NICOLAUS COPERNICUS UNIVERSITY IN TORUŃ
Faculty of History

Society for Experimental Prehistoric Archaeology

EXPERIMENTAL ARCHAEOLOGY IN NCU

Newsletter

Edited by GRZEGORZ OSIPOWICZ

EDITORIAL

Dear readers, first and foremost, I am very much hoping that you are still with us and I would like to apologize for the delay in the publication of this and the next issue of the Newsletter (number six will be published in a few days). As always, it is because of a lot amount of work and no time... However, I hope that the articles published below will be for you to some extent interesting and worth sacrificing those few moments for reading.

In this issue, you will find, as always, three texts. The first relates to the very old experiments carried out by members of the Society for Experimental Prehistoric Archeology with the reconstruction of a stone-age lathe. This topic has not been widely discussed so far, so it's definitely worth reading. The other two articles relate to bone arrowheads. The first of them report the experiments performed by students of the Institute of Archeology, Nicolaus Copernicus University with the production and decoration of medieval arrowheads made from antler. The second one takes us back to the Stone Age, where we will look at our old experiments with the use of this kind of weapons. Have a nice read!

It happened in the past

Larger projects realized by the members of the Society for Prehistoric Experimental Archaeology are usually realized in the course of one- or two-week experimental camps. One of the camps took place in 2004 at the Ethnographic Museum in Kaszczorek (a small village near Toruń). During its course a number of experiments were conducted, the results of which were partly published. Among them, one can mention the experiments aiming at a reconstruction of holes drilling methods in stone axes, methods of birch tar production without using a ceramic, as well as experiments with the use of obsidian and bone tools for working on various materials.

The photo on right presents early experiments with drilling the holes in stone axes.

INSIDE THIS ISSUE

Published in:
Institute of Archaeology
Nicolaus Copernicus University
Toruń, Poland

Turning lathe treatment of wood, bone and antler in the Stone Age – from the archival works of the Society for Experimental Prehistoric Archaeology members

Many of us today perceive the Stone Age people as quite "primitive". However, from this period, there are objects that were impossible to make without the use of relatively complicated devices. Products of this type include, among others, osseous arrowheads turned on the lathe (Figures 1 and 2), known for the East European sites and dated to the Middle and Younger Stone Ages.

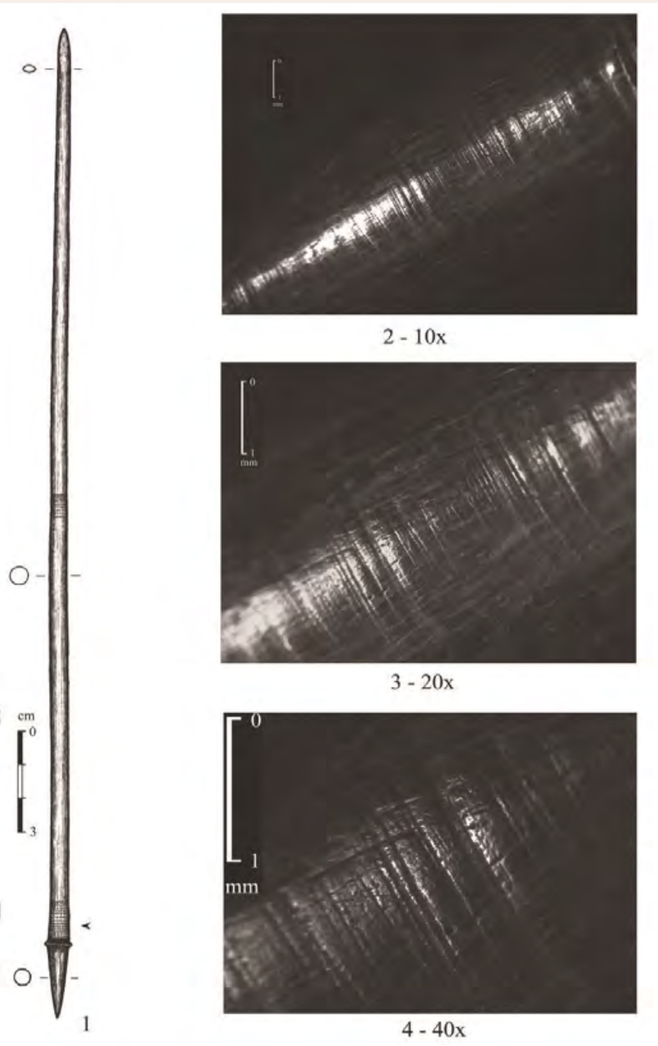

Fig. 1. Needle-shaped arrowhead, traces of turning lathe treatment; Ivanovskoye 7 (layer IV) (after Zhilin 2015, Figs. 7).

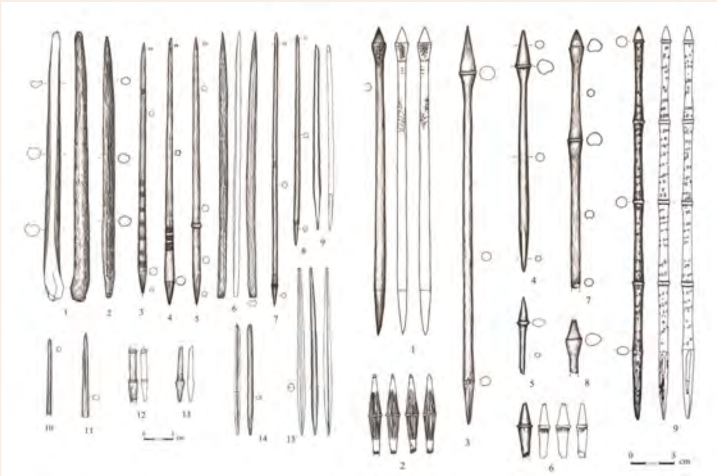

Fig. 2. The examples of the Mesolithic arrowheads from the Volga-Oka interfluve, central Russia. Some of them are turned on lathe (after Zhilin 2015, Figs. 2, 3).

Reconstruction of the method of their production requires reconstruction of devices used in this process as well. The experiments in this regard made many years ago by SEPA members are described below.

Lathe (Fig. 3)

The basis of the lathe was made of split pine wood trimmed to the dimensions of 50 cm (length) x 25 cm (width) x 10 cm (thickness). At a distance of 5cm and 15 cm from the ends of the base, 4 rectangular holes were grooved (two on each side of the base) with a depth of about 4 cm, in which later 4 guides for rolling shafts (also made of split pine wood) were fixed. The guides were rectangular in shape and had dimensions: 20 cm (height) × 15 cm (width) × 2 cm (thickness). Before mounting the guides in the base, holes for the rolling shafts were drilled in their central part. The guides were glued in such a way that the holes formed a straight line. This operation had to be carried out very carefully to preclude possible wedging of the rolling shafts during the processing. In this matter, it was helpful to stick all the guides together with the stick posted through all the holes.

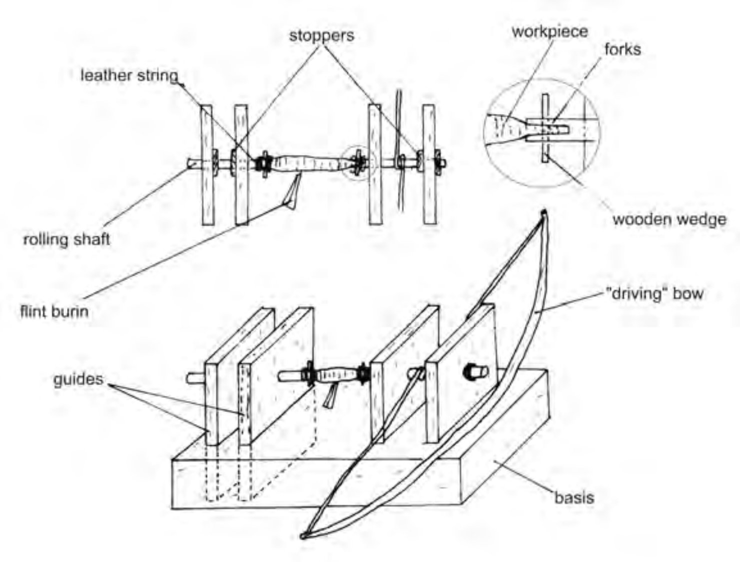

Fig. 3. Scheme of the experimental lathe made by members of SEPA (draw. G. Osipowicz).

The "grips" holding the workpiece were made of two simple sticks, each of which was passed through the two guides. Their ends (to which the turned item was later attached) were formed into the shape of a forks. They created "tongs", that were supposed to keep the workpiece in a proper position. Such a method of fastening forced preparation of the ends of processed fragment of the raw material before placing it in the lathe. After its placement, the area of connection was additionally secured with a leather string. The appropriate "holding" of the workpiece by the rolling shafts supposed to be guaranteed by 4 stoppers (two for each rolling shaft), which were fixed between the guides. Originally, the stoppers were made of leather strings tightly tied on rolling shafts. The lathe was driven by a "drilling" bow. Flint burins were used for processing.

Turning

The lathe was used during the experiments with the treatment of objects made of wood, bone and deer antler. As it turned out later, it also worked well during the processing of amber. Problems with fixing the workpiece were noted already during the first experimental tests. It turned out that the forks (despite the additional wrapping of the leather string) are not able to keep it in a place. The rings limiting the movement of the rolling shafts made of leather strings also did not stay in place. Wooden rings proved to be a short-term solution because they loosened or cracked after just a few minutes of work. Problems have been solved by drilling the holes inside the forks and the ends of the turned object and placing there the wooden wedges. The mounting of the object in the lathe was more complicated, but it turned out to be a definitive solution.

It is difficult to draw any broader conclusions about the effectiveness of the lathe because experiments with this tool have been carried out in our Institute for a relatively short time.

At this stage of the research, it can only be concluded that it depends mainly on the type of the raw material being processed and the type of tool used for work. Wood is the easiest material to be processed with this method (fig. 4). Making a 15 cm long wooden arrowhead takes about an hour. Similar turning efficiency was observed during the experimental treatment of amber. Bone and antler are much more difficult materials to process. However, it should be noted that experiments with the turning of softened raw materials have not been carried out and it is possible that processing them with the use of a lathe can be very effective.

Fig. 4. Experimental turning of wood.

Fig. 5. Use-wear traces observed on burin working in wood.

It is also worth to pay an attention to unique characteristics of the use-wear traces created on the flint tools used in the course of described experiments (fig. 5). Traces of this type have not been observed so far on any of the Mesolithic artefacts found in Polish territories, which may indicate that in this area devices of this type were not used.

References :

Zhilin M. 2015. Early Mesolithic bone arrowheads from the Volga-Oka interfluve, central Russia, Fennoscandia archaeologica XXXII, 35-54.

Processing and hafting of the Medieval antler arrowheads (based on artefacts from Grzybowo site, Poland)

The experiment was conducted by students Szymon Macek and Michał Stopierzyński as a part of the Experimental Archeology classes taught by dr. hab. Grzegorz Osipowicz. The aim of the experiment was to determine the time and difficulty of making Medieval ornamented antler arrowheads, with the use of simple metal tools (knife, file, saw blade), the method of their hafting, also the strength and effectiveness of the arrows armed this way (this part of the experiment is not finished, so it won't be described below). The function of such artefacts is debatable and they are often referred to as "ceremonial" due to the numerous decorations on the lower part of the sleeve. They are known from such Early Medieval sites as Wolin, Grzybowo and Niemcza.

Two types of arrowheads can be distinguished (Fig. 1):

a) simple arrowheads made of antler tines with a hollow interior-sleeve (being much more often discovered);

b) arrowheads with advanced construction, also made of antler tines and sleeve with three or four barbs (occasional for Medieval).

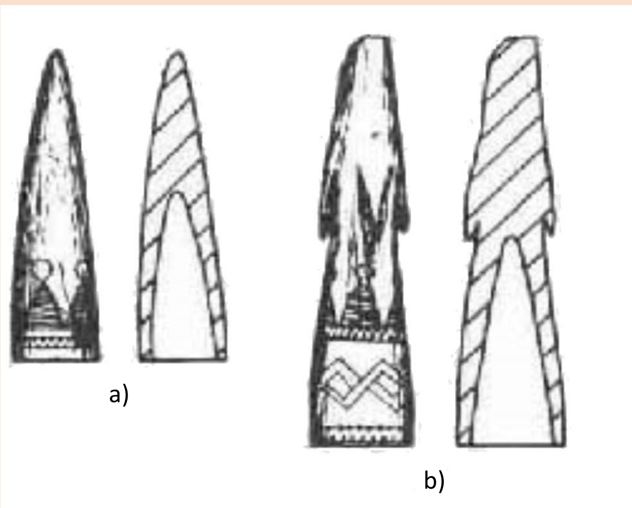

Fig. 1. Arrowheads made of antler discovered in Grzybów site.

In the experiment, the first type of arrowheads were included, due to the small experience in the field of antler processing of the persons performing the works.

The experiment was started on 29.10.2018 at 18:20. The first part was to choose the right raw material. Five tines from various parts of the red deer antler with the best matching in shape and size were selected: two tines from the crown and three with a curved shape made from brow tine and bez tine. As a raw material, stag antler from a three-year-old red deer (Cervus elaphus) was used.

The second step was to divide the raw material into the semi-products. Using a metal knife, from each piece of antler a 5-6 cm long fragment of the raw-material was cut off (fig. 2).

Fig. 2. Finished semi-products (photo by Szymon Macek).

The sawing time and the dimensions of the resulting semi-finished products were measured (compare Tab. 1).

The sawing time and the dimensions of the resulting semi-finished products were measured (compare Tab. 1).

Part of the antler	Length	The width at the base	The width of the end	Sawing time
Crown (A1)	6 cm	1,4 cm	0,6cm	4 min
Crown (A2)	5,5 cm	1,3 cm	0,7 cm	3 min
Brow tine (B1)	5,8 cm	1,3 cm	0,7 cm	4 min
Bez tine (B2)	5,8 cm	1,3cm	0,6 cm	3 min
Bez tine (C)	5,2 cm	1,4 cm	0,8 cm	5 min

Tab. 1. Dimensions and time from sawing semi-products.

After the description and documentation, at 18:55, the fragments of antler were placed inside the container with a capacity of 0.8l and flooded with a half of the liter of water. The container was exposed to the outside overnight at a temperature of 6-9^{o}C. The next day at 9:00, one of the fragments (B1) was taken out of the water to develop a further processing scheme. The semi-product was scraped with a knife from the outer layer.

For ease, a desired shape and size have been drawn on it starting from the wider part. Next, to remove the unwanted fragment of antler, a tip of the worked piece was grooved around using knife, to facilitate planning of the raw material at the acute angle (Fig. 3a). In the case of this semi-product, this stage was repeated three times, after which, the unwanted part easily broke off. Semi-product with the size approximate to the artefact, still required processing to give it the desired shape. It was scraped roughly using a knife being pressed firmly at the right angle to the surface of the material. When a suitable shape has been obtained (Fig. 3b), the inside of the sleeve was hollowed out to the appropriate width.

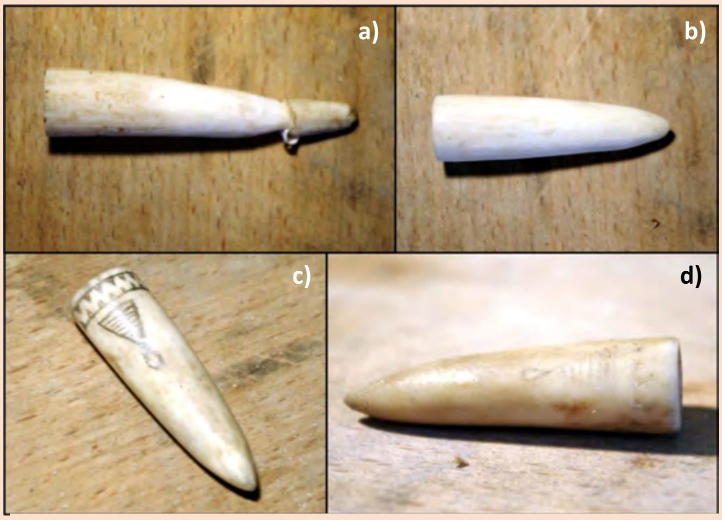

Fig. 3. Stages of production (photo by Szymon Macek).

During each of these stages, the time of individual activities was measured (Tab. 2). The arrowhead pre-prepared this way was placed back in a container with water.

At 18:10, processing of semi-products A1 and A2 was started according to the above scheme. While the treatment of fragment A2 proceeded similarly to B1, the object A1 was damaged during

Semi-product	Pre-scraping	Cutting the tip	Scraping	Hollow
A1	2 min	26 min	28 min	18 min
A2	2 min	25 min	45 min	23 min
B1	1 min	26 min	16 min	21 min
B2	2 min	28 min	26 min	19 min

Tab. 2. Time of processing stages.

the cutting off the tip, so its form significantly changed compared to the original. According to the measurements made, the processing time was between 1h 4 min and 1h 35min. The remaining fragments were left in a container with water for one week to check whether their processing will be easier and faster after longer soaking of the raw material. After this time, one of the semi-products (B2) was selected, which, without any larger differences, was processed like the previous ones. Immediately after the processing, specimens B1 and A2 were prepared for covering with an ornament engraved according to the decoration of the arrowhead from Grzybowo. In the beginning, a pattern was drawn on the surface with a pencil, but the graphite quickly rubbed and smudged, so the ornament was being drawn only in small sections. During the work, the need to use an additional tool with smaller blade appeared, which in this case was a woodcarving knife. The process of decoration of arrowheads was divided into two parts:

Cutting out with a knife the ornament in the shape of triangles, filled in with the horizontal lines;

Cutting out a small ornament at the widest part of the arrowhead using a woodcarving knife.

In the case of a less successful arrowhead (A1) it was decorated with a incised ornament patterned with ornaments of one of the artefacts from the Wolin site. This pattern is much simpler and it took about 30 minutes to make it. At the end, the ornaments of the arrowheads (A1 and B1) were covered with previously prepared birch tar, so that after wiping off the excess, it revealed ornaments.

To sum up the process of producing this type of arrowheads from an antler, we can draw a few conclusions. With the use of metal tools and above-mentioned techniques, the time of production of such arrowheads, including making the decorations, is between 2.5 and 3.5 hours. The soaking time and the selected type of antler fragment had a slight influence on the work time. On the other hand, the experience of the person performing the experiment was the most important (looking from the point of view of the time used). Although in the end the arrowheads more or less extent deviate from the original, their processing did not cause much of the problem to inexperienced craftsmen. On the basis of these observations, we can suppose that objects of this type were not particularly unusual products. It is also worth noting that the time of decorating the arrowheads was longer than the time of their production.

Bull's-eye! A few words about experiments with ossous projectile points

Research on the osseous projectile points was initiated in the 1980s and continued over the next decade, resulting in many important studies regarding their functionality, technology, or the traces left by them in the bone material (i. a. Petillon et al. 2016). In issue 2/2018 of the NCU Newsletter, a short article was published dedicated to experiments with different types of projectile weapons and damages that they can generate as a result of hitting an animal bone. The departure point for those research were seal spatulas discovered in the sub-Neolithic site in Šventoji, Lithuania. This time, we would like to introduce our readers to a different aspect of this type of experiments carried out by NCU students, namely, experiments aimed at learning the characteristics of damage arising on the bone arrowheads shot into specific targets from the bow.

For the purposes of the presented research, a series of archery experiments were performed, during which twenty replicas of Late-Paleolithic and Mesolithic bone projectile points were used. Ten of them were made from the metatarsal bones of a deer, the rest from the antler of this animal. The arrowheads were in the form of straight points, oval in cross-section, with a double-bevelled base. Similar forms are known for example from the area of the Polish Lowland (e. g. Orłowska, Osipowicz 2019). The length of the arrowheads was on average from 6.5 to 8 cm, their weight varied on average from 8 to 10 g. The arrows shafts were made of beech wood. They were about 70 cm long and about 1 cm in diameter. The weight of the complete arrow fluctuated from 35 to 40 g, its total length (including the hafted arrowhead) was 86 cm on average. Water-soluble glue was used to insert the arrowheads, which allowed their subsequent removal easily. Finally, the whole connection was reinforced with hemp wrapper. During shooting, a straight bow with a pulling force of 16 kg was used.

The dead roe deer was used as the basic shooting target. Shots were also given to the objects with which the arrowheads could have been in contact when they missed the target, i.e. to trees and soil (fig. 1). The shots were shot from a distance of about 15 m. Experimental arrowheads analyzed in the work were shot several times.

Fig.1 Experimental shooting.

Most of the experimental arrowheads were shot several times, many of them had contact with all types of materials, i.e. the dead body of deer, wood and soil. A total of thirteen arrowheads were shot into the body of the roe-deer, i.e. six made of bones and seven made of antler. The maximum number of hits in the target using one bone arrowhead was thirty-three times, one antler arrowhead twenty-five times. In three cases, the arrow perforated the skull, the long bone (fig. 2) and the vertebral column of the animal. In total, a hundred and thirty-five shots were shot. In the experiment with shooting in the ground, three bone arrowheads and eight antler arrowheads were used. In total, the target was shot thirty-five times, with the maximum number of four hits of a single bone arrowhead, and eight hits of antler arrowhead. In total, the target was shot thirty-five times, with the maximum number of four hits of a single bone arrowhead, and eight hits of antler arrowhead.

Fig.2. Experimental hit in a dead roe deer.

Fig.3. Experimental hit in a tree.

In six out of ten cases of hitting a tree, the arrowhead stuck in deep enough so that it was not possible to remove it, or such attempts ended with a fracture. This ended the "life" of this replica (fig. 3). To sum up, ten shots were fired into the tree using seven bone arrowheads and three made of antler. In total, during the entire experiment, one hundred and eighty-three shots were made. Detailed data can be found in the table below.

The experimental work carried out with the osseous projectile points resulted in a few generalizing insights regarding the manner of their destruction, closely related to the type of raw material from which they were made and the type of material with which the point was in contact.

The experiments carried out also showed that such forms could be used for a very long time until they were lost or completely destroyed. Currently, works are underway to classify the observed damage and their detailed characteristics.

Further works are also planned in this respect, including different methods of throwing and various types of tools used for this task.

References :

Orłowska, J., Osipowicz, G. 2019. Bone working practices in the Late Palaeolithic Poland: an example of a three-edged bone point from Lisi Ogon, site 13. In: Proceedings of UISPP meeting in Amersfoort/Schleswig (in Press).

Pétillon, J.-M., Plisson, H., Cattelain, P. 2016. "Thirty Years of Experimental Research on the Breakage Patterns of Stone Age Osseous Points. Overview, Methodological Problems and Current Perspectives", Multidisciplinary approaches to the study of Stone Age weaponry (Iovita, R., Sano, K. eds.), Springer (Vertebrate Paleobiology and Paleoanthropology Series), pp. 47-63.

No.	Raw material	Target and number of shots			The total number of shots	Comments
		Dead roe-deer	Ground	Tree		
1	bone	33	2	-	35	
2	bone	5	-	1	6	the arrowhead stayed in the tree
3	bone	15	4	1	20	
4	bone	-	-	1	1	arrowhead broken at the base
5	bone	-	-	1	1	the top of the arrowhead stayed in the tree
6	bone	2	3	1	6	
7	bone	-	-	1	1	
8	bone	3	-	-	3	arrowhead broken at the base
9	bone	1	-	-	1	arrowhead broke at the base - shot in the bone
10	bone	-	-	1	1	arrowhead broken at the base
11	antler	5	3	-	8	last shot - skull
12	antler	5	4	-	9	last shot - long bone
13	antler	-	1	1	2	the arrowhead stayed in the tree
14	antler	8	-	-	8	
15	antler	-	4	1	5	the arrowhead stayed in the tree
16	antler	13	2	-	15	
17	antler	-	-	1	1	
18	antler	6	2	-	8	last shot in the vertebral column
19	antler	15	8	-	23	
20	antler	25	4	-	29	

Our recent publications

Grzegorz Osipowicz, Katarzyna Kerneder-Gubała, Mariusz Bosiak, Daniel Makowiecki, Justyna Orłowska

THE OLDEST OSSEOUS MINING TOOLS IN EUROPE? NEW DISCOVERIES FROM THE CHOCOLATE FLINT MINE IN OROŃSKO, SITE 2 (SOUTHERN POLAND)

Quaternary International

The oldest osseous mining tools in Europe? New discoveries from the chocolate flint mine in Orońsko, site 2 (southern Poland)

Abstract: This article presents the results of the traceological, experimental, physico-chemical and archaeozoological analyses undertaken on bone artefacts from one of the oldest known flint mines, i.e. the chocolate flint mine in Orońsko, Site 2, Poland. Based on typological and 11 radiocarbon measurements, the mine dates to the end of the Alleröd period and the early Younger Dryas. The results of the traceological and chemical analyses demonstrate that the bone artefacts were used as chisels/picks for removing limestone and extracting lumps of flint, which makes them some of the oldest known osseous mining tools in Europe. The identification of these unique tools has provided the impetus for conducting a multifaceted discussion on the state of research on the oldest mining tools from organic raw materials and the need to intensify specialist research in this area. The presence of ochre on one of the artefacts may indicate the possible movement of peoples connected with mining activities during the Late Palaeolithic/Mesolithic. Moreover, the results make an important contribution to our knowledge of the use-wear traces typical for prehistoric osseous mining tools.

In Journal: Quaternary International (2019); https://doi.org/10.1016/j.quaint.2019.02.005

Grzegorz Osipowicz

PLANT PROCESSING IN THE LATE MESOLITHIC POLAND: IN SEARCH FOR FUNCTION OF THE MYSTERIOUS ‘CURVED KNIVES’

ORIGINAL PAPER

Plant processing in the Late Mesolithic Poland: in search for function of the mysterious 'curved knives'

Abstract: Studies on the treatment and use of plants in the Mesolithic are difficult due to the small number of sources. However, they are important because it was one of the basic branches of the economy of the early Holocene community. This article presents the results of use-wear and experimental studies aimed at the interpretation of the function of the so-called curved knives. These tools are associated with the treatment of silica plants, but their actual function is not fully understood. The research was based on a collection of 66 products of this type from five sites in central Poland and is one of the first published research on tools of this kind from this part of Europe. As a result of microscopic analysis, eight types of curved knives were distinguished. In order to identify the plant species, the knives were used on an experimental programme based on the results of palynological studies carried out at site 6 in Ludowice, an economically specialised site. As a result of the traceological analyses, a number of correlations between artefacts and experimental tools have been identified that can provide an important step towards interpreting the actual function of the curved knives. At the same time, the large discrepancies in the traces resulting from the processing of different species of silica plants were documented and the probable use of many of their species in the European Mesolithic was suggested.

In Journal: Archaeological and Anthropological Sciences (2019); https://doi.org/10.1007/s12520-019-00784-w