The 2012 Excavation of the University of Tübingen in MSA deposits at Sibudu Rockshelter, KwaZulu-Natal

Introduction

Building on the excellent results of the 2011 season we scheduled a period of 6 weeks for work on the Sibudu project in 2012. The majority of the crew members arrived in KwaZulu-Natal by February 22, when work began. The early days of the season were spent with lab work and preparing the site for excavation. We had left much unsorted material from the 2011 season at the KwaZulu-Natal Museum in Pietermaritzburg, and the first order of business was to sort the screened sediments from last year. This also served as a good way of familiarizing the crew members with all of the important classes of material that we could expect during excavation.

All of the preparation for digging was complete by March 6 when we began daily excavations. The size of our crew ranged from 10 to 14 people, and included the following students and researchers.

Prof. Christopher Miller,
Dr. Guillaume Porraz (Paris X)
Dr. Susan Mentzer,
Mohsen Zeidi, MA
Sarah Rudolf,
Gregor Bader,
Frank Brodbeck,
Michaela Ecker, MA
Mathias Göden,
Pholoso More (Durban)
Flora Schilt, MSc
Julia Wachtel
Alexander Weide

With the exceptions of Dr. Porraz and Mr. More, all of the participants are members of the Department of Early Prehistory and Quaternary Ecology of the University of Tübingen. All of the participants are experienced archaeologists, who have worked on Stone Age sites. Excavations stopped on March 28, we backfilled the site with sandbags on March 29. We anticipate continuing the excavation in February and March 2013, but the site is secure regardless of what the future brings.

The field season focused on two main goals. 1) Continuing the excavation in the deep sounding (DS), 2) Continuing the excavation in the eastern excavation (EE). As work continues in the DS, we will gain an impression of the depth of the archaeological deposits and the time span during which prehistoric people occupied the site.

The DS consists of 6 main excavation units B4 – B6 and C4 – C6. After straightening the walls and removing many rocks to open up a larger surface, we also have included the southernmost 20 cm of A 4 –

A6 in the deep sounding. This year's excavation took place mainly in C4, B4 and A4. Mohsen Zeidi, a very highly skilled excavator, was the only person to dig in the DS.

The eastern excavation is defined as the $6m^2$ of C2, C3, D2, D3, E2 and E3, and here Nicholas Conard excavated. After last year's experience, we anticipate the need for a large crew for lab work. Still we were surprised that two excavators produced so much material that the whole crew was kept busy with various kinds of lab work. Only on rare occasions was it possible to have students join in digging in the EE.

Methods

We followed the same excavation methods that we used in 2011. Excavators dug in *Abträge*, which are like spits except they rigorously follow the slope of the strata. Larger or important finds were left in place; these single finds were piece-plotted using a total station and the excavation software developed by Dibble and McPherron called EDM. We piece-plotted most lithic artifacts and bones over 3cm, while smaller finds were collected by screening the buckets of sediment. This means that the provenience of finds from the screens can be located to within a quarter meter and a thickness of a few centimeters.

We used a coarse screen with a mesh of 5 mm and a fine screen with a mesh of 1 mm for sieving (To be more exact, the 5mm mesh has two holes per centimeter. The wire is thick, so the actual holes are about 3 mm on a side. The 1mm mesh has six holes per centimeter, but the actual hole is about 1mm on a side). Since sorting the material from the 1 mm screen is extremely time consuming, we have decided to sort only a small sample from the fine screens. This includes two continuous quarter meter columns from the EE and one from the DS.

This year we implemented flotation to increase the recovery of botanical remains. Alexander Weide conducted many tests and demonstrated significantly better recovery of seeds and charcoal by flotation rather than by dry sorting. Typically we would float all the sediments before screening. This year, for logistical reasons, we floated the samples after screening. There may be room to improve our system, but in the humid climate near Sibudu it takes longer than ideal to dry the samples after floating. This year we also had rain on many days, and finally the windy weather also makes for complications. Still, it is clear that for the upper strata flotation is a good way to recover botanical remains. We need more tests from the DS to be sure that flotation works well for the deeper strata. The botanical remains in the DS are more mineralized and do not float as readily as do the remains from the post-HP. Chrstine Sievers, who has been working on the flora from Sibudu for many years, kindly advised us and worked closely with Weide on these matters. Like with Lyn Wadley's excavation before us, we recovered specimens of unburnt leaves from the stratigraphic unit of Brown Sand (BS) in the DS.

In the lab we made no attempt to identify the faunal remains at this stage. All faunal remains are being saved for later study. All of the find horizons have yielded many faunal remains. The preservation of bone varies considerably, and, as Jamie Clark has pointed out, the intense burning at the site has led to the damage and destruction of much of the material that was originally brought to the site.

In the lab most of our attention was directed toward the rich lithic assemblages from Sibudu. Many buckets contained hundreds of pieces of chipped lithics from the 5 mm screen. We have not yet had enough time to process all the lithic artifacts in detail. We have "upgraded" more important finds from the screens as appropriate to complete the picture given by the single finds. These include cores and tools from the buckets and complete debitage over 30 mm. We classified cores and tools in considerable detail. We have only had time to record major variables among the debitage. Following Boeda and others, we used the techno-functional approach to help guide our study of the tools, we have classified the tools in detail based on distinguishing the working edge, the prehensile end and the intermediate parts of the tool that connects the other two portions.

Stratigraphy

One of the most critical issues at Sibudu is stratigraphy. As Wadley and others have pointed out in numerous contexts, the high resolution of the depositional units at Sibudu is a blessing, but a mixed one. In many parts of the stratigraphy, there are so many micro-stratigraphic units that it is impossible to excavate them individually. The matter is complicated further by radical lateral facies shifts and by the presence of numerous lenses of limited spatial dimensions. This problem is particularly acute in the thick post-HP unites dated by Jacobs to about 58 ka.

What this means in practical terms is that great care must be administered to respect the stratigraphic relationships at the site. I see only two basic approaches. In one approach we could define every micro and mesostratigraphic unit with a unique designation. This would help us to distinguish each stratigraphic context. This approach, however, would become extremely complex because in nearly every square meter new designations would be needed. Then we would quickly go from the many dozens of stratigraphic units defined by Wadley to a situation in which for justifiable reasons, hundreds of stratigraphic units would exist. This approach could lead to high degree of chaos, because it is often difficult to correlate the many units.

The second approach is the one I have adopted. It has both strengths and weaknesses. In this approach I have taken the stratigraphic profile on the east wall of B4 and C4 at the type section of the site. The layers defined there provide the stratigraphic framework for the adjacent areas. This means that despite lateral facies shifts and lenses of new material, I have tried to define robust chronostratigraphic units that reflect the major units of Wadley's stratigraphic system. The drawback with this system is that layers with very different lithology are given the same designation. For example, a layer like Black Magic (BM) could have black, silty, organic characteristics, but as one moves further away from the type section the chronostratigraphic equivalent of BM could change dramatically. This means that units like BM or Ivory (Iv) will have different characteristics depending on where one is laterally on the site. Obviously, using this approach it will not be possible to provide a single universally valid description of the lithology of a stratigraphic unit. Still the advantages of this approach are many. This means that terms like BM or IV in the Wadley excavation will be directly comparable with layers by these names in the Tübingen excavation.

In the EE we use the *Abtrag* approach to rigorously follow the geometry and structure of the strata across all six square meters. If we dug one meter at a time this would be nearly impossible and correlations would become difficult. As the new phase of excavation continues, we may encounter completely new layers that are so thick and distinctive that they could warrant a new name. If this were to happen we would resume the use of the type section to define the stratigraphy once we had fully excavated the new stratigraphic unit and localized it in the sequence.

The definition of features presents another problem in this complex sedimentary setting. The majority of the deposits at Sibudu are of anthropogenic origin. This is particularly the case in the layers we dug in the EE, where innumerable patches of burnt silty deposits prevailed. Wadley and colleagues have described these sediments and demonstrated that they reflect many burning episodes and include both hearths and areas of burnt bedding. Many of these areas result from dumping and have been affected by trampling, diagenesis and other processes. This being said, the deposits are remarkably well preserved. Strictly speaking nearly every one of these patches of sediment could be viewed as a feature. This, however, would not be manageable and would slow the excavation to a near standstill, with all the paperwork and documentation. Thus we follow a system used by Wadley and document features in cases where a clearly defined patch of white ashy material is visible after an *Abtrag*. These more major features are recorded individually and placed in the appropriate stratigraphic unit in which they are located. This year we collected numerous micromorphological samples for study by Chris Miller and his team in Tübingen.

In the DS we extended the dig through the long sequence of Brown Sand (BS), which was the deepest unit defined by Wadley, into Burnt Mouse (BMo), then into Red-Brown Silt (RBS), and then into Grey Sandy Silt (GSS). Here the east profile of excavation units B4 and C4 will again serve as the type section for these units. This year we went to great lengths to open a larger area in the deep sounding and all indications so far suggest the sequence will continue downward for some time.

We also made good progress in the upper part of the sequence. This year we excavated the strata Ivory, Black Magic and the upper parts of the Pox complex in the EE. After linking the EE to the type section of the DS, we concluded that some *Abträge* dug in 2011 and attributed to SpCa were actually in a lower stratigraphic position. This situation was remedied by renaming the lower portions of SpCa from 2011 to Chestnut (Che), Speckled Sunrise (SS), Mahogany (Ma), and to the top of Iv.

Results

In 2011 and 2012 the dig produced roughly equal amounts of material. The tables at the rear of the report summarize the number of single finds and the finds that have been upgraded among the bucket finds from both years together. The bulk of the material 2012 came from BMo in the DS and from Pox, BM and Iv in the EE.

Botanical remains were present in every bucket. Wood charcoal is particularly abundant and documents the importance of the use of fire at the site in all layers. We assume that much of the wood charcoal originates from fires in hearths, while many of the ashy units could be the result of burnt bedding. None of the wood charcoal has been identified yet. Weide and Sievers have identified six taxa of seeds so far, but roughly 20 taxa of seeds were recovered this year. All of the identified seeds had previously been identified by Sievers among the botanical remains from Wadley's excavation.

This year's excavation yield very large amounts of faunal material. The faunal analysis will be undertaken in the future. The fauna from the post-HP was particularly intensely burnt. The lower horizons of the DS seem to have better faunal preservation than in the younger units. More work will be needed to confirm this impression. Small fish bones were identified among the fauna from the EE.

Ochre was present in multiple layers, but excavators and sorters, had the impression that ochre was more common in the post-HP layers dug in 2011 than in the layers dug this year. Several pieces of ochre preserve clear indications of ground surfaces, but none of the pieces of ochre carried engraved patterns as documented at other MSA sites. Despite careful observation during sorting, no examples of bone tools or shell ornaments have been identified in either season of our excavations at Sibudu.

This year it came as no surprise that the lithic artifacts were the most numerous class of finds. The raw materials seen in the debitage are dominated by different variants of dolerite and hornfels, with lesser amounts of quartzite, sandstone, quartz and perhaps silcrete. All of the cores that we have studied other than on small quartz platform core are of dolerite or hornfels, but distinguishing between these two major classes of raw material is not always straight forward. Primary outcrops of dolerite are present immediately below Sibudu on the Tongati River, and secondary cobbles of dolerite are present in the Tongati gravels. Given the local availability of the dolerite, we assume that much of this raw material originates within a few km of the site. Work on sourcing dolerite and other raw materials is currently underway by Hellen Kempson and Guillaume Porraz.

We have yet to conduct an exhaustive study of core reduction technology and blank production in the layers Pox – BSp. A study of the cores from this part of the sequence shows the use of several reduction strategies, including parallel (Levallois-like) cores, HP-like cores, platform cores as well as category of cores on flakes. The cores include good examples of uni-directional, centripetal and bi-directional opposed reduction, with uni-directional reduction best represented in the cores and debitage. A small number of cores on flakes documents a degree of variability, some of them being exploited on their dorsal surface and others in a burin-like manner along their narrow edge. The production of small blades and bladelets is documented, but this reduction sequence, while clearly visible, seems to play a minor role at the site. A brief examination of the cores from the DS documents similar patterns of core reduction compared to the upper units, with highly reduced cores in a two-surface system present. The oldest cores we have thus far recovered come from layer RBS, and they fall within the general class of parallel cores.

The 2012 season yielded three hammerstones from the deep sounding. Two of them are rounded sandstone cobbles weighing 169 and 531 grams and a smaller hammerstone that shows only week evidence of use that appears to be quartzite and weighs only 44 grams.

In the DS we recovered six bifacial points in layers LBG – BMo (see figures). The presence of so many bifacial points in these layers underlying the strata that have been assigned to the Still Bay raises questions about the stratigraphic definition of the Still Bay and the nature of this cultural tradition's chronological and technological development. We have yet to study the tools from the base of the deep sounding in detail, but they include unifacial points and far fewer tongati tools than the deposits from Pox – BSp. In BMo we recovered several finds with very small pronounced triangular working edges that are often oriented off-axis. These finds may form a different kind of tool, but this suggestion needs to be checked. The raw materials here include visibly more quartzite than in the upper part of the sequence. The artifacts are also better preserved with lower amounts of thermal breaks from fires and much lower levels of mineral crusts than the finds from the upper part of the sequence.

Following up on last year's preliminary conclusions, we focused this year's analysis on the lithics from the post-HP to see if they present a consistent picture of the lithic technology that would warrant using Sibudu as a type site for characterizing this period. In close collaboration with Guillaume Porraz we classified the lithic artifacts using a techno-functional approach that emphasizes the distinction between a working edge, a prehensile end and the portion of the tool that links the working edge to the prehensile end. This approach emphasizes the dynamic nature of tool use and reduction more than a traditional more static typological approach.

We arrived at four main classes of tools that can be used to define the Sibudu Techno-Complex (STC) which can also be referred to as the Sibudan. We argue that these classes of tools 1) tongati tools, 2) Ndwedwe tools, 3 naturally back tools (NBT) and 4) biseaux all exist within a single technological system and that the tools have complimentary functions (see figures). Examples of these tool types found in the figures at the end of the paper. Within the major classes, and especially within the group of tongatis, we see multiple types that probably were used to perform distinctive tasks. During the STC, different activities were performed, including knapping and retooling activities. The different types of tools suggest that they were not used in same activities and that different activities were performed on the site. This is documented by the morphology and dynamics of reduction of the working edges (tongati = short triangular, Ndwedwe= long narrow thick triangular, NBT = long circular edge, Biseau = short rectilinear edge). This pattern of organizing working edges to meet the needs of the inhabitants of Sibudu can be viewed as a hallmark of the Sibudan.

In the layers of the STC that we have examined in detail, the economic economy shows a clear pattern. Much primary reduction is indicated by high numbers of cortical flakes and cores with cortical surfaces document early stages of knapping and reduction. The later stages of reduction are documented still better by the very high numbers of retouch debitage and high percentages of tools and tools that have been recycled over the course of their life histories. This pattern of lithic production, use and discard does not need to be a defining feature of the Sibudan, because one can easily imagine assemblages belonging to the STC that reflect more knapping more toward the beginning of the reduction cycle. Still it is noteworthy that at Sibudu the STC is characterized by this pattern of intense reduction with many products that are from late in the reduction sequence.

In the context of defining the STC, one key variable is identifying robust cultural stratagraphic patterning. Our sample of cores and tools presents a stable pattern over the main stratigraphic units Pox – BSp. Tongati tools and Ndwedwe points are the two dominant classes of tools in all of the layers under study. In every stratum the percentages of tongatis varies between 35% and 52% of classifiable tools and tool fragments (see Tables 1 and 2). The blanks for these tools are typically elongated and thick. With Ndwedwe points usually being made on somewhat larger, longer and thicker blanks than tongatis (see figures). The percentage of Ndwedwe tools typically varies between 10 and 20% of the tools in each layer. While the percentages of NBT and biseaux vary between layers, this is in part because they are present in relatively low numbers and exhibit higher levels of stochastic variation.

We hope with this initial study of the lithic artifacts from the Tübingen excavation from BM – BSp to have demonstrated that these assemblages document robust archaeological signals. Based on the variables we have examined so far, all of the six stratigraphic units reflect the same technological and functional pattern and can contribute to our definition of the Sibudan. The material from the Wits excavation can be used to confirm, refute or modify the results presented here. Obviously, if a definition of the STC is to be meaningful it needs to have a high degree of reproducibility at the type locality. As our work continues at Sibudu, we can examine when in the sequence the Sibudan as defined here begins and when it ends.

Plans for the future

The 2012 season of the University of Tübingen at Sibudu was a great success. The team made important progress excavating in the EE. Equally important three new archaeological layers could be defined in the DS. With the expanded excavation in the DS, it now looks like the archaeological horizons will continue still deeper. At present we plan to continue excavations at the same time of year in 2013. We hope before long to connect the stratigraphy of the DS and the EE, which will provide a complete sequence for all layers moving downward starting at BSp. I suspect that this goal will take two or three more seasons, based on the current rate of progress. We also plan to continue our studies on all classes of information and to move toward publishing key results as our research proceeds.

Acknowledgements

I am greatly indebted to Lyn Wadley for the invitation to work at Sibudu and for her generosity in sharing her vast knowledge and experience related to the site. I thank the 2012 research team at Sibudu including: Chris Miller, Guillaume Porraz, Susan Mentzer, Mohsen Zeidi, Sarah Rudolf, Gregor Bader, Frank Brodbeck, Michaela Ecker, Matthias Göden, Pholoso More, Flora Schilt, Julia Wachtel and Alexander Weide. Among other important work, I wish to mention the following contributions to the excavation specifically. Guillaume Porraz, Gregor Bader, Julia Wachtel contributed greatly to the lithic analysis. Chris Miller, Susan Mentzer and Flora Schilt conducted geoarchaeological studies. Sarah Rudolf and Michaela Ecker operated the total station and coordinated the data base. Frank Brodbeck prepared the lithic illustrations. Alex Weide and Flora Schilt led the archaeobotanical work in close cooperation with Christine Sievers. Matthias Göden organized the find work in Ballito. Sarah Rudolf and Mohsen Zeidi organized the logistics for the dig. M. Zeidi worked tirelessly in the field and lab. I especially wish to thank Gregor Bader, who, in addition to his other duties, cooked dinner most nights and often cooked hot breakfasts and lunches. I am grateful to Carolyn Thorp and Gavin Whitelaw from the KwaZulu-Natal Museum for storage space and logistical support. Finally, I wish to mention the hard earned victory of the Franky Boys soccer team in the annual Sibudu soccer tournament played on March 23. The research at Sibudu was funded by the University of Tübingen, the project The Role of Culture in the Early Expansion of Humans of the Heidelberger Akademie der Wissenschaften, the Tübingen-Senckenberg Center for Human Evolution and Paleoecology and the Deutsche Forschungsgemeinschaft.

Tables

Layer	# of Lithics	Debitage	Tools	Cores	Angular debris	% Tools
Ore	9	7	2	0	0	22,2
RD	11	7	4	0	0	36,4
RSp	10	8	0	0	1	0
BSp	918	769	109	13	27	11,9
SpCa	617	514	83	7	13	13,5
SS	32	32	0	0	0	0
Che	147	122	21	2	2	14,3
Ma	200	149	45	1	5	22,5
Iv	823	627	155	14	4	18,8
BM	261	206	49	2	4	18,8
Pox	758	714	31	2	4	4,1*
GR	5	5	0	0	0	0
GS	23	23	0	0	0	0
PGS	54	42	8	1	3	14,8
RGS	31	19	11	0	1	35,5**
LBG	78	68	9	1	0	11,5
BS	500	444	43	2	11	8,6
BMO	844	784	29	5	26	3,4
RBS	71	65	2	2	2	2,8
GSS	10	9	1	0	0	10

Table 1. Sibudu. Classes of lithic artifacts from the 2011 and 2012 excavations of the University of Tübingen. *The assemblages below Black Magic (BM) have not been studied in detail, so the percentages of tools are under-estimates based on the designations made in the field. **Some layers with very small samples are unrepresentative samples from straightening profiles. Data compiled by Gregor Bader and may contain some minor inconsistencies.

	Tongati tools	Ndwedwe tools	NBT	Biseaux	Other formal tools	Burin-like tools	Informal tool	Broken tools	Piéces esquillées	Total	% Tongatis
BSp	**46**	**24**	**14**	**4**	**4**	**0**	**8**	**9**	**0**	**109**	**42,2**
SPCA	**34**	**15**	**6**	**1**	**6**	**3**	**3**	**15**	**0**	**83**	**41**
Che	**9**	**4**	**4**	**0**	**1**	**0**	**0**	**3**	**0**	**21**	**42,9**
Ma	**20**	**11**	**4**	**2**	**2**	**1**	**2**	**3**	**0**	**45**	**44,4**
Iv	**80**	**24**	**14**	**3**	**8**	**5**	**5**	**15**	**1**	**155**	**51,6**
BM	**23**	**8**	**4**	**0**	**2**	**0**	**3**	**8**	**1**	**49**	**46,9**
***Pox**	**11**	**5**	**1**	**0**	**4**	**0**	**6**	**4**	**0**	**31**	**35,5**
Total	**223**	**91**	**47**	**10**	**27**	**9**	**27**	**57**	**2**	**493**	

Table 2. Sibudu. Distribution of classes of tools from the Sibudu Techno-Complex. *The data from Pox were incomplete at the time of writing. Data compiled by Gregor Bader and may contain some minor inconsistencies.

Figures

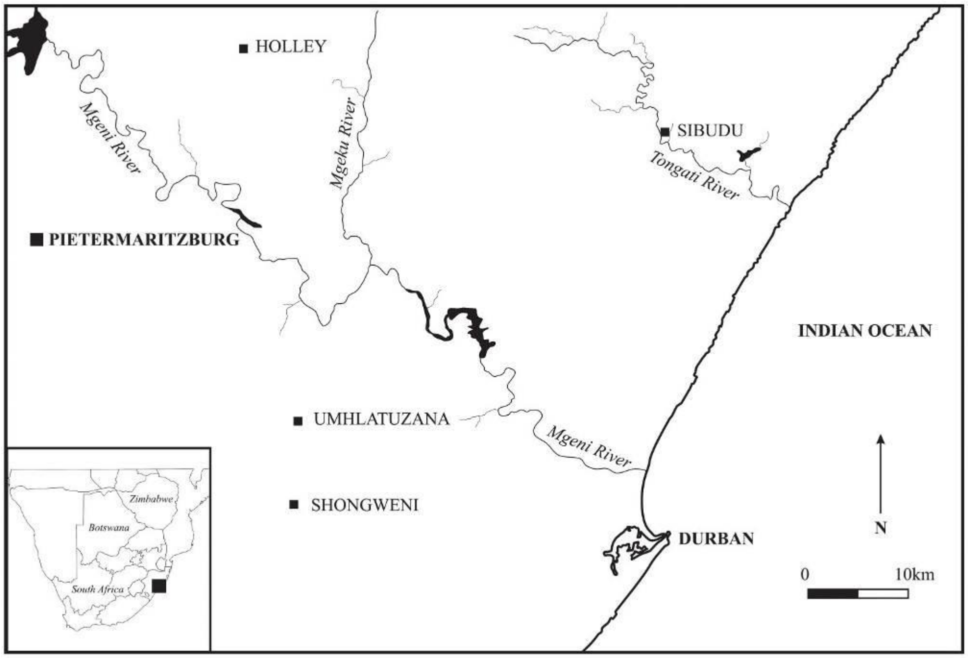


Figure 1. Location of Sibudu Rockshelter. Figure after Wadley and Jacobs 2006.

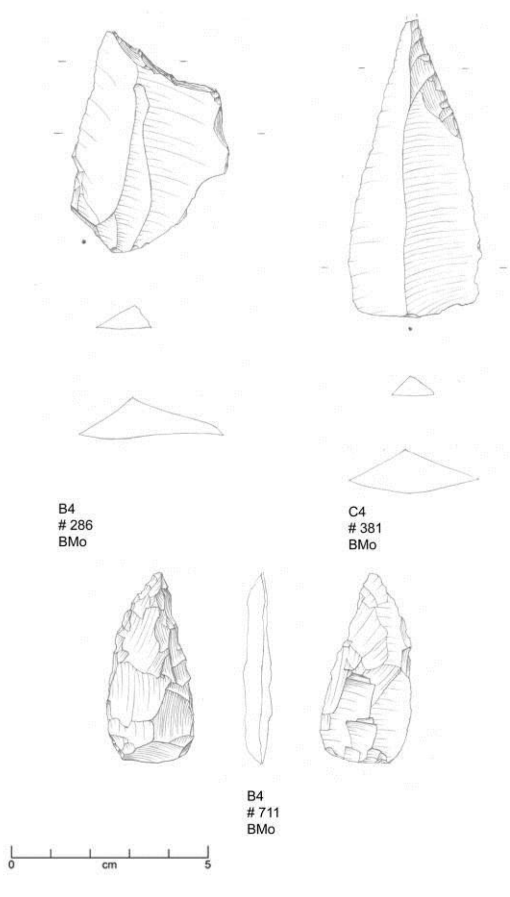


Figure 2 Sibudu. Tools from Burnt Mouse (BMo) in the deep sounding. Drawings F. Brodbeck.

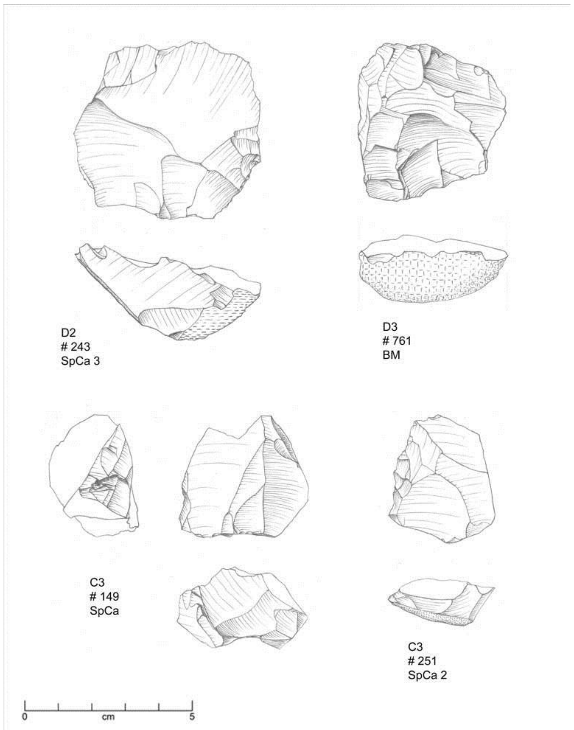


Figure 3. Sibudu. Cores from the Sibudu Techno-complex. Drawings F. Brodbeck.

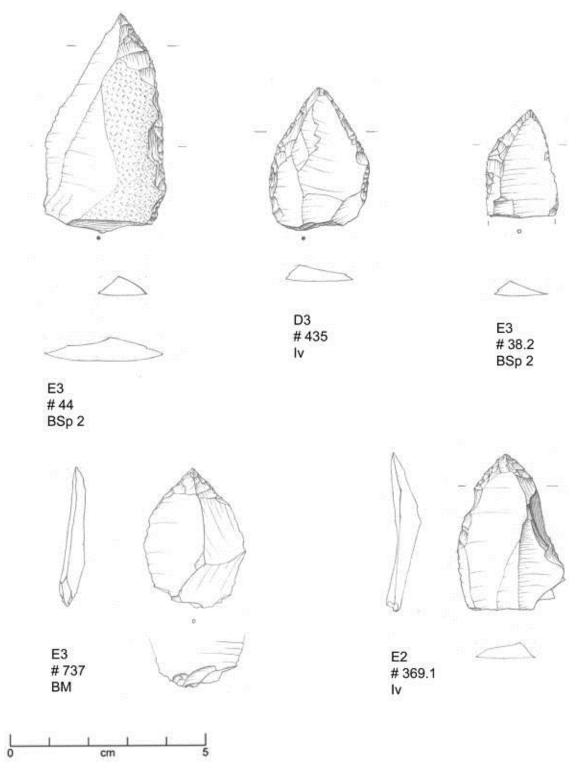


Figure 4. Sibudu. Tongati tools from the Sibudu Techno-complex. Drawings F. Brodbeck.

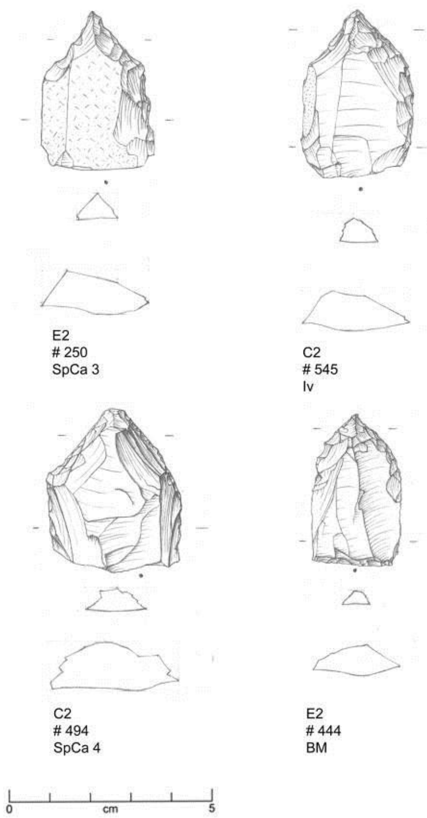


Figure 5. Sibudu. Tongati tools from the Sibudu Techno-complex. Drawings F. Brodbeck.

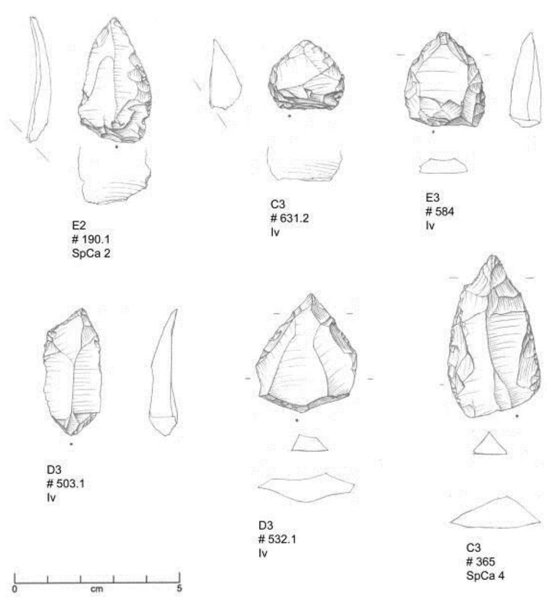


Figure 6. Sibudu. Tongati tools from the Sibudu Techno-complex. Drawings F. Brodbeck.

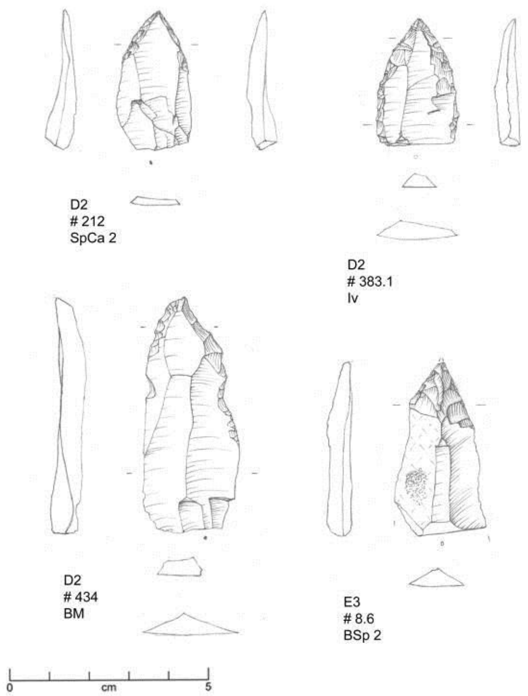


Figure 7. Sibudu. Tongati tools from the Sibudu Techno-complex. Drawings F. Brodbeck.

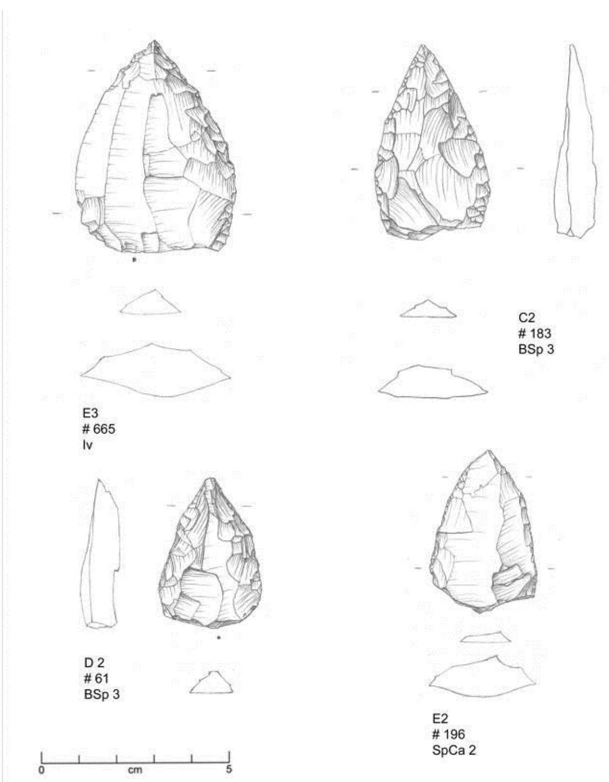


Figure 8. Sibudu. Tongati tools from the Sibudu Techno-complex. Drawings F. Brodbeck.

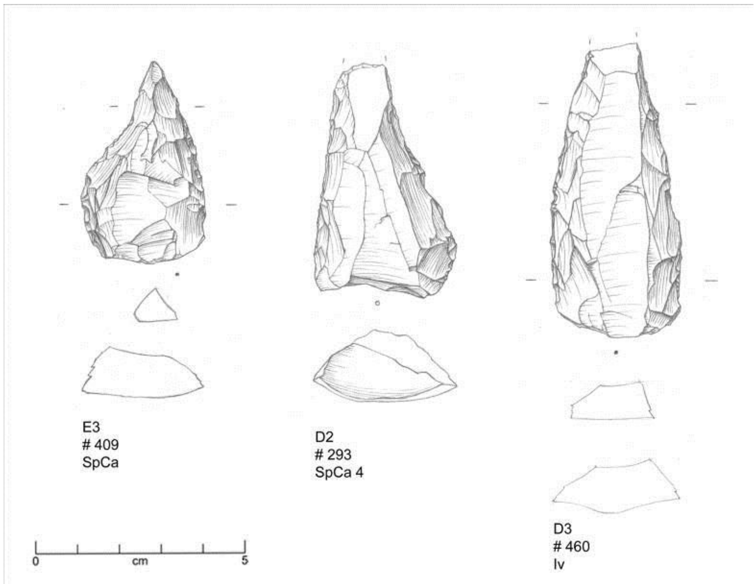


Figure 9. Sibudu. Ndwedwe tools from the Sibudu Techno-complex. Drawings F. Brodbeck.

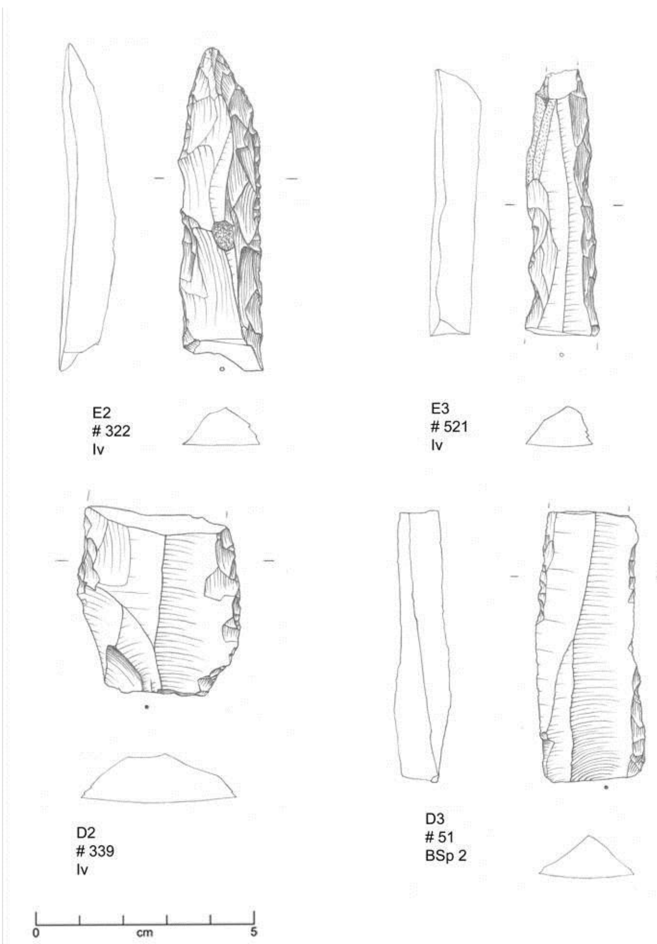


Figure 10. Sibudu. Nedwedwe tools from the Sibudu Techno-complex. Drawings F. Brodbeck.

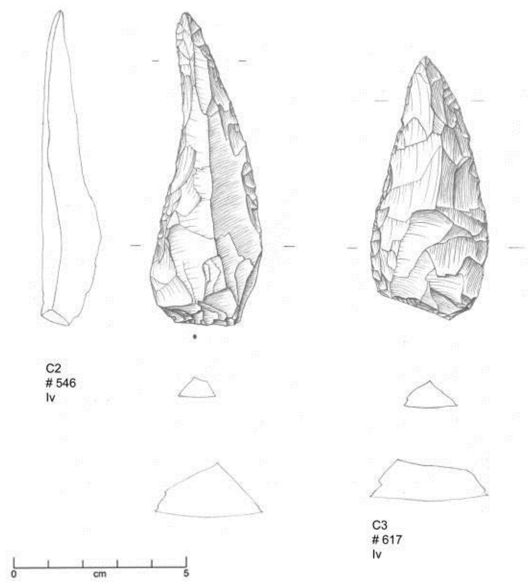


Figure 11. Sibudu. Nedwedwe tools from the Sibudu Techno-complex. Drawings F. Brodbeck.

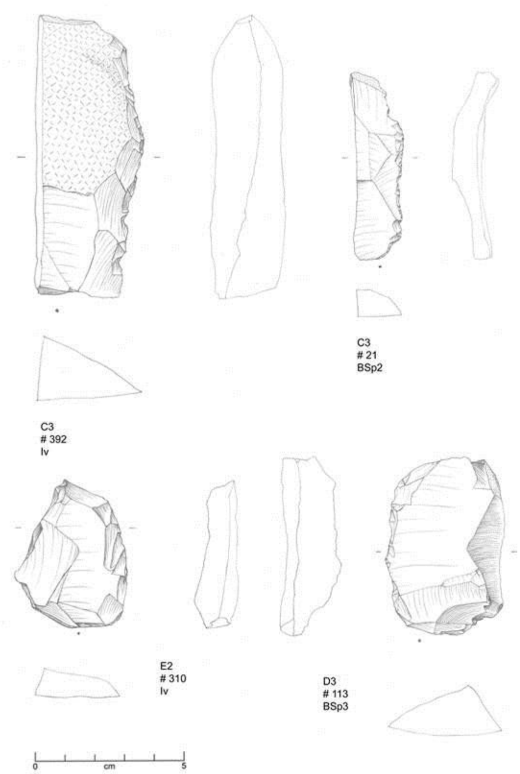


Figure 12. Sibudu. Naturally backed tools from the Sibudu Techno-complex. Drawings F. Brodbeck.

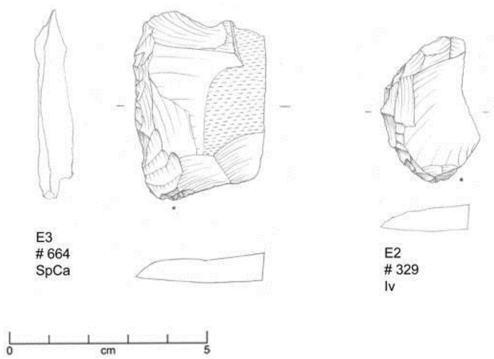


Figure 13. Sibudu. Naturally backed tools from the Sibudu Techno-complex. Drawings F. Brodbeck.

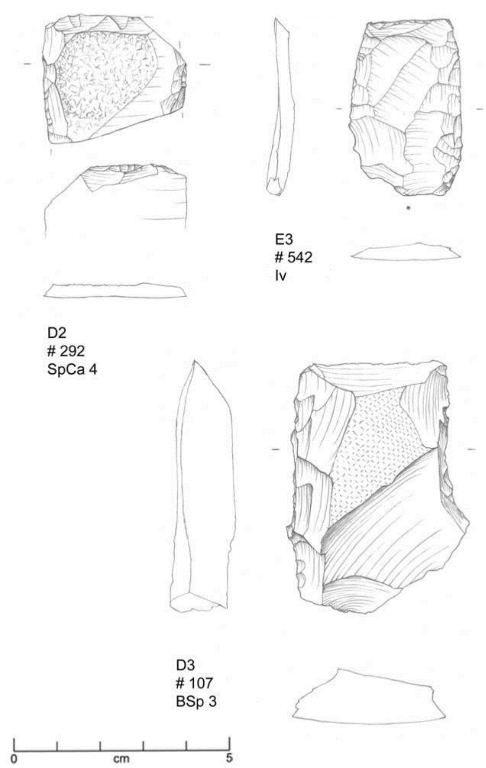
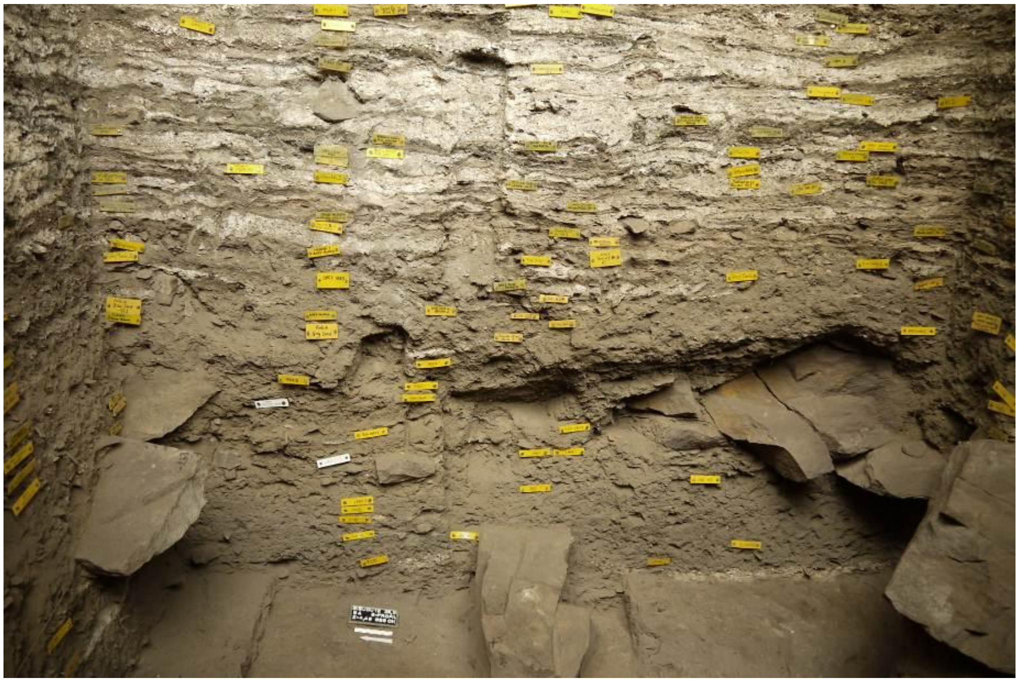


Figure 14. Sibudu. Biseaux from the Sibudu Techno-complex. Drawings F. Brodbeck.

Photographs

Photograph 1. Sibudu. Overview of the excavation, March 23, 2012. Photo N. J. Conard.

Photograph 2. Sibudu. View of the deep sounding and eastern excavation. M. Zeidi is working in the deep sounding and F. Brodbeck in the in the eastern excavation, March 8, 2012. Photo N. J. Conard.



Photograph 3. Sibudu. View of the strata in the deep sounding. The white layer clearly visible on the bottom of the excavation unit on the right (C4) is Burnt Mouse (BMo), March 28, 2012. Photo M. Zeidi.

Photograph 4. Sibudu. Finds from the third *Abtrag* in Ivory, March 9, 2012. Photo N. J. Conard.

Photograph 5. Sibudu. S. Rudolf cleaning the surface of the base of the second *Abtrag* in Pox with many areas of burnt and ashy sediments, March 27, 2012. Photo N. J. Conard.

Photograph 6. Sibudu. Base of *Abtrag* 3 in Ivory showing many areas of burnt and ashy sediments. N. J. Conard and M. Zeidi overlooking the excavated surface, March 11, 2012. Photo S. Rudolf.

Photograph 7. Sibudu. Visit of the Archaological Society. C. Sievers in center of the picture, March 17, 2012. Photo M. Ecker.

Photograph 8. Sibudu. Overview of the site after the excavation had been closed for the season, March 29, 2012. Photo M. Zeidi.

Photograph 9. Sibudu. Images of six bifacial points and two unifacial points from the deep sounding. Photos M. Zeidi.

Ballito, KwaZulu-Natal
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