klein's proposed timing, if not all his arguments, are supported by Lyn Wadley (2001:216-217), who believes modern behaviour first appears in the final stage of the MSA at ca. 40 ka, with personal and lithic style as the first signs of symbolic storage. She argues that singular artefacts, like incised shell, are not intrinsically endowed with symbolism, and that material culture only takes a symbolic role when it participates in social behaviour (Wadley 2001:207).

Along the same line of thinking, Anne Thackeray (Thackeray 1992, 2000) emphasizes the differences between the South African MSA and LSA records, and believes that even if MSA populations had the capacity of modern behaviour, they did not express it the way LSA people did. A similar argument is put forward by D. Bruce Dickson and G.-Young Gang (2002), documenting that the greater sophistication, systematization and efficiency evident in resource use, tool manufacture and style evident in the LSA of Shurmai and Kakwa Lelash, Kenya compared to that of the MSA, indicates that the origins of modern behaviour can be found in the LSA.

Conversely, the model favouring an early, consistent pattern of development, has the last decade gained more support, and varieties of this now appears to be backed by most researchers working on the MSA. A thorough summary of the African evidence for an early and gradual development of behavioural modernity is presented by McBrearty and Brooks (2000). They argue that the modern human adaptation was not due to a biological or cultural revolution *"...but the fitful expansion of a shared body of knowledge, and the application of novel solutions on an "as needed" basis"* (2000:531). They do recognize an increase in the archaeological evidence for behavioural modernity after 50 ka, but attribute this to population growth and environmental deterioration. An important part of this argument is that the appearance of our species (if one includes *Homo helmei*) coincides with the appearance of MSA technology at 250-300 ka, thus the major behavioural "threshold" would be between different hominids.

Comparisons of the Acheulean and early MSA lithic technologies of Kapthurin, Kenya, where the researchers argue that Levallois forms developed locally from Acheulean origins, further support the theory of a mosaic of gradual change into modernity taking place in different

African locales (Tryon et al. 2005; Tryon 2006). Similar arguments are put forward by Chris Henshilwood and Curtis Marean (2003), emphasizing the presence of finds carrying symbolic meaning (like beads, engraved ochre or exceptionally well-crafted tools) as hallmarks of advanced levels of symbolic thought and language. With Francesco d'Errico (Henshilwood and d'Errico 2005) they argue against a revolutionary change at 50 ka, and consider the specimens of engraved ochre of Blombos, though unique, to be part of a temporally and spatially constrained Pan-MSA cognitive system. Some claims have also been made to a Lower Palaeolithic emergence of symbolic behaviour (Bednarik 1995; Mania and Mania 2005).

Consequently, although there is no universal agreement on when and how modern behaviour emerged varies, most researchers now agree that it emerged in Africa, before 50 ka, and that the emergence was far more complex than the European "revolution" (see for example McBrearty and Brooks 2000; Barham 2002; Watts 2002; Van Peer et al. 2003; Deacon and Wurz 2005; Marean and Assefa 2005; McBrearty and Stringer 2007).

Signals of modern human behaviour in the Middle Stone Age

A wide variety of traits and behaviour patterns have been interpreted to signal modern human behaviour in both the Upper Palaeolithic and the Later Stone Age - symbolically imbued artefacts, colourants, personal ornaments, burials, spatial organization, composite and bone tools, long-distance raw material transport, large-game hunting and exploitation of marine resources. A walkthrough of the MSA archaeological record focusing on these aspects, show that though not common, examples of most "traits" can be found. Though large areas of the African continent are scarcely researched and even less well documented, the better-known sequences of South and Eastern Africa provide ample contributions to the issue of modern behaviour.

The presence of a large number of symbolically imbued artefacts appears to be one indication of modernity virtually all researchers agree upon. In the MSA debate pigment use and personal ornaments have been central symbolic elements. The use of ochre is well-documented throughout the Middle Stone Age (Watts 1999), possibly as early as 285 ka at Kapthurin, Kenya (McBrearty 1999:149), and most recently proclaimed to occur as early as 164 ka at Pinnacle Point, South Africa (Marean et al. 2007). However, while Ian Watts (2002) claim that the use of ochre in itself signifies symbolic behaviour, experiments and microscopic analysis of MSA points show that ochre has also been used as an ingredient in adhesives for hafting in the MSA (Wadley 2005; Lombard 2006a). Another colorant, specularite, a mica-like, glimmering substance used by the San for decorative purposes has been found in MSA layers in Twin Rivers, Zambia (Barham 2001:241-242), Porc-Epic, Ethiopia (Clark et al. 1984:50), and in Rhino Cave, Botswana (Robbins, Brook et al. 2000:21). Unlike ochre, there are no other known uses of specularite besides that of a colourant.

With regards to personal ornaments, the pierced shells from Blombos Cave (d'Errico et al. 2005) are now followed by finds of virtually identical beads in Grotte des Pigeons, Morocco, dated to 82 ka (Bouzouggar et al. 2007). Similar beads have been found in the MSA layers of Oued Djebbana, Algeria and layers dating to between 100-135 ka in Skhul, Israel (Vanhaeren et al. 2006). Together, they present a convincing argument of both the capacity and capability of symbolic actions.

Though not common, several occurences of incised objects are reported in the MSA, including two engraved pieces of ochre from Blombos (Henshilwood et al. 2002), notched bone from Sibudu (Cain 2004), and intentionally marked ostrich eggshell pieces at Diepkloof (Parkington et al. 2005) – together they indicate that MSA people of South Africa were behaviourally modern. They do not appear to have buried their dead, another significant Upper Palaeolithic invention, though defleshing and post-depositionary polish on the cranium is interpreted as mortuary practices at Herto, Ethiopia (Clark et al. 2003:751). Neither is spatial organization of living sites a trademark of the MSA – the exception being three possible windbreaks, interpretated from semi-circular outlines of posthole structures, found in the Upper MSA layers of Mumbwa Caves, Zambia (Barham 1996:195-198). Lyn Wadley (2006) considers symbolic use of space to be an important indication of behavioural modernity, and documents that in contrast to the LSA inhabitants of Sibudu Cave, South Africa, the MSA inhabitants had not significantly altered their cave environments.

With regards to technology, there is ample evidence in the MSA of composite toolmaking and hafting (Lombard 2005; Brooks et al. 2006; Lombard 2006b; Villa and Lenoir 2006), as well as use of bone materials and harpoons (Brooks et al. 1995; Yellen et al. 1995; Backwell and d'Errico 2005; d'Errico and Henshilwood 2007). The amount of variation and standardization of tools, as well as the attribution of style is variable – but given the geographic and temporal scale that should not be surprising. The attribution of style is important due to its link to symbolism. This argument is proposed by Sarah Wurz (2000; Wurz 2005), who documents stylistic changes through the stages of MSA I, MSA II and Howieson's Poort at Klasies River, South Africa (but see Thackeray 1989; 2000). In East Africa, Desmond Clark sees a distinct emergence of regional variation and style right through the MSA lithic assemblage (Clark 1988).

Blade technology, normally considered a hallmark of the European Upper Palaeolithic, is not present in the African MSA in the strictest sense, as the punch technique was not used. However, standardized, elongated flakes (in Africa often termed blades, see below) are present at a number of sites, including Klasies River (Wurz 2002) and the Kapthurin Formation, Kenya (Texier 1996). Concerning the selection of raw materials, most of the lithic raw materials sources are considered local, but long-distance transport of raw materials does occur. With distances of up to 340km, it is likely the materials moved through exchange networks (Marwick 2003).

As for the MSA subsistence strategies, the ecological niche appears to gradually increase. There is now abundant evidence for hunting of large game and small mammals (Bartram and Marean 1999; Assefa 2006). In Aduma, Ethiopia, the MSA inhabitants exploited a wider range of resources including river fish (Yellen et al. 2005). At Blombos Cave and Pinnacle Point, both South Africa, shellfish was gathered at respectively 78 and 164 ka (d'Errico et al. 2005; Marean et al. 2007).

In short, the MSA record provides evidence for examples of modern behaviour both according to the trait-list approach of the 90s and to the post-2000 emphasis on symbols and thought processes. The *"skill, the intelligence, the potential to achieve its later accomplishments"* must have been present at this stage (Renfrew 1996:11). The irregularity of the finds signalling modern human behaviour appears to centre on the focus of research and the state of preservation, rather than the presence of modernity.

2.2 Ritual and ritualized behaviour

Though symbolism has played a very important role in the debate on modern human behaviour, the question of whether ritual practice was also present in the MSA has not been addressed. This begs the questions has to wonder if this is because rituals were not practiced, if it reflects a scarcity of material remains, or if researchers simply have focused on other aspects of modernity. The few claims that have been made with regard to ritual capacity in the

MSA are mainly centred around the use of ochre as a part of ritualized display (Watts 1999, 2002), and the early mortuary practices are reported at Herto, Ethiopia (Clark et al. 2003:751).

Due to the scarcity of research on ritual in MSA contexts, I will attempt to bring in aspects from other fields of study besides archaeology. Ritual is a major area for anthropological, pschychological and Darwinian research, and I do not presume to give a full or even representative overview of this literature here. I will only attempt to offer some examples, which in my belief can can aid this discussion of behavioural modernity. Rituals and ceremonies are generally seen as a human trademark – they are present in all known human societies. They signal a conscious view of life, where communication takes place not only in rational exchanges between individuals and groups, and they presuppose advanced use of symbols and language.

A classic definition of ritual was devised by the anthropologist Roy Rappaport. He describes them as :

> *"… conventional acts of display through which one or more participants transmit information concerning their physiological, physiological, or sociological states either to themselves or to one or more of their participants"(1971:25).*

This definition takes into account the great significance ritual plays in social relations, and stresses that the acts of display have to be conventional; they have to be well known to the receivers of the messages as part of a recognized pattern. That ritual functions as a means for social communication and discourse, is further discussed by sociologist Douglas Marshall (2002). He believes that the key constituents of ritual action – assembly, attentional focus, and effortful action – are responses to uncertainty and crisis. He further states that individuals and groups facing threats are likely to engage in one or more of these activities, and thereby derive benefits such as belief and a sense of belonging (2002:369). That the actions are effortful, are essential to the practices – they involve the surrendering of hard-won resources, various forms of abstinence, or take time and energy away from necessary pursuits (2002:365).

However, while both Rappaport and Marshall's contributions to the understanding of ritual are of great importance, they are not adequate to cover the distinction necessary to differentiate between modern and non-modern behaviour. They do not show a distinction between human and animal ritual - as witnessed, for example, in peacock feather displays.

Alternatively, it has been proposed that this difference lies in the essential collectiveness of human ritual, and in the way the individual relates to it:

> *"Through exposure to ritual, art and other external memory stores, every individual constructs, in addition to the cognitive map just described, a personalized copy of a communal map, access to which defines membership of a symbolic community"* (Knight et al. 1995:75).

While this definition highlights an important distinction, it is not easily transferred to the interpretation of archaeological material, as in this case the difference is only visible to the individuals participating in the ritual.

Ritualized behaviour as a response to danger

Recently, a distinction between rituals and ritualized behaviour has been proposed by evolutionary psychologists Pascal Boyer and Pierre Liénard (2006; Liénard and Boyer 2006), in an attempt to clarify the processes underlying human ritual. I believe this theory may be helpful in distinguishing between human and animal ritual, as well as serving as an analytical tool when searching for ritual behaviour in archaeological contexts. Liénard and Boyer (2006:815) are inspired by Rappaport, and construe ritualized behaviour as a way of organizing behaviour characterized by compulsion, rigidity, redundancy, and goal demotion. They find forms of ritualized behaviour in various domains: children's rituals (for example children's organizing of toys), obsessive-compulsive disorders (for example repeatedly washing hands), and life-stage-relevant intrusive thoughts (for example occurring amongst pregnant women). For them, though a human ritual like a ceremony has meaning, ritualized actions do not, even though they may comprise most of the ritual (Liénard and Boyer 2006:817). This coincides with Marshall's (2002:376) view that ritual behaviour will be distinctly non-utilitarian in nature, not as a matter of happenstance, but due to a conscious choice away from utilitarianism – sanctity is characterized by non-utilitarianism.

Boyer and Liénard (2006; Liénard and Boyer 2006) also point out that although rituals serve a function in social relations, these negotiations can take place in many other contexts – the reasons for ritual lie elsewhere. They believe the roots of ritualized behaviour can be found in human ways of reacting to potential danger, in what they call the hazard-precaution system. This comprises of danger triggers, specific reactions to potential danger, and descriptions of appropriate precautions. When the hazard-precaution system is triggered, certain ritualized behaviour patterns take over; goal-demotion of actions is forced, resulting in what they term a "swamping of working memory". This swamping, caused by the repetitious, ritualized actions, has the function of temporarily overloading the brain and thus relieving the individual of the stress reactions to nearby danger (Boyer and Liénard 2006; Liénard and Boyer 2006). According to Liénard and Boyer, these reactions to inferred danger are the basis of human ritual:

> *"There are collective rituals in human groups because certain sets of actions are selected through cultural transmission as more compelling or "natural" than other possible sets of actions. We need not assume a specific human need or capacity to perform collective rituals. All we have to assume is that, in given circumstances, these sets of actions seem more appropriate than others—certain ritual sequences are found more attention grabbing or memorable than others"*(2006:815).

Liénard and Boyer do not view collective ritual as a human adaptation, but rather as a by-product of the evolved cognitive architecture. The common use of rituals is then a function of *"(1) how easily they are comprehended by witnesses and (2) how deeply they trigger activation of motivation systems and cognitive processes that are present in humans for other evolutionary reasons"* (2006:826).

Repeated patterns of non-utilitarian, effortful behaviour

On the basis of this research and the definitions presented by Rappaport, Marshall Boyer and Liénard, one can then suggest relevant methods to search for ritual in archaeological contexts where the modernity of the prehistoric peoples are in question. We should search not for the ritual itself, most probably carrying a meaning that now is lost, but for ritualized behaviour patterns that would give meaning in the context of a collective ritual. An added indication of the importance of these behavioural patterns would be if the execution of the actions was expensive or incurred the use of considerable effort (involved high risk, intensive labour or similar, as framed by Marshall 2002:365). The actions would be characterized by not carrying meaning in themselves – being non-rational or non-utilitarian, and by being repeated in a recurring pattern. Singular, symbolically imbued artefacts, important as they are as evidence of modernity, do not fulfil this requirement. These actions patterns would have to be repeated on a large number of artefacts for them to be classified as ritualized. One would need, as framed by Klein, "relatively large numbers of highly patterned objects" (2000:218) to make a credible claim for modern human behaviour.

To summarize, a convincing assertion for human ritual occurring in the MSA could be found in repeated patterns of non-utilitarian, effortful behaviour that would make sense in a human, collective ritual. These patterns would have to be found in both well-dated and sealed archaeological contexts, or in objects that indisputably originate in the MSA.

3. Methodology – a chaîne opératoire approach

The methodology of the *chaîne opératoire*, the stuffy of lithic production sequences, is well known and established in Europe, but has only recently been introduced in southern Africa. In the study of the MSA lithics from Rhino Cave, I have employed a *chaîne opératoire* approach, as this method is highly suited for the stuffy past human behaviour patterns. This will be further discussed below, followed by a brief outline of the lithic research on the MSA in Botswana.

3.1 The *chaîne opératoire* approach to prehistoric behaviour

According to Jacques Pelegrin, interpretations of lithic data can only be discussed after an in-depth reading of the lithics:

> *"This reading comprises of the following steps: identification of raw material, recognition of knapping techniques and methods (with, eventually, the help of experimentation and refitting), technological classification according to the stages of manufacture represented at the site or in the chaîne opératoire, distinction of types of blanks and types of tools, subsequent modifications of these tools (resharpening, transformations, discard patterns) and so forth"* (1990:116).

The *chaîne opératoire* combination of artefact life-stories, agency and emphasis on social organization of prehistoric society, is now a well-known approach to analysis of lithic assemblages. It was developed as an alternative to typological methods of research, wanting to go beyond the collection of data and descriptions of artefacts to analyze patterns of past behaviour. It also developed a deeper understanding of knapping and the aspects of lithic technology. It has been defined as a *"technical chain of sequential material operations by which natural resources are acquired and physically transformed into cultural commodities"* (Dobres 2000:154). It has proved a most rewarding way of recognizing both patterns of behaviour and prehistoric individuals in action (see for example Cahen et al. 1979; Cahen and Keeley 1980; Volkman 1983; Bodu et al. 1987).

However, technical behaviour patterns do not exist in a social vacuum, and as Marcia-Anne Dobres (2000:162) points out, technology should be analyzed as both part of social processes and agencies as well as a shaping element in them. For this reason, the chaîne opératoire methodology makes possible a study of how lithic artefacts can be part of specific social settings, and can help interpret their role. It is my belief that by employing the *chaîne* *opératoire* approach to archaeological material from the African MSA the results will contribute to uncover past behavioural patterns with consequences for our assessment of the level of behavioural modernity. For further discussion of the *chaîne opératoire*, I refer to the extensive literature available (see for example Edmonds 1990; Dobres 1995; Inizan et al. 1999; Dobres 2000).

In the study of lithics from Rhino Cave, I will use a *chaîne opératoire* approach focused on answering specific questions regarding the archaeological material. A full *chaîne opératoire* analysis was not possible due to the large amount of material (in excess of 11,000 pieces) and the small scope of this thesis. However, I believe that this narrowed focus can still prove a productive mode of research when concentrated on problem-solving – as stated by Dobres (2000:167), the *chaîne opératoire* should be modified to fit the interests of both the researchers and the material nature of the technology. The research focuses on one artefact type, the points recovered in the MSA layers. I do not propose that this limited focus on conspicuous pieces can replace a full *chaîne opératoire* analysis, or that it is the only way to analyze the material. The large amount of lithics makes many other roads of analysis possible – for example analysis of blanks and flakes vs. the cores present, more extensive refitting or an analysis of the breakage patterns of the flakes – all potentially informative of the behaviour patterns executed in the MSA in Rhino Cave.

There are several reasons the points were chosen – firstly, they are *fossiles directeurs* of the MSA, and unquestionably attributed to this period regardless of the questionable dating of the MSA layers of the cave (see below). Secondly, the points were present in large numbers throughout the MSA layers. They therefore should reflect patterns of past behaviour and not merely separated incidents. During excavation it was noted that most of the points were produced in high-quality, often non-local raw material, that most of them were well-executed and had no obvious signs of use. It is my belief that even this limited focus on can provide some answers regarding the questions surrounding the possible ritual use of the cave in the MSA.

The points were examined specifically to address the following aspects:

- Integrity of the stratigraphic layers (the extent of post-depositional movement).
- The point production sequences present in the cave
- Post-production actions that had altered the points (impact fractures, breakage, burning etc)

- Comparison to other artefacts recovered in the MSA layers
- Assessment of this analysis with regards to possible ritual use of the cave, fuelled by the fact that the points were recovered directly underneath the carved wall panel
- Refitting was central in the analysis. In addition, a more typological, descriptive approach was applied to the tools and cores from Rhino Cave. This was necessary to enable comparison to other sites, as the chronological and typological map of the MSA is not complete, and a large number of approaches and typologies are in use.

Refitting has also played another important role, in that it has helped determine the amount of movement of artefacts within the MSA layers. As the sediment mostly consists of very fine sand, a degree of movement was expected (Hofman 1986).

3.2 Southern African terminologies and typologies

Research on lithic artefacts from the African MSA has been undertaken using a variety of traditions and approaches. While North Africa is heavily influenced by European terminology and methodology, strong regional traditions have developed in Eastern and South Africa. Most of the literature, especially older publications, put a strong emphasis on typology and statistical analysis of artefact numbers and distributions. This is slowly changing, and other aspects are now appearing, like shape and biplot analysis (Wurz et al. 2003), experimental knapping (Barham 1986), core reduction strategies (Conard et al. 2004; Tryon et al. 2005), technological *chaîne opératoire* analysis (Wurz 2000), macrofracture and residue analysis (Lombard 2005), as well as comparisons with the European Middle Palaeolithic (Villa and Lenoir 2006). However, to my knowledge, the *chaîne opératoire* has not been used to examine patterns of MSA behaviour.

South African research and methods have been highly influential in Botswana archaeology (for an overview of the research history, see Mitchell 1999; Schlanger 2005). South African typologies composed by C.G. Sampson (1972), Thomas Volman (1981) and Singer and Wymer (1982) have been and are often still used as frameworks for the MSA of Botswana even though these typologies were established sites in different geographic and temporal settings. This is understandable insofar as few other frameworks are available. For example, Larry Robbins et al. (1996:29) used Volman and Janette Deacon (1984) to categorize the earlier finds from Rhino Cave. The Botswana MSA site of ≠Gi was analyzed by Kathleen Kuman (1989:289) using the frameworks established by Volman and Singer and Wymer, though she also compares the finds to the Zimbabwean MSA. Mike Murphy (1999:74) used

Volman's typology for his research on the nearby MSA site of White Paintings Shelter. The methodology of lithic research in Botswana has also mainly been typologically oriented, focusing on statistical analysis and size profiling of assemblages. As there is no comprehensive MSA chronology available for Botswana, using the more established chronologies from South Africa is perhaps necessary to place the Botswana finds in a larger context. However, I believe there to be several problems in applying the South African system directly, firstly because many of the South African sites are found in very different geographical, climatic, and temporal settings, secondly because the lithic assemblages from Botswana often are very different. Differences in the raw material, the invasive retouch on tools, and the large proportion of discoid technologies, to name but a few, are perhaps more reminiscent of examples from Zimbabwe and Zambia. This will be further discussed in chapter 6.

I have chosen to use Bordesian terminology, as described by Inizan et al. (1999), with its strong technological basis, rather than the terminologies used in the South African publications noted above. This is a prerequisite for using a *chaîne opératoire* approach, but it makes direct comparisons with previous finds somewhat more complicated. For example, the earlier publications of Rhino Cave consider a "blade" to be essentially any elongated flake, and a "bladelet" to be a shorter version of this (Robbins, Brook et al. 2000). I employ the stricter definition of a blade, where the flake has to be twice as long as it is broad, and display parallel dorsal ridges and lateral edges (Inizan et al. 1999:130-131). The different approaches to technology also makes for marked differences in interpretation, which will also be further discussed in Chapter 6. An added bonus of employing the Bordesian terminology is that the analysis of the Rhino Cave lithic assembly will be more readily available to a wider audience of researchers outside Africa, as well as researchers employing a more French-inspired approach to lithic technology within the continent. I believe that as long as researchers are aware of them, the diverging terminologies do not make comparisons between published sites impossible. The wide variety of approaches now in use in MSA lithic research may indeed prove to be a strong point, highlighting different aspects of the archaeological material.

4. Background: the Middle Stone Age of Botswana, the Tsodilo Hills, and Rhino Cave

4.1 The Middle Stone Age of Botswana

Archaeological research in Botswana has a relatively short history. In contrast to neighbouring Zimbabwe (then Rhodesia) or South Africa, the Bechuanaland Protectorate witnessed little archaeological research in colonial times (Lane et al. 1998:14), although some incursions from the more well-researched neighbouring countries took place. It was not until the 1970's when the National Museum started employing archaeologists that the field of study became a priority. After independence, the San[2] peoples of the Kalahari became the focal point for ethnographic and early ethnoarchaeological research (see for example Wiessner 1983). Later, much focus was given to the 'Kalahari debate', and the arrival of domesticated animals in southern Africa (Sadr 1998). Today, there are both national and international archaeological teams working in Botswana, carrying out research on a variety of epochs and sites. However, the earlier prehistory, including the Middle Stone Age, remains a largely unmapped entity, as to date only excavations from three sites have been published.

As lithic material from the MSA is readily visible as surface finds many places in Botswana, the limited number of publications is not due to the region having been sparsely occupied in the MSA, but rather to the modest amount of research. It is thus necessary to examine the MSA of Botswana in a wider context including the surrounding subcontinent (Robbins and Murphy 1998:50). The more well-developed chronologies of Zimbabwe, and, especially, South Africa, have therefore been essential to research in Botswana. Lithic artefacts remains the determining factor to assign sites to the MSA, often defined along the lines of *"a stone tool technology derived from that illustrated by final Acheulean and/or Sangoan artefacts, being often based upon elaborations (eventually with reduced size) of a prepared-core technique"* (Phillipson 2005:92). In other words, a shift from handaxes to points, from core to flake tools, and prevalence of prepared core techniques, especially discoid or Levallois variants. This general pattern also applies to the MSA assemblages from Botswana.

The three published MSA Botswana sites are ≠Gi, White Paintings Shelter, and Rhino Cave, (see Figures 1 and 2). The open-air site of ≠Gi in north-western Botswana was excavated in the 1970s and TL-dated to 77,000 ±-11,000 BP (Brooks et al. 1990). The finds included

[2] Earlier known as Bushmen, the San peoples are in Botswana now often referred to as the Basarwa.

bifacially worked, small to medium-sized points as well as scrapers, notches and denticulates. Importantly, a large amount of faunal material was also recovered, including large mammals like zebra and giant buffalo (Brooks and Yellen 1977; Helgren and Brooks 1983). The site is interpreted as a repeatedly used special-purpose site on the margin of a river channel (Kuman 1989:197-216).

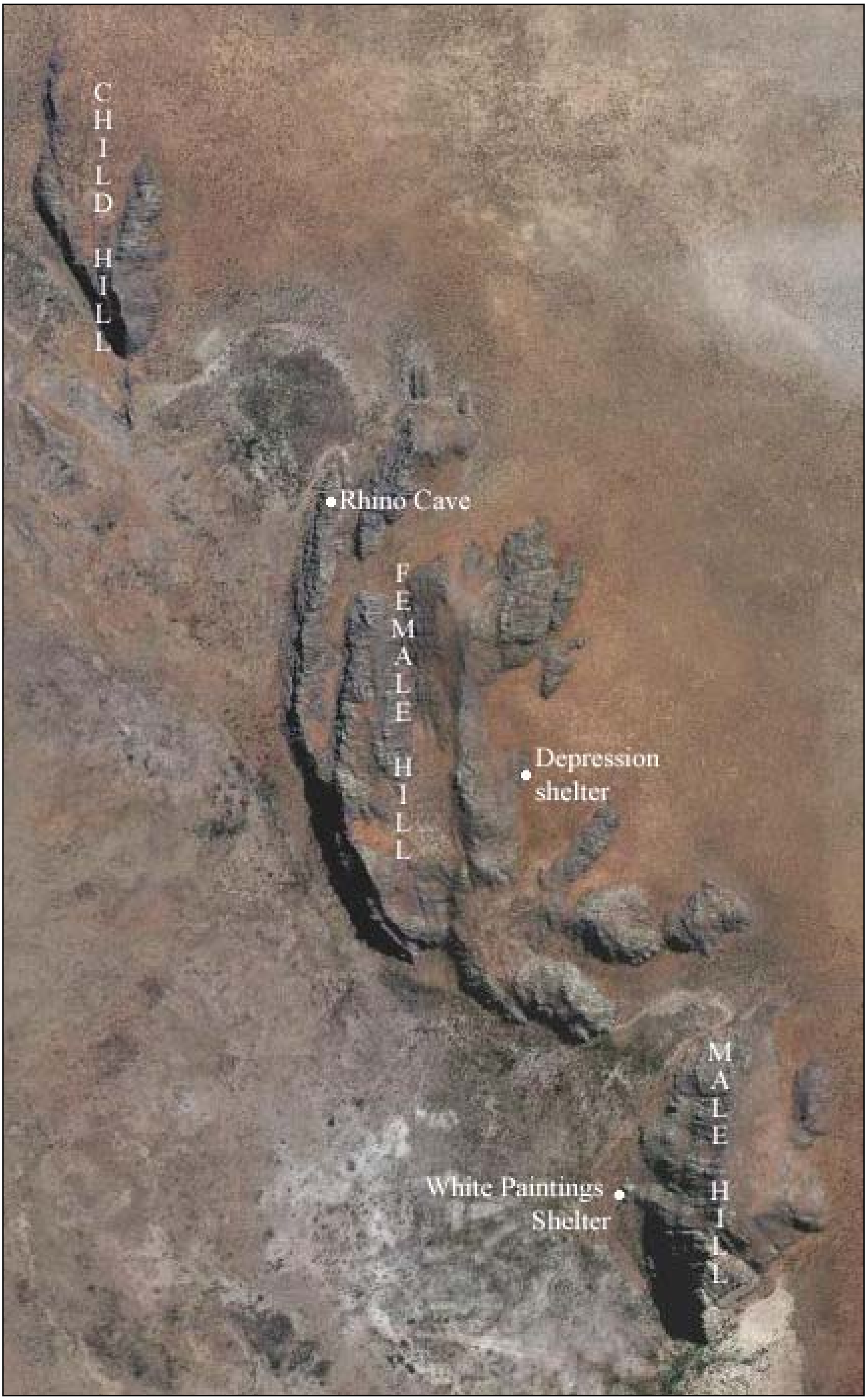

Figure 2. Aerial view of Tsodilo Hills with sites mentioned in text, modified from Google Earth.

The excavations at White Paintings Shelter in Tsodilo Hills, revealed a transitional MSA-LSA layer defined by large blades struck from prepared cores as well as an almost 3m thick MSA layer with a more vague stratigraphy. The MSA finds included unifacial and bifacial points, denticulates, notches, burins, awls and becs; and some faunal material, including fish bones. Two TL dates of 66,4000±6,500 and 94,300±9,400 were taken in the MSA layers. However, the excavators believed these dates to be uncertain (Robbins, Murphy et al. 2000:1093). The upper and transitional MSA layers have been interpreted as a workshop/habitation site (Murphy 1999:368-386), and microwear analysis of ten points concluded they had been used as spear points (Donahue et al. 2004).

Rhino Cave, a small cave site in Tsodilo Hills, was first excavated in 1995 and 1996 (more on the 2003-2006 excavations below). The excavators reported a large number of unifacial and bifacial points, as well as scrapers, awls, denticulates, notches and bladelets (Robbins, Murphy, Brook et al. 1996; Robbins, Brook et al. 2000). Two dates of 14,500 ±50BP and 18,175±871BP were again considered by them to be uncertain (Robbins, Brook et al. 2000:19). The material from Rhino Cave and White Paintings Shelter has recently been reanalyzed by Laurel Phillipson (Phillipson 2007a, 2007b) using attribute cluster and other technological analysis. Some features are present in all these three sites – the MSA assemblages are rich, contain a number of bifacially and unifacially retouched points, and non-local raw material is frequently used.

A third Tsodilo site, Corner Cave, has also recently been excavated, and will hopefully soon be published (Coulson and Walker 2002). In addition to the excavated sites, some surface collections have been reported, including Kudiakam Pan (Robbins 1988), where prepared cores, unifacial and bifacial points, denticulates and handaxes were recovered; and at Orapa Mine (Cohen 1974), where discoid cores and scrapers were found. It is also worth noting that the deepest levels of the otherwise LSA-assigned site of Depression Shelter, Tsodilo Hills, is reported to possibly date to the MSA (Robbins 1990:61; Robbins and Murphy 1998:61). Although no comprehensive record of the MSA of Botswana is available yet, the three main sites now have been analyzed to the point where they can be used for comparisons and provides a foundation upon which further knowledge can be built.

4.2 Tsodilo Hills, north-western Ngamiland

The Unesco World Heritage site of Tsodilo Hills ('The Mountain of the Gods') is situated in Ngamiland, northwestern Botswana, close to the Namibian border (see Figure 2). It consists of three hills, named Male Hill, Female Hill, and Child Hill by the local San groups (Segadika 2006) The hills are a stunning sight – surrounded by the plains of the Kalahari, they tower above their surroundings – Male Hill is particularly imposing, with its sheer sides and great height (Figure 2). Female Hill is lower, but wider, and contains several valleys and ridges. In prehistoric times there would have been several reasons to come to Tsodilo – the hills' dominance of the landscape makes them natural meetings points and provide a wide view for example to spot game. Contrary to the semi-desert around them, the hills also supply a precious resource - permanent water-sources – three rain wells are located on Female Hill. The hills are also good sources of lithic raw material, essentially high quality quartzite and quartz. These materials not readily available in the surrounding Kalahari.

There are archaeological indications of settlements at Tsodilo Hills from ca. 100 ka. Two MSA sites have been documented, Rhino Cave (Robbins, Murphy, Stevens et al. 1996; Robbins, Brook et al. 2000) and White Paintings Shelter (Robbins, Murphy et al. 2000). A third excavation has taken place at Corner Cave (Coulson and Walker 2002). These three sites contain LSA layers as well, as does Depression Shelter (Robbins and Campbell 1988; Robbins 1990). There are also remains on from two Iron Age villages situated on Female Hill – Divuyu (6th and 8th centuries AD) and Nqoma (9th and 11th centuries AD), both have evidence for farming and herding (Reid et al. 1998; Segobye 1998). Today, two communities live close to the hills, the Hambukushu and the Ju/hoansi San, and to both groups the hills have significant spiritual meanings.

The hills are well-known for the more than 1400 paintings, depicting humans, animals and geometric patterns (for an overview see Walker 1998). They are generally attributed the San groups living near Tsodilo in the late 1800s, and while the Hambukushu ascribe the rock art to the Almighty, the San believes it to be the work of the ancestors (Segadika 2006:32). There are also several cupmark sites, including Rhino Cave, Depression Shelter, Corner Cave, and Female Cave. To local groups, the Tsodilo Hills are a place of origin – according to Ju/hoansi legend, this is where life began – its ethnographic significance can perhaps be likened to that of Ayers' Rock in Australia. Pilgrims (both animists and Christian) come to Tsodilo even today to pray and drink from the natural wells (Segadika 2006).

4.3 Rhino Cave

Rhino Cave is a small, hidden cave in the northern part of Female Hill (see Figure 3). The main, eastern cave opening is facing a small interior valley, well away from other archaeological sites on Tsodilo Hills. The entrance is completely hidden even by sparse winter vegetation. Entering the cave requires climbing the valley wall, squeezing between huge boulders and finally climbing (or sliding) down into the cave itself (see Figure 3). Around the entrance to the cave, there are several ledges, which offer a good view into the interior, and down into the small valley below – one can also climb around to the opposite entrance to the cave and get a view of the Kalahari north and west of Female Hill towards Child Hill. Inside, the roof is roughly Λ-shaped, and the cave is ca. 11 m long and 1.5-5 m wide. It is also possible to exit the cave on the north and southwest, though the passages are quite narrow. The very back end of the cave is blocked by boulders fallen from the roof, but still allows a small amount of light to enter. The cave floor is covered in deep, loose, fine-grained sand.

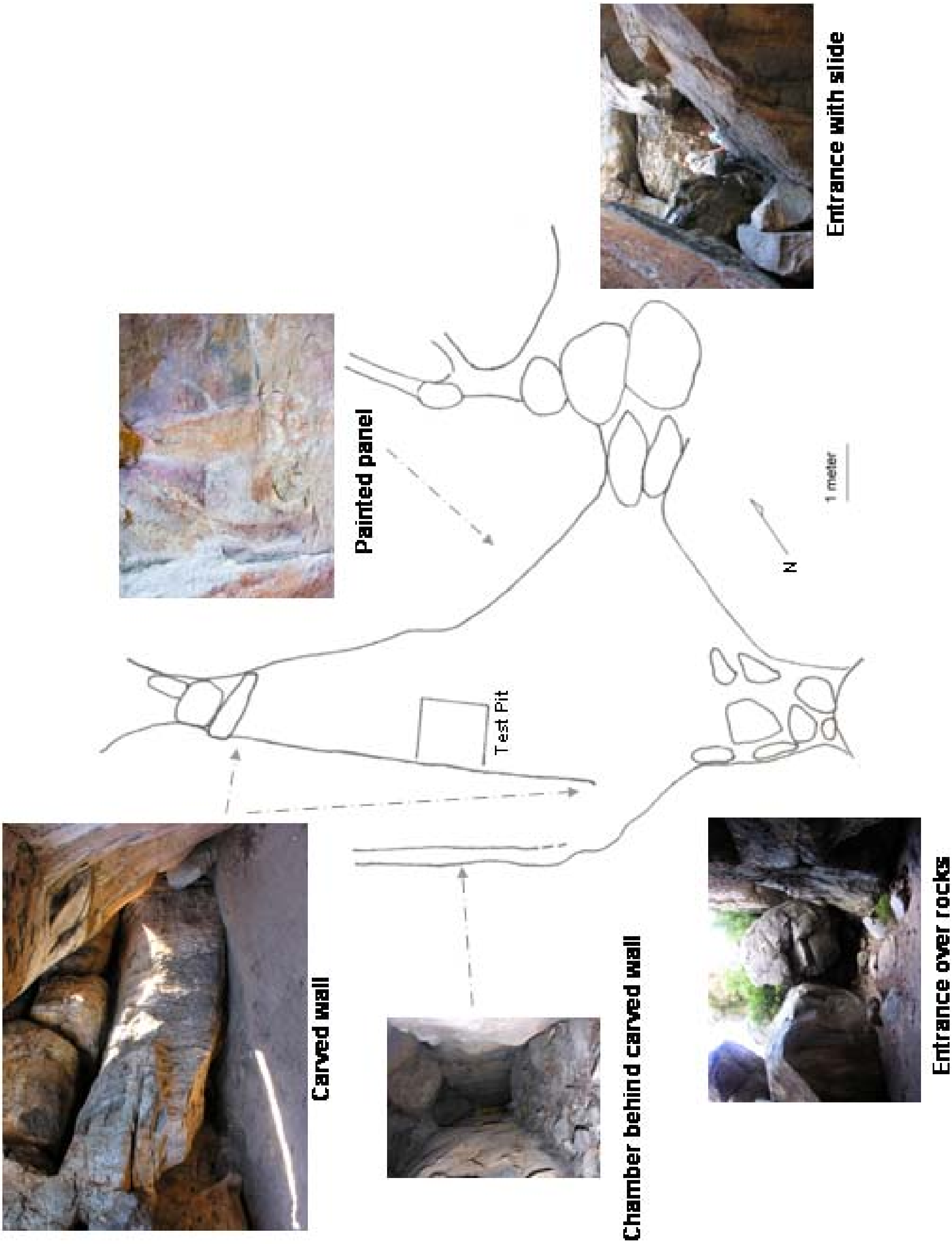

Figure 3. Interior and layout of Rhino Cave, Tsodilo Hills, Botswana. Illustration courtesy of Sheila Coulson.

The north wall is the site of the LSA paintings (se Figure 3) - a red giraffe, a white “rhino” and three shapes interpreted as turtles. The “rhino” was identified by Robbins et al (1996:33) and is responsible for the name assigned to the cave. It has now been reinterpreted as an elephant by Sheila Coulson and Lopang Tatlhego of the National Museum (Coulson, personal comment 2007).

The most notable feature of the cave is a natural rock outcrop on the western wall that resembles a serpent, with a crack for a “mouth” and a natural depression for an “eye”, and a raised head. This outcrop, a dominating feature at 6.75x2m, has been enhanced by hundreds of man-made grooves, which emphasize the serpentlike shape and are reminiscent of reptile scales. There are ca. 350 elongated grooves or cupmarks, ca. 2-4 cm deep and in a variety of several shapes – from almost circular to cigar-shaped. In Rhino Cave, these are *only* located on this outcrop, and limited to the lower section of the vertical panel – none can be found underneath or on top of it. The panel is heavily weathered in places, and some unweathered grooves are superimposed over heavily weathered ones. In addition, parts of the panel have spalled off, especially on the lower parts, and new grooves have been made on the revealed surface. In all, these factors indicate that the making of the grooves was an activity that has been undertaken over long periods of time. Another natural feature of the cave further enhances this panel – at regular times on Winter days, the small opening in the back of the cave admit a beam of sunlight which plays upon the grooves. To the left of the entrance, one can reach a narrow chamber behind the carved wall (see Figure 3), which eventually leads to another constricted exit.

1995-1996 excavations: below the LSA paintings

Rhino Cave was first registered in the Tsodilo rock art surveys in the 1990s (Robbins, Murphy, Brook et al. 1996:23). It is worth noting that it was showed to the archaeologists by the local San chief, whose son (and current chief), Xuntae Xhao, has since confirmed ritual use of the cave by his grandfather (Sheila Coulson, personal communication 2006). Excavations have since been undertaken by two archaeological teams – Robbins/Campbell and team in 1995 and 1996 (1996; 2000), and Coulson/Walker and team in 2003, 2004 and 2006 (Coulson 2004, 2006). My analysis is based on the materials recovered by Coulson and Walker, though I have also briefly examined some of the materials excavated by Robbins and Campbell now housed in the National Museum of Botswana.

Robbins, Campbell, and team (1996; 2000) excavated a four m² trench across the cave, beginning from the wall underneath the LSA paintings. These yielded some LSA finds and a relatively large MSA assemblage. The excavators reported 92 points, as well as scrapers, awls, denticulates, notches, bladelets, cores, hammerstones and specularite. An AMS radiocarbon date of 14,500±50 BP and a TL date of 18,175±871BP were considered by the excavators to be uncertain and too late (Robbins, Brook et al. 2000:19). They note that tool production must have taken place on-site, mainly of points, which they considered comparable to those of White Paintings Shelter.

2003-2006 excavations: below the carved wall

In 2003, Nick Walker and students of the University of Botswana initiated a one-day test excavation in Rhino Cave with the explicit goal of understanding the context and dating of the carved wall panel. He opened two quadrants (T and U) directly below the carved panel, which were taken down to a level of 90 cm below surface (b.s.) – see Figure 4. The quadrants were dug in mechanical layers – "buckets" – each full bucket being the approximate equivalent of 1/100th of a cubic meter. No depth measurements were recorded, which definitely lends an air of inaccuracy to the finds. To make comparisons between quadrants easier, I have stipulated unit depths based on excavation notes (Nick Walker, personal communication 2005). The sediment consisted of loose, Aeolian sand with some occurrences of old termite mound material and gravel. There were no readily visible changes in the sediment, but some change could be traced in the artefact assemblage. The excavation yielded mainly LSA finds – mostly lithics, but also some pottery, bone, ochre and specularite. The deepest units (approx. 80-90 cm) were richer and showed a concentrated LSA layer including backed microliths and a gradual transition to an MSA assemblage, though no characteristic tools were recovered. An excavation report has not been made available from this dig; hence, the assessment of the 2003 finds is based on the excavation forms produced on site, personal comments from the excavator (Nick Walker), as well as the analysis of the recovered material. It should be stressed that these finds are mentioned here as they were part of the lithic collection submitted to analysis, but that since all but fraction of the finds can be attributed to the LSA, they have no practical influence on the argument per se.

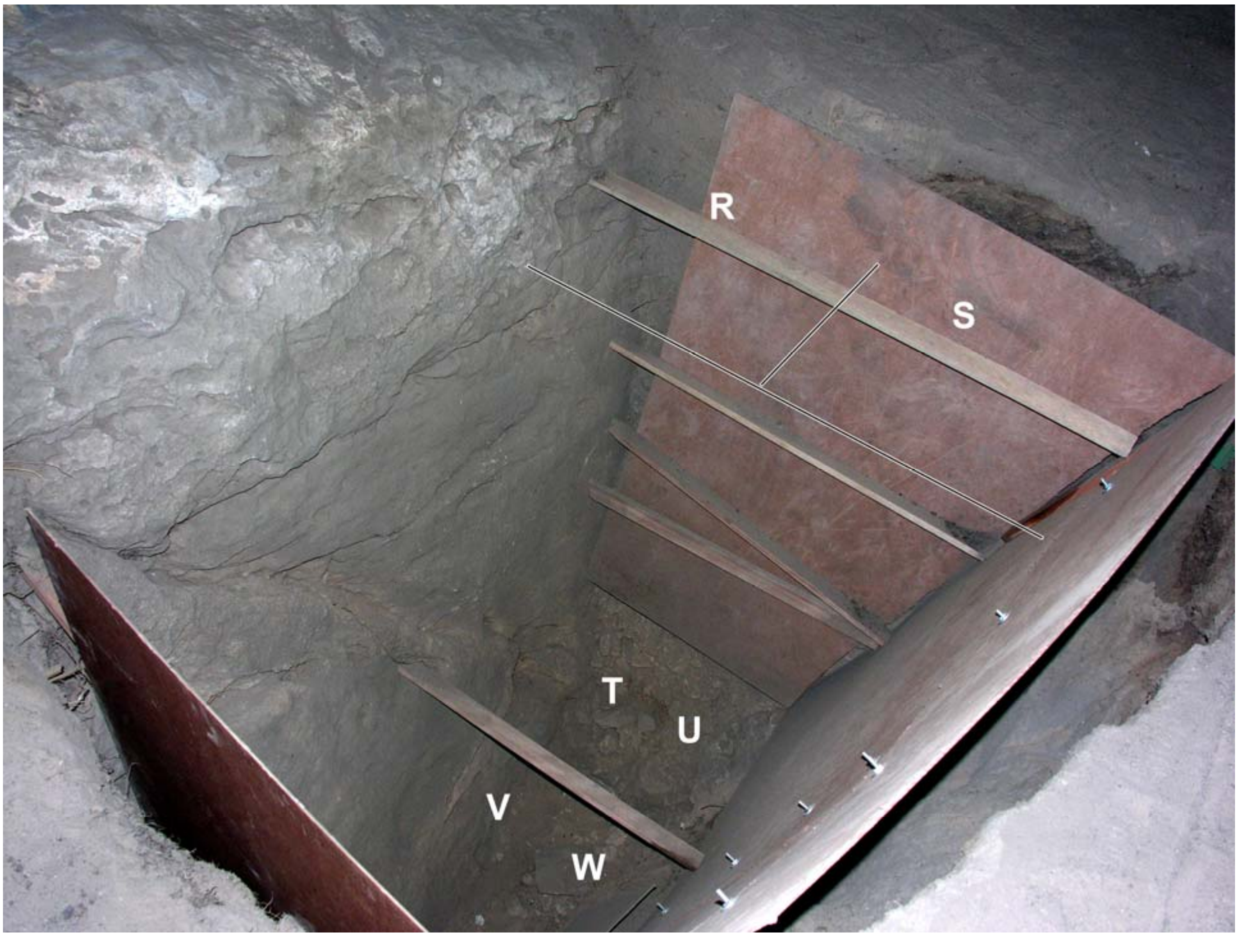

Figure 4. Test pit in Rhino Cave, 2006. Quadrants T, U V and W are 50x50cm, while the 2006 additions R and S are 30x50cm. Note the crack in the cave wall, which was filled with quartz flakes in the MSA levels. Photo courtesy of Sheila Coulson.

In 2004, excavations were continued under the joint leadership of Sheila Coulson and Nick Walker (Coulson 2004). The same excavation method was used, though this time depth measurements were supplemented and recorded. Two new quadrants, V and W, were added southeast of T and U and taken down to the same depth. The entire m² was then excavated down to 150 cm b.s. At ca. 90 cm b.s., there was a marked change in the sediment - from loose sand to compact gravel. This change coincided with the appearance of an extremely rich MSA assemblage. The 2003 and 2004 excavations together yielded ca. 10 000 pieces of struck lithics. The excavation had to stop at 150 cm b.s. due to the lack of shoring to prevent pit collapse. The rich MSA assemblage continued below this depth.

In 2005, Coulson and students from the University of Oslo visited the cave to further document the grooves, especially viewed in the light emanating from the back of the cave on winter afternoons (Coulson 2005).

In 2006, excavations were continued, led by Sheila Coulson with a team of students from Oslo, Museum employees and local guides (Coulson 2006). The excavation was now conducted in 5 cm mechanical spits. This change in excavation strategy was undertaken to facilitate comparisons between layers and quadrants. The pit walls were supported by hardboard shoring, which enabled the excavators to reach deeper, though the danger of cave-ins still prevented us to reach the bottom of the cave. To control the strata and make further excavations in the pit safer, two additional half-quadrants were opened northwest of T and U; these were labelled R and S. They were dug down to 150 cm b.s., after which all six quadrants (R-W) were continued. U and W were taken down to 170 cm b.s., R and S were stopped at 180 cm, while T and V were taken down to 185 cm. There was still archaeological material in the pit when excavations had to stop, though noticeably less than further up. Note that the available excavation area in the deepest section of the pit was substantially reduced due to the concave cave wall and inadequate materials for shoring. The assemblage recovered from the new quadrants confirmed the general pattern documented in 2003-2004. The excavators also cleaned the cave wall section in the pit, revealing a natural crevice stretching from c. 60-120 cm (see Figure 4). This crack was densely packed with struck lithics in the MSA layers, mainly with large quartz flakes.

Stratigraphy and disturbance

Three challenges were evident in the attempt to outline a stratigraphy for Rhino Cave. Firstly, the sediment consists mainly of very fine sand, showing little if any change in composition or matrix until a gravel layer appears at ca. 90 cm b.s. This loose, powdery matrix makes it highly likely that artefacts have moved from their original placement (for example, by bioturbation). Secondly, the test pit of 1x1.25m may not be representative of the cave deposit in its entirety. It should be noted that this stratigraphy differs markedly from the one described by Robbins et al. (Robbins, Murphy, Brook et al. 1996; Robbins, Brook et al. 2000) in their four excavated m2 on the opposite cave wall. Thirdly, the three different excavation methods of 2003, 2004, and 2006 was a major obstacle in internally comparing the finds. The units from 2003 and 2004 are in no way horizontally aligned, and of varying sizes, furthermore the 2003 excavation also lack depth measurements. The 2006 introduction of 5 cm mechanical layers simplified the analysis significantly. The opening of quadrants R and S in that year was partially undertaken to confirm the 2003-2004 finds and supply more reliable stratigraphic information.

Due to these concerns, this rough stratigraphy of Rhino Cave has by necessity been based on what depths characteristic artefacts are recovered, not on changes in the sediment. In addition, as will be demonstrated below, the degree of artefact movement within and between some layers indicate that the loose sediment precludes any attempt to determine precise recording of the stratigraphy.

The archaeological finds from Rhino Cave document a stratigraphy with three distinct layers (see Figure 5). The top 90 cm comprise a scatter of LSA material – mainly flakes and chips, though some piece esquilées, denticulates, bone, and pottery did occur. Beneath lies a more concentrated LSA layer containing microlithic points, borers, blanks, and cores. Immediately below are the MSA layers, their appearance marked by a manifest increase in the lithic material. Large flakes and cores, MSA points, large scrapers and an abundance of knapping debris were recovered. The MSA layers coincides with, and in some places appear immediately above, the only actual change in the entire deposit – at c. 90 cm below surface the loose sand is supplemented by very coarse, tightly packed gravel. This sand and gravel matrix was found to continue down to the lowest level reached. As both artefact technology and typology of the MSA materials were distinct and markedly different from the LSA finds, the lithics themselves could for the most part readily be classified as either LSA or MSA. However, some distinctly MSA artefacts appear to have percolated up through the looser sediments of the LSA layer and must therefore be considered out of context. However, no evidence was found of LSA artefacts infiltrating the more densely packed MSA layers.

When comparing the six quadrants, it became apparent that archaeological strata appear at somewhat different depths, indicating sloping towards the cave mouth (see Figure 5). A possible source of error for this sloping is the lack of a fixed point on the surface for reading depth measurements. As the cave floor is covered with powdery sand, it is also probable that the "surface level" changed between excavations. The archaeological strata in quadrants R and S appeared higher up in than in the other quadrants. Even allowing for some sloping in the sediment, I believe this alone does not account for the large differences: this probably indicate that the "surface" was higher during the 2003 and 2004 excavations.

Archaeological layers	Quadrants					
	R	**S**	**T**	**U**	**V**	**W**
Scattered LSA: Denticulates, *pieces esquilées*; some bone and pottery. Mainly produced in quartz and chalcedony.	Surface to 65-70 cm	Surface to 75-80 cm	Surface to 83-86 cm	Surface to 87-90	Surface to 90-94	Surface to 84-90
Concentrated LSA: Microlithic points, cores and borers. Mainly in chalcedony and clear quartz.	65-70 cm to 70-75 cm	75-80 cm	83-86 cm to 90-96 cm	87-90 cm to 90-96 cm	90-94 cm to 85-90 cm	84-90 cm to 115-119 cm
MSA layers: Rich assemblage including points, becs, burin spalls, thick scrapers, discoid and Levallois cores. Mainly in chalcedony, silcrete, quartz, and quartzite. Also recovered smoothing stones, specularite and a fragment of the caved wall panel.	70-75 cm to base of pit	75-80 cm to base of pit	90-96 cm to base of pit	90-96 cm to base of pit	85-90 cm to base of pit	115-119 cm to base of pit

Figure 5 Rhino Cave stratigraphy from the 2003-2006 excavations, showing at what depth the archaeological layers were encountered in the different quadrants. All depth measurements are in cm below surface.

Concerning horizontal variation between the quadrants, there is a marked increase in the number of artefacts closer to the cave wall. The quadrants closest to the wall (R, T, V) are much richer than the ones furthest from the wall (S, U, W). However, a larger excavation area is necessary to substantiate if and to what degree the cave has been organized spatially by its MSA inhabitants.

Determining if and what subdivisions exist within the MSA layers unfortunately require additional analysis beyond the scope of this thesis. In general, the lithic assemblage appears largely unchanged throughout the MSA layers. Points, cores, and flakes occur throughout the sequence. However, the number of large flakes and points increased towards the deepest sections of the deposit. In addition, there lower levels include more quartz than the upper levels, and less chalcedony and silcrete. The MSA layers continued below the point where the excavation had to stop (at 185 cm b.s.), although there was gradually fewer artefacts.

Stratigraphic integrity

The somewhat unclear limits between the archaeological layers observed during excavations stressed the possibilities of disturbance and mixing in the sediment. A number of factors could have contributed to this, for example bioturbation and running water. Both factors were likely to have affected the archaeological record of the cave, as even today, there is water running through the cave in the rain season, and several termite mounds and numerous remains of small scavengers were found in the upper 50 cm of sediment. In addition, the powdery sand deposit of the upper 90 cm would provide little resistance to such movement. An experiment on human trampling of artefacts in loose sand revealed that the artefacts quickly disappeared underneath the surface, and were dispersed after just an hour (McBrearty et al. 1998:114).

There are several examples of sites once believed to contain undisturbed deposits, where testing and refitting the archaeological material has exposed considerable secondary deposition (see for example Cahen and Moeyersons 1977; Villa 1982; Hofman 1986; Dibble et al. 1997). The post-Acheulean site of Gombe, Dem.Rep.Congo, is of special interest – even though it is an open-air site, the deposit on this site consists of homogenous Kalahari sand. Systematic refitting on this collection documented that conjoined artefacts could be found at distances sometimes exceeding 1m (Cahen and Moeyersons 1977:812). As stated by Harold L. Dibble et al. (1997:644) even apparently undisturbed sites cannot be properly understood without a *"rigorous and comprehensive set of tests of the archaeological material"*. It was thus determined imperative to examine the Rhino Cave lithic material more closely to investigate if and how much the layers were disturbed.

One aforementioned possible cause of movement in the sediment was considered, but ruled out - water. According to Tsodilo Museum guides, water runs out from the hidden recess behind the carved wall and onto the cave floor near the entrance in the rain season. Water also runs down the opposite wall, where the LSA paintings are located, but there are no indications of water running close to the area excavated between 2005-2006. No trace of damage from water-rolling was found in the lithic collection. Some smoothed pebbles were found in the MSA layers, but they probably originate from ostriches' stomachs.

As the lithic assemblage contained distinctive raw materials groups (for example a highly distinct colour, a particular cortex or a striped pattern), some of these groups were selected for refitting. In this process, material from all layers was included, specifically to discern mixing between the MSA and LSA layers. While no refits were found between these layers, a number of refits were made between different units within the MSA layers, confirming that there has been post-depositional movement. Several refits document vertical movement of at least 40 cm (examples in Figures 6 and 7). Several refits were also made between neighbouring units at approximately the same depth, but since the location of each artefact within a unit was not registered this does not necessarily demonstrate significant horizontal movement. Note that in addition to the refits between units, a much higher number was made on flakes originating from the same unit. Therefore, even though there has been movement in the deposit, a large portion of the artefacts has remained relatively stationary.

In short, the MSA layers of Rhino Cave have been affected by vertical disturbance, and like other sites with similar deposits, it is not possible to designate a precise sequence or stratigraphy. Based on initial investigations, the artefact movement does not appear to exceed 40 cm, and water can be excluded as a disturbance factor.

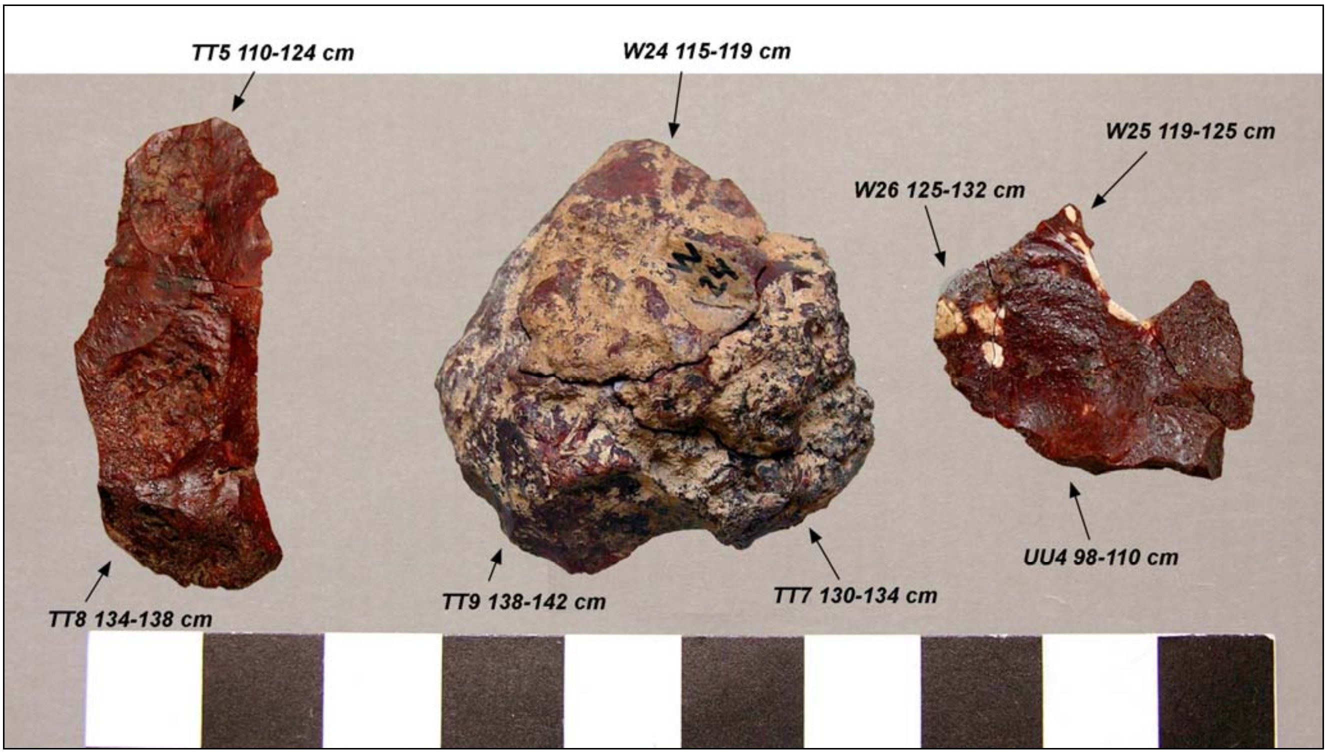

Figure 6. Examples of refitted, burnt debris from the Middle Stone Age layers of Rhino Cave indicating there is both vertical and horizontal movement in the sediment: (a) Broken flake, chalcedony. (b) Knapping fragment (broken from burning), chalcedony. (c) Broken flake, fine-grained silcrete.

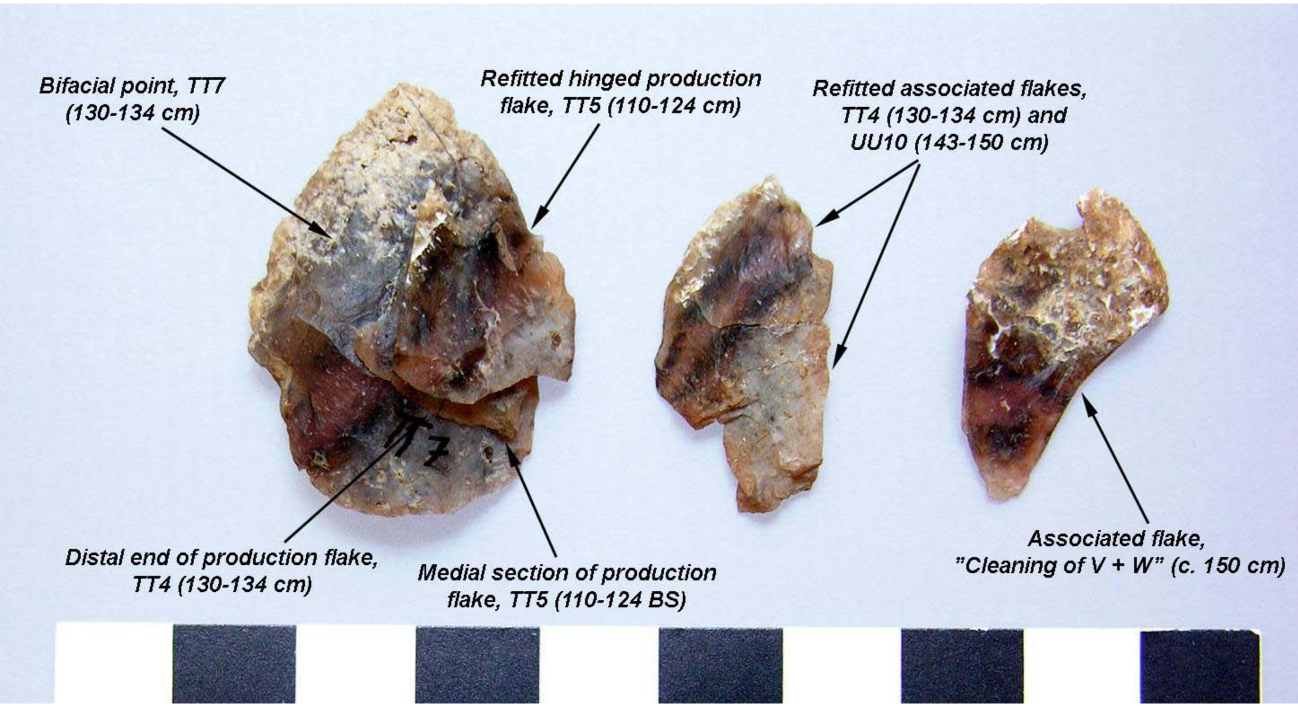

Figure 7. Middle Stone Age bifacial point with refitted production flakes, chalcedony. Refitting and photography courtesy of Sheila Coulson.

5. Archaeological material

The rich MSA layers from the Rhino Cave excavations of 2003-2006 provided an excellent but challenging assemblage for lithic analysis. The large amount of material made it likely that behavioural patterns over time could be identified. As mentioned above, the large amount of struck MSA lithics necessitated a limitation. I focused my analysis on the points. However, all retouched forms, cores and some artefacts of special interest (such as burin spalls) underwent initial examinations. The four subsections of this chapter are organized as follows: section 5.1. outlines the Rhino Cave assemblage and the lithic raw materials. The next section focuses on the morphological and technological features of the MSA points. Following that, section 5.3 comprises a closer look on points that were burnt or broken, as well as discussing the possibility of impact fractures. Finally, section 5.4 gives a brief overview of other MSA lithics, including cores and retouched tools. Note that unless otherwise stated, all finds discussed here originate from the 2003-2006 (Coulson and Walker) excavations. A comparison to the earlier Rhino Cave finds from 1995-1996, can be found in chapter 6.

During excavations, the recovered material was sieved with 2 mm mesh and bagged, as the conditions in the cave were not ideal for sorting small chipping debris. The materials then underwent a preliminary sorting undertaken by students of the University of Botswana at the University Archaeological Laboratory in Gaborone. My study of the finds commenced in June-August 2005, and was continued June-August 2006, and was continually supervised by Dr. Sheila Coulson. The lithic finds were subjected to the following procedure:

- Washed very gently in clean water.
- Sorted by level and material type, and laid out on cardboard sheets. Each level was then briefly described and registered in a database. The number of specimens from the different raw materials for each unit was tallied.
- Tools, cores, non-lithics, and other finds considered diagnostic or of special interest were removed from the trays, labelled, photographed, and described.
- These finds were then subject to further analysis, comparisons, and selective refitting.

Descriptions of the units and the special interest finds were entered into the database with photographic documentation of each artefact. The sorted finds and a copy of the database were presented to the National Museum of Botswana, in Gaborone, in August 2006.

Due to time concerns, it was not possible to subject the 2006 finds to as thorough an analysis as the earlier finds. A complete tally of all of the specimens was not possible: a lower number of refits from these units also reflect these time constrains. It is my belief that this does not compromise the interpretations, as the 2006 finds overall confirmed the hypotheses made based on the 2003 and 2004 material.

5.1 The Rhino Cave assemblage

The MSA layers of Rhino Cave yielded a variety of lithic raw materials, tool types, and reduction strategies. The wide range of raw materials, including coarse-grained quartzite and quartz, medium-grained silcrete, fine-grained chalcedony and crystalline quartz has clearly presented the prehistoric knappers with different challenges and possibilities.

Lithic raw materials

The inhabitants of Rhino Cave utilized both local and imported raw material types (se Figure 8). This practice is also present at nearby Tsodilo MSA sites White Paintings Shelter (Murphy 1999:231-238) and Corner Cave (Coulson and Walker 2002:13-15). In all three sites, the raw materials selected are mainly quartz, chalcedony, and silcrete (sometimes referred to as chert). However, the lithic raw materials from Rhino Cave differs from these sites in being very colourful – intensely red, green, yellow, white and blue raw materials dominate the assemblage. Many also display distinct patterns such as stripes or spots.

Figure 8. A selection of MSA points from Rhino Cave. Note the colours and variation in raw materials.

The most frequent raw material for retouched tools in Rhino Cave is chalcedony. When knapped, chalcedony behaves virtually like flint. This makes it particularly well suited for lithic analysis, as the performance and characteristics of flint as a knapping material is well documented compared to that of other African raw materials. It is also an easy material to read. Note that in the literature, banded chalcedony is sometimes listed as agate and red chalcedony as jasper. For the sake of simplicity all variants of this cryptocrystalline silicate (Whittaker 1994:70-72) are here listed as chalcedony. There are no chalcedony outcrops close to Tsodilo Hills; the nearest larger outcrop in Botswana is located near Bodibeng, approximately 210 km to the southeast. However, chalcedonies can also be found in various gravel trains, old riverbeds, and pan edges throughout the Kalahari (Jones 1980; Thomas and Shaw 1991:63-67). These sources are too limited to appear on geological survey maps, but would have been a substantial source of raw material throughout the stone ages. The raw material from these sources commonly surface as golfball-sized, corticated nodules in a wide variety of colours, as well as patterned varieties like fern agate and banded agate. These nodules are often water-rolled. Raw material occurrences of this kind have as yet not been discovered close to Tsodilo Hills, although it seems likely they are also present in this part of the Kalahari. Some raw material from Rhino Cave clearly comes from sources similar to these – a number of small cores display curved cortexed bases or other pebble characteristics. A few flakes also display patches of desert varnish on the dorsal face implying that they have been exposed to open Kalahari environments for a considerable period of time before collection. However, a number of the chalcedony artefacts from Rhino Cave are made on flakes too large to come from such sources, and must originate from more major outcrops, which hitherto remain unknown.

Like chalcedony, silcrete is not locally available at Tsodilo, but appears at various locations in the Kalahari in larger outcrops as well as cobbles and gravels (Thomas and Shaw 1991:76-77). The sources of the silcrete recovered Rhino Cave is unknown, but the size and shape of the artefacts imply access to both cobbles and larger outcrops. Ongoing research on the sourcing of silcrete may add considerably to the knowledge of these sources (Nash et al. 2004). The silcrete found in Rhino Cave is variable in texture and quality – from fine-grained pieces bordering on chalcedony, to coarser silcretizied quartzite. It is well suited for knapping, but coarser and drier in texture than chalcedony - in general it is comparable to European chert, which it is sometimes listed as in publications. There are also some examples of silcrete/chalcedony conglomerates. Both chalcedonies and silcretes can occur in almost any colour, and almost all artefacts of in these raw materials in Rhino Cave were brightly coloured, especially reds, yellows, blues, and greens.

With regards to quantity, the largest raw material group from Rhino Cave is quartz. As would be expected, this is primarily production shatter. The quartz artefacts vary from good-quality, fine-grained, semi-transparent material to white, bluish and crystalline examples. The latter appears to have virtually the same knapping qualities. There are several veins of quartz surfacing throughout Tsodilo Hills, and the material is readily available in small nodules and slabs, for example on the south-eastern edge of Male Hill. As mentioned earlier, a natural crevice in the cave wall in was in the MSA layers packed with struck lithics, many of which were such large quartz flakes.

A somewhat less commonly used raw material in Rhino Cave is quartzite. This is readily available at Tsodilo Hills, and the cave itself is formed in quartzitic schist. While there are some pebble cores, the majority of the archaeological artefacts are tabular or vein quartzite. The most common variant is a good-quality, dense quartzite in shades of blue, grey and beige. In general, the quartzite cores, artefacts, and debris are much larger than other materials, which is to be expected due to the knapping capabilities of the material.

In addition to these four major raw materials, a few examples of flaked diorite, petrified wood, ironstone and specularite were found. With regards to the condition of the artefacts, there was little evidence for weathering – excepting a few pieced covered by a thin film or patina, and some flakes originating from cores with desert varnish. While most of the lithic assemblage had no traces of leaching or patina, a portion of the lithics were so badly degraded it was not possible to discern the original raw material. This group was quite distinct, and there were few transitional pieces. Damage from burning may have accelerated the degradation in some of these specimens. The majority of these pieces appear originally have been fine-grained materials like chalcedony and silcrete. However, these are minor exceptions and in general, the lithic assemblage of Rhino Cave was recovered in excellent condition and formed a good basis for lithic research.

5.2 Middle Stone Age points

As mentioned above (section 3.1.), points were chosen as the focus for this study. There were several reasons for this - although the dates from Rhino Cave are uncertain at best, the points unquestionably originate in the MSA. In addition, many MSA researchers have focused on points, which make them suitable for comparison to other sites. They are also the dominant tool category, in Rhino Cave, and are present throughout the MSA layers of the cave. Other tools and significant artefacts will be addressed more briefly in section 5.4. While the term "point" here refers more to the morphology of the artefact, than to any inferred use of the tool, most researchers agree that many MSA points were in fact hafted and used for hunting (see for example 2005; Shea 2005; Villa et al. 2005; Lombard 2006a). I have chosen not to enter into the discussion on whether the MSA points were used as darts, arrowheads, spearheads, for stabbing or as more general cutting tools (see for example Shea 2005; Brooks et al. 2006).

A point is here defined simply as a flake shaped to a pointed, symmetrical form either by retouch or by Levallois technology. Very thick or irregular pointed forms are not included in this category, nor are any convergent retouched flakes with no definite point tip. This definition corresponds somewhat more with African MSA research than with the European Bordesian tradition (Lombard 2005). I employ it both to simplify comparisons to published sites, and because the extensive Bordesian terminology, being based on European assemblages, cannot be directly reassigned to the morphology and technology of the MSA in Rhino Cave. Instead, I will include a tentative classification of the points and an overview of frequent morphological and technological aspects.

MSA point groups and subgroups

Inspired by Kathy Kuman's (1989) research on the MSA assemblage from #Gi, the points from Rhino Cave were first separated into three main categories – bifacial, unifacial, and Levallois points. Within these groups, several subdivisions were made on a morphological and technological basis (see Figure 9). Divisions based on size were disregarded, as the length of the points varies from 2.1-6.7 cm (median length of 3.3 cm), and varying sizes were found in all subgroups. These tentative classifications were undertaken to facilitate comparisons to other sites, and to make patterns of production and use easier to identify. Note that 1/3 of the unifacial and bifacial points could not be fit into a subgroup. What was truly prominent in the Rhino Cave assemblage, was the large variation.

Point type/raw material	C	S	Q	Qz	D	P	De	Total	(% of total)
Unifacial	10	1	5	2			2	20	(16%)
Unifacial, convex	8	7	7	1			2	25	(21%)
Unifacial, flat	13	7	5				4	29	(24%)
Bifacial	7	6	2	1	2		1	19	(16%)
Bifacial, convex	1	2	1					4	(3%)
Bifacial, finely worked	7		6			1	1	15	(12%)
Bifacial, flat	1		1					2	(2%)
Levallois, no retouch		2	2	1				5	(4%)
Levallois, some retouch		2						2	(2%)
Total (% of total)	48 (39%)	27 (22%)	29 (24%)	5 (4%)	2 (2%)	1 (1%)	10 (8%)	121	

Figure 9 MSA points and lithic raw materials from Rhino Cave. Includes broken points. Ch = chalcedony, S = silcrete, Q = quartz, Qz = quartzite, D = diorite, P = petrified wood, De = degraded, unidentified material.

Unifacial points are retouched on one face only, which in Rhino Cave always is the dorsal face. At 61%, they make up the majority of the points (N=74). However, shapes, sizes, thickness and retouch are extremely varied. Some of the points are retouched continuously along both lateral edges and the base, some only along one edge, or only the base, but all have tips that have been shaped by retouch. Several modes of retouch are evident – scraper retouch being the most common, though there are examples of stepped and subparallel retouch. Two subgroups of unifacial points were identified – “convex” and “flat” points, referring to their cross-sections. These groups were based on a number of characteristics evident in the overall shape of the points, and more than 2/3 of the unifacial points could be placed in one of these categories. It should be emphasized that these points come in a wide variety of shapes, and the two subdivisions should be regarded rather as sets of characteristics occurring jointly on a large number of artefacts than as fixed categories.

The *convex unifacial points* are made on relatively thick flakes, and have a cross-section resembling a pointed, elongated oval. In most instances, the lateral edges are convex, while the base is rectilinear. Frequently, the bulb of percussion is prominent and the point will rock when placed ventral face down on a flat surface. Most of them have fully invasive retouch with a low angle of detachment. Twenty-five of the points fall into this category, which make up the second largest subgroup. Examples of this type are Figure 10 (c), (d), (h) and (i). The *flat unifacial points* are made on thinner, flatter flakes, and their cross-sections are normally rectangular or trapezoid. Their overall shapes are more varied than those of the convex points are, though their edges are generally rectilinear and the tips more acutely pointed. Bulbs of percussion are usually removed or not prominent. The retouch is normally executed with a more acute angle of detachment, and the removals are shorter and seldom invasive. The flat, unifacial points are the most common points and constitute 24% (N=29) of the points in total, slightly more than the convex unifacial points. Examples are Figure 10 (e) and (f).

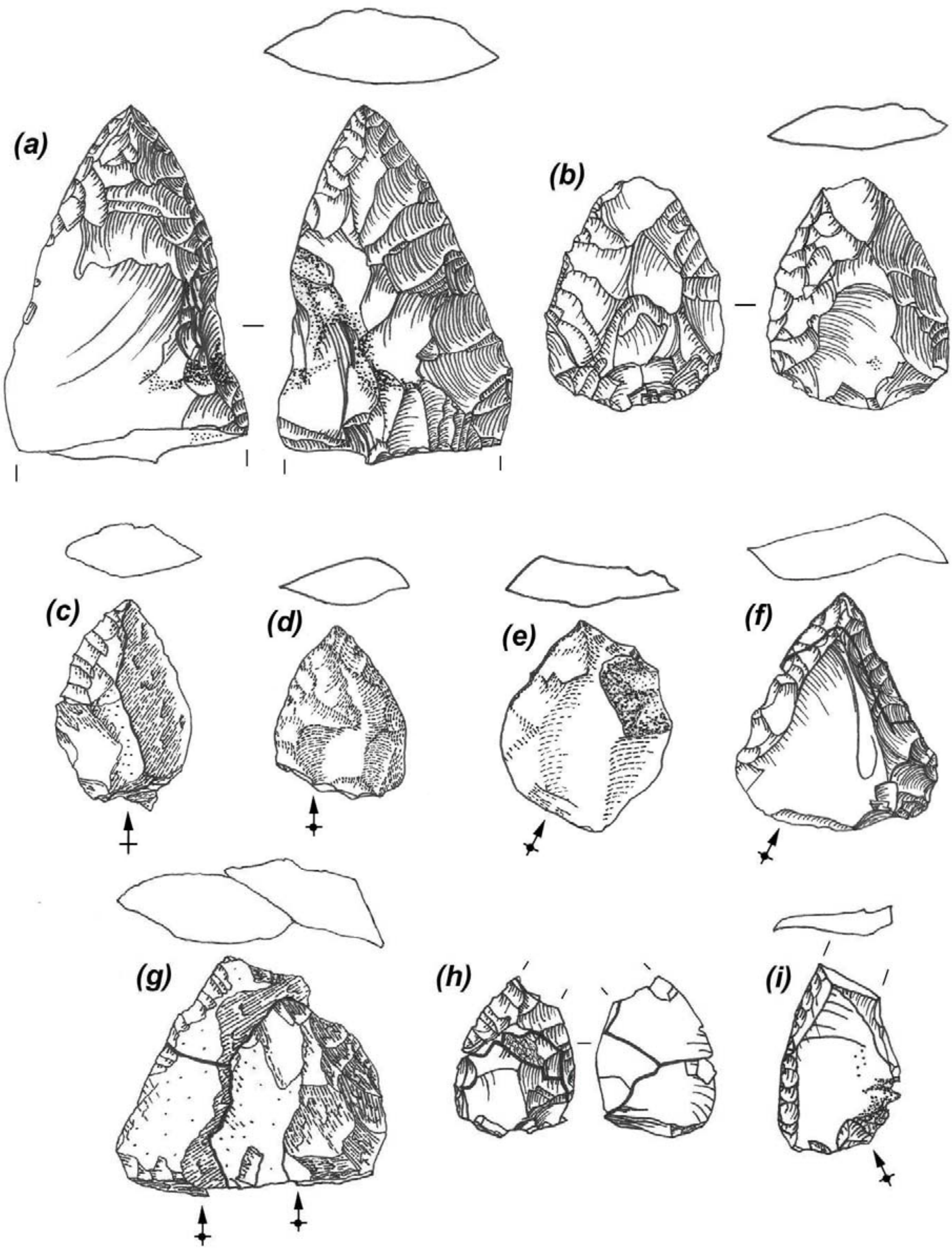

Figure 10. Middle Stone Age points from Rhino Cave: (a) Broken bifacial point, fossilized wood, 143-150 cm. (b) Bifacial point, chalcedony, 120-130 cm. (c) Unifacial point, clear quartz, 142-150 cm. (d) Unifacial point, silcrete, 119-125 cm. (e) Unifacial point, quartzite, 110-124 cm. (f) Unifacial point, chalcedony, 137-143 cm. (g) Refitted scraper and unifacial point, white quartz, 143-150 cm. h) Refitted, burnt and broken unifacial point, silcrete, 130-139 cm. (i) Broken, unifacial point, chalcedony, 138-143 cm. Scale 1:1. Measurements are in cm below surface.

Bifacial points display removal scars on both faces, stemming from the same edge, i.e. not alternating (Inizan et al. 1999:130). They constitute 1/3 of the points (N=40) and come in a wide variety of shapes, sizes and thicknesses. The distribution of retouch varies from continuous to partial shaping of the only tip, sides and/or base. Most of the retouch is common or scraper retouch, while some points display more invasive covering retouch, which at times is subparallell. Most points have a relatively equal extent of retouch on both faces, but on a small number, the retouch on the ventral surface is concentrated on the proximal end, thereby removing the bulb and thinning the base. Three subgroups of bifacial points were identified: convex, flat and finely worked. Again, not all the bifacial points could be placed in one of these groups, and they should be regarded more as a cluster of characteristics rather than fixed types. The *convex bifacial points*, comparable to the convex unifacial points, have a relatively thick and bulging cross-section, the lateral edges are convex, while the overall outline is oval to egg-shaped. *Flat bifacial points* have a flatter and thinner cross-section than the convex points. There are relatively few examples in these last two groups, but they were included as categories because the morphology of the points resemble their unifacial counterparts. The *finely worked bifacial* points are perhaps the most striking category - formed by invasive, bifacial retouch, these points are generally quite thin and characterized by skillful retouching that at times resembles pressure flaking. Examples are Figure 10 (a) and (b). While they might be said to resemble the more well-known Stillbay points of the South African MSA, it should be noted that none the bases of the Rhino Cave points are concave or rectilinear, but not pointed. Their outlines are usually egg-shaped or triangular.

Levallois points are here understood as the pointed, preferential removals from a Levallois core (for a description of the technique, see Inizan et al. 1999:61-70). While few Levallois points were recovered (N=7), a substantial number of small Levallois cores were present, see section 5.4. The points are generally quite crudely made, and two of them display a small amount of retouch, apparently to even out the edges and the tip.

The choice of lithic raw material has clearly influenced what type of point the knappers made. For example, the crude make of the Levallois points were probably influenced by the fact that they were made on quartz, quartzite and coarser-grained silcrete, neither of which hold a retouched edge well. The invasive retouch of the finely worked bifacial points (like 10 a)) obviously require good quality raw material like the chalcedony, fine-grained quartz and petrified wood that these points were made on. Chalcedony appears to have been the favoured raw material for producing points – while only ca. 25% of the debris is in this material, chalcedony points constitute 40% of the point total. Except for the finely worked points, it appears that chalcedony and silcrete have been used much in the same way – although removals are commonly somewhat larger and more uneven on the silcrete examples than those on the chalcedony points. The quartz points also appear to have been subjected to the same knapping strategies, but most of the points are markedly thicker and larger. This is to be expected due to the knapping qualities of this raw material, and in the instances where the quartz is almost crystalline, it has been knapped and retouched virtually like chalcedony. These tendencies of selective raw material use amplifies the impression that the MSA knappers of Rhino Cave had extensive knowledge of the properties of the different lithic materials, and made a conscious choice of material and end product.

Some technological aspects regarding Rhino Cave points

During this study, several interesting aspects of the point production became evident – three examples will be further discussed. Firstly, the Rhino Cave points do not fit with the cores from the cave. Numerous refitting attempts were undertaken, but when comparing the cores to the points it became evident that raw materials and sizes were so different, that most of the points must have originated from cores that were not present. For example, most of the chalcedony cores are too small to have been the origin of the chalcedony points – many of them are golf-ball sized cobble cores, often with enough cortex preserved to determine that their original size was probably not very much larger. However, refitting evidenced that retouching points took place on site (see Figure 7), and that at least one scraper and one point come from the same core (see Figure 10 (g)). This may imply that that the production sequences of the points are broken, and that mainly finished and nearly finished points were taken to the cave. The refitting also revealed that there are a large number of fragmented or partial production sequences present in the lithic assemblage, and that each of these should be viewed as a piece of a larger puzzle, the extent of which requires both more data and analysis to determine.

Secondly, though direct evidence from refitting is lacking, the morphology of the points can be used to discern the technological basis of their production. The presence of Levallois technology has already been mentioned, but this was not the principle strategy of point production in Rhino Cave. In an attempt to identify the type of cores the points were produced on, the proximal ends and butts of the points were examined. Of the points where the butt was not removed or otherwise missing, 26% had flat (not prepared) butts, 26% were dihedral and

31% facetted or otherwise prepared before the flake was removed. The majority of the dihedral and otherwise prepared butts were reminiscent of the bulbar scars and ridges from discoid cores. As there are several discoid cores present on the site, it does seems likely that most of the blanks originate from similar cores. These characteristics were also found on some potential point blanks, otherwise a very small category. The remaining 16% of the butts were corticated, and in many instances this appears to have been a conscious choice - the butt and base was prepared before removal, but the point of impact was kept fully corticated. This might have been simply a response to small cores. It could also be intentional, as the cortex softens the removal blow, thus decreasing the size of the bulb and making the point more aerodynamic. However, several of the unifacial points have prominent bulbs that would reduce their effectiveness as projectiles and probably would make them difficult to haft.

Thirdly, in a large number of the points the morphological axis does not coincide with the debitage axis – essentially they have the same characteristics as a *déjeté* or canted scraper (see for example Inizan et al. 1999:107; Villa and Lenoir 2006:100). This phenomenon was also noted by Robbins et al. (1996:32), who calls them “corner-struck”. Usually, the points of impact on these artefacts are indeed located on the ‘corner’ where the butt and one lateral edge meet (this is particularly true where the dihedral butt originates from a discoid core). However, there were also some examples where the morphological axis is virtually perpendicular to the debitage axis.

In conclusion, the most striking feature of the MSA points of Rhino Cave are their dissimilarity. They are made using mainly discoid and Levallois production strategies, and can be grouped into subtypes that share a number of characteristics. Some distinct traits can be found on several points, including corticated butts and “canted” orientation. However, the extent of these categories make it evident that the most prominent attribute of the points is their variation. Several implications can be drawn from this – for example that the MSA inhabitants of Rhino Cave were little concerned with uniformity or distinct styles, or perhaps more likely, that the variation indicates a very large number of styles, bound together in a general technological framework.

5.3 Burning, breakage and the apparent lack of impact fractures

During the analysis of the finds from the MSA levels of Rhino Cave, it became apparent that while most of the points were recovered in a very good condition, a large portion displayed signs of burning. A number were also broken, but none displayed readily recognizable features diagnostic of impact fracture. As both systematic use of fire and points used as hunting weapons would substantially contribute to the knowledge of the Rhino Cave behaviour patterns, these topics will be addressed more extensively here.

Burning

MSA lithic assemblages have seldom been examined for thermal damage, and the presence of this is normally just taken as evidence for the use of fire on site and not elaborated further. This pattern of extensive burning appears atypical in the MSA. For example, as noted by Mike Murphy (1999), only <1% of the MSA lithic assemblage from nearby White Paintings Shelter is burnt.

Lithic raw materials respond differently to burning. Chalcedony and fine-grained silcrete reacts almost identically to flint, while it is much harder to discern whether quartz, quartzite and coarser-grained silcrete has been subjected to fire, unless the damage is very substantial. Focus was therefore placed upon the chalcedony and silcrete points. 38% of these displayed well-documented (see for example Purdy and Brooks 1971; Inizan et al. 1999) characteristics of thermal damage, such as potlids, crazing or cracking. For chalcedony points only, the figure was even higher, at 47%. Most of the burnt points only displayed a few potlids, minute cracks and a glossy surface; a few showed several potlids and/or breakage due to firing. One point was damaged to such a degree that it was burnt white, porous and falling apart, and several had broken from fire damage. However, the majority of the points, had probably been subject to a shorter period of firing, and a large fire would not have been necessary.

A variety of other tools, cores and debris were burnt, though burning was far more frequent for points than for other artefacts. The burnt points displayed the same tendencies as the points in general with regards to originating from a large number of different *chaînes opératoires* - overall they give an impression of a long series of one-offs. There are a few examples where both a point and debris believed to originate from the same core are burnt. The higher proportion of burnt points vs. burnt debris indicates a form of selection that would not be present if they had been burnt in random, everyday fires.

One possible explanation for the high percentage of burnt points could be that they had been consciously subjected to heat alteration to improve the knapping qualities of the raw material. As documented by both experimental work and prehistoric examples from in Europe and North America (for example Purdy and Brooks 1971; Crabtree 1982:72-74; Schindler et al.

1982; Inizan and Tixier 2001), controlled burning can make certain raw materials easier to flake. The technique is believed to originate in Solutrean Europe 20 ka (Inizan and Tixier 2001). According to Inizan et al.(1999:22), the knapping qualities of chalcedony (examples from France, Algeria and the U.S.) can be "very much improved" by thermal treatment. However, there are no examples from Rhino Cave of knapping taking place on artefacts after burning. In addition, the artefacts are burnt to a degree beyond that in which the raw material becomes easier to flake – the cracks and potlids make it too brittle. If the thermal damage patterns evident at Rhino Cave are results of attempts to improve knapping qualities, this experiment failed every time.

In contrast to the MSA assemblage, none of the LSA lithics from Rhino Cave had been burnt. The emergence of a large amount of burnt material corresponded with the top of the MSA layers, and continued all the way down. The burnt artefacts were found intermixed with unburnt ones, both tools, debris and cores. No spatial organization was evident for the burnt pieces, neither was there any trace of hearths. This is likely at least partly a result of movement within the strata, but as burning was evident throughout the entire MSA sequence, it seems likely that burning of artefacts (conscious or otherwise) was a recurring behaviour pattern. The of intermixing of burnt and unburnt artefacts in the densely packed surrounding matrix is not readily explained. Taking into account that there was movement within the sediment, this did not appear so extensive as to completely obliterate all spatial concentrations. The lack of hearths could indicate that the artefacts had been burnt in other parts of the cave, and directly beneath the carved panel where they were recovered. However, that would imply that burnt tools, cores and debris had been moved from the hearths to the wall.

One feature of the burnt chalcedony points deserves further discussion – ¾ of them have a characteristic deep, blood-red colour. None of the unburnt points display this colour, it is also very rare in the remaining MSA assemblage. To my knowledge, no burning experiments have been undertaken on African chalcedony, but it is not unlikely that like flint, it changes colour when burnt. It appears that the chalcedony used in Rhino Cave tends to turn bright red when subjected to fire. A similar pattern can be found in the more fine-grained silcrete points. Experiments would be needed to examine whether the colour is the result of a specific temperature, length of burning, surrounding matrix etc. Due to the numerous examples and the distinct and striking colour, it is likely that this effect was well-known in the MSA.

Impact fractures

Recent experimental work, residue and fracture analysis from South Africa confirm that MSA points were hafted and used as hunting weapons (Wadley et al. 2004; Lombard 2005; but compare Shea 2005, 2006b, 2006a; Villa and Lenoir 2006; Lombard 2007). An expected feature in a point-rich assemblage like the recent Rhino Cave would therefore be the presence of impact fractures, evidencing successful use of the points as spear armatures. Impact fractures are reported both from ≠Gi (Kuman 1989:201; Brooks et al. 2006:239), White Paintings Shelter (Donahue et al. 2004), and from the earlier Rhino Cave finds (Phillipson 2007a).

While controlled experiments of impact fractures on MSA points are relatively new (Lombard et al. 2004), they build on well-documented tests and prehistoric finds from Europe and North America. The pioneer work of C.A. Bergman and M.H. Newcomer (1983) presented the first systematic research on impact fractures combined with prehistoric finds. Through experimental firing, they produced impact-damaged points similar to archaeological finds from the Upper Palaeolithic of Ksar Akil, Lebanon. They further identified three types of damage that occurs on impact: burin-like fractures (where slivers resembling burin spalls detach from a lateral edge), bending fractures (transverse breaks some way down the point's length) and flute-like fractures (small, shallow flake scars resembling flutes) (Bergman and Newcomer 1983:241-243). Further experiments were undertaken by Anders Fischer et al. (1984), who tested a large number of replicas of mainly transverse arrows and Brommian points, from the Scandinavian Upper Palaeolithic and Mesolithic. They found several characteristics considered diagnostic of projectile function – cone fractures originating close to the contact area; step terminating bending fractures and bending fractures from which "spin-offs" originate, the two latter not necessarily located at the impact area (Fischer et al. 1984:22-24). They also determined that for larger projectiles, like the Brommian points, the spin-offs had to be at least 6 mm to be considered diagnostic (Fischer et al. 1984:24). The authors then compared their finds to 397 prehistoric flint points of different ages and locations, which confirmed their diagnostic criteria. Further impact experiments undertaken by George Odell and Frank Cowan (1986) confirmed the results of the two former studies. Also John Dockall (1997:327-328) builds on the work of Bergman and Newcomer and Fischer et al. when he further categorizes impact fractures in two main types – abrasive and fatigue wear.

Both Bergman and Newcomer (1983:243), Fischer et al. (1984:25), as well as John Dockall (1997:321) state that they expect the breaks to be similar regardless of mode of delivery to target, i.e. whether it was thrusted, propelled by hand, atlatl or bow. Fischer et al. (1984:43) also state that irrespective of the morphology and mounting method of the points, their diagnostic characteristics of the projectile function are universal for any point made from flint or related stone. This is confirmed by Marlize Lombard (2005), who found similar macro fractures as those described by Fischer et al. in raw materials such as hornfels, quartzite, chert and mudstone at Sibudu, South Africa (see also Villa and Lenoir 2006). Consequently, the criteria established by Bergman and Newcomer and Fischer et al. should serve very well as a basis for examining the also the Rhino Cave points for impact fractures.

Surprisingly, none of the Rhino Cave points displayed diagnostic criteria for impact fractures. While a number of other breaks were found (see next section), no breaks have originated in impact. Several points have damaged tips, but these can be attributed to burning-induced breakage, knapping mistakes, common breaks or bag damage. While the points from Rhino Cave have not been examined by microscope, one should in accordance with Fischer et al. (1984:24) expect relatively large and easily visible spin-off fractures on points of this size. When compared to the impact fractured, but otherwise similar points from ≠Gi (Brooks et al. 2006:239), it becomes readily apparent that these features are not present in the recent material from Rhino Cave. Two possible explanations for this are that a) the points were intended for other use than hunting, or b) they were never used. The morphology of the points can support both explanations - several of the points would be difficult to haft due to prominent bulbs or cortexed bases and might not have been intended for use as spear armatures. However, a large number of points have removed bulbs and a finely shaped symmetrical shape, which would be ideal for hafting.

Impact fractures have also been reported from nearby MSA sites. The finds from ≠Gi are already mentioned – Kathy Kuman (1989:201) claim only one impact fractured point, while a later study by Alison S. Brooks et al. (2006:239) report multiple examples of projectile damage, include characteristics like hinge fractures, broken tips, burination spalls, and micro-striations. The points from ≠Gi are very similar to those from Rhino Cave (see section 6.3) and give a clear indication of what damage impact would have left on Rhino Cave points. Randolf Donahue et al. (2004:158) report that five of ten examined points from White Paintings Shelter, Tsodilo Hills displayed multiple characteristics of impact damage, such as long parallel-sided fractures initiated at the tip. Curiously, impact fractures are also reported in the archaeological material from the Rhino Cave excavations undertaken by Larry Robbins et al.(Robbins, Murphy, Brook et al. 1996; Robbins, Brook et al. 2000). Laurel Phillipson

(2007a) re-examined 32 whole and broken points from these collections, using cluster attribute analysis. She claimed that several of these display readily identifiable characteristics of impact, including patterns of transverse, slightly twisted breakage, and argued that the points had been components of hand-held stabbing spears (Phillipson 2007a:4-5). It is unfortunate that Phillipson does not refer to the work undertaken by Bergman and Newcomer or Fischer et al.; a reference to their finds would have clarified upon what criteria she bases her conclusions. It appears very unlikely that the cave was so strictly organized that impact fractured points are only situated in one section of the cave, especially as the points are prevalent throughout the entire MSA sequence. Phillipson's claims have recently been contested (Coulson 2008), and until Phillipson's claims are better documented, I retain my scepticism to their validity.

Note that the studies of impact damage from White Paintings Shelter and the 1995-1996 Rhino Cave excavations were undertaken on selections of the archaeological material. Donahue et al. (2004) only examined ten points from White Paintings Shelter; Phillipson (2007a) analyzed 32 points from Rhino Cave.

Breakage

While there was no evidence for impact fractures, several of the Rhino Cave points were broken. These consisted mainly of clean breaks that were probably caused by natural factors such as trampling, bioturbation or rockfall. In addition, several of the more severely burnt points had broken as the firing made them more brittle. However, one point displayed characteristics of intentional breakage (see Figure 10 (a)). This point is the second largest in the assemblage, 6.5 cm from tip to break. The raw material is believed to be petrified wood (Sheila Coulson, personal communication 2008). It is almost covered by bifacial, invasive retouch and is symmetrically shaped save for a some apparent knapping mistakes due to an inclusion. C.A. Bergman and M.H. Newcomer (1983:24-25) list several characteristics of intentional breakage: the presence of point of impact and cone of percussion on the break; incipient cones and crushing of the dorsal ridges. The break on the Rhino Cave point has a clear negative cone of percussion with a point of impact on ventral face and a lip at the dorsal. As only one point displayed such clear characteristics in such a large assemblage, the first assumption was that had to be accidental; however, two details indicate that it might not be entirely unintentional. Firstly, the point is very thick, and would require a heavy blow on a hard surface to break. A glancing blow would not be enough. Secondly, there are several examples of intentionally broken flakes in the MSA assemblage. These are all in white or translucent quartz, and were mostly found stuffed into and in the area around a crack in the wall below the carved panel. They are, like the point, all relatively large and thick, and display points of impact and cones of percussion on the breaks.

As so few artefacts display characteristics of intentional breakage, it cannot have been a frequent occurrence in the MSA of Rhino Cave. However, it did occur, though the underlying purpose of breaking otherwise functional artefacts is not clear. When seen together with the repeated pattern of burning points, and especially that of not using them for hunting, it appears that the points from Rhino Cave have not been used as one would expect at a normal habitation site.

5.4. Other lithic artefacts from Rhino Cave

As evident by the ca. 11,000 struck artefacts recovered in the MSA layers of the 2004-2006-pit, Rhino Cave has seen a significant amount of lithic production during the MSA. Obviously, not all was related to the production of 121 points. For the sake of completeness, and to find out whether other artefacts display the same tendencies as the points, a selection of other artefacts will be briefly discussed here. These are other tools, cores and some characteristic knapping debris.

Cores

A total of 70 cores and large core fragments were recovered, displaying mainly Levallois, discoid and amorphous reduction strategies. A distinct and frequent core type (N=23) were golf ball-sized, Levallois cores made on cobbles (examples in Figure 11). Many still displayed visible cortex or worn outer surface, making it possible to discern the circumference of the original nodule. A number of these Levallois cores were preferential, others were recurrent – possibly related to the size of the core. As discussed above, in both cases the resulting Levallois flake would have been smaller than that required to make the MSA points. It appears that some of these small cores have been struck against an anvil when removing the preferential flake. Further research is necessary to determine if this was a general trend. Although some Levallois flakes in quartzite were recovered, the cores were only produced in finer-grained materials like chalcedony, silcrete and quartz (see Figure 12). A number of discoid cores (N=15) were also recovered, and this mode of production appears to have been utilized on both fine-grained and coarse-grained materials. One quartzite example has first served as a discoid core, and then been used as a hammerstone. Two examples of the Kombewa technique was also recovered – one core (see Figure 11), and one flake. While both

Levallois, discoid and Kombewa techniques are quite distinct, they all share the notion of carefully preparing the core before detaching a flake. In that respect, the lithic production in Rhino Cave can be said to emphasize prepared core technology. However, as made evident by the points, retouching the flakes after detachment was just as important.

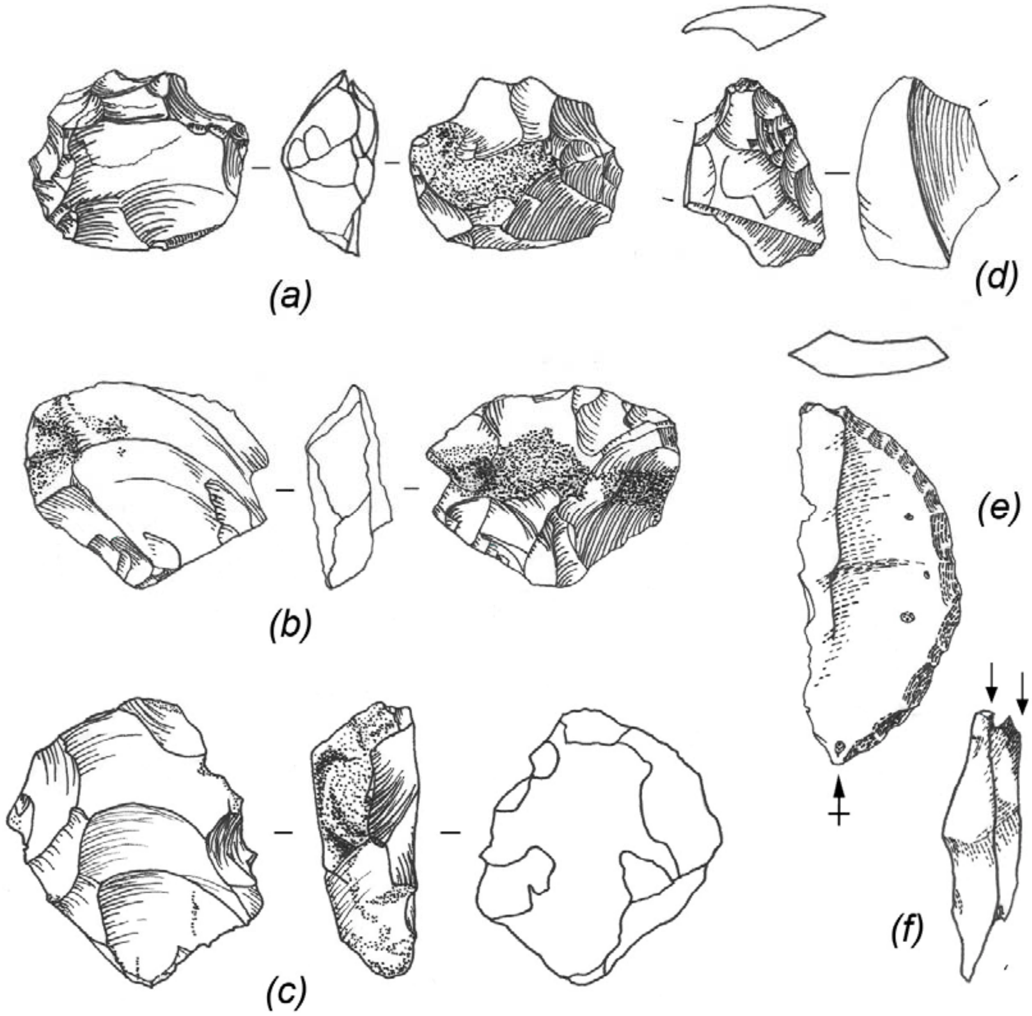

Figure 11 Cores and miscellaneous lithics from Rhino Cave. (a) Preferential Levallois core, chalcedony, 75-80 cm (burnt). (b) Kombewa core, chalcedony, 130-135 cm. (c) Recurrent Levallois core, chalcedony, 133-139 cm. (d) Resharpening flake, chalcedony (burnt), 115-119 cm. (e) Backed crescent, silcrete, 95 cm. (f) Refitted burin spalls, silcrete, 139-150 cm. Scale 1:1. All measurements are cm below surface.

Artefact types/raw material	C	S	Q	Qz	De	Total
Scrapers	13	9	7	1	2	32
Backed pieces	2	1	1			4
Becs	2	1	1			4
Denticulates	2		2	1		5
Notches			1			1
Burin spalls	1	3	2			6
Misc. retouched	12	13	2	4	2	33
Amorphous cores	6	8	10	3	2	29
Bipolar cores			2			2
Discoid cores	4	3	2	6		15
Kombewa cores	1					1
Levallois cores	15	3	2		3	23

Figure 12 Selected artefact types and raw material from the MSA layers of Rhino Cave. Ch = chalcedony, S = silcrete, Q = quartz, Qz = quartzite, De = degraded, as yet unidentified material.

Tools and knapping debris

Excluding the points, scrapers were the most frequent tools (N=32). These came in several varieties, including end, side, and convergent – shapes, sizes and thickness were extremely diverse. Although a few could clearly be grouped together, for example two very thick, concave, chalcedony end scrapers, the scrapers as a whole were quite dissimilar. No burins were recovered, but six burin spalls indicate that this tool had been produced in the cave. Two of them were refitted, evidencing that use and resharpening of burins took place in the MSA (see Figure 11). In addition, a few backed flakes, becs, denticulates and notches were recovered (see Figure 12), as well as a large group of miscellaneous retouched pieces (MRPs), which mainly consisted of broken, often burnt flakes that could not readily be placed in a tool category.

Interestingly, the tools did share some earlier mentioned aspects with the points. Firstly, they were unusually brightly coloured (as was most of the debris). Secondly, a number of them had been burnt, in exactly the same way as the points. They displayed the same potlids, cracks and crazing, and the burnt artefacts were again found intermixed with unburnt. This was also the case with regards to debris and cores, though to a lesser degree.

In addition to the burin spalls, there were several examples of what appear to be resharpening of tools. An example can be seen in Figure 11 – a flake that has removed part of a retouched edge, where the point of impact is on the dorsal face, well away from the edge on the original piece. A total of six such flakes were recovered, displaying exactly the same characteristics, four of these were ≤1.5 cm in length. Note that while the shape and retouch displayed on the example in Figure 11 is reminiscent of a point, this is not the case with the other examples. None of them have been refitted, although attempts have been made. Notwithstanding what artefacts they originate from, these flakes prove that tools were resharpened and probably used in the cave. Another unexpected find was the backed crescent in Figure 11. This silcrete artefact is well-executed and very reminiscent of the *fossils directeurs* of the South African Howiesons Poort. However, it was the only one of its kind, and displayed a blade-like technology and retouch completely different from the rest of the assemblage. Insofar, it appears more likely to be the result of an isolated incident rather than any direct relationship to the South African industry. However, the resharpening flakes and the crescent both illustrate the excess of distinct, often stand-alone artefacts from Rhino Cave whose presence are still not comprehended, but together evidence the richness of the assemblage.

6. Comparisons to other Middle Stone Age assemblages

The chronology and dating of the Botswana MSA is still poorly documented, with Rhino Cave being only the third excavated site in the country. Attempts at placing this assemblage in a wider MSA context have therefore been one of the main goals of this thesis. Comparisons to other sites have also been essential in trying to establish what constitutes "normal" behaviour patterns at these sites – an example being the presence of impact fractures at White Paintings Shelter and ≠Gi, but not at Rhino Cave. Direct comparisons with other sites are complicated due to the variety of different approaches has been used on southern African material. As points are of the safest *fossils directeurs* of the MSA, and usually receive considerable attention from researchers, they are excellent focal points for such comparisons. With that in mind, the Rhino Cave finds will here be very briefly compared to select other sites with regards to point morphology and technology, as well as their influence on the interpretation of the behaviour patters believed to be in use in the MSA. Included are also the finds from the 1995-1996 excavations at Rhino Cave.

The other finds from Botswana sites will be addressed first – materials from the early excavations at Rhino Cave, from White Paintings Shelter and from ≠Gi. I will then briefly turn to elements from the MSA of Zimbabwe. While the discussion of the Botswana material is based upon a cursory examination of the material as well as the publications, it was not possible to undertake any study of the Zimbabwean materials, thus my interpretation of them is based solely on the written reports.

6.1 Earlier Rhino Cave finds

During excavations in 1995 and 1996, a total of four m² were excavated by Larry Robbins, Alec C. Campbell, Mike Murphy and team (1996; 2000). In 1996, two TL dates were obtained for the MSA levels. These are regarded as uncertain by the excavators, as they substantially younger than other MSA dates (14 500±50 BP and 18 175±871 BP), and as no field gamma spectrometer measurements were made (Robbins, Brook et al. 2000:10). The research team encountered an LSA layer followed by a rich MSA assemblage consisting of large amounts of debitage as well as tools like unifacial and bifacial MSA points, end and side scrapers, denticulates and notches. They report points in different stages of manufacture, including preforms, partly prepared, failed, and finished (Robbins, Murphy, Brook et al. 1996:31; Robbins, Brook et al. 2000:20), and suggest that due to their relatively small size they may in fact have been arrow points. They note that a number of the points are "corner-struck", and that these types of small points from prepared cores are not present at White Paintings Shelter (Robbins, Murphy, Brook et al. 1996:31). These "canted" points are in fact products of discoid cores, as described in section 5.2. While the assemblage remained largely unchanging through the MSA levels, the excavators propose that two artefact types may be chronological markers within the MSA layers – small core/steep scrapers, and small distally backed points which in 1995 also was found in the LSA levels (Robbins, Brook et al. 2000:20). While most of these elements comply with my analysis of the recent finds from Rhino Cave, they also mention several aspects I did not encounter, including heavily patinated artefacts, a significant blade element, and a large number of awls and burins.

During my examination of the finds from the 1995-1996 excavations, only the material from 1996 was available for study. It soon became clear that much of the difference in the reports from these and the later excavations come from different approaches and sets of terminologies. Robbins et al.'s determination of what constitutes for example points, cores, awls, blades or burins do not comply with the definitions usually applied in Europe (for example by Inizan et al. 1999). For example, several broken flakes are characterized as burins and awls. The tendency to label any flake longer than it is wide as a blade has already been mentioned - this disguises the fact that the Rhino Cave production strategies are mostly discoid and Levallois. Despite the diverging descriptions and tool counts, the finds from the two excavation sets are almost identical. Raw materials, modes of tool production, point morphology etc could are the same. Some minor differences includes that the recent assemblage is richer, and contains fewer core scrapers. Both assemblages also had a heavy component of burnt artefacts, which it is curious that the first excavators failed to report. More serious is their failure to properly address the possibility of artefact movement within the sediment. According to Robbins et al. (1996:28), the relative integrity of the upper layers was suggested by the refit of two pieces of a broken flake recovered from the same unit. The value of such a statement is minimal when based on only one refit. As demonstrated above, there has been significant movement within the MSA layers, as is to be expected in a sandy deposit. Several artefacts from the earlier excavations come from very characteristic raw materials that very also encountered during the latter excavations, and several of them appear to come from the same cores. I believe that artefact movement explains why the "distally backed points" described by Robbins et al. (2000:20) are present in both the LSA and MSA levels. They correspond to a series of microlithic points and borers encountered in the recent excavations, which are present in the layer directly above the MSA, along artefacts that clearly belong to the MSA (see section 4.4). I see no reason to assign them to the MSA.

With regards to behaviour during the MSA, Robbins et al (1996:29; 2000:21) make no suggestions regarding Rhino Cave other than that it has served as a location for tool production, which may have been concentrated around a large boulder near the cave wall. A different approach is taken by Laurel Phillipson (2007a; 2007b), who recently re-analyzed parts of the finds from the early excavations. As discussed above, she believes that many MSA points are impact fractured (2007a). However, she also analysed a peculiar wear pattern on lithics from Rhino Cave and White Paintings Shelter. After examining the points from the 1995-1996 excavations I was astonished to read her description of them: *"…every one of the bifacial and unifacial points was heavily worn, blunted and/or broken"* (Phillipson 2007a:24). In fact, the MSA points showed no signs of use, impact fracture or blunting from use. Like the more recent materials, the points were for the most part pristine, though some were burnt, and some were snapped. Phillipson also undertook a production and wear replication study, and concluded that certain flakes, labelled "fabricators", had been used to produce serrations on the edges of the points, subsequently the points had been worn down by use (Phillipson 2007b). This leads her to conclude that the chief, and perhaps sole activity carried out at Rhino Cave had been replacing worn-out spearheads with new-made points (Phillipson 2007a:24). Again, a detailed description of the damage she construes is lacking, as are references to similar experiments that could clarify or support her position (Coulson 2008). Pending more thorough documentation, I can at least agree with her regarding one thing: *"…it is clear that the type of analysis used greatly influences and limits the information that can be derived from it"* (Phillipson 2007a:29).

6.2 White Paintings Shelter, Tsodilo Hills

One of the few archaeological sites at Tsodilo Hills located at Male Hill, White Paintings Shelter (see Figure 2) was subject to extensive excavations in the 1990s. A team including Larry Robbins, Alec C. Campbell and Mike Murphy uncovered a total of 13 m², some down to 7m below surface (Robbins, Murphy et al. 2000). Interestingly, they describe a transitional layer of late LSA/early MSA material dominated by large blades from prepared cores, as well as backed blades, burins, large scrapers, notches and awls (Robbins, Murphy et al. 2000:1103-1104). Below this, they encountered almost 3 m of MSA layers, with no clear-cut stratigraphy. The most common retouched forms were unifacial and bifacial points, while large side and end scrapers, denticulates, notches, burins, awls and becs were also present. They report that 55% of the raw material was imported chert and silcrete, and that these materials were dominant amongst the cores, which included multi-platform, prepared, disc and blade cores (Robbins, Murphy et al. 2000:1105). The upper part of the MSA deposit was TL-dated to 55·4±4·7 ka, but this was regarded as uncertain by the excavators (Feathers 1997). Two TL dates of 66·4±6·5 ka and 94·3±9·4 ka (Robbins, Murphy et al. 2000:1093) was obtained from deeper levels, but as the samples were collected by sand auger outside the excavated area, they must also be considered ambiguous.

The lithic assemblage from White Paintings Shelter was further analyzed by Murphy (1999), relying on a combination of American and South African research traditions. He found that the non-local raw materials were brought as prepared cores to the site, and then extensively used to produce formal tools, while local quartz and quartzite was more common in the debitage category (Murphy 1999:208, 234). Murphy believes the Rhino Cave assemblage is roughly equivalent to, or more recent than, the upper MSA levels of White Paintings Shelter, due to the smaller size of the Rhino Cave points (Murphy 1999:289-290). During the MSA, he believes White Paintings Shelter was used as a temporary camp for a large number of people on a seasonal basis, while the transitional MSA/LSA layers see a shift to smaller groups, possibly hunting solitary browsers as contrary to large herds (Murphy 1999:396). This focus on hunting is supported by Randolph Donahue et al. (2004:155), who later examined 78 artefacts for micro and macro wear, and reports work in wood, hide, bone, butchering and impact damage. As discussed above, Laurel Phillipson envisions White Paintings Shelter (like Rhino Cave) to have been mainly used for the refurbishment of blunted points (Phillipson 2007a).

When examining the finds from White Paintings Shelter, the same obstacles regarding different research traditions and approaches were encountered. Notwithstanding, there were several obvious similarities to the Rhino Cave material, including the prominence of points, use of discoid and Levallois reduction strategies, and production of formal tools from imported raw materials. However, several differences soon became apparent. The White Paintings Shelter assemblage was not as rich, and both local and imported raw materials were of lower quality and without the intense colours present at Rhino Cave. As noted by Murphy (1999:234, 264), most of the White Paintings Shelter imported cores were exhausted and many tools intensively resharpened, which can be interpreted to that the raw materials were not easily available. These tendencies are not prominent at Rhino Cave. With regards to points, some examples from White Paintings Shelter are very similar to some from Rhino Cave, especially the bifacials. Conversely, there was much less variation amongst the White

Paintings Shelter points, and there were several examples of Levallois points with no retouch, which are very seldom at Rhino Cave. In general, the points from White Paintings Shelter were more elongated, narrower and larger. I believe this to be a result of the reduction strategies – as is also mentioned by Robbins et al. (1996:31), “canted” points are not present at White Paintings Shelter. An important technological difference between the two assemblages appear to be this Rhino Cave emphasis on discoid reduction strategies.

6.3 ≠Gi[3], Aha Hills

The open-air site of ≠Gi is situated on a pan edge in near the Aha Hills southwest of Tsodilo. It was dug by Alison Brooks and John Yellen (1977) in the 1970s, and was the first stone age site in Botswana to be carefully excavated and dated. The excavators encountered a well preserved MSA assemblage with both faunal and lithic materials, interpreted as a living floor (Brooks and Yellen 1977:29). The top of the MSA levels was later TL-dated to 77±11 ka (Brooks et al. 1990:62), and as the layers were capped by a 20-50 cm protective layer of hardpan, this is in fact the most secure date for the MSA in Botswana.

The lithic assemblage of ≠Gi was analyzed by Kathy Kuman (1989), using largely South African methods and terminology, but including extensive technological discussions. Her systematic and comprehensible approach makes it apparent that the material from ≠Gi is very similar to that of Rhino Cave. The assemblage comprised of ca. 26,000 artefacts, of which ca. 22,000 was debris. Note that as she only analyzed the cores and modified artefacts (Kuman 1989:191), my brief examination of the artefacts were also limited to these. The lithic raw materials at ≠Gi are quite similar to those at Rhino Cave, including silcretes, chalcedonies, quartz and quartzite. However, the colours of the ≠Gi assemblage are usually grey, light green or almost black. Fine-grained raw materials appear to have been locally available at ≠Gi (Brooks et al. 2006:239). Despite this, Helgren and Brooks (1983:192) emphasise the amount of curation present at ≠Gi, where a large number of artefacts were resharpened and recycled, indicating a shortage of good quality cherts and chalcedonies, which make up more than 80% of the raw material. Kuman (1989:247-248, 255-256) agrees with this argument, and reports several examples of patinated flakes with fresh knapping scars. This intense use and re-use of artefacts is an important contrast to the use of retouched tools at Rhino Cave.

[3] The ≠ refers to an alveolar click, as the site name comes from a local San language. The site is also sometimes referred to as #Gi or just Gi. I chose this format as it appears to be the more widely used.

The principal tool types at ≠Gi were bifacial and unifacial small to medium-sized pointed forms, which constituted 25% of the retouched sample. Scrapers, notches and denticulates were also present (Helgren and Brooks 1983:192). My own cursory overview of the ≠Gi material confirms that these are very similar to those of Rhino Cave – both in size, reduction strategy and retouch patterns. Points made from discoid cores are common in ≠Gi as well as in Rhino Cave. Although she prefers the term radial rather than discoid, Kuman's description of these points can just as well apply to those from Rhino Cave: *"…usually the striking platform is not opposite the point. Indeed it is to one side of the point's midline, in a corner position. This feature, the faceting of striking platforms, and the centripetal dorsal scars are all considered typical of the radial flaking technique"* (1989:259). These features are also mentioned by Brooks et al. (2006:239), confirming that they are characteristic of discoid rather than Levallois technologies. An important difference between the two assemblages is that the ≠Gi point bases are heavily thinned and modified, presumably for hafting. Several of them are impact fractured (Brooks et al. 2006:237, 239). Their small size places them closer to the range of ethnographically documented dart or arrow point than spearheads, according to Brooks et al. (2006:239). The prevalence of points, the presence of impact fractures and abundant large mammal fauna led Helgren and Brooks (1983:192-193) to conclude that ≠Gi had been a specialized hunting venue. Kuman (1989:188) adds that the site would likely have been used for similar purposes for many millennia, given the overall similarity of the MSA assemblage and the environmental resources over time.

Both Helgren and Brooks and Kuman point to the Zimbabwean MSA as the most similar industries to that of ≠Gi. Helgren and Brooks (1983:192) considers the closest analogous site to be Bambatan site of Redcliff (see Figure 1).

6.4 Regional aspects: the MSA of Zimbabwe

When considering how that only three MSA sites from Botswana have been published, it is evident that comparing the Rhino Cave assemblage to the MSA of Botswana's neighbouring countries would be highly useful. Comparable sites within the well-documented South African chronologies would have made it much easier to place Rhino Cave in a geographical and chronological context. Unfortunately, the South African MSA is very different to that of Botswana. The Rhino Cave and ≠Gi emphasis on small, oval and heavily retouched artefacts produced on discoid cores are not analogous to the South African prevalence of large, parallel-sided or convergent flakes with little or no retouch of for example Klasies River

Mouth (Wurz 2005). In addition, most of the South African sites are coastal and their MSA inhabitants relatively seldom used fine-grained materials like chalcedony. The distinctive Howieson's Poort and Stillbay industries (Wurz 2005) include invasively retouched bifacial points (Stillbay) and significant use of imported, fine-grained raw materials (both). However, the resulting point types (Sampson 1974) are still very different to those from Botswana. The MSA of south-western Namibia appear to fit into the South African framework (Vogelsang 1996), the northern part of the country is unfortunately less documented. Concerning Angola, this is still largely uncharted territory with regards to MSA research. As suggested by Kuman (1989:187-188), a more parallel MSA tradition can be found in Zimbabwe.

While there was several large excavations in the Zimbabwean MSA before World War II, and considerable research undertaken in the 1960s, the large number of finds and proposed industries are still not properly understood, and lack a concise chronology (Larsson 1996; Walker and Thorp 1997). Very little MSA research has been undertaken since then, and the current political situation in the country now makes investigations impossible. However, when looking at publications from isolated sites, the similarities to the MSA technology at Rhino Cave are striking. Bambata Cave in the Matopos Hills, in particular, has an MSA assemblage that appears quite similar to that of Rhino Cave. The Lower and Middle Bambata strata yielded imported, fine-grained materials, a widely varied assemblage with an emphasis on highly retouched points, discoid and Levallois technologies (Armstrong 1931). The same aspects are apparently present in the Magosian levels of Khami, near Bulawayo (Jones and Summers 1946). Without entering into the extensive debate on the chronology of the different Zimbabwean MSA industries (Clark 1965), or the difference in research methods and terminologies, the excellent illustrations and thorough descriptions from these sites make it apparent that the point technology is comparable to that of Rhino Cave. In fact, Kuman's comparison of the ≠Gi material to the Bambatan industries can be applied to that of Rhino Cave as well: *"Traits they share in common are the richness and variety of retouched tool types, the variety of unifacial and bifacial points, an emphasis on the radial working of cores and the rarity of blades"* (1989:187-188). While much is yet unclear regarding the assemblages from Zimbabwe, I concur with Kuman that the Zimbabwean MSA is a good starting point for further mapping of the regional connections of the Botswana MSA.

7. Discussion and conclusion: Interpretation of the MSA behaviour patterns in Rhino Cave

The aim of this thesis has been to analyze the recent lithic materials from Rhino Cave in the context of the ongoing debate on behavioural modernity in the MSA. I also wished to see whether the employment of a *chaîne opératoire* approach could be helpful in investigating MSA behavioural patterns.

In the extensive debate of the last decade, many aspects of modern human behaviour have been proposed, contested, rejected and developed. One of the few unifying statements appears to be that use of social rituals is an exclusively modern human trait. They are prevalent in all known human societies and form a substantial part of how we interact with each other as individuals and groups. Current research suggest that the use of ritualized behaviour, both employed by individuals when in stressed situations and when participating in communal rituals, are part of the human brain's response to stress and danger (Boyer and Liénard 2006; Liénard and Boyer 2006). The challenge lies in whether these behaviours can be detected archaeologically.

MSA behaviour patterns as evidenced by the lithic assemblage and the features of the cave

My analysis was undertaken by applying a limited *chaîne opératoire* analysis to the MSA points recovered from the Rhino Cave, and then briefly compare the points to the other excavated material, as well as to points from some other MSA assemblages. The aim was to search for repeated patterns that could indicate what behaviours had taken place in the MSA. This approach enabled me to determine several unusual characteristics of the MSA of Rhino Cave, which were not found at other sites:

Firstly, the inhabitants selected vividly coloured lithic raw materials and brought them to Tsodilo Hills. While few sources are known, it is evident that a large amount of this material had to be transported for considerable distances. That the vividly coloured artefacts were present throughout the MSA sequence, indicate that this was a tradition, a repeated practice with regards to this site. The collection of such raw materials presupposes that the MSA inhabitants were capable of planning their visits to the cave on beforehand and prepare in advance. It also presupposes a need for raw materials not present at Tsodilo, which, as all point forms were also produced in local quartz, cannot be explained by straightforward economic reasons.

Secondly, these selected raw materials were then used to produce points, which do not appear to have been used. In stead, large amounts of them were burnt and one was intentionally broken. The rest were abandoned unused. In short, the points were produced for other purposes than hunting. Parts of the remaining archaeological material of the cave were also burnt, and a number large of quartz flakes were intentionally broken and stuffed into a natural crevice in the cave wall.

Thirdly, they gathered colorants (specularite and ochre) and brought them to the cave for hitherto unknown uses.

The context of Rhino Cave itself should also be considered: The Tsodilo Hills would have been a natural meeting point in the MSA, both due to its prominence in the landscape and the natural resources it provided. Rhino Cave is however a hidden location on this very visible location. It is hard to find and enter, and there are many places on Tsodilo better suited as a shelter. There is no apparent practical reason to bring exotic lithic materials to this cave and knap them there. While practical benefits as a shelter may not be apparent, the small, narrow cave provides several features to that contrast starkly to those characterising the open, flat landscape of the Kalahari. These include large amounts of rock, being surrounded by walls, the feeling of being inside and hidden. These must have been rare experiences for an inhabitant of the Kalahari in the MSA. Curiously, the MSA inhabitants further modified the most prominent feature in the cave, a large natural outcrop. At least to modern eyes, it appears that they saw a recognizable serpent shape in the rock, and then enhanced it to look more like what they imagined. The snake comparison notwithstanding, they spent a considerable amount of time modifying their surroundings in a way that make little practical sense.

The production of these grooves in the cave wall has several interesting aspects in common with the production of MSA points. They are both expensive in terms of the amount of labour invested in selecting raw materials and in grinding depressions in a hard rock surface. They also appear to have been repeated over a long period of time. The wall outcrop had been carved, weathered down and carved again. The points come from a very large number of cores, many appear to be one-offs and others display varying features while following the same general approach to production. In all, they appear more likely to be the product of many visits over perhaps thousand of years rather than of separate, intensive periods of use. Finally, both the production of the grooves and the points are not rational in economic terms.

There is no direct benefit in making grooves in a wall, nor in the production of points that are not used, and in many instances are destroyed.

In short, the abovementioned features and behaviours are not characteristic of a normal habitation or hunting site in the MSA. If the finds had dated to the LSA, it would have been tempting to use ethnographic analogies to sacrificial sites and ritual destruction. However, there is no definite proof that rituals were undertaken in the MSA, and the time span is anyhow so great that any analogy would likely be meaningless. One then has to turn to the definitions of ritual and ritualized behaviour outlined in chapter two – do the MSA finds from Rhino Cave comply with these?

Repeated patterns of non-utilitarian, effortful behaviour

Firstly, both sociological (Marshall 2002) and neurological (Boyer and Liénard 2006; Liénard and Boyer 2006) approaches to discerning ritualized behaviours emphasize that they have to involve a considerable effort on the part of the participant. This can involve for example surrendering of hard-won resources or take time and energy away from necessary pursuits (Marshall 2002:365). The point production sequences of Rhino Cave certainly fulfil these criteria. They involve considerable effort in the collection and transport of rare lithic raw material, which is then fashioned to well-made points that are consequently surrendered or destroyed without being used. This must certainly have taken time and energy away from necessary pursuits.

Secondly, a characteristic of ritualized behaviour emphasized by both Liénard and Boyer and Marshall, is the non-utilitarian nature of the actions. As stated by the former, the ritualized actions are only meaningful in the context of the ritual (Liénard and Boyer 2006:817), and Marshall even view the ritual behaviours as consciously non-utilitarian (2002:376). This also appears to apply to the destruction and/or abandonment of fully functional points at Rhino Cave. While the act of burning artefacts gives meaningless and non-utilitarian separately, it can be meaningful in a wider ritual context.

Finally, the abovementioned researchers emphasize the repetitious nature of ritualized behaviours. The acts can not be singular in nature, but must be recurrent and conventional to give meaning to a society (Rappaport 1971:25). This emphasis on the need for repeated patterns is also mentioned by archaeologists like Lyn Wadley (2001:207), who state that singular artefacts are not intrinsically endowed with symbolism, and Richard Klein

(2000:218), who sees the need for relatively large numbers of highly patterned objects to make any claims for behavioural modernity. It is my belief that the point production sequences of Rhino Cave are examples of such repeated behavioural patterns. The acts of production and destruction/discard have been undertaken on many occasions over a long period of time.

If one applies a definition of ritualized behaviour as repeated patterns of non-utilitarian, effortful behaviour, it is my belief that the point production visible in the MSA levels of Rhino Cave fulfils the criteria. When added to the other unusual features of the cave, it becomes apparent that this has not been a normal habitation site in the MSA, and it is highly likely that ritual actions have taken place there. If this is correct, it has wide-reaching consequences. Following most researchers, the individuals participating in such actions must be considered behaviourally modern. They would have to be capable of abstract thinking, of using symbols and of communicating their meaning to others through language. In essence, they would be human.

Epilogue

After my examination of the Rhino Cave finds ended in 2006, Dr. Sheila Coulson has further studied them, as well as the assemblages from ≠Gi and White Paintings Shelter, for the purposes of publication of the Rhino Cave material. Her studies have confirmed my assessment of the finds, as well as added significant new information. I mention this here because the discovery that one more point from Rhino Cave has been subjected to attempts of intentional breakage support the suggestion that artefacts from the cave were deliberately destroyed. The point in question is a concave, unifacial point from the 2004 excavations, and the attempts to break it has left distinct traces on both faces.

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