

# FROM POLISHING TO BURNING: DECIPHERING A MIDDLE NEOLITHIC HOARD FROM BERINGEN BROUWERSHUIS (BELGIUM) THROUGH FUNCTIONAL ANALYSIS

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## ABSTRACT

The Beringen Brouwershuis hoard, distinguished by its well-documented and radiocarbon-dated context, offers a unique opportunity to explore the hoarding practices of the Middle Neolithic period in the Campine region of Belgium. As one of the few excavated hoards from this period, it provides rare contextual information about these hoarding practices. This study aims to provide new insights into the life cycles of buried lithic artefacts through a detailed functional and contextual analysis. By employing macro- and microscopic analytical methods, we examined residues and use-wear traces on 17 artefacts, including six polished axes, seven endscrapers, and four smaller tool fragments. The detailed functional analysis of these stone tools confirmed that they were hafted, used, and resharpened before being deposited. Moreover, it enabled the reconstruction of a unique biography for each individual artefact, demonstrating that each had a distinct life encompassing own set of lifecycles stages.

**Keywords:** Neolithic, Michelsberg, hoards, functional study

## Introduction

Here, we present a detailed functional analysis of axes and endscrapers recovered from a depositional context at the Beringen Brouwershuis site during developer funded excavations. This deposition pit is composed of a diversity of artefact types including a core, flakes, bladelets, different axe types, multiple scrapers and a hammerstone, with most tools showing significant heat damage (Geerts et al. 2021). This has led to the hypothesis that these artefacts were deliberately selected and burned, possibly as part of a ritual (Geerts et al., 2021). Notably, the fire did not occur directly in the deposition pit, as evidenced by the scarcity of charcoal pieces or other in situ indications for heating. The missing fragments further suggest that the tools were exposed to fire elsewhere before being deposited. The dating of charcoal fragments, combined with typological characteristics of the objects, attributes the assemblage to the Michelsberg culture (Geerts et al., 2021).

The Michelsberg culture, which emerged in the late 5th millennium BC, represents the Middle Neolithic in Belgium and is primarily associated with sites in the country's fertile loess region (Bakels 2009; Vermeersch & Burnez-Lanotte 1997; Vanmontfort 2004, 2022). This culture originated in the Paris Basin and expanded into the Rhine and Neckar valleys (Scollar 1959; Jeunesse 1998; Beau et al., 2017), with flint mining as a distinctive cultural marker (Allard et al. 2008; Bostyn et al. 2023). Michelsberg material culture has been characterised through studies of various artefact types, including ceramics (Vanmontfort et al. 1997), macrolithic tools (Messiaen et al. 2019), and lithic tools (Vermeersch et al., 1990). The lithic assemblage of the Michelsberg culture is notable for its specific tools, such as tranchets, polished axes, and a significant number of endscrapers (Vanmontfort et al., 2001/2002; Vanmontfort 2004; Schreurs 2016). While the evidence for the Michelsberg culture in Belgium is well-documented in the fertile loess belt, little is known about it in the sandy Campine region (Vermeersch & Burnez-Lanotte 1998). The discovery of the deposition pit at Beringen Brouwershuis, located within the Campine region, provides thus a unique opportunity to enhance our knowledge in this area.

In this study, we adopt a biographical approach inspired by Van Gijn and Wentink (2013) to explore the lifecycle of artefacts recovered from the Beringen Brouwershuis site. This approach considers that artefacts often accumulate diverse meanings and functions throughout their existence, reflecting changing social and ritual contexts. By examining wear traces and residues that were accumulated during all stages of the active life (e.g., production, hafting, use, maintenance and recycling) and afterlife (e.g., deposition, destroying, burying) of the artefacts, the often-complex biographies of these lithic artefacts can be reconstructed (Van Gijn 2009).

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## Material and methods

### Site context

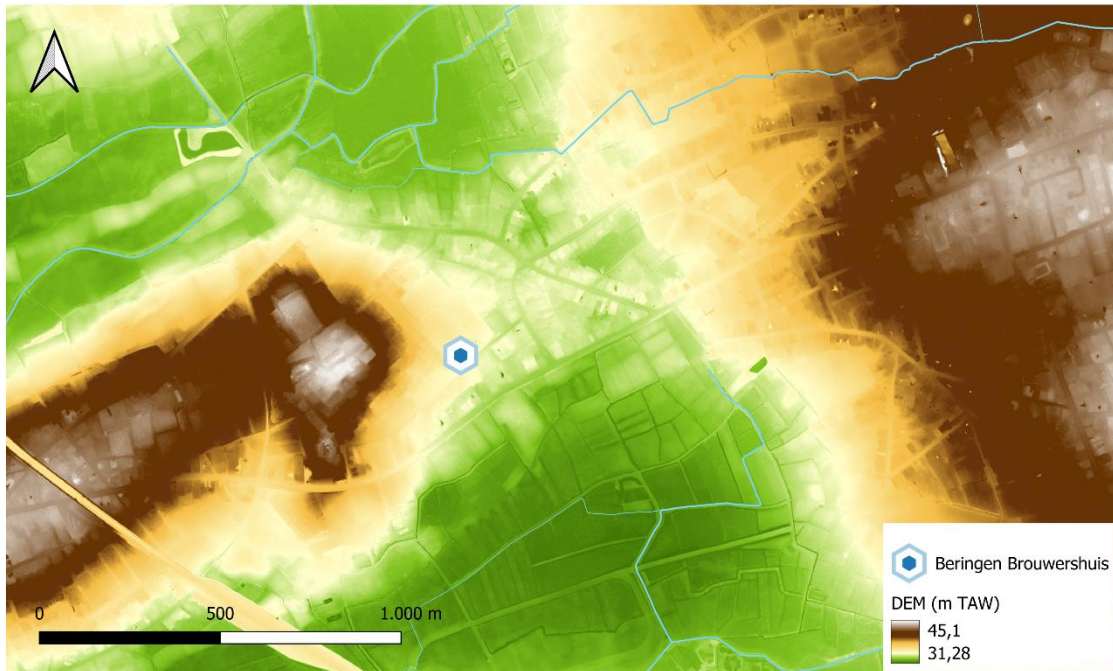
In 2020, a developer funded excavation was conducted in Koersel (Beringen, Limburg province, Belgium), located in the heart of the Campine region, which is known for its characteristic drift sands. This area lies geomorphologically on the intersection of the glacia of Beringen-Diepenbeek to the east and the Lummen hills to the west (Beerten et al., 2018), forming a unique transition zone between the elevated Campine Plateau to the east and the lower Campine Plain to the west.

The site has an interesting position within the local topography as it is situated approximately 34.5 meters above sea level, at the eastern footslope of one of the easternmost Lummen hills that reaches 44.5 meters above sea level. The 2 km long and 400 m wide hill is oriented southwest to northeast. The subsoil consists of a well-drained loamy sand, where a moderately dry podzol soil has developed (Fig. 1). The site location may have provided strategic and environmental advantages, with a connection to the top of the hill at only 300 m distance that will have offered a comprehensive view of the surrounding landscape.

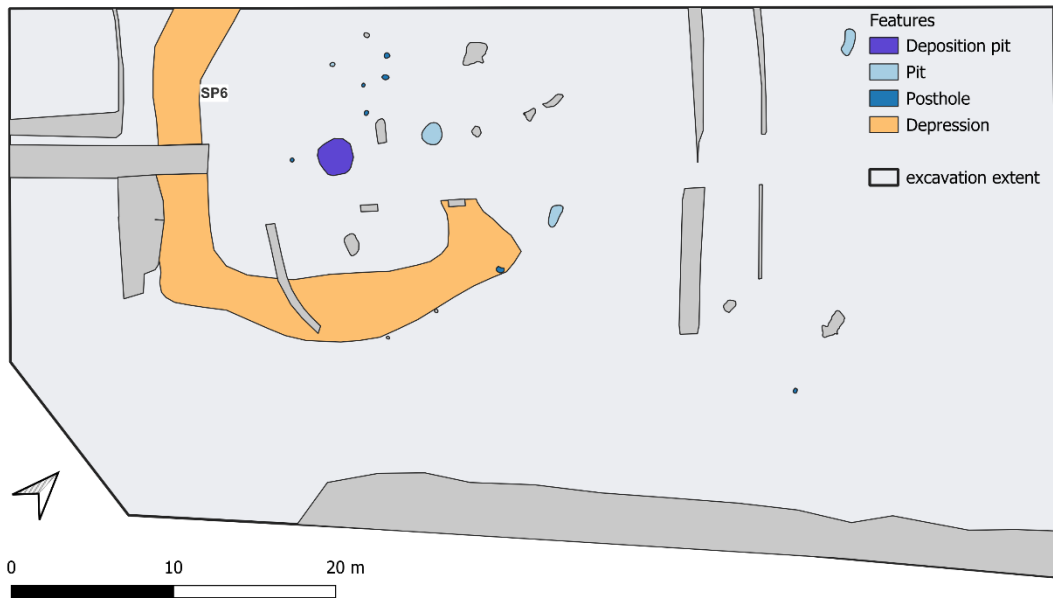
One of the most important discoveries at this site was a deposition pit (SP8) containing 53 lithic artefacts (see Table 1), including polished axes and scrapers (see Fig. 3) two pottery sherds, and

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89 fragments of charcoal. The pit, about 0.5 square meters large, was centrally located within a zone  
90 surrounded by an approximately four-meter-wide feature with distinct soil development, interpreted  
91 as a ditch (see Fig. 2).



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93 **Figure 1** - The location of the archaeological site within the local topography. DEM  
94 © Digitaal Vlaanderen.



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96 **Figure 2** - Plan of the Beringen Brouwershuis site with indication of the observed  
97 archaeological features (adapted from Claessen et al. 2021, fig. 32).

98 The deposition pit has been attributed to the Michelsberg culture, on the basis of radiocarbon  
99 dating and the typological characteristics of the scrapers (Geerts et al., 2021). Radiocarbon dating  
100 of two charcoal samples from different depths in the fill of the deposit pit SP8 provided a date of  
101  $5200 \pm 38$  BP (Ua-67453), between 4059 and 3949 cal BC (with a probability of 87.1%), and 5144

102 ± 37 BP (Ua-67454), between 4041 and 3803 cal BC (with a probability of 95.4%). Additionally,  
 103 the typological characteristics of the scrapers, particularly the hoof shape of some, support a  
 104 cultural attribution to the Middle Neolithic Michelsberg culture (Schreurs 2016). The types of  
 105 polished axes and the use of flint mined from the Lanaye chalk (Schreurs 2016; Vandendriessche  
 106 et al., 2015), further reinforce this attribution.  
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<i>Artefact type</i>	<i>Quantity (N)</i>	<i>Damaged by fire (N)</i>
<i>Core</i>	1	1
<i>Flake</i>	20	20
<i>(Micro)blade</i>	5	5
<i>Axe</i>	4	3
<i>Tranchet</i>	1	1
<i>Axe pre-form</i>	1	1
<i>Scraper</i>	10	7
<i>Retouched flake</i>	1	1
<i>Tool fragments</i>	8	7
<i>Hammerstone</i>	1	0
<i>Pebble</i>	1	0
<i>Total</i>	53	46

108  
 109 **Table 1** - Typo-technological characteristics of the 53 lithic materials that were found in the  
 110 deposition pit  
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**Figure 3** - Morphological variability of the deposited axes and scrapers (Geerts et al., 2021, Fig. 4)

115 **Materials and methods**

116 A total of 17 artefacts, most promising for functional analysis, were selected from the 53 lithic  
 117 artefacts. This included six polished axes and one associated potlid fragment, seven mostly  
 118 complete scrapers, and three scraper fragments. The preservation state of each tool was first  
 119 determined, thereby focussing on a meticulous documentation of traces that result from post-

120 depositional processes and their distinction from possible functional wear (Cnuts and Rots 2024,  
121 Tomasso et al. 2021). The presence and intensity of six types of alteration were evaluated: patina,  
122 gloss, heat damage, rounding, and metal traces. Alterations resulting from intense heat exposure  
123 received special attention, such as fractures, potlids, cracks, or discoloration.

124 Microscopes with varying technical characteristics (e.g., magnification, lighting techniques)  
125 were used to detect edge and surface modifications and residues. A Zeiss Macro-Zoom V16  
126 microscope, equipped with PlanApo Z objective lenses (0.5x/0.125 and 1.0x/0.25) and offering a  
127 magnification range from 5.6x to 180x, was employed. For higher magnifications, a Zeiss Axio  
128 Imager M2m metallographic microscope was utilised, featuring 10x oculars and six objective  
129 lenses (EC Epiplan 5x/0.13 HD; EC Epiplan-Neofluar 10x/0.25 HD DIC; LD EC Epiplan-Neofluar  
130 20x/0.22 DIC; LD Epiplan 20x/0.40; LD Epiplan 50x/0.50; and LD EC Epiplan-Neofluar 100x/0.75  
131 DIC) with magnification capabilities ranging from 50x to 1000x.

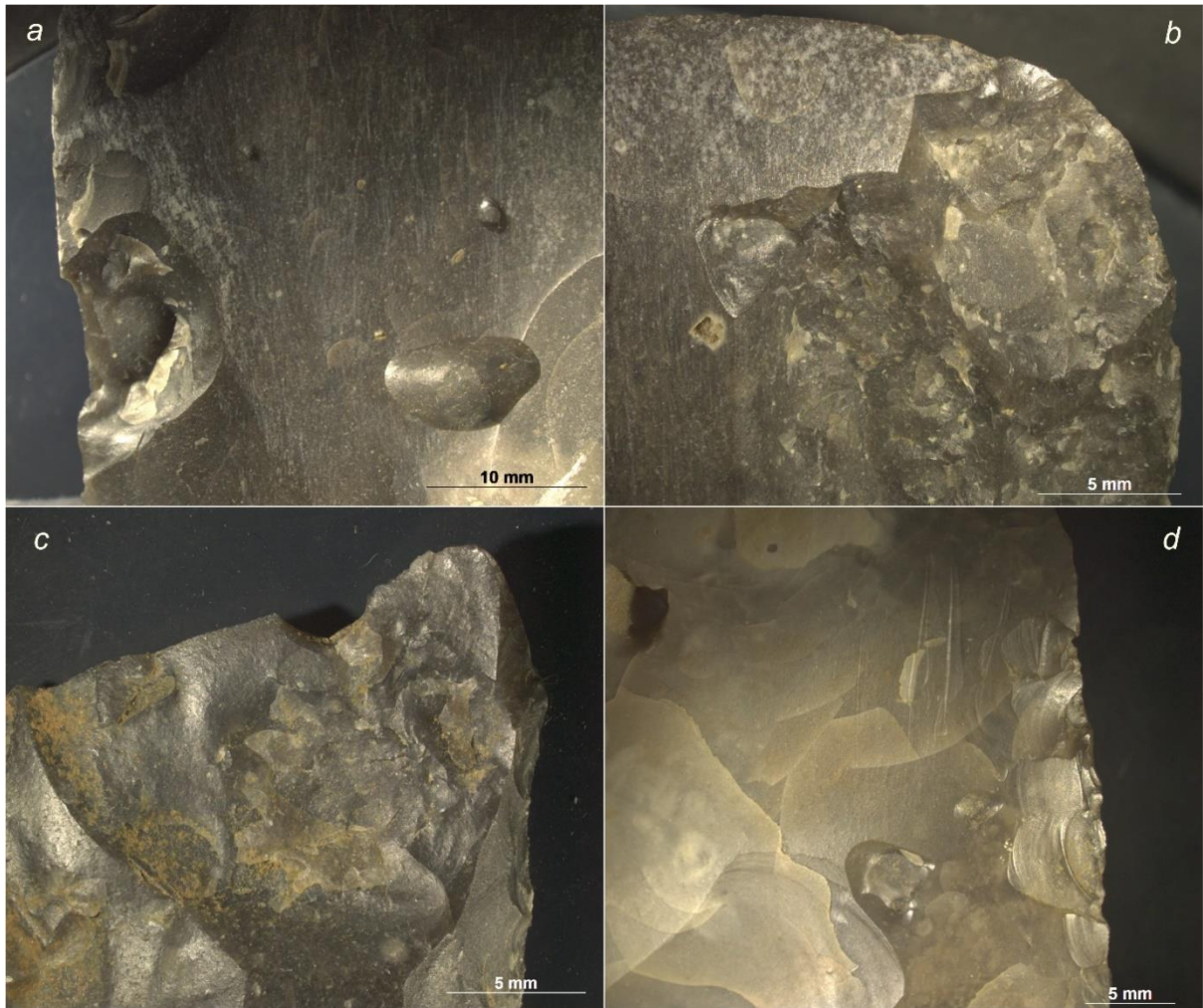
132 To better visualise certain microscopic details, a JEOL IT 300 scanning electron microscope  
133 (SEM) was used. The interpretation of all wear traces and residues relied on comparisons with the  
134 large experimental reference collection TRAIL of TraceoLab, which includes more than 7,000 lithic  
135 artefacts (Rots 2021). TRAIL includes artefacts submitted to a wide variety of processes and is  
136 representative for wear traces from production (Rots 2010b), hafting (Rots 2010a), and use (Rots  
137 2021), including projectile impact (e.g. Coppe 2020; Coppe & Rots 2017; Lepers et al., 2024).  
138 TRAIL also includes artefacts from taphonomic experiments (e.g. Michel et al. 2019, Michel and  
139 Rots 2022, Cnuts and Rots 2024) and experiments related to the impact of excavation (e.g.,  
140 contact metal tools, sieving) (Cnuts et al 2021) and storage (eg. Rots 2010b). The elemental  
141 composition of the residues was further characterised with a JEOL IT300 scanning electron  
142 microscope (SEM) equipped with energy-dispersive X-ray spectroscopy (EDX).

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## Results

### 144 Post-depositional traces and residues

145 Thirteen of the selected artefacts exhibited clear damage from heat, consisting of potlid  
146 negatives, fractures and edge scarring (Fig. 4), which indicates direct and intense exposure to fire  
147 and significantly limits the potential of functional analysis for some tools. In contrast, three scrapers  
148 and one axe lacked clear evidence of exposure to heat. Little or no impact from other post-  
149 depositional processes was observed in the sample. The absence of traces from mechanical  
150 weathering, such as rounding, abrasion, or edge damage, indicate a rapid burial of the material.  
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**Figure 4** - Examples of heat altered artefacts with (a) potlids, (b+c) fractures, (d) incipient cracks

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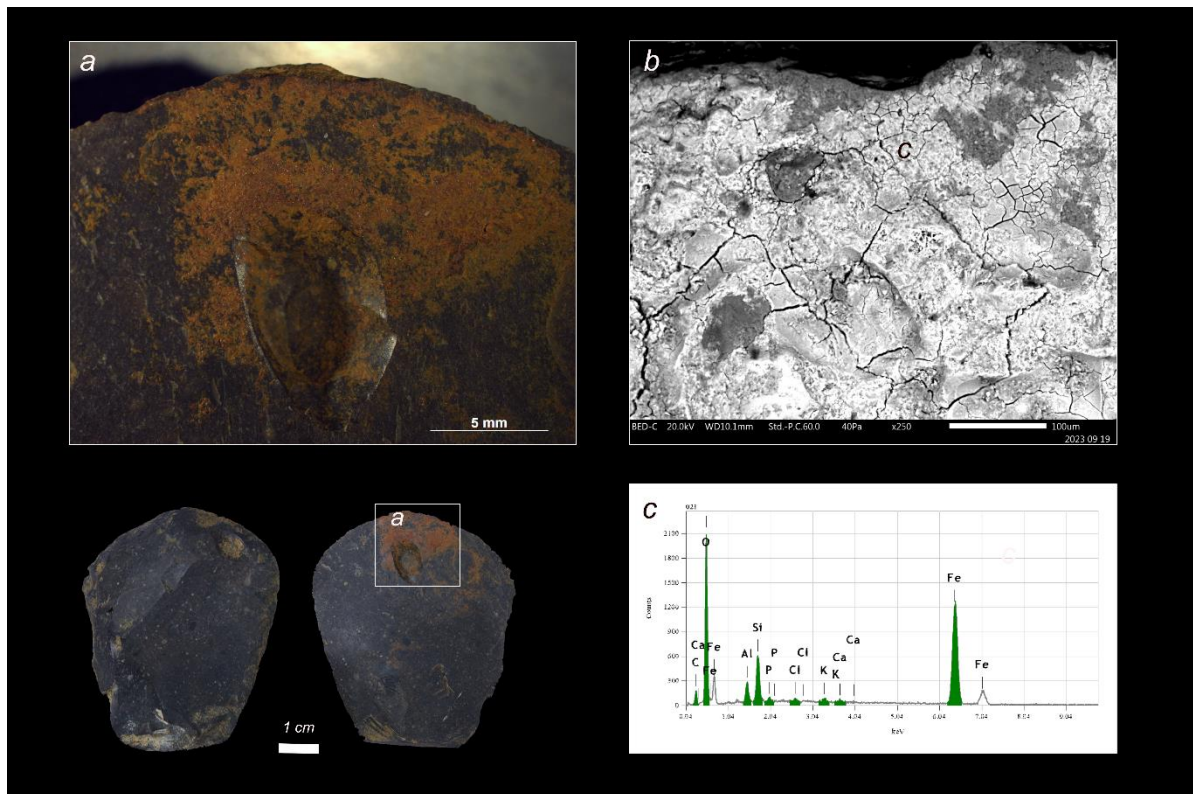
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All artefacts were also screened for taphonomic residues to make sure that these would not be confused with functional evidence. Interestingly, an iron oxide deposition was observed on several artefacts, including axes and scrapers (Fig. 5). The absence of a clear distribution pattern, such as a direct association with the used edge or an exclusive presence on the passive part of the tool, rules out the possibility that these residues were deposited through either use or hafting of these tools. Furthermore, the presence of iron oxide within the potlid negative of one scraper (Fig. 5a) suggests that the deposition occurred at a later stage, after the burning of the artefacts.



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**Figure 5** - (a) Overview of the iron residue on the ventral surface of the scraperhead (x10), (b) detail of the iron residue with the scanning electron microscope (x250) and (c) the elemental analysis indicating high peaks of iron elements

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During analysis, an intriguing azure-blue residue was observed on two artefacts that also show heat damage. An elemental analysis using the scanning electron microscope permitted to determine that these residues were predominantly of organic nature, which indicates their recent origin as the exposure to intense heat would have caused the destruction of all organic residues of functional origin. In addition to the organic-rich peak, a subtle presence of titanium was also detected and this combination is similar to what is observed when analysing very small remnants of plasticine. Plasticine had indeed been used during the initial photographic documentation of the objects.

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### Production traces on axes

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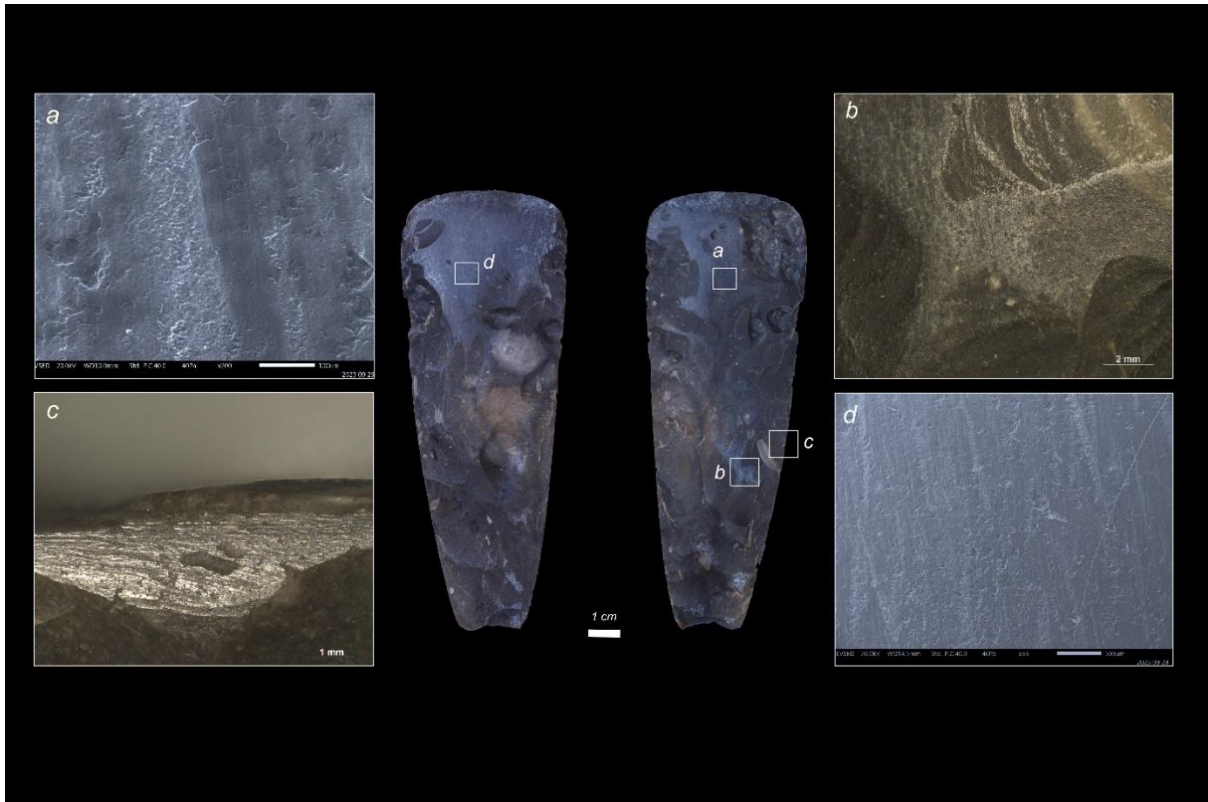
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The sample includes five bifacial axes and one unifacially shaped axe, with several phases of manufacturing still visible. Evidence of grinding was observed on at least three axes, consistently overriding flaking negatives (see Fig. 6a). Observations of deep, large, linear, and parallel grooves, along with polish and a white sheen, were most likely the result of grinding the tools on coarser-grained sandstone to achieve the initial desired shape (van den Dikkenberg, 2024) (see Fig. 6). In a subsequent phase, or the finishing phase, evidence of more regular abrasion or a smoother surface, accompanied by fine parallel striations, suggests the use of finer grains than in the initial stage for abrasion. However, at this stage of the analysis, it was not possible to determine whether the second phase involved the same raw material, such as sand with finer grains, or if other materials like ash were employed to complete the production phase of the axes.



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**Figure 6** - Examples of the production traces, with (a) microscopic detail of linear striations with parallel orientation (x200), (b) linear abrasion posterior to the shaping (x16.0), (c) deep linear grooves recorded on the lateral edges of the axe, indicating the longitudinal grinding motion on a coarse grained mineral material (x32.0), (d) fine striations with parallel orientation that are most likely the result of grinding and polishing the axe on a finer grained mineral material (x33.0)

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### Use-wear traces on axes

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Although few functional traces could be observed on the axes, the absence of use-wear traces does not mean that these axes were unused. First, the polished sheen of the axes can be attributed to the manufacturing (grinding) process, which may complicate the identification of use-wear polish. Second, if the axes were resharpened after use, any developed use-wear would have been removed and, therefore, cannot be observed. Third, the intense heat damage on some of the axes, in the form of pottids and edge damage, may have also removed any initial use-wear, as portions of the potential active edges were destroyed.

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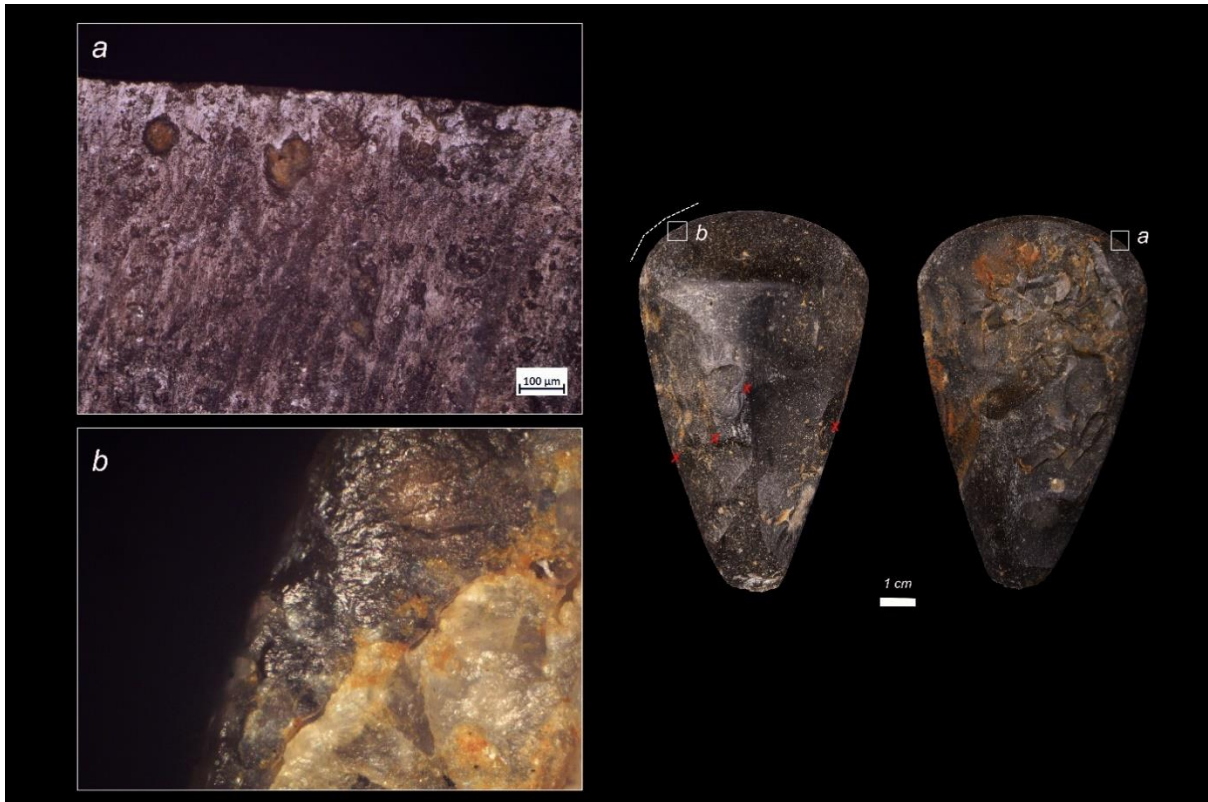
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Even macroscopic functional traces proved to be very limited, which is unsurprising given that the grinding procedure of the flaked axes rendered the edges more resistant to damage. Indeed, it is known that a polished edge offers enhanced strength and longevity compared to a rough, flaked edge (Hayden 1989, Madsen 1984, Barkai 1999). Only one of the examined axes suggests that it was used on moderately hard material, such as fresh wood. In this case, a polish was developed along the cutting edge (see Fig. 7), posterior to the polished surface from manufacture, in association with concentrations of macroscopic and microscopic scars.



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**Figure 7** - Distinctive polish developed on the cutting edge of the axe (x100) (a), also linked with microscopic and macroscopic scarring (step fissured termination) (b)

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Evidence of hafting wear is also scarce. When identifiable (n=3), it consisted of concentrations of feather- and step-terminating scars with perpendicular orientations on the lateral mesial edges. However, this does not necessarily imply that these tools were not hafted. It is possible that the mesial parts or lateral edges of the axes were ground or polished after flaking to dull sharp edges, likely to prevent cutting of binding materials (e.g., ropes, strings, leather) during hafting (Barkai 1999). This process may have obscured or eliminated evidence of hafting.

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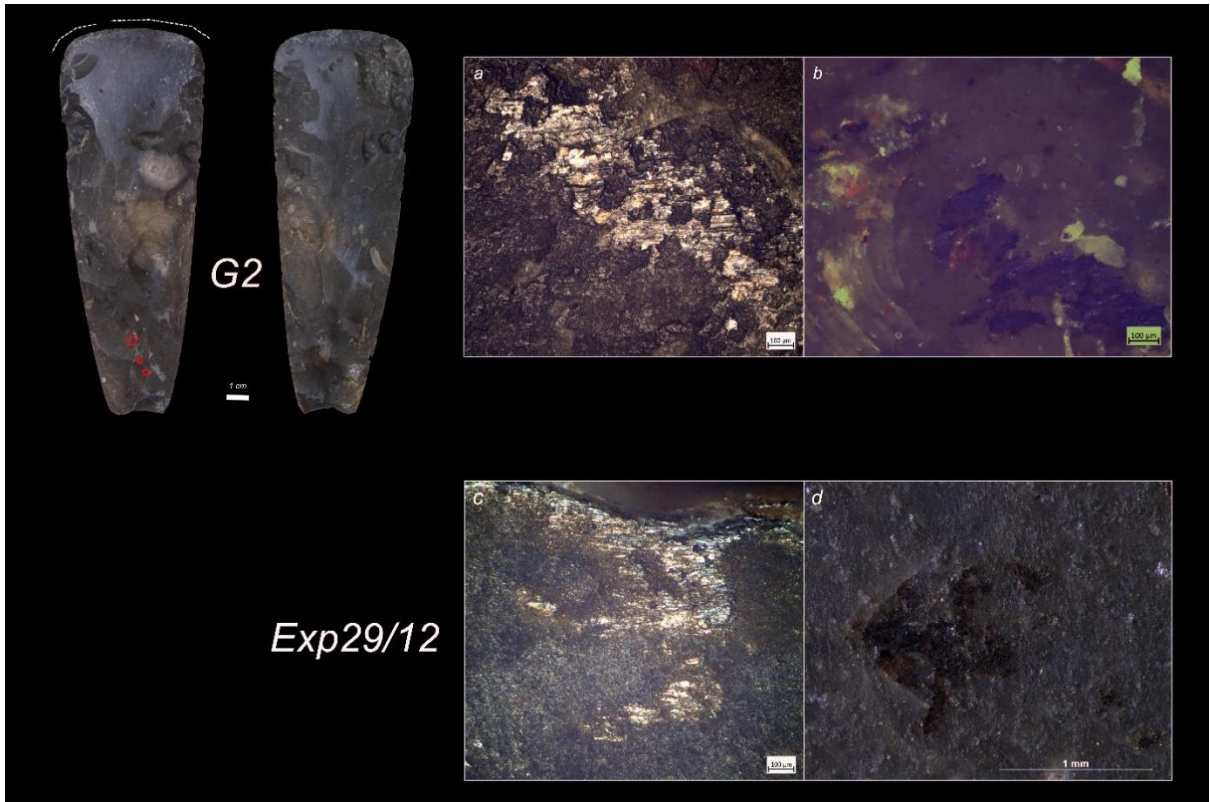
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One axe is particularly notable for its evidence of use as a strike-a-light, suggesting a complex or multifunctional use history. Characteristic fire production traces include parallel striations and percussion marks (c-pits) associated with a shiny layer of red residue from contact with pyrite (Sørensen et al., 2018). The iron oxide component of pyrite was identified with EDS analysis, but the more fragile sulfur component had disappeared (see Fig. 8 and 9). It could not be determined at which stage of the artefact's lifecycle the use as a strike-a-light occurred—whether this function preceded its hafting and primary use or took place in a later phase.



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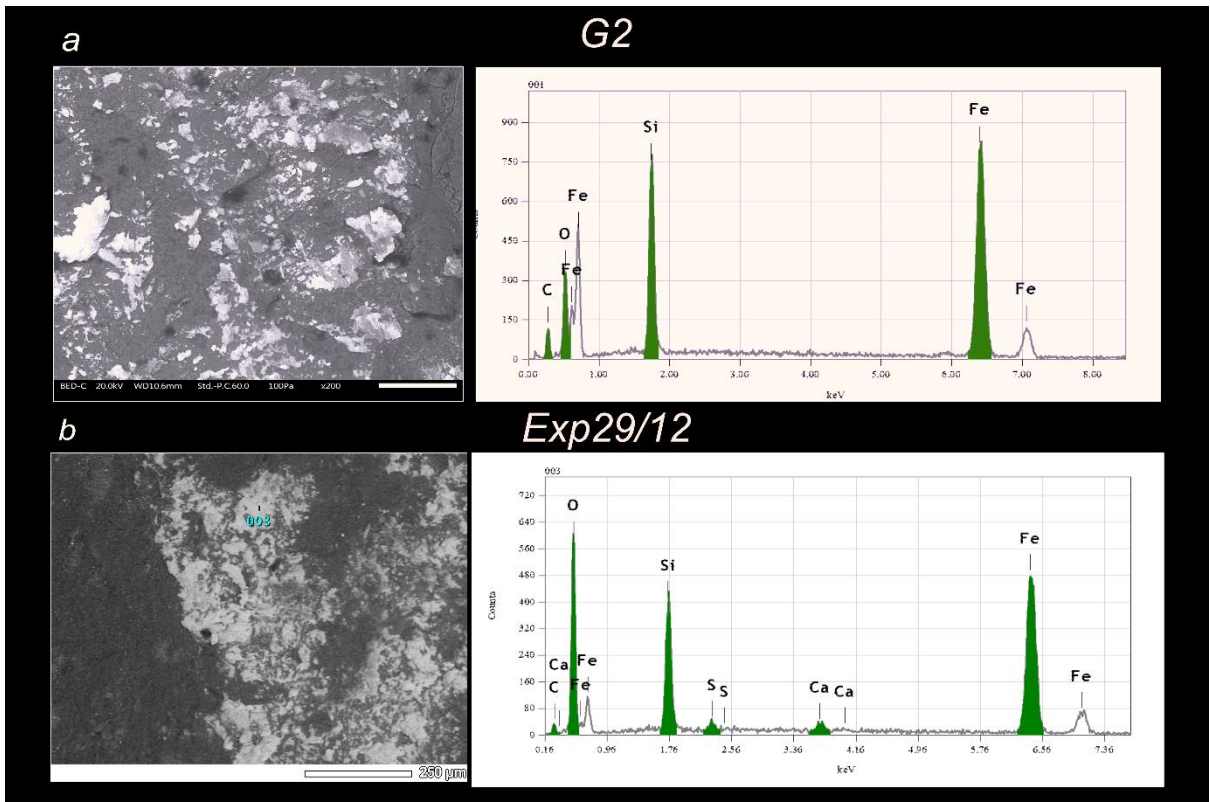
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**Figure 8** - Details of mineral wear recorded on axe G2 with high magnification, compared to experimental evidence on a strike-a-light using pyrite (Exp 29/12). (a+b) striations with parallel orientation associated with abrasion and incipient cracks from percussion similar to what has been observed on experimental tool Exp 29/12 (see c+d)



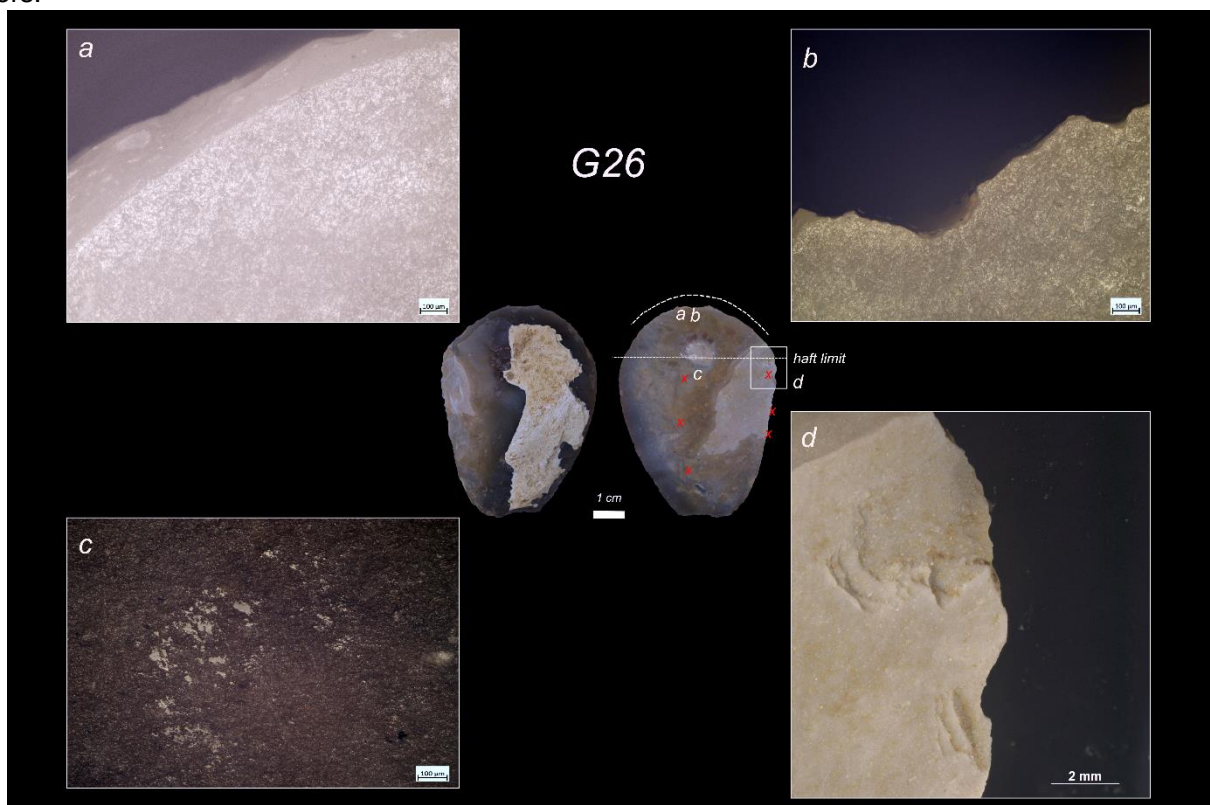
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232 **Figure 9** - Elemental analysis of the fire production traces on axe G2 and  
 233 experimental artefact Exp29/12:  
 234 (a) EDS spectrum of red residue on axe G2 showing a strong presence of iron  
 235 (b) EDS spectrum of fire production residue on Exp29/12 showing peaks of iron and  
 236 sulfur.

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238 **Use-wear traces on scrapers**

239 Distinct use-wear evidence was visible on all endscrapers and could be interpreted with varying  
 240 levels of confidence. In comparison to the axes, the scrapers were generally better preserved and  
 241 not as heavily impacted by heat alteration. Four tools show explicit use-wear from hide processing  
 242 with transverse motion consisting of polish with varying development associated with moderately  
 243 to strongly developed edge rounding. The relatively bright appearance of the polish and its greasy  
 244 aspect suggests use on fresh hide (e.g., Keeley, 1980; Rots, 2005). Evidence of hafting was  
 245 observed on all scrapers in the form of macroscopic edge damage and bright spots (Rots 2002,  
 246 2010a) (see Fig. 10) and it could be interpreted with varying levels of confidence. Evidence for  
 247 multiple resharpening cycles could be identified, and, combined with the well-developed hafting  
 248 traces, this indicates that the tools were intensively used and maintained over time. This suggests  
 249 that the scrapers were valuable implements, likely subjected to repeated use and upkeep to extend  
 250 their functional lifespan, highlighting the importance of these tools in the daily activities of their  
 251 users.

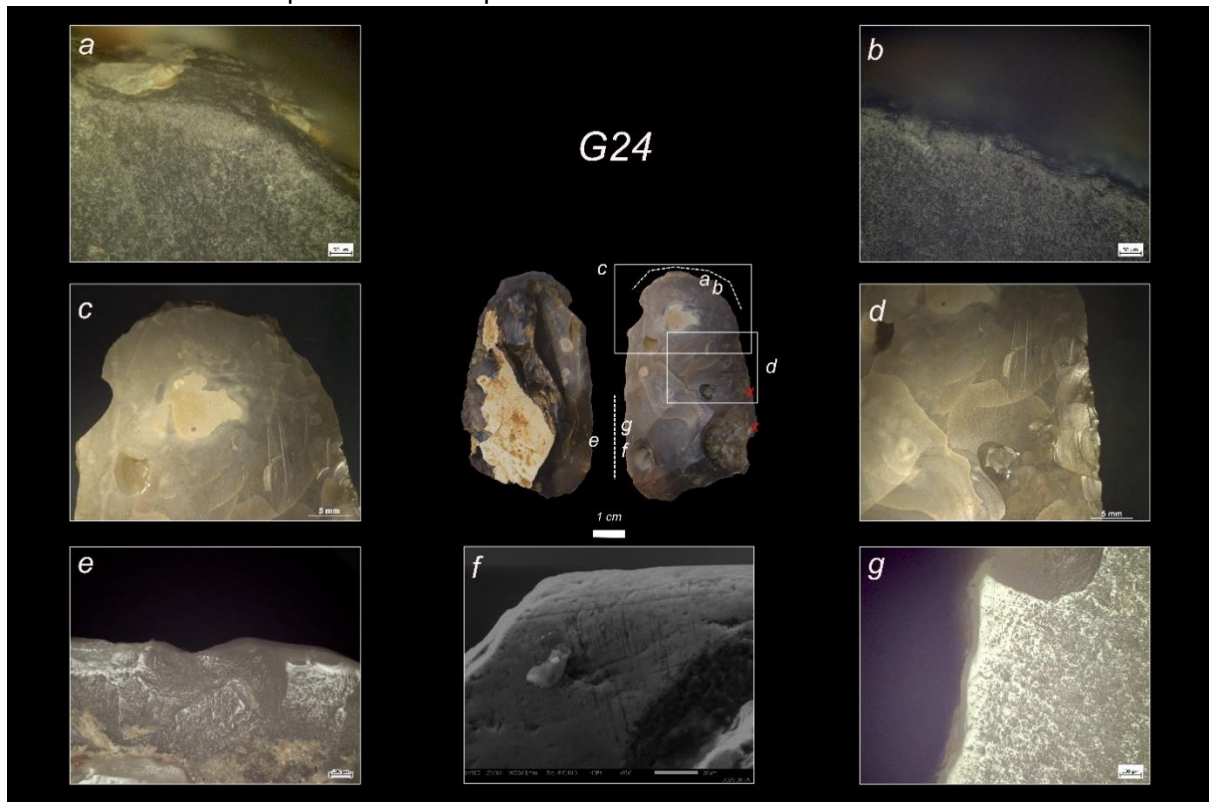


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253 **Figure 10** - Overview of the use and hafting traces observed on scraper G26: (a)  
 254 edge rounding due to use (x100), (b) edge rounding cut by removals from  
 255 resharpening (x100), (c) bright spot on the ventral mesial zone located close to the  
 256 potential haft limit (x100), (d) lateral edge damage oriented obliquely to the edge  
 257 indicating the potential haft limit (x16.0).

258 Despite being subjected to fire, which caused incipient cracks and potlids, one scraper still  
 259 exhibits evidence of two distinct uses. Well-developed use-wear from hide-working (polish and

260 pronounced edge rounding) was observed on the ventral scraper-head and well-developed use-  
 261 wear from plant processing on the lateral right mesial edge. The latter traces include well-  
 262 developed edge rounding and a very bright reflective polish on the dorsal and ventral surface of  
 263 the edge (Fig. 11). On the ventral face, very fine striations with a parallel or slightly oblique  
 264 orientation to the edge were visible with the scanning electron microscope and indicate a  
 265 longitudinal cutting motion. Superposing edge scarring on the right edge and a concentration of  
 266 scars on the left edge are most likely due to posterior hafting, although this remains uncertain. If  
 267 confirmed, it would suggest that the tool was first used on its lateral right edge and subsequently  
 268 hafted and used as a scraper on its distal part.



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270 **Figure 11** - Overview of the use-wear traces found on scraper G24: (a + b) strongly  
 271 developed edge rounding from use on hide (x200), (c) macroscopic detail of  
 272 incipient cracks and negatives of potlids from exposure to intense heat (x6.3), (e +  
 273 f + g) well-developed polish, pronounced edge rounding, and scratches caused by  
 274 use on silica-rich plant material (x8), (x100) for e+g, and (x950) for f.

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## Discussion

276 This study employed a biographical approach, inspired by Van Gijn and Wentink (2013), to  
 277 investigate the lifecycle of artefacts from the Beringen Brouwershuis site. By examining the wear  
 278 traces and residues accumulated during different stages of active use, including production,  
 279 hafting, use, maintenance, and recycling—as well as their subsequent afterlife, such as deposition,  
 280 destruction, and burial, we aimed to reconstruct detailed biographies of these lithic artefacts. This  
 281 method provided a deeper understanding of the complex histories and multifaceted roles these  
 282 objects played over time.

283 The axes from the Beringen Brouwershuis site exhibited limited functional traces. In one case,  
 284 use wear patterns along the cutting edge, developed after the original polished surface from  
 285 manufacture, suggest that the axe was used on moderately hard material, likely wood. Although  
 286 potential woodworking traces were identified on only this axe, the significant diversity in the shapes  
 287 of the other axes could suggest they may have been used for various wood-related tasks, such as  
 288 felling trees, producing planks, or other wood technologies (Elburg et al., 2015; Holsten and

289 Martens 1991; Jørgensen 1985). This inference is further supported by previous studies (e.g.  
290 Jørgensen 1985, Van Gijn 2009; Out 2017; Roy et al. 2023; Tegel et al. 2012), which have  
291 underscored the functional versatility of axes and align with the observed diversity in shape and  
292 use-wear traces at the Beringen Brouwershuis site.

293 Interestingly, the use of one of the axes as a strike-a-light may reflect its symbolic significance  
294 in Neolithic communities, as suggested by its inclusion in grave offerings and its potential  
295 connection to ritual activities (Baales et al. 2016). This observation is particularly noteworthy, as  
296 such wear is typically associated with other tool types (e.g., blades) or indicated by pyrite remnants  
297 (Baales et al., 2016; Van Gijn et al., 2013).

298 In contrast to the polished axes, clear functional traces were observed on the scrapers. Hide-  
299 working traces were identified on five of the seven endscrapers, highlighting the importance of  
300 hide-working in Neolithic daily life, where hides were essential for making clothing, containers, and  
301 other items (Van Gijn 2005, 2009). Frequent resharpening traces, combined with well-developed  
302 hafting evidence, suggest that these tools were intensively used while being hafted. Hafting traces  
303 appeared as bright spots and residues, possibly originating from vegetal components within the  
304 hafting arrangement. Notably, one scraper demonstrated multifunctional use, with hide-scraping  
305 wear on one end and plant-processing traces along a lateral edge. The wear traces observed on  
306 both the axes and scrapers indicate their intensive use, emphasising their critical role in Neolithic  
307 daily tasks such as woodworking and hide processing

308 Functional analysis also revealed traces associated with the afterlife of these artefacts. Heat-  
309 related evidence, including potlids, fractures, and scarring, indicated exposure to temperatures  
310 exceeding 270°C (Cnuts et al. 2018; Larsson 2000). The absence of extreme discoloration or  
311 complete fracturing suggests controlled burning, likely reflecting an intentional transformation  
312 rather than destruction, aligning with Neolithic fire mastery (Larsson 2011). This controlled  
313 exposure implies that the tools were purposefully modified before deposition, potentially carrying  
314 ritual significance.

315 The most likely explanation for the presence of iron oxide on these artefacts is a natural origin.  
316 The absence of a clear distribution pattern, such as a direct association with the used edge or an  
317 exclusive presence on the passive part of the tool, also rules out deposition through use or hafting.  
318 Additionally, the presence of iron oxide within the potlid negative of one scraper suggests that the  
319 deposition occurred at a later stage, after the burning of the artefacts. The high iron content of the  
320 surrounding soil, combined with the site's location at the footslope of an iron-sandstone hill, makes  
321 it highly plausible that the iron oxide is a post-depositional feature related to pedogenesis. Context  
322 pictures further support this interpretation, clearly showing the iron-rich composition of the soil.

323 Alternatively, the concentrated iron oxide deposits observed on the tools might present a more  
324 complex picture. One possibility is that the iron oxide resulted from ochre deposition, a practice  
325 commonly associated with Neolithic traditions. If this were the case, the presence of iron oxide  
326 could reflect ritualistic behaviour, aligning with the symbolic significance of ochre in burial rites and  
327 other ceremonial activities (Jadin et al., 1989). Further geochemical analysis (e.g., XRD, Raman  
328 spectroscopy, FTIR) is required to confirm the mineral composition of the iron oxides (e.g.,  
329 goethite) and refine interpretations of their origin.

330 Our biographical approach, supported by comprehensive functional analysis, provided deeper  
331 insights into the Beringen Brouwershuis deposit and reinforced the hypothesis that it represents a  
332 hoard. The deliberate modification and careful deposition of the tools suggest ritual and symbolic  
333 undertones. As Belgium's only excavated axe hoard attributed to the Michelsberg culture, this  
334 deposit offers unique insights into Neolithic hoarding practices. Hoarding was common in Neolithic  
335 and Bronze Age Northwestern Europe (Fontijn 2019; Hamon & Quilliec 2008; Wentink 2006;  
336 Wentink & Van Gijn 2008), often associated with votive offerings placed in remote or challenging-  
337 to-access areas and comprising large or damaged items. Such deposits were frequently found in  
338 isolated, waterlogged locations, leading researchers to associate them with ritual burials imbued  
339 with symbolic meaning (Larsson 2000, 2011). Over the last two decades, detailed analysis of these  
340 deposits, including functional analysis, has shown that they often contain important objects from  
341 daily life, intricately tied to their immediate surroundings (Bamforth et al., 2004; Bradley 2012;

342 Bradley 2016). Moreover, it has also suggested that Neolithic hoards in Scandinavia were more  
343 closely linked to settlements than previously believed (Sørensen et al., 2020). Our study  
344 demonstrates that the Beringen Brouwershuis hoard bridges both ritual and practical realms,  
345 illustrating how utilitarian tools could acquire symbolic significance through their use,  
346 transformation, and intentional deposition. This finding enriches our understanding of the  
347 complexity inherent in Neolithic hoarding practices.

## 348 **Conclusion**

349 The comprehensive functional analysis of axes and endscrapers from the Beringen  
350 Brouwershuis site has illuminated the complex biographies of these artefacts, highlighting their  
351 dual roles in both practical and ritual contexts. By employing a biographical approach, we  
352 uncovered significant wear traces and residues that revealed the multifaceted uses of these tools,  
353 from woodworking and hide processing to their eventual exposure to controlled burning and ritual  
354 deposition. The analysis confirmed that the axes were likely involved in Neolithic woodworking  
355 tasks, while the scrapers demonstrated intensive hide-working, both essential activities in daily life.

356 Evidence of heat damage, strike-a-light wear, and ochre-associated iron precipitation further  
357 pointed to intentional, symbolic modifications of the artefacts before their deposition. These  
358 findings support the hypothesis that the Beringen Brouwershuis deposit represents a deliberate  
359 hoard with ritual undertones, aligning with known practices of the Michelsberg culture and broader  
360 Neolithic traditions. The combination of utilitarian and symbolic aspects in the Beringen  
361 assemblage bridges the gap between practical and ceremonial use, demonstrating how everyday  
362 tools could accumulate layers of meaning before their final deposition.

363 This study not only enriches our understanding of the Michelsberg culture, particularly within  
364 the less-documented Campine region, but also contributes to broader discussions about Neolithic  
365 hoarding practices in Northwestern Europe. By illustrating the intertwining of functional and  
366 symbolic purposes, the research underscores the importance of considering both utilitarian and  
367 ritual dimensions when interpreting archaeological assemblages. Ultimately, the Beringen  
368 Brouwershuis hoard exemplifies how artefacts can transcend their primary functions to become  
369 part of meaningful cultural and ritual practices, deepening our insight into the social complexity of  
370 Neolithic life.

371

### 372 **Supplementary information availability**

373 Data or any supplementary material are available at <https://osf.io/qaewt/>

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377

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383 The authors of this preprint declare that they have no financial conflict of interest with the  
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