



NICOLAUS COPERNICUS
UNIVERSITY
IN TORUŃ
Faculty of History



EXPERIMENTAL ARCHAEOLOGY IN NCU

Newsletter



Edited by GRZEGORZ OSIPOWICZ

EDITORIAL

Dear Readers, conducting research in the field of experimental archaeology is extremely difficult during the Covid pandemic, and in the case of our centre, most of the projects in this area



Covid!
We don't want you in 2021!

have been temporarily stopped. Therefore, in this issue, we present only our past works, with the hope that the next issue of our Newsletter that is planned to be published in spring 2021 will bring the possibility to present the results of some fresh research. The first article in this number is about one of the oldest experiments carried out in our centre, i.e. about Kazimierz Żurowski's research on methods of softening osseous raw materials. In the second text, we present the experimental works carried out during the two-week camp organised in 2004 by the members of Society for Prehistoric Experimental Archaeology. The last article presents recently conducted experiments with casting bronze axes. On behalf of the Editorial Board, I wish you a pleasant reading and all the best in the New Year!

People of the experiment

Dorota Nowak

A graduate of the Institute of Archaeology NCU and a long-term member of the Society for Prehistoric Archaeology. She specializes in Stone Age hunting techniques, especially in the flint arrowheads and geometric inserts of the projectile weapons. She was a participant and organizer of several dozen educational events in the field of experimental archaeology that took place throughout Poland between 2000 and 2005.



The most important scientific work:

Osipowicz, Nowak, 2017. Complexity of use-wear traces formed on flint projectile points : a voice in discussion, Cuad. Prehist. Arqueol. Univ. Granada, No. 27, 83-109.

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Acid or water? The history of the first studies on methods of softening of the osseous raw materials carried out at the Institute of Archaeology NCU

Bone and antler are one of the basic raw materials used by man throughout history. For a long time, the studies on methods of softening these raw materials have been an important part of the experimental work carried out in the Institute of Archaeology, NCU in Toruń. The first researcher in our centre to take up this topic was Prof. Kazimierz Żurowski (Fig. 1), who in the years 1953-1976 was the head of the Department of Archaeology of the Polish Lands at the NCU. The starting point for his research were numerous finds of bone and antler products, as well as semi-finished products and production wastes discovered at the medieval sites, such as a rich collection of antler and bone artefacts with numerous traces of processing from Gniezno (Fig. 2).



Fig. 1. Prof. Kazimierz Żurowski.

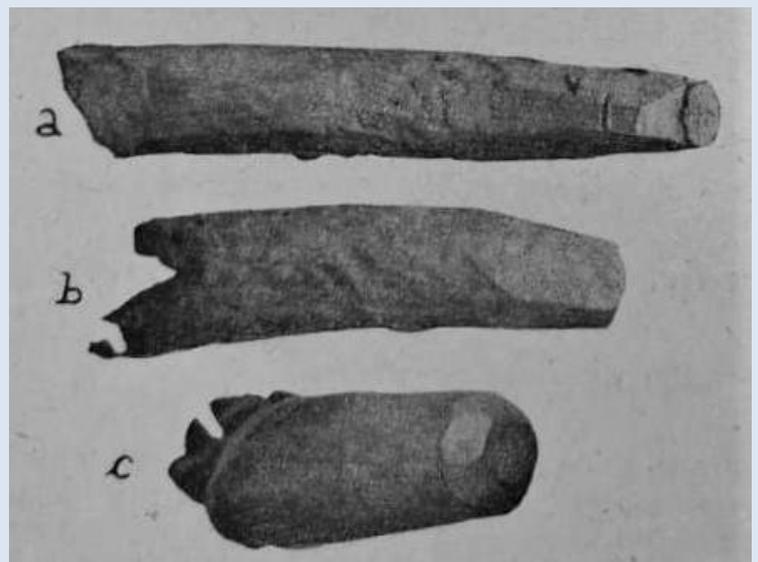


Fig. 2. Few examples of fragments of antler with knife cuts from Gniezno (photo by K. Żurowski).

Materials and methods

The idea for the experiment was born in Żurowski's mind as a result of an accidental observation of the softening of a spoon made of antler which was left for a long time in mustard, which contained vinegar. In the first experiment carried out in 1951 in Ostrów Lednicki (Żurowski 1953), natural plant acid was used for softening. Among the acid-containing plants, hogweed (*Heracleum Sphondylium*) and sorrel (*Rumex Crispus* and *Rumex acetosella*) can be mentioned. The seeds of these species were discovered in the layers of medieval sites such as Gniezno, Poznań or Santok.

The course of the experiment

In the described experiment, fresh sorrel leaves were used, which were chopped into a pulp. Then, an attempt to cut a fragment of the non-softened deer antler with a knife was made - without any effect. The next step was to place the same piece of antler in the sorrel pulp. After a week, another attempt of cutting was made, this time successful. It was softened to a depth of about 3 mm.

The antler was placed back in the sorrel for a further five weeks, after which complete softening of the material was observed allowing for easy treatment (Fig. 3). Two days after taking it out of the sorrel, the antler slowly began to harden, and on the fourth day, it completely regained its original hardness.

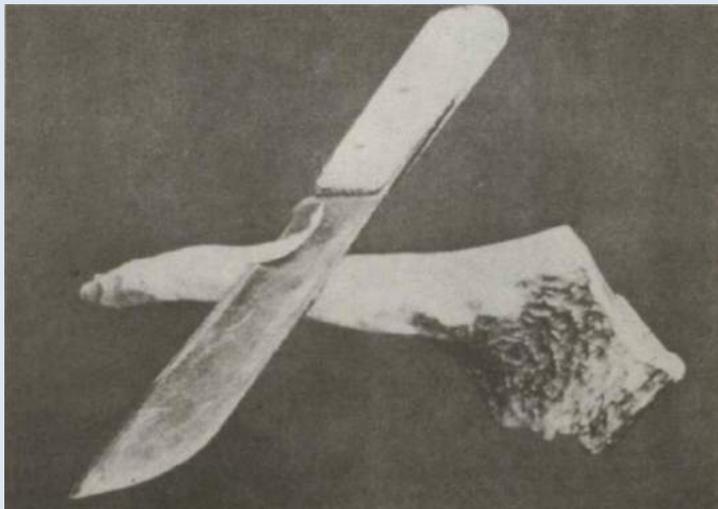


Fig. 3. Cutting the softened fragments of deer antler with a knife (photo by K. Żurowski)

Conclusions

For Żurowski, the successful course of the first experiment proved that the softening of osseous raw materials with plant acids could be used in the Middle Ages. As he emphasized, this process was simple, it did not require any special equipment, only soaking the raw material until the item was finished. In his opinion, the raw material could be pre-cut or broken into smaller fragments to accelerate softening, because the internal porosity of the antler facilitates the absorption of acid. He considered numerous finds such as features with deposits of antler fragments as indirect evidence for the use of such treatments.

Further work

The results of the first experiment and its positive reception from the archaeological community encouraged Żurowski to conduct further research in this field (Żurowski 1974). In the following years, he tested substances such as sauerkraut, sour milk and sour buttermilk. In their case, he noticed that the raw material was softened 2-3 days after immersion, and in his opinion, sour milk gave the best results. He also made attempts to soften the antler by boiling it in water for many hours (7-11 hours), which, as he emphasized, had a partial effect, as the raw material quickly hardened as it cooled. The next experiments concerned softening the bones and giving them a specific shape. The basis for these works were the finds of Neolithic arm bracelets made of bone (Fig. 4A). In his experiment, he used a plate made of ox rib, which he softened by soaking in sour milk. Then the softened plate was slowly bent to the desired form. The next step was to tie it to secure the shape and let it dry. As Żurowski noted, the arm bracelet that he made hardened and retained its shape (Fig. 4B), and the attempt to straighten it dry failed.

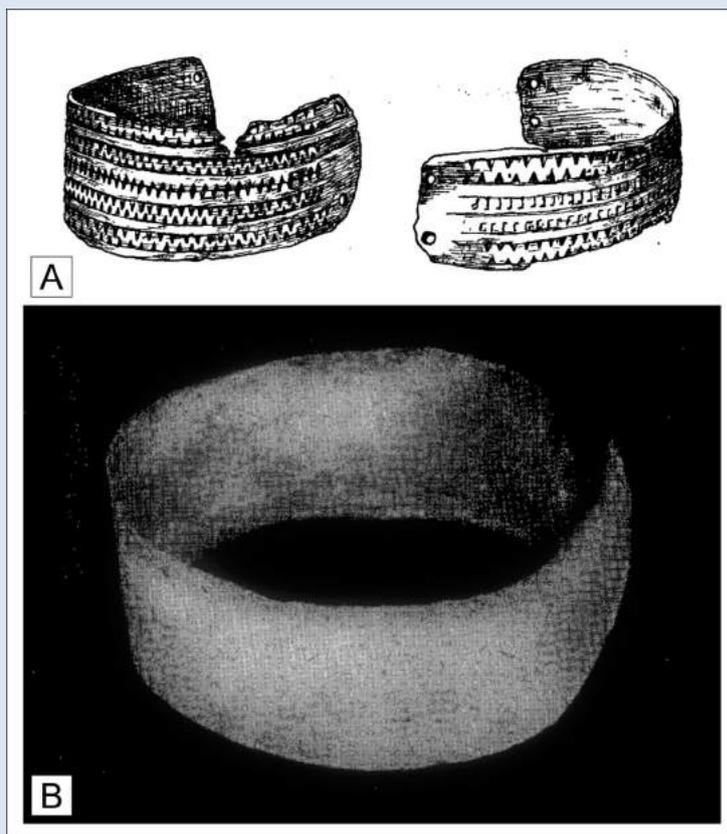


Fig. 4. A - Neolithic arm bracelets from Brześć Kujawski, district Włocławek (by K. Jażdżewski) B - arm bracelet made of ox rib bone, softened in sour milk (photo by K. Żurowski)

Summary

The pioneering works of Kazimierz Żurowski have been continued in our Institute to this day. An example of this is, among others, a book "Methods of softening bone and antler in the Stone Age in the light of archaeological experiments and use-wear analysis" written by Grzegorz Osipowicz (Osipowicz 2005), as well as numerous experiments in this area, including new research on softening techniques and their identification on historic materials, the results of which we hope to present soon.

References:

- Osipowicz G. 2005. Metody rozmiękczenia kości i poroża w epoce kamienia w świetle doświadczeń archeologicznych oraz analiz traseologicznych, Wydawnictwo Adam Marszałek, Toruń.
- Żurowski K. 1953. Uwagi na temat obróbki rogu w okresie wczesnośredniowiecznym, *Przegląd Archeologiczny*, t. IX, s. 395-401.
- Żurowski K. 1974. Zmiękczenie poroża i kości stosowane przez wytwórców w Starożytności i we wczesnym średniowieczu, *Acta Universitatis Nicolai Copernici, Archeologia*, z. 4, s. 3-23.

International Camp of Experimental Archaeology

Toruń 2021



We invite everyone interested in experimental archaeology to participate in a two-week *International Camp of Experimental Archaeology*, connected with a seminar presenting the state of art of this method in Poland and accompanying traceological workshops.

The event is organized by the Department of Prehistory of the Institute of Archaeology, Nicolaus Copernicus University in Toruń, in cooperation with the Society for Experimental Prehistoric Archaeology (SEPA).

Papers presented during the seminar and the results of experimental work carried out during the camp will be published in the book entitled *Experimental Archaeology in Poland*. The event is directed to all people who want to deepen the knowledge in the field of experimental archaeology, as well as in the traceological method.

June 14-27, 2021

(initial date, depends on the pandemic situation)



More information about the camp, including the number of places and fees, can be found on the event website: <http://www.exarchcamp.umk.pl>



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**So recently and at the same time so long ago...
The second two-weeks experimental archaeology camp of the
Society for Prehistoric Experimental Archaeology. Spring 2004.**

2004 was an eventful year for members of the Society for Prehistoric Experimental Archaeology. There was a generational change in Society, which meant lots of new ideas and new energy, but also extra work for the old members teaching the new "fry" how to scientifically conduct experimental research. At the Institute of Archaeology NCU, it was slowly planned to formally establish the Laboratory of Traceology, which needed many experimental tools from various raw materials used for various activities for its research. Thanks to them, a database of products of this type was to be created, being a comparative material used during microscopic analysis of artefacts. All these factors contributed to the shape of the experiment program, which was planned and carried out during a two-week experimental camp organized in spring of this year at the Ethnographic Museum in Toruń. 10 members of the Society for Prehistoric Experimental Archaeology attended.

One of the most important experiments performed successfully during the event was the production of birch tar without the use of ceramic vessels. (Fig. 1). The goal was to develop a method which uses in the Stone Age would have left no clear traces po-

ssible to identify in the archaeological materials today.

The designed kiln was built directly on to the ground. For its construction, small stones were used, that were sealed with a mixture of sand, grass and a little bit of clay. When dry, this "cover" formed a solid and compact shell, resilient to cracks that form during the drying or firing of the kiln. After the kiln walls were finally sealed, their thickness was about 8-10 cm. The kiln had the shape of a dome, it was about 40 cm in diameter and had a similar height. It was left to dry for about 16 hours. Then, it was filled up with the fresh birch bark ripped into narrow strips, covered with a big stone, finally sealed and fired. The firing took about 3-4 hours and was preceded with the process of preheating, which means keeping a fire at the beginning in some distance from the kiln for about 1,5 hour. When the firing was finished, the remnants of burned wood and ashes were removed and the kiln was left for about 3 hours to cool down. Then, it was opened. The wood tar made with this method is strongly contaminated with charcoal and the remnants of birch bark. The detailed description of this experiment can be found here - Osipowicz 2005a).

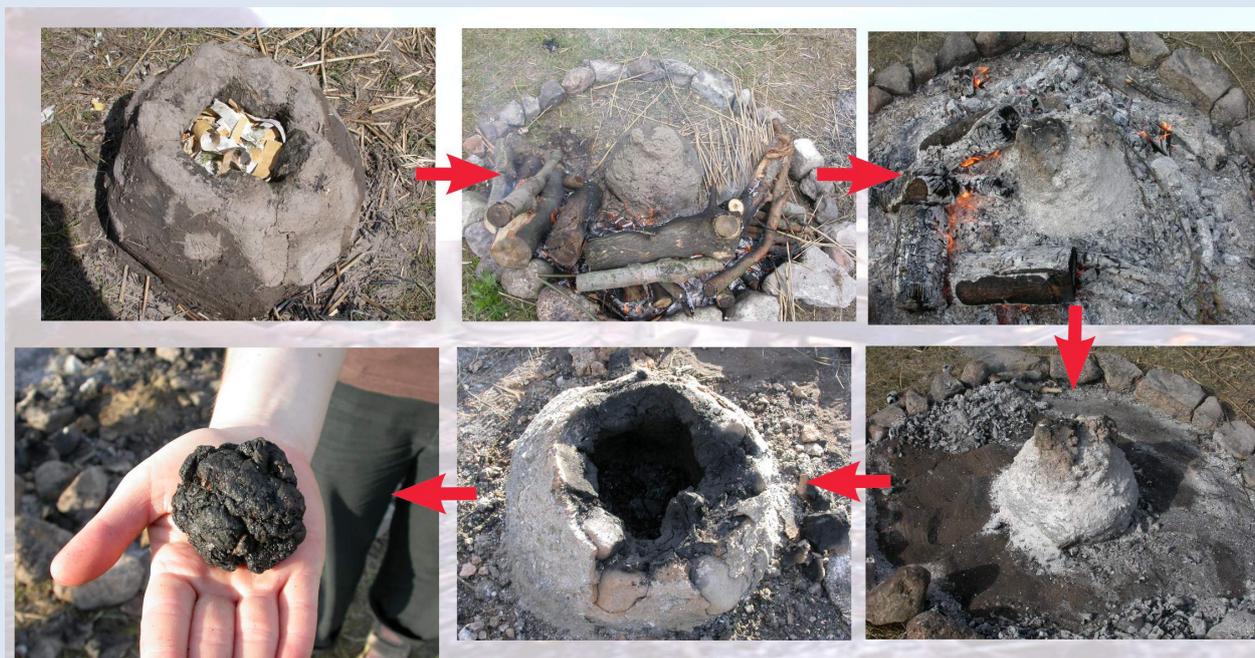


Fig. 1. Experimental production of birch tar without the use of ceramic vessels.

The aim of the second important experimental project carried out during the camp was to reconstruct the method of making holes in the stone axes known from Europe since the Neolithic. The work was carried out with the use of reconstructed drilling machine and drill bits made of long bones of mammals (Fig. 2). The experiment required the use of a sand bed as drilling material. The work was successful. As a result, a fairly regular hole was drilled in the stone axe made of porphyry, 2.9-2.3 cm wide and 2.5 cm deep. A detailed description of these studies can be found in an article published elsewhere (Osipowicz 2005b). Work in this field was continued by the members of the SEPA. However, in subsequent experiments, wooden drills were used.

An interesting, though unfortunately insufficiently verified, an experiment conducted during the Camp were the first attempts at turning wooden and bone objects with the use of a reconstructed lathe and flint tools. We have already written about these works in one of the previous issues of the Newsletter (1/2019), so we will not devote more space to them here. It is worth noting, however, that despite the preliminary nature of these works, they were quite successful, both from the perspective of the effectiveness of the reconstructed device and the uniqueness of the use-wear traces created with its use on the products of flint.

Fig. 3. First attempts at turning wooden and bone objects with the use of a reconstructed lathe and flint tools.



Fig. 2. Experimental project carried out during the camp connected with the reconstruction of the method of making holes in the stone axes known from Europe since the Neolithic.

As mentioned in the introduction, a large part of the experiments carried out during the camp was aimed at creating a database of experimental tools used as comparative material during the traceological analysis of artefacts. This was also the purpose of the work conducted with the use of obsidian tools. Several dozen of this type of experiments were carried out, during which tools made of this material were used for many activities within the framework of processing such materials as leather, wood, bone, shells, soft stone and ceramics (Fig. 4).

The experiments with bone products had a similar profile. In this case, however, not only experiments related to the poten-

tial function of artefacts were realised, but also works with a technological profile, aimed at reconstructing the techniques of processing bone raw materials in prehistory (Fig. 5).

An important part of the work conducted during the camp was the experimental processing of various types of plants. In this field, both typical woodworking was carried out with the use of flint and bone tools and various supporting processes, such as burning technique. However, many experiments were also realised with the bark and bast from various tree species, which were used to produce ropes and various types of containers, modelled on archaeological finds and ethnographic analogies.



Fig. 4. Experiments with using tools for various activities.



Fig. 5. Experiments with bone and antler processing.

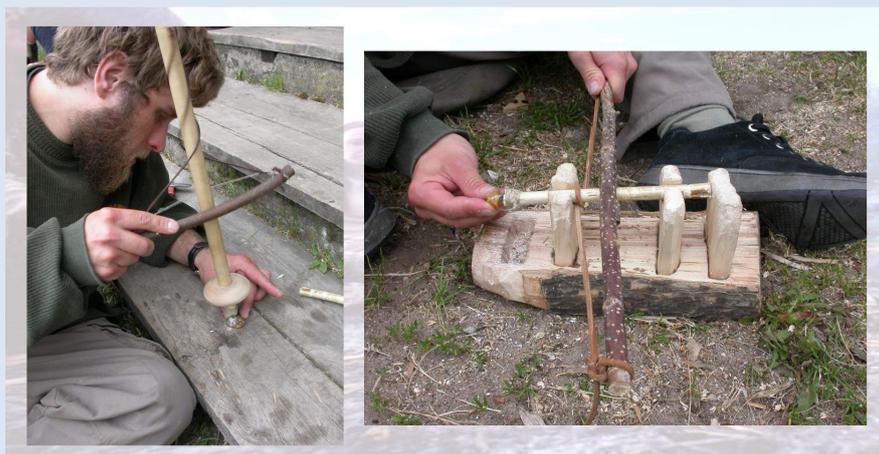


Fig. 6. Experimental processing of various types of plants.

The last type of experiments conducted at the camp were works aimed at reconstructing the prehistoric techniques of amber processing, and above all the methods of drilling holes in this material, using tools made of various stone and organic materials (Fig. 7).

In total, during the described camp, members of the Society for Prehistoric Experimental Archaeology performed about 150

different archaeological experiments. Some of them lasted a few minutes, others even 25 workhours. The results of these studies have already been used in several scientific articles, and the experimental tools used during the Camp are used every day at the Institute of Archaeology of the Nicolaus Copernicus University during microscopic analyses of prehistoric artefacts and the education of students. We would like to thank all participants of the camp for that!



References:

Osipowicz G. 2005a A method of wood tar production, without the use of ceramics. *EuroREA: (Re) construction and Experiment in Archaeology – European Platform*, 2, pp. 11-17.

Osipowicz G. 2005b Drilling through stone axes. *Experimentelle Archäologie in Europa*, 4, pp. 115-122.

Fig. 7. Experimental processing of amber.



The experimental casting of the model of a bronze mould and socketed axe from Elgiszewo, Poland, 900–700 BC

Described experiment was performed by Łukasz Kowalski, Aldona Garbacz-Klempka, Jacek Gackowski, Dominik Ścibior, Małgorzata Perek-Nowak, Kamil Adamczak and Piotr Długosz and was described in the article entitled: **Towards direct casting: Archaeometallurgical insight into a bronze mould from Elgiszewo, Poland, 900–700 BC.**, published in 2019 in the journal *Archeologické Rozhledy LXXI* (Kowalski et al 2019).

The complete two-part bronze casting mould (Fig. 1) was discovered by chance in 2013 in the village of Elgiszewo (Golub-Dobrzyń district, north Poland). The mould was part of the so-called founder's hoard deposited on the southern borders of the territory occupied by the Chełmno group of the Lusatian culture between 900 and 700 BC (Kowalski et al. 2019). The well-preserved negative parts indica-

te that the mould was designed to multiply the looped socketed axes. A widely held belief in Polish archaeology has been that metal moulds, due to their low thermal resistance, were used only for preparing wax or lead models. The aim of the presented experiment was to check if the mould from Elgiszewo was capable of ensuring direct casting and was in fact used by the Lusatian metalworkers for this purpose.



Fig. 1. Casting mould from Elgiszewo (Poland; courtesy of the Province Historical Monuments Conservation Office in Toruń; after Kowalski et al. 2019).

Methods

The experimental casting was divided into two stages and carried out in the Metal Color Starachowice foundry. In the first stage, a model alloy similar in chemical composition to the mould from Elgiszewo was used to cast an experimental mould. The mould was shaped in the sand mass. The melts were carried out in a graphite crucible and a NABER TERM resistance electric furnace. An organic coating was applied. The bath was mixed with a ceramic body and the temperature was monitored. The pouring was completed with the use of a thermocouple. The alloy was composed of pure ingredients which were successively introduced. After the chemical composition and temperature were stabilized, the sand form was poured at the temperature of 1180 °C. The second stage of the experiment involved casting the socketed axe which fit the reconstructed mould. The hardness (HB) of the axe model alloy was controlled. The HB testing was conducted on samples cut perpendicular-ly to the direction of casting and measured with a universal Brinell hardness tester at the temperature of 20 °C.

Experimental casting

In the first stage, a model alloy consistent with the chemical composition of the mould from Elgiszewo was used to cast an experimental mould (fig. Fa). The second stage of the experiment involved casting a socketed axe that would fit the reconstructed mould. The alloy used for the model axe was composed with reference to other LBA socketed axes (Przedmieście and Czarków type) recognized in terms of chemistry.

Two parts of the mould were covered with a layer of organic coating (composed of milled charcoal mixed with animal fat and ash in a 1:1 ratio) to prevent welding with the poured liquid metal. The coating was mechanically applied on the mould surface and fired in the flame of the burner. Next, both parts were matched together and pre-heated to the temperature of 130–150 °C (Fig. 2b). The casting temperature was 1150 °C. The alloy solidification proceeded very quickly due to the rapid dissipation of heat from the mould which was allowed to cool, and after 10 minutes, the casting was knocked out (fig. Fc).

Conclusions

An experimental approach proved that the mould from Elgiszewo could have been successfully employed by the Lusatian metalworker for direct casting. If the mass of the mould was adequately high in comparison to the casting, there was no danger of melting the mould. However, direct casting required an extremely short cast time of about 3 s. Otherwise, the final product would be incomplete in the edge parts. It is reported that the casting of fifteen socketed axes in one bronze mould is possible with no apparent damage to the mould (Baron et al. 2016, 188).

References:

Baron, J., Miazga, B., Ntaflos, T., Puziewicz, J., Szumny, A. 2016. Beeswax remnants, phase and major element chemical composition of the Bronze Age mould from Gaj Oławski (SW Poland). *Archaeological and Anthropological Sciences* 8, 187–196.

Kowalski Ł., Garbacz-Klempka A., Gackowski J., Ścibior D., Perek-Nowak M., Adamczak K., Długosz P. 2019. Towards direct casting: Archaeometallurgical insight into a bronze mould from Elgiszewo (900–700 BC, Poland) *Archeol. rozh.*, 71 (1) (2019), 45–66

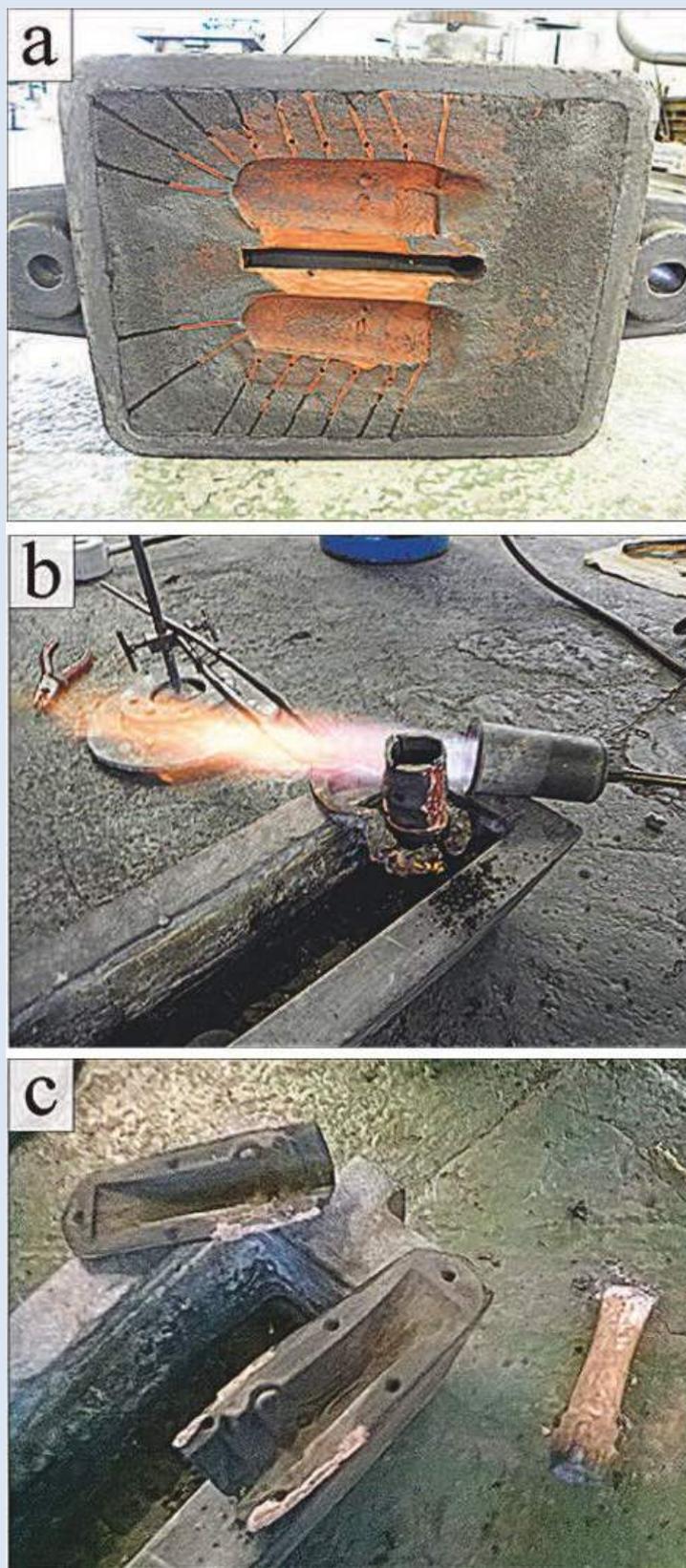


Fig. 2. The stages of the experimental casting of the Przedmieście type axe compatible with the casting mould from Elgiszewo: a – casting the mould; b – pre-heating the mould; c – knocking the casting out of the mould. (after Kowalski et al. 2019).

EAC12

Experimental Archaeology Conference

WORLD TOUR

Date: Monday, March 29, 2021 - Thursday, April 1, 2021

Experimental Archaeology: the Past in the Future

The #EAC12 Conference will be an “around the world in 80 experiments” taking place in March 2021 (exact dates to be confirmed). It will start in New Zealand & Australia, turning towards Asia, Africa, Europe, North and South America as the time proceeds. #EAC12 has online lectures as well as presentations by local hotspots in different time zones. With the lectures and hotspots, #EAC12 shows the diversity of experimental archaeology and the geographic spread. EAC12 is open access, and will include many ways of interaction between the participants, the speakers and the hotspots...

You can still register to the meeting at <https://exarc.net/meetings/eac12/registration>

We will be there too! :)

Our recent publications

Grzegorz Osipowicz, Justyna Orłowska, Giedrė Piličiauskienė, Gytis Piličiauskas

FRONTLETS FROM THE SOUTH-EAST COAST OF THE BALTIC SEA? SEAL CRANIUMS FROM ŠVENTOJI: A UNIQUE CLUE TO UNDERSTANDING THE SYMBOLIC CULTURE OF EUROPEAN MIDDLE HOLOCENE HUNTER-GATHERERS

Abstract: The starting point for the studies described in the article were the results of traceological studies of a collection of seal craniums discovered during archaeological excavations at a Subneolithic site complex in Šventoji, Lithuania. Microscopic analysis revealed repetitive technological traces and well-developed use damages on the surfaces, and the characteristics of which most likely indicate their use during ritual practices, possibly in a similar way to that suggested for antler frontlets known from several Mesolithic sites. This is the first such discovery in this part of Europe, shedding new light on the symbolic culture of the hunter-gatherer communities inhabiting the south-eastern Baltic Sea coast between 3200 and 2700 cal BC, and especially the role of seals and their skulls, what is discussed in the article in a wider perspective. The use-wear traces described in the article are also a unique example of damage created on the surface of artefacts that are associated with ritual practices, and can, therefore, provide important information in identifying and correctly interpreting similar objects of this type elsewhere.

In Journal: Journal of Archaeological Science: Reports 34 (2020) DOI: [10.1016/j.jasrep.2020.102638](https://doi.org/10.1016/j.jasrep.2020.102638)

