BREITENBACH-SCHNEIDEMÜHLE, GERMANY:
A MAJOR AURIGNACIAN OPEN AIR SETTLEMENT
IN CENTRAL EUROPE

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Abstract

Despite its significance for the understanding of the Aurignacian in terms of behavioural variability and adaptive strategies in northern latitudes, the archaeological material of Breitenbach has never been published comprehensively for almost a century since its discovery in 1924. Moreover, despite the fact that the excavation extends over ca. 400 m², making it the largest Aurignacian site currently known, no spatial analysis has ever been attempted. This paper endeavours to remedy some of these shortcomings. Besides a description of the main features of the complete lithic assemblage from the early excavations, providing, for the first time, a spatial analysis of the lithic assemblage, backed up by refits.

Results indicate that post depositional processes lead to displacement and relocation of at least part of the archaeological material and must be accounted for when undertaking a reconstruction of intra-site activity patterns. Nevertheless, an analysis of the technological organization, including raw material use, indicates a strategy of “provisioning places” (sensu Kuhn, 1992). It is proposed that Breitenbach corresponds to a site of residential character, probably resulting from an accumulation of repeated seasonal occupation events over a longer time-span.

Key words: Aurignacian, Central Europe, settlement patterns, technological organization

INTRODUCTION

The importance of open air sites for reconstructing past settlement systems and mobility strategies has long been recognized (e.g. Binford, 1983; White, 1985; Soffer, 1985; Gamble, 1986). As far the Central European Upper Palaeolithic record is concerned it is generally agreed that the presence of extremely large sites, interpreted as semi-permanent base camps, is critical for the differentiation of Aurignacian and Gravettian land-use strategies (Klima, 1967; Svoboda et al., 2000).

Although, the timing and nature of the sociocultural changes occurring between the Aurignacian and the following Gravettian are still matters of discussion (e.g. Kozłowski, 1996a, 1996b; Street and Terberger, 2000; Terberger and Street, 2003; Conard and Moreau, 2004; Svoboda, 2007; Rigaud, 2008; Haesaerts et al., 2010; Jöris et al., 2010; Pesesse, 2010; Higham et al., 2011; Otte, 2011; Moreau, 2009, 2010, 2011, 2012a).

To date Breitenbach represents the largest open air site securely attributed to the Aurignacian (Jöris and Moreau, 2010; Moreau and Jöris, 2012). Excavated in 1927 over a surface of ca. 400 m², the site has been compared with the large open air sites of the Middle Danube Gravettian (Niklasson, 1928). In fact, by drawing on A. Montet-White’s characterization of Eastern Gravettian open air sites (Montet-White, 1988: 362), Breitenbach falls within the range of “intensively used campsites”, providing artefact counts exceeding 10,000 and retouched tools in the thousands. So far however, neither a comprehensive study of the archaeological material nor a spatial analysis have ever been attempted.

The aim of this paper is to provide a detailed description of the complete Aurignacian lithic assemblage of Breitenbach (excavations 1927), encompassing a description of its main features with regard to lithic typology and blank production
Fig. 1. Germany, showing the location of Breitenbach
technology. Moreover, for the first time a spatial analysis of the lithic material, backed up by refits, is presented. In the final discussion I address the question to which extent Breitenbach resembles the alleged basecamps known from the Gravettian of the Middle Danube region, the so-called Pavlovian.

THE SITE

Breitenbach-Schneidemühle, in short Breitenbach, is located in the loess area of Eastern Germany (former GDR) in the southern part of the Federal Land of Sachsen-Anhalt (51°00′31.25″; 12°05′6.75″; 195 m asl.) on the border between the northern lowlands (Leipziger Tiefebene) and the upland Mittelgebirge zone (Fig. 1). The site is “hidden” in a small fluvial basin near the confluence with the main river valley of the Weiße Elster, on the southern slope of a smooth spur.

Given its geographic location on 51° degree of latitude north the site belongs to the northernmost sites of the Aurignacian expansion range, besides some British and Belgian sites (e.g. Paviland and Maisières-Canal). Moreover, Breitenbach is one of the rare known open air stations attributed to the Aurignacian in Germany, besides Lommersum (Nordrhein-Westfalen) (Hahn, 1989), Keilberg-Kirche (Bavaria) (Uthmeier, 1996) and Königsbach-Stein (Baden-Württemberg) (Floss and Poenicke, 2006).

The Aurignacian layer excavated in 1927 extends over a surface of approximately 400 m² (Pohl, 1958). The presence of Aurignacian remains farther afield, all over the shallow hill on which the site is located, has been alleged based on exploring core drillings (Hess von Wichdorff, 1932: 461). This is not to say that Breitenbach should be understood as a single internally contemporaneous settlement. Nevertheless, the area exposed makes Breitenbach the most extended open air site currently known in Western Eurasia, securely attributed to the Aurignacian (Jöris and Moreau, 2010; Moreau and Jöris, 2012).

HISTORY OF RESEARCH

The discovery of the site occurred in 1924 as mammoth bones and teeth came to light in the course of earthworks aimed at extending an existing storage yard for wood related to the adjacent cutting mill (Wilcke, 1925, 1927; Hess von Wichdorff, 1927). The archaeological layer itself, a few cm thick, stood out essentially due to the abundant presence of charred bones besides numerous fresh mammal bones and stone artefacts (Wilcke, 1927; Hess von Wichdorff, 1932). Although much shallower than the modern hill slope, the Aurignacian horizon still slopes towards the south (Wilcke, 1927; Hahn, 1977: 102, fig. 18). The archaeological material stemming from a first test-trench of 3–4 m² (spring 1925) has never been published and is allegedly lost (Grünberg and Unruh, 2010: 317; but see Richter, 1987: 66). In fact, the abundant archaeological material of Breitenbach essentially derives from excavations conducted by N. Niklasson in January/February and November/December of 1927 on behalf of the State Office for Prehistory (Landesanstalt für Vorgeschichte) of Halle/Saale. Besides an archaeological component attributed to the early linear pottery, the Aurignacian represents the only attested Palaeolithic occupation phase at the site.

The Aurignacian character of the finds, drawing on the presence of carinated and nosed scrapers in the lithic industry, has already been noticed by the first discoverers (Wilcke, 1927: 16; Niklasson, 1928: 90; Hess von Wichdorff, 1932: 460), an attribution accepted by the prehistorians of that time (Riek, 1934: 198; Andree, 1939: 416). Given especially the absence of typically Aurignacian retouch and to a certain extent the general slenderness and regularity of blade blanks in the industry they placed the assemblage within the so-called “Upper Aurignacian” facies – which later on in the 1930es was renamed as the “Upper Perigordian” and subsequently as the “Gravettian” (Peyrony, 1933; Garrod, 1938). According to the first excavator, N. Niklasson, Breitenbach even represented the northernmost extension of the Moravian mammoth hunters (i.e. Pavlovian or Middle Danube Gravettian) (Niklasson, 1928: 90).

Niklasson’s comparison of the site with the large Pavlovian settlements (e.g. Dolní Věstonice I, Pavlov I), with diameters of 100 m and more (Svoboda, 2003), is certainly appropriate to emphasize the outstanding character of Breitenbach in terms of extension. Nonetheless, the latter did not receive much recognition in the prehistoric lit-
erature, compared to the well-known open air sites of the Middle Danube region, such as Dolní Věstonice I or Předmosti in Moravia, both excavated by K. Absolon since 1924 (Valoch, 1996: 9), not to speak of the Austrian sites (Neugebauer-Maresch, 1999). A series of unfortunate circumstances are obviously part of the explanation: N. Niklasson was dismissed from the Landesanstalt für Vorgeschichte in Halle/Saale in 1929 (Grünberg and Unruh, 2010: 317), hence except for two short reports (Niklasson, 1927, 1928) he never published his findings; the re-excavation planned by G. Pohl and Prof. W. Schultz, former director of the Landesmuseum Halle, in 1939 had to be cancelled due to the breakout of the Second World War (WWII) (Pohl, 1939, 1958: 190). Finally, the absence of any radiocarbon dating until the end of the 1980es (Richter, 1987) certainly did not foster the integration of Breitenbach in the more general discussion about the structuring and timing of the Aurignacian in Europe.

Generally speaking, the few studies devoted to Breitenbach after the WWII dealt with aspects of geo-stratigraphy (Toepfer and Nulgisch, 1962; Toepfer, 1968), lithic assemblage composition (Pohl, 1958; Hahn, 1977: 101–103; Richter, 1987), site function (Richter, 1987), faunal assemblage composition (Groiß, 1987), lithic use wear (Schulte im Walde, 1987), chronology and resulting culture-historical scenarios (Street and Terberger, 2000; Terberger and Street, 2003; Grünberg, 2006; Jöris and Moreau, 2010; Moreau and Jöris, 2012).

**CHRONOLOGY**

The Aurignacian of Breitenbach is associated with a reworked (by solifluction) reddish-brown palaeosol (*Fließerde*) formation attributed to the late middle pleniglacial (i.e. Stillfried B, according to Hahn, 1977: 150), given its stratigraphic position below an important sterile light loess cover of the late pleniglacial (Hess von Wichtendorff, 1927, 1932; Lehmann and Lehmann, 1928; Toepfer and Nulgisch, 1962; Toepfer, 1968).

According to the available radiocarbon dates – all made on bones kept in museums – the palaeolithic occupation of the site took place shortly after 30 ka $^{14}$C-BP uncalibrated, at the end of the Aurignacian time range (Street and Terberger, 2000; Terberger and Street, 2003; Grünberg, 2006; Jöris and Moreau, 2010; Moreau and Jöris, 2012). The chronological setting of Breitenbach thus indicates a rough contemporaneity with the very first manifestations of the Gravettian in southern Central Europe in the time frame of 30–27.5 ka $^{14}$C-BP uncalibrated (i.e. Swabian Gravettian, Bavaria and lower Austria) (Moreau, 2010, 2012a; Jöris et al., 2010).

However, the absence of any interstratification of Aurignacian and Gravettian levels so far coupled with the awareness that dates might be older than previously assumed, due to contamination by modern carbon (Higham, 2011), and given recent progress in the refinement of pre-treatment method aiming at improving dating accuracy and confidence (Marom et al., 2012), the possibility of a coexistence of Aurignacian and Gravettian manifestations later than 29 ka $^{14}$C-BP uncalibrated should be checked through new dates.

**COMPOSITION OF THE LITHIC INDUSTRY**

The Aurignacian lithic industry of Breitenbach (excavation 1927) comprises 10198 artefacts (Table 1), with a total weight of ca. 74 kg. In accordance with its geographical location on the edge of the maximum extension of the Saalian

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**Table 1**

Breitenbach (excavation 1927). Lithic assemblage structure, including both retouched and unretouched blanks, shatters, frost shards and volumetric cores, in absolute numbers and percentages. Blades with a width <12 mm were classified as bladelets.

<table>
<thead>
<tr>
<th>Class</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blade</td>
<td>3520</td>
<td>34.52</td>
</tr>
<tr>
<td>Bladelet</td>
<td>1235</td>
<td>12.11</td>
</tr>
<tr>
<td>Flake</td>
<td>3764</td>
<td>36.91</td>
</tr>
<tr>
<td>Burin spall</td>
<td>86</td>
<td>0.84</td>
</tr>
<tr>
<td>Chip (&lt;10mm)</td>
<td>82</td>
<td>0.80</td>
</tr>
<tr>
<td>Shatter</td>
<td>746</td>
<td>7.31</td>
</tr>
<tr>
<td>Frost shard</td>
<td>684</td>
<td>6.71</td>
</tr>
<tr>
<td>Core</td>
<td>81</td>
<td>0.79</td>
</tr>
<tr>
<td>Prefom (incl. tested raw material)</td>
<td>18</td>
<td>0.18</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10198</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
moraines and some 30 km north of the so-called *Feuersteinlinie* marking the maximum extension of the Elsterian moraines (Eiissmann, 2008), the dominant stone raw material used is a high-quality erratic flint. The presumed provenience of the latter is from the nearby channel of the Weiße Elster to the northwest, about 2–3 km away. In any case, the exploited raw material had to be of local origin, given the proximity of the site to the moraines deposited by the Saalian and Elsterian ice sheets. As a matter of fact, more than 99 % of the lithic industry was produced from erratic flint. Only 23 items were manufactured on local quartzitic material.

Retouched blanks comprise 1040 specimens that account for 10.2% of the whole assemblage (Table 2; Figs 2–4). Tools (i.e. retouched blanks) are dominated by burins (27.4%) and endscrapers (20.87%), among which almost 70% are carinated and nosed endscrapers (Fig. 3). While laterally retouched blade blanks are also well represented (27.1 %), lateral retouch is generally light, unilateral and rarely extends over the entire length of the blank (Fig. 2: 18–20). Proper “Aurignacian”-retouch is not attested.

Retouched bladelets can be subdivided into three main types:

1) Dufour bladelets (sub-type Roc-de-Combe) (Fig. 2: 1, 2), i.e., inversely retouched small twisted bladelets associated with the reduction of nosed endscrapers-cores.

2) Small bladelets with a fine marginal, dorsal retouch (Fig. 2: 3–6). Their profile is straight or rather slightly curved. These bladelets stem from the reduction of carinated endscrapers-cores.

3) Abruptly retouched bladelets with a

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### Table 2

<table>
<thead>
<tr>
<th>Tool classes</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>simple endscraper (on blade or flake)</td>
<td>52</td>
<td>5</td>
</tr>
<tr>
<td>endscraper on blade with lateral retouch</td>
<td>13</td>
<td>1.25</td>
</tr>
<tr>
<td>double endscraper</td>
<td>3</td>
<td>0.29</td>
</tr>
<tr>
<td>carinated endscraper</td>
<td>123</td>
<td>11.83</td>
</tr>
<tr>
<td>nosed endscraper</td>
<td>26</td>
<td>2.5</td>
</tr>
<tr>
<td>burin on break (simple or double)</td>
<td>79</td>
<td>7.6</td>
</tr>
<tr>
<td>burin on truncation (simple or double)</td>
<td>79</td>
<td>7.6</td>
</tr>
<tr>
<td>dihedral burin (simple or double)</td>
<td>21</td>
<td>2.02</td>
</tr>
<tr>
<td>on natural surface</td>
<td>19</td>
<td>1.82</td>
</tr>
<tr>
<td>multiple mixt burin</td>
<td>18</td>
<td>1.73</td>
</tr>
<tr>
<td>transversal burin</td>
<td>12</td>
<td>1.15</td>
</tr>
<tr>
<td>carinated burin</td>
<td>5</td>
<td>0.48</td>
</tr>
<tr>
<td>busked burin</td>
<td>2</td>
<td>0.19</td>
</tr>
<tr>
<td>undetermined (i.e. broken end)</td>
<td>22</td>
<td>2.11</td>
</tr>
<tr>
<td>Borer</td>
<td>23</td>
<td>2.21</td>
</tr>
<tr>
<td>Pointed blade</td>
<td>10</td>
<td>0.96</td>
</tr>
<tr>
<td>Lateral retouch (on blade or bladelet)</td>
<td>282</td>
<td>27.11</td>
</tr>
<tr>
<td>Truncation</td>
<td>89</td>
<td>8.58</td>
</tr>
<tr>
<td>Laterally retouched bladelet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dufour (Roc-de-Combe)</td>
<td>2</td>
<td>0.19</td>
</tr>
<tr>
<td>Backed (i.e. abrupt retouch)</td>
<td>2</td>
<td>0.19</td>
</tr>
<tr>
<td>Marginally retouched bladelet from carinated-endscraper</td>
<td>3</td>
<td>0.29</td>
</tr>
<tr>
<td>Scraper</td>
<td>49</td>
<td>4.71</td>
</tr>
<tr>
<td>Splintered piece</td>
<td>56</td>
<td>5.38</td>
</tr>
<tr>
<td>Combination tool</td>
<td>50</td>
<td>4.81</td>
</tr>
<tr>
<td>Total</td>
<td>1040</td>
<td>100</td>
</tr>
</tbody>
</table>

Only those tools that are labelled so as to be securely attributed to and localized within the excavated surface are reported in this table.
Fig. 2. Breitenbach (excavation 1927). Blades and bladelets affected by retouch or impact fracture. 1, 2: Dufour bladelets (Roc-de-Combe); 3–7: Marginally retouched bladelets; 8–12: Bladelets retouched by means of an abrupt retouch; 13–17: Small blades and bladelets probably fractured by impact (arrows indicate burin-like fractures; triangles indicate bending fractures); 18, 19: Laterally retouched blades; 20: Laterally retouched burin on truncation (drawings L. Moreau). While all artefacts represented here are labelled, only those that are marked so as to be securely attributed to and localized within the excavated surface are reported in table 2.
Breitenbach-Schneidemühle, Germany

Fig. 3. Breitenbach (excavation 1927). 1: Carinated burin; 2: Busked burin; 3: Nosed endscraper; 4: Carinated endscraper (drawings 1–3 L. Moreau; 4 G. Rutkowski)
Fig. 4. Breitenbach (excavation 1927). Blade blanks. 1, 2: Burins on truncation; 3: Simple endscraper; 5: Unretouched blade blank; 6: Truncated cortical blade (drawings L. Moreau)
straight profile stemming from the reduction of prismatic bladelet cores (Fig. 2: 8–12).

Among the unretouched straight bladelets from prismatic cores the presence of implements with alleged impact breakage scars indicating their function as projectiles is noteworthy (Fig. 2: 13–17).

From a typological point of view, the lithic industry of Breitenbach corresponds to an ‘evolved Aurignacian’ or ‘Post-Aurignacian I’. Besides a positive burin/endscraper ratio this is most notably indicated by the presence of inversely retouched Dufour-bladelets (sub-type Roc-de-Combe) (N = 2) (Fig. 2: 1, 2), busked and carinated burins (N = 7) (Fig. 3: 1, 2) and the absence of any fossiles directeurs characteristic of the early Aurignacian ( Peyrony’s Aurignacian I), such as split-based osseous points and blades retouched by means of heavy “Aurignacian” retouch. Note that besides a few perforated fox canines, the modified organic material (i.e. bone industry) of Breitenbach is sparse (Pohl, 1939; Hahn, 1977; Richter, 1987). Mobile art fashioned from ivory is not attested in the archaeological record.

Lithic technology

Lithic reduction was primarily oriented towards the production of laminar blanks. In fact, blades and bladelets represent indeed 46.6% of the total assemblage, before flakes (36.9%) (Table 3). Moreover, the amount of modified blades and bladelets (69.4%) compared to retouched flakes (25 %) indicates that the primary concern of technological activities undertaken at the site was the manufacture of laminar blanks (Table 3). This holds true despite a probable underrepresentation of the small fraction (< 2 cm), small bladelets from endscrapers-cores in particular, given the absence of wet-sieving or dry-screening in the course of the early fieldwork. Finally, structuring of operational schemes towards the production of laminar tools is indicated by the Tool Laminar Index (Indice Laminaire de l’Outillage) (Demars, 1989), which accounts for 73.9% (or 82.45% when endscrapers-cores are excluded from the tool categories).

Pristatic blade and bladelet debitage was conducted at the expense of nodules, frost shatters, thick flakes or natural debris, the latter pre-senting at least one natural diaclastic or frost fractured surface (Figs 5–8). Judging from preforms and complete blanks, raw material did not exceed 13 cm maximal length (Fig. 5: 2). However, smaller raw material of 5–7 cm initial length is also well represented (Figs 5: 1; 6: 3; 7: 3; 8: 2). As far as the reduction processes are concerned, the smaller raw material, the thick flakes and part of the frost shards correspond to an operational scheme devoted to an exclusive bladelet production. The bigger raw material (>7 cm) correspond to an operational scheme entailing a technological continuum in the production of blades and bladelets (i.e. the processing begins with the production of blades, and, later on in an advanced reduction stage, proceeds with the production of bladelets). Although half of the prismatic cores have two striking platforms, the observation that solely 6.1% of the laminar blanks (both retouched and unretouched) wear bidirectional dorsal scars suggests that core reduction occurred preferentially in a unipolar manner (Figs 2 and 4).

Finally, besides blank production on volumetric cores, an exclusive bladelet production on endscrapers-cores is noteworthy (Fig. 3: 3, 4). Without refuting the possibility of an ad hoc function of the latter as scrapers (Schulte im Walde, 1987), in the present study all specimens assigned to the type “carinates” seem to be functionally identical: namely cores for the production of small standardized bladelets (Hays and Lucas, 2000; Lebrun-Ricalens, 2005). The latter served

<table>
<thead>
<tr>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blade</td>
<td>667</td>
</tr>
<tr>
<td>Bladelet</td>
<td>55</td>
</tr>
<tr>
<td>Flake</td>
<td>260</td>
</tr>
<tr>
<td>Burin spall</td>
<td>0</td>
</tr>
<tr>
<td>Chip (&lt;10mm)</td>
<td>0</td>
</tr>
<tr>
<td>Shatter</td>
<td>13</td>
</tr>
<tr>
<td>Frost shard</td>
<td>44</td>
</tr>
<tr>
<td>Core</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>1040</td>
</tr>
</tbody>
</table>

Breitenbach (excavation 1927). Representation of retouched items in absolute numbers and percentages. Blades with a width <12 mm were classified as bladelets.
Fig. 5. Breitenbach (excavation 1927). Cores. 1: Bladelet core; 2: Preform of blade core on thick frost shard (drawings L. Moreau)
Fig. 6. Breitenbach (excavation 1927). Cores. 1, 2: Bladelet cores; 3: Preform of a bladelet core on thick cortical flake (drawings G. Rutkowski)
Fig. 7. Breitenbach (excavation 1927). 1–3: Bladelet cores (drawings G. Rutkowski)
Fig. 8. Breitenbach (excavation 1927). 1–3: Bladelet cores (drawings L. Moreau)
for the manufacture of both inversely retouched Dufour bladelets and marginally retouched implements (cf. above).

Given the numerical importance of carinated and nosed endscrapers (in short: carinates) among the ‘retouched’ flakes (almost 40%), the role of flake production in the organization of the lithic technological system in Breitenbach has been investigated (Moreau, 2012b). The analysis showed that flake production was indeed characterized by predetermination as far as blanks for carinates were concerned. Though flakes mainly represent by-products of the laminar operational sequences attested at the site, flakes for carinates were systematically struck off by hard hammer technique. Moreover, metrical analyses of both unretouched and retouched flakes indicate that thickness was indeed a critical variable governing flake production as far as blanks for carinates were concerned.

**SPATIAL ORGANISATION**

Besides the actual archaeological remains there is also basic contextual data on their spatial provenience, detailed enough to serve for spatial analyses of the recovered material. Yet, given that the archaeological material presented here stems from excavations undertaken almost a century ago, the issue of the spatial context of the recovered artefacts has to be addressed in the light of the excavation techniques implemented at that time.

In fact, in contrast to many other excavations of that time the accuracy of the contextual information provided by the excavations in Breitenbach is noteworthy. The Aurignacian material was provenienced by means of a two-dimensional coordinate system adapted for the site. Each single artefact has been recorded and labelled in the traditional manner of a Cartesian grid system comprising a letter (x-axis) + number (y-axis), with reference to an excavation unit of half a m²; thus the item can be assigned retrospectively to one of the ca. 750 units composing the former two-coordinate grid system (ca. 400 m²). While the major stratigraphic position of the Aurignacian horizon has been documented (see above), individual depth-coordinates of the recovered artefacts were not.

By the same token it should be made clear that the early excavation of Breitenbach was mostly designed to document and maximize the archaeological material to be recovered in response to the intended extension of the storage yard which actually represented a direct threat to the archaeological layers. Hence, although the archaeological material stems from an overall area of ca. 400 m², the Aurignacian layer was not excavated via large-scale horizontal exposure including individual plotting of artefacts in the style of A. Leroi-Gourhan’s paleoethnographic approach in Pincevent (Leroi-Gourhan and Brézillon, 1972). According to G. Pohl, it was rather the meteorological conditions that prevented a large-scale horizontal exposure of the Aurignacian level (Pohl, 1958: 179).

The excavation technique adopted in 1927 can be reconstructed from partial descriptions (Pohl, 1939, 1958) and black-and-white photographs hosted in the archive of the Cultural Heritage in Halle/Saale (Landesamt für Denkmalpflege und Archäologie Sachsen-Anhalt). It consisted in setting back the loess profile “in slices” eastwards. In the first place, the sediment on top of the archaeological level was removed in order to expose it over several meters on a width of 0.5 m. Subsequently, the material was recovered and recorded according to its respective excavation unit (i.e. half a m²), before removing the sterile ‘socket’ and continuing with the next ‘slice’ of sediment.

**Spatial analysis**

The present mapping of the Aurignacian lithic assemblage (Figs 9–14) was achieved on the one hand by recording each labelled artefact according to its spatial provenience (along with other nominal and metrical attributes) into a computerized database (Access 2003); and on the other hand by creating a computerized two-dimensional coordinate system which enabled the mapping of all labelled artefacts with regard to the finds density and spatial distribution (Excell 2003). In order to avoid distortions in the representation of the finds density the half-m² units were merged into equal units of one m². At the same time, as the exact provenience within the excavation unit of each artefact is unknown, the two-dimensional coordinate assigned to the artefacts arbitrarily references to the centre of the excavation unit in which they were recovered.
The mapping itself was achieved by means of Surfer 8, Golden Software (Inc. 2002).

The question whether the distribution patterns of the archaeological material reflect various aspects of the intra-site activity patterns or whether they actually result from post-depositional processes, was examined in the light of intensive endeavours of refitting. The sample chosen comprised lithic material (N = 3461 artefacts) from a demarcated area of 180 m². The time dedicated to the systematic refitting endeavours comprised 100 hours distributed over two weeks. Given the raw material homogeneity and the overall patination of the lithic assemblage, cortical blanks, fragments of laminar blanks and frost shatters were targeted preferentially for refits within and between excavation units.

Results

It turns out that the area with the highest finds density (i.e. over 100 artefacts per m²) lies in the south-western part of the excavated surface. To the north and east, the finds density progressively decreases. The abrupt change in the finds density to the southwest marks the limits of the earth works undertaken in 1924 that led to the discovery of the site. At the same time, it suggests the irrevocable destruction of a certain portion of the site. Furthermore, finds density reveals zonation characterized by areas empty or near empty of finds in contrast to those with high densities of finds.

Evident features, hearths in particular, were not reported from the early excavations. However, besides the abundant presence of charred bones (Wilcke, 1927; Hess von Wichdorff, 1932), burned lithic artefacts (N = 424) strongly indicate the former presence of hearths (Fig. 10). Items of different lithic artefact categories have been plotted against the background of the finds density to verify the existence of features indicative of intra-site activity patterns: carinates (Fig. 11), volumetric cores (Fig. 12), simple endscrapers (Fig. 13). It turns out that the various items are rather loosely dispersed over the whole excavation area without noticeable clusters and there is no correlation between specific artefact types and zones of high finds density.

Altogether 182 lithic artefacts, representing 5.3% of the sampled lithic assemblage of the investigated excavation surface of 180 m², could be refitted. Only refitting-lines between excavation units have been represented, as the position of the artefacts within single excavation units has not been documented in the course of the excavations (cf. above) (Fig. 14). Almost half of the 91 refitting-lines have been achieved between excavation units, with their total length measuring between 1 and 8 m. As far as their orientation is concerned, almost all refits have a broadly N–S direction, which coincides with the slight slope of the cultural layer. Moreover, almost 60% of the artefacts refitted have been affected by frost weathering with “pot lid” fractures caused by frost action. This attests to a significant correlation between refitting-lines, frost-weathering and sloping as regards the site formation processes involved.

It can be further mentioned that 8.1% of the artefacts (N = 828) of the total lithic assemblage have been affected by frost weathering, while frost shards make out 6.7% (N = 684) of the whole assemblage. Stone slabs exceeding 10 cm in length (N = 6) were recovered from the southern part of the excavated area. Retouch type indicative of cryoturbation processes has not been observed.

DISCUSSION

Given the documentation bias of the early excavations and the absence of evident features, hearths in particular, around which social life would have taken place, inferences on settlement organization, domestic structures and functional areas, are unfortunately restricted. The unidirectional arrangement of conjoining lines of refitted artefacts in correlation with frost action and sloping further suggest solifluction (i.e. slope wash) processes. These must had influenced the material accumulation after deposition and are likely to be responsible for decimetre to meter-wise displacement or relocation of archaeological material in relation with downslope sediment movement. My results corroborate stratigraphic observations made during the excavations referring to a secondary embedding of the archaeological remains (Wilcke, 1927; Niklasson, 1928). Admittedly, it is not clear whether all parts of the site were equally affected by those processes. Neither can we exclude the option that part of the clusters representing a higher
Fig. 9. Breitenbach (excavation 1927). Find density map of all lithic artefacts labelled with reference to an excavation unit (plan L. Moreau)
Fig. 10. Breitenbach (excavation 1927). Find density map of burned lithic artefacts (N = 424). Scaling of X and Y axis is expressed in meters (plan L. Moreau)
Fig. 11. Breitenbach (excavation 1927). Spatial distribution of piece-plotted carinated and nosed endscrapers. The background corresponds to a Kernel density map based on the complete lithic assemblage. Scaling of X and Y axis is expressed in meters (plan L. Moreau)
Fig. 12. Breitenbach (excavation 1927). Spatial distribution of piece-plotted volumetric cores. The background corresponds to a Kernel density map based on the complete lithic assemblage. Scaling of X and Y axis is expressed in meters (plan L. Moreau)
Fig. 13. Breitenbach (excavation 1927). Spatial distribution of piece-plotted simple endscrapers. The background corresponds to a Kernel density map based on the complete lithic assemblage. Scaling of X and Y axis is expressed in meters (plan L. Moreau)
Fig. 14. Breitenbach (excavation 1927). Plan of refitting-lines between lithic artefacts from distinct excavation units. The sample chosen for systematic refits comprised 3461 artefacts from a demarcated area of 180 m². The background corresponds to a Kernel density map based on the complete lithic assemblage. Scaling of X and Y axis is expressed in meters (plan L. Moreau)
finds density indeed denote features somehow related to the original spatial organization of the site (e.g. activity zones or trash disposal).

This being said, even when keeping in mind the restrictions imposed by taphonomical processes and early excavation and recovery techniques on the significance of spatial distribution of the remains, the investigation of technological organization implemented at the site, including raw material use, certainly allows for inferences on the type of settlement. The latter can be defined as an adaptive strategy drawing on interaction of different variables, including raw material availability, residential mobility, labour scheduling and the nature of the activities conducted (e.g. Nelson, 1991; Kuhn 2004: 433). In this respect, besides artefact densities the extensive lithic scatter over hundreds of m² as well as the tool abundance and diversity, firmly speak in favour of prolonged settlement dynamics.

While the identification of seasonal patterns based on a thorough analysis of the faunal record will certainly provide us in the future with a more accurate picture of the occupational schedule, the size of the lithic assemblage and its focus on good quality local raw material already suggest that the knowledge of raw material availability was incorporated into the “technological plan” of the occupants, making a repeated use of the locality over a longer time-span likely. The Aurignacian of Breitenbach thus probably represents a palimpsest of repeated occupation events. In any case the focus on local good quality raw material and the absence of any evidence for import of raw materials is noteworthy. Since there is no indication that the manufacture of tools took place in advance of the actual occupation it is further expected that blank production occurred without major transport cost and time constraints. Altogether, drawing on the observations made before, Breitenbach most likely corresponds to a strategy of “provisioning places” (after Kuhn, 1992, 2004), which entails the supply of a location with raw material according to anticipated needs.

Although not entirely accurate, Niklasson’s inference that Breitenbach represented the northernmost extension of the mammoth hunters of the Moravian Gravettian (i.e. Pavlovian) (Niklasson, 1928: 90) is nevertheless informative. While comprehensive publications of the late Aurignacian record of the open air sites Alberndorf I and Stratzing/Krems-Rehberg (both in Lower Austria) are still in progress, the nearest sites of comparison, geographically and chronologically are still the large Moravian campsites of the Pavlovian. Even though the latter are presently explained as accumulations of middle-sized and small sites through time (Verpoorte, 2000; Svoboda, 2003) and even though significant variability within Pavlovian site types has long been recognized (Kozlowski, 1986; Svoboda et al., 2000). One major difference with the Pavlovian open air sites is that Breitenbach provides no indications of ritual or symbolic activities (i.e. figurative art or burials). Another significant difference concerns the provisioning strategy attested in Breitenbach as compared to the Pavlovian sites. Admittedly, in both cases places were provisioned with good-quality raw material. However, while long-distance transport of important quantities of siliceous lithics over 250 km and more is usual in the large Pavlovian campsites (Kozlowski, 1991; Svoboda et al., 2000; Oliva, 2000), the catchment area for provisioning stone in Breitenbach is restricted to the vicinity of the site. Provided “in the case of provisioning places transfer distances for raw materials should reflect duration of occupation to some degree” (Kuhn, 2004: 434), the residential stability (i.e. duration of occupation) attested in Breitenbach must have been lower compared to that of the large Pavlovian sites, interpreted as base camps of semi-permanent character. The absence of figurative art or burials in Breitenbach would be in accordance with this inference.

Although our knowledge about Aurignacian settlement systems is still rather limited, it is clear that in Breitenbach there is no indication of a short-term specialised occupation, given the abundance and richness of tools (even without knowing their specific function); the high amount of blanks derived from all stages of the different operational production schemes documented at the site; and finally the abundance and richness of the faunal assemblage (Groß, 1987). These rather point to the residential character for Breitenbach, portraying a range of different activities, including resource procurement and processing. Picking up the question introduced at the beginning of this paper, instead of a semi-permanent base-camp in the manner of the Pavlovian ones, the evidence at
hand rather indicates that Breitenbach corresponds to an accumulation of repeated occupation events, possibly of a seasonal character, over a prolonged time-span. However, more work is needed to understand the proper nature of (late) Aurignacian settlement patterns and the processes surrounding the socio-economic changes leading to the subsequent Gravettian.

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