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A SUPERB AXE-HEAD OF G-TYPE FLINT FROM THE VICINITY OF BRONOCICE AS A REASON TO CONSIDER THE PRODUCTION OF MACROLITHIC FOUR-SIDED TOOLS IN THE ENEOLITHIC OF LESSER POLAND

ABSTRACT

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This article presents the study of a unique artefact in the form of a very large trapezoidal axe-head with rectangular section from Słupów, Lesser Poland, against the background of Eneolithic phenomena occurring in the area. The specimen is in the collection of the Archaeological Museum in Kraków since 1929, but has not been discussed until now. It was made by local communities from flint of the G variety, a raw material exploited by Eneolithic groups in western Lesser Poland. The axe-head from Słupów is one of the largest flint axes to have been discovered on Polish lands. This find provokes a broader discussion of the role of local production of macrolithic four-sided forms against a wider background.

Keywords: Eneolithic, Funnel Beaker culture, Funnel Beaker-Baden assemblages, flint axe, microwear analysis

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INTRODUCTION

In 1929, the Archaeological Museum of the Polish Academy of Arts and Sciences (AM PAAS) in Kraków purchased for its collection a flint axe-head (hereafter abbreviated as "axe") discovered in the village of Słupów, located near Bronocice on the Nidzica River in Miechów district. Due to its raw material, dimensions, state of preservation, as well as the area where it was found, it is a unique artefact, but it has not been studied for over 90 years. Although it is hard to believe, the axe from Słupów, one of the largest flint axes to have been discovered on Polish lands, has not been included as a source or comparative material in any study of flint knapping and in works on the Eneolithic in Poland in general. With this publication, we fill this gap by discussing the axe from Słupów in typological, raw material, use-wear and cultural aspects.

Since its addition to the collection, the artefact in question (inv. no. MAK/8513) remains stored at the Archaeological Museum in Kraków (AMK). On the subject of the find from Słupów itself, there is little information in the museum's archival sources (Archives of the AMK). There are just two pieces of information about the artefacts and a list of several bibliographic items, but do not refer to the axe purchased by the AM PAAS. It was only in 2018 that it became an exhibit in the temporary AMK exhibition („From collecting to museology. 160th anniversary of the first exhibition at the Archaeological Museum in Kraków") and an element of the catalogue accompanying this exhibition (photo and brief catalogue note; Liwoch 2018, 68, 69). Recently, information about the artefact discussed here has been included in an online popular science portal titled "Archaeological Atlas of Małopolska" (Atlas 2021), developed by the AMK.

CONTEXT OF THE FIND AND INFORMATION ABOUT THE ARTEFACT

Except for the date of the acquisition of the axe from Słupów by AM PAAS in Kraków in 1929, unfortunately, no further information is known (has not survived) about the circumstances of the purchase of the object, its finder (seller), and, above all, where the axe was discovered in the field. Słupów is a small village located on the border of the Miechów Upland and the Proszowice Plateau, on the right bank of the Nidzica River, at a distance of 2.5 km from the town of Działoszyce and less than three kilometres from Bronocice (Fig. 1). The eastern and northern parts of Słupów are occupied by a floodplain valley of the Nidzica River with numerous fish ponds, while the rest of the area is dominated by a typical upland landscape, with several terrain-exposed loess hills (including the names Mojżeszówka and Grudziec).The area is used extensively for agriculture and is almost entirely deforested. It is drained by only one larger right-bank tributary of the Nidzica River, which flows into the river in the centre of the village. According to the Polish Archaeological

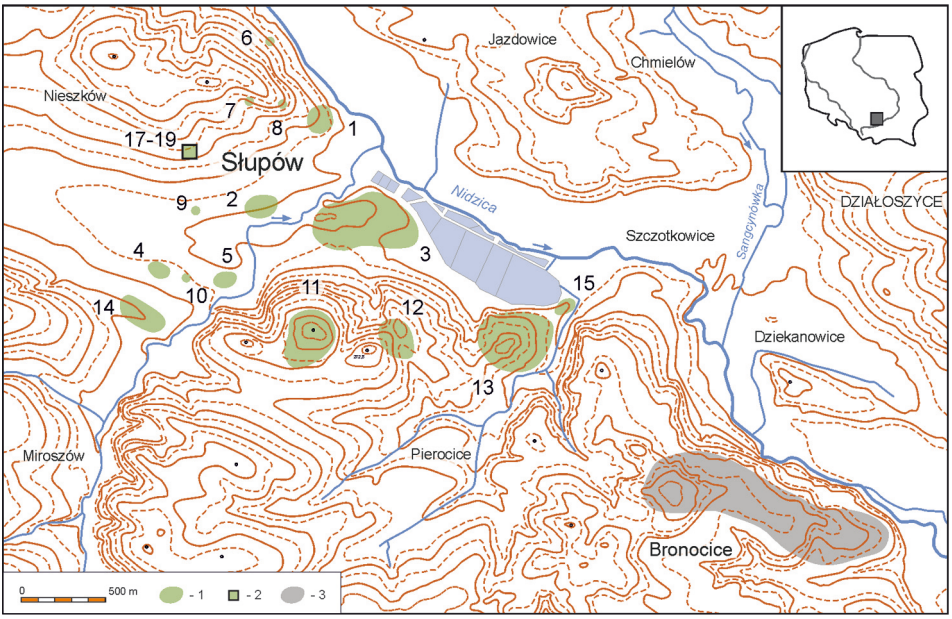

Fig. 1. Distribution map of archaeological sites in the area of Słupów, Miechów district: 1 – sites, 2 – finds without location, 3 – Site 1 in Bronocice. Illustration by A. Zastawny

Record (Polish abbreviation: AZP), twenty archaeological sites are registered in Słupów. Settlement points are located within two AZP areas: 96-59 and 96-60. The axe discussed in the article was given No. 17 in the locality and on the sheet AZP No. 96-59/2 (KESA card by J. Górski and M. Zając), as a stray find, with no known location. This designation is no more than a sequential number. The exact find-spot of the artefact remains unknown.

We know of the first archaeological finds from Słupów thanks to the field activity of M. Wawrzeniecki. At the end of the nineteenth century, he collected a little archaeological material in the fields belonging to this village in the form of "a few fragments of vessels of a very ancient period" (Wawrzeniecki 1898, 56; 1900, 93). These artefacts are not in the collection of the AM PAAS (it is uncertain whether they were stored there at all), but the information about them was repeated in later literature, including Słupów in the list of Neolithic sites on this basis (Kozłowski 1924, 49, 174, fig. 2). In the interwar period, a ceramic vessel was accidentally discovered at an unknown location, interpreted as burial equipment of the Pomeranian culture (Kostrzewski 1922/1924, 42, 43; Nosek 1946, 58). In 1952, surface research in the Słupów area was conducted by T. Lesiak, who discovered tools made from Jurassic flint of the G variety on one of the loess hills (collection of the AMK). The first finds with an established and documented location were obtained only during several field campaigns organised within the framework of the AZP by a team of archaeologists from the Polish Academy of Sciences in 1977-78 (Liguzińska-Kruk 1981),

W. Morawski in 1985, and J. Górski and M. Zając in 1999 (AZP documentation). This work led to the discovery of material primarily of the Bronze Age, of the Mierzanowice, Trzciniec, and Lusatian cultures, with much less numerous Neolithic/Eneolithic finds.

In trying to indicate the presumed site of the discovery of the axe from Słupów, only two sites with Neolithic/Eneolithic material currently known. The first is site No. 13 (AZP 96-60/18), located in the southeastern part of the village, situated on an isolated hill in the fork of the Nidzica River (Fig. 1) and the stream feeding it, flowing through Pierocice (a site located on the border of Słupów and Pierocice, also referred to in the literature as Pierocice, Site 1; Liguzińska-Kruk 1981, 201). During W. Morawski's surface survey in 1985, a fragment of a vessel with Funnel Beaker-Baden (FB-Baden) features was discovered here. The second site is located about 1 km to the west of the above, site No. 11 in Słupów (AZP 96-60/16), located in the part of the village called Grudziec, on the culmination of a loess elevation. An assemblage of several dozen fragments of Neolithic/Eneolithic pottery comes from surface examinations in 1977-1978 (Liguzińska-Kruk 1982, 201). Some artefacts made of type G raw material (among others, a continuous retouched blade fragment), discovered by T. Lesiak in 1952, can also be associated with this site. No excavations have been conducted at any of the sites indicated as potential sites for the discovery of the axe discussed in the article.

The middle basin of the Nidzica River is an area with traces of intensive Neolithic and Eneolithic settlement settlement from phases representing almost all cultural groups, from the Linear Pottery culture to the Corded Ware culture (CWC) (Kruk *et al.* 1996). The upland settlement of Bronocice, Site 1, is located in the centre of this area, with Słupów nearby (Fig. 1). In the settlement region of Bronocice (an area with a radius of 10 km around the site), the most numerous are traces of the Funnel Beaker culture (FBC), BR II-III phases, more than 100 sites (Kruk *et al.* 1996, 28; Kruk and Milisauskas 2018, 10, fig. 1: B).Traces of FB-Baden settlements have also been recorded on a dozen of them, with the main settlements in Bronocice from two settlement phases: BR IV and BR V (Kruk and Milisauskas 2018). During the period c. 3600-2900 BC, Bronocice played a leading role here in both the extensive settlement system of the FBC and the heavily reduced network of the FB-Baden sites (Kruk and Milisauskas 1999). Situated at a distance of three kilometres from Bronocice, Słupów was in the immediate zone of diversified settlement activity of the communities living at the site in Bronocice.

DESCRIPTION OF THE AXE-HEAD AND MANUFACTURING TECHNIQUES

The specimen in question is a trapezoidal flat axe with rectangular section, which regularly expands towards its cutting edge (Figs 2-4). The axe is characterised by unusual symmetry and not much thickness in relation to other dimensions. Its maximum dimensions

Fig. 2. Słupów, Site 17, Miechów district. Axe made from flint of type G. Photo by A. Susuł

are 240 mm long, 101 mm wide, and 32 mm thick. It weighs 1080 g. Other dimensions are: width at its midpoint – 83 mm, side width – 26 mm, thickness at its midpoint – 32 mm, width at the top (2 cm below the edge of the butt) – 60 mm, thickness at the top (2 cm below the edge of the butt) – 23 mm, width of the butt – 55 mm, thickness of the butt – 17 mm. It is made from flint of the G type. Raw material outcrops of the G variety have been identified in the central part of the Kraków-Częstochowa Upland (Pelisiak 2008; Kopacz 2020).

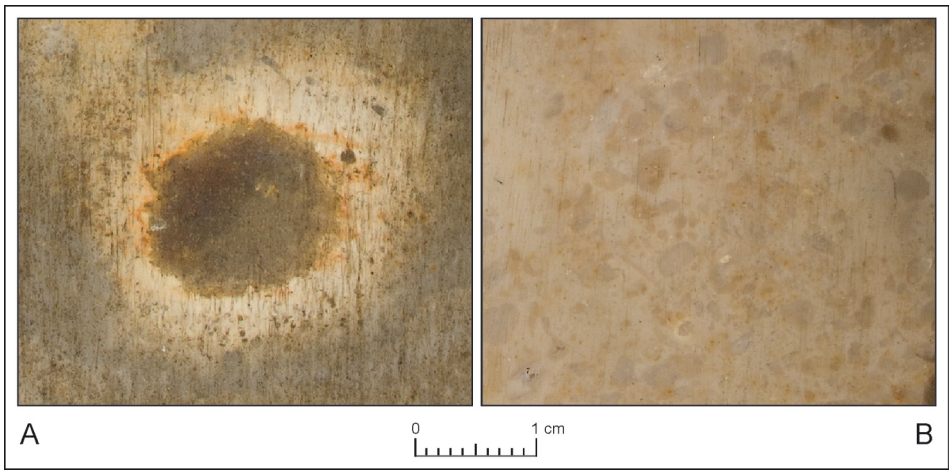

Fig. 3. Słupów, Site 17, Miechów district. Features of G-type flint visible on the surface of the axe: A – brown oval structure framed by a reddish and white matt bands, B – "greasy" spots. Photo by A. Susuł

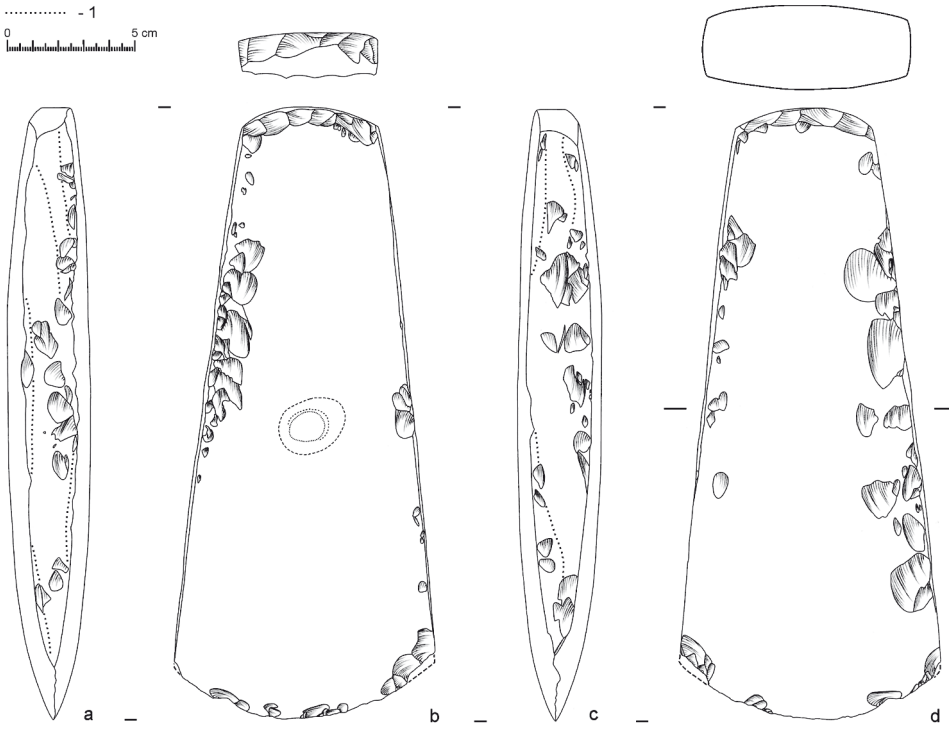

Fig. 4. Słupów, Site 17, Miechów district. Axe made from flint of type G: 1 – zone boundaries ground at different angles, a-d – designations of faces and sides. Drawn by A. Brzeska-Zastawna

It was mainly used for the production of rectangular-sectioned axes and large blades. It is very distinctive, different from other raw materials (Figs 2 and 3). On macroscopic viewing, the G flint is beige in colour and has characteristic "greasy" spots (Fig. 3: B). In the flint mass, sometimes there are structures in the form of an oval brown colour, edged with a white matte band (Fig. 3: A). It is the best locally occurring raw material in the Kraków-Częstochowa Upland, suitable for producing the largest blades as well as durable and large rectangular-sectioned forms, used mainly by the communities of the FBC, FB-Baden assemblages, the Baden culture (BaC) and also the CWC.

The cutting edge is markedly curved and symmetrical with a height of 21-22 mm. The spine plane angle is 70°. On the edge of the blade, damage is visible in the form of small scars. In cross-section, it is rectangular, with moderately convex wider faces (6 mm), and minimally convex, almost flat, sides (2 mm). The sides of the axe were formed centripetally by flaking from both main faces. The surface of the butt has a roughly rectangular outline. The surface of the butt shows traces of faceting, which has been partially smoothed. In plan view, the part at the butt is symmetrically trapezoidal with a convex top. The part at the butt has also been shaped with regular facets (blows in the direction of the cutting edge) visible on both main faces. Flake scars of the axe forming process have been almost completely removed.

The axe was shaped by flaking the so-called "full core" method (for a characterisation of the technology, see for example Migal and Sałaciński 1996), which involves the gradual reduction of the flint nodule in several stages (Vemming Hansen and Madsen 1983), starting with giving it a tetrahedral form, and ending with giving the semi-finished product the final form, with formed cutting edge and butt. In the final stages of shaping, the semi-finished product of this type of axe was precisely aligned using indirect percussion and sometimes a very precise pressure technique (Vemming Hansen and Madsen 1983). The final stage of shaping axes involved grinding main the faces, or all surfaces, including sides – as in the case of the specimen from Słupów. The sides of the axe discussed here were shaped with centripetal flaking from two wide faces, resulting in symmetrical even sides (symmetrical shape in cross-section). The axe bears traces of two major grinding stages. The first stage consisted of wide-surface removal of negative flake scars (and any irregularities), most likely with the support of an additional weight (Madsen 1984), a process that left regular, longitudinal, wide grooves on its surfaces (see also microscopic analysis). The extra weight increased the efficiency of grinding (Madsen 1984), a process more tedious when processing very large axes by hand. The second consisted of giving the final desired form (including symmetrical protuberances), by hand grinding the surfaces at the appropriate angles. In the case in question, the vast majority of scars from the basic axe-forming stage were completely removed in this final process. The grinding procedure, although time-consuming, especially in the case of larger axes (Madsen 1984), was essential for obtaining a damage-resistant blade (Olausson 1983). The resistance of the axe-head was sometimes further increased by performing additional polishing of the area near the

Fig. 5. The axe from Sigerslev Bog. Photo © National Museum of Denmark; after Noble 2017, fig. 3.2.

cutting edge itself. The degree of polishing of an axe (obtaining smooth surfaces) is reflected in its strength when performing work (Olausson 1983), *i.e.*, the greater the degree of polishing and the fewer remaining negatives, the greater the axe's strength and resistance to damage. The edge angle of the axe is 70 degrees, indicating high efficiency in entry into the wood of the blade while maintaining a "safe" angle for cutting edge strength (Olausson 1983). A smaller angle increases the work efficiency of a blade, but then it is more susceptible to damage. In order to maintain the high efficiency of the blade's entry into the wood, while not exposing it to such damage, it was common to make a thinner line on the very edge of the axe-head. The cutting edge of the axe from Słupów bears traces of such flattening of the very end of the cutting edge and resharpening of the blade. Moreover, axes with a curved blade, as in the case of the specimen in question, are more durable than those with a straight blade.

As microscopic analyses (see below) have shown, the axe in question bears traces of use. It is likely that its main function should be related to woodworking. There are also traces that may indicate interaction with the soft material used for binding. The possible kind of hafting of the axe-head from Słupów can be indicated by the example of axe-head finds with preserved shafts from waterlogged regions of the western part of the North European Plain. An example as close as possible in general form and dimensions to the Słupów specimen is a thin-butted polished axe from Sigerslev Bog (Fig. 5, after: Noble 2017, fig. 3.2). The length of the axe-head itself is 21 cm, whereas the preserved handle (not preserved in its entirety; combined measure of fragments) made of ash measures 53 cm (Olausson 1983). In this case, the butt protrudes beyond the shaft.

MICROWEAR ANALYSIS

One of the fundamental questions raised while studying ground flint tools is the functional interpretation of these objects. This should be based on the observation of use-wear traces recorded on tools (Madsen 1984; Rots 2010; Wentink *et al.* 2011; Pyżewicz 2013; Pyżewicz *et al.* 2016). Traces suggest the type of activity performed and category of material processed with a stone tool, relative duration of use, and a hafting method. In the case of the flint axe from Słupów, we discuss two main issues, whether the object was used as a tool *sensu stricto*, or whether it had been produced for a special purpose, and also what kind of hafting and binding method had been applied. Due to the fact that the axe was collected decades ago from a surface site and then stored in the museum, it was necessary to assess the state of the artefact and the influence of its condition the on preservation of microwear.

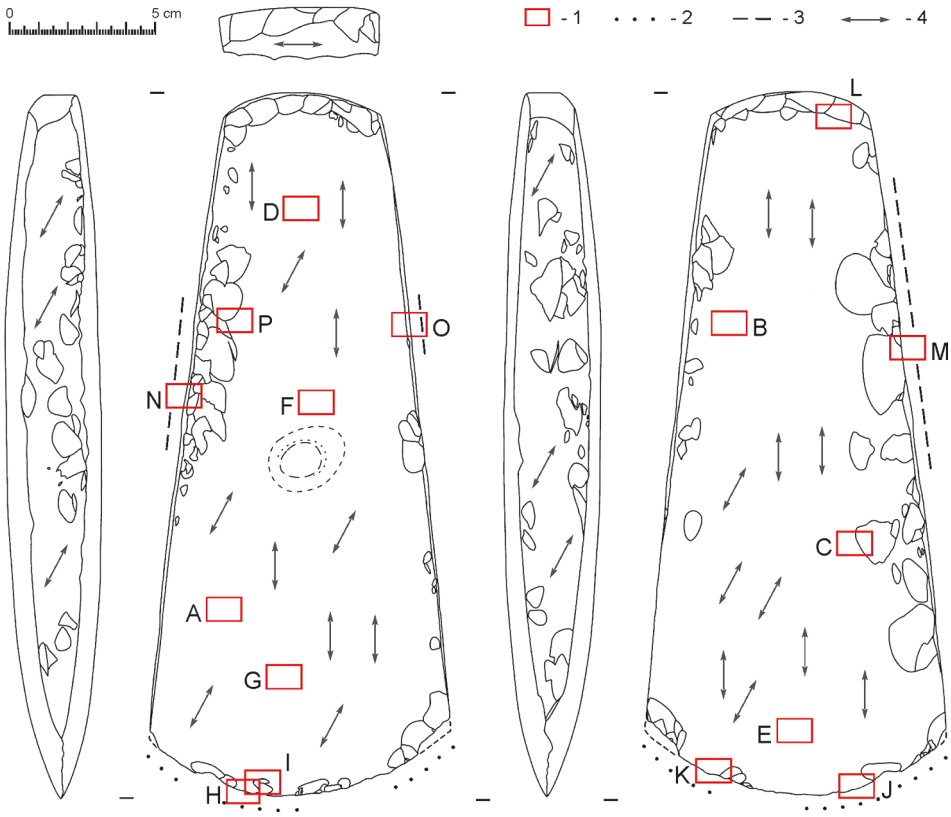

Fig. 6. Słupów, Miechów district. Microscopic observations of the flint axe: 1 – area documented under the microscope (letters correspond with photos on the Figures 7 and 8), 2 -use-wear limit, 3 – limit of a haft/wrapping, 4 – direction of grinding. Drawn by A. Brzeska-Zastawna and B. Kufel-Diakowska

Traces were analysed using two optical microscopes: an Olympus SZX9 stereomicroscope (×6.3-114) for identification of the use retouch and the sequence of the technological traces; a Nikon ECLIPSE LV100 metallographic microscope (×50-500) for identification of use and hafting polish. Prior to the microscopic observations of use-wear, the axe was wiped with acetone in order to remove dirt covering the surface and bottoms of the negatives of technological retouch and use scars. The artefact did not bear any soil remains. Therefore, to prevent the removal of possible microresidues, we decided not to apply a chemical or ultrasonic method of cleaning. Due to the large size of the artefact and the limited working distance of microscopic equipment, especially in case of the microscope with higher magnifications, more detailed observation of microtraces (use polish) located on the cutting edge was not possible. Identification of use-wear traces was limited to observation of mechanical damage of the cutting edge (use scars) and hafting traces.

The artefact is complete and well-preserved. No mechanical damage was recorded with the naked eye (Fig. 6). Under magnification, the surface of the artefact is weathered and "etched" (Fig. 7: A). Alterations are mostly observed on the top parts of the surface relief. Moreover, on one main surface, close to the side surface, there is modern abrasion filled with reddish-brown iron oxide (Fig. 7: B). Similar phenomena are also observed on the very edge adjoining the side surface. These patches of abrasion owe their origin to contemporary activities, such as agricultural machine work, occurring directly in the place of deposition. Remains of ink suggest that the axe was subjected in the past to some kind of labelling (presumably in the museum).

Microscopic observations showed that despite post-depositional changes, traces of manufacture and use of the flint axe are still preserved on the surface of the artefact (Fig. 6). The production process included a few phases. The traces of the initial phase are barely visible on the finished product. Only the bottom parts of the flake negatives relating to the flaking phase are preserved on all four sides of the tool, particularly along the edges and near the butt. We notice the most dense clusters of scars there. The edges of the flaking scars are flattened as a consequence of the next phase, the grinding of all four faces and the butt (Fig. 7: C). Grinding traces are visible in the form of broad or narrow striations thoroughly covering the whole surface of the tool. A similar grinding method and direction of movement were applied to all surfaces. First, both main faces were ground longitudinally. Work with extra weight applied cannot be excluded at this stage of the axe production (Madsen 1984; Pyżewicz *et al.* 2016). Coarse grinding produced broad scratches parallel to the lateral edges, densely distributed on both main faces (Fig. 7: D, E). Then, all four sides and the butt were shaped using fine-grained slabs and probably additional sand (Pyżewicz *et al.* 2016). Different grinding directions were applied, in order to obtain a convex profile of main faces in the cross section. The hand grinding resulted in some separated grinding surfaces on both sides of the axe. This activity produced fine striations diagonally orientated to the main axis, preserved on the side surfaces, over almost the whole area of main surface 1 and about half of main surface 2. Oblique striations from the fine grinding phase

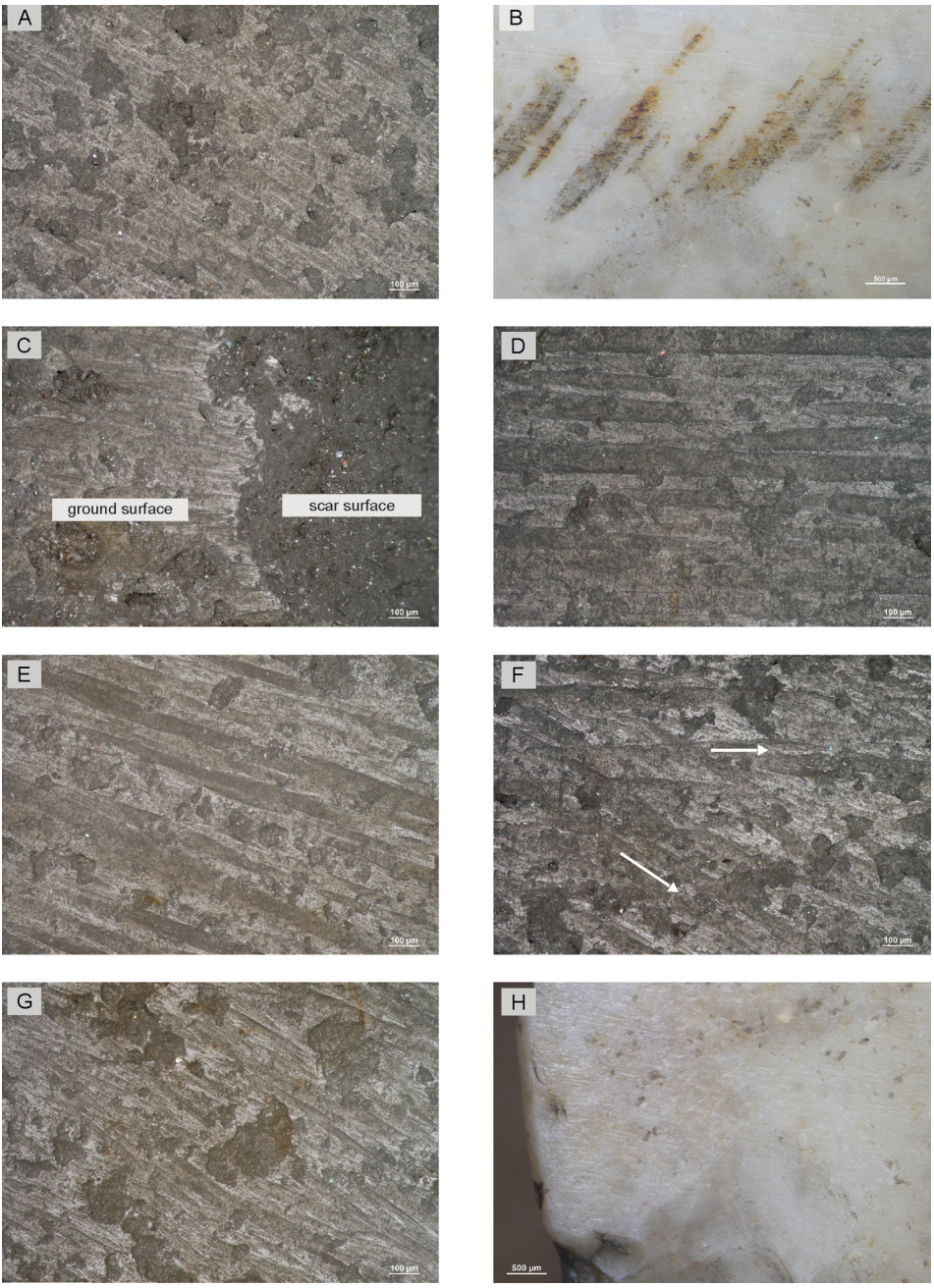

Fig. 7. Słupów, Miechów district. Photographs showing traces on the flint axe: A – weathered surface; B – modern abrasion and reddish-brown iron oxide; C – ground scar's ridge; D-G – grinding traces on the surface; H – grinding traces on the cutting edge. Photo by B. Kufel-Diakowska

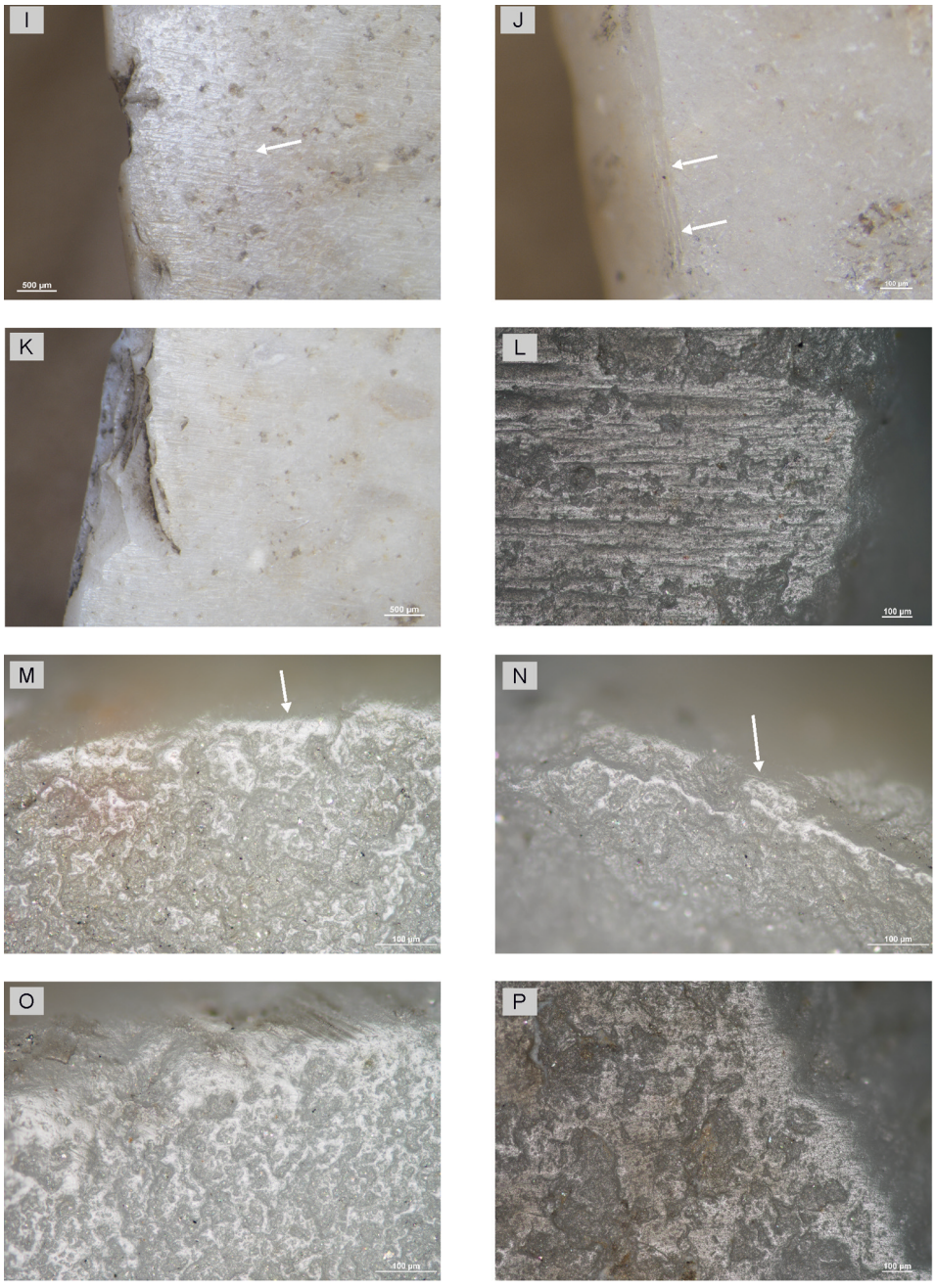

Fig. 8. Słupów, Miechów district. Photographs showing traces on the flint axe: I – grinding traces on the blade; J – flattening of the blade; K – use scars on the cutting edge; L – rounding of the scar's ridge; M-O – "plant" polish and rounding of the lateral edges; P – rounding of the scar's ridge. Photo by B. Kufel-Diakowska

clearly cross the longitudinal furrows produced by coarse grinding (Fig. 7: F, G). The traces of grinding the butt are barely visible. They were most likely smoothened in the course of usage.

There are two separate grinding surfaces along the cutting edge. The first one reaches about 4 mm into the main surface, on each side; the second one is located next to it, but only on one side (Fig. 8: I). Traces of blade re-sharpening (Gijn 2010, fig. 6.8; Januszek and Pyżewicz 2018, fig. 8) are visible as short, fine, densely distributed striations, diagonally and longitudinally orientated to the blade (Fig. 7: H). Moreover, the very edge of the blade was flattened. It is not sharp, but 1 mm thick. The flat surface exhibits fine parallel striations (Fig. 8: J). The traces of use preserved on the cutting edge are secondary to flattening, which excludes the post-use origin of the blade abrasion. We suppose that this deliberate action was performed for the purpose of protecting the blade against mechanical damage. Also, it might be a part of a re-sharpening process.

The blade is densely covered by deep and semi-deep feather- and hinge-terminated scalar fractures. They are distributed in small groups and located on both sides of the cutting edge. Unfortunately, this edge damage was of accidental, post-depositional origin and caused the loss of valuable data on the use of the axe. Some use scars, such as small, step-terminated trapezoidal fractures preserved only on protruding parts of the blade (Fig. 8: K) were produced as a result of chopping of an undetermined material. There is no use polish observed on the cutting edge.

Despite the fact that there are few traces of use on the working edge, marks detected in other parts of the artefact unquestionably suggest that the axe represents long-lasting circulation in the cultural context. First, abrasive traces of grinding the butt have been smoothened. This part of the axe is slightly rounded, including the butt surface and the edges of the negatives from the flaking stage of the manufacture process (Fig. 8: L). Secondly, in the middle part of a tool, three longitudinal edges of the axe are highly rounded and covered by bright reflective polish. This type of gloss suggests contact with plant material (Fig. 8: M-O). The polish extends from the butt part to about two-thirds of the length of the tool, which is clearly visible on one of the edges. Furthermore, the ridges of the flaking scars located close to the longitudinal edges of the axe are also highly rounded and covered by abrasive, short striations, suggesting contact with hide (Fig. 8: P). The traces described here might have been produced by the interaction between the tool and the materials used for fixing a wooden shaft (Pyżewicz 2013). Because of the lack of composite finds from the middle part of Europe, we need to look for the analogies of flint tools fixed in organic hafts from Denmark and the Netherlands (Vang Petersen 2008, fig. 48, 50). In case of the axe from Słupów the shaft must have been solid and made of wood. The axe was inserted into a hole or a deep groove at one of the shaft extremities (lateral tool placement according to Rots 2010, 12). In this case, the flint axe was probably fixed with bindings (using soft vegetal or animal materials). The limit of the traces observed show that the haft reached down about two-thirds of the whole length of the tool.

Based on the microtraces recorded on the flint artefact from Słupów, we can describe this tool as an axe, which might be used for falling trees as well as was engaged in construction works and other activities that required chopping wood. Traces of use are not well developed, though, in case of macrolithic ground tools this is nothing extraordinary (Korobkowa 1999, 140; Pyżewicz *et al.* 2016). Also, the multifaceted process of manufacture, which included the flaking stage, coarse grinding, and fine grinding, as well as two separate phases of blade re-sharpening, represents typical mode of operations. What is unusual is the size of the axe. The length reaches 24 cm. Slightly developed traces in the butt area may suggest rather short duration of work. In this context, the most interesting is well-developed plant polish on the lateral edges of the tool. K. Wentink (2006) interprets a presence of bright reflected gloss on TRB flint axes as a result of a kind of passive action, like wrapping, unwrapping, and transport of the objects, particularly oversized ones (Wentink 2008). This concerns mainly tools retrieved from the contexts of votive offerings, which consist of a few similar artefacts; those of biggest size display no traces of use (Wentink 2008; Wentink *et al.* 2011). Regarded as impractical due to their size and weight, oversized axes are linked to the ideological sphere of life in the past and a ceremonial role in a broad sense (Van Gijn 2010). In the case of the axe from Słupów, the uncertain contextual data prevent from further interpretations concerning the use life and function of a tool.

Due to the large size of the artefact and the limited working distance of microscopic equipment, especially in case of the microscope with higher magnifications, more detailed observation of microtraces (use polish) located on the cutting edge was not possible. Identification of use-wear traces was limited to observation of mechanical damage of the cutting edge (use scars) and hafting traces.

DISCUSSION

Axe dimension

Certainly the sheer size of the axe (24 cm) also draws attention. The specimen surely belongs to the group of the largest flint axes from Polish lands. Among the producers of very large quadrilateral forms, the communities of the FBC come to the fore (Balcer 1983). B. Balcer (2002a) divided the axes of the FBC into small ones, up to 110 mm long, and large ones, over 120 mm long. Among the axes of the FBC associated with the south-eastern production centres, specimens less than a dozen centimetres in length are most common, but there are more large axes compared to other Eneolithic cultural units (Balcer 1975; 1983; 2002a). Also noteworthy are the very large axes from Pomerania coming from the northern production centres of the FBC (Balcer 1983). In addition, there are large, more than 20-centimeter-long axes from Kuyavia, including those representing specimens very similar to the axe discussed here (*e.g.*, Balcer 1983, fig. 27: 4). Interestingly, there is

evidence of the importation of these macrolithic tools into the area of the Eastern Group, made in addition to "south-eastern" and ""northern" raw materials, also those made of Jurassic flint (Balcer 1983, 153), presumably of the G variety. However, this is a separate issue. Small axes dominate in the contexts of other units of the Late and Final Eneolithic, in which quadrifacial axes play a leading role, in the graves of the Globular Amphorae (GAC) and CWC (Balcer 1983; Nosek 1967; Bronicki 2021; Włodarczak 2006; Budziszewski and Włodarczak 2011). Among the GAC axes, as in the case of the CWC, specimens up to several centimetres in size predominate, infrequently exceeding the dimension of 15 cm. Very large axes, more than 20 cm in length, are sporadically found in the context of the GAC. Against this background, specimens exceeding this size definitely stand out, including the exceptional find of an axe from Sadłowice, Opatów district, made of striped flint, a 'model' example of the GAC axes, with a dimension of 23.3 cm, probably from a destroyed grave or graves of this culture (Bajka and Florek 2022). In the graves of the Złota culture, among the less numerous axes from the above-mentioned units, there are smaller axes, about 10 cm long, and those whose length oscillates around 15 cm (Krzak 1976). In other cultural units, the axes are mainly represented by artefacts of settlement character.

From the central and eastern part of Lesser Poland in the context of the FBC, there are relatively many axes classified as large specimens according to B. Balcer (2002a); a relatively large proportion of a non-transformed form exceeds the dimension of 15 cm in length, compared to the axes of other units (Balcer 1975; 1983; 2002a). Among the finds from Lesser Poland linked to the FBC, the most noteworthy are axes made of striped flint, a trapezoidal axe from Ostrowiec Świętokrzyski 1 near Krzemionki, about 23 cm long (Balcer 1983, fig. 21; Migal 1997, fig. 1), ground only at the cutting edge. The specimen is, moreover, very similar to the unfinished axe from Ćmielów from Cluster 1, mentioned by B. Balcer and measuring about 20 cm in length (Balcer 2002a, 34a). Z. Podkowińska (1951/52) determines its length at as much as 25 cm. W. Migal (1997) mentions the largest known axe of the FBC made of striped flint measuring 28 cm in length. The axes listed above represent type A according to Balcer. However, in outline and proportions they assume the shape of an elongated trapezoid with a slightly expanded cutting edge, somewhat different from the types represented by the larger axes associated with Baden settlements. In the BaC, as in the Złota culture, a group of axes measuring about 10 cm and another about 15 cm long are almost equally represented (Brzeska-Zastawna 2020b). They do not exceed the dimension of 20 cm. However, the proportions of some of the fragmented specimens, as well as axes without preserved parts at the cutting edge, indicate that very large axes, originally reaching a dimension of about 20 cm in length, also occurred here, similar to those of the FBC in western Lesser Poland and the FB-Baden assemblages. They are made of locally occurring flint of G variety. Axes made from other raw materials that were brought to the area of western Lesser Poland (*e.g.*, Kraków-Mogiła 62, Zawarża 1, Bronocice 1, Książnice Wielkie 1; Balcer 1983; 2002b; Brzeska-Zastawna 2020a; Kluzik 2010, table VIII: 11; Pipes *et al.* 2018, fig. 5 (right), 6) are generally characterised by small sizes and often a high degree of transformation. The

group of axes produced from locally occurring raw material of the G variety stands out decisively not only in terms of dimensions, but also of morphology. It cannot be ruled out that these differences are due to the later chronology of these finds.

Interpretation, cultural affiliation

The way the specimen was manufactured, shaped, and ground would indicate that the tool in question was associated with the highest degree of specialisation in the production of rectangular-sectioned axes. It is noteworthy that the craftsman had excellent knowledge of the structure and properties of G flint, which had been used to manufacture the tool. Sections where the flint mass of this raw material has light bands and turns brown – these are the weak points of this raw material and places most susceptible to tool damage. In the case of the axe from Słupów, this is visible in the form of a small oval structure left exactly in the central part of the axe-head (Fig. 3: A). In addition to practical reasons, its manufacturer was probably also guided by aesthetic considerations, leaving this distinctive part inside the flint nodule more accurately in this part of the tool. The most spectacular examples of the adaptation of the flint knapper in shaping flint axes in a way related to the structure and colour of the flint nodule that was probably not of a random nature, but allowed achieving an aesthetic, delightful effect, can be identified among the Scandinavian axes (Högberg and Olausson 2007, fig. 35). The best-preserved axes from this raw material are either all made of beige flint mass of raw material G, or a brown transparent fragment encircled with a white band present in the central part of the axe (Słupów, Dodów) or in a part of the butt (*e.g.*, Smardzowice 38, Miechów 3). There are many known examples of broken axes made of this raw material that fractured during use precisely because these weak points were left in the most critical parts, mainly on the cutting edge or at the transition point of the cutting edge part into the middle part of the axe. Examples of this are broken BaC and FBC/FB-Baden axes, like the specimen shown here from the Marchocice 2 site (Fig. 9: B). The most valuable axes in a practical sense were by far those made of G raw material where they were entirely of (or a decided majority of the axe was of) a uniform beige colour. This raw material is a specific variety of the high quality locally occurring flint, the development of the exploitation and use of which is associated with the Eneolithic period in western Lesser Poland, a period of high demand for the raw material, which enabled the production of macrolithic blades and axes (FBC, FB-Baden, BaC, also used in the CWC for the production of axes).

The initiation of the manufacture of flint axes in western Lesser Poland is associated with the emergence of the FBC. The region from which the axe comes belongs to an extremely richly represented settlement region in the Middle/Late Eneolithic, particularly well represented by the FBC and FB-Baden settlements. The greatest development of the Bronocice settlement was in BR Phase IV corresponding, according to J. Kruk and S. Milisauskas, to the first FB-Baden phase (Kruk and Milisauskas 2018), currently dated to

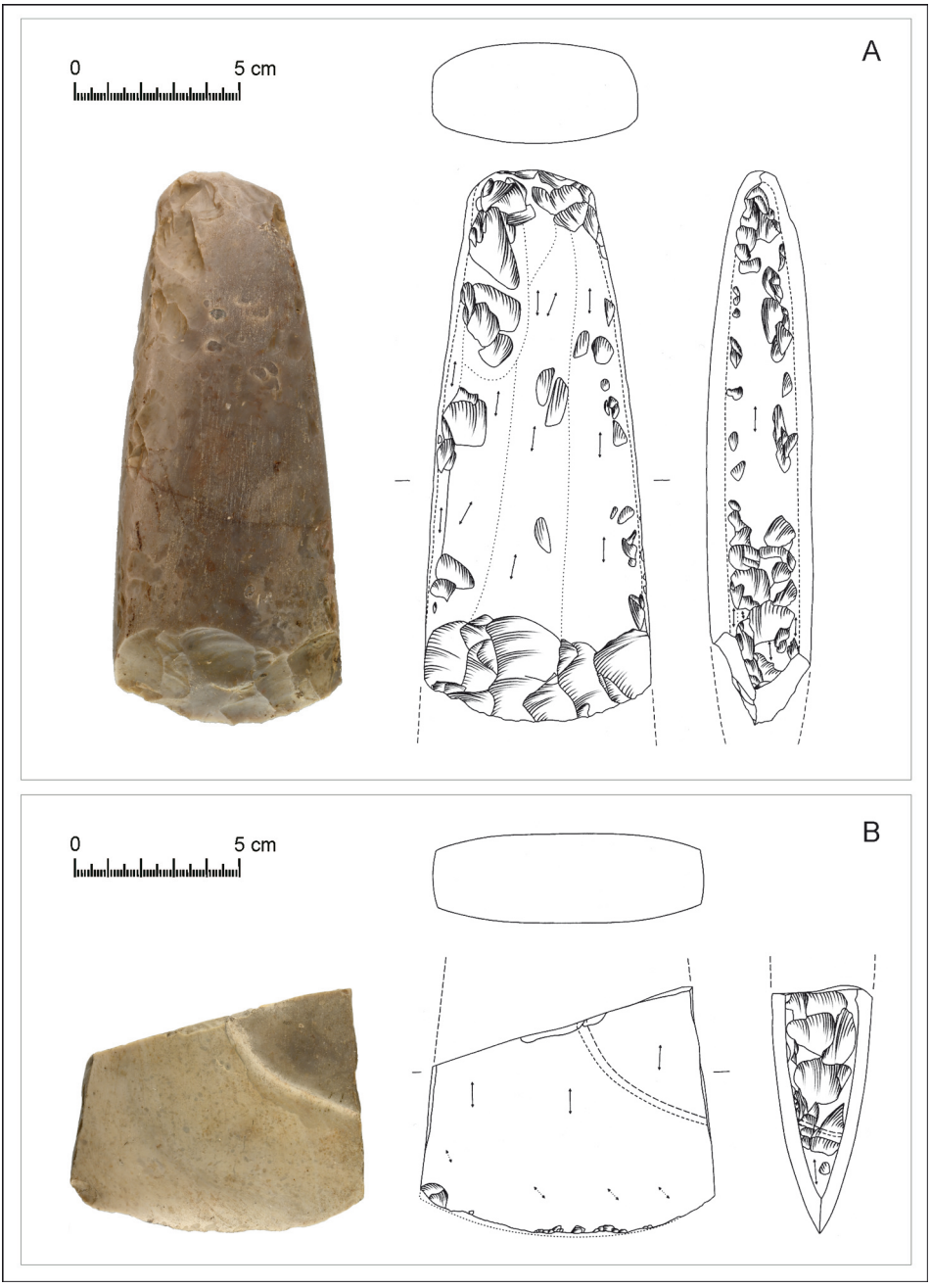

Fig. 9. Axes made from flint of the G variety: A – Baden culture (Wiatowice Site 2, Wieliczka district), B – Funnel Beaker-Baden assemblages (Marchocice Site 2, Miechów district).
Photo by A. Susuł, drawn by A. Brzeska-Zastawna

3350/3300 and 3200/3100 BC (Kruk *et al.* 2018). In particular, a development in the exploitation of raw material of the G variety, accompanied by its distribution to distant areas, is associated with the period of development of the so-called FB-Baden assemblages (Kopacz and Pelisiak 1991; 1992; Pelisiak 2006; 2008). During the period of Baden influence, especially in the horizon in question, there are transformations in these communities that are manifested in material culture, including visible ideological changes (which is, by the way, a broader phenomenon, also visible in other areas of Central Europe). This also coincides with the development of the GAC phenomenon. Only its direct reflection is marked in western Lesser Poland after about 2900 BC, at a time when CWC also appears in the area (Przybyla *et al.* 2013; Włodarczak 2020). This coincides (Zastawny 2015; Kruk *et al.* 2018) with the final stage of the development of the BaC and FB-Baden settlement. Undoubtedly, the period of development of the FB-Baden groups and the Baden culture in western Lesser Poland is a period of dynamic changes, associated with the interaction of several environments, which also affect the nature of lithic inventories, including in the production of forms with a quadrilateral section. This is indicated, among other things, by the strong connections of the Baden and FB-Baden axe groups and their stylistic relationship to the GAC axes, not to mention some related forms of the Złota culture and selected forms from the CWC graves. There is no doubt that these topics require separate research.

The authors associate the artefact in question with the Funnel Beaker traditions, probably to a later period, the so-called FB-Baden assemblages. The characterisation of the unique object discussed here fully corresponds to the tools produced and used within these communities, which, unfortunately, have not been properly studied separately so far. As already submitted, analogous axes made of G-flint come from the FB-Baden (FBC-FB-Baden sequence) and from BaC settlements. It is noteworthy that the discussed group of axes from western Lesser Poland in general refers to axes commonly associated with the GAC (Nosek 1967; Balcer 1983), mainly due to regularity, grinding of all surfaces, small thickness, and trapezoidal regular outline**.** However, these are by no means only features of the GAC axes (*e.g.*, Libera 2009). B. Balcer (1983; 2002a) himself points to examples of axes representing the FBC as flagship examples of this type of axe.

Trapezoidal flat regular, completely polished specimens are considered 'model' specimens from graves of the GAC (Nosek 1967; Balcer 1983). For the most part, these are very regular specimens, flat rectangular and flat in cross-section, trapezoidal or rectangular in shape, and mostly or almost entirely ground (*e.g.*, Bronicki 2021), although a certain group of axes of this unit deviates significantly from this 'model' characteristic (Libera 2009). There are specimens with curved, including asymmetrical, butts, or with a slightly higher blade, or with raised edges of the blade itself, or with grinding covering only selected parts of the axe. In the area of loess uplands in the upper Vistula basin, finds of the GAC are incidental (reports of graves of cist construction – Rosiejów, Kazimierza Wielka, Żurawniki; Wawrzeniecki 1908; Nosek 1967). Single pottery sherds of this culture occurred at Bronocice and Książnice Wielkie (Kruk and Milisauskas 2018; Zastawny and Brzeska-Zastawna

2020). Against this background, the highly spectacular find of a mass burial from Koszyce, dated to 2875-2670 BC, stands out, together with an exceptionally rich cluster of core tools made of striped flint (Przybyła *et al.* 2013). The grave yielded products made from striped flint 'exemplary' for the GAC, among others a small flat trapezoidal axe, including an unfinished form with a straight blade, flat butt and sides. They are characterised by a different grinding method than on the discussed group of large trapezoidal FB-Baden axes. Namely, these axes have traces indicating only hand grinding, without the use of additional support or extra weight (Pyżewicz 2013). Nevertheless, they are among the only finds of certain GAC axes (from an excavated context) from the discussed area (not to mention the axe mentioned by S. Nosek 1967, 190, which, according to his description, was a part of the equipment of a grave with a cist construction from Żurawniki). It is worth mentioning that axes from western Lesser Poland made of flint type G are known to the authors from personal examination, which represent analogous 'model' specimens for this unit, having counterparts among the mentioned group of products (*e.g.*, an axe from Książnice Wielkie 1 near Koszyce; Brzeska-Zastawna 2020a, fig. 2: 1, 202-203; and an almost identical one from Poznachowice Dolne, Myślenice district; AMK collections). Admittedly, the sides are less grounded than the main surfaces, but these are, in fact, features found in all these groups. They are different from the expanded-blade axes of the discussed group of western Lesser Poland axes from the Baden influence period – they are very flat, without the characteristic convexity, have a separated flat butt, and do not have a clearly curved cutting edge. Forms that we would attribute to 'exemplary' specimens of the GAC also occur among other specimens considered by B. Balcer to be typical of the FBC, with reference, for example, to products from the Sandomierz Uplands (*e.g.*, Balcer 2002a).

The problem, unfortunately, is the over-generalisation of these issues and the paucity of studies that focus on these subjects placed in local realities. It would also be appropriate to focus on a set of traits, rather than on individual traits independently, as in practice we find that separately these traits are found in each Eneolithic culture. It should also be noted that the outlined 'model' type of axes (type B) of the so-called Lesser Poland type industry of the FBC according to B. Balcer (*e.g.*, 1983, 142, 272, 273), is not at all the 'model' type of the axes produced in western Lesser Poland. Also noteworthy is the fact that the standpoint of B. Balcer does not take into account the chronological differences, the classical and late FBC units. In a comparison of the axes of the FBC and GAC, B. Balcer (1983) reports that axes of the A variety are less common in the FBC than in the GAC, which is, of course, completely untrue for western Lesser Poland, since type B in its original form is not properly represented here. What is more, axes of the A variety are commonly characterized by a more pronounced expanded blade, often with an outlined convexity of the cutting edge, not to mention the grinding covering most of the axes' surfaces, which distances them from the 'model axe of the FBC according to B. Balcer, and brings them closer to the 'model' axe of the GAC. For the rest, the dissimilarity of these axes was noted by the researcher himself (Balcer 1983, 152), but without giving it further attention.

One should be aware that, as B. Balcer himself put it, the core of the Lesser Poland type industry of the FBC consists of finds from the Sandomierz Upland (Balcer 1983, 149). The assemblages from western Lesser Poland are actually treated as subordinate. In addition, the late FBC groups, including those close to the BaC and GAC assemblages from Lesser Poland, were not given a separate place in his work.

In the discussed group of regular trapezoidal axes of the FB-Baden assemblages and BaC, in their original forms these axes have a convex arched butt and, as a rule, a more clearly outlined curve of the cutting edge and are made of flint type G. This applies to larger specimens; small axes, usually transformed, are characterised by greater morphological variability. Another extremely interesting and – in our opinion – important feature is the occurrence of a group of axes made of G raw material in western Lesser Poland in the BaC and FB-Baden assemblages with ground side-edge rims (the grinding of a straight angle with a "sharp" ridge between the main and side faces, giving the axe in cross-section a more oval or rectangular shape with rounded corners, *e.g.*, the BaC axe presented here from Wiatowice, Fig. 9: A). This is interesting, especially with regard to the opinion that the analogous grinding pattern that occurred on the axe from Miłocin-Kolonia, associated with the FBC burial, from the perspective of J. Libera and A. Zakościelna (2006) is "unprecedented among flint manufacturers of this group of the FBC" and they point to an analogous grinding pattern on only one axe, found with GAC pottery, from Krasne Kolonia, Chełm County. It is likely that in western Lesser Poland we are dealing with another local trend in the period of development, brought along with the Baden influences, and is probably related to Western influences, more markedly manifested in Lower Silesia. Let us remember that the development of these cultural units (the FB-Baden and BaC assemblages), falls within a timeframe from after c. 3350 BC, to c. 2900/2850 BC. A completely separate issue is the occurrence in some burials of the CWC of axes with Middle/Late Eneolithic stylistic traits, including those made of flint G. Nevertheless, attention should be paid to the problem of core tool manufacture in western Lesser Poland, as the local character of this branch of production in the discussed communities to a large extent reflects the cultural changes that took place in communities developing in the 4th and early 3rd millennia BC in this area.

Axes made of G-type flint

Little attention has so far been paid to Middle and Late Eneolithic axes from western Lesser Poland. First, it should be noted that there was a local axe production centre here. They were made mainly from Jurassic G-type flint, outcrops of which have been identified in the central part of the Kraków-Częstochowa Upland (Pelisiak 2006; Kopacz 2020; Přichystal 2013). Workshops have also been identified where axes and large blades were produced near these outcrops (Kopacz, Pelisiak 1988; Pelisiak 2008; Kopacz 2020) but also within large settlements with some production features such as Bronocice, where they

were also being manufactured (Pipes *et al.* 2018). The development of the exploitation of this raw material is associated primarily with the period of Baden influence on the local FBC communities (early identified in fact with the BRIII phase), the FB-Baden complexes (*i.e.*, BR phases IV and V according to Kruk and Milisauskas) and the Baden culture (Pelisiak 2008), parallel to some of the FB-Baden groups. This raw material was also used by representatives of the CWC, who in parallel also targeted the use of K-type flint in local manufacturing. Macrolithic flint products, axes and long blades, made of G flint, were distributed over considerable distances, including the area of Greater Poland, Moravia, the Czech Republic, Slovakia, or Hungary (Pelisiak 2008). They are represented by different types of axes. Among them, we find specimens that are analogous to the large axes of the model examples of the FBC according to B. Balcer (1975, 2002).

The first group of Middle/Late Eneolithic axes made from G flint is represented among the finds from the so-called hoard from Dodów (Kowalski 1963; AMK collection), located quite close to the site discussed in the article. A chisel and three axes came from here, including one thick one of the A variety with an elongated shape and a slightly expanded cutting edge, 18 cm long, and a smaller, flat trapezoidal one. This finds close parallels among the forms of the FBC proper and the classic large axes of the A variety, made from Świeciechów flint from Lesser Poland (Balcer 1975; 2002a). For this group of axes, the grinding mainly covers the faces; the sides are ground less carefully or not at all. An identical specimen of a large axe in unpolished form was found, for example, among the settlement materials from the not so distant Site 3 at Miechów (NCN project 2016/23/B/HS3/00387 carried out under the direction of M. Nowak at Institute of Archaeology of the Jagiellonian University). A morphologically similar specimen, also made of G-flint, comes, for example, from Słupia in the Limanowa district (Valde-Nowak 1988, pl. 8: 1, 3). In this case, the fine grinding covers all surfaces of the axe. It is possible that this type of axe has connotations with the older 'classic' assemblages of the FBC. The question is whether it was also present in the FB-Baden assemblages.

The second group of axes made from G-type flint, of more interest to us here, is represented by trapezoidal specimens of slightly different proportions, less elongated, with a gradually or more markedly expanded cutting edge. They are represented by specimens associated with settlements with the FBC and FB-Baden sequences, such as those from: Marchocice 2 (AMK collection), KsiążniceWielkie 1 (Brzeska-Zastawna 2020a), Miechów 3, Bronocice 1 (Balcer 1983), and the BaC, *e.g.,* from Wiatowice 2, Kraków-Zesławice 21, Kraków-Wyciąże 5, Kraków-Pleszów 17-20 (Brzeska-Zastawna 2020b). They are represented by massive, thicker specimens and flat ones, as in other cultures. These are specimens that have been ground on their entire faces and usually the sides as well. They are very regular, rectangular in cross-section, almost always, however, with a slight convexity, especially of the faces (except in the group of small axes where there are specimens with quite flat sides and main faces). They have a trapezoidal butt with a rounded top. In side view, unless reworked and modified, they have an intermediate shape between wedge-

shaped and lenticular, with the greatest thickness at mid-length of the specimen. The cutting edge is most often curved, sometimes very distinctly so. Large and flat specimens relate more clearly to the Baden horizon. An analogous form to the specimen from Słupów must have been represented by one of the axes from Marchocice (Fig. 9: B), which broke during working at the spot where a flaw occurred. It also has identical grinding marks to those observed on the axe from Słupów. Analogous grinding is also visible on other axes and their fragments of the FB-Baden and BaC axes already mentioned, sometimes preserved only fragmentarily on specimens transformed and ground by hand. Interestingly, the strict standard of this group of large axes is also indicated by their thickness, which is exactly or nearly 30 mm.

Purpose of the item

Unfortunately, as mentioned in the introduction, the exact context of the discovery and the location of the find are unknown. We can only indicate the potential locations from where it came (one of the loess hills in the Słupów area; Fig. 1). The axe from Słupów was undoubtedly an object of value for its users. It is possible that, like the hoard from Dodów (discovered on the slope of a loess hill; Kowalski 1963), it cannot be ruled out that it was deliberately deposited or hidden.

In general, it is noticeable that a large portion of axes from hoards have significant dimensions, larger than axes from settlements and graves, often exceeding 25/26 cm in length (Olausson 1983; Wentink *et al.* 2011). Arguably, extremely long axes with proportions that precluded their practical use and the proportions of which indicate that they had only ceremonial roles or as a symbol of high status should be associated with a special purpose (Nielsen 1977). These include axes of monstrous size, such as the example from Kardyb, probably the longest from northern Europe, which measures 50.5 cm in length! (Sørensen *et al.* 2020). According to some researchers, it is difficult to unequivocally indicate the limit of sheer length, which would indicate their non-utilitarian nature, since it is demonstrable that, depending on the proportions and weight, it is possible to effectively use axes of really large dimensions (Olausson 1983; Sørensen *et al.* 2020). The close relationship between the length of the axes themselves and their purpose is noted, among others, by K. Wentink (2006). In a group of studied axes of the FBC from the northern Netherlands, on specimens over 22 cm in length, no traces indicating practical use of axes and hafting were found, but traces of wrapping and unwrapping of the axes from hoards and the presence of red ochre, often in the region of the cutting edge, testifying to their ceremonial character (Wentink 2006; Wentink *et al.* 2011). According to research (Wentink *et al.* 2011), supported by examples from ethnographic studies, these axes would be kept and hidden and carried long distances, unwrapped and shown only on special occasions, as symbols of special power. Finally, they were deposited in waterlogged places. More than half of the thin-butted axes from hoards of southern Scandinavia were completely ground, but few

show signs of use, and many axes from deposits are unfinished specimens (Midgley 1992). However, it should be kept in mind that not only axes without signs of use were deposited. This is evidenced by finds of deposits of more than one axe, where some have signs of use and some do not (Sørensen *et al.* 2020). The specimen from Słupów bears traces indicating that it may have been used for felling trees, as well as for construction work and other wood chopping activities, which, of course, does not exclude its non-utilitarian function as well.

The axes of the FBC played an important role not only in everyday life, but also in ideology. This is evidenced by axes deposited as burial gifts in megalithic tombs and votive deposits, especially in waterlogged places (Nielsen 1977; Midgley 1992; Sørensen *et al.* 2020; Larsson 2011). Although flint hoards are found throughout the FBC range, the vast majority are from southern Scandinavia and the North European Plain (Midgley 1992). Deposits of flint products are also known in the South-Eastern group of the FBC. There are also examples of axes being deposited as grave gifts. These are undersized forms, they are most often less shapely, with irregular cross sections, and are characterised by varying degrees of grinding (Libera and Zakościelna 2006). There are examples of flint axes constituting a component or the entire cluster of finds linked to the FBC, only some of which can certainly be described as intentional deposits (Libera *et al.* 2019a). Associated with this cultural unit is the custom of storing flint products in hiding places in the territory of the settlements and in separate places, especially those associated with a watery environment also in its south-eastern range (Bronicki 1995; Kadrow 1989; Kaflińska 2006; Libera 2003; Libera *et al.* 2019b; Zakościelna 1997).

SUMMARY

The axe from Słupów should be linked to the Funnel Beaker traditions, most likely from the period of of Baden domination in Lesser Poland, *i.e.*, the so-called FB-Baden assemblages. Unfortunately, the exact context of the discovery of the discussed article is unknown. In addition to analogous specimens from the FB-Baden and BaC settlements, it should be pointed out on the basis of data from Bronocice that the particular period of intensification and development of the settlement falls in the period of 3350/3300-3200/3100 BC, the older FB-Baden phase (Kruk and Milisauskas 2018; Kruk *et al.* 2018). The second phase of the development of the FB-Baden assemblages at this site is placed in the time frame between 3150/3100 and 2900/2800 BC (Kruk *et al.* 2018). The period of emergence and intensification of the impacts of the Baden complex on the Funnel Beaker communities is also combined with a huge intensification in the use of G-type flint. Given the uniqueness of the specimen in question, it cannot be ruled out that the item (after being used for daily work) was hidden in some kind of act of deposition. It is interesting to note that it bears traces of a relatively short period of use, as well as marks of plant polish on the lateral edges of the tool. Such traces may be related to the passive use of axes, their

wrapping, unwrapping, and transportation, merged with ideological functions combined with ideological functions, as in the case of the FBC votive axes (Wentink 2008). Among the closest finds of collective deposits containing axes are the ones from Dodów, only a dozen kilometres away in a straight line from Słupów. All of the items in this find are also made of G flint, and some bear signs of use, as in the case of the votive depots of the northern group of the FBC. It cannot be ruled out that these finds are related to a period of some upheaval or social change. In this context, it is worth noting that large settlements concentrate and traces of defensive structures and strategically located livestock pens are noted on them during the development of the so-called FB-Baden assemblages (*e.g.*, Miechów 3, Marchocice 2, Gniazdowice 1, Bronocice 1; Kruk and Milisauskas 2018; Przybyła *et al.* 2019; Przybyła 2020), from which, by the way, the examples of analogous axe fragments indicated here come. Undoubtedly, the axe from Słupów was an object of value to the communities of the time. There is a possibility that it was deliberately deposited.

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