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Reviewed Article:

Killing the Cauldron: Experimental Research on Dented Bronze Cauldrons from the (post)Medieval Period

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Bronze cauldrons from the late Middle Ages, and the 16th and 17th century are hardly ever discovered during archaeological excavations but are usually unearthed by detectorists having discovered the find of their life. Many of these vessels happen to be damaged. Sometimes one or two legs are lost, or a piece of the rim is missing, more often they exhibit one or more dents. We know that in prehistory the ritual destruction of objects was common practice (Chapman, 2000; Verbaas and Van Gijn, 2007; Gerloff 2010; Knight, 2017; 2019).

Could this practice also have been performed on bronze cooking ware in a Christian setting in The Netherlands in the Medieval and Postmedieval periods? Considering the robustness of the bronze cauldrons, there are suspicions that many of the dents were not caused by someone accidentally dropping the vessel, but by a deliberate blow, for example with an axe. Experimental research is required to verify this hypothesis.

> “Of course, it is possible that a bronze cauldron may have slipped out of someone’s hands in the past. In such case, the height of the fall would have been about one and a half meters at most. However, the experiment demonstrated that much more energy is required for the dents and butts that we encounter on bronze cauldrons. The dents and butts must therefore have been deliberately inflicted. Why would you want to make a dent in a bronze cauldron?

Introduction

The experiment was carried out in June 2020 and is part of a PhD research at the Radboud University of Nijmegen. In that context, an inventory is carried out for The Netherlands, which resulted in more than 250 finds of bronze cauldrons recorded so far. Bronze cauldrons of the type in question (with three legs and with usually two lug handles) (See Figure 1) were rather common in many parts of Northwestern Europe. Dating of these vessels ranged from the 13th until the 17th centuries A.D., as they were being replaced by similar vessels of cast iron. Many of the bronze cauldrons from Germany have been studied and published by Hans Drescher (1969; 1982). A survey of English cauldrons was published by Butler and Green (2003).

The fact that many of the bronze cauldrons were damaged, has so far not surprised anyone. People find it quite normal that a clay pot which is broken, subsequently was thrown away and ended up as garbage. Pottery that fell apart could not be repaired and could no longer be used for any other purpose. For a bronze cauldron, the situation is quite different. Once broken or worn out, such vessels still had a considerable residual value as a raw material. It could be melted down, thus delivering the customer a considerable discount on the acquisition of a new cauldron. Therefore, the presence of bronze cauldrons found in soil does not make sense.

Bronze cauldrons played a role in ritual practices in the Middle Ages and beyond (Van Vilsteren, 2005; 2007; 2008; 2013; 2014a; 2014b). It appears that many of the bronze cauldrons have been deliberately deposited, although the reasons for their deposition were not always clear. Unfortunately, historical sources that mention this practice are lacking.

Several arguments may be given for the interpretation that bronze cauldrons were deliberately deposited:

1. The cauldrons were almost always discovered as solitary finds: hardly ever is there any settlement waste found in association with the bronze vessels, therefore, they have not been thrown away as waste.
2. The number of cauldrons was far too high to be viewed as 'accidentally lost or forgotten'.
3. Remarkably, often the cauldrons have been found in a 'wet context', i.e., in moors, in brook valleys, in rivers, in harbors, in wells or in moats of cities or castles.
4. Bronze cauldrons - even if they were worn or damaged - still had too much residual value to be discarded.
5. Often the cauldrons were damaged. Taking the robustness of the vessels into account, the percentage of damaged cauldrons was so high that an explanation in terms of deliberate damage should be taken into consideration. In some cases, even for a single cauldron it can be demonstrated that the vessel must have been damaged intentionally.
6. Sometimes cauldrons have not been finished by the founder and/or show no traces of being used for cooking, suggesting they were produced especially for deposition (Van Vilsteren, 2014a; 2014b).

Damage

So far it has only rarely been possible to determine if an individual cauldron has deliberately been deposited (or 'sacrificed'). The proof for such practice has to be extracted from general patterns emerging from the total number of inventoried vessels. Specific damage patterns can be used as an argument that a specific vessel was deliberately deposited. If the damage resulted not from a fall, then it was deliberately inflicted by people prior to deposition. Such is the case with a bronze cauldron found in 1867 near the church of Eelde, in the Dutch province of Drenthe (See Figure 2). On the underside of this pot two attempts were clearly visible made to pierce the bottom from the inside with a pointed object (See Figure 3). Neither attempt was successful. On both damage sites, the bottom of the pot had been torn and pushed outwards. Such damage was intentional. It looks as if, because it failed to pierce the bottom, a dent was made on the outside of the belly of the cauldron, in the middle between both handles. This dent too, cannot have been caused by a fall on a floor or paving, as the dent site is not easily accessible (See Figure 4).

Such damage patterns frequently occur on other bronze pots (Van Vilsteren, 2020b). The frequent occurrence suggests that such damage was inflicted deliberately, an assumption that needs to be substantiated. An experiment could establish the provenance of the dents: were they the result of accidental falls or intentional mutilations?

The experiment

The experiment was carried out with collaboration from Jaap Verhage, a retired lecturer in materials science and metallurgy at the NHL University of Applied Sciences in Leeuwarden. To

make the experiment controlled, measurable, and reproducible, a bronze cauldron was attached to a pendulum or swinging arm (See Figure 5). For a good comparison we wanted to swing the cauldron with the pendulum in a controlled way from varying heights against various materials. We opted for a wooden plank, a soft brick, a boulder of quartzite sandstone, an iron axeblade, and the back of an iron axe. Of course, the dents that would be inflicted with the axe were not meant to imitate an unlikely fall on an axe, but to show what kind of impact a blow with an axe would have on a bronze cauldron.

For the experiment two bronze pots were available, both were from the antiques trade without archaeological context (See Figure 6). The first one was supplied by Jaap Verhage from his own collection. This cauldron appeared to have one of the three legs (relatively recently) being replaced by a new one of high zinc content. The second one was somewhat larger and was acquired at the auction site Catawiki thanks to a grant from the Scientific Fund of the Drents Prehistoric Society. Both cauldrons were of a wide-mouthed type, fairly common in the Netherlands in the 16th and 17th century.

		Cu	Sn	Pb	Sb	Ni	As	Zn
		%	%	%	%	%	%	%
Cauldron 1 (small)	rim	77,27	3,63	11,38	4,54	1,12	1,85	<0,0
	belly	80,66	3,61	7,99	4,53	1,12	1,8	<0,0
	handle 1	75,61	3,42	13,8	4,26	1,07	1,68	<0,1
	handle 2	78,16	3,78	10,22	4,73	1,08	1,77	<0,0
	leg 1 (repair)	69,05	0,64	2,05	0,02	0,03	0,33	27,87
	leg 1 (repair)	65,09	0,86	3,22	0,04	0,05	0,12	29,93
	leg 2	75,51	3,6	13,72	4,41	1	1,52	0,03
	leg 2	68,12	4,48	17,41	5,65	1,33	2,6	<0,0
	leg 3	68,52	3,39	21,33	4,05	0,96	1,46	0,1
Cauldron 2 (large)	rim	78,94	4,27	11,36	3,26	0,66	1,27	0,08
	rim	77,66	4,47	12,33	3,38	0,67	1,23	0,08
	belly	80,76	4,17	9,85	3,12	0,66	1,16	0,08
	belly	78,26	4,26	12,11	3,2	0,66	1,2	0,1
	handle 1	79,68	4,68	9,91	3,49	0,67	1,34	0,08
	handle 2	79,29	4,69	10,23	3,56	0,63	1,4	0,06
	leg	55,62	5,82	31,11	4,51	0,78	2,01	0,09

TABLE 1. CHEMICAL COMPOSITION OF THE TWO BRONZE CAULDRONS. ANALYSIS (XRF) BY DR. BERTIL VAN OS, STATE SERVICE OF ARCHAEOLOGICAL HERITAGE (RCE) IN AMERSFOORT, THE NETHERLANDS.

As to their metallurgical properties the cauldrons used in the experiment were quite representative for the group of late medieval cauldrons from archaeological contexts.

Analysis of their chemical composition did not reveal any abnormal percentages of Cu-Sn-Pb (cf. Dungworth and Nicholas, 2004, p.26). So, the results of the experiment should also be valid for other vessels. The experimental pendulum consisted of a tubular frame that was attached to a pergola in the garden of the author's house in Assen. The biggest problem was how to attach the vessel to the pendulum in such a way that all the energy of the blow would be used to create the dent. No energy could 'leak away' by a distortion of the cauldron after the collision with the brick, the boulder or the axe.

A lot of time was spent positioning the vessel correctly. To make this as easy as possible, a multi-axis vice was attached to the pendulum, thus achieving maximum flexibility in freely maneuvering the pot in any position (See Figure 7). The advantage was that in dropping the cauldron this allowed us to target the exact position where we wanted the dent to be inflicted. The disadvantage was that the pendulum itself and the vice provided extra mass, which of course affected the amount of energy at impact. Thus, there would be too much energy released at the blow on the cauldron compared to a free fall of the cauldron on its own. This extra mass of the tube and the vise, however, could be measured, thus allowing us to use specific formulae to calculate exactly how much energy was released during the blow.

We dropped the cauldrons from three different heights: about 40, 80 and 120 centimeters. At each attempt, the exact height of the fall was noted accurately to the centimeter. These were the heights in which the mass of the pendulum was included. If we wanted to convert the mass to only the weight of the cauldron (excluding the masses of the tube and the vice), then this corresponds for pot 1 weighing 1.73 kg with falling heights of approximately 11, 20 and 43 meters. For the slightly heavier pot 2 (2.63 kg.) it corresponded to heights of 12, 24 and 48 meters.

Results

The attempt with wood yielded only a small superficial dent in pot 2 (See Figure 8, nr. 20). In pot 1, the drop on the wood left no dent. Wood clearly made the energy of the impact spread over a relatively larger surface. Brick also yielded only minimal results, no more than some bumpy dents were left after falling (See Figure 8, nrs. 4, 21 and 23). In the attempts with the boulder (See Figure 8, nrs. 5, 11, 12, 24, 25 and 31) the energy of the impact was not spread that much. The boulder hit one spot, admittedly, but even at a height of fall of 43 meters (pot 1, See Figure 8nr. 12) and 48 meters (pot 2, See Fig. 8, nr. 31) the resulting dent was not comparable to the dents usually found on the bronze cauldrons from an archaeological context.

Apart from a dent the experiments with falling on wood, brick and boulder did not yield a crack in the wall of the cauldron, even when dropped from a considerable height (after correction more than 40 meters). This observation is very important, as cracks are regularly observed on vessels from archaeological provenance.

The attempts with the axe did result in dents similar to those observed in cauldrons from archaeological contexts (See Figure 9). There was a large difference between the impact of the axe blade on the one hand (See Figure 8, nrs. 8, 9, 10, 26, 27 and 30) and the impact of the axe butt on the other hand (See Figure 8, nrs. 6, 7, 28 and 29). The 10-centimeter-long blade of the axe left an elongated dent with a clear imprint of the axe's blade. The length of that imprint was directly related to the height of fall of the cauldron. In addition, the dents in the lighter pot 1 were also significantly smaller than in pot 2. In cauldron 1, only the smallest fall height did not result in a crack in the wall (See Figure 8, nr. 8). The other two fall heights resulted in a clear crack in the pot. Whereas for pot 2, cracks resulted in impacts from all three heights.

The attempts with the butt of an axe had a greater impact. The energy was spread over a much smaller area than for the blade of the axe. The dents and the cracks created in the cauldrons wall with the axe's butt corresponded with the damage that we have encountered in vessels from an archaeological context. The resemblance was most striking at the fall height of 80 centimeter (pot 1; See Figure 8, nr. 6)) and 88 centimeters (pot 2; See Figure 8, nr. 29). This corresponded to a corrected fall height from almost 20 to more than 26 meters, respectively. It is inconceivable that a cauldron would have fallen precisely from that height on the butt of an axe and therefore we can conclude that the axe has 'fallen' on the pot - in other words that someone gave the cauldron a firm blow with the butt of an axe.

A short film of the experiment is to be seen below (Film by G.Ph. Alberts):

Leg and rim

Apart from dents on various parts of the vessel, other types of damage regularly occur on bronze cauldrons from archaeological contexts: a missing leg (See Figure 11) and a piece of broken out rim. The breaking of a leg is a phenomenon that must have been very widespread, given the number of detached legs found by detectorists. Besides the attempts to produce dents in the experiment, we also tried to measure how much energy it would take to break a leg and to break a piece of the rim. Although we dropped both cauldrons at the most advantageous angle, the attempts failed in breaking a leg on wood or brick. The fall attempts on a boulder were more successful in this respect. But with cauldron 1, it first failed from 40 centimeters and only succeeded at a fall height of 84 centimeters (converted after use of formulae to 26 meters). For cauldron 2, it took a fall height of 124 centimeters to break off a leg (converted to 52 meters). It is of course unthinkable that all those legs collected by detectorists were broken by a fall from the first or second floor of the nearest bell tower. Thus, for detached legs, intentional mutilation seems to be the only possible conclusion.

The same conclusion must be drawn about breaking a piece off the rim. This type of damage, which is also often encountered on bronze cauldrons, could not be achieved with a fall on wood, brick, or a boulder in the experiment. Even blow on the outside of the rim with the back of the axe did not result in breaking a piece of the rim (See Figure 12 yellow arrows). This is not unexpected, because the blow was inflicted on the convex side of the rim. The arched shape gives extra resistance to the material from deformation. In the case of cauldron 2, the back of an axe only managed to break a piece off the rim when it hit the (hollow) inside of the rim (See Figure 12 red arrows). For cauldron 1, every attempt to break off a piece of the rim by a blow on the inside failed. In case a pot is dropped accidentally, it is impossible that any energy is released on the rim of the vessel from the inside. The breaking of a piece of the rim must therefore always have been the result of an impact on the inside of the rim, in other words of an intentional blow on that spot with, for example, an axe.

Discussion

Of course, it is possible that a bronze cauldron may have slipped out of someone’s hands in the past. In such case, the height of the fall would have been about one and a half meters at most. However, the experiment demonstrated that much more energy is required for the dents and butts that we encounter on bronze cauldrons. The dents and butts must therefore have been deliberately inflicted. Why would you want to make a dent in a bronze cauldron? At the beginning of this paper several arguments were given as to why bronze pots ended up in the soil as intentional depositions. Intentional damage of the cauldrons fits these statements perfectly and supports the evidence. We cannot interpret this in any way other than as a form of ritual mutilation. It resulted in a cauldron no longer being treated as a cooking pot, but as an object of deposition or 'sacrifice'.

Such ritual mutilation is not unique to bronze cauldrons. We also know the phenomenon from other groups of objects. For example, Knol and Bardet (1990, p.220) described several swords from the early Middle Ages that were ritually bent. From prehistoric times mutilated saddle querns have been reported (Verbaas and Van Gijn, 2007), as have bronze axes and bronze swords (Knight, 2017; 2019). From a slightly younger period (Late Iron Age and Roman times) milling stones of tephrite were also intentionally damaged (Hopman, 2013). The occurrence of ritual mutilation is also reported for pottery from the Iron Age and Roman period (Nieuwhof, 2018). The rituals in which the intentional mutilation was performed may be very diverse. However, we do not know the exact nature of those rituals. In the case of the bronze cauldrons, we may have a clue. There are strong indications that deposition often took place at the beginning of a large-scale project (Van Vilsteren, 2019; 2020a;, 2020b). This may have been the construction of a castle or a rampart, the construction of a city wall, the building of a dyke, a dangerous crossing of the sea, the cultivation of a piece of farmland or the reclamation of a peat bog. For all kinds of projects, salvation and blessing could be requested in the form of a deliberate deposit of a bronze cauldron. It is therefore directly comparable with the Medieval ritual of laying a few coins under the foundation stone (De Vries, 1994, pp.111-120; Van Uytven, 2011).

Epilogue

The experiment emphatically forces us to take a closer look at the bronze cauldrons that are known so far. An excellent example is the vessel that was discovered in 2012 during an excavation in the Medieval centre of the Dutch city of Coevorden. During sewage works a large bronze cauldron was discovered in the Weeshuisstraat in a raised platform, dated to the 14th century (See Figure 12). The pot was torn apart by the digger during excavation and the upper part was partly collected from the dump. However, the pieces were fitted together after retrieval. A silver coin was found in the pot - a Brabant sterling, minted between 1323 and 1336 under the reign of Jan I van Kuinre. This is the only coin-dated bronze cauldron in The Netherlands. The pot was damaged by the excavator so severely, that the dent in the belly did not appear to be of note. It was not even mentioned in the excavation report (Nooijen, 2013, p.18). Yet this dent (See Figure 13) gives important information about the interpretation of the find. The experiment has shown that such damage cannot possibly have been caused by an accidental fall on wood, brick or a boulder. The dent is highly comparable to the damage caused in our experiment by the butt of an axe, especially to the tests with a fall height of more than 20 meters (See Figure 8. nr. 29). This implies that the dent could only have been caused intentionally by a severe blow with the back of an axe or a hammer. We may assume that the construction of the platform in which the cauldron was found was the reason for this ritual. Perhaps this raised platform was related to the digging of a moat. Nevertheless, it was a large-scale earthworks operation in which such a ritual action was deemed appropriate.

The ritual destruction or 'killing' of a cauldron reminds us of a phenomenon practiced in the Aegean Bronze Age where objects such as bronze vessels, pottery, figurines, and weapons were deliberately destroyed (Chapman, 2000). Such mortuary ceremonies have tentatively been interpreted as "a rite of passage before entering to the ritually controlled heterotopic space of death" (Hamilakis, 1998, p.122). The ritually killed / sacrificed cauldron in Medieval Coevorden may very well have been an object involved in a similar 'rite of passage', associated with the beginning of a largescale earthmoving operation. The frequent occurrence of dents on Medieval cauldrons in The Netherlands suggests that the practice of deposition at the start of a large-scale project was widespread in Medieval society of The Netherlands.

The results of the experiment are currently being analysed in more detail with a more extensive report in preparation (Van Vilsteren and Verhagen, Forthcoming).

Keywords container / vessel
bronze

Country the Netherlands

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FIG 1. THE AUTHOR AMIDST THE COLLECTION OF BRONZE CAULDRONS OF ‘HIS’ MUSEUM, THE DRENTS MUSEUM IN ASSEN (NL). PHOTO BY J.R. BEUKER.

FIG 2. THIS BRONZE CAULDRON (24,5 CM HIGH) WAS DISCOVERED IN 1867 NEAR THE CHURCH OF EELDE (NL). DATING 14TH CENTURY. BOTH BOTTOM AND BELLY HAVE SUFFERED RITUAL MUTILATION. COLLECTION AND PHOTO DRENTS MUSEUM.

FIG 3. THE UNDERSIDE OF THE CAULDRON FROM EELDE SHOWS TRACES OF TWO ATTEMPTS (ARROWS) TO PIERCE THE BOTTOM FROM THE INSIDE. SUCH DAMAGE CAN ONLY BE INTENTIONAL. PHOTO BY V.T. VAN VILSTEREN

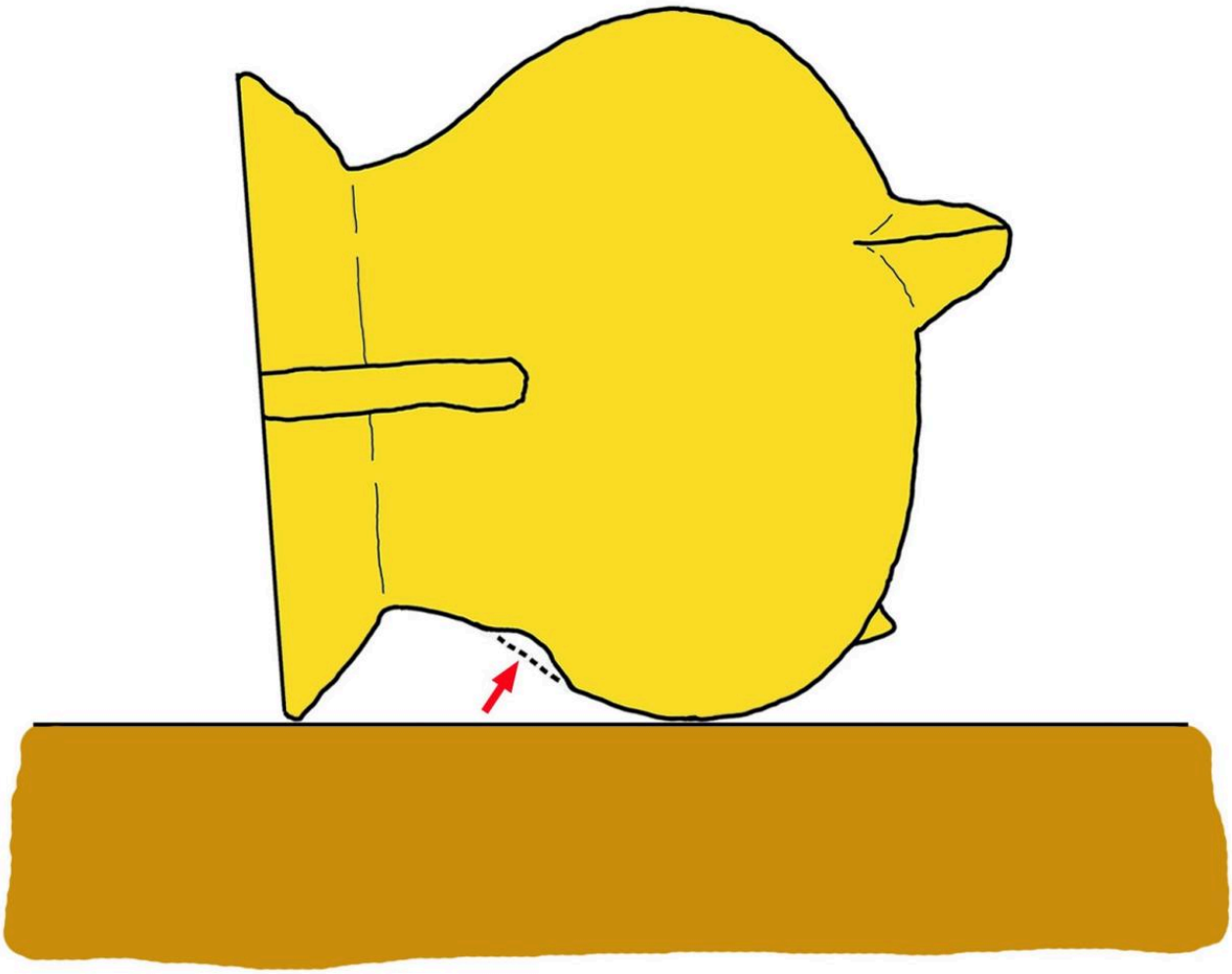

FIG 4. THE POSSIBILITY THAT THE DAMAGE ON THE BELLY OF THE CAULDRON FROM EELDE WAS CAUSED BY AN ACCIDENTAL FALL IS RULED OUT BY THE POSITION OF THE DENT. DRAWING BY V.T. VAN VILSTEREN.

FIG 5. THE CONSTRUCTION OF THE PENDULUM USED FOR THE EXPERIMENT. IN THIS CASE THE CAULDRON IS CLOSE TO A COLLISION WITH A BOULDER OF QUARTZITE SANDSTONE. PHOTO BY J.R. BEUKER.

FIG 6. THE TWO BRONZE CAULDRONS FROM THE ANTIQUE TRADE, STILL IN IN UNDAMAGED SHAPE BEFORE THEY WERE MUTILATED IN THE EXPERIMENT (H. 15,4 AND 18,6 CM; W. 1726 RESP. 2628 GR.). PHOTO BY J.R. BEUKER.

FIG 7. IN ORDER TO BE ABLE TO MANEUVER THE CAULDRON FREELY IN ANY POSITION IN THE EXPERIMENT, THE VESSEL WAS FASTENED BY A MULTI-AXIS VISE ATTACHED TO THE PENDULUM. PHOTO BY J.R. BEUKER.

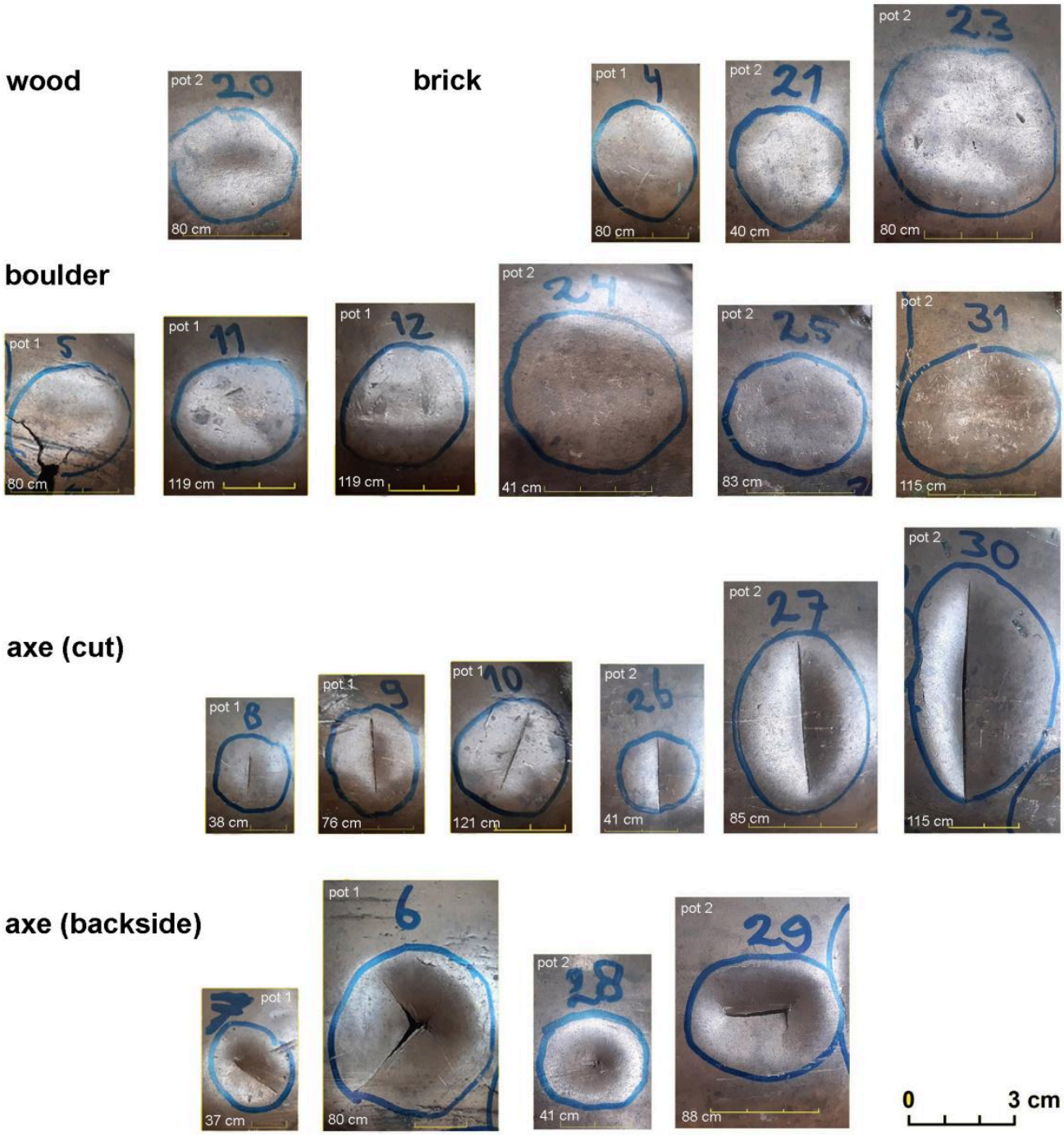

FIG 8. EXPERIMENTAL MUTILATION OF THE TWO BRONZE CAULDRONS: RESULTS OF THE ATTEMPTS WITH WOOD, BRICK, BOULDER, AND AXE. NOTE THAT THE CRACK AT NR. 5 IS NOT THE RESULT OF THE ATTEMPT WITH THE BOULDER, BUT OF A LATER ATTEMPT TO BREAK OFF THE NEARBY LEG. PHOTO BY V.T. VAN VILSTEREN.

FIG 9. CAULDRON NR. 2 AFTER THE ATTEMPTS. LATER ON, WE ALSO MANAGED TO STRIKE A PIECE OUT OF THE RIM. PHOTO BY E.M. KOERSELMAN.

FIG 10. CAULDRON NR. 1 HITTING THE BACK OF AN IRON AXE. PHOTO BY J.R. BEUKER.

FIG 11. BRONZE CAULDRON (H. 20,2 CM) IN 1906 DREDGED OUT OF THE RIVER WAAL NEAR WINSSEN, MUNICIPALITY OF BEUNINGEN. DATING 14TH CENTURY. COLLECTION NATIONAL MUSEUM OF ANTIQUITIES, LEIDEN. PHOTO BY V.T. VAN VILSTEREN.

FIG 12. CAULDRON 2. IN ATTEMPT 40 (YELLOW ARROWS) A BLOW WITH THE BACK OF AN AXE ON THE OUTSIDE OF THE RIM DID RESULT IN A CRACK, BUT NOT IN BREAKING A PIECE OF THE RIM. IN ATTEMPT 41 (RED ARROWS) A BLOW WITH THE BACK OF AN AXE ON THE INSIDE OF THE RIM DID RESULT IN BREAKING A PIECE OF THE RIM. PHOTO BY V.T. VAN VILSTEREN.

FIG 13. THE CAULDRON DISCOVERED IN 2012 DURING AN EXCAVATION IN THE MEDIEVAL CITY CENTRE OF COEVORDEN. COLLECTION NOORDELIJK ARCHEOLOGISCH DEPOT NUIS. PHOTO AND DRAWING BY V.T. VAN VILSTEREN.

FIG 14. DETAIL OF THE DENT IN THE BELLY OF THE COEVORDEN CAULDRON. THE RESEMBLANCE WITH DENT 29 (SEE FIG. 8. NR. 29) IS STRIKING. PHOTO BY V.T. VAN VILSTEREN