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EDITORIAL

Welcome to *Lithics* 35. We hope that you will read it with interest!

This year has been one of change for *Lithics*. As the journal's new editor, I begin by giving our warmest thanks, on behalf of the Lithics Studies Society, to Beccy and Andy Shaw, who for a great many years were the steadfast stewards of, and driving force behind, *Lithics*. I also welcome Lynden Cooper, the new assistant editor, to the editorial staff.

I am pleased to say that our inaugural issue is full of fascinating articles that span the globe. First, Riris and Romanowska take us to Argentina, where they explore the reduction of curved cleavers and raise some interesting new questions about their manufacture. Serwatka also piques our interest with a study of shape variation among central European Late Middle Palaeolithic bifacial tools focusing specifically on southern Poland. Davis highlights the importance of often-underused archival material for understanding and interpreting Pleistocene archaeological sites with his paper on the geological context of a handaxe assemblage from southern England. Harding provides his account of replicating the Neolithic axe haft from Shulishader, Lewis, UK and some of the experiences gained. Finally, Beresford gives us a preliminary report on some Palaeolithic sites from the Upper Ravensbourne area in Bromley.

This year, we mourn the unexpected passing of Ron Waite—who was instrumental to the Midlands community of prehistoric archaeologists. The two letters from friends and colleagues printed in this issue, one by Alan Saville and Anne Graf and the other by Terry Hardaker, attest to the large hole that he leaves behind. We thank them all for their touching and warm homages and offer his loved ones our condolences.

The quality of these articles is in no small part due to the peer reviewers who edited and commented on manuscripts. Their anonymous help is the quality control of scholarly discourse that keeps our discipline grounded.

The world of publishing is, for better or worse, changing and we are no exception. *Lithics* has in recent years been moving ever so slowly towards augmenting its online presence and as a result, supplementary data, colour copies of the articles and PDF copies of recent issues are now available within the members' area of the Lithic Studies Society website. We here at *Lithics* are constantly thinking about how we can improve the distribution and quality of our publication and we welcome any thoughts or suggestions by email to lithicseditor@gmail.com.

From now on, *Lithics* will only accept submissions by electronic copy. Updated notes for contributors and a cover form for submission are available on the website. Please use these! The submission deadline for *Lithics* 36 is June 27th, 2015 and submissions from all members and non-members alike are very welcome.

We hope you enjoy reading *Lithics* 35.

Wei Chu

Cover. A scanning electron microscope photograph of Brandon flint. (Photograph © Wei Chu.)

A RECONSTRUCTED REDUCTION SEQUENCE FOR CURVED BIFACIAL STONE TOOLS FROM THE EASTERN LA PLATA BASIN, ARGENTINA

P. Riris[1] & I. Romanowska[1]

ABSTRACT

A distinctive regional lithic industry is found in the eastern La Plata basin, known as the Altoparanaense culture in northeastern Argentina, and the Humaitá tradition in southern Brazil. These archaeological cultures are recognised on the basis of large bifacial tools. The earliest deposits are dated to the ninth millennium BP, and elements of these industries continue to be produced into the post-contact period (8640±95 to 310±50 cal BP). One of the most characteristic features of the assemblages in the region is the presence of a particular class of bifacial tool known as "curved cleavers", whose name stems from their distinctive asymmetrical shape. We describe the reduction sequence of these tools based on a spatially extensive sample from Misiones province, Argentina. This study provides for the first time a full chaîne opératoire *for curved cleavers and compares it to the findings of the only published experimental study. We use a logistic regression model to verify the reconstructed five-stage reduction sequence and further support it with a metric analysis of artefact attributes within each identified stage of reduction. Our results support the conclusion that many bifacially reduced artefacts encountered in the larger study region may actually be unrecognised pre-forms of curved cleavers.*

Full reference: Riris, P. & Romanowska, I. 2014. A reconstructed reduction sequence for curved bifacial stone tools from the eastern La Plata basin, Argentina. *Lithics: the Journal of the Lithic Studies Society* 35: 5–17.

Keywords: Argentina, curved cleavers, *chaîne opératoire,* regression analysis, bifacial reduction

INTRODUCTION

In this paper we identify and describe the reduction sequence of a class of lithic artefacts commonly encountered in the material record of Misiones province, Argentina and the bordering southern Brazilian states of Santa Catarina, Paraná and Rio Grande do Sul. The artefacts in question are referred to typologically as curved "cleavers", or "boomerangoids" (Menghin 1955/56; Schmitz 1984 & 1987; Prous 1992), owing to their distinctive curvaceous shape (Fig. 2)*. On the basis of ethnographic parallels, the function of these bifacial artefacts has been interpreted in Misiones as digging or foraging implements (Nami 2006: 141).

Typological classification has been the dominant methodology for the analysis of stone tool technology in the region for much of the history of archaeological research (Laming-Emperaire 1967; Barreto 1998: 575; Noelli 2005), and curved cleavers have been used as a fossil index of the Humaitá tradition. Additionally, the date range cited for assemblages containing curved cleavers extends over nine millennia, implying a great continuity of their production over a vast region and immense time span. This suggests that there was either a high degree of conservatism in lithic tradition on a tremendous spatial and temporal scale (see Dias 2012; Okamura & Araujo 2014) or that the spatially or temporally sensitive properties of the curved cleavers, e.g. their regional diversity, have yet to be fully characterised (Barreto 1998: 579). This paper is a step in that direction as it focuses on a spatially secure sample of these artefacts collected in western Misiones province in the upper Paraná valley, near the town of Eldorado. Unfortunately, coming from non-stratified contexts, the collected assemblages can shed no light on the variability of curved cleavers over time.

HISTORY OF RESEARCH ON CURVED CLEAVERS

Curved cleavers were first classified by Menghin (1955/56), and were ascribed to a "Palaeolithic" occupation of the territory of Misiones he named the *Altoparanaense* culture. This cultural division was based on the presence of curved cleavers—large bifacial lithic artefacts also recognised in assemblages in Paraguay (Menghin 1955/56: 181). In Menghin's framework, the appearance of the Altoparanaense represented the migration of the first South Americans into the region (Menghin 1957). In the decades following this initial description, archaeological investigators working in Rio Grande do Sul assigned curved cleavers to the pre-ceramic *Humaitá* tradition

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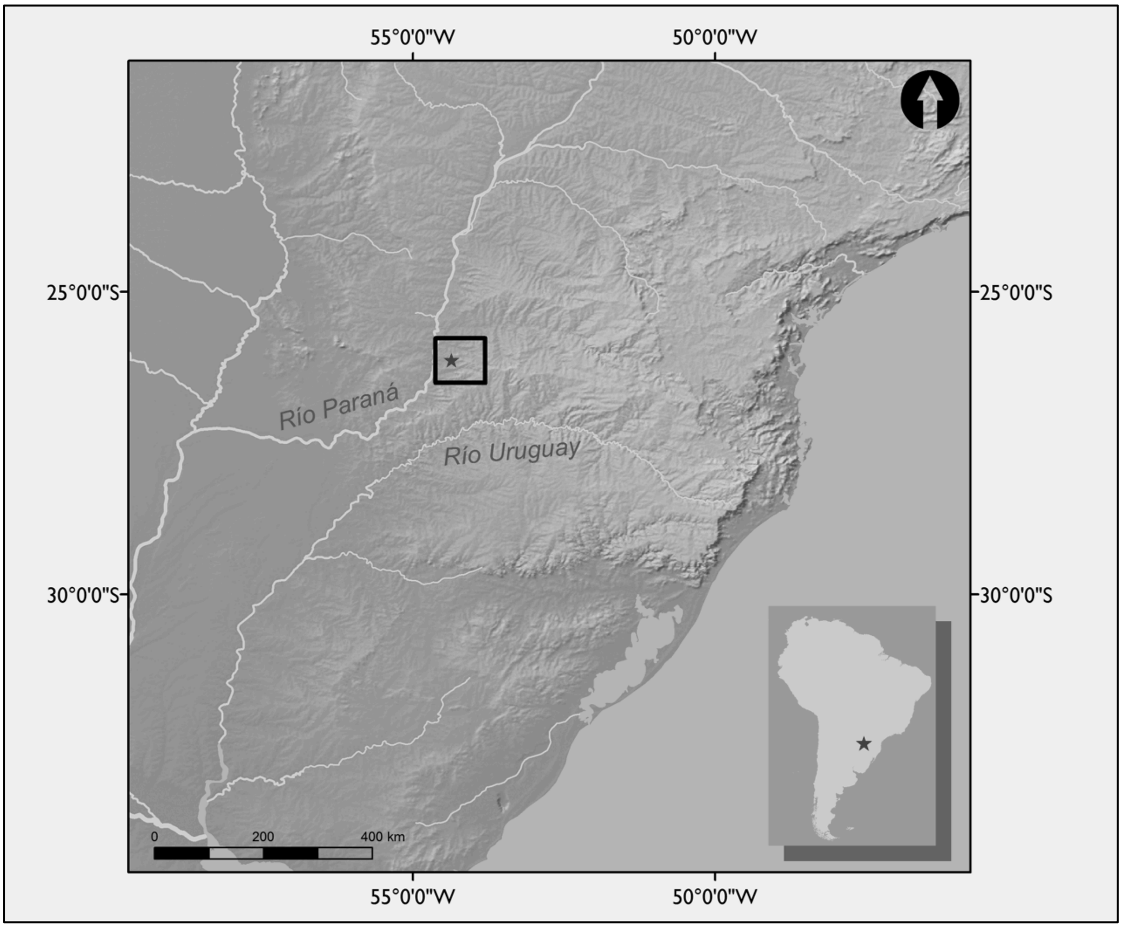

Figure 1. Location of Eldorado (star) and the Piray Mini and Piray Guazú valleys in southeastern South America

(Miller 1969a; Schmitz 1987). The expansion of coverage by later research across the southern states of Brazil showed that the artefacts recognised as curved cleavers and curved cleaver preforms are ubiquitous in the material record of the region (Miller 1969b; Brochado 1971; De Masi & Artusi 1985; Kern 1991; Hoeltz 2005). In disagreement with Menghin's original chronology, the groups that produced this particular tool type were found to post-date the first peopling of the continent (Schmitz 1987). The provenance of the cleavers was formerly thought to be small, highly mobile bands of hunter-gatherers adapted to forested environments (Schmitz 1987). This way of life, characterised by the lack of ceramic technology or cultivation, was thought to persist almost to the present (Kern 1981).

However, recent overviews of the lithic industries of southern Brazil have questioned the integrity of the received chronological and typological frameworks derived from the earliest archaeological research in the region (Hilbert 1994; Dias 2003; Dias & Hoeltz 2010; Hoeltz 2010). This critique notwithstanding, the majority of researchers assume that the Humaitá Tradition and Altoparanaense culture are effectively synonymous terms for related pre-ceramic cultures which existed over a broad time period (9th millennium BP to the contact period) within the southern Brazilian highlands including parts of Argentina and Paraguay. The earliest available radiometric date for a Humaitá assemblage is 8640±95 cal BP at site SC-U-6 in the upper Uruguay river, while the latest dates are in the mid-seventeenth century at site RS-RP-81 (Dias & Hoeltz 2010: 44). The extremely broad temporal range implies their production by both pre-ceramic groups and later ceramic-producing cultures (perhaps the Taquara/Itararé or Tupiguaraní traditions) (Hoeltz 2007: 210; Dias & Hoeltz 2010).

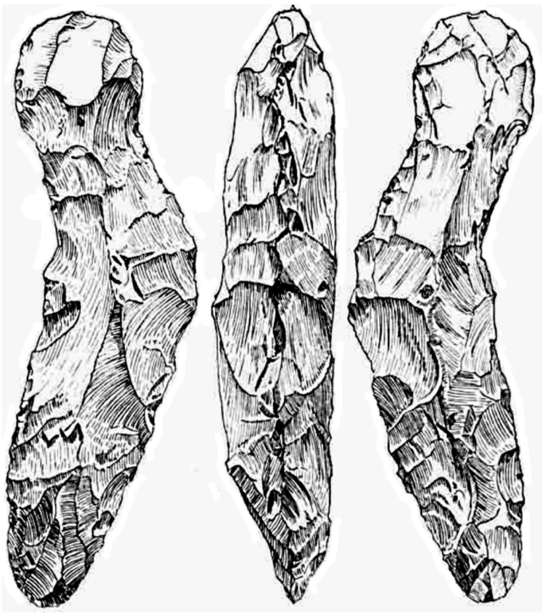

Figure 2. Curved cleaver from Yaguarazapá, Paraguay (after Menghin 1955/56)

Although the tool morphology is well recognised, a review of the literature that includes curved cleavers (e.g. Menghin 1955/56; Miller 1969b; Brochado 1971; Kern 1981; Schmitz 1984; De Masi & Artusi 1985; Schmitz 1987; Kern 1991; Hoeltz 2005) reveals a significant amount of variability in size, curvature, and overall elaboration of the tools. The large spatial and temporal range of this particular type of stone tool, as well as its association with more than a single cultural group, indicates that some of the culturally imposed variability in the shape, size and technology of curved cleavers might have not been recognised (see Dias 2003). No complete reconstruction of the curved cleaver reduction sequence based on archaeological material has been performed so far. What is the relationship between the initial blank size and subsequent stages of reduction? Is the curvature imposed during production or, as suggested elsewhere (Hoeltz 2007: 232), due to the selection of naturally curved nodules? Which attributes can be employed to distinguish curved cleaver blanks from those of other bifacial artefacts? The aim of this study is to fill some of those gaps in our understanding of the curved cleavers production process. To achieve this, we fully characterise the reduction sequence of curved cleavers from a specific region of Misiones province, Argentina, as well as compare it with an experimental study on this tool type. Apart from answering some of the aforementioned questions this should help to establish a point of reference for further comparisons with other regions, therefore providing a baseline for assessing potential variability of curved cleavers through their apparently wide spatial and temporal range.

The only technological study of curved cleavers was performed by Nami (2006), who tried to experimentally reproduce curved cleavers and identify distinctive stages of their *chaîne opératoire*. His proposed five stages of reduction (Table 1) are based on the morphological attributes of each stage, from the blank to the completed tool.

Nami (2006: 150) highlighted a lack of information on the initial stages of reduction but recognised that a blank could be obtained both by removal of flakes from a tabular core or a selection of an appropriately sized nodule of raw material (Nami 2006: 143−144). In his study, the blank was roughly worked to regularise the shape and prepare it for further work. This was followed by the main stage of the sequence, the bifacial flaking of the piece aimed at obtaining an elongated symmetrical shape. Only after this stage is the distinctive curve imposed on the tool, followed by careful regularisation of the edges by pressure flaking. Nami’s experimental study provides an informed conceptual yardstick for assessing the morphology of curved cleavers; however, it does reflect the choices taken by a modern-day knapper. It is therefore informed by our knowledge of the *chaîne opératoire* of better-understood bifacial tools that are mostly unrelated to curved cleavers (e.g. Acheulean handaxes). As such, it is in need of being checked against archaeological examples. Nami notes that his experimental work was aimed to provide researchers with a framework against which to compare archaeological assemblages. Here, it serves as a benchmark for the reduction sequence as reconstructed from archaeological examples of cleavers.

ARCHAEOLOGICAL MATERIAL AND ANALYSIS

Sample creation

The dataset used in this study has been derived from three primary sources. The majority of the specimens were obtained in June−July 2013 through systematic field walking survey in Misiones province as part of the Piray Mini River Exploration Project (Fig. 1). Second, we sampled an assemblage from the upper Piray Guazú river valley, which was surface collected by a University of Exeter project in 2010 and which remained in storage in Eldorado. Finally, we extended the sample with pieces from the collection of Ulf Moensted held in the *Casa del Fundador y Museo Municipal* in Eldorado, Misiones that were made available to us. From these three sources of material, we chose all artefacts showing signs of bifacial knapping. The total combined dataset (n = 66) represents all the stages of reduction of the curved cleavers, which allowed us to follow a traditional *chaîne opératoire* methodology (Inizan *et al.* 1999; Martinón-Torres 2002).

Method

We undertook qualitative and quantitative analysis of the sample (n = 66). The qualitative analysis consisted of a visual assessment of the artefacts and identification of the variability within the assemblage as well as changes in reduction strategy from tested cobbles to fully shaped and retouched pieces. For the quantitative analysis, a total of nine attributes were recorded on each artefact. In order to understand the range of variability in artefact size throughout the reduction sequence, we recorded the length, width and thickness in millimetres as well as weight in grams. Second, in order to derive a measure of the intensity of reduction at each stage, the amount of cortex on each side was recorded in a five-point nominal scale. Finally, the number of removals on each face was counted in order to reconstruct the order and intensity of reduction.

We also sought to test the predictions of the five-stage reduction sequence suggested by Nami (2006) and therefore compared his stages with the ones identified in this study. Additionally, we wanted to understand how and at what stage the distinctive asymmetrical outline, which gives the "curved" cleavers their name, was imposed on the artefacts. Thus, we recorded the symmetry in dorsal-ventral and left-right planes of the artefact as two Boolean variables.

RESULTS

Qualitative analysis of the *chaîne opératoire*

We identified five stages of reduction in the sample assemblage. This was achieved by observing the variability in cleaver morphology and establishing an ordinal ranking based on the amount of percussion and working on the pieces (Fig. 6).

Table 1. Summary of Nami's (2006) stages for curved cleavers

#	Stage	Description
1	Obtaining the blank	Large flakes or tabular nodules used as blanks.
2	Initial edging	No platform preparation; flakes often cover less than half of the width of the artefact; sinusoid, irregular edge.
3	Bifacial flaking	The piece is shaped into an elongated oval form; irregular pattern of flake removals; bi-convex, rectangular and triangular cross-sections.
4	Initial shaping	Careful bifacial flaking into roughly the correct shape.
5	Final shaping	Regularising the edges by pressure flaking. Cross-section is rhomboidal.

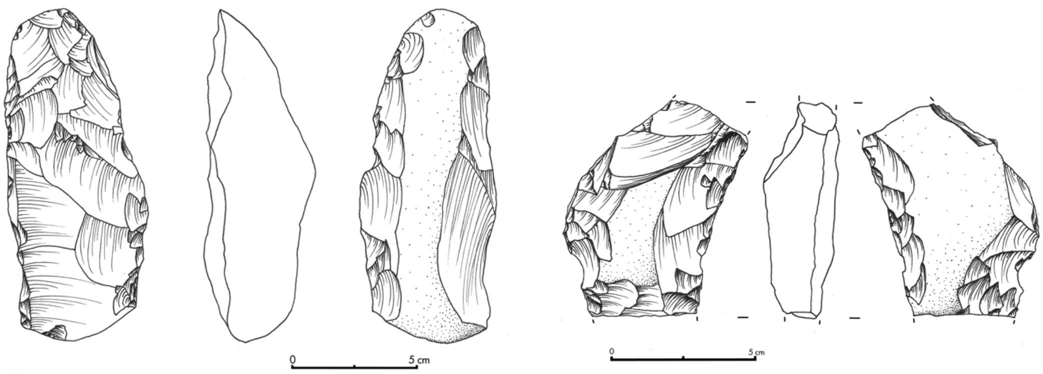

Figure 3. Examples of front-back asymmetry in a Stage 2 cleaver (left) and left-right asymmetry in a broken Stage 5 cleaver (right) from the sample assemblage

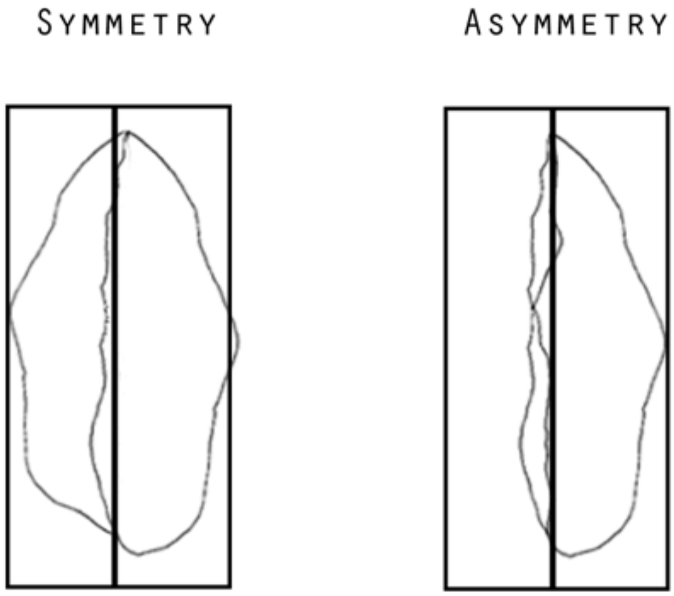

Figure 4. Method for assessing the dorsal-ventral symmetry of artefacts

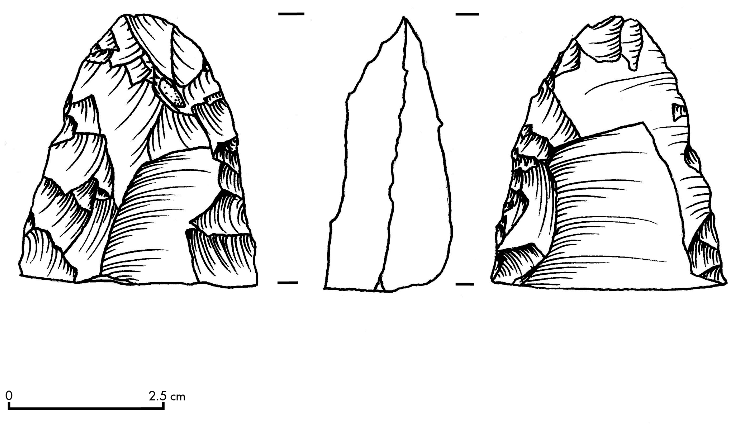

Figure 5. Broken tip of a curved cleaver exhibiting fine retouch

1. *Obtaining the blank*

   Two methods of obtaining the blank were recognised. Both classes of blank appear plano-convex.

   - 1a, in which a large flake is removed from an edge of a tabular nodule. The resulting blank has a flat surface (the ventral face of the flake) and a domed face (the edge of the original nodule) covered in cortex.
   - 1b, in which an elongated nodule had one of its faces reduced to create a flat surface, an equivalent of the ventral face in step 1a. The removals are usually broad and shallow, similar to thinning removals commonly observed in Middle Palaeolithic handaxes. The dorsal face remains cortical.

2. *Cortex removal on the domed face*

   The second stage consists of a series of detachments that remove the cortex on the domed face but maintain the dorsal-ventral asymmetry observed in the blank. These removals are usually deeper and shorter than the ones used to obtain the flat face in step 1b.

3. *Imposing dorsal-ventral symmetry*

   In the following stage, more reduction on each side is aimed at reducing the dorsal-ventral asymmetry and regularising the thickness of the piece. This stage of pre-form usually preserves small patches of cortex. A number of artefacts in the sample assigned to this stage had a triangular profile, which might have led knappers to abandon them, as suggested by Nami (2006).

4. *Shaping and regularising the rough-out*

   In stage four, the pre-form acquires its distinctive curved shape i.e. left-right asymmetry. The cross section is usually rhomboidal, and the distal end of a tool is more intensively worked.

5. *Finished product*

   Stage 5 tools have little cortex on both faces, and many display a pronounced left-right asymmetry. Most of the Stage 5 tools in our sample were broken at approximately one third of the total length of the piece (Fig. 5).

Quantitative analysis of reduction sequence

To validate this qualitative assessment, a logistic regression model was used to investigate the relationship between all of the recorded variables and the identified stages of reduction. In our case, we used logistic regression to assess the relationship between an independent variable, here the stage of reduction identified through the *chaîne opératoire*, and the dependent variables listed in Table 2. We emphasise that this quantitative analysis seeks to *verify* the stages identified through the qualitative analysis, which could be biased by the analysts' skills and previous experience. The results showed that all the dependent variables were highly significant demonstrating that each attribute has predictive power, and can explain up to 42% of variance in the sample. Furthermore, the results were assessed using a one-way analysis of variance (ANOVA), which confirmed a highly significant effect of all of the recorded variables on the affiliation between each artefact and a given reduction stage (Table 3).

Table 2. The results of the Logistic Regression Analysis performed on each dependent variable

Variable	*F-value*	*p-score (significance level)*	*R^2*
Cortex on the flat face	7.412	0.00834 **	0.1038
Cortex on the domed face	46.61	$3.74e^{-09}$ ***	0.4214
Symmetry: left-right	20.69	$2.46e^{-05}$ ***	0.2443
Symmetry: dorsal-ventral	39.12	$3.71e^{-08}$ ***	0.3793
Absolute difference between number of removals	28.12	$1.51e^{-06}$ ***	0.3053

Table 3. ANOVA results

Variable	$F_{1,60}$	*p-score (significance level)*
Cortex on the flat face	23.060	$1.09e^{-05}$***
Cortex on the domed face	79.913	$1.25e^{-12}$***
Symmetry: left-right	20.157	$3.30e^{-05}$***
Symmetry: front-back	32.200	$4.26e^{-07}$***
Difference in the number of removals on each face	6.853	0.0112*

Table 4. The results of the multiple regression analysis. R^2: 0.73 $F_{5,60}$= 32.44 p = $7.32e^{-16}$

Variable	*p-score (significance level)*
Cortex on the flat face	0.0345*
Cortex on the domed face	$1.41e^{-07}$***
Symmetry: left-right	0.0977
Symmetry: front-back	$1.37e^{-05}$***
Difference in the number of removals on each face	0.0112*

Finally, to investigate the possibility of covariance between dependent variables confounding the results of the logistic regression; a multiple regression model (termed the Full Model) was used (Table 4). The overall result of the Full Model was highly significant ($F_{5,60}$ = 32.44, p = $7.32e^{-16}$) with an R^2 value of 73%. The multiple regression model has also allowed us to recognise which, if any, of the variables have the highest predictive power that enables the attribution of an artefact to a given reduction stage. Here, we will discuss each of the recorded variables in light of the qualitative analysis. The Full Model indicated that the amount of cortex on the domed face and the dorsal-ventral symmetry are the best predictors for the reduction stage, which is consistent with our qualitative interpretation of the *chaîne opératoire*.

The amount of cortex on the domed face was more significant as a predictor for a given stage of reduction than the cortex on the flat face, which is not surprising as the latter is strongly related to the choice of blank rather than to the intensity of reduction. While Stage 2 and Stage 3 focus predominantly on removing the cortex from the domed face, the amount of cortex on this plane is a better indicator of the stage of the reduction sequence.

Further, the high significance of dorsal-ventral asymmetry is not surprising given that the early stages show a significant front-back asymmetry, which decreases as the piece is thinned in Stage 3. On the other hand, left-right asymmetry (i.e. the curve) is imposed only in the very late stages and is, therefore, virtually absent throughout most of the sequence and is therefore a worse predictor.

As would be expected, as a piece is gradually reduced, the absolute difference between the number of removals on each face steadily decreases throughout the sequence (Fig. 7), indicating that the stages identified in the qualitative analysis maintain their consistency in a quantitative analysis. This variable is also initially dependent on the method of obtaining the blank. If the blank was removed from a larger nodule then the number of removals on the flat equals one, while the domed face is fully cortical.

If, however, one side of a nodule was worked to obtain the preferred flat shape, then the number of removals on that face will be much higher than on the cortical domed face. For this reason this variable has lower predictive power compared to the dorsal-ventral symmetry and the amount of cortex. In addition, the change from a single intensively-knapped face to an equal amount of removals on both sides happens in the early stages of the reduction sequence.

Aikaike's Information Criterion (AIC) was used for model reduction and assessing the quality of each dependent variable relative to the Full Model (Table 5). This confirmed that the cortex on the domed face and the front-back symmetry possess the highest individual predictive power. Overall, the Full Model provides the best fit to the assemblage and, therefore, the statistical analysis supports the abovementioned qualitative assessment of the curved cleavers *chaîne opératoire* into the five stages presented in section 4.1.

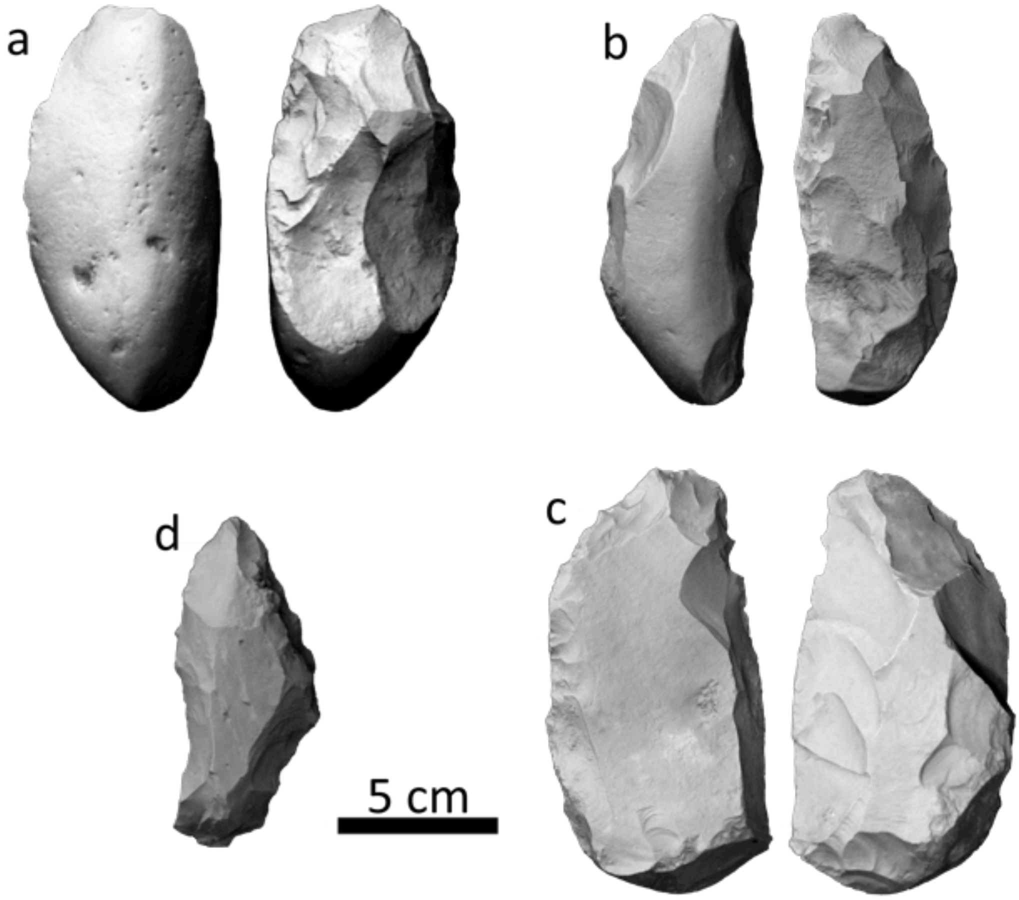

Figure 6. Photographs of cleavers in reduction stages 1 to 4 (a to d)

Table 5. The results of the model reduction using Aikaike's Information Criterion

Regression Model	*Degree of freedom*	*AIC*	*Drop 1*
Full Model	7	156.75	156.75
Cortex: flat face	3	227.92	159.71
Cortex: domed face	3	199.04	185.47
Symmetry: left-right	3	216.66	157.79
Symmetry: front-back	3	203.67	175.72
Difference in removals	3	211.11	161.89

Table 6. Descriptive statistics of the metric analysis of the sample assemblage (units in mm and g)

	Min	*1st Qu.*	*Median*	*Mean*	*3rd Qu*	*Max*	*St. Dev.*
Length	45.0	108.8	121.0	119.8	133.0	176.0	24.0335
Width	31.0	47.7	54.0	54.0	61.2	75.0	10.59034
Thickness	21.0	31.0	36.5	36.6	43.0	53.0	8.543805
Weight	29.0	204.2	324.5	303.8	371.0	618.0	135.2815

Metric analysis

All broken pieces were excluded from the metric analysis. Summary statistics of the sample assemblage shows a high degree of homogeneity in terms of dimensions, with artefact width and thickness possessing particularly low standard deviations (Table 6). In order to identify the directionality of reduction throughout the sequence, we compared the artefact dimensions within each reduction stage (Fig. 7).

Notably, the length of the artefact remains almost constant throughout the sequence until the final stage (Fig. 7). The width of the pre-forms decreases steadily from stage 2 when the tool begins to experience bifacial working and more cortical flakes are removed from its circumference. Contrary to this, the thickness shows a significant decrease only from Stage 3, which marks the beginning of the imposition of dorsal-ventral symmetry through the removal of the domed cortical surface obtained from the blank.

Not surprisingly, the weight shows a steady and continuous reduction throughout all the stages of *chaîne opératoire*. The consistency in weight decrease throughout the sequence supports the notion that the aforementioned patterns are not a result of the random noise in the sample, but instead reflect a genuine gradual reduction in the bulk of the raw material.

DISCUSSION

A number of the stages described above are consistent with the ones described by Nami (2006). Nonetheless, the two reconstructions differ significantly in several aspects, most notably in their understanding of when final shape is acquired. We performed a two-tailed, paired t-test on the data to test if the allocation of stages by Nami and the current model match. The results showed that the attribution of artefacts to his stages and the classification proposed in this paper differ significantly, which warrants further evaluation.

The point on which the two studies agree includes the suggestion that blanks are either large flakes detached from a tabular core, or a nodule. Furthermore, Nami's suggestion that the left-right asymmetry is imposed late in the sequence matches our observations. The distinctive 'curved' shape is virtually absent before the final stages. This disagrees with suggestions that naturally curved blanks were preferentially selected for producing curved cleavers (Hoeltz 2007: 232).

The main body of the experimental results, however, diverge significantly from the *chaîne opératoire* observed in the sample assemblage. The experimental study of Nami (2006) followed a standard procedure for bifacial reduction (see Callahan 1979; Le Tensorer 2006) in the experimental design. The archaeological assemblage analysed in this paper tells a different story. The asymmetrical working of the pre-form and the maintenance of one flat and one domed surface throughout the reduction sequence stands out clearly as a specific feature of the curved cleavers' *chaîne opératoire*. In terms of the sequence of actions required to produce a curved cleaver, the knappers intentionally concentrated on one face before working the other. This asymmetrical nature of the intensity of reduction was quantified by calculating the absolute difference between the numbers of removals on each face (Fig. 8). This index shows that until Stage 3, the disparity in the intensity of reduction between the two faces of a pre-form is pronounced. It is further supported by the aforementioned lack of dorsal-ventral symmetry in the early stages.

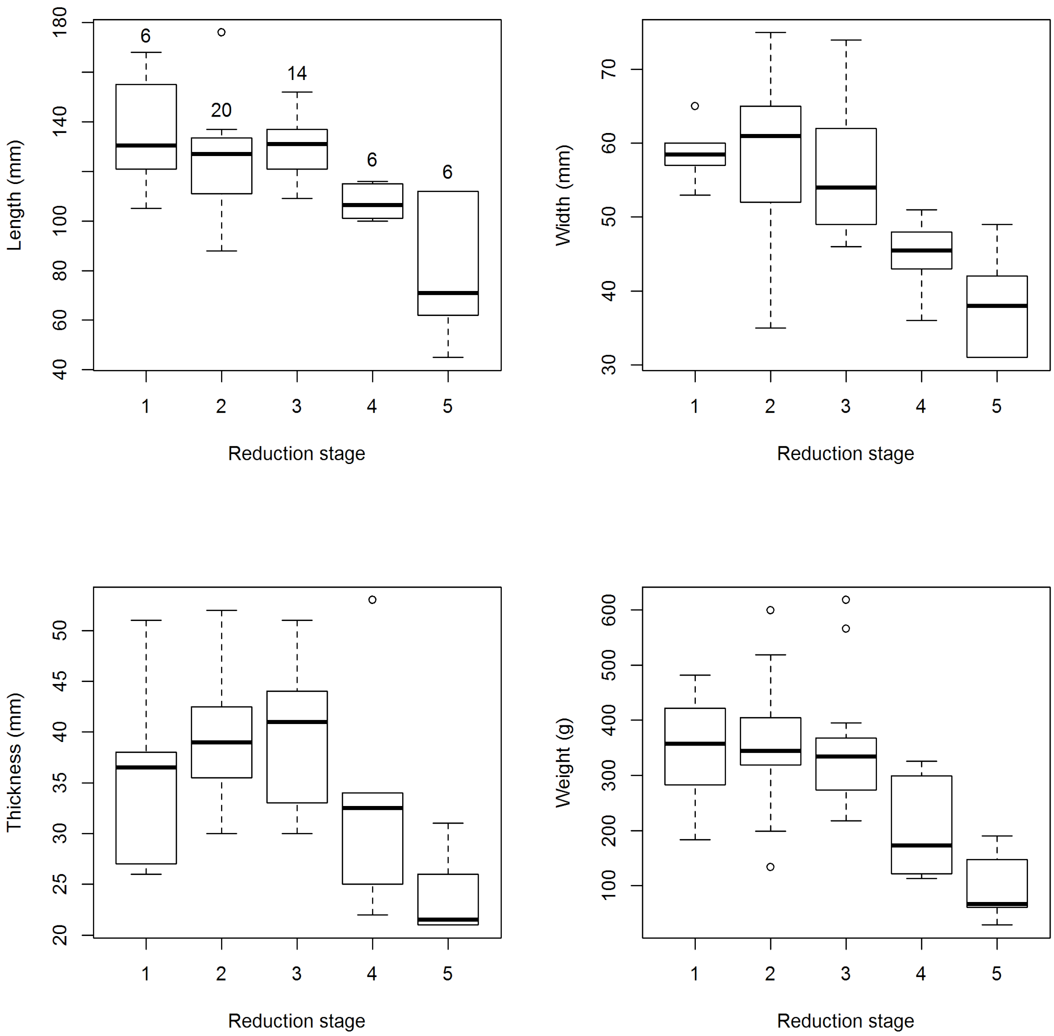

Figure 7. The metric analysis broken down by stage of reduction. Sample size for each stage displayed above each box in top-left plot

Asymmetry in the dorsal-ventral dimension only levels off when the piece undergoes the final shaping in Stages 4 and 5. Similarly, the most diagnostic feature of the artefacts, the pronounced curve, is absent and hence undetected for the majority of its reduction sequence. Finally, the metric analysis highlighted a significant degree of homogeneity in terms of dimensions in the pre-forms and finished tools. This may indicate a strong preference for obtaining raw material of a certain size and standardisation in the finished tool form, perhaps related to the functional requirements of the tools as foraging implements (Nami 2006: 150).

CONCLUSIONS

In this paper we used a sample from Misiones Province, Argentina to conduct a qualitative reconstruction of the reduction sequence of a common tool type found in large parts of eastern South America over nine millennia. Our qualitative reconstruction of the curved cleaver *chaîne opératoire* is supported by the metric analysis of the artefacts. We also compared our five-stage schema to an experimental study by Nami (2006), which used a standardised bifacial reduction sequence and highlighted the peculiarities of the curved cleavers' sequence. This study confirmed that blanks were selected from elongated nodules and large flakes. The differences between the two blank types are distinctive in the early stages of reduction but completely obscured by the final stages of working. Some cultural features of the reduction sequence, however, differed significantly from the predictions of Nami's experimental study: most notably the characteristic asymmetrical working of the preforms, and the order in which the frontal-dorsal symmetry and the cleavers' "curve" were imposed on blanks.

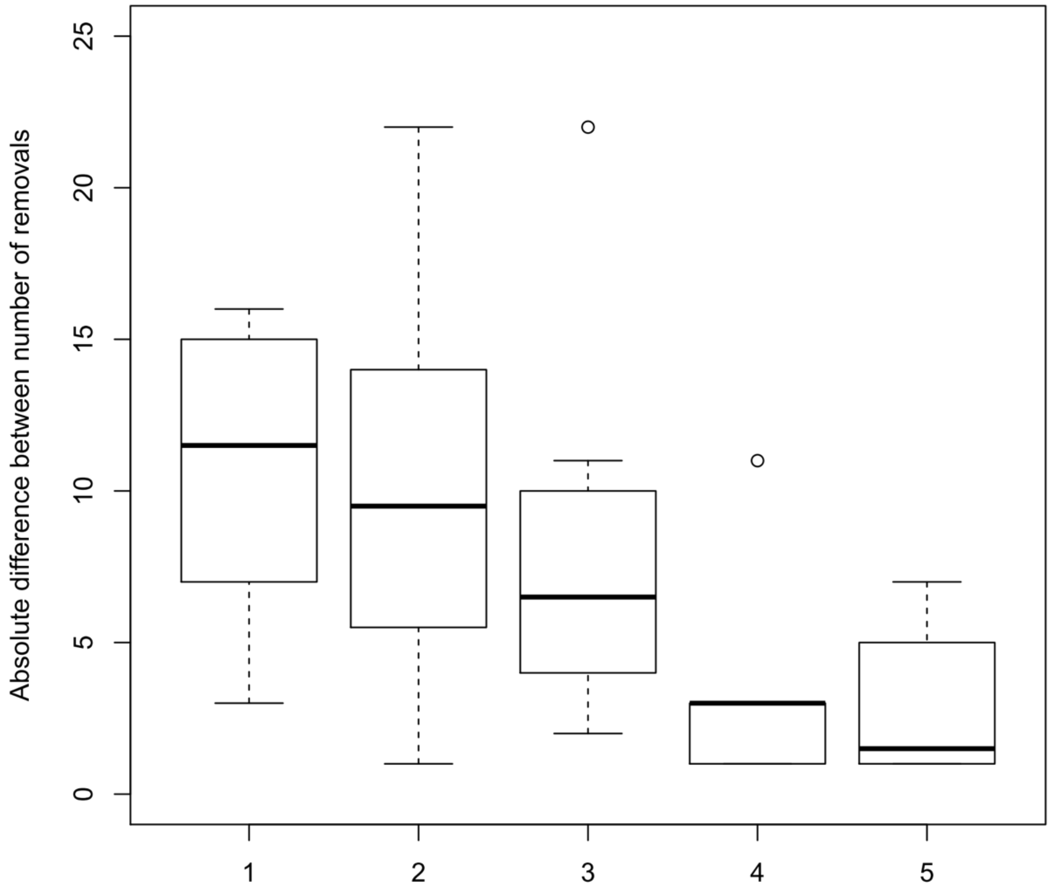

Figure 8. The absolute difference between the number of removals on each face separated by production stage

Nami (2006: 150) notes that the later stages of curved cleaver production mask the variability of earlier stages to some degree. The principal implication of this finding is that several "types" of bifacial tools possessing dorsal-ventral asymmetry (for example, Menghin 1957: fig. 11; Hoeltz 2007: fig. 2) may actually be unrecognised parts of the curved cleavers' *chaîne opératoire.* Hence, investigations that only focus on the finished tool types are limited in their ability to reconstruct the organization of stone technology. We therefore suggest that more extensive sampling of curved cleaver pre-forms, representing the intermediate stages as defined here, should be included in future analyses in order to better distinguish between curved cleaver pre-forms and other types of bifacial tools.

Finally, as noted in the introductory paragraphs of this paper, the spatial and temporal distribution of this distinctive class of tool is tremendous. Its spatial distribution spans three Brazilian states, Misiones province (Argentina) and the eastern sectors of Paraguay (Menghin 1955/56; Miller 1969a; Schmitz 1987), while its temporal range is believed to cover almost nine millennia. The principal limitation of a better understanding of the archaeological record of the region is presently the lack of a fine-grained technological and spatial framework for comparing assemblages from different regions and time periods. We hope that this study provided a useful attempt at recognising the true variability of curved cleavers.

Due to the nature of the sample analysed in the present study, we were unable to shed any light on the temporal aspect. However, by describing the characteristics of the reduction sequence of curved cleavers within secure spatial limits, we provide a stepping stone for identifying the variability in the lithic material record of neighbouring regions. In future macro-regional scale work, examples will need to be compared across secure and dated stratigraphic contexts to construct a framework for when, how, and why curved cleavers were produced. Dissecting the long period of time when curved cleavers were produced, including throughout the pre-ceramic (Humaitá) to ceramic (Taquara/Itararé) transition, would be particularly relevant to understanding how curved cleavers were integrated in different past economies. In addition, further studies, in particular microwear analyses, should concentrate on identifying which components of curved cleaver variability are due to the functional requirements of these tools.

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The content of this paper remains the responsibility of the authors.

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[*] *It is worth noting that in this case the name 'cleaver' is typologically incorrect. Cleavers are defined as bifacially worked tools with either an unworked distal edge (Debénath & Dibble 1994: 170; Inizan* et al. *1995: 55−56) or with a clear transversal removal negative at its distal end when the distal part is secondarily treated (Debénath & Dibble 1994: 165). This is clearly not the case in the vast majority of 'curved cleavers' but the name is nevertheless ubiquitously used.*

SHAPE VARIATION OF MIDDLE PALAEOLITHIC BIFACIAL TOOLS FROM SOUTHERN POLAND: A GEOMETRIC MORPHOMETRIC APPROACH TO *KEILMESSERGRUPPEN* HANDAXES AND BACKED KNIVES

K. Serwatka[1]

ABSTRACT

In the past decade, geometric morphometrics have come to be widely implemented in lithic studies. Because of the application of multivariate statistical methods, morphometric shape analysis is considered an accurate methodological tool for exploring the diversity of bifacial artefact morphology. The aim of this paper is to test the utility of morphometric outline shape analysis in assessing the variability of Late Middle Palaeolithic (LMP) bifacial artefacts. An assemblage of 42 handaxes and 51 Keilmesser *was analysed and compared to 54 LMP leaf points to seek out patterns of their shape variation. The results reveal patterned changes of bifaces' proportions that may have been caused by continuous reduction, as well as by diachronic changes in artefact design.*

Full reference: Serwatka, K. 2014. Shape variation of Middle Palaeolithic bifacial tools from southern Poland: a geometric morphometric approach to *Keilmessergruppen* handaxes and backed knives. *Lithics: the Journal of the Lithic Studies Society* 35: 18–32.

Keywords: Late Middle Palaeolithic, *Keilmessergruppen*, geometric morphometrics, *Keilmesser*, handaxes, leaf points

INTRODUCTION

Classification of bifacial artefacts has always been a problematic issue in lithic studies. Given the numerous factors influencing the morpho-technological features of bifaces, such as raw material properties, reduction and resharpening trajectories or knapping skills of ancient artisans (e.g. Kelly 1988; Pope *et al.* 2006; Stapert 2007; Machin 2009; Archer & Brown 2010), it is often hard to properly interpret the diversity of their forms.

Particular difficulties in the subject of bifacial artefacts classification can be observed in central European studies on *Keilmesser-gruppen* implements (Hauser 1916; Bosinski 1967; Sobczyk 1975; Richter 2000 & 2002; Ruebens 2006). Given the strong inclination towards the manufacture of bifacial tools in this cultural unit, it is often hard to distinguish artefact types, since one form merges into another. In traditional typology, one of the criteria taken into account during classification is the overall shape of an artefact with respect to handaxes (Bordes 1961: 80–85) or the outlines of individual tool's sections in case of *Keilmesser* (Jöris 2006: fig. 6). Outline shape can be a distinctive characteristic of bifaces, but it is usually described by ostensibly defined, qualitative terms, such as "cordiform" or "subtriangular" (e.g. Doronichev & Golovanova 2003: 88, 89; Schick & Clark 2003: fig. 1.19; Boroń 2006).

In the past few years, landmark-based morphometrics became widely implemented in lithic studies (e.g. Lycett *et al.* 2010; Iovita 2011; Charlin & González-José 2012; Eren & Lycett 2012). There were approaches using geometric morphometry as an aid in artefact classification (Buchanan *et al.* 2007), in identifying reduction effects on lithic tools (Thulman 2012) and in evaluating the morphological diversity of assemblages in general (Azavedo *et al.* 2013). However, the focus of these studies is mainly on finely crafted bifaces, such as Paleo-Indian points. There has been some research dealing with Lower and Middle Palaeolithic handaxes and *Keilmesser* in this manner, for example, studies by Iovita (2009 & 2010), Archer & Braun (2010), Costa (2010) and Iovita and McPherron (2011), but such approaches still seem scarce.

The aim of this paper is to test the utility of geometric morphometric outline shape analysis in assessing the variability of Late Middle Palaeolithic (LMP) bifacial tools. *Keilmessergruppen* handaxes and backed knives are highly diverse in terms of morphology. Patterns of their shape variation are often complex and hard to grasp using

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classical typological criteria. Typology often uses mixed attributes, such as morphology, function and technological features. The attempt to capture these traits altogether can be confusing, especially when comparing large assemblages (Iovita 2009). This creates a need for an approach focused expressly on the morphology of LMP bifaces.

BACKGROUND

Keilmesser

Keilmessergruppen backed knives (*Keilmesser sensu* Jöris 2006), were first recognised as a separate typological category by Krukowski (1939–1948). Later on they were formally defined by Chmielewski (1969). Initially, one of the most distinctive features of these artefacts was the paraburin scar resulting from a blow made at the distal end of the tool. This 'Pradnik technique' proved to be a convergent technical feature, which emerged independently in geographically distinct regions, probably as a method of resharpening the working edge (Schild & Wendorf 1977; Marks 2002; Solecki 2004). In the group of *Keilmesser* investigated here only two specimens bear the traces of Pradnik technique.

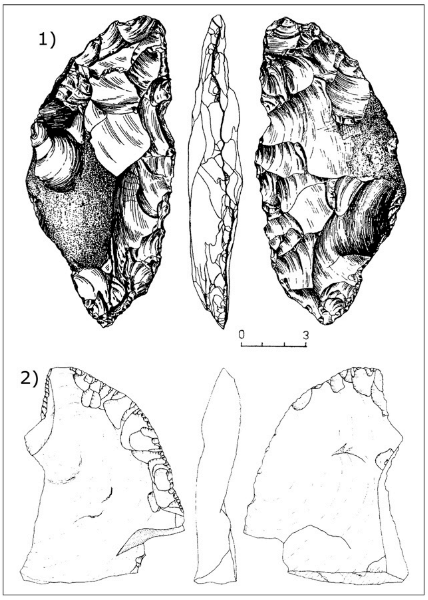

Figure 1. 1) Keilmesser *from Wylotne Rockshelter, layer 8/7; 2)* Keilmesser *from Biśnik cave, assemblage F_2*

In 1975 Sobczyk (1975) offered an innovative approach to the variability of Polish *Keilmesser* assemblages. Using the method of numeric taxonomy he analysed a group of 100 *Keilmesser* for their mutual correlations according to qualitative and quantitative features. The results showed that the examined *Keilmesser* make up a highly variable, polymorphic group. The study made by Sobczyk was effectively a follow-up of research on the classification of lithic artefacts started by Kozlowski (1972).

Nowadays it is widely accepted that the main reason for the morphological diversity of *Keilmesser* forms was the rejuvenation of the working edge, which induced the shift of their proportions (Jöris 1994; Pastoors & Schäfer 1999; Jöris 2001; Pastoors 2001; Migal & Urbanowski 2006).

It should be noted that similar analyses of Micoquian *Keilmesser* outline shapes were conducted by Veil *et al.* (1994), Jöris (2004) and by Iovita (2009 & 2010). From a techno-functional point of view (*sensu* Boëda 2001 & Jöris 2013), studies by Veil and Joris focused mainly on active parts of *Keilmesser*, such as the cutting edge and other elaborated sections. For his part, Iovita used the *Keilmesser* only as a part of his sample. Focusing on the technically active sections seems a reasonable procedure but I think that in case of many *Keilmesser* the cortical areas were left unworked to preserve the natural ergonomics of a blank, and as such they form an element of the overall tool design. Including these sections in the outline shape analysis can have interesting results.

Handaxes

The LMP is the period of recurrent appearance of handaxe-rich assemblages in Europe. After diminishing in number at all of the early Middle Palaeolithic sites, handaxes reappear between MIS 5d and MIS 3 (*ca* 115−35 ka BP) as a distinctive implement of two important cultural entities: *Keilmessergruppen* and Mousterian of Acheulian Tradition (Soressi 2002; Ruebens 2007 & 2013).

There exists a commonly accepted view that a handaxe's design contains not only strictly functional traits but also carries deeper cognitive and social values, such as the aesthetic sense and symbolic behaviour. These ideas are supported by the relatively large effort invested in the manufacture of handaxes, their complex use-life and characteristic

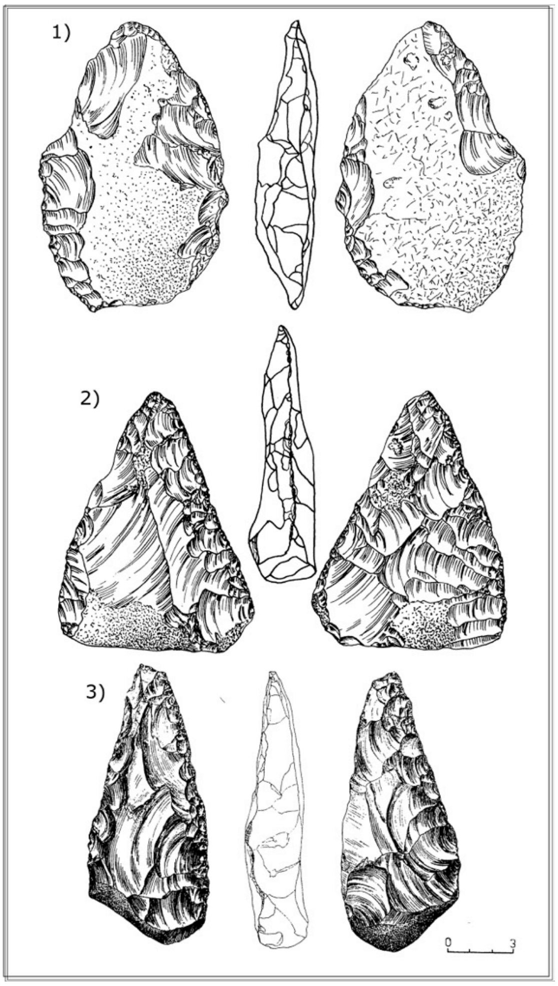

Figure 2. Three main morphological types of handaxes in the studied assemblage. Wylotne Rockshelter, layer 6

morphology (Wynn 1996; Kohn & Mithen 1999; Wenban-Smith 2004; Porr 2005).

In the studied assemblage there are various forms of handaxes. Using established nomenclature, types such as triangular, cordiform or lanceolate can be distinguished (see Fig. 2), yet the asymmetry of *Keilmessergruppen* handaxes sometimes makes the distinction between them and asymmetric knives difficult. Schild, for instance, placed *Keilmesser* in the wide category of handaxes (Schild & Wendorf 1977), while Hahn (1994) pointed out that *Keilmesser* and handaxes appear to be closely related typological categories.

There are two models for interpreting the morphological variability of handaxes. McPherron's model emphasises the role of reduction process on a tool's form (McPherron 1994, 1999, 2000, 2003 & 2006; see also below), while the model created by White focuses on the impact of raw material on handaxe shape (White 1995 & 1998). These models were originally developed for Acheulian large cutting tools but they are sufficiently broad to be used for other handaxe forms as well. Both frameworks are relevant, since the shape of bifaces was influenced both by resharpening and by raw material properties (Archer & Brown 2010). White's model will not be taken into account since most of the handaxes, as well as other types of bifaces under analysis, were made of the same type of raw material (Table 1).

Leaf points

Leaf point industry is the youngest Middle Palaeolithic unit with bifacial tools. It is observed between *ca* 50 and 30 ka BP (Kozłowski 1999: 87−89). Formerly, a number of regional groups were distinguished, such as Jerzmanowician in southern Poland (Chmielewski 1964; Mańka 2005) and Altmühlian in Middle Franconia in Germany (Bosinski 1967). With time, the comparison of assemblages and revised chronological setting showed that these groups share common features present at a similar time. Except the bifacially worked leaf points, which became the type fossil for this industry, the most intriguing attribute is the presence in Middle Palaeolithic toolkits of Upper Palaeolithic artefacts such as burins and endscrapers.

The leaf point industry derives from the *Keilmessergruppen* tradition or the Mousterian with Micoquian Option as defined by Richter (2008−2009). Leaf points appear sporadically in *Keilmessergruppen* and M.M.O. contexts, also in southern Polish sites like Biśnik Cave (Cyrek 2002: table XVII). Richter emphasises the presence in the final Micoquian of a tendency to produce larger and more perfectly crafted bifacial leaf points, which probably marks the emergence of the leaf point industry (Richter 2009).

The technology of manufacture of leaf points changes significantly through time. They gradually lose their all-over flat bifacial retouch until, in the latest stages of the leaf point industry, the retouch covers only the proximal or the distal end of long, slender blades. This pattern is observable in the younger episodes of occupation of the Nietoperzowa Cave (see Fig. 3) and in Mauern as well (Kozłowski 2004: 400−402).

In this study leaf points are used only as a comparative sample and principal focus is on handaxes and *Keilmesser*.

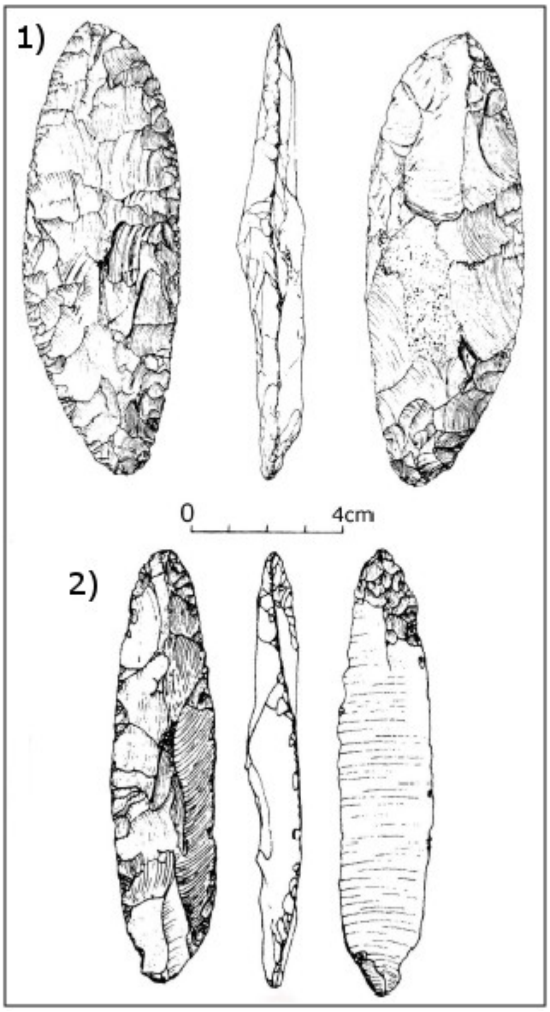

Figure 3. Late Middle Palaeolithic leaf points from Nietoperzowa Cave: 1) layer 6; 2) layer 4

MATERIALS

The main sample consists of handaxes (*n* = 42) and *Keilmesser* (*n* = 51). Their outlines were obtained by scanning illustrations from the monographs of the major LMP sites in southern Poland, namely the Wylotne Rock shelter, Biśnik Cave and Pietraszyn 49 (Table 1). This procedure was applied also by Costa who used illustrations of bone and stone bifaces from Castel di Guido (Costa 2010). Photographs of artefacts are not always available and illustrations provide easily accessible and reliable data on biface shapes.

All the stratified sites examined here are homogenous in terms of assemblage integrity and stratigraphical sequences. The exceptions are Pietraszyn 49, where artefacts were discovered on a secondary deposit, as well as Pietrowice Wielkie 8c and Cyprzanów 3 (see below). Despite this fact the overview of the composition of artefact types from Pietraszyn 49 and their technical features confirms the LMP character of this assemblage and its affiliation to the central European *Keilmessergruppen*.

The pattern of shape variability in LMP leaf points is clear and comprehensible (see above). For this reason a group of LMP bifacial leaf points (*n* = 54) was included in the analysis for comparative purposes. The points come mostly from well-dated stratified sites such as Nietoperzowa Cave and Mauern (Table 1).

Additionally, two surface finds from upper Silesian sites Pietrowice Wielkie 8c and Cyprzanów 3 were included in the sample. These artefacts were initially recognised as *Keilmesser*, but in the author's opinion they lack basic features characteristic of *Keilmesser*, such as the presence of a back and base opposite to the cutting edge. Comparing these artefacts to a larger sample of *Keilmesser* will test the morphometric shape analysis as a discriminator of bifacial artefacts that deviate from the general set in terms of technology.

The sample is suitable for testing the outline shape variability of *Keilmessergruppen* bifaces for two reasons. First, groups representing individual typological categories contain implements of different shapes and sizes, yet they all belong to homogenous assemblages in respect of similarities in technology of manufacture and dating. When assigning artefacts to the typological categories, the author followed the classification proposed by the authors of the monographs (see Table 1). Secondly, the studied series come from different types of site, which gives a more comprehensive view on artefacts' variability.

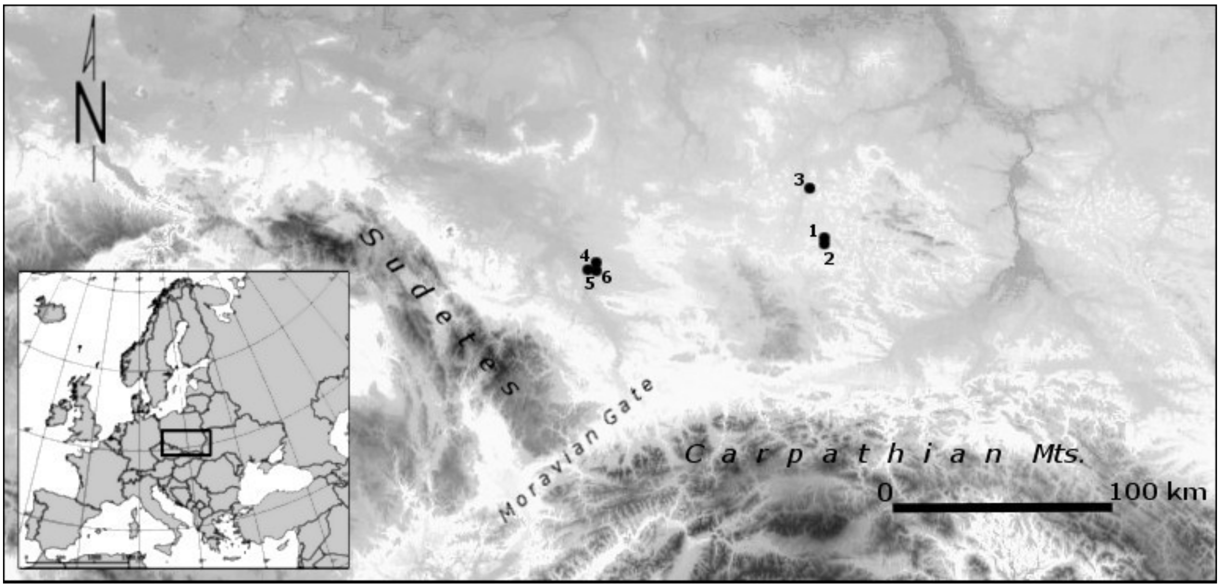

Figure 4. Map of the sites containing the studied assemblages: 1) Nietoperzowa Cave; 2) Wylotne Rockshelter; 3) Biśnik Cave; 4) Pietraszyn 49; 5) Cyprzanów 3; 6) Pietrowice Wielkie 8c

Table 1. List of materials used in the study

Typological category	***Site***	***Raw material***	***Site type***	***Stratigraphic unit***	***Date***	***Specimens (n)***	***Reference***
Handaxes	Wylotne	Jurassic flint	Rock shelter	5, 6, 8/7	*ca* 100−60 ka BP	38	Kozłowski (ed.) 2006
	Pietraszyn 49	Erratic flint	Open air	-	Undetermined	4	Fajer *et al.* 2001
Knives	Biśnik	Jurassic flint	Cave	5/6	67±15 ka BP	8	Cyrek (ed.) 2002
	Wylotne	Jurassic flint	Rock shelter	5, 6, 8/7	*ca* 100−60 ka BP	32	Kozłowski (ed.) 2006
	Pietraszyn 49	Erratic flint	Open air	-	Undetermined	8	Fajer *et al.* 2001
	Pietrowice Wielkie 8	Undetermined	Surface find	-	Undetermined	1	Fajer *et al.* 2001
	Cyprzanów 3	Undetermined	Surface find	-	Undetermined	1	Fajer *et al.* 2001
Leaf points	Nietoperzowa Cave	Jurassic flint	Cave	6, 5a, 4,	30−38 ka BP	25	Chmielewski 1962
	Ehringsdorf	Jurassic flint	Cave	-	Undetermined	18	Kot 2013
	Mauern	Jurassic flint	Cave	4, 5	*ca* 60−28 ka BP	12	Kot 2013
Sum						**147**	

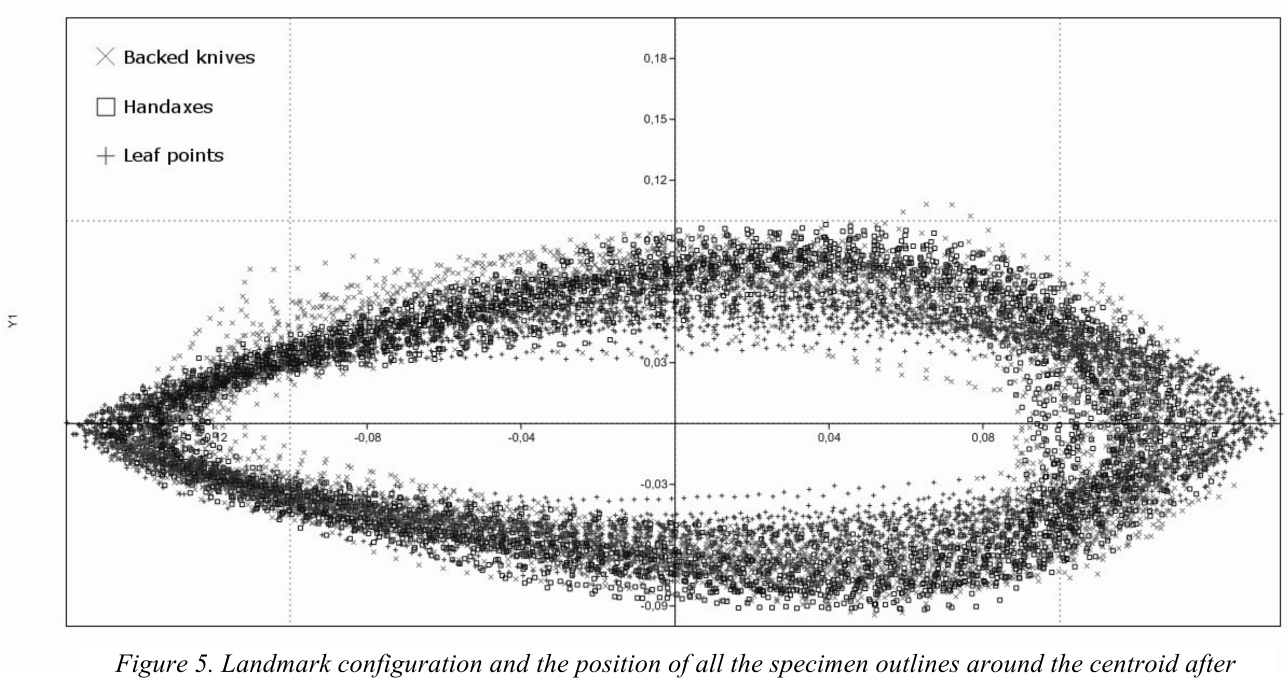

Figure 5. Landmark configuration and the position of all the specimen outlines around the centroid after conducting the Procrustes superimposition

METHODS

Artefact orientation, landmark configuration and the Procrustes analysis

The author used a standard geometric morphometric method of outline shape analysis based on landmarks. Before the actual analysis, a set of procedures, generally based on data processing, had to be carried out.

To project the outline shape, the illustrations of the artefacts were scanned with a Canon CanoScan LiDE 210 scanner at 400 dpi. The image of each artefact was extracted as a single jpg file and oriented in GIMP according to its axis of symmetry. To allow further comparisons between shapes, all outlines had to be oriented in the same manner. The method of orientation applied in this study was first described by McPherron & Dibble (1999) and improved upon by Costa (2010). In it all the bifaces are oriented around their long axis of symmetry so that the longest orthogonal lines drawn from a central line were equal in length (Costa 2010: fig. 2.1b). The tip of a biface was used as the point from which the outline was drawn along the biface's perimeter. This outline will then be transformed into a set of equidistant landmarks.

After performing the orientation a thin plate spline file was created in TpSutility program (Rohlf 2006). This stores all the images in one tps file and allows a further digitisation of the images. The tps file with all the images was then opened in TpSDig (Rohlf 2004), a program used mainly for placing landmarks on specimens.

In natural sciences when the morphology of living or fossil organisms is taken into account landmarks are often placed on relevant biological structures (e.g. Querino *et al.* 2002). Of course one can do the same for lithic artefacts, such as their tip or base, but this way the complex shape of bifaces is reduced to just a few landmarks. In the studied case the best way to capture the outline shape is to set a number of landmarks around the perimeter of an artefact. To allow further comparison between tool shapes the landmarks must correspond to each other, i.e., they need to be placed at equal distances and according to a standardised configuration. Using the TpsDig outline tool it is possible to draw an outline from the tip, along the perimeter of an artefact, and then transform it into a set of equidistant landmarks (Costa 2010). The number of entered landmarks is left for the user to choose. Costa used 75 points (Costa 2010: 27), while Iovita employed 60 landmarks (Iovita 2009). These numbers are chosen on a trade off between the labour-cost of hand-digitising and the accurate delineation of artefact shape. I decided that 100 landmarks would describe the outline shape with a greater accuracy since

LMP bifaces contain large natural surfaces and are often irregular. After assigning the landmarks for each specimen the tps data were opened with PAST (Palaeontological Statistics), a program enabling statistical shape analyses (Hammer *et al.* 2001).

Landmarks are subject to several kinds of movements in two-dimensional space, such as rotation and translation (Richtsmeier *et al.* 2002). These may affect the correct orientation of specimens and cause errors during a comparison of artefact shapes. One should also bear in mind that some of the digitised outlines were represented in a different scale than the others. To eliminate landmark displacements a Procrustes analysis must first be conducted. Procrustes analysis is a set of mathematical operations which transforms the matrix of XY coordinates so that translation, rotation and the difference of scale is eliminated from the assemblage (Rohlf & Slice 1990) (Fig. 1). Additionally all outlines are superimposed around a centroid, which is the 0,0 coordinate on the XY axis (Hammer & Harper 2006). This operation subtracts the mean shape referred to as "consensus" from all the coordinate values, allowing for further tracking of shape deformations of specimens in relation to the consensus shape. Superimposition scales bifaces' dimensions to a common centroid, equalising their size, while preserving the original shape (Jungers *et al.* 1995).

Principal component analysis

Bifacial tool shapes differ in many variables. The best way to explore this variability when dealing with multiple landmark data is to conduct principal components analysis (e.g. Gowlett 2006).

The set of landmarks is a K×M matrix, that is, a matrix of K number of landmarks in M dimensions (Dryden & Mardia 1998). It is

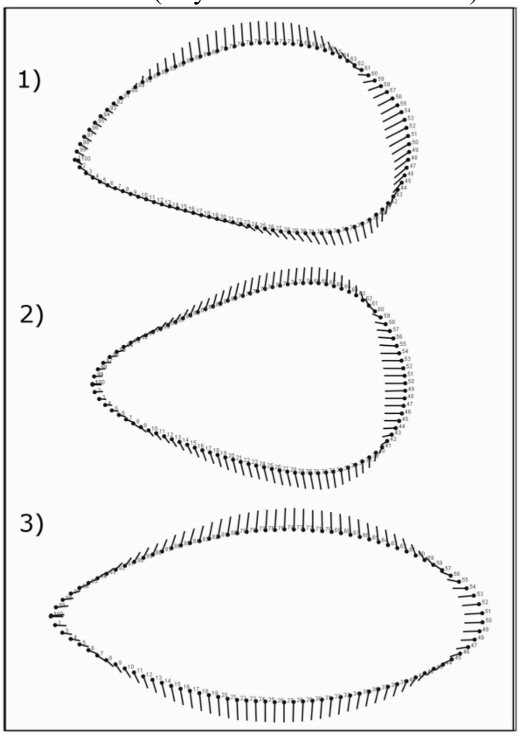

Figure 6. Vectors indicating the shift of landmarks position according to principal component 1 in comparison to consensus shape in each typological category: 1) Keilmesser*; 2) handaxes; 3) leaf points*

Table 2. Eigenvalues and the percentage variance of the selected principal components generated singly for each typological group

Knives			***Handaxes***			***Leaf points***		
PC	*Eigenvalue*	*% variance*	*PC*	*Eigenvalue*	*% variance*	*PC*	*Eigenvalue*	*% variance*
1	0,0049351	37,169	1	0,004922	53,873	1	0,0041795	66,185
2	0,0030593	23,041	2	0,0014226	15,57	2	0,000665	10,531
3	0,0016673	12,557	3	0,001092	11,953	3	0,0004884	7,7349
4	0,0010285	7,7463	4	0,0004367	4,7801	4	0,0002431	3,8494
5	0,0005537	4,17	5	0,0003116	3,4109	5	0,0001435	2,2717
6	0,0004958	3,7341	6	0,0001802	1,9728	6	0,000112	1,7741
7	0,0003602	2,7131	7	0,0001703	1,8643	7	7,82E-05	1,2376
8	0,0002323	1,7494	8	1,00E-04	1,0941	8	5,76E-05	0,91152
9	0,0001891	1,4246	9	9,10E-05	0,99559	9	4,73E-05	0,74897
10	0,0001373	1,0344	10	6,23E-05	0,68244	10	4,23E-05	0,67056
11	0,000132	0,99426	11	5,93E-05	0,64853	11	3,64E-05	0,57634

expected that some regions of the tool outlines will overlap since they generally belong to the same typological category, but patterns of their variation and covariation are often complex and difficult to interpret. The purpose of PCA is to simplify those patterns and make them easier to interpret by reducing the number of shape variables (Zelditch *et al.* 2001: 156). PCA transforms the matrix of landmarks so that most of the variation is described by principal components. This method serves as a useful indicator of patterns in complex sets of data, characterised by numerous variables. Where knives and handaxes are expected to differ in several factors it is safe to apply PCA, which will hopefully identify patterns in their shape variability.

RESULTS

The first two principal components describe 56.021% and 18.544% of the whole variance and only those PCs were taken into account during analysis (Table 3). The number of generated PCs is equal to the number of all specimens (n = 147) but most of them hold very little of the overall variance, therefore 11 PCs are presented in Tables 2 and 3 for comparative purposes.

To compare the eigenvalues and the percentage variance between the assemblages, a set of eleven principal components was also generated for each typological group (Table 3). The percentage variance values indicate that To test the accuracy of observations, a 95% ellipse will be applied as a supplement to the PCA analysis. The ellipse is drawn based on the assumption that the data is subjected to a two-dimensional normal distribution. The orientation of an ellipse depends on the correlation coefficient between the variables, for example, the longer axis of an ellipse is approximately imposed according to the regression line of values. The probability that a new value will fall in the range of the ellipse (for instance 0.95) is the parameter determining its size (Tracey *et al.* 1992). 95% ellipses can serve as a discriminative tool, indicating which specimens are deviating from the range of shapes predicted for each typological group.

Leaf points are the most uniform group in terms of outline shape, as the first two principal components describe 76.716% of the overall variance. Knives are the most variable typological group in which the values of the percentage variance are more evenly distributed between the individual principal components. This implies that there is no clear trend in the distribution of their outline shapes.

PC1 axis shows the regression of the most expanded tool shapes towards the most contracted ones. It is hard to define the range of distribution shown by PC2 since there are too few specimens scattered according to this principal component (Figs 7 & 8). Most of the knives are distributed according to PC2, but

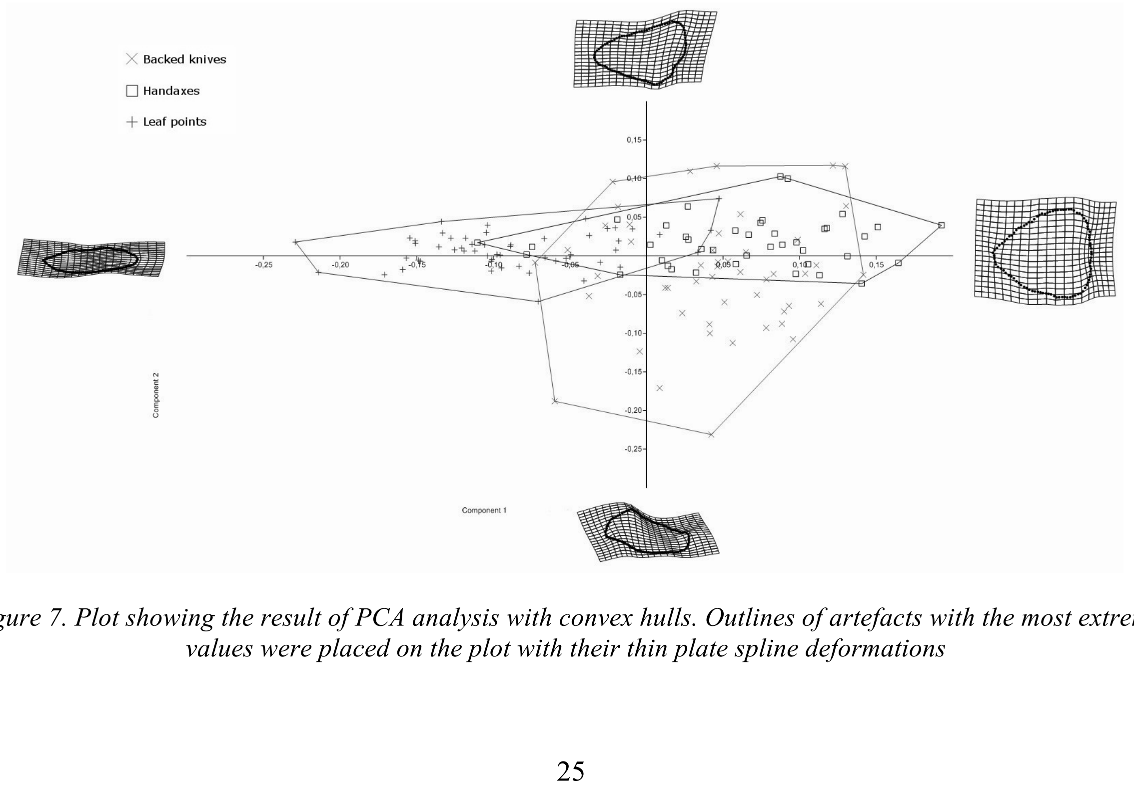

Figure 7. Plot showing the result of PCA analysis with convex hulls. Outlines of artefacts with the most extreme values were placed on the plot with their thin plate spline deformations

the reason for this arrangement is unclear.

Knives seem to be scattered in a random manner, without indication of a significant pattern of distribution. However, some trends can be noticed by observing the shape deformations of individual *Keilmesser* landmarks according to the consensus shape (see Fig. 6.). It is apparent that most deformations are located at the back or in the basal parts of *Keilmesser*.

The position of handaxes on the PCA plot confirms a shift of proportions from expanded shapes with an oval contour (i.e. Fig. 7, 8: specimen 107: Fajer *et al.* 2001: Fig. 3; specimen 127, 128: Targosz 2006, Plate 42 and 46) through forms with straight edges and a triangular contour (i.e. Fig. 7, 8: specimen 130, 123: Boroń 2006, Plate 99; Targosz 2006, Plate 40), to handaxes with straight or slightly concave edges, which are intensively elaborated with flat, surface retouch (Fig. 7, 8: specimens 108, 110, 142: Fajer I in. 2001, Fig. 4a; Targosz 2006, Plate 43; Figure 8: 110, 126, 144: Targosz 2006, Plate 44, 45; Boroń 2006, Plate 104). It is notable that handaxes and leaf points are similarly distributed, mainly according to PC1, which generally shows the transition from broad, oval shapes to the most elongated specimens.

None of these sets of artefacts is exclusive in their plan shape, and mutual relations occur between each group. The strongest connection seems to be between knives and handaxes, as most of them are located in the same area designated by the 95% ellipse (see Fig. 8). The ellipse also shows that two knives are located clearly outside of its perimeter. These are the artefacts from Cyprzanów 3 and from Pietrowice Wielkie 8 (Fajer *et al.* 2001: fig. 19b).

DISCUSSION

It is interesting that the *Keilmesser* are scattered randomly on the plot. If reduction affected their proportions it should come as a regression on the plot, since the studied assemblage comprises specimens which can be considered as initial (i.e. Fig. 1; Fig. 8: specimens 75, 96: Targosz 2006: plates 54 & 55; specimen 102: Cyrek 2002: plate IX) as well as exhausted (i.e. Fig. 8: specimens 73, 92 & 105; Milewski 2006: plate 16 & 26; Cyrek 2002: plate VIII: 1). On the basis of these observations it is hard to conclude that reduction was the main reason for *Keilmesser* outline shape variability.

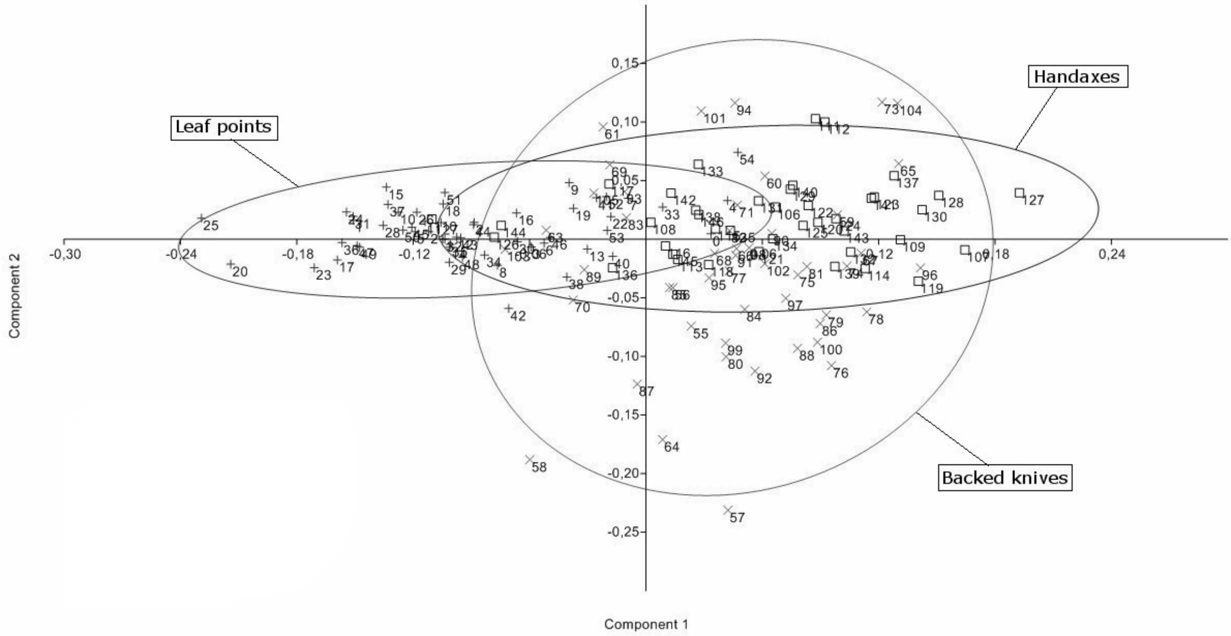

Figure 8. PCA plot with 95% ellipses

Table 3. Eigenvalues and the percentage variance of the selected principal components generated for knives, handaxes and leaf points altogether

PC	*Eigenvalue*	*% variance*
1	0,0082381	56,021
2	0,002727	18,544
3	0,0010987	7,471
4	0,0007311	4,9715
5	0,0004667	3,1737
6	0,000329	2,237
7	0,0002065	1,4043
8	0,0001453	0,98826
9	0,0001228	0,83532
10	8,07E-05	0,54844
11	7,08E-05	0,48119

Most of the variance in the *Keilmesser* assemblage is produced by the irregularities of natural surfaces in the back and at the base of these tools (Figs 1 & 2). Landmark vectors show that regions of the tip and the cutting edge are held relatively constant, while the back and the base undergo serious deformations as compared to the consensus shape (Fig. 6). This indicates that knives were made of nodules of raw material that differed in sizes and shapes and this probably affected the overall form of the finished tools. This diversity can be simply explained by ergonomic requirements. Given the numerous tasks that *Keilmesser* were involved in (Rots 2009: 44−48), the prehensile parts were clearly extended in comparison to handaxes, simply to get a better grip on the tool when performing different activities. Therefore it seems that the available raw material, and specifically its form, had a major influence on *Keilmesser* shapes.

These results are generally similar to those obtained by Iovita (2010). By applying a variant of morphometric outline shape analysis (elliptic Fourier) this researcher learned that *Keilmesser* may have been reduced selectively due to the position of their prehension parts or hafting elements. That is why the trajectories of their shape change through reduction are not so easy to observe. In my opinion a more detailed statistical shape analysis would help to overcome this difficulty. If the natural sections of *Keilmesser* are responsible for blurring the overall view of their variability then the analysis should focus strictly either on the prehension areas or on the active parts of the tool, which were more likely to have been exposed to the reduction process.

The position of two *Keilmesser* falls clearly outside the 95% ellipse (Fig. 8: specimens 57 & 58). These are the surface finds from Pietrowice Wielkie 8c and Cyprzanów 3. Their position on the plot confirms that they deviate from the outline shape predicted for *Keilmesser*.

The relationship between the assemblages of knives and handaxes seems to confirm the genetic relationship connecting these implements emphasised by Hahn (1994). Handaxes show a clear regression from cordiforms or irregular ovate specimens, through triangular forms, toward slender handaxes with a pronounced tip. In my opinion, this pattern may have been caused by continuous resharpening and/or reduction. It is especially apparent in case of the transition from irregular ovate to triangular handaxes.

Acheulian handaxes showed a pattern of reduction involving mainly the rejuvenation of the tip. This resulted in the transition from a pointed to an oval morphology of their contour (McPherron 1995, 1999, 2000 & 2003; see also Iovita & McPherron 2011). If reduction was the reason for the pattern revealed by this study than in case of *Keilmessergruppen* handaxes an opposite trajectory can be observed. It seems that the reduction was aimed at resharpening or simply losing the material from the edges more than from the tip (see Fig. 6). In general, this may have had an influence on handaxe outline shape, causing the transition from cordiform or ovate morphology towards handaxes with straight or concave edges and a pronounced tip (Fig. 2). Nevertheless the applied method does not take artefact size into account; therefore additional metric study of *Keilmessergruppen* handaxes is needed to resolve this issue.

Our analysis also revealed an interesting pattern in the leaf point assemblage. The width of these implements undergoes evident contraction, which obviously is due to the changes in leaf point manufacture mentioned earlier. This shift of form appears to be regular and affects mostly the edges of the leaf points while the proximal and distal areas remain relatively constant, as if the intention was to maintain elongation as well as the tip and base within the same proportions (Fig. 6; 3). At this point it is hard to properly interpret this pattern in shape variation and further research on this subject needs to be conducted. Nevertheless the author would like to emphasise that this type of change in leaf point morphology may be connected with adaptive changes in lithic projectile technology, such as the transition from thrusting to hand cast spears (Hughes 1998).

CONCLUSIONS

The results of the morphometric shape analysis indicate that there may exist two types of change in artefact outline shape: synchronic, involving the reduction of tool proportions caused by repeated resharpening in handaxes, and raw material selection in *Keilmesser*; and diachronic, based on alterations to the design of tools.

The method deals poorly with exploring the variability of artefacts with large natural surfaces. The results show that there is no observable trend among *Keilmesser* outline shapes. Natural sections tend to produce variance since they are often irregular, and this may disrupt the actual patterns of shape change. I believe that this method may be applied to *Keilmesser*, but with some modifications. Placing the landmarks on active parts of tools can have a positive effect.

Applying 95% prediction ellipses also served its purpose in discriminating artefacts from extraneous contexts. The knives from surface finds were placed clearly away from the majority of specimens and were left out from the general set.

Although this method is limited because it takes no account of the technical and metric features it may be useful in constructing holistic models of artefact shape reduction (occurring synchronically or diachronically). Nevertheless, to avoid misinterpretation, one should bear in mind two limitations encountered in the course of the discussed analysis. First, the method serves best when applied to quantitatively large assemblages. Lower and Middle Palaeolithic bifaces are often irregular, and a larger sample (one preferably assembled from several sites) will allow for a more comprehensive view. Secondly, including a test sample of different provenance than the main assemblage can assist the interpretation of shape change trajectories and bring in potentially interesting results.

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CONCERNING THE EARLIEST ACHEULEAN OCCUPATION OF BRITAIN: THE GEOLOGICAL CONTEXT OF A HANDAXE ASSEMBLAGE FROM FOXHOLES, BOURNEMOUTH, SOUTHERN ENGLAND

R.J. Davis[1]

ABSTRACT

In recent surveys of the Palaeolithic record of the River Solent, a small handaxe assemblage recorded from Foxholes in the Bournemouth area of southern England has been identified as a candidate for evidence of the earliest Acheulean occupation of the Solent region, and among the earliest handaxe assemblages in Britain. However, archival material and cartographic evidence has been identified that indicates the provenance of the Foxholes material has previously been misunderstood. The correct provenance suggests that these handaxes are considerably younger than previously thought, with implications for the timing of the first appearance of handaxes in the Solent region. This paper serves as a cautionary tale of a potential pitfall when studying old collections recovered from gravels of Pleistocene rivers, and highlights the importance of conducting a thorough search for all available contextual information.

Full reference: Davis, R.J. 2014. Concerning the earliest Acheulean occupation of Britain: the geological context of a handaxe assemblage from Foxholes, Bournemouth, southern England. *Lithics: the Journal of the Lithic Studies Society* 35: 33−39.

Keywords: Lower Palaeolithic archaeology, early Acheulean occupation of Britain, handaxes, River Solent, antiquarian history

INTRODUCTION

A small handaxe assemblage recorded from Foxholes, Bournemouth, has been identified as one of the oldest to have been recovered from the fluvial deposits of the erstwhile River Solent and its tributaries, and potentially among the oldest in Britain (Ashton & Hosfield 2010; Hosfield 2011). This claim is based on the estimated provenance for the assemblage supplied by the Southern Rivers Palaeolithic Project database (SRPP; Wessex Archaeology 1993), which suggests the handaxes were recovered somewhere in the region of Foxholes, Poole (Fig. 1). No reasoning for this location is provided, and it contrasts Roe's (1968) earlier gazetteer in which the Foxholes assemblage is listed as being of unknown provenance. The SRPP suggests the assemblage originated in fluvial deposits associated with either Terrace 12 or Terrace 13 of the River Solent as mapped by Bristow *et al.* (1991). These are the oldest Solent terraces in the Bournemouth area and equivalent to Allen & Gibbard's (1993) Setley Plain Gravel, Tiptoe Gravel and Sway Gravel. Ashton & Hosfield (2010) proposed the older Sway Gravel as the likely source, since this is the only terrace as mapped by Allen & Gibbard to be found in the Foxholes area (Fig. 1). This claim is supported by the extensive historic gravel extraction of the Sway Gravels in the area (*ibid*: Supplementary Information Fig. 1), thereby providing a potential means of recovery for the assemblage.

The Sway Gravel is two terraces higher in the Solent sequence than the Setley Plain Gravel, from which the well-known Corfe Mullen assemblages were recovered (McNabb & Hosfield 2009; McNabb *et al.* 2012). While the Solent suffers from a great deal of uncertainty over the age of its terraces, Corfe Mullen has been widely cited as providing evidence for human occupation during MIS 13 (Wymer 1999; Roe 2001; Westaway *et al.* 2006; McNabb & Hosfield 2009; Ashton & Hosfield 2010; McNabb *et al.* 2012). This suggests that Foxholes may provide evidence for Acheulean occupation during the preceding MIS 15 interglacial or earlier (Hosfield 2011). If correct this would have important implications for our understanding of the timing of the first appearance of Acheulean technology, not just in Britain, but in northern Europe as a whole (e.g. Roebroeks 2006; Mosquera *et al.* 2012). However, a recent study of the provenance and context of the Solent Palaeolithic record has identified archival material and cartographic evidence that demonstrates the provenance of

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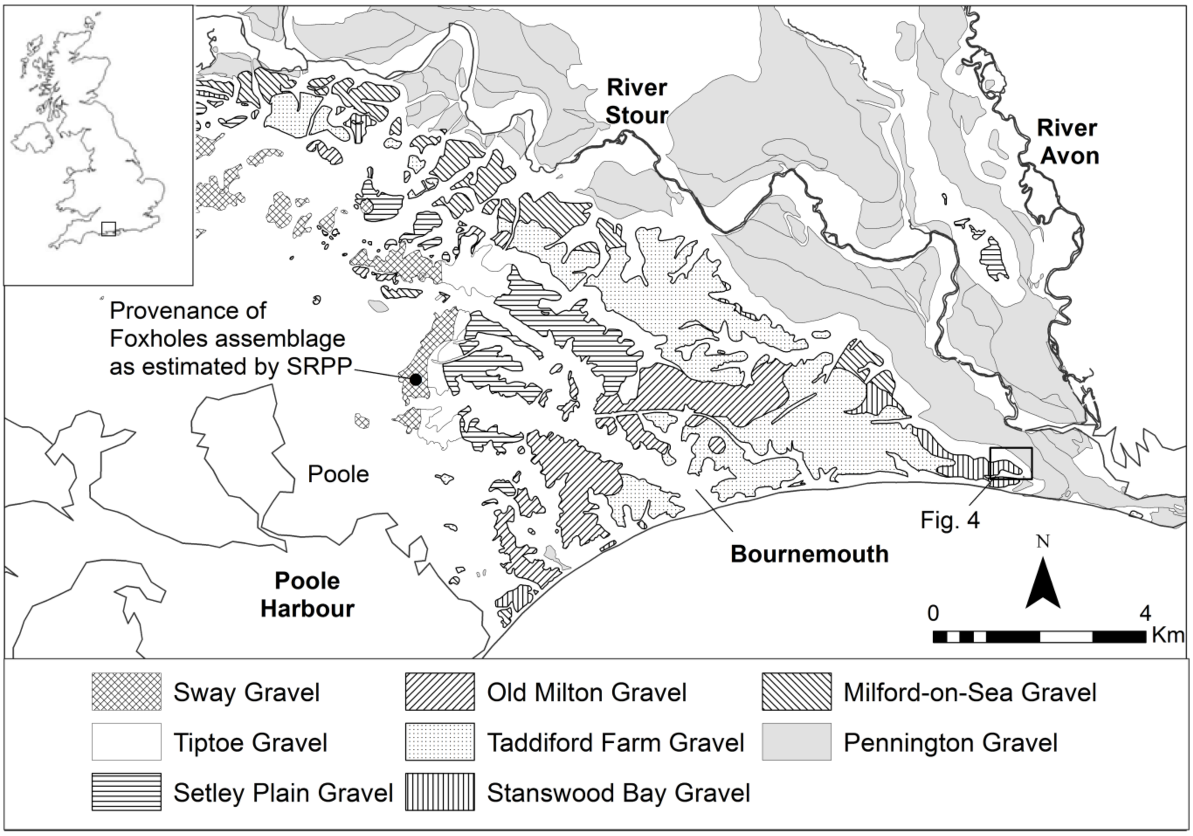

Figure 1. The terraces of the rivers Solent and Stour in the Bournemouth area of southern England and the estimated provenance of the Foxholes assemblage as listed in the SRPP database. Terrace mapping after Allen & Gibbard (1993) and adapted from BGS (2009)

the Foxholes assemblage supplied by the SRPP is incorrect, and that the Foxholes handaxes are likely to be considerably younger than previously thought (Davis 2013).

RELOCATING FOXHOLES

The Foxholes assemblage is formed of 12 handaxes and two roughouts that are made on flint and are dominated by pointed forms. All but one are moderately or heavily rolled and they are all stained, a general condition that is indicative of an origin within a fluvial gravel context (Fig. 2). They form part of the Old Red House Collection held by the Hampshire Cultural Trust, although three remain on display at the Red House Museum in Christchurch, Dorset. The Old Red House Collection is predominantly formed of the collections of Herbert Druitt, a Christchurch-based antiquarian who established the Red House Museum as a private museum to house his collections. During the early decades of the 20th century, Druitt amassed a vast Palaeolithic collection that included the Foxholes handaxes and accounts for more than half of the known Bournemouth record (Davis 2013). For much of his collecting career, Druitt maintained a detailed catalogue of his acquisitions which, fortunately for us, was subsequently updated by John Bernard Calkin. Calkin was another local collector who, according to his own notes, took on the task of sorting and updating the catalogues of Druitt's archaeological collections after his death. The Druitt Catalogue, also held by the Hampshire Cultural Trust, is organised by site or area and lists each artefact by a unique identification number, along with details of the purchase, depth of recovery, and some basic typological and metric information. Druitt's code for Foxholes was 'BFH', indicating that the site was located in his Area B, defined by Christchurch Road and the River Stour to the north and east, the coast to the south and the River Bourne to the west (Fig. 3a). This detail alone immediately casts doubt on the SRPP Foxholes provenance, which is located in Druitt's Area E, approximately 6 km to the northwest of Area B.

Figure 2. From left to right, Foxholes handaxes BFH12, BFH10 and BFH8. Note the abraded scar ridges and damaged edges, a condition indicative of an origin within fluvial gravels. Reproduced courtesy of Hampshire Cultural Trust

The Druitt Catalogue indicates that the Foxholes handaxes were recovered between 1906 and 1914. Most are simply recorded as coming from Foxholes; however, three have more specific entries (Fig. 3b). Handaxe BFH10 was found in "Foxholes on the Guildhill Road side of tram route", handaxe BFH11 was found "on the corner site at Guildhill Road, Foxholes", while handaxe BFH 15 was recovered from "Foxholes Road between Guildhill Road and Lion Way". These details combine to point to an area of Southbourne as the provenance for the Foxholes assemblage, not Poole as suggested by the SRPP. While there are two Foxhole Roads in the Bournemouth area, only one of them shares a junction with Guildhill Road and was part of an early 20th century tram route, and that is the Foxholes Road located in Southbourne and within Druitt's Area B. Contemporary Ordnance Survey mapping of Southbourne adds further support (Fig. 4). Not only does it confirm the existence of Foxholes Road, Guildhill Road and the tramway in this area at the time of artefact recovery, it also shows an active gravel pit and on-going urban development in the area at this time, thereby providing a potential means of artefact recovery (a detail that is not recorded in the catalogue). The clincher is the fact that the area of Southbourne in question is identified as Foxholes on the historic mapping.

It is clear that Druitt recorded this assemblage as coming from Foxholes in Southbourne and not from Foxholes in Poole. For any of the handaxes to have originated at the latter would require Druitt to have made a mistake or to have been misled, which, considering his diligent and detailed recording of his collections, seems unlikely. The only terrace present in the Foxholes area of Southbourne is the Stanswood Bay Gravel of the River Stour, a north bank tributary of the River Solent, although as can be seen from Figure 4, Guildhill Road and the northern part of Foxholes Road are outside the mapped terrace area. This raises the possibility that some or all of the handaxes may have originated within a bluff gravel and not from *in situ* terrace deposits. It is necessary to be cautious when dealing with bluff gravels, since there is the potential for younger artefacts to become incorporated in older terrace gravels during the formation of a terrace bluff (McNabb & Hosfield 2009). However, the rolled character of the Foxholes assemblage suggests that the majority are likely to be contemporary with the Stanswood Bay Gravel deposits; if they were recovered from the bluff then they had simply been part of the terrace gravels from which the bluff had formed.

The Stanswood Bay Gravel is five terraces lower than the Sway Gravel in the Solent

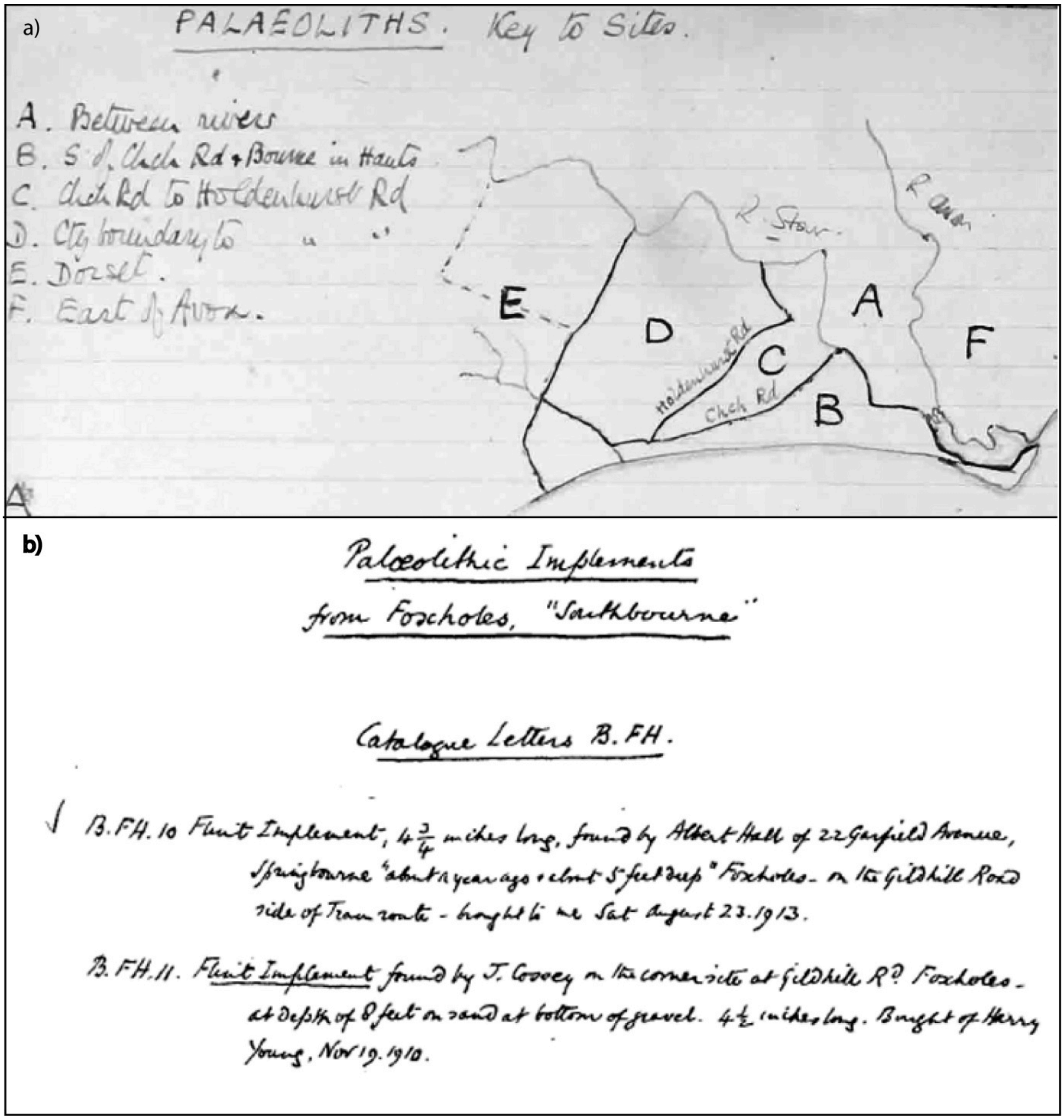

Figure 3. a) a reproduction of Druitt's plan of his collecting areas by Calkin. Note the position of Area B; b) extract from the Druitt catalogue showing two of the Foxholes entries that supply important information relating to the provenance of the assemblage. Reproduced courtesy of Hampshire Cultural Trust

sequence. Its age is far from clear, with recent estimates varying between MIS 6 (Hatch 2014) and MIS 8 (Briant *et al.* 2006; Westaway *et al.* 2006), perhaps suggesting the handaxes relate to occupation during either the MIS 7 or MIS 9 interglacials. Given the rolled character of the assemblage, it is of course possible that some or all of the handaxes are of greater antiquity and have been reworked into the Stanswood Bay Gravel from a higher terrace, so a precise age for the assemblage is presently unobtainable (even at the coarse scale of marine isotope stages). However, what is clear is that a case for the Foxholes handaxes being among the oldest handaxes in the Solent region cannot be upheld.

DISCUSSION

The reassignment of the Foxholes assemblage from the Sway Gravel to the Stanswood Bay Gravel has implications for the timing of the first appearance of Acheulean technology in the Solent region. Based on their reading of the SRPP database, Ashton & Hosfield (2010)

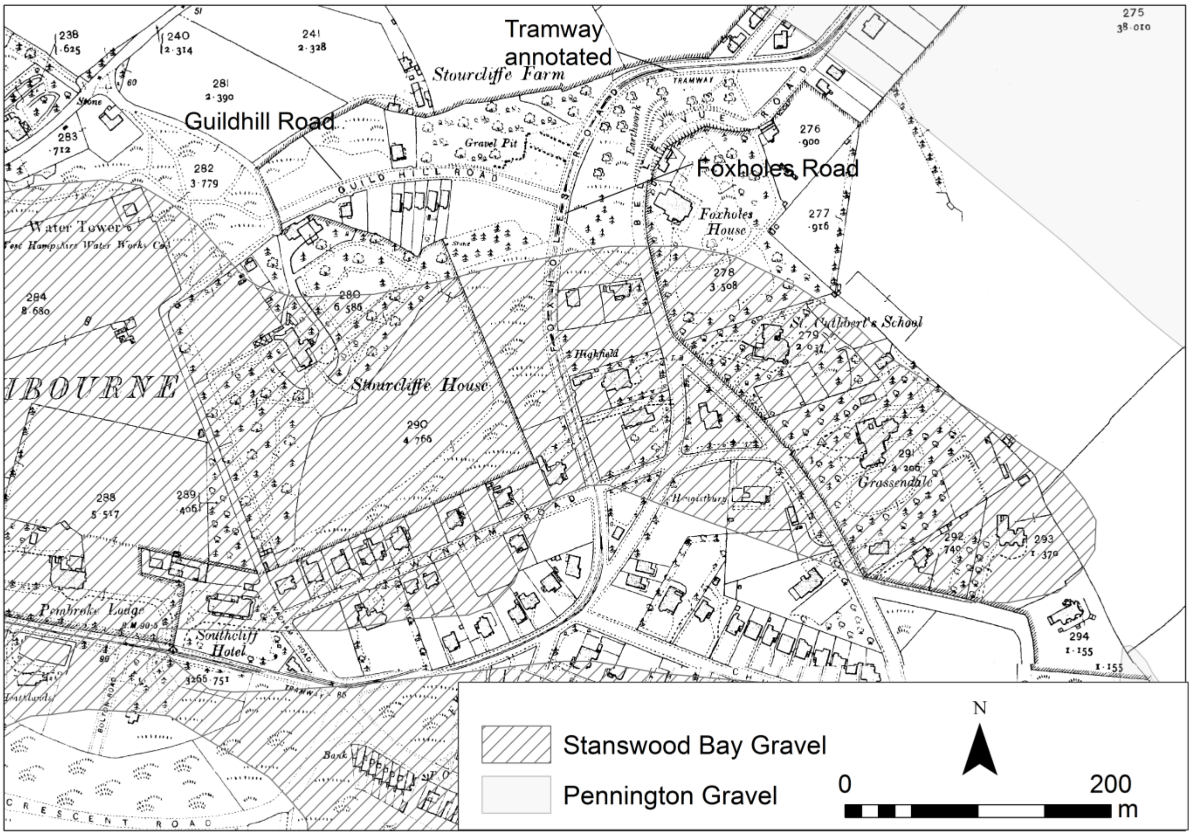

Figure 4. The Foxholes area of Southbourne at the time the Foxholes artefacts were recovered. Note the intersection of Foxholes Road and Guildhill Road, and the tramway that ran along Foxholes Road. It is from this area that the Foxholes handaxes were recovered, most likely from deposits associated with the Stanswood Bay Gravel. See Figure 1 for location. Created using 2nd Rev. (1909) 1:2500 County Series (Hampshire Sheet), © Crown Copyright and Landmark Information Group Limited (2014). All rights reserved. (1909)

presented the distribution of handaxes across the five main terrace sequences of the Solent River system which, from west to east, are associated with the River Frome, the rivers Solent and Stour in the Bournemouth area, the Hampshire and Wiltshire Avon, the River Solent in the New Forest area and the River Test. They highlighted a pattern that is common across the region, whereby the highest terraces are characterised by small numbers of poorly contextualised handaxes and contrast the large handaxe assemblages of known provenance associated with the middle and lower terraces. Now that the true provenance of the Foxholes handaxes has been established, the higher terrace record is even more impoverished.

Westaway *et al.* (2006) excluded all of the higher terrace handaxes from their analysis of the Solent Palaeolithic record due to the lack of contextual information. In most cases they argued that the height at which they were found, and consequently the relative age of the associated terraces, suggested that these were surface finds and therefore younger than the associated terrace. Another possibility is that the recorded provenance, usually based on the testimony of workmen, may simply be false; Worthington Smith (1894) provides a first-hand account of the unscrupulous behaviour of some workmen as they attempted to extract more money from the collectors. However, a recent search of museum archives has discovered some contextual information pertinent to the provenance of three assemblages associated with these higher terraces (Davis 2013). This suggests that a small number of handaxes may be attributable to the Sway Gravel of the River Solent and Terrace 8 of the River Test (Davis in prep.). Of course the actual age of these terraces and the associated archaeology remains unclear. It is tempting to view the first appearance of large handaxe assemblages in the Setley Plain Gravel of the Solent and Terrace 6 of the Test as corresponding with the broader proliferation of handaxes across Britain and northwest Europe during MIS 13 (Roebroeks 2006). If true, then handaxes from the higher terraces are likely to have been discarded during at least the preceding MIS 15 interglacial. However, there remains no direct dating evidence to support this, so at best the Solent region remains a candidate for early Acheulean occupation of Britain that requires further investigation.

The case of Foxholes also serves as a cautionary tale for the potential pitfalls of using the SRPP database and its partner *The English Rivers Palaeolithic Survey* (TERPS, Wessex Archaeology 1996), and highlights the potential for important contextual information to exist undiscovered in museum archives. The Druitt Catalogue was one of a number of documents discovered by the author in museum archives that did not come to light through a standard museum enquiry or catalogue search (Davis 2013). The information garnered from these helped to establish accurate provenances for a substantial portion of the Solent Palaeolithic record, providing a more accurate view of the region's archaeology than has previously been possible (Davis in prep.). It is clear that several of these documents, including the Druitt Catalogue, had not been utilised in previous studies/surveys of the Solent's archaeology (Roe 1968; Wessex Archaeology 1993; Westaway *et al.* 2006; Ashton & Hosfield 2010), presumably because their existence was simply unknown. Given the amount of contextual information found for the Solent (Davis 2013), a record that has previously been characterised by its general lack of contextual information (Ashton *et al.* 2011), it seems likely that there is a greater quantity of information available for other British fluvial archives than is often assumed.

It is also likely that the errors identified in the Solent section of the SRPP such as at Foxholes mirrors similar inaccuracies for the other river valleys covered by the SRPP and TERPS databases. This is not meant as a criticism, since the sheer size and scope of these projects meant that they could not be expected to conduct the same level of detailed study that is possible for a three-year doctoral study of a single river system. It is meant as a cautionary note for future studies of the fluvial archive. The SRPP and TERPS databases provide an essential foundation on which studies of the British fluvial archive can be built (Hosfield 1999). However, as has been demonstrated for Foxholes, they do contain inaccuracies, generalisations and errors that can have a significant affect on our reading of the archaeological record. It is therefore essential that the use of the SRPP and TERPS databases is accompanied by a thorough search for and study of all available contextual information wherever possible.

CONCLUSION

It is now clear that the small Foxholes handaxe assemblage was recovered from an area of Southbourne in eastern Bournemouth and not from the Foxholes area of Poole as has previously been assumed (Wessex Archaeology 1993; Ashton & Hosfield 2010; Hosfield 2011). Its association with deposits of the Stanswood Bay Gravel of the River Stour suggests that the handaxes are younger than much of the Palaeolithic material associated with the Stour and Solent terraces in the Bournemouth area. Although the poor chronological control in the Solent region and the potential for the handaxes to have been reworked from higher terraces prevents a confident age estimation, it is clear that they can no longer be decisively considered as candidates for early Acheulean technology in southern Britain. Foxholes serves as a cautionary tale of the potential pitfalls of using the SRPP and TERPS databases without conducting a thorough study of all available contextual information to verify site/assemblage provenance.

ACKNOWLEDGEMENTS

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WORKING WITH FLINT TOOLS: PERSONAL EXPERIENCE MAKING A NEOLITHIC AXE HAFT

P. Harding[1]

ABSTRACT

Neolithic woodworking techniques undoubtedly formed an important component of the ancient technology of the period; however few attempts have adopted a practical approach to examine the efficiency of stone tools in undertaking the task. This paper describes an attempt to replicate features of a Neolithic axe haft based on an example found at Shulishader, Lewis. It details the tool kit selected, challenges faced, and methods adopted to complete the task. The paper also considers the role of axe hafts as an integral part of the axe for Neolithic communities.

Full reference: Harding, P. 2014. Working with flint tools: personal experience making a Neolithic axe haft. *Lithics: the Journal of the Lithic Studies Society* 35: 40–53.

Keywords: Neolithic archaeology, replication, stone tools, ancient woodworking, axe hafts

INTRODUCTION

Having made stone tools for over 40 years, I realised that I had only limited practical experience using or hafting them. It seems I may not be alone; a review of the pages of *Lithics* indicates that these subjects have been featured sparingly (Hattat 1984; Clarke 1989; Mitchell 1996; Fluck 2007). The incentive to redress this and explore aspects of Neolithic woodworking technology on a personal level, using stone tools, arose from conversations during an ambitious experiment to reconstruct a half-size replica of the Bronze Age Dover boat (Parfitt 2014). The reconstruction of the vessel was undertaken by craftsmen using authentic bronze tools and necessitated that mortises be cut through cleat rails in the bottom of the vessel. This sophisticated piece of woodworking was relatively straightforward using bronze tools and the issue was raised about how easily a mortise could be cut using stone tools. Such skills were probably fundamental to prehistoric woodworkers living in an organic world and may have been resolved during the Mesolithic period as a means of hafting tranchet axes.

The lack of studies that examine Neolithic woodworking techniques using stone tools may be related to the relative scarcity of preserved wooden remains in Britain. Posts and cleaved planks, some of which were modified by open mortises, as well as hurdles woven from coppiced woodland stems, have been recorded (Coles *et al* 1973; Coles & Orme 1977). Traces of more sophisticated wooden artefacts have also been documented including axe hafts (Taylor 1998), bows (Clark 1963), bowls (Coles *et al* 1973; Taylor 1998), and domestic utensils (Coles *et al* 1973) that demonstrate the role of woodworking on a day-to-day basis. Analysis of waste products (i.e. chips: Taylor 1998 & 2011) and observations of tool signatures preserved in the surface of excavated timbers have also been exploited to study stone-tool use in prehistoric woodworking (Taylor 2011). The paucity of data in Britain stands in contrast to the wealth of material from mainland Europe, including Spain (Palomo *et al* 2013), France (Pétrequin & Pétrequin 1988), Switzerland (Boisaubert *et al.* 1974) and Germany (Tegel *et al.* 2012) where well-preserved wooden structures and artefacts have been recovered and studied. This abundance has also generated numerous programmes of experimental work, including a number, printed in German, on the use and hafting of axes and adzes in prehistoric woodworking, but not necessarily describing their manufacture (Meier 1990; Holsten & Martens 1991; Weiner & Pawlik 1995).

AXE HAFTS

Axe hafts constitute one of the most easily recognisable forms of organic, prehistoric artefacts. They provide stronger evidence to show how the head was mounted and used than the symmetry or asymmetry of the head

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itself. Versteeg & Rostain (1999) listed two methods by which Amerindians of South America attached the axe head to the haft: 1) 'hafting by inclusion', in which the axe head was inserted in a mortise, optionally supplemented by binding or glue; and 2) 'non-inclusion hafting' where the axe head was glued or tied to the haft. Prehistoric axe hafts are known both on mainland Europe (Harding & Young 1979; Hafner & Suter 2003) and in Britain and Ireland where at least ten Neolithic examples have been recorded (Evans 1897: 152; Taylor 1998: table 21). This relatively limited corpus of discoveries in Britain were all made so that the blade was 'hafted by inclusion', mounted parallel to the haft as an axe with none apparently mounted transversely as adzes are supposed to be. No evidence survives to suggest that supplementary binding or adhesives were employed. Axe hafts and adze hafts, also 'hafted by inclusion', are relatively plentiful on the European mainland with ten adze hafts being found at La Draga, Spain alone (Palomo *et al* 2013).

An axe haft was therefore considered to be an appropriate candidate for testing the effectiveness of stone tools. Specific choice of design was based on an example (Fig. 1A) from Shulishader, Lewis (Sheridan 1992). This haft, radiocarbon dated to 3500–2890 cal BC (OxA-3537 4470±95 BP at 95% confidence) was found with its polished stone axe head of Antrim porcellanite still in the socket. The haft survived for a total length of 480 mm and had been made from a log at least 160 mm in diameter, and thought possibly to be hawthorn, that had been cleaved lengthways. The housing for the axe head was formed by a steep sided rebate at the top with an angled rebate on the bottom. These slots thinned the wood to a thickness of approximately 40 mm, through which the central mortise was cut. The mortise was also especially well preserved and showed that considerable care and attention had been expended to ensure that the axe head fitted precisely into the socket. The axe head was fitted asymmetrically to the haft, with the front edge of the axe fitting snugly against the face of the lower rebate below the mortise socket. This asymmetrical pattern has been noted on hafted axes from Denmark where the axe heads were set at an angle of 80° to the haft, possibly to compensate for an angled swing of the axe and ensure correct impact against the tree (Becker 1945).

The Shulishader haft also included a number of similarities to hafts (Fig. 1B) from Ehenside Tarn, Cumbria (Darbishire 1874: plate viii, fig. 3; Fig. 1C) from the base of a ditch at the early Neolithic causewayed enclosure at Etton, Cambridgeshire (Taylor 1998: fig. 161). Foremost of these features on the Shulishader haft were a series of parallel flutes, which ran for approximately 70 mm from the back of the upper rebate and extended along the upper part of the haft. Taylor (Sheridan 1992) speculated that these were decorative facets and had been made using an axe or adze. Similar flutes were present around the end of the haft from Ehenside Tarn.

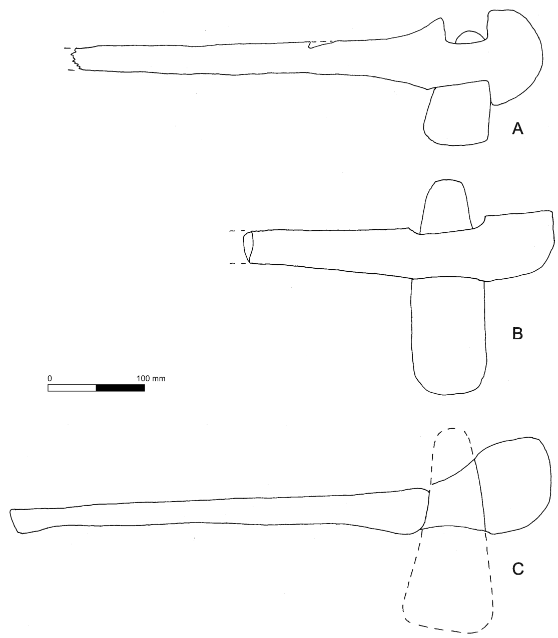

Figure 1. Neolithic axe hafts from Britain: A) Shulishader, Lewis (redrawn from Sheridan 1992); B) Ehenside Tarn, Cumbria (redrawn from Evans 1897); C) Etton, Cambridgeshire (redrawn from Pryor 1998)

TOOL KIT

The manufacture of the axe haft required a tool kit to complete a number of woodworking procedures, including cleaving, shaping, shaving and chiselling. Most importantly it demanded precision to create a mortise that mirrored the size and shape of a replica polished flint axe head that could be held in the haft without the need for additional binding. This flint axe head measured approximately 115 mm by 47 mm, which is slightly smaller

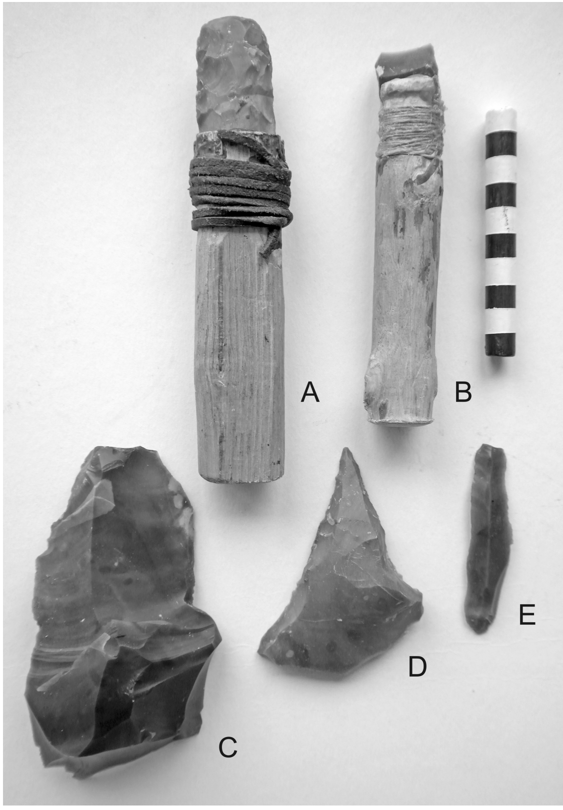

Figure 2. Tool kit: A) polished chisel; B) 'chisel' arrowhead; C) shave; D) piercer; E) snapped blade

than that found at Shulishader, and took approximately eight hours to grind, by hand, on a sandstone bench. The selection of stone tools (Fig. 2) also necessitated consideration of what tools were available to the Neolithic woodworker: wedges, axes, chisels, drill and draw knife or spokeshave, a choice that was heavily influenced by their modern equivalents, but which probably developed from stone originals.

The stone axe undoubtedly formed a principal component of the Neolithic woodworking tool kit. Blackwood (1950: plates 2 & 3) observed that, in the hands of a skilled person, high levels of precision can be achieved using only a stone bladed adze/axe. Taylor (Sheridan 1992) also considered that the stone axe was the prevalent tool that was used in the manufacture of the Shulishader axe haft. Much of the published experimental data related to stone axes has concentrated on aspects of their manufacture including flaking (Newcomer 1971; Hansen & Madsen 1983; Mandal *et al* 2004), grinding and polishing (Madsen 1984; Harding 1987). Manufacture of hafts (Harding & Young 1979) has been necessary where stone axes have been employed in studies of their use for felling trees (Iversen 1956; Coles 1979), although few of these projects, have described in detail manufacture of the haft or used stone tools in their production. Where flint has been used very little detail or consideration of the methods used has been provided on the effectiveness/success of the work (Maigrot 2001, 2003 & 2011).

Polished stone chisels also feature in British Neolithic stone tool assemblages but are less common than axes. The task of making an axe haft therefore made it possible to consider whether other options were available and specifically whether a 'chisel arrowhead' (Clark 1934; Green 1980) might function in an unconventional role as a woodworking 'chisel'. Chisel arrowheads have been found with Mortlake and Fengate pottery (Middle Neolithic) from 3500 BC (Gibson 2002: 80) and within the broad date range of the axe hafts from Shulishader and Etton. The function of 'chisel arrowheads' as projectile points was established by examples that survived in their shaft (Evans 1897: fig. 344). However chisel arrowheads occur in a range of sizes; some larger examples grading imperceptibly into waisted tranchet tools, while Richards' (1990:

fig. 11b) 'Y' shaped tool, for which very little study has been undertaken and no function yet established. The 'chisel' arrowhead used in the manufacture of the axe haft fell within the parameters of mean length and breadth, but at the upper end of thickness, of 'chisel arrowheads' catalogued by Green (1980: table II.19). The tool blank was selected deliberately with a cutting edge that was sufficiently strong to reduce the likelihood that it would crush in use. The 'chisel arrowhead' was supplemented by a bifacially flaked chisel with a ground blade. Both tools were mounted into wooden handles.

The rotary drill, possibly used in conjunction with a sand abrasive, undoubtedly featured in the Neolithic tool kit, while hand-held piercers, of varying sizes, are well known components of many flint assemblages (Semenov 1964: fig. 25).

The role of unretouched flint blades and/or scrapers, in conjunction with grinding and abrading the wood, has also been acknowledged. Coles *et al* (1973) considered that such techniques were more likely to have been restricted to smaller objects and felt that it was unlikely that they were appropriate to work hard woods such as oak or yew. However Blackwood (1950) noted that unretouched flakes of flint or chalcedony were indispensible to supplement the polished stone adze in the production of a wooden adze haft. The tool kit was therefore completed by a large 'waste flake' with straight, relatively strong edges, which was used as a shave and by a snapped blade (Semenov 1964: fig. 51). This was adopted subsequently to produce the mortise. Snapped blades broken by flexion are a common occurrence in flint knapping, but they can also be broken deliberately, by 'voluntary fracture' (Bergman *et al* 1987; Anderson-Whymark 2011).

Consideration was also given to alternative tools, materials and techniques that may have been available to the Neolithic woodworker, but which were not made of stone. Ethnographic studies have documented the effective use of hafted animal teeth as woodworking tools (Bubberman 1972). Bone chisels/gouges, found throughout the Neolithic (Piggott 1954: 85 & 146), have also been described. Smith (1965: 128) included four examples from the upper levels of the causewayed enclosure on Windmill Hill where they were considered to be skinning tools. Experimental studies have been conducted in Europe (Lobisser 2005) but remain relatively poorly discussed or tested in Britain.

Taylor (1998) and Tegel *et al* (2012) have both described the role that charring may have played in woodworking, similar to the technique used in antler pick manufacture, to make the material brittle and easier to work (Clutton-Brock 1984: 26). Fire provided an effective means to prepare wood in the replication of the Clacton spear point (Fluck 2007). Of more relevance to this project, Taylor (Sheridan 1992), drawing on observations of the way in which wooden bowls appeared to have been made at Etton (Taylor 1998: 154), thought it is likely that the mortise of the Shulishader haft had also been formed by charring and scraping.

TECHNIQUES

The haft manufacture involved:

1) roughing out and shaping the stave;
2) shaving;
3) cutting the rebates; and
4) creating the mortise and fitting the axe head.

The haft was made from a green oak log, approximately 0.10 m in diameter that was felled in May 2012. Throughout the early stages of the operation, the wood was kept permanently wet in a bucket of water, but during the later stages of manufacture, it was wrapped in moist paper kitchen towels and plastic bags to retain moisture. Recorded axe hafts from Britain and Ireland show that a variety of wood species were used (Taylor 1998: table 21). Rosaceous species, either hawthorn or apple, were most common although oak was employed to manufacture a haft from Ehenside Tarn, Cumbria. Axe hafts from the Swiss Lake Village sites were predominantly of ash (Harding & Young 1979).

The use of wooden wedges or stone axes to cleave roundwood radially along the grain is well understood, has been recorded at a number of Early Neolithic sites (Coles *et al* 1973; Taylor 1998: 147) and offered nothing new to this project.

Figure 3. Roughing out and shaping the haft with a polished flint axe. The image shows the distinctive fluting, the individual signatures of the blade and the resulting wood chip

Figure 4. Shaving using an unretouched flake to create the distinctive flutes

Roughing out and shaping the haft

The preliminary conversion of the cleaved stave into a suitable round shaft was achieved using a flaked axe with a ground and polished blade (Fig. 3). The process proved remarkably easy to complete and confirmed the removal of long, thin parallel ‘blade-like’ wood chips (Taylor 1998: fig. 146). Each wood chip exploited an existing arête, in much the same way that crests/ridges are exploited in the manufacture of stone blades and resulted in the creation of regular flutes. These are reminiscent of the type described for the Shulishader haft that Taylor (Sheridan 1992) considered were probably produced using a stone axe and were intentionally decorative. Subsequent trimming created a rounder form but in each case clear traces of the blade signature were retained that corresponded to individual blows of the axe.

Shaving

The initial process of roughing out and shaping the haft confirmed that regular flutes could be produced as by-products of manufacture. This stage of production also provided an opportunity to examine alternative options of tool use and test the effectiveness of a large unretouched blade/flake as a stone equivalent of a shave or draw knife. The process (Fig. 4), whereby the haft was clamped firmly in a modern workbench, seemed to work better when pushing the shave away. The operation created similar arêtes and 'blade-like' wood chips to those produced by a stone axe. Several embryonic pushes were required to open the shaving, but once the flint had engaged with the grain of the wood, the shaving was removed smoothly in a continuous flowing stroke. The removal of long wood shavings created a similar, clear, regular pattern of parallel flutes, which lacked only the traces of individual axe blows. The technique seems to be within the possibilities of Neolithic technology, provided that a means of clamping the wood was available; a 'horse' as used by traditional woodworkers is entirely organic and rots away leaving no trace.

Cutting the rebates

The rebates at the top and bottom of the haft were cut using the 'chisel arrowhead', which was tested successfully in two preliminary trials. In these trials, a square mortise was cut in slabs of green oak 25 mm and 45 mm thick respectively. Each mortise was cut from one side before the timber was turned over and the task repeated on the reverse side, creating a classic 'hour-glass' perforation.

The rebates on the haft were made by cutting a small 'V' shaped slot with the 'chisel arrowhead' across the wood grain (Fig. 5) at both ends of the rebate. The potential benefits were provided by the sharp tranchet edge, which, although not as robust as the polished chisel, cut through the green oak more efficiently. The sharp blade could be positioned accurately at the point at which the wood needed to be cut. Provided the chisel was used at a relatively low angle the blade remained undamaged. This angle of blow was similar to that normally used with a polished flint axe and allowed the blade to exploit the natural grain of the wood. The central slab of wood (Taylor 1998: fig. 148) was then broken out (Fig. 6) with the polished chisel, the blade being more robust. This technique is similar to 'log notching' by which a round timber can be squared-up by cutting notches and removing the intervening slabs of wood. The wood chips produced are characterised by one or two chamfered ends, according to whether the entire slab is removed complete. The process was repeated to achieve the required depth and produced a rebate with slightly angled ends. The base of the rebate was also refined using the 'chisel arrowhead'.

Figure 5. Cutting the rebates employing the 'chisel' arrowhead. Note one slot has already been cut to the left

Figure 6. Breaking out the central wedge with the polished chisel

Creating the mortise and fitting the axe head

This created the biggest challenge, requiring a made-to-fit aperture to accommodate the tapering lenticular cross section of the axe. An initial attempt was made to produce the relatively small mortise using fire, as speculated by Taylor (Sheridan 1992) for the Shulishader haft, but this process proved to be painstaking, ineffective and unsuccessful. There was an inordinate time needed to control the ember, encourage it to stay alight in the green wood and within the confined space of the mortise. It also offered little opportunity by which the shape of the mortise could be controlled to accommodate the axe head. To some degree these unsatisfactory results may have been due to inexperience of the technology. The use of a small 'chisel arrowhead', similar to that used to manufacture the rebates in the haft, was similarly unsuccessful, creating a square, rather than oval mortise hole. Use of a bow drill, wooden spindle and abrasive sand was also abandoned as being ineffective.

The most successful results were obtained using the hand held piercer (Fig. 7) that was manufactured with a tapering square-sectioned point. This was used to create a round, hourglass shaped perforation through the wood that could be expanded using the cutting edge of a flint blade/flake. This process, which was achieved using the end of a snapped blade (Fig. 8), was by far the most efficient and precise. The snapped blade provided a tool with sufficient length to penetrate the depth of the mortise and a square sectioned profile perpendicular to the axis of the blade that offered attributes of strength and relative sharpness. These characteristics are similar to those found along the edge of a burin facet, which is parallel to the blade axis but also provides an effective scraping edge. The snapped blade showed no visible traces of use and remained totally indistinguishable from one that has broken accidentally during manufacture. The butt of the axe was blackened before being inserted into the mortise to isolate areas that needed to be removed to accommodate the axe head. The areas of contact could then be pared away in a controlled fashion using the snapped blade to push away the protruding areas of wood. This method of shaping the mortise using stone tools proved to be only marginally less efficient than using metal chisels. The snapped blade was also used subsequently to produce more right-angled edges to the rebates.

The body of the completed haft (Fig. 9) was also smoothed using the edge of a blade, although the surface created by the stone axe was by no means untidy. The finished haft was hung up to dry naturally, minimising the chance of cracking.

Figure 7. Creating the mortise using a piercer to form the initial perforation. Note the wood shavings created in the process

DISCUSSION

This small project set out to explore and document the manufacture of an axe haft, based on British Neolithic examples, using only retouched and unretouched stone tools. The challenge was undertaken by someone more adept at making stone tools than using them. One of the initial conclusions was that the task was made easier by the use of green wood. In this state, all the tools performed efficiently and better than might have been expected. It is highly likely that prehistoric craftsmen had a comprehensive knowledge of species and the working properties of individual woods. However the apparent benefits of green woodworking should not be taken for granted; craftsmen in Irian-Jaya allowed the wood to dry for several months before it was used (Versteeg & Rostain 1999).

Fluting, which is a distinctive feature on some Neolithic hafts, was produced, as anticipated, using a polished flint axe although similar results were obtained using a large flake as a shave. Whether these features were intentionally decorative (Sheridan 1992), or by-products of manufacture, as produced in this exercise, or a combination of both, remains unresolved.

The production of the relatively small mortise posed the greatest technological challenge; the solution proved to be relatively simple and underlined the efficiency and potential value of something as simple as a snapped blade, an object that might conventionally be included as no more than a by-product of debitage (waste). These implements, like all the unretouched flakes and blades used in the work, showed no visible traces of use or edge damage to the cutting edge. Micro-wear analysis did not form part of the project, nevertheless the results of micro-wear analysis and low-power use-wear techniques (Grace 1992; Anderson-Whymark 2013) have also confirmed the extensive use of unretouched stone artefacts in prehistoric activity.

The replication underlined the adaptability of stone tools and confirmed that they may not always have been used in the way we expect them to have been. A ‘chisel arrowhead’ conventionally regarded as a projectile point functioned well when used as a chisel. In isolation this does not constitute conclusive proof that all chisel arrowheads were used as chisels, but merely offers an alternative workable option about how some larger examples might have performed and the use to which they were put. Most importantly, it warns against complacency that accepted function as assigned to stone tools is always correct. It underlines the contribution that experiment and replication can make to improve and expand understanding of stone tool function (see, e.g., Barton & Bergman 1982; Bergman & Newcomer 1983).

The process of creating the haft generated considerable appreciation of the prehistoric examples on which it was based. Neolithic axe hafts that have been recorded from Britain and Ireland share features of common design; a wooden haft with a through mortise into which the axe head was inserted. The hafts from Shulishader, Ehenside Tarn and Etton all incorporate rebates to a greater or lesser degree at the top, base, or both, of the mortise. This process effectively thinned the staves of these hafts to a central band approximately 40–50 mm thick through which the mortise was cut. The design was also repeated in an account of a haft from Glamorgan (Savory 1971), the upper surface of which was recessed around the socket but which rose again at the end of the haft in a similar fashion to the Ehenside Tarn haft. A poorly described and illustrated haft from Bogancloch Aberdeen was also slightly 'waisted' around the axe head (Curle 1925). One explanation for this recurring feature may lie with the fact that by reducing the thickness of the stave, it became easier to produce the mortise. This compromise retained a greater mass of wood where it was most needed, both in front of and behind the axe head, thereby reducing the likelihood of the haft splitting longitudinally, a flaw that accounted for the demise of the Etton haft. The British corpus currently includes no known examples of composite hafts with elaborate bindings, as described in ethnographic studies (Blackwood 1950) or of antler sleeves (Maigrot 2011), known on the European mainland, which plug into a stub mortise. Nevertheless it would be unwise to assume that all hafts in Britain were constructed in the same way, or did share a common design or function. In parts of New Guinea methods of hafting and binding varied significantly. Phillips (1979) noted strong contrasts between the relatively rudimentary hafting of axes designed for work, similar to those from Neolithic Britain, and the elaborate embellishments afforded to the hafts of ceremonial axes. Similarly Sillitoe (1988) described how variations in haft design provided a signature of individual groups within separate areas.

Figure 8. Reconstruction of the snapped blade as used to enlarge and form the mortise. Shown in use on the outside of the wood to demonstrate the efficiency of the tool more clearly

Figure 9 .The finished axe head and haft

Axe heads were undoubtedly practical implements and, in this role, could not have functioned without a haft. Blackwood (1950), referencing axe-using communities in New Guinea, observed that axes formed an integral part of everyday life for most males in the community. She noted that each individual would have been capable and indeed did manufacture their own axe hafts. Some were of more superior quality and more finely finished than others, where the bark was left in place. Nevertheless most craftsmen did at least fashion the haft to fit their grip. Similar trends may well have also existed in prehistoric Britain, where variations in individual skill, degrees of perfectionism or the ultimate function of the axe determined the quality of the end product. Irrespective of these individualities, the production of a haft necessitated production of a mortise that precisely reflected the shape of the axe head; one being useless without the other.

In this purely practical sense, the haft may be seen as being no more than a means of providing leverage for the axe head. However few stone tools have been imbued with as many variations of value, use or symbolism as axe heads, making it possible for some to function without a haft. Pétrequin & Pétrequin (2011: 335) stressed the importance of understanding the *meanings* in order to understand the *social* role of the axe within a community. That axe heads were multifunctional objects, endowed with prestige, symbolism and power as well as their practical role and as objects of exchange was noted by 19th century antiquaries (Evans 1897: 55). However just as the axe head is regarded as an object of great symbolism, prestige and power, it is possible that the haft itself, and its manufacture, also acquired a symbolic and spiritual role; a stone axe is depicted with its haft carved in the decorated menhir at Table des Marchand, Brittany.

The role of axes, both hafted and unhafted, as objects of significance and meaning is reinforced by evidence that they featured in acts of deliberate deposition. A sufficiently large number of axe heads have been found, some in waterlogged deposits where preservation of hafts would be guaranteed. Those from the Sweet Track, Somerset (Coles *et al* 1974; Coles & Orme 1979) included not only a highly flaked flint example, in mint condition, but also one of jadeitite, an exotic raw material from the Alps, which was possibly already an heirloom at the time of its deposition. Sheridan (1992) speculated that the deposition of the Shulishader axe head, which showed no signs of use, and its haft, may have been similarly deliberate; an amalgam of Parker Pearson's (2012: 6) life, as represented by wood, and death, by stone. While this argument may be idle speculation, it may have some merit; the axe head of the hafted Ehenside Tarn axe was also undamaged and probably deliberately deposited. Understanding the processes involving the haft from the causewayed enclosure at Etton is more speculative, although objects, including axes or axe fragments were frequently deposited in pits and ditches in a number of such monuments (Wheeler 1943: 166; Saville 2008: table 10.53). It is perhaps just as likely that the haft from Etton was merely discarded as being broken and escaped the understandable view that it was only good for firewood. Nevertheless it is an intriguing possibility that many axe heads from excavated pits and ditches, where no organic material survives, were originally buried with their haft.

The process of making the axe haft was satisfyingly creative. To what extent these creative aspects formed a part of the Neolithic world or were driven by spiritual issues is open to question. The results, documented here, provide only an account of the work undertaken and its success. They do not profess to provide a definitive description of how certain skills were undertaken by Neolithic people but more accurately how a relatively naïve craftsman can achieve acceptable results. In addition they serve to arouse awareness of the importance of handles, not merely axe hafts but an entire range of handles for all types of flint tools. No systematic record was kept of the time taken to manufacture the haft, although collectively production probably took between 3 and 4 days. In the event this is immaterial; the work was undertaken by an individual with limited use of stone tools and a large amount of trial and error. In comparison Blackwood (1950) noted a time of four hours by a craftsman skilled in the use of a stone adze to manufacture an open socket, a less demanding task than the completion of a through mortise, and bind a stone adze blade to its haft. There is undoubtedly a need to repeat the exercise, using a thorough preliminary study of extant hafts, to test the efficiency of hafts in use, assess different types of wood, describe the results and produce data to repeat, modify or challenge the work described here. The time is ripe to develop more individuals with the necessary craft skills, techniques, experience and inquisitiveness to determine the efficiency of the stone implements in a woodworking role.

The axe and haft were donated to Salisbury and South Wiltshire Museum at Salisbury, together with a copy of the photographic archive. The object now forms part of the public display at the Stonehenge Visitor Centre although regrettably the haft was sanded down for display, removing the finishing traces produced by stone tools.

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A PRELIMINARY NOTE ON THE PALAEOLITHIC SITES IN THE UPPER RAVENSBOURNE AREA, BROMLEY, KENT

F.R Beresford[1]

ABSTRACT

Many Palaeolithic sites, first discovered in the late 19th century or early 20th century, lacked adequate publication and coherent curation of the finds which were frequently exchanged or sold and dispersed. This study focuses on a number of minor sites that have suffered in this way. The study area is in the parish of West Wickham, Kent, now part of the London Borough of Bromley. Three men discovered most of the lithic material found in the study area in the years from 1878 to 1898. All three gave partial accounts of their finds in various contexts during the period 1882 to 1908 and many of these accounts have been located for this study. Parts of their collections have been identified in the collections of two museums. The aim of this study is to investigate to what extent it is now possible to construct a useful account of the Palaeolithic of the Upper Ravensbourne Valley.

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Keywords: *Palaeolithic, Upper Ravensbourne*

INTRODUCTION

Many sites discovered in the late 19th century or early 20th century were not adequately reported or not published at all. The finds were frequently exchanged with examples from the collections of other collectors or sold and dispersed, particularly on the death of the original collector. However some of these finds were eventually placed in museum collections. This note relates to some minor sites of this sort.

THE STUDY AREA

The study area is in the southern end of the parish of West Wickham, Kent, now part of the London Borough of Bromley where it adjoins the parishes of Hayes and Keston on the east and the former Kent/Surrey border on the west (Fig. 1).

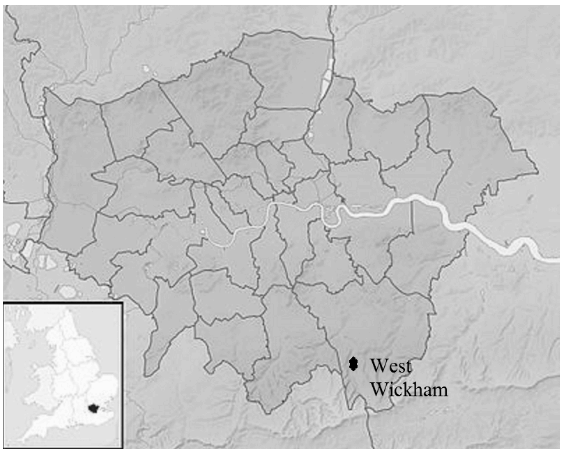

Figure 1. West Wickham location map

It is located where the Weald Anticline in the south meets the edge of the London Basin in the north. In the south, there is an outcrop of the Upper Chalk of undifferentiated Lewes Nodular Chalk formation and Seaford formation representing a portion of the lower dip slope of the North Downs. The interfluves are capped by clay with flints and towards the edge of the chalk there are patches of the Thanet Sand Formation. Two main arms of the Ravensbourne Valley, now dry, with some smaller subsidiary valleys dissect the chalk with patches of higher-level gravels along its course. Dewey noted that the chalk forms a re-entrant angle into the Tertiary outcrop in the north of the area on account of the erosion of the overlying beds by the River Ravensbourne. The Harwich Formation occupies much of the northern part of the area. It forms a plateau with marked escarpments down to the valley and its two arms. On the fringes of the plateau are narrow outcrops of the Woolwich Formation of the Lambeth Group and the Thanet Sand Formation, but both are usually obscured by downwash from the Harwich Formation (Dewey *et al*. 1924: 74; Burnham & McRae 1974: 84; Ellison *et al* 2004).

THE LOCATION OF KNOWN COLLECTIONS AND ARCHIVES

Palaeolithic flint material was located in this area in the period 1878 to 1905. Parts of the original collections are now curated at the British Museum and Bromley Museum – all

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Table 1. Palaeolithic artefacts found in the Upper Ravensbourne area between 1878 and 1905 that are now in the British Museum or Bromley Museum collections or that were described in contemporary accounts

Museum	***Hand axes***	***Cores***	***Scrapers***	***Points***	***Flakes***	***Total***
British Museum	31	1	61	6	11	**110**
Bromley Museum	5	1	2	0	0	**8**
Described	9	0	4	0	3	**16**
Total	**45**	**2**	**67**	**6**	**14**	**134**

having passed through the collections of at least one other person or museum. One hundred and eighteen artefacts have been located. An analysis of this is in progress to which will be added published information about 16 other artefacts that can no longer be traced (see Table 1) The original collectors wrote about their finds in academic journals, popular journals, personal notebooks and maps, personal scrapbooks, privately published papers and local newspapers during the period 1882 to 1908. Many of these accounts have been located for this study in the academic journals and at Bromley Local Studies Library, the British Library, Bexley Reference Library and the Library of the Society of Antiquaries, Burlington House.

THE COLLECTORS

Three men can be linked to the discovery of lithic material in the study area in the years from 1878 to 1898.

George Clinch (1860−1921) grew up on Rowes (or Rouse) Farm in Church Field Valley. He collected Palaeolithic, Mesolithic and Neolithic material from the surface of fields on the farm from 1878 to 1888, when he married and moved away (Knowlden 2010). He found Palaeolithic material in six fields all of which are located in Church Field Valley (Clinch 1889: 184). These fields are listed in Table 3 and shown in Figure 2. He published a table of his finds in Church Field in 1893 (see Table 2) Clinch wrote about these finds many times (Clinch 1881, 1882, 1884, 1886, 1889a, b, 1893, 1900 & 1908). Flaxman Spurrell included Clinch's initial finds in his survey of Palaeolithic implements found in west Kent (Spurrell 1883).

Table 2. Table of finds in Church Field as published in Science Gossip *(Clinch 1893: 136)*

Description or class	***Number***
Hatchets and almond-shaped weapons	20
Scrapers and trimmed flakes	34
Flakes	50
Miscellaneous	20
Total	124

Arthur Santer Kennard (1870–1948) grew up about five miles away from Beckenham. His first discovery of lithic material in the area was made in 1887. He carried out a wider survey of the fields in the area in 1894−5 and subsequently paid the farmworkers to supply him with anything they found (Griffin 1906: 57.) During the period from 1888 until 1909 he belonged to the Bromley Naturalist Society. He frequently talked at their meetings on a range of topics including his Palaeolithic finds in the study area. These meetings were fully reported in the *Bromley District Times* by Kennard and he kept copies of the reports in a scrapbook (Kennard 1900, 1904 & 1909).

Alfred Edward Salter (1863–1926) visited the area with Kennard as part of his research into the superficial deposits of central and parts of southern England. (Salter 1899 & 1904) In 1904, he noted, "[a]t West Wickham, 261 ft. O.D., Mr G. Clinch, Mr A.S. Kennard, and myself have obtained Palaeolithic implements from the fields" (Salter 1904: 9).

Material now in the British Museum can be clearly linked to Clinch and Kennard. There is

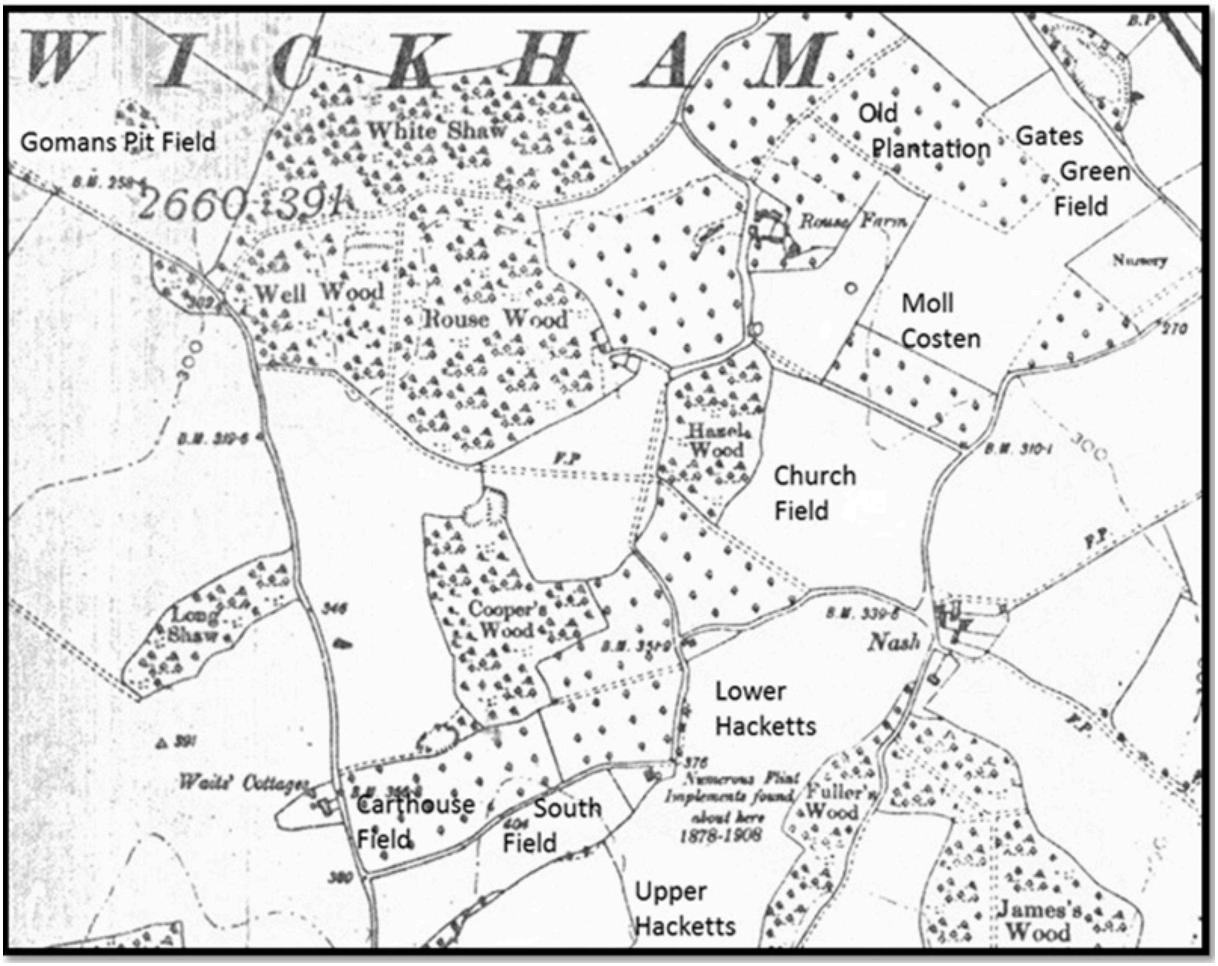

Figure 2. Fields in Church Field Valley and Chestnut Avenue Valley (top left) in which Palaeolithic material was found (based on the Ordnance Survey six-inch sheet 1910)

more of Clinch's collection in Bromley Museum. A third collection in the British Museum could have been Salter's collection or part of Clinch's collection. It was bought by the Wellcome Collection at the sale of the de Barri Crawshay collection at Stevens Auction House in 1929. The sale catalogue included material from Clinch's collection although the lots that included this third collection did not mention Clinch's name.

As members of the Geologists' Association and Fellows of the Geological Society, all three wrote about and discussed the geological context of their finds. Even though the finds were mainly surface finds after ploughing, they all linked them with river terraces. The finds in Church Field Valley were considered to be of sufficient significance to be mapped on the 1910 six-inch Ordnance Survey sheet (see Fig. 2).

THE IDENTIFICATION OF FIELDS/FIND LOCATIONS

Three find areas have been identified using the contemporary accounts, writing on the artefacts, the field names and find sites from an 1882 sketch map drawn by Clinch (Clinch 1889b) and field names on the 1838 tithe map.

These are:

1. Church Field Valley
2. Chestnut Avenue Valley
3. Tiepigs Lane Gravel Pits

Ouline details of each site are given in Table 3.

Table 3. Details of the three identified find areas

Find Locations	Geology	Fields/Pits in which artefacts were found.	Notes
Church Field Valley (TQ 463640; 82−105 m OD) This meets the main Ravensbourne Valley eastern arm about a mile south of its confluence with the western arm.	Colluvial sequence with palaeo-argillic brown earth soil on Clay-with-Flints at the top, and shallow soils directly on the chalk on the downslope. The dry valley bottoms have Pleistocene head (Coombe deposits) and Holocene hillwash (Burnham & McRae 1974: 86). Dewy *et al.* (1924: 101) noted "Traces of a higher terrace" at the end of Church Field Valley and this terrace at 90 m OD was clearly mapped on the contemporary BGS geological map.	Church Field, Moll Costen, Gates Green Field, Carthouse Field, Old Plantation, South Field, Lower Hackett's Orchard and Upper Hackett's Orchard (all shown in Fig. 2).	Most of these fields are now used for grazing and have not been ploughed for many years.
Chestnut Avenue Valley (TQ 394644; 78–96 m OD) This meets the main Ravensbourne Valley eastern arm about half a mile south of its confluence with the western arm.	As above.	Goman's Pit Field. (located in Fig. 2)	This valley, including Goman's Pit Field, is now partially built over along a road called Chestnut Avenue.
Tiepigs Lane Gravel Pits (TQ 395659; 61 m OD) These pits were at the confluence of the two, now dry, arms of the Ravensbourne.	"A good section in the alluvial flat was seen. Unrounded flints rested sharply on Thanet Sand, and the President (Mr A.S. Kennard) suggested that these deposits were caused by Solifluction, during the later stages of the Glacial Period" (Wood 1945).	Two Palaeolithic artefacts were reported as being found in association with a range of late Pleistocene mammals (mammoth, rhinoceros, horse and reindeer) at the base of the gravel on the Thanet Sand (Griffin 1906: 55.)	One pit is now covered with housing; the other is a playing field.

DISCUSSION

The Palaeolithic flint material found in the Upper Ravensbourne area can be broadly assigned to three discrete areas, the most important of which is Church Field Valley. Most of the flint material would appear to be from the fields on either side of Church Field Valley. That part of the material that is still available for research in museum collections may represent less than 40% of what was originally found. Some original finds are now allocated to the Mesolithic period and are still in the collections of the museums. The aim now is to combine the evidence from the surviving lithics with that available from the documentary evidence to construct an account of Palaeolithic activity in this area that is as complete as is now possible.

FURTHER WORK

A final report is being prepared. This will include an analysis of the lithics and further consideration of the context and age of the finds.

ACKNOWLEDGEMENTS

I would like to thank Nicholas Ashton and the team in the Sturge Room at the British Museum (Franks House) for their help as well as Marie-Louise Kerr and the team at Bromley Museum. I am also very grateful for the help given to me at the Bromley Local Studies Library, the British Library, the British Museum Anthropology Library, Bexley Reference Library and the Library of the Society of Antiquaries, Burlington House.

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LETTERS AND NOTES

RON (BARRY) WAITE (4 JULY 1949–23 JULY 2014): AN APPRECIATION

A. Saville[1] & A. Graf[2]

His family and friends, including many archaeological colleagues, were shocked to hear of the sudden death of Ron Waite in July 2014, killed by a train in tragic circumstances. Ron made an invaluable contribution to the study of prehistory in the Midlands, especially the Mesolithic and Palaeolithic periods, through his lifelong interest in archaeological field-walking and the recovery of surface finds, at which he was especially skilled.

Ron was proud of belonging to Nuneaton, Warwickshire, where he was born and spent his life. He attended local schools, including Arbury High, then held a variety of jobs before joining the army, which he left after a brief period due to health problems. His life thereafter was devoted in many ways to his field-walking (Fig. 1). His father's name was also Ron, and for a while, somewhat confusingly for his correspondents, the young Ron sometimes preferred to use his second name, Barry, until after his father's death. Throughout his life Ron enjoyed frequent and regular visits with his sister Lorraine and her husband in nearby Hinckley. He is survived by his sister and two brothers, amongst other relatives.

A kind and generous person, Ron had a keen sense of humour, albeit one which reflected his own idiosyncratic view of the world. He was a loner from childhood, content in his own company and did not socialise easily; but his friendship, while sometimes a little erratic, made a strong impact on its recipients, with whom he corresponded extensively, usually on any odd scrap of paper to hand.

Ron read widely, enjoyed popular music and took an interest in other people, whom he often attempted to categorise on his own terms. This sometimes led to 'fallings out' when he could not resist telling people directly how he thought of them — tact was not one of Ron's strong points! He was very fond of animals, became a vegetarian, and admired mystical religions. He lacked any interest in worldly goods and refused to have a telephone, television or even a fridge; his kitchen cupboards and other furniture were full of prehistoric finds.

Figure 1. Ron Waite during a visit to a gravel pit near Hopwas, Staffordshire, in 2008. (Photograph: Terry Hardaker.)

Ron's interest in archaeology was already strong in his teenage years, when he found a Romano-British site near his home. His attention moved on to Egyptology, but then to local prehistory, including finding rough-outs near the Nuneaton Group XIV axe factory (Alan Cook, pers. comm.). Through the late

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Francis Fawcett (†1972), of Nuneaton Museum, Ron met many supportive people with whom he could discuss his finds and their origins. Over the years Ron became an expert knapper, easily making handaxes from seemingly intractable quartzite cobbles, and barbed-and-tanged arrowheads and other tool-types from flint, glass or any knappable material to hand.

In 1967 the discovery of a flint blade before construction of the Bedworth Bypass started Ron's field-walking for flints, his well-thought-out tactic being to search near a spring or elevated position as a likely early focus. With time he acquired an intuitive 'feel' for landscape elements likely to favour the traces of Mesolithic to Bronze Age activity, and very often he was proved correct when surface finds materialised. A November 1972 item in the local Nuneaton newspaper was headed 'Flinthound Ron on hunt for early man', and 400 of his finds, dated by specialists from Birmingham and Cambridge universities to periods from the Mesolithic to the Bronze Age, were exhibited in Nuneaton Museum (Struebig 1972a & b).

Thus Ron's fieldwork extended over a period of nearly 50 years. His searches encompassed parts of Warwickshire, Northamptonshire, Leicestershire and, lately, Staffordshire. He thought nothing of cycling for miles to one of his sites, spending hours searching the field, and then cycling back again in all weathers. He had a gift for spotting an artefact at 50 paces! He labelled and recorded almost all of his finds, often noting the locations on his own sketch maps (Fig. 2) or on Ordnance Survey sheets which his archaeological contacts were pleased to supply, and which he made available to Historic Environment Records and other enquirers. He would delight in showing his latest finds, which he sometimes just gave away to those interested, while he donated large quantities to local museums. However, he retained most of his Palaeolithic finds from around Nuneaton, of which he was especially proud, along with selected other 'specials'.

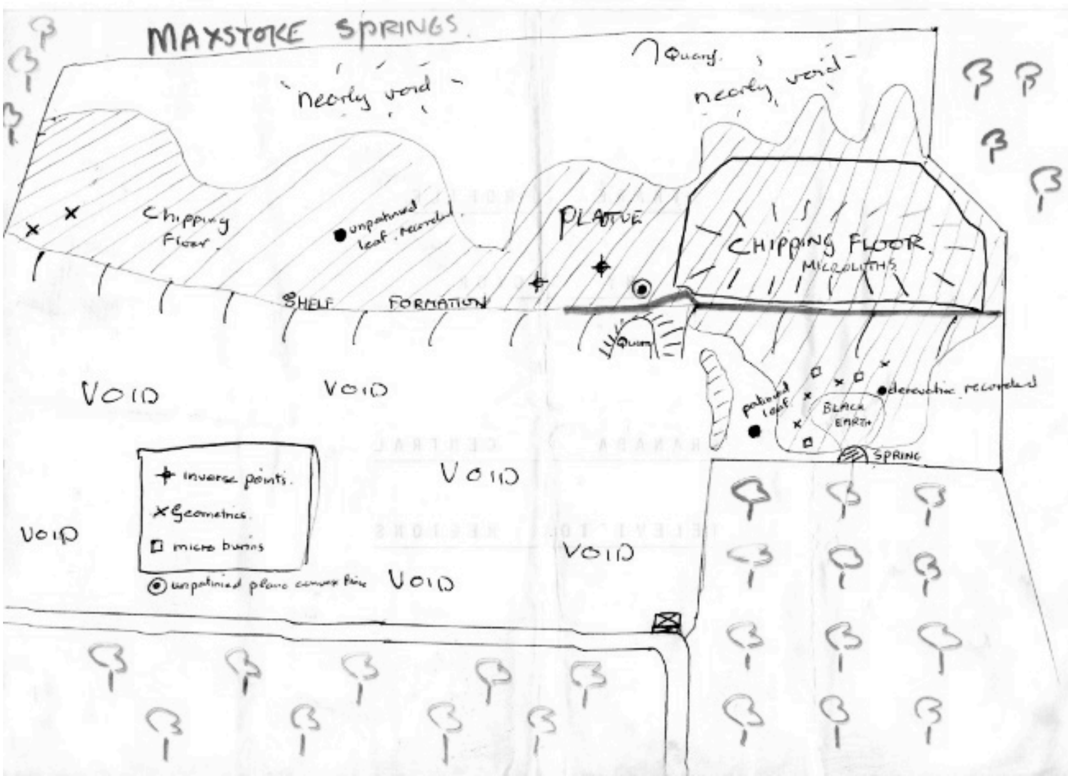

Figure 2. Ron Waite's sketch map of his Maxstoke Springs site, Warwickshire, as included in a letter to Alan Saville, November 1982

He never sought acknowledgement or publicity, and left it to others to analyse and publish his work, which is not to say that he had no views and ideas about the implications of his finds. On the contrary Ron had his own very firm and well-argued interpretations of how the implements he found were made and used, and what they meant in terms of the pattern and sequence of prehistoric occupation in the region. These were expressed in conversation and in his voluminous correspondence.

It is no exaggeration to say that Ron's finds have contributed to significant rewriting of the existing records and will continue to be invaluable in the study of prehistory in central England, as reflected by the way in which the Waite collection is referenced in so many academic publications (e.g. Wise 1990: 32; Hingley 1996: 4; Wymer 1999: 178; Lang & Keen 2005: 67; Lang & Buteux 2007: 13; Myers 2007: 31; Garwood 2011: 12; Bridgland *et al*. 2014: 243).

Ron was virtually the first to draw major attention to the Mesolithic of the region through his contact with specialists such as the late Dr Lawrence Barfield at Birmingham University, which is how many of his find-spots came to be recorded in the CBA's Mesolithic Gazetteer (Wymer 1977). At Honey Hill, Elkington, Northamptonshire, Ron identified a large surface flint scatter, including distinctive microliths with inverse basal retouch (Saville 1981a), with three similar and more than a dozen smaller scatters in east Warwickshire (Saville 1981b). On the basis of Ron's discoveries, Saville (1981b) suggested the Honey Hill type of microlith assemblage represents the denser peopling of the Midlands around the time of the earlier to later Mesolithic transition (*cf.* Reynier 1998; Myers 2006), and Honey Hill has become a type-assemblage eponym for this variant of the Mesolithic in Britain (Reynier 2005). Ron's contribution was finding these distinctively Midlands types of assemblage and making them available to specialists. It should also be noted that Ron had no inhibitions about collecting flint and stone artefacts he personally thought interesting, even if others regarded them as typologically dubious. In this way he brought attention to interesting aspects of the regional Mesolithic that might otherwise have been overlooked (e.g. Saville 1977a). Furthermore, blades of Late Upper Palaeolithic type may also be identifiable amongst Ron's archive of finds (Cooper pers. comm.).

Following his Mesolithic forays, Ron next made an extremely valuable contribution to the study of the earlier Palaeolithic period in the Midlands. He singlehandedly multiplied many times over the number of Palaeolithic finds in the region with his discovery of handaxes, mostly of quartzite, but also of flint (Fig. 3) and a few of rarer raw materials such as andesitic tuff or rhyolite (Saville & Shotton 1973 & 1974; Saville 1986 & 1988; Pickin 1988; Brown 1992 & 1993a; Graf 2002, 2004, 2011 & 2013). Ron highlighted quartzite as the main locally available raw material in this non-flint-bearing region of Triassic geologies (MacRae & Moloney 1988) and very astutely developed the ability to recognise signs of human modification even on highly abraded quartzite artefacts. Ron also commented that 'the … flint ones look like they have been to the North Pole and back' (undated letter to Anne Graf received 31 May 2014), reflecting on the poor quality of much glacially imported flint in the Midlands.

Ron also retrieved a wide range of other quartzite artefacts, mainly chopper-cores, and small numbers of other tool types (Saville 1988; Graf 2004, 2011 & 2013), sometimes in significant concentrations. Whilst the handaxes and probably the chopper-cores are clearly of Lower to Middle Palaeolithic typology, the other quartzite artefacts, mostly made on cobble raw material and usually in similar condition to the handaxes, are unfortunately undatable, though often found on a field surface close to handaxes of flint or quartzite. Their variety is perhaps best matched by finds from the Neanderthal reoccupation at Creswell Crags in MIS 3 (Graf 2004), but an open mind needs to be kept for the possibility of the utilisation of the locally abundant quartzite resource in an *ad hoc* fashion during more recent periods (*cf.* Saville 2009).

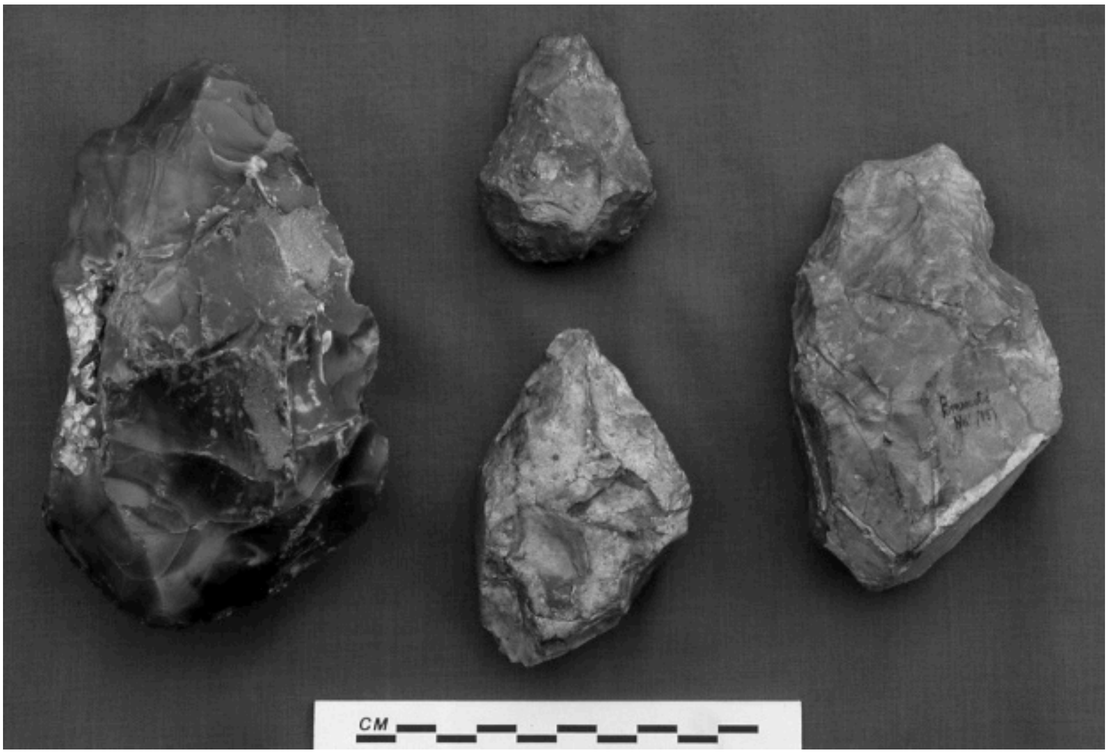

Figure 3. Flint handaxes from Bramcote Hill, Warwickshire, in the Waite Collection. (Photograph: Alan Saville.)

Ron's finds have emphasised the unexpected density and extent of Palaeolithic activity across the entire landscape, the interfluves as well as the river valleys (Wymer 1999). These finds occurred over a range of local surface geologies (Graf 2004), which outside the river valleys date back to the Anglian glaciation, when the Midlands drift deposits are now known to have been laid down, a surface not subsequently disturbed by any further glaciation in Ron's search areas. The relationship of the finds to these surface deposits has been a subject of keen enquiry by Ron, disputed with the late Professor Fred Shotton of Birmingham University, with whom he disagreed over this matter (Shotton 1988; Waite pers. comm.). Whatever the precise contexts from which the Lower Palaeolithic handaxes were derived, what Ron's fieldwork showed conclusively and very significantly was that in parts of central England they were present as frequent surface finds.

Whilst not ignoring his home area, Ron began during the last five years to focus on Staffordshire, where by May 2014 his finds total for handaxes alone, ignoring all other types, was 28 quartzite, two flint, and one other. Ron was happy to donate these finds and to have them all recorded at Birmingham Museums (Teresa Gilmore pers. comm.).

Although it is true that Ron's archaeological interests came to be focused on first the Mesolithic and latterly the Palaeolithic periods, he did not ignore more recent archaeology and, particularly in the 1970s, he made several significant later prehistoric discoveries. Perhaps chief amongst these was his identification of the Bronze Age round barrow cemetery at Abbey Farm, Warwickshire, and the recovery of one of the richest Midland collections of Neolithic and Bronze Age flintwork from the surrounding areas (Saville 1974a; Rankama 1983; Garwood 2007). For example, Ron's collection of flint arrowheads from around Nuneaton was one of the key indicators of the distribution of later Neolithic activity there (Fig. 4). He also made many discoveries of individual later prehistoric artefacts (e.g. Saville 1974b & 1977b; Saville & Shotton 1975; Brown 1993b; Prinsen 1997a, b & 1994) or drew attention to finds made by other workers (e.g. Saville 1975).

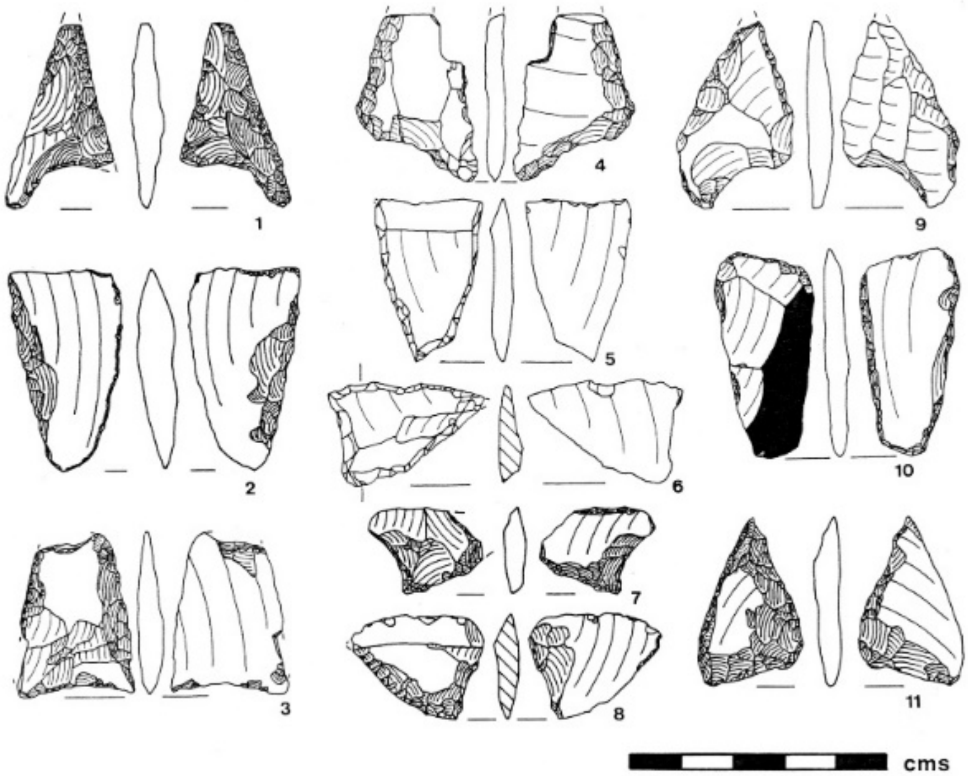

Figure 4. Late Neolithic chisel and oblique flint arrowheads from Warwickshire found by Ron Waite: 1) Ansley; 2, 5 & 6) Bramcote; 3, 4 & 10) Wolvey; 7) Oldbury; 8 & 9) Corley; 11) Attleborough (reproduced from Saville 1974a)

'STILL COLLECTING STONES'

Ron's death is a sad loss to his family, to all who knew him, and to archaeology in the Midlands. He had just reached the age of 65 and was continuing to make significant discoveries; his talents will be sorely missed. The importance of his Palaeolithic finds has been widely appreciated and celebrated; for example, 'The Waite Collection from north Warwickshire and south Leicestershire is now recognised as one of the most important private collections of Palaeolithic material in the country' (Buteux & Lang 2002: 18). It is a consolation that his name will be remembered and live on in The Waite Collection (Rann 2011; and see: http://archaeologydataservice.ac.uk/archives/view/waite_na_2011/). In his final letter (to Anne Graf) he reported 'still collecting stones'; that might well be a suitable epitaph for Ron.

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RON WAITE—A PERSONAL TRIBUTE

T. Hardaker[1]

I met Ron Waite only twice, but over a period of 25 years, through my friendship with the late R.J (Mac) MacRae, who knew him well, I was aware of his work, his letter-writing and his eccentricities.

Ron was one of a number of amateur archaeologists who pursue their hobby with a passion that few professionals can match. His interest in things from the past seemed to be almost genetically embedded, it was 'in his blood', and was manifest from an early age, starting with his childhood discovery of Roman material near his home in Nuneaton. His ability to find prehistoric artefacts in ploughed fields developed over a period of more than 40 years, and it became his main archaeological interest.

As a result he collected one of the largest, if not *the* largest, assemblage of surface artefacts of Palaeolithic and Mesolithic age in his travels in Warwickshire, Leicestershire, Staffordshire and Northamptonshire. I never asked Ron what his motivation was for such compulsive activity, but it seems to have had something to do with the wonder of finding things very old, that had probably never been noticed since the day they were dropped by their makers. The potential monetary value of these finds did not enter his mind, despite a lifelong shortage of money (his letters were typically written on scraps of second-hand paper because proper stationery was unaffordable).

Working in the Midlands, his finds were most commonly made of quartzite, a material harder to work than flint that produces a different range of tools, so the authenticity of his finds often attracted heated discussion. Nevertheless he possessed an unshakeable certainty about the veracity of his discoveries, which would become even more entrenched when others expressed scepticism. I once pressed him on the specific human qualities of a particularly doubtful item. After a lot of close-focused debate, he came up with a telling phrase: "[y]ou are not seeing what I am seeing", as if

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he possessed an inner eye on the subject. Only towards the end of his life did he begin to admit that, just perhaps, some of his finds might be natural, although most were sound enough. This self-assured confidence chimed with his interest in eastern mysticism, which gave him a deep spiritual appreciation of the meaning of life: despite the frugal lifestyle, he had managed to acquire a number of icons, prominent amongst which was a seated Buddha adorning the shelf in his modest home.

Ron had his ups and downs with the academic community in whose presence he sometimes felt uneasy. But once he had gained the trust of a curator, he was generous in handing over selected finds to museums. Problems only arose when the professionals begged to differ on some issue. Although he equipped himself with the basics of his subject, delving into the latest archaeological journals was not a priority. He felt his innate understanding of the nature of Palaeolithic man needed no statistics or lab tests to support it. This was at the root of most of the disagreements, and for Ron, acrimonious fallouts were very hard to repair.

So while others brought science to archaeology, Ron was away in the fields. That gave him one great advantage: he accumulated more experience of finding palaeoliths than probably any other archaeologist in Britain. We would have done well to pay more attention to his interpretations and even the rambling accounts in his letters, for therein lay a deep wisdom about the past culled from a lifetime’s digestion of field data, a skill which most archaeologists have limited time to hone. Apart from the stone tools themselves, Ron’s greatest legacy is perhaps that he showed us the value of human intuition, unshackled by proof, yet an essential part of any study.

After I heard of Ron's death I went to the MacRae archive, of which I am the custodian, to find the many letters Ron had written to Mac. There was a folder, but no letters remained. They had fallen victim to Mac's thinning-out of his paperwork which he had considered timely as he approached his late 80s. A pity, for we shall not see the likes of Ron again.

JOHN WYMER BURSARY 2014

EXCAVATIONS IN OXFORDSHIRE

James Osborn[1]

Items that were purchased

With the Wymer bursary I was able to purchase a collection of tools and equipment to assist me with my dissertation. My dissertation included the cataloguing and collection of material 'in-the-field' but focuses on analysis of lithic tools and cores. The tools and equipment purchased with the Wymer bursary included steel pins, measuring tapes, a trowel, weighing scales, callipers, a handheld microscope, finds bags, tags, a planning frame and planning equipment. Most of the items were purchased through the 'past Horizons' tool shop but some, such as tapes, finds stickers and shovels were purchased for the lowest cost through other means.

How it was used

For the first stage of my dissertation I had to collect lithics from the surface of a field in Oxfordshire. To try and give the finds context I gridded out and excavated two shovel pits and a test pit using strings, tapes, a trowel and grid pins to make the work of a professional standard. The longer tapes were also used to grid out areas of the field in an aim to create some spatial data for the assemblage. The first shovel pit, by chance, was located directly over what little remains of an archaeological context. The finds were all bagged and samples were taken with illustrations also produced for spatial information. The finds included a blade core and some bladelets, some burnt flint and some small charred seeds that may be archaeological. The test pit, located over a surface concentration of finds, was excavated and recorded down to the natural subsoil revealing no archaeological contexts.

The second stage of analysis for the dissertation consisted of weighing, measuring and identifying a series of characteristics on the flints. Each lithic (both cores and tools) had its length, width and thickness measured, it was then weighed and analysed at both macroscopic and microscopic levels to create a catalogue/ database. Flint blade cores also had their platform angles analysed as well as noted for any signs of rejuvenation. Bladelets had their angle (much like blade cores) and their retouch also noted, as these are characteristics deemed significant in lithic analysis.

Current progress and learnings from work

The current stage of the dissertation is focused around the analysis of the lithics and the creation of a dataset. The lithics are being weighed and measured with some particular tool types receiving other types of analysis based on their characteristics. The dissertation conclusions are interpretations that can be made based on analysis of the dataset. Although typological analysis is very inexact, it is the only dating method useable on the surface assemblage; accurate dating could be acquired if sealed stratigraphic contexts are identified with material that can be carbon dated. Other interpretations circle around the activities that may have been carried out at the site during the Mesolithic, Neolithic and Bronze Age periods. I do acknowledge in my dissertation that there are many other archaeological features and finds which have been recorded and discovered in the immediate area which could themselves be separately catalogued, analysed and interpreted.

The possible site functions may have been; a manufacture site, a settlement site, a seasonal/ temporary site which the suggested activities including hide scraping, tool production, animal hunting and animal butchery. Flint scrapers discovered at the site appear in several typological forms; button scrapers, bifacial scrapers and end scrapers which may have been used to work hides or similar organic materials. Composite tool fragments (Microliths) were also recovered from the site that is the closest form of typological dating for the site. Two hand-axes I discovered may

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be indicative of early land clearance or simply the chopping down of trees. Several barbed and tanged arrowheads along with the composite tools, although assumed to be separated distinctly in date, may be evidence for the hunting of wild animals in the area; especially with the barbed and tanged arrowheads that, at a glance, appear to have been damaged or destroyed during antiquity through use.

Future uses

After the completion of the dissertation fieldwork and studies the equipment will continue to be useful. Further work on the site could lead onto Masters or doctoral studies so it will be continued to be carried out and studied under relevant guidance at all stages. The standard to which everything is recorded would be regarded as ‘professional’. The long-term intentions for the site are based on preserving the knowledge that the site holds as much of the evidence is being destroyed by modern agriculture. The finds themselves can be collated more and used to create spatial data for the assemblage within the field. The spatial data would have even more significance if geophysical surveys could be carried out on the site to perhaps identify any archaeological features that the surface collections may relate to. There are other sites which have been and can be discovered through desktop surveys and field walking and much more work that I can take part in within the field of archaeology, all of which is made possible by the equipment I purchased using the Wymer Bursary.

BOOK AND CONFERENCE REVIEWS

FROOM, R. 2012. *THE MESOLITHIC OF THE KENNET VALLEY*. OXBOW BOOKS, OXFORD

ISBN 978-0-957471-20-7 (PB, 340 PP., B/W ILLUS £40)

This book is the second of Froom's publications reporting the results of his excavations of Upper Palaeolithic and Mesolithic sites in the Kennet Valley. The first of these, *Late Glacial Long Blade Sites in the Kennet Valley*, was published in 2005, this volume, the larger of the two, focuses on the Mesolithic. This book is the result of five decades of work on the early prehistory of the Kennet Valley, during which some 50 Mesolithic sites have been identified: Froom's archaeological career spans work with Douglas Connah, with John Wymer and the Newbury Museum Research group at Thatcham, through excavations on a series of sites in the Kennet, focusing on the Wawcott and Kintbury areas, with students from St Bartholomew's Grammar School, where he worked as a chemistry teacher. This tells: the volume shines through with the detailed knowledge of an area and its archaeology that only several decades of meticulous research can produce.

Froom's Mesolithic work displays the same features as his Long Blade analyses, a highly rigorous approach to lithic analysis which can serve as a model for analysis of sites of this date. To be able to pursue this approach across so many sites, several of which have yielded very large assemblages, is truly remarkable. To add to this Froom has undertaken a considerable amount of refitting, and he has also examined the numerous important, but unpublished (or minimally published) collections from the Kennet, such as Marsh Benham, the Mud Hole and Victoria Park, excavated by others, making this an extremely valuable resource for all scholars of the Mesolithic.

The book focuses in the main on the analysis on some of the more extensively excavated sites: the early Mesolithic Wawcott XXX and the late Mesolithic Wawcott XXIII, Wawcott I and Avington VI with a reprise of the earlier published site of Wawcott III (Froom 1976). These are set within the context of smaller excavations undertaken by Froom himself, and previous work undertaken by other individuals. The former focuses in two main areas: the Wawcott/Kintbury area (Wawcott I–XXX) and to the west, the Avington area. To these are added some discussions of the cluster of sites on the edge of Newbury itself (Greenham Diary Farm/Faraday Road and Victoria Park), and of the Thatcham complex to the east (Thatcham I–V, Sewage Works, Mud Hole, etc.) allowing for a detailed picture of the occupation of different zones of the Kennet Valley to appear.

Wawcott XXX, Froom's main early Mesolithic excavation, is an important site for the region, as it is one of the first where a modern analysis, including refitting, has been possible. These analyses have permitted a detailed glimpse into the lives of the inhabitants and the tasks they undertook there. The site is composed of several lithic scatters, all focused on different activities. Froom's analysis gives a sense of tasks associated with each scatter: Concentration 3 for example was focused on the manufacture and discard of microliths; concentration 4 on the production of axes and the use of and repair of burins (the blanks of some of which were made at concentration 3). With this exception, refits between scatters are rare or absent, probably indicating repeated occupation of the same place, a common feature in the Kennet Valley.

Wawcott XXX is unusual in the Upper Kennet Valley in having reasonable quantities of faunal remains preserved. It is also unusual in the wide range of species represented, which is more analogous to sites such as Star Carr than those in the Kennet. This may have a chronological component: Froom suggests on the basis of blade length that Wawcott XXX is one of the earlier sites in the region. Further dating of this site would be intriguing as the current dates of 10,960±100 BP and 6130±100 BP do not seem to match the microlithic component. Further dating also might throw light on an interesting pattern noted by Froom, the presence of a small cluster of unpatinated microliths at the site that may post-date the main assemblage.

Froom points out a broader pattern arising from his analysis of the early Mesolithic of the region: the homogeneity of the early Mesolithic microlith assemblages in the Kennet. With the exception of the patinated series at Thatcham, these are all classic Deepcar types (Radley & Mellars 1964), with slender obliquely blunted and part-edged points, some with retouch on the leading edge, and the occasional bitruncated piece and large triangle. From perusing his excellent illustrations, some assemblages seem more homogenous than others (Wawcott XXXIII and Sheridan's collection from Marsh Benham) others less so (Greenham Dairy Farm, for example). Given the fact that these sites are all likely to be palimpsests of some form, these very minor differences possibly have some chronological component that is currently difficult to elucidate. However the broader point of homogeneity holds. This returns us I think to a point originally made by Jacobi (1978) in the context of the Mesolithic of Sussex: that we seem to find clusters of Mesolithic sites within particular regions with very similar microlithic components. Froom's point perhaps tells us something about the nature of early Mesolithic landscape occupation, with 'persistent places' (Barton *et al*. 1995) revisited for several generations before being finally abandoned.

For the late Mesolithic Froom presents three sites in detail: Wawcott XXIII, Wawcott I and Avington VI, with a reprise of the previously published Wawcott III. These sites immediately show a contrast with the early Mesolithic in this region. Here we have places that appear to have been repeatedly reoccupied and that have generated large, high-density lithic assemblages. Over 100,000 lithic were recovered from Wawcott III with average lithic densities of 3000 pieces per square yard; this is in contrast to the early Mesolithic sites where Froom suggests densities are more usually in the region of 30 per square yard. In addition, these sites have evidence, in the form of different microlith types, for revisits over millennia. The wide variety of microlith types encountered at both Wawcott III and Wawcott XXIII, spanning basally modified forms to scalene triangles with three retouched sides and small crescents (the latter two forms probably represented by the single radiocarbon dates from each site of 6120±134 and 6079±113 respectively) is likely to represent repeated occupation over around three millennia. In the late Mesolithic (or to be more precise from the end of the early Mesolithic, given the presence of Horsham material) the nature of landscape occupation appears to have changed, from shifting occupation within a small area in the early Mesolithic to repeated occupation of the same place in the late.

The Mesolithic of southern England is in general poorly understood, with little written on the region since Roger Jacobi's synthetic articles of the late 1970s and early 1980s. This has begun to change with knowledge of the Mesolithic of the Thames tributaries in particular increasing in the last two decades, mainly through developer-funded work. Of these tributaries, the Kennet is now by far the best known, initially through the work of John Wymer and the Newbury Museum group, and more recently through developer-funded excavations (Healy *et al.* 1990; Ellis *et al.* 2003) and doctoral projects (Chisham 2004; Overton 2014). With the addition of Froom's work the Kennet Valley can reclaim its rightful place as a rival to the Vale of Pickering, both in the quantity of the work done there and the richness of its archaeology.

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MUNNERY, TOM. 2014. *LATE UPPER PALAEOLITHIC/EARLY MESOLITHIC, ROMAN AND SAXON DISCOVERIES AT FETCHAM NEAR LEATHERHEAD.* SPOILHEAP OCCASIONAL PAPER 4.

ISBN NO 978-0-9576509-2-3 (90 PP., 71 ILLUS £12 + £2.80 P&P)

This monograph edited by Tom Munnery from the Surrey County Archaeological Unit presents the results of excavation at Cobham Road, Fetcham, an interesting site in Surrey exhibiting several occupations spanning from the Terminal Palaeolithic to the Anglo-Saxon period. This review uniquely focuses on Chapter 1 of the book that is dedicated to the prehistoric occupations of the site and especially the Upper Palaeolithic/Early Mesolithic occupation(s). This study is particularly interesting because of the scarcity of the Terminal Palaeolithic sites in the UK and indeed the general rarity of these sites in western Europe.

The Cobham Road assemblage is particularly unusual because of the presence in the same lithic assemblage of both a blade industry with Terminal Palaeolithic characteristics associated with microliths made by the microburin technique, usually found only in Early Mesolithic assemblages. It is not always clear how the author considers this issue. Most of the time he seems to consider this assemblage to be transitional. Sometimes he seems to consider these two periods, very different in many ways, as a whole. In the conclusion he however suggests the eventuality of a palimpsest. Even if the last hypothesis appears to me to be the more probable regarding the context of the site, this debate is particularly interesting in the perspective of the understanding of the Palaeolithic/Mesolithic transition in northwestern Europe.

In the first sections of the chapter the author presents the history of research, the geological and archaeological background of this part of Surrey, the methodology of the excavation, the stratigraphy of the site and describes the various archaeological components and features identified. As well as the Anglo-Saxon cemetery studied in Chapter 2 of the book and the Upper Palaeolithic/Early Mesolithic occupation(s) of the gridded area, the excavation highlighted Late Mesolithic, Neolithic, Bronze Age, Iron Age and Roman testimonies. It is regrettable that the stratigraphy section is not more developed. This is a very important point, especially in the key question of determining if the "Upper Palaeolithic/Early Mesolithic" assemblage is the result of a transitional site or a palimpsest mixing several late Pleistocene/early Holocene occupations. The stratigraphy seems to be highly perturbed by biological and frost action. If, as suggested by the author, these taphonomic processes did not affect too much the spatial organisation of the site, these processes could have very much perturbed the vertical distribution of artefacts belonging to different prehistoric occupations, especially those that are very close chronologically such as with Terminal Palaeolithic and Early Mesolithic occupations. It is thus essential to evaluate these perturbations in order to discuss the homogeneity of the lithic assemblage. The development of micromorphology studies, fabric studies, simple x/z projections and even just refittings, essential on any Palaeolithic site, is thus particularly regrettable in the case of Cobham Road.

The main part of Chapter 1 is dedicated to the study of the lithic assemblage. The Cobham Road collection is not very rich with a total of 1843 lithic artefacts retrieved by hand and an additional 3608 lithic artefacts discovered from the bulk samples. Among this assemblage, only 843 artefacts (plus 1954 from the bulk samples) were recovered from the gridded area located on the western part of the site where the Upper Palaeolithic/Early Mesolithic collection has been excavated. The study starts with the description of the main lithic assemblage coming from the gridded area. The author considers the assemblage to be fairly homogeneous and attributed to the Upper Palaeolithic/Early Mesolithic (62% of the assemblage), even if some more recent elements have been recovered in this area (mainly Neolithic and Bronze Age with some possible late Mesolithic artefacts). The technological study of the assemblage is well conducted and gives a clear description of the raw materials and production objectives and methods. The comparisons with other sites are however too limited to a few English sites and two sites from the Netherlands. The author should have tried to extend his comparisons to a wider area, especially to France where the study of this period has been very dynamic in recent years.

The lithic production of this part of the site of Cobham Road is clearly oriented toward the extraction of blades. The author suggests similarities with Early Mesolithic assemblages based on the short length of the blades. On the other hand, the fact that some blades are extracted from two opposite platforms leads the author to suggest a Terminal Palaeolithic component. Even if some Terminal Palaeolithic sites (more often localised on excellent raw materials and with particular status) exhibit long and even very long blades, others assemblages are mainly constituted of relatively short blades. The size of the blade is not really good evidence for a dating an assemblage. This characteristic is rather indicative of raw materials availability and above all mobility and site status. Terminal Palaeolithic sites are actually much more diversified than previously described. Recent works showed that these communities were organised around a complex mobility system constituted of a great variability of site status (Valentin 2008; Naudinot & Jacquier 2014). This tendency to ‘do typology’ with technological characteristics is relatively recurrent in the book. If technology is a particularly efficient tool, it is only when the various technological observations are considered as a whole.

The following paragraph describes the shaping and management of the cores. Despite the small size of the assemblage, it would has been interesting to describe the shaping and management processes in more detail, not only describing the various crests and tablets but considering the lithic entirety to discuss the various strategies developed by the knappers (extraction of large blades, use of two opposite platforms, thick blades to clean the extraction surface, lateral blades, etc.). As mentioned above in the case of the size of the blades, the morphology of the crests is also used as an element to discuss the chrono-cultural attribution of the assemblage. Again, this tendency to use technological criteria is particularly hazardous and dangerous. By example, even if unilaterally crests are common in Early Mesolithic assemblages as suggested by the author, they are also the main process used in core shaping, management and reduction re-initialisation in several part of western Europe during the Terminal Palaeolithic of the Younger Dryas/Preboreal transition.

The study of the cores suffers from the same problem. The size of a core cannot be considered as a diagnostic element to attribute an assemblage to a cultural component; too many parameters can have an impact on core size: raw material availability, production objectives (notably importance of projectile point production), skills, site status, mobility, etc. Likewise core shape is not a good criterion to discuss the attribution of an assemblage. The shape is however interesting to allow discussion of the process used to fashion and maintain the convexities of the volume, to describe the reduction of the core etc., all of which are interesting parameters to consider in the perspective of attributing an assemblage to a cultural component.

Some readers will probably be disturbed by the lack of drawings in this study; they are replaced by photographs here. I do not consider this choice to be a problem since most of the images are of good quality and allow for a good understanding of most of the artefacts. However, in the case of the cores, more photos would be suitable for the reader to get a better idea of the volumes and to understand core exploitation and maintenance strategies. With the available photos I am even not sure that all of the cores presented are actually cores – No 2 notably which seems to be a large tablet, the large scar being probably the negative of a previous tablet extracted on the flank of the core. There is a similar problem with core No 3 that is supposed to be reduced from three platforms: looking at the photo, I would rather say that this third platform is actually the remains of a lateral crest. Is this third extraction surface on the back of the core? More photographs would help the reader to understand this kind of point.

The next part of the book is dedicated to the retouched tools. In this part the author describes the various types of retouched tools of the assemblage and compares them with other English lithic collections in a chrono-cultural perspective. The armatures of the sites are mainly obliquely truncated points which complicates being diagnostic since this kind of point is both common in the Terminal Palaeolithic assemblages and the Early Mesolithic collection. There are however some characteristics that distinguish these armatures from each other. The more obvious, well described by the author, is the concavity of the truncations in the Terminal Palaeolithic industries. These armatures have been well described for several sites in western Europe including Launde (Cooper 2006), Uxbridge (Lewis & Rackham 2011), Le Buhot (Biard & Hinguant 2011) or in western France (Naudinot 2010 & 2013). The author also tries to study the orientation of the apex of the points considering that Late Upper Palaeolithic microliths more often retain their proximal ends. I think the question is much more complex. In the case of the truncated backed points such as 'Blanchères points', the points are almost systematically realised on the proximal end of the bladelet (Valentin 1995; Naudinot 2014). The case of the truncated points as discovered at Cobham Road is less clear. In most of the sites where they were described, they seem to be realised with no preference in the orientation of their apex on the proximal or the distal end of the bladelet. In my opinion, the only tendency that can be highlighted is a trend to produce the point of the armature on the larger extremity of the blank (maybe reserving the narrower extremity for the hafting of the projectile point). As suggested by some scholars (Cooper 2006; Naudinot 2013 & 2014), this technical choice, as well as the concavity of the truncation, could be evidence of affiliation between these points and the Ahrensburgian tanged points: such small truncated points could be a simplified form of these armatures. Finally, a trapeze is mentioned in the text but the photograph does not allow a clear understanding of this artefact. It is a pity since some recent works have demonstrated that this kind of projectile had been used very often at the very end of the Late Glacial and constitutes the first evidence of the use of transverse arrowhead in the prehistory of western Europe (Naudinot 2014).

The fact that some of the Cobham Road microliths are realised using the microburin technique is particularly interesting. This process is never identified in the Younger Dryas/Preboreal transition assemblages. When it is, it is generally the result of mixed industries or confusion between real microburin and Krukowski breakages. The presence of these elements at Cobham Road and the identification of microburin evidence on the microliths are thus critical in understanding the assemblage and the occupation(s) of the site.

Other non-microlithic retouched tools are rare. If this phenomenon can be interpreted as an evidence for a short-term occupation oriented toward the manufacture of projectiles it is however important to highlight that, unfortunately, no use wear analysis has been carried out on this assemblage. Recent works have demonstrated that unretouched blades constitute a very high proportion of the tools used by Terminal Palaeolithic communities at the very end of the Late Glacial (Jacquier 2014; Naudinot & Jacquier 2014).

With these rare retouched tools is a refitted blade exhibiting wear described by the author as similar to the Terminal Palaeolithic bruised blades. If for the author the damaging corresponds to the ones known on the bruised blades (it is hard to discuss this point with the available photo), he underlines the facts that the size and weight of this artefact only correspond to the smaller and lighter bruised blades of the Avington VI assemblage. It is important here to be precise in that with some other assemblages, bruised blades can be small and light. It is also essential to keep in mind that what we call 'bruised blade' actually embrace a variety of different tools used on various materials for various tasks (Valentin 2008; Jacquier 2014; Naudinot 2014 & in prep.). If they were used in a percussion motion on mineral materials (notably to reshape soft stone hammers) they could also have been used to work hard organic materials like antler or bone.

The next part of the chapter is dedicated to the spatial analysis of the site. The study is well conducted and the illustrations are very clear. Because of the context of the site and the taphonomic problems described by the author, I however think that this study goes a little too far in its interpretations. If it is possible that the vertical perturbation did not affect the horizontal distribution of the artefacts too much, the succession of occupations on the same spot and the mixing of different cultural components had an impact on the interpretation of the distribution of the lithics. This part of the site of Cobham Road is interpreted by the author as a small knapping area of 4.5 x 6 m occupied during a single visit for intensive blade production and microlith manufacture.

The rest of the chapter is dedicated to the other area of the site where Palaeolithic/Mesolithic artefacts have been identified. East of the gridded area, one thousand lithic artefacts were collected by hand from a variety of context and a further 1654 lithic artefacts have been retrieved from the bulk samples. The author shows that the various assemblages retrieved in the different part of the site are very similar in their composition and could be attributed to the Late Mesolithic and that the raw materials used in this industry are different from the ones identified on the gridded area. In the same way, the technological study of the lithic assemblage suggest the production objectives and methods to be quite different from the ones identified in the gridded part of the site. With these elements are some artefacts also suggesting occupations during the Neolithic and the Bronze Age on this part of the site.

To conclude, this study will interest everybody involved in the study of Late Upper Palaeolithic and Early Mesolithic periods in western Europe. The study is interesting and well conducted and furnishes new elements for the study of these Pleistocene/Holocene communities. I however look forward to reading more information about the stratigraphy and the complex question of taphonomy at Cobham Road in the future. This information is particularly critical for this site since it is still difficult to comprehend if the lithic assemblage is the result of an occupation by a transitional group or, more probably, the result of a succession of occupations on the same spot over several millennia. The study of the last communities of the Late Glacial has progressed well in recent years in northwestern Europe. It is thus not always easy to follow all the developments of this very active research. Sites, and especially those in a good context, are also quite rare and are not always published in English. Even if a more extended comparative study would have improved this study of the Fetcham site, the work presented in this book by Tom Munnery contributes to the building of a greater understanding of this complex period of climatic and cultural transition and there is no doubt that this book will be useful in future years for everybody trying to study the Palaeolithic–Mesolithic transition in England.

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A REPORT ON THE 'WILD THINGS 2.0: FURTHER ADVANCES IN PALAEOLITHIC AND MESOLITHIC ARCHAEOLOGY' CONFERENCE 8th−10th JANUARY 2014, DURHAM UNIVERSITY

Between January 8th and 10th, Durham University once again played host to the Where the Wild Things Are conference, this time under the title of Wild Things 2.0 and brought under the umbrella of the larger series of symposia that began with the *Unravelling the Palaeolithic* conference at CAHO (University of Southampton) in 2010. The first Wild Things conference, which took place in March 2012, was a huge success, attracting over 120 delegates from a wide variety of international institutions. Therefore, the stakes were high to keep to this standard of quality. However, the conference organisers did a fantastic job, especially the postgraduate students amongst them, as attested by the exceptionally positive feedback received from attendees.

The conference opened on the 8th with registration followed by a thought-provoking keynote talk from Professor Robin Dennell (University of Sheffield), one of three invited speakers, who posited the concept of naïve faunas and how this may have affected hominin dispersals in the Palaeolithic (Fig. 1). Afterwards, attendees retired for the drinks reception, where local beer and (not so local) wine was served (Fig. 2). Given the large contingent of postgraduate students, this also provided an excellent arena for networking and a chance for individuals to discuss research amongst their peers in an informal environment. A second chance for such networking was provided by the conference dinner on the Thursday evening.

The conference began in earnest on the morning of the 9th, with the two remaining days delivering a total of 24 research papers and two further keynote speeches. Unfortunately, given the winter season, there were a few absences due to illness, and the organisers and delegates hope that they subsequently made full recoveries. Professor Peter Mitchell (University of Oxford), who was due to give the keynote talk at the end of the second day, was one such speaker. While he was missed, Durham's own Peter Rowley-Conwy stepped in at the last second to provide a highly amusing but insightful talk. Drawing on parallels with the eighteenth century 'Age of Wonder', he outlined how archaeology has entered its own 'Age of Wonder', as we make discoveries beyond the imagination of previous years. Peter also took up the challenge of introducing our third keynote speaker, Professor Leendert Louwe Kooijmans (Universiteit Leiden), who presented a detailed and extremely informative account of the history of Mesolithic and Neolithic archaeology in the Netherlands.

Outside of these keynotes, speakers from a variety of UK and European institutions presented the results from exciting new research covering the great range of Palaeolithic and Mesolithic archaeology. A number of the papers aimed to cast new light on the interpretation of lithic assemblages, or bring new discoveries to light. Highlights included Stephanie Piper (Durham University), who reported on the first Mesolithic sites found on the Western Isles of Scotland, outlining the use of flint and non-flint raw materials, such as quartz, and the implications this has for understanding how raw material use informs us of Mesolithic adaptations to coastal environments on the Atlantic seaboard. Katie Davenport-Mackey (University of Leicester) spoke to advocate turning from cave site assemblages to small, discrete lithic scatters so that temporal developments within the stone tool cultures of the British Upper Palaeolithic can be better understood.

Others looked to reinterpret older assemblages, with both Lucie Bolton (CAHO, University of Southampton) and Samuel Benghiat (Independent) discussing prepared core technology. Benghiat focused on Garrod's assemblages from Tabun, using morphometric analysis to also suggest that prepared cores are well established in the Lower Palaeolithic and their use into the Middle Palaeolithic conformed to the functional needs of hafted technology, rather than indicating a stepwise change in cognition. Bolton explored its origins through the analysis of simple prepared cores from British Lower Palaeolithic sites, such as Caddington, Purfleet and Cuxton, suggesting an *in situ* development from the Acheulean indicating complex innovation processes over a single tradition. Helen Drinkall (Durham University) also looked at the site of Caddington, in addition to a suite of other assemblages from the Chilterns and Kent Downs. Using a multi-scalar, landscape approach, she used both viewshed and techno-typological analysis to demonstrate how upland sites were areas of preparation and planning, where processing activities occurred,

Figure 1. Attendees prepare to hear Robin Dennell's opening keynote address. (Image courtesy of James Walker.)

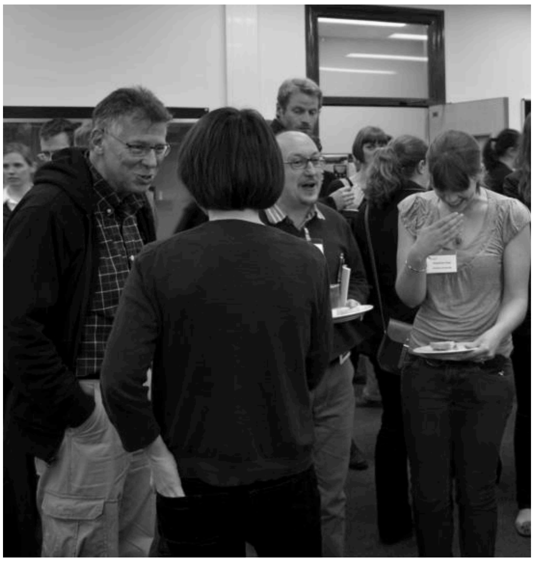

Figure 2. The drinks reception provided an excellent opportunity to network with other researchers from a wide range of institutions and fields. (Image courtesy of James Walker.)

while lowland sites are of a more *ad hoc* nature.

These themes carried into the poster session as well, which further represented the strength of Palaeolithic and Mesolithic research (Fig. 3). Spencer Carter and Paul Preston (Lithoscapes) discussed best practice in lithic analysis in respect of the British Mesolithic and the complex *chaîne opératoires* from White Gill, Westerdale, as well as the evidence for inter-site refitting and raw material acquisition. Christian Hoggard (CAHO) touched on early laminar technology, detailing its occurrence and the complex, inter-site differences that appear between Europe and Africa compared with western Asia. Finally, Josephine Mills (UCL) outlined her research at La Cotte a La Chèvre, where the lithic assemblage has been placed back into its stratigraphic sequence using archived material and contextual records.

Papers discussing lithics truly represent only the tip of the iceberg in terms of what Wild Things 2.0 had to offer, with others discussing new research into Palaeolithic mobiliary and parietal art, Mesolithic mortuary practices, experimental archaeology and Pleistocene and Early Holocene landscape use. The mixture of larger scale projects, complemented by smaller, finely focused offerings from postgraduate students, together provided a strong overview of the research currently taking place within the fields of Palaeolithic and Mesolithic archaeology. The presentation of new sites and finds underscored the need for new discoveries that allows us to readdress our previous interpretations. In a similar vein, those who have taken it upon themselves to study older sites emphasised how new and innovative approaches can help us to better understand and reinterpret the data we already have to hand. Such an event always brings to the fore what a richly diverse and exciting field this is to work in and the strength of its future was keenly demonstrated, especially by those early career researchers who took part. I, for one, am certainly looking forward to seeing what further developments will be brought forth at the next iteration of this wider seminar series next year.

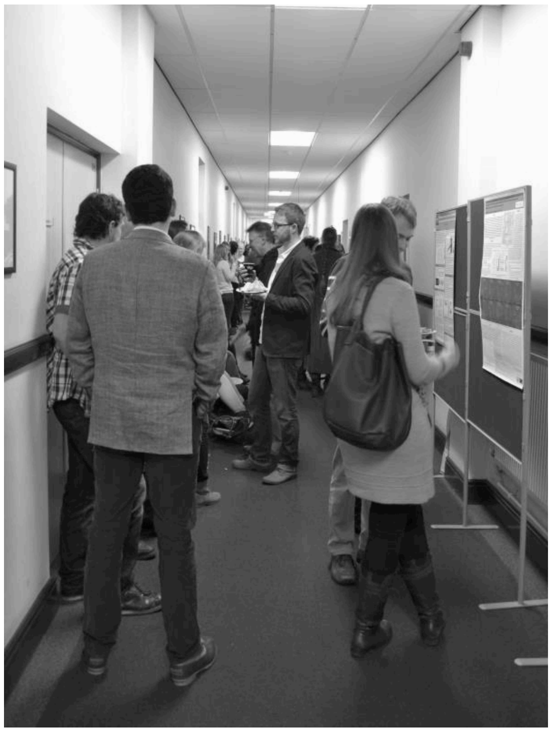

Figure 3. Conference attendees discussing the range of research found within the poster presentations. (Image courtesy of James Walker.)

For those interested in further information about the research presented at Wild Things 2.0, the abstract booklet can still be downloaded from the conference website at www.wildthingsconference.com.

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MINUTES AND FINANCES

Minutes of the Annual General Meeting of the Lithic Studies Society held on Friday 7th November 2013 at 12pm at Franks House, 38-56 Orsman Road, London, N1 5QJ

Present:

Laura Basell (**LB**), Olaf Bayer (**OB**), Rob Banbury (**RB**), Claire Harris (**CH**), Molly Pearce (**MP**), Rob Davis (**RD**), Ella Egberts (**EE**), Francis Wenban-Smith (**FW-S**), Frank Banford (**FB**), Paul Whitcome, Jacky Sommerville, Hazel Martingell (**HM**), J. Edwin Jarvis (**JEJ**)

1) **Apologies**: Andy Shaw (**AS**), Beccy Scott (**BS**), Wei Chu (**WC**), Dave Underhill (**DU**), Hannah Fluck (**HF**), Sam Griffiths (**SG**), James Cole (**JC**)

2) **Minutes of the Last Meeting**: Unanimously accepted as correct

3) **Matters Arising**: None

4) **Chair's Report**:

   - It's been a hectic year with lots of activity. There have been 4 committee meetings, both within and outside of London. Attendance at committee meetings has greatly improved this year, with only 1 meeting where decisions couldn't be made due to the meeting not being quorate.

   - The planned conference had to be cancelled due to organisers getting new jobs at the last minute. **LB** and the committee apologise for any inconvenience or disappointment caused. However, a new conference is in the works for next year in collaboration with Reading University.

   - The committee is aware of the competing journals that have surfaced and is working hard to do something about the problems they pose.

   - The society has received a number of requests from students for knappers to help with their research. Although the first several of these were emailed to the membership, the society is conscious of not bombarding the membership with such emails. **LB** suggests that instead an area of the website and a section of *Lithics* be set up with the purpose of advertising those members willing to knap for students. **LB** to discuss this with **DU**, **SG** and **WC**.

   - There have been some enquiries about how members can book events if they don't have access to email. All events can be booked via post to the Franks House address (advertised in *Lithics* and on the website), as long as this is done far enough in advance and a phone number is included for the purpose of confirmation.

   - This year, LSS has been represented at lots of different society meetings and conferences within and outside of the UK. We currently have lots of international society members, so it is important and worthwhile to keep this international representation of LSS up wherever possible.

   - Butser went ahead as usual this year, although difficult weather conditions meant that the second day was effectively cancelled. The society is in the process of sorting out refunds for those who attended. Thanks to **OB** for stepping in and helping to organise this event.

   - **LB** will be stepping down as chair this year, in line with the new constitution. Over the next year the society will be looking for someone to become Vice Chair and then Chair. If anyone is interested, please get in touch with **OB**, **LB** or **MP**, who will be more than happy to help.

   - **AS** will be stepping down as Treasurer this year. **LB** and the committee would like to offer sincere thanks to **AS** for his hard work, and also to **BS** (who's final *Lithics* as editor came out this year). A small gift has been purchased to thank them.

   - **JC** will be standing down as an ordinary committee member this year. **LB** and the committee would like to thank him for his contribution to the society.

5) **Treasurer's Report**:

   -Accounts will be published in *Lithics.*

   - Only 1 Wymer payment was made out of the two awarded this year as Peter Reavill is out of action. The money will be kept for when he is ready.

- Quite a lot of membership payments have lapsed recently. **AS** has been chasing these up, but can all members please make sure they are paid up to date.

- **AS** is happy to work closely with the new Treasurer to facilitate a smooth changeover.

6) **Editor's Report**:

- **BS** sends her apologies for the errata in the last issue of *Lithics*, corrections have been emailed to members and will also be sent out with the next issue of *Lithics*.

- 13 articles have been submitted for this year's *Lithics*, with proofs sent for authors' approval, ready for press at the start of December.

7) **Secretary's Report**:

- It's been a busy year with membership details being updated and the move to primarily online communication to the membership. This change should save the society a huge amount of money and time, as well as helping us be a little greener. However, do rest assured that, as long as you have notified **MP**, those who would prefer to receive paper mailings will still do so.

8) **Webmaster's Report**:

- Everyone is very busy and, as such, only 2 members being able to update website content has proved an issue.

- The committee has discussed a revamp of the webpage to enable us to compete with the up-and-coming journals (see Point 4), as well as to enable the whole committee to post updates.

- **LB** welcomes suggestions, advice and information from members re: webpage revamp.

9) **Publicity Report**:

- More membership leaflets have been printed and sent out to a variety of conferences. If any members would like leaflets to hand out, please get in touch with **RB**.

- The banner has been taken to various events and is always well received.

- Please do make sure that your emails are up to date, there are always 20-30 addresses rejected.

- The ATC Symposium was postponed this year but will hopefully go ahead next year.

- **RB** is looking into badges and other merchandise, just need to sort out cost. Nice, tasteful badges have been found at £3-4 each initially, with a reduced price subsequently.

10) **Events Report**:

- There have been 2 Franks House Research Group meetings held over the past year, one in February focussing on cognition and another in September with talks on Lower Palaeolithic Britain and digital refits. **CH** is aiming to run several more Research Group meetings over the coming year.

- The Illustration workshop with Craig Williams from the British Museum was run again this year following demand for the last one, although there was a surprisingly low uptake – this may have been due to a clash with university exams, however. **CH** is happy to put this workshop on again if there is enough interest. **HM** stresses her belief that the society needs to continue with workshops such as this to emphasise the importance of lithic illustration.

- **CH** will help Rob Hosfield with the society's joint conference with Reading University in 2015. The Society will also be heavily involved in the 2015 London ESHE conference and will have some involvement in the Experimental Archaeology Conference coming up in Dublin.

- **CH** and Nick Ashton have been editing a book in honour of Roger Jacobi, using money from the Society as well as from AHOB. It is being published as a *Lithics* occasional paper with LSS and AHOB logos and the profits will be used to create a Jacobi bursary as a memorial for Roger, honouring his encouragement of new research. This will help to raise the society's profile, also.

- Butser went ahead again this year, with around 15 participants. Although the Sunday was rained off, the Saturday was very successful. Refunds are being sorted out for those participants who missed out on the second day due to the unfortunate weather.

11) **Wymer Bursary:**

- There were a huge number of applications this year, resulting in discussion by the committee to split into multiple awards focussed on different research areas, allowing more people to be helped. 2 awards of £250 were granted this year.

- Applications with clear and specific research aims involving lithics are favoured.

- **LB** proposes that the committee discuss and decide upon such a split, with the permission of the membership. Seconded by **OB**. Unanimously in favour.

12) **Competing Journals**:

- The committee is aware of up-and-coming journals that are very similar to *Lithics* and is working hard to make sure that *Lithics* holds its ground.

- The committee has discussed the merger proposed by *Lithic Technology*, but decided against due to the poor quality of the publication.

13) **Conference**:
- A conference is to be held at Reading University on 28/03/2015, in collaboration with Rob Hosfield and the university.

- A combination of papers and workshops.

- Fee: £20, or £10 for students/unemployed.

- Deadline for abstracts: 21/01/2015.

- Deadline for attendance: 01/03/2015.

14) **Terminology Working Group**:

- **FW-S** is setting up a lithic technology terminology working group and would like to act as representative of the Society.

- English Heritage currently controls the archaeology terms to be used but the terminology is very poor with regard to lithics. **FW-S**'s project, awaiting approval, aims to rectify this.

- The Forum on Information and Standards in Heritage is willing to let **FW-S** collaborate with all stakeholders and produce a list of appropriate terms.

- **CH** and Nick Ashton will represent the British Museum.

- **LB** has received an email from English Heritage about an Archaeology Reference Resources Project – potential overlap here will need to be considered.

- **OB** emphasises the important of including terminology about the types of sites represented by lithics.

- Any members wishing to offer suggestions and contributions should get in touch with **FW-S**.

15) **Election of New Committee Members/Officers**:

- Treasurer/Membership Secretary: Rob Davis proposed by **LB,** seconded by **OB**. Unanimously in favour.

- Ordinary Member: Ella Egberts proposed by **LB**, seconded by **RB**. Unanimously in favour.

16) **Any Other Business**:

- FW-S notes that it should state 'Franks House' on AGM Agenda, not 'Frank's House'. **MP** to change this.

- **HM** raises the issue that many museums are not currently accepting new collections, leaving collectors in a difficult position. **LB** points out that this relates to a working group that the society set up last year but which had to be put on hold, suggests that perhaps collectors should approach universities. **CH** agrees that not much can be done other than encouraging collectors to register finds with the Portable Antiquities Scheme and their HERs, also notes that the changes in the school curriculum might mean that they would accept teaching collections. **JEJ** notes that many collectors worry about what will happen to collections after they die. **FB** suggests that collections are passed down to younger researchers, but **OB** notes that this is only a temporary solution. **CH** notes that often artefacts shouldn't be collected unless the collector is willing to do the necessary curating, recording and archiving.

17) **Date of the Next Meeting:** Friday 6th November, noon, Franks House, London.

Treasurer's Statement of Accounts (30th September 2014)

2013/2014	
INCOME	
Subscriptions	£3,533.76
Subscriptions (Paypal)	£1,482.61
Publications and back issues	£8.13
Publications and back issues (Paypal)	£136.5
Interest on National Westminster reserve account	£0.83
Interest on Nationwide account	£0.00
Events	£0.00
Events (Paypal)	£0.00
Other*	£1,019.39
	£6, 181.22
EXPENDITURE	
Events	£573.40
Travel	£233.20
Postage	£3.30
Printing	£853.45
CBA affiliation	£60.00
Lithics	£2,116.00
Web expenses	£0.00
Paypal charges	£77.53
Paypal refunds	£15.76
Wymer bursary	£250.00
	£4, 182.64
Surplus/Deficit	**£1,998.58**
Bank Balances	
National Westminster current account	£15,399.16
National Westminster reserve account	£2,741.86
Nationwide	£1,054.51
	£19,195.53
Less Creditors	-
Plus Debtors	-
	£19,195.53
Increase on previous accounts	**£1,998.58**

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ERRATA

The Editors regret the following errors in *Lithics* 34 (2013):

1. On the Contents Page: Letters & Notes: p. 34 should read p. 43, and Butzer should read Butser.

2. Bingham, P. and McNabb, J. 2013. How reliable are traditional methods of assessing handaxes? *Lithics: the Journal of the Lithic Studies Society* 34: 5−9.
In the above article, Tables 3−8 and Figures 3−5 are missing. This has been corrected online.

3. Crandell, O.N., Niţă, L. and Anghelinu, M. 2013. Long-distance imported lithic raw materials at the Upper Palaeolithic sites of the Bistrița Valley (Carpathian Mts.), eastern Romania. *Lithics: the Journal of the Lithic Studies Society* 34: 30−42.
In the above article, in the full reference: Crandall should read Crandell.
On p. 31, first paragraph, line 14, Figure 5 should read Figure 6.
On p. 35, Figure 4: captions are missing for samples e and f; they should read e) chert from Voievodeasa River near Voievodeasa village; f) siliceous shale from the Tarcău River near Tarcău village, Neamţ county.
On pp. 36 and 38, lettering on images of microphotos a–h in Figures 6 and 7 is incorrect. This figure has been redone online.