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LIFE AND AFTERLIFE OF TOOLS: AXES OF THE CORDED WARE CULTURE IN MORPHO-FUNCTIONAL ANALYSIS

ABSTRACT

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Two stone shaft-hole axes found in a destroyed grave of the Corded Ware culture in Brożec, Strzelin district, SW Poland, have been subjected to morpho-functional analysis. Both tools bear various traces of use, repair and ante-depositional treatment, which points to their interesting life histories. The high-resolution analysis involved detailed microscopic and morphometric observations aimed to determine the function of the axes and the scale of modifications made before the artefacts became grave goods. The axes are quite similar typologically (according to the typologies by Jan Machnik 1966 and Piotr Włodarczak 2006). However, before being placed in the grave, they were definitely used, and their use-wear traces show that the roles of the artefacts were different.

Key words: Corded Ware culture, shaft-hole axe, use-wear, biographical approach

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INTRODUCTION

Stone axes of different forms rank among the most representative elements of Corded Ware inventories. Found in different contexts: settlements, graves, deposits/offering places, they are mostly stray finds, and this is true for the entire area covered by that culture (e.g. Šebela 1999; Cholewa 2004; Johanson 2006). Although secondary changes have

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been documented on axes since the early 1950s (eg. Smutek 1950, 157), research has centred on the classification and chronological determination based on the shape of the tools (Struve 1955; Machnik 1966; Włodarczak 2006). Since the beginning of the 21st century, the idea of the typological evolution of axes deposited in Corded Ware graves has been revised with more advanced methods, including radiocarbon dating and comparative analysis (see Czebreszuk and Müller 2001; Tunia and Włodarczak 2002).

There have been relatively few funeral contexts with axes in Lower Silesia (e.g. graves in Wojkowice 15; Gralak *et al.* 2001 — 2 axes; Wrocław-Jagodno: Dwojak *et al.* 2011 — 1 axe). One of such contexts has been found accidentally in Brożec, Strzelin district, SW Poland. Two stone shaft-hole axes with macroscopically discernible traces of use, repair and ante-depositional treatment have been recovered from a destroyed grave and subjected to morpho-functional analysis. Traces of work, such as scars on the cutting edges, and other evidence of modifications made during the life-cycle of the axes suggest their long biography. Opinions about funerary offerings and their symbolic function are divided, and stone axes from graves of the Corded Ware culture are no exception. Some researchers believe that axes were grave goods produced especially for the funeral purpose, and that they were never used (Knutsson 1995, 206). Others point to heavily worn and damaged axes found in graves (Lekberg 2002, 120; Johanson 2006, 107). These discrepancies, which may initially seem to have a regional background, have led to the question of what was the reason, apart from the typological development in time, for morphological differences between those tools.

Attempts toward explaining the diversity have been made independently by Scandinavian and Polish researchers. Per Lekberg has analysed the morphology of items recovered from three contexts and proposed a generalised scheme of the life history of axes (Knutsson and Knutsson 2003, 67, fig. 22). Andrzej Bronicki and Sławomir Kadrow (1998) have carried out comparative metrical analyses of more than one hundred axes from the Lublin province, SE Poland. They both conclude that all forms developed from a long axe, type A3 in Karl W. Struve's typology (a long and slender boat-shaped axe with an asymmetric cutting edge and a central shaft-hole; Bronicki and Kadrow 1998, fig.10), due to modifications and repair of used and damaged tools. The authors describe various breaks and methods of maintenance that have resulted in the different final forms of the artefacts. Both models suggest that all the axes had only a utilitarian purpose. This thesis, according to which all axes were used and worn in the same way, is a kind of simplification. Nevertheless, it may be true for SE Poland, where local communities had no direct contact with western production centres (Bronicki and Kadrow 1998, 269). However, the availability of raw material in Lower Silesia was entirely different. Moreover, petrographic analysis and earlier, though poorly documented reports, indicate that at least a few prehistoric outcrops and workshops within the Ślęża Massif were related to the Corded Ware culture (Wojciechowski 1988). Lower Silesian workshops could have produced different forms of axes intended for different purposes. The diverse biographies of individual items may still be detected under a microscope.

This paper shows the results of a preliminary study of the stone shaft-hole axes from Brożec, presented at the Corded Days International Conference in Kraków in 1–2 December, 2011. Adopting the biographical approach developed by many researches for nearly twenty years (see Van Gijn 2010 for further references), we have carried out detailed microscopic and morphometric analysis to determine the function of the artefacts and the technique used, but primarily to assess the scale of modifications made before the axes became grave goods.

THE GRAVE IN BROŻEC, STRZELIN DISTRICT

The Brożec site is located in Lower Silesia, within the Niemcza-Strzelin Hills in the Sudetes Foreland (SW Poland), approx. 30 km from the Ślęża Massif. A partial human skeleton and two stone shaft-hole axes from the younger phase of the Corded Ware culture were found there in a gravel outcrop in 1974 (Kwiatkowska, Miskiewicz 1983). No details about the form or the exact location of the grave were documented; however, the burial was described as placed in sandy-gravel sediments 1.2 m below the ground level. The grave was oriented north-south, and the body lay on the right side, facing east. Anthropological analysis has identified the burial as an *adultus/maturus* man, no more than 40 years old.

MORPHOLOGY AND TYPOLOGY

Two stone axes deposited in the grave as grave goods are made of serpentine from the Ślęża Massif or from outcrops near the mount in Nasławice or Gogołów (K. Sadowski, personal communication). The axes differ in weight, but are fairly similar in size and quite similar in terms of typology (according to Machnik 1966 and Włodarczak 2006).

Axe 1/74 (Fig. 1) is made of bottle green serpentine. The nearest outcrop of that material is located within the Gogołów-Jordanów Serpentine Massif, approx. 30 km from the site. The tool has a trihedral or pentagonal shape with arched edges and a loaf-like profile. Its surface was ground and then smoothed very carefully. The axes are similar in length and width (length: approx. 10 cm; width: approx. 4–5 cm), but axe 1 is slimmer in its view and profile. The ratio of its maximum length to width and blade height is over 2.5; its weight is 335.5 g. The same morphometrical criteria are met by so-called battle axes. Nevertheless, current typologies include the majority of short items into the group of so-called working axes (see Machnik 1966; Wojciechowski 1971; Šebela 1999; Włodarczak 2006). According to these typologies, particularly the most recent one, proposed by Włodarczak for inventories from Małopolska (Włodarczak 2006, 35–36), axe 1 corresponds closely to type H, although the presence of a notch may also suggest type I. In the Małopolska Upland, both types of axes were related to the younger phase of the Corded

Ware culture (phase III), but they may have appeared earlier, possibly in phase II (Włodarczak 2006, 120, table 34). Lower Silesian items seem to have similar, older chronology, because they are accompanied by axes of type B (in Struve's typology) or vessels of older provenience (Wojciechowski 1971, 62, fig. 15:5, 15:8).

Axe 2/74 (Fig. 2) is made of light green serpentine. Outcrops of that material are widely distributed within the Ślęza Massif. The surface of the tool was smoothed less carefully than in the case of axe 1, but the edges were ground, too. The tool has arched edges on one side and a more pentagonal shape on the other. Consequently, it is an unusual form that combines traits of two different types, H and D, according to Włodarczak's typology (2006, 34–36). It has a trapezoidal profile with curved edges, recorded mostly in type D2. Crucially, axe 2 is heavier (445.3 g) than axe 1 and squat in its view and profile; the ratio of its maximum length to width and the height of its cutting edge does not exceed 2. These parameters suggest that it is a typical working axe. Its closest analogy is an artefact from Site 22 in Kraków-Zesławice (Grave 7), dated to phase IIIB (Włodarczak 2006, 325). It is worth emphasising that similar forms have usually been found in graves as the only piece of grave goods or as accompanied by vessels and flint axes (Šebela 1999; Włodarczak 2006). Axe 2 has traits of at least two different forms and was placed in the grave together with the battle axe. We have, however, insufficient data for estimating precise chronology of the find. According to the most recent study, types D and H are both well-documented for phase III of the Corded Ware culture (Włodarczak 2006, 120, table 34). In Lower Silesia, axes with a trapezoid profile are linked to the youngest phase as well (Bronowicki 2003). In this case, axe 2 may represent a slightly older form.

Macroscopic traits of both axes indicate that their shape, size and characteristics are a result of modifications the artefacts went through. That is, reading the biography of those tools has been more important to us than comparing them to other forms whose shape has often resulted from changes and recycling as well. Accordingly, the cutting edges, surfaces and butts of the axes have been subjected to microscopic analysis in order to detect traces of production and use or traces of modifications (repair and sharpening, reuse *etc.*).

MICROSCOPIC ANALYSIS

Microscopic analysis, carried out in the Laboratory for Conservation of Archaeological Artefacts, Institute of Archaeology, Wrocław University, has involved the low-power method (an Olympus SZX9 stereomicroscope with the magnification range 6,3–114×), which is more adequate for examining traces of use on tools made of crystal rocks.

Axe 2/74 bears very intense traces of production and use. Parallel scratches resulting from sharpening and re-sharpening (multi-directional grinding traces) are well visible on two surfaces of the blade. Marked traces of use and reuse are present on the very edge. There are three micro-scars, two scars on two opposite sides of one corner and one scar on



Fig. 1. Axe 1/74 (photo by M. Skuła)



Fig. 2. Axe 2/74 (photo by M. Skuła)



Fig. 3. Use-wear traces on axe 2/74 (photo by B. Kufel-Diakowska)

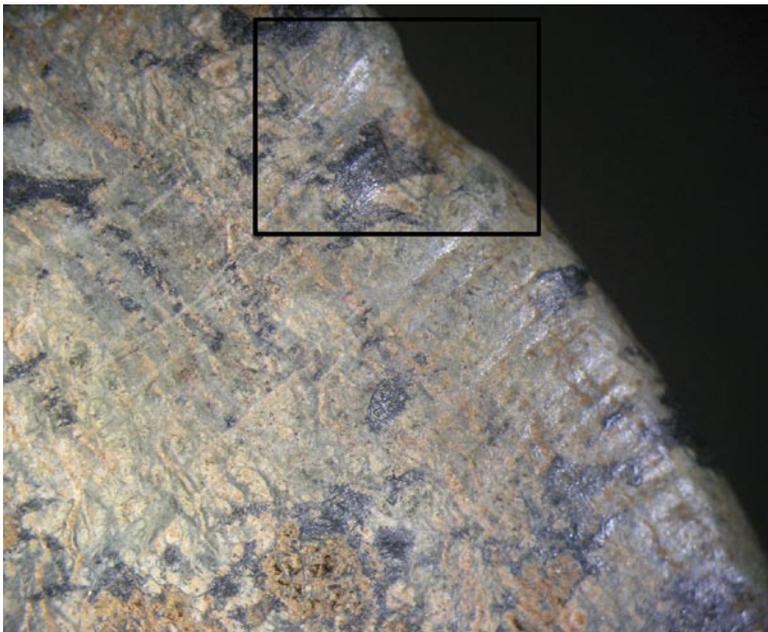


Fig. 4. Use-wear traces on axe 2/74 (photo by B. Kufel-Diakowska)

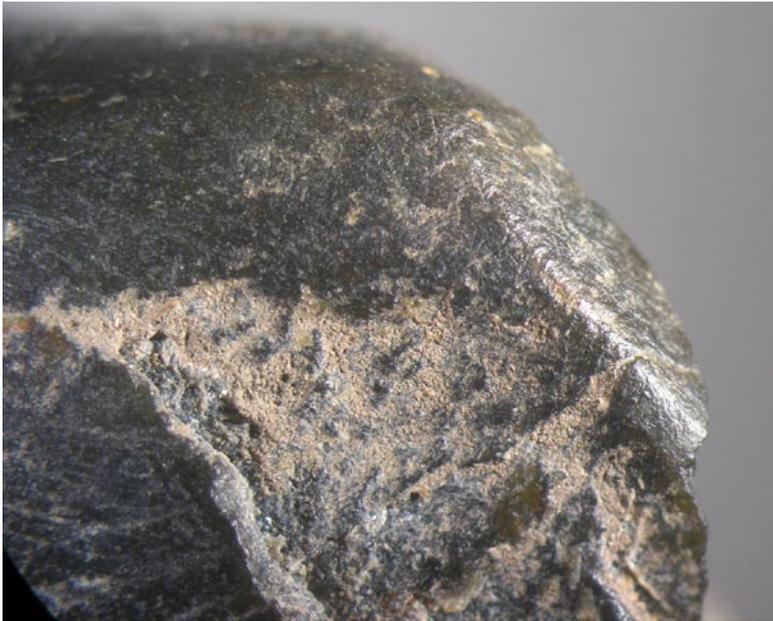


Fig. 5. Use-wear traces on axe 1/74 (photo by B. Kufel-Diakowska)

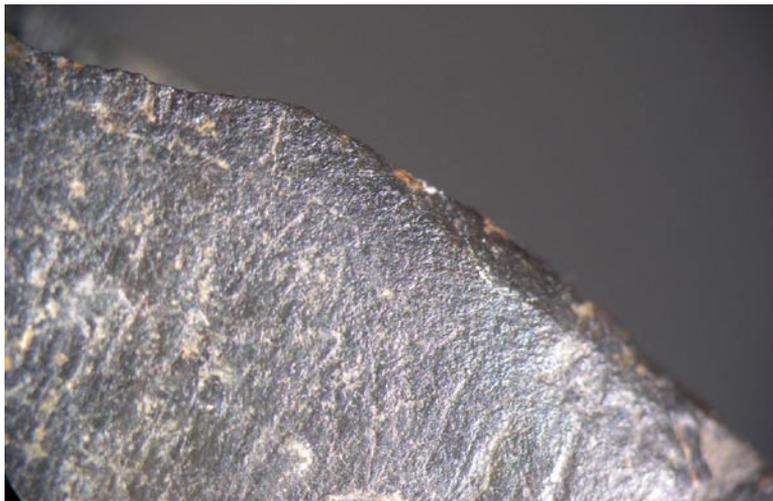


Fig. 6. Use-wear traces on axe 1/74 (photo by B. Kufel-Diakowska)

one side of the other corner; ridges of those scars and the cutting edge itself are strongly rounded (Fig. 3–4). There are also many short scratches, perpendicular and oblique to the blade, very dense on both sides of the corner with two opposite scars (Fig. 4). They overlap the grinding traces.

Use-wear analysis of artefacts made of crystal rocks is difficult, because there are no reference materials or trace patterns based on experimental work. Comparison between those traces and the results of Kristiina Johanson's experiments with stone axes (Johanson 2006, 108) or use-wear models established for flint axes (Wentink, Van Gijn 2008, 36) shows that the scars and scratches should be interpreted as brought about by chopping and subsequent re-sharpening. The Estonian scholar mentions that heavy woodwork removes tiny pieces from the blade. Nevertheless, we plan to carry out our own experiments, because traces vary and depend on the kind of crystal rock.

All the other surfaces and the butt are ground; the main edges of the pentagonal axe are sharp. The grinding traces are well visible on two surfaces, although they are carefully smoothed; this seems to have resulted from hafting and binding, but intentional polishing before use cannot be excluded. The butt is heavily damaged, because the tool broke during its production or use. Despite the damage, the maker/user did not discard the item, but used it for a relatively long time. The surface of the break is highly smoothed, rounded and polished.

Axe 1/74 bears few traces of use. There are two big scars on the edge, on the opposite sides of one corner (Fig. 5). The edges of the scars are rounded, but not as heavily as in the previous case. The blade was damaged after it had been deposited (a big scar). There are also abrasive linear traces of sharpening on two surfaces (grinding traces). Interestingly, there are no traces on the very edge and in the narrow zone next to the cutting edge. Moreover, the cutting edge is intentionally flattened (Fig. 6). All other surfaces are polished and smoothed very carefully, there are no visible grinding traces, and the main edges of the axe are rounded and polished as well. The tool may have been hafted in a different way. Its butt is as interesting as its cutting edge. There is a round notch on its back, surrounded by several small surfaces with well visible linear grinding traces. Two explanations are possible: either the axe broke during its production or it was converted from a longer damaged item.

There are many examples of modified stone axes from the Corded Ware culture, coming from Poland, Czech Republic and Germany (e.g. Šebela 1999, plate 136:6, 150:6, 198:1–2, 4). In this case, however, we have doubts about that part of the history of the tool. Preliminary observations suggest that the notch is a trace of the first attempt to drill the eye. First of all, it is oblique in relation to the proper eye, while it does not lie in the same line with the proper eye, which means that it is distinctly asymmetrical in relation to the whole tool and its blade. Next, the diameter of the hypothetical first eye seems too small to accommodate a handle. In this situation, the first explanation appears more probable: the maker tried to drill the eye from one side, but the unfinished item broke; another eye was subsequently drilled, closer to the cutting edge, and the butt was ground. The crucial thing

is that it changed entirely the initial idea of the tool and probably of the user. However, this explanation is difficult to prove without precise measurements. The problem might be settled by morphometric analysis which includes 3D scanning and measurements.

DIFFERENT FORMS — DIFFERENT FUNCTION — DIFFERENT MEANING?

The data obtained in the morphological and functional analysis prove unambiguously that the axes from Brożec represent two different forms; that they played different roles and were placed in the grave as items treated differently. The artefacts are made of two kinds of serpentine extracted from outcrops located within the Ślęza Massif, approx. 30 km from the site. Both axes are ground and polished, but the second item bears linear grinding traces that are well visible on its surfaces and the blade. After grinding, the first tool was polished more carefully. According to their morphometric traits, both items should be classified as working axes, but they are not the same in shape. The ratio of their length to width measured in their view and profile shows that axe 1 is definitely more slender than axe 2. These properties are probably related to the function which was already determined at the stage of production or conversion from another form. Axe 2 was curated, but not converted from an earlier form; its dimensions are too large.

The use-wear analysis confirms the assumption that the tools from Brożec played different roles during their use. The cutting edge of axe 2 bears intense traces of work and re-sharpening, which means that it was a heavy-duty tool, probably used for woodworking. It served as a working tool for a relatively long time, as proven by the strongly polished surface of the damage within its passive part. By contrast, traces of use on axe 1 are scarce and there is no evidence of re-sharpening. The blade of that tool provides other information instead. The cutting edge was intentionally flattened. Annelou van Gijn (2010) has noticed similar traits, when examining flint axes; in her opinion, this suggests that the artefacts were treated in a special way before being deposited in the grave, e.g. traces of previous work were removed from them. In this case, axe 1 cannot have been a working tool. The question whether it was changed deliberately or broke during its production remains open. If the tool was modified, the initial form could have resembled battle axes of the Ślęza type, because the item has the appropriate dimensions and proportions. In the case of a fault in its production, the value both of the tool and the raw-material increased; thus, the ante-depositional treatment of the axe becomes more understandable.

A common trait for both axes from Brożec is their relatively long biography, although the artefacts were deposited at the “end of their life”, not far from the putative workshop where they had been made. Both were also mechanically damaged within the area of their butt and/or cutting edge, which seems to be a result of their use and repair (axe 2) or some other factor (axe 1). Finally, they both served as grave goods. The axes differed in their

functions, were treated differently by their user/owner (?), and so had a different meaning, but both were curated/maintained with equal care in order to lengthen their life.

Thus, the explanation of the morphological differences between the axes is not simple or limited to the chronological aspect, trends changing over time or modifications during the use. Cultural cohesion and regional distinction were no doubt important factors. Workshops maintained and followed their traditions, but they could also have differed in their methods and styles, which were typical of a given workshop and definitely related to the quality and properties of accessible raw materials. Tools were intended for various people with various needs. The ergonomic aspect may have influenced the form as well, not unlike the function, interpreted so far on the basis of the size and shape of the items. Axes made for different purposes and specialized use were given different hafts and handles. Raw material economy was also significant because of the access to deposits, development of exploitation techniques and specialisation of workshops. In Brożec, tools were not discarded after they had broken or at the beginning of their production process. The analysed items bear traces of modifications, accidents during their production, of re-sharpening and retooling.

CONCLUSIONS

A typological study focused merely on morphological traits can lead to the situation when two functionally different items are interpreted as the same category of tools. Although the context may suggest such an interpretation, what is actually examined is the final stage in the history of the recovered items, and the history may often be very long. The shaft-hole axes from Brożec are examples of tools whose long biographies have been interpreted on the basis of morpho-functional analysis. Before being placed in the grave, the artefacts were definitely used, and the traces of work help to determine their real function. The diverse evidence of use, re-sharpening and recycling, modifications and treatment of the blades, indicates that the axes had played entirely different roles before they became grave goods. The items represent tools produced within a coherent chronological context which lasted in Lower Silesia from phase II (Wojciechowski 1971: Siciny, Góra district; Petersen 1934, 46, fig. 5: Szklary Górne, Lubin district) to phase III (Bronowicki 2003, 304, fig. 5: Wrocław-Oporów, Site 1, Graves 72, 79) of the Corded Ware culture.

The planned further study will include functional analysis of axes from Lower Silesia, experimental research aimed to provide reference material and a database, and petrographic analysis helping to identify particular workshops and the distribution of raw materials and final products.

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