The Earlier Stone Age Lithic Assemblage from Wonderwerk Cave, Northern Cape Province, South Africa

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The site of Wonderwerk Cave, located in the Northern Cape Province between the towns of Danielskuil and Kuruman, preserves an extraordinary sequence that spans close to 2 million years of hominin activity (see Chazan and Horwitz, this volume, for an overview of the site). The earliest phases of occupation have only been recovered in Excavation 1 near the front of the cave in excavations carried out by Peter Beaumont between 1979 and 1992. The dating of this sequence has been the main thrust of publications on Excavation 1 (Beaumont & Vogel 2006; Chazan et al. 2008). Analysis of the lithic assemblage from the Acheulean occupation is now well advanced and a preliminary report on this analysis, focused on the bifaces that are the dominant component of the assemblage, is presented here. The basal assemblage from Archaeological Stratum 12, which is attributed to the Oldowan, is not discussed here (see Chazan et al. 2012). The results of analysis of the Acheulean bifaces from Excavation 1 identify important trends in the development of biface technology through the Wonderwerk sequence.

Beaumont excavated in a yard square grid inherited from earlier excavations by Malan (Malan & Cooke 1941; Malan & Wells 1943). He excavated by stratigraphic layer and within each stratigraphic layer by 5-10 cm. spits. The Earlier Stone Age corresponds to Archaeological Strata 11-6. Our team has developed a sequence of Sedimentary Units for Archaeological Strata 9-12 as part of a program to date the exposed sections of Excavation 1 (Chazan et al. 2008; Chazan & Horwitz, in this volume). Unfortunately, artifacts recovered by Beaumont cannot be securely correlated to the sedimentary units so the Archaeological Strata form the basis for this study.

In Beaumont’s excavation all sediments were sieved through a fine mesh and all material recovered in the sieves is curated in the McGregor Museum (Beaumont 1990; Beaumont & Vogel 2006). The bulk of the material from Excavation 1 is non-artefactual rubble and the actual artifact assemblage is remarkably small, given the scale of the excavation and the time depth it represents (Table 1). The size of the flake and core assemblage from the Acheulean limits the observations that can be made about these aspects of technology. There is little evidence for prepared core technology and no evidence for blade production from these contexts.

The initial stage of analysis focused on collecting metric data for the biface assemblage, using the methods developed by Roe (1964). The results of this analysis point to a high degree of stability through the sequence, particularly in terms of the size of bifaces. Thus no evidence was found to support Beaumont’s assertion that the Stratum 5 through 8 assemblages were dominated by small handaxes and thus fit with the criteria for the Fauresmith. Based on the absence of both blade production and small bifaces we suggest that Strata 10-5 in Excavation 1 are best attributed to the Acheulean. The Stratum 11 assemblage is too small for a cultural attribution. The most striking aspect to emerge from the metric analysis is a reduction in the thickness of bifaces between Archaeological Stratum 9 and Archaeological Stratum 8. This trend remains apparent when one looks at length/thickness, with an increase in this value between Archaeological Stratum 9 and Archaeological Stratum 8.

A second stage of analysis has now focused on a qualitative description of the production sequence for each handaxe. The results of this analysis are presented here for Strata 11-8, which corresponds to the section for which ages have been determined based on a combination of palaeomagnetism and cosmogenic burial age dating (Chazan et al. 2008; Matmon et al. 2012, Chazan & Horwitz, in this volume).

Stratum 11

Stratum 11 overlies the red sand deposits of Stratum 12, which have yielded a small flake industry attributed to the Oldowan. There are only two bifaces, and 19 tools in total, from this stratum. The first biface (SPL 37, Figure 1a) was found near the base of Stratum 11 and possibly should be attributed to Stratum 121. This piece appears to be made on an irregular natural spall of ironstone. Most knapping is confined to one edge, oblique on one face and invasive on the other face where there is a sequence of unidirectional

1 SPL numbers refer to the cataloguing system for the lithic analysis at Wonderwerk.
flake removals. The tip is created by a series of small removals and the tip itself is blunt. This piece is similar to some of the bifaces from Sterkfontein Member 5 (Kuman 1994).

The second biface (SPL 36) is from the top of Stratum 11 and might belong to Stratum 10. This is the earliest large ironstone slab found in Wonderwerk Cave and knapping is limited to a series of short removals along the periphery. The tip is missing. The piece is heavily damaged by potlids that are associated with the development of calcium carbonate.

**Stratum 10**

Seven bifaces were recovered from Stratum 10. With one exception none of the bifaces show invasive flake scars. Biface tips tend to be cleaverlike, although the dimensions do not match the definition for cleavers. All are on slabs of ironstone with the exception of two (SPL 39 and 702) which are on large cortical flakes. One piece (SPL 45) included as a biface could be classified as a chopper as it consists of three large removals with deep bulbs of percussion on an ironstone cobble. Several of the bifaces have more than one working edge. The most striking of these is SPL 39 (Figure 1b), which is on a large semi-cortical flake of homogenous grey ironstone. This biface is trapezoidal in section with one edge formed by a pre-existing dorsal flake scar and the other by abrupt removals off the opposing edge. There are just a few invasive flake scars, all with prominent bulbs. The tip is offset from the main axis and has been formed with a series of flat removals off one face. There is also limited working on the base which has a cleaver-like edge that is quite sharp. From a functional perspective this can be seen as a double cleaver/handaxe tool.

SPL 701 is a very finely made biface that seems out of context in Stratum 10. It is on red homogenous banded ironstone, a material rare in St 10, and badly fractured, again a feature not common in this stratum. The piece is flaked bifacially around the entire circumference creating a symmetrical handaxe with a pointed tip damaged by what might be impact fracture. Unlike any other pieces from Stratum 10 the retouch is fine and invasive without prominent bulbs of percussion. It seems most likely that this is intrusive from Stratum 9 or higher up in the sequence.

**Stratum 9**

Stratum 9 is at the top of the dated section. The palaeomagnetic signal for this stratum is normal but there is clear evidence for a major unconformity within the stratum. Because of this unconformity it is quite plausible that Stratum 9 spans both the Jaramillo (1.1 ma.-0.9 ma.) normal event and the onset of the Brunhesmal chron (0.78 ma.). During excavation, Stratum 9 in some squares was subdivided into subphases A through J, however we are still in the process of working out the horizontal and vertical definition of these subphases. As a result, it is very difficult to determine the stratigraphic relationship between bifaces within Stratum 9. This is a critical problem as the sample of bifaces from Stratum 9 includes the only clear evidence of the Victoria West technique at Wonderwerk Cave. The overall diversity of the Stratum 9 assemblage is consistent with the possibility that it incorporates two distinct time horizons.

Four bifaces (SPL 98, 104, 397, and 398) were found in squares 029, S28, and S29 at 20-30 cm below the top of the Stratum 9 (Figure 1c). Because these excavation squares are in close proximity to the dated section we can say with confidence that these bifaces were found below the discontinuity in the sequence. None of these bifaces has evidence of invasive flaking and for all three the working end is either broken or unclear. SPL 397 is apparently made on a rolled flaked piece of ironstone which was then retouched with a series of very abrupt flake removals.

Four bifaces can be confidently attributed to the top of Stratum 9 above the unconformity. Two of these bifaces, (SPL 96 and SPL 394) have flat invasive retouch, the first evidence of this feature in the sequence (with the exception of SPL 702 found in Stratum 10 but apparently out of context). There is also one very finely retouched distal handaxe fragment from Square Q32. SPL 394 is a cleaver on what appears to be a large ironstone flake.

Unfortunately some of the most interesting pieces from Stratum 9 can only be tentatively assigned to the upper part of the stratum. SPL 97 (Figure 2b) is a biface that shows two stages of manufacture. Flaking is bifacial around the entire circumference and consists of invasive flake scars with shallow bulbs. This fine workmanship stands in sharp contrast to a final stage of fabrication which involved pinching in the distal end to form a tip. Here the removals are unifacial steep removals with deep bulbs. It is tempting to see this as the reshaping of a broken handaxe where the reshaping was carried out either without time for careful knapping or by an individual who did not have a high level of skill. This piece comes from 10-15 cm below the top of Stratum 9 in a square 5 m from the dated section.
SPL 95 is a rare biface on a large block of chert. The impression is that this was a very difficult material to work. Much of one face and the base remain unworked and the second face also maintains some cortex. Most removals have deep bulbs and are not very invasive and there are even a number of hinge fractures. A series of very fine removals off one edge with shallow bulbs were used to shape the tip.

SPL 99 (Figure 2a) is a classic Victoria West cleaver on igneous rock. Unfortunately the labelling on this object is indistinct but it appears to come from substratum 9a which is at the top of the sequence. The most similar object, SPL 394, does clearly come from the top of the stratum. The presence of a Victoria West cleaver links Stratum 9 with the site of Canteen Kopje on the Vaal River where the Victoria West is a dominant technology (Sharon and Beaumont 2006; McNabb 2001). It is important to note that there are sources of igneous rock on the west side of the Kuruman Hills, 5-10 km. from Wonderwerk.

**Stratum 8**

In Stratum 8, flat invasive retouch is well established (n=9) however bifaces formed by steep non-invasive retouch remain a significant component of the assemblage (n=8). Among the steeply retouched bifaces, fine retouch or tranchet removals near the tip are common. Although ironstone slabs are the dominant raw material there are also bifaces made on dolomite, ironstone, igneous rock, and chert. Handaxe shapes are dominant but tips can be either cleaver form or pointed. Several bifaces show damage to the tip. One dolomite biface (SPL 85) is lancelate in shape. The well formed bifaces tend to be plano-convex in section.

One particularly interesting piece (SPL 18) is a Victoria West cleaver made on a large ironstone flake. The cleaver bit is finely retouched on the dorsal face. It appears that the platform has been knapped away in the process of shaping the right margin of the distal surface. There is continuous non-invasive retouch along this edge while on the other edge there is no clear evidence for retouch that postdates the removal of the flake. This piece was found near the base of Stratum 8 and supports the conclusion that the Victoria West Cleaver from Stratum 9 (SPL 99) comes from the upper part of this stratum. Another biface found near the base of Stratum 8 (SPL 7) is a cleaver on a flake and fits within the Victoria West concept. However, the acute edge here is not from the shaping of the core but rather is the acute angle of the natural edge of the ironstone slab.

Several of the bifaces from Stratum 8 have notches created by single large flake removals. For example on SPL 77 (Figure 2c) there are four notches around the base. There is one deep hinge fracture near the tip that creates a small notch. On SPL 82, a chert biface, the final phase in the working of the tip is a series of small removals off the convex face creating a notch. The edge opposite the notch is very regular.

SPL 28 found near the top of Stratum 8 is an extraordinarily small biface (L= 4.5 cm.) made on a chert pebble. It is formed essentially by bifacial abrupt retouch of one edge and invasive flakes off one face. The surface without invasive retouch has some remaining cortex.

**Discussion**

The first biface at Wonderwerk Cave is found near the base of Stratum 11 which we place, based on a combination of cosmogenic burial age dating and palaeomagnetism, at the beginning of the Reverse period following the Olduvai subchron. This period covers the interval from 1.8-1.07 ma. but the cosmogenic age suggests that the base of Stratum 11 is towards the beginning of this interval. Regular biface production begins in Stratum 10 with an absence of flat invasive flake removals. Bifaces are made on flat slabs of ironstone but at least two bifaces appear to be made on large cortical flakes. There is one handaxe that is an exception to this pattern but it appears to be intrusive. Stratum 10 is attributed to the Jaramillo Normal subchron on the basis of palaeomagnetic and cosmogenic age determinations. This stratum fits within the description of the Early Acheulean (Sharon 2007) or the Earliest Acheulean (McNabb, Sinclair & Underhill 2009). The bifaces from the base of Stratum 9 continue to lack invasive flaking and are very similar to the bifaces from Stratum 10. We hypothesize that the unconformity visible within Stratum 9 corresponds to the Reverse period intermediate between the Jaramillo Normal subchron and the Brunhes Normal chron (1.0-0.78 ma.) and that the bifaces from the upper part of Stratum 9 are younger than 0.78 ma. It is at this point that two new technologies appear in the Wonderwerk sequence: invasive flaking and the Victoria West technology. These technologies persist in the overlying Stratum 8. Based on the Wonderwerk sequence it appears that biface manufacture first appears ca. 1.5 ma. but is limited to shaping of tools with non-invasive flakes with deep bulbs of percussion. Cleavers make up a significant component of this assemblage. Invasive flake scars and the Victoria West technology first appear in the upper part of Stratum 9 which we sug-
gest dates to the Bruhnes Normal even (<0.78 ma). Ongoing research on the dating of the Excavation 1 sequence will further test this model for the development of bifacial technology at Wonderwerk Cave.

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**References**


**Table 1. Breakdown of Artefacts for Strata 11-8, Excavation 1, Wonderwerk Cave**

<table>
<thead>
<tr>
<th>Stratum</th>
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A. SPL 37, Stratum 11. The earliest appearance of the bifacial concept at Wonderwerk found at a depth of 30-35 cm in Stratum 11. This biface appears to be made on a natural spall of ironstone. It is possible that the bottom right of the right side view should be reinterpreted as a large flake scar but there is no evidence of ripples or other features that would support this view. Most knapping is along one edge, oblique on one face (right) and invasive on the other where there is a sequence of invasive unidirectional flakes. The tip is created by a series of small removals without any particular order and is somewhat blunt. It is possible that the small removal off the right side is actually damage.

B. SPL 39, Stratum 10. Apparently a large semi-cortical flake of homogenous grey ironstone. The tip is offset from the main axis. Essentially trapezoid in section with one edge formed by a pre-existing dorsal flake scar and the other by abrupt removals off the opposing edge. Just a few invasive flake scars, all with prominent bulbs. There is a flat removal off tip on one face. Limited working on the base, which has a cleaver-like edge and is quite sharp. In a sense this could be seen as a double tool, cleaver/handaxe.

C. SPL 98, Stratum 9 (bottom). This is a small flat slab of ironstone with cortex on much of both faces. There is no clear effort to create a working end, although there is possible damage at what is identified as the tip. None of the flake scars is invasive and there is one massive hinge fracture.
Figure 2. A. SPL 99, Stratum 9; B. SPL 97, Stratum 9; C. SPL 77, Stratum 8.

A. SPL 99, Stratum 9 (top?). This is a cleaver made on a large flake consistent with a removal from a Victoria West Core, on igneous rock. The cleaver tip is unretouched but does have some edge damage. There is continuous unifacial retouch along the dorsal face of the edge that did not come of the edge of the core.

B. SPL 97, Stratum 9 (top?), Flaking is bifacial around the entire circumference and consists of invasive flake scars with shallow bulbs. The raw material is red ironstone with no obvious bedding plains. The fine workmanship stands in sharp contrast to a final stage of fabrication that involved pinching in the distal end to form a tip. Here the removals are unifacial steep removals with deep bulbs. It is tempting to see this as the resharpening of a broken handaxe. There are concretions adhering to small areas of the piece and that feature along with the shallowness of the flake scars make it difficult to determine whether there is cortex from a slab or features that would suggest that this was made on a large flake.

C. SPL 77, Stratum 8. A very symmetrical handaxe made on a block or slab of homogenous ironstone. No cortex remains. The handaxe has been finely knapped all the way around including the base. It is plano-convex in profile with little evidence of successful invasive thinning flakes. Given the care taken in manufacture a set of notches along one edge from the base until just past the midpoint are interesting. The notches are created by single invasive flakes off the convex face and show no evidence of fine finishing. The tip is oval and creates a cleaver-like cutting edge.