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Bifacial and unifacial technology: A real difference or a problem of typo–technological approach? The example of the Ehringsdorf assemblage

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ABSTRACT

Discussion of differences and possible links between bifacially and unifacially shaped tools has quite a long tradition. Certain techno-complexes are distinguished due to the presence or absence of bifacial technology (e.g. Keilmesser group, MP/UP transition leafpoint industries). The paper draws attention to a problem of defining bifacial and unifacial technology. The Ehringsdorf (Germany) tools show traces of multiple, subsequent resharpening. The knapper started from unifacial retouch on one or both edges of a flake's dorsal side. In the course of further resharpening, the ventral side of the flake required certain adjustments. After several rejuvenation phases tools show all the features of bifacially shaped tools in a type of leafpoints or knives. From a technological point of view, the question arises if such a reduction sequence can be called bifacial, unifacial, or should be defined in a different way.

1. Introduction

The scope of the paper is to present and discuss the results of technological analyses of unifacially and bifacially worked artefacts from the lower travertine layer in Ehringsdorf dated to MIS7. A scar pattern analysis of 30 artefacts from Ehringsdorf assemblage was conducted as a part of a project of studying the earliest Palaeolithic leafpoints in Europe (Feustel, 1983; Gladilin et al., 1995; Kozłowski, 2003).

Ehringsdorf is one of the most known Pleistocene sites in Germany, rich in both stone artefacts and human remains. The site is located in a travertine quarry near Weimar (Thuringia) in the Ilm river valley. Description of the site's stratigraphy, which became a reference point for future research, was made by Soergel (1926, 1940). He separated the profile into the upper and lower travertine layers, divided by a layer known as the Pariser Horizon. Animal and human remains, intact fossilized flora remains as well as flint artefacts were found in the 19th and the beginning of 20th century on the site, mainly in the lower travertine layers. Initially, human remains of at 6 individuals were interpreted as Neanderthal (Virchow, 1920, Weidenreich et al., 1928 after: Behm-Blancke, 1960; Vlček, 1993). Today the remains are considered to belong to either early Neanderthals (Tattersall and Schwartz, 2000; Street et al., 2006, p. 555, p. 201) or even pre-Neanderthals (Vlček, 1993; Henke and Rothe, 1994, p. 442).

The most extensive archaeological studies were carried out between 1957 and 1959 by Behm-Blancke in several places throughout the quarry. The richest in artefacts was the so-called "central area" of the Kämpf quarry. Behm-Blancke (1960) basically kept the overall stratigraphy described by Soergel. Within the lower travertine layer Behm-Blancke distinguished several (depending on the location-up to 10) levels of "hearths", the so-called *Brandschicht* where flint artefacts were found.

The inventory includes several thousand of stone artefacts collected continuously for over 200 years. Artefacts are mostly made of flint and are heavily frost cracked. The inventory is fully of the flake type (Schäfer, 2007, p. 177). The assemblages are dominated by various types of small side scrapers, also the bifacially worked ones. Certain artefacts, due to their regular shape, are defined in the literature as leafpoints (Feustel, 1983; Gladilin et al., 1995).

Behm-Blancke (1960) named several settlement levels within the lower layer of travertines. He defined the entire inventory as "old, developed Mousterian" (Behm-Blancke, 1960, p. 169). Due to the presence of bifacial tools, he eventually described them as "PreSzeletian Mousterian" (Behm-Blancke, 1960, p. 199). Both Andree (1939) and later Hülle (1977, 1939) drew attention to the similarity between some of the Ehringsdorf forms and Ranis leafpoints.

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Behm-Blancke (1960) dated the whole travertine profile as Eemian. In later works, the upper travertine layer was dated to the Amersfoort and Brørup Interstadials (Behm-Blancke, 1967). To this day, certain scholars think that such late sediment dating should be maintained (Schäfer, 1991), with their arguments based on comparative analysis of flint inventories. However, the uranium analyses carried out in the early 1980s produced a date of ca. 230 ka for the lower travertine level (Brunnacker et al., 1983; Blackwell and Schwarcz, 1986). Mallick and Frank (2002) published the results of a new comprehensive profile dating with the use of U/Th. The results confirmed the previous ones showing that the lower travertine layer was accumulated around 243 ± 6.2 ka. Most recent ESR dates (Schüler, 2003) made on five teeth samples from different layers (from the lower travertine level up to the upper travertine layer), gave results similar to the average date of 204 ka. Based on the numerical dating, the lower travertine layer containing flint inventories which are of interest here is dated securely to MIS7.

2. Methods and materials

In order to find a general technological concept of the bifacially worked tools, it was decided to apply the so-called scar pattern (Urbanowski, 2004) or working stage/step (Pastoors, 2000) analysis method. This type of analysis has been used for a short time only (Richter, 2001; Bar-Yosef and Van Peer, 2009) and it was mostly applied in the analysis of bifacial knives and handaxes (Pastoors and Schäfer, 1999; Pastoors, 2000; Boëda, 2001; Graßkamp, 2001; Jöris, 2001; Soressi and Hays, 2003; Soressi et al., 2003; Urbanowski, 2004; Migal and Urbanowski, 2006; Brumm and Rainey, 2011). Thus, some elements of analysis were tailored by the author in accordance with the needs of symmetric and only partly bifacially worked tools. The accuracy for the scar pattern analysis is still to be verified. First attempts have been done with the use of experimental refittings, but have not been published yet (Urbanowski et al., 2005).

Scar pattern analysis allows reconstruction of the tool manufacturing process. In general, it is based on the knowledge of conchoidal fracture properties, which gives the possibility of establishing the relative chronology of scars visible on tool surface (Pastoors, 2000; Richter, 2001; Kot, 2013). The scar pattern gives a similar result as the refittings, but the result is restricted to the *chaîne opératoire* stages visible on the tool surface.

The aim of the analysis is to reconstruct consecutive stages of the manufacturing process. In order to obtain it, single flake scars are combined into flaking sequences which would, as a whole, reflect a particular action in the tool reduction sequence. Thus, the term “sequence” is applied to denote a few-to-several flake scars detached on the tool for a common purpose and bearing similar morphometric characteristics (positioning, angle, size, direction). Mutual chronological interrelations of particular flaking sequences enable identification of particular tool manufacturing stages. The final result of the analysis is a relative chronology of subsequent manufacturing steps of a single artefact *chaîne opératoire*, presented usually in a Harris matrix (Pastoors, 2000; Jöris, 2001; Urbanowski, 2004; Kot, 2013).

Based on the differences in morphology of the flaking sequences, the analysed tool can be divided into separate parts which were treated differently during both manufacturing and rejuvenation stages. Such distinct techno-functional units (Kot, 2013) are characterized by different ways of knapping. These units are designated only when a given tool fragment is formed in a specific, possible to identify, and described manner.

An important examination component, but also the most subjective one, is to establish the aim of actions undertaken at consecutive manufacturing stages and correlate them with particular techno-functional units. Comparison of morphology of flaking sequences forming different tool units of several analysed tools determined the common features which would resemble the aim of forming a certain tool part (Boëda, 2001; Kot, 2014). Consequently, traits/parameters significant for the tool creator, which decided the utility of a given form or its abandonment, can be traced (McPherron, 2006, p. 281).

Apart from the scar pattern analysis, the author decided to undertake quantitative sequence frequency analysis. Its aim was to find a proper measure to establish the intensity with which the tool's particular sections were treated. This would enable conclusions as to which sections of the tool were processed more and which less intensively. Therefore, it was decided to calculate the removal sequences distinguished as part of scar pattern analysis. Consequently, the examination will establish the number of removal sequences as a measure of the extent to which certain tool parts were treated. The examination proposed may then illustrate not only the intensity with which the formation of particular tool sections was approached, but also how often it was used and rejuvenated.

For the sake of analysis, each artefact was arbitrarily divided into 12 sectors (Fig. 1). The main principle of the examination is to calculate the removal number within each tool sector so as to show which tool parts were knapped with higher intensity. It was justified, then, to calculate only those sequences which had been detached from the observed edge. Each face of the tool was considered separately (Fig. 1). Flake ventral surface, remains of vast removals with an unidentified removal direction, postdepositional sequences, and fracture scars were not considered as belonging to a given sector (Fig. 1).

The analysis covered in total 30 artefacts from the Ehringsdorf site (Fig. 2, Fig. 3). Twenty-five of them were discovered in the central part of the site where the excavations took place (Behm-Blancke, 1960). Five of the analysed artefacts (79/93, 315/93, 1463/93, 2304/93, 7932/93) were found outside the main excavations area and their dating is not clear (Tim Schüler; oral information). Nevertheless, it was decided that the analysis will include these tools in terms of their morphological similarities.

3. Results

The analysed tools from Ehringsdorf are characterised by small size (average length–5.07 cm, average width–2.65 cm) but relatively large thickness (average–1.26 cm) (Figs. 2 and 3). They were most often made on flakes. The tools are characterized by a plano-convex cross section and an exposed tip, which is often sharp and set in the tool vertical axis. Both edges were retouched onto the dorsal face. However, one of them has a straight course in a side view (edge I), whereas the other one (edge II) has a slightly S-shaped profile (Fig. 5). Considerable discrepancies in both edges profile sinuosity may imply the existence of a difference in their treatment during the *chaîne opératoire* (Kot, 2014, 2013). It can be assumed that the edge with S-shaped course was treated with the use of fewer deeper and broader removals detached onto both sides of the tool (Fig. 5). The straight-profiled edge was formed with the help of more tiny removals, or was detached on one side of the tool only. This difference stems from the specific character of the tools' rejuvenation method.

3.1. Manufacturing scheme

Generally, the manufacturing scheme was divided into two stages. First was the acquisition of the blank. The stage of obtaining flakes from which the tools were knapped is visible only

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