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Hallstatt Period Textiles from Slovenian Burials: Methods and Analyses of Artefacts from Old Excavations

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Abstract

Multiple Slovenian cemeteries of the early Iron Age/Hallstatt period (800–400 BC) offer the opportunity to explore mineralised textile finds. The preservation of textiles on metal objects requires that these materials be contextualised and analysed using a variety of methods. Additional difficulties arise due to the lack of documentation of the old excavations and the past restoration work. The following paper discusses what methods are useful and what can be learned from very small textiles fragments. Gaining information from microstratigraphy, comparing relevant finds, and fibre analysis are just a few methods shown within this research.

Keywords: Iron Age, textile analysis, old excavation, Slovenia, fibres

27.1. Introduction

The archaeological sites Magdalenska Gora, Brezje, and Podzemlj represent settlements and necropolises of the so-called Dolenjsko group in south-eastern Slovenia (Kromer 1959: 7; Biehl 2001: 4913). Large settlements, such as Magdalensk Gora, Sticna, and Vace developed into wealthy centres and reached their cultural peak between 725–600 BC according to the Hallstatt stages HA C1 to HA C2, which were named after the Iron Age cemetery and salt mine in Hallstatt, Austria (Dular 2003: 117). Iron and salt mining generated wealth in the Hallstatt areas (Egg 1996: 55; Dular and Tecco Hvala 2007: 50; Grömer 2018: 214). Most of these sites in Slovenia dating from the Hallstatt period were excavated between the end of the 19th century and the early 20th century (Tecco Hvala 2012: 19). Private excavators and noblewomen from Germany and Austria concentrated on the large tumuli, where they expected to discover jewellery and weapons (Dobiat 1982: 4–5). These mounds were in use until the early Latène period (450–380 B.C.) and each contained several burials, including both urn graves and inhumations (Dular 1978: 17; Tecco Hvala 2012: 50, 75).

Unfortunately, the acidic soil destroyed most of the skeletal material and other organic objects (Dular 1978: 19). Characteristic grave goods for "rich" graves in Slovenia are weapons, jewellery, horse harness, and drinking vessels, mostly in the form of situlae (Egg 1996: 65).

The excessive late 19th-century excavations were insufficiently documented (Rutar 1893; Kromer 1959: 9; Dular 1990: 547; Dular 2003: 95; Tecco Hvala 2012: 26). As Slovenia and the sites were part of the Austrian Monarchy, most of the objects were transferred to Vienna and are now part of the Natural History Museum's collections (von Österreich 1891: 312). All three sites, Magdalenska Gora, Brezje and Podzemlj, were published between 1960 and the early 2000s. These publications are useful for the interpretation of the textile finds (Kromer 1959; Barth 1969; Gabrovec 1975; Dular 1978, 2003; Tecco Hvala 2012; 2017).

Lise Bender Jørgensen analyzed some of the textiles in the 1980s, and published her results in 2005 (Bender Jørgensen 2005). During my research more textiles were identified inside the Museum's storage facilities.

A total of 26 textile fragments are mineralised on different metal objects. The preservation varies from single threads in the millimetre range to fragments several centimetres in size. Due to the preservation and conservation, the textiles are rigid and no longer flexible, nor do they show any colouring, as the patina encloses everything. Depending on the metal, the colours range from green and blue to rusty red. The weave and thread structure can be recognised in most cases.

As the material consists of old finds, of which some lack context and moreover have outdated conservation treatment, the question arises as to what information and data can be obtained from the analysis of these textiles and how these can be interpreted. The first question is to what extent a material analysis can be carried out. Can we collect meaningful data to answer questions about textile quality, material (animal or plant fibres) and manufacturing techniques? Additionally, can questions only be asked about the deceased's attire, or are utilitarian textiles included among the textile remains found in the graves.

27.2. Methods

Over the past several decades, textile research has adopted a relatively uniform system as the basis for recording and documenting materials (Wild 1988; Grömer 2014: 9–16). This research applied various types of methods, some of which are more closely aligned with natural science-based methods than to those common in the humanities. As such, the following methods were used: Fibre analysis by scanning electron microscopy (SEM: JEOL, JSM-6610LV in the Central Research Laboratory of the Natural History Museum Vienna), microstratigraphy, wool fineness measurements, three-dimensional investigations, and whole garment reconstructions (Grömer 2015: 90). With respect to performing fibre analysis, samples from modern animals are essential, as they can show differences in fibre quality or developments in animal breeding (Banck-Burgess 2012: 37).

Overall, the Creativity and Craft Production in Middle and Late Bronze Age Europe (CinBA) research project seeks to name and interpret the properties and technical fibre details of these materials. As part of this research, Lise Bender Jørgensen, Karina Grömer, and Helga Rösel-Mautendorfer developed definitions and terminologies in English and German (Grömer 2014: 9–16; CinBA 2020).

Textile layers and associated items are presented here utilising microstratigraphs, based on the guidelines of the Landesamt für Denkmalpflege in Bayern and the standards of the Naturhistorisches Museum Wien (Nowak-Böck and Voß 2015; Bayerisches Landesamt für Denkmalpflege 2017). In addition to the textiles, all known tools from the tombs related to textile production were also recorded for this work. The data basis created here adopts the project of the Centre for Textile Research (CTR) in Copenhagen. It was designed, among others, by Eva Andersson Strand, Lone Gebauer Thomsen, and Joanne Cutler for the research projects in Denmark.

27.3. Examples

Sixteen bronze foot rings, two belt plates, a heavily corroded bronze chain with attached textile fragments, and a clay bead were discovered in grave 4 (d) at tumulus XXVIII in Podzemlj Grm (Barth 1969: 136). Unfortunately, there is no additional information about the grave's measurements, stratigraphy, or the condition of the deceased. The grave inventory suggests it was probably a wealthy female burial. The corroded chain with textile fragments of find 66808 (Figure 1) was discovered in storage and first analysed as part of this project.

Technical details, such as yarn/ply, thread twist, twist angle, yarn diameter, and thread count can be collected from digital microscope images (Table 1). As it is usually impossible to clearly identify warp and weft, due to the fragment's small size with no surviving starting borders (Figure 2), for identification purposes they are addressed as system 1 and system 2 instead. The fragment has technical details common to Slovenian textiles, including single, unplied yarn. However, spinning direction patterns appear, which unfortunately can only be seen irregularly due to the preservation. The twist angle, thread count, and fabric density are very uniform and similar in both systems.

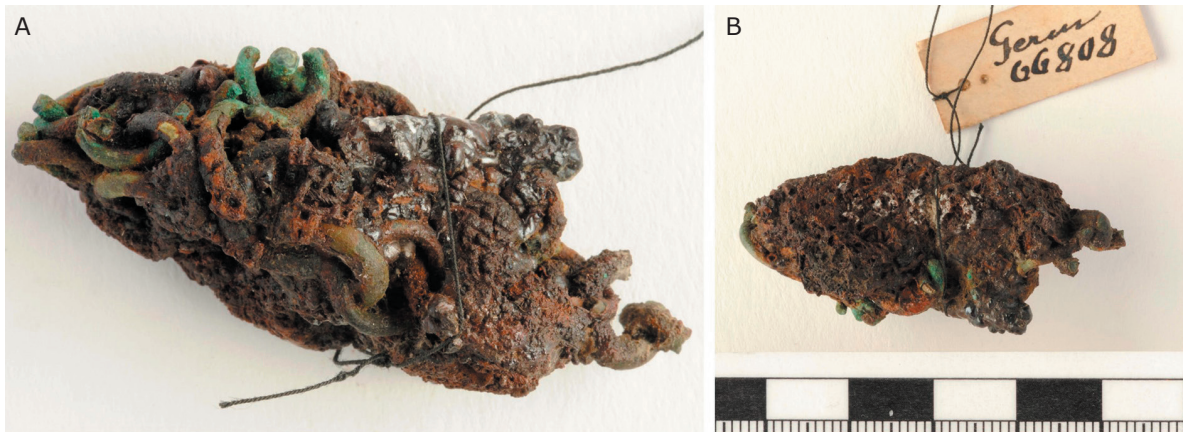


Figure 1. A) Podzemlj, Grave 6, Find 66808. Left: the corroded bundle of metal chain of find 66808. B) Detail photo with clear traces of fabric. (Photograph: A. Schumacher)

Table 1. Technical data for textile of find 66808.

Item	System 1	System 2
Yarn or ply	Yarn	Yarn
Twist direction	s/z	s/z
Twist angle (ca.)	40°	40°
Thread diameter (ca.)	0.4 mm	0.4 mm
Thread count (ca.)	8 y/cm	8 y/cm



Figure 2. Podzemlj, Grave 6, Find 66808, chain with textile. Microscopic image, 50x. (Image: R. Lau)

Find 86602 is a bronze belt plate from Magdalenska Gora, Preologe, Tumulus II, Grave 57. It was found in an inhumation burial orientated east-west. A horse was buried half a metre above the human remains. Multiple objects were found together with the belt plate: a bronze helmet, two fibula, two belt plates, a celt (axe), two lances, a knife, three bronze lids, multiple bronze buttons, bronze fittings, a bronze divider, an iron hook, an iron axe, multiple iron and bronze rings (probably from horse equipment, as there is hair attached to it) and four clay vessels (Rutar 1893: 252–253; Tecco Hvala et al. 2004: 136).

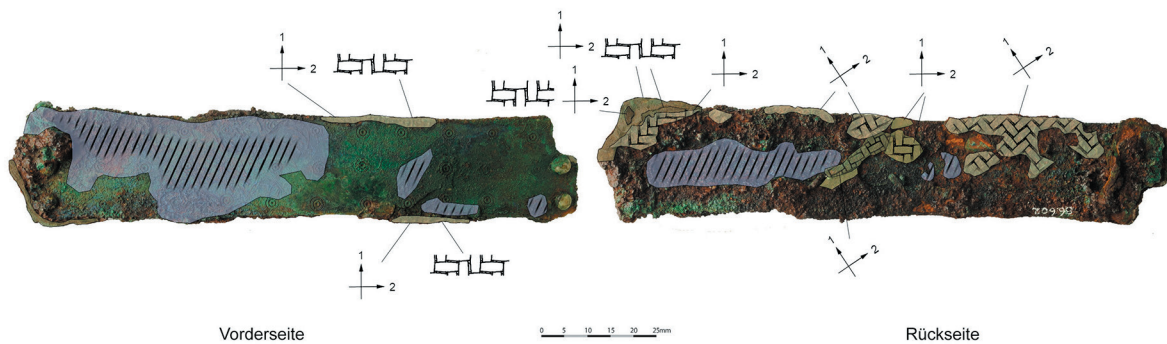
The belt plate (find 86602) has a number of interesting attached textile fragments, and is therefore a good example to show the microstratigraphy of textiles and other objects by applying the Bavarian Cultural Heritage Office's free Photoshop PlugIns (Nowak-Böck and Voß 2015; Bayerisches Landesamt für Denkmalpflege 2017). This guarantees a uniform mapping of information like structure, material, and technical data directly onto the picture of the archaeological object.

Microstratigraphy visualises the behaviour of the textiles in with the associated objects. Organic fragments can be identified using the same colours and structures seen on the map (Figure 3) As seen in Figure 4, the blue area was a layer of fur with textile layers on top. Some fabrics were bent around the edge of the belt plate, as shown on the left-hand side, with textile 86602-D and A. This method is very useful for interpretation.

Usually, fibre samples cannot be taken from mineralised textiles. The fragments are no longer flexible and already persevered. Identifying the fibres of a mineralised textile requires the use of a Scanning Electron Microscope (SEM). While belt plates and other larger finds are not suitable for this method, another special object (Find 86608) did fit inside the SEM and had visible animal fibres attached, which can be seen in Figure 4. Mineralised fur was discovered on multiple rings which

Kartierung von organischem Material

Magdalenska Gora, 1893/94, : Tumulus II, Grab 57, Inv. Nr.: 86.602



Mikrostratigraphie

Magdalenska Gora, 1893/94, : Tumulus II, Grab 57, Inv. Nr.: 86.602

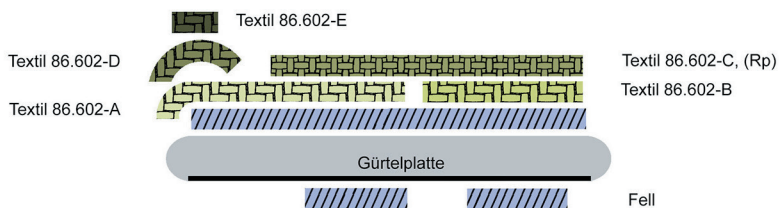


Figure 3. Microstratigraphy of Find 86602, belt plate. (Image: R. Lau)



Figure 4. A) One of the five iron rings of Find 86608. Pieces of fur are attached, which were used for the SEM examinations. B) All of the rings of find 86608. (Photograph: A. Schumacher)

originated from the same burial as belt plate 86602. The excavator said it was found within the male burial (Rutar 1893: 252–253; Tecco Hvala et al. 2004: 136), but the hair was clearly from a horse. The Natural History Museum's zoological department assisted by providing samples from a Przewalski horse, which originated in Mongolia (Figure 5). When it became extinct in its natural habitat, it could be reintroduced into the wild through breeding (Rast-Eicher 2016: 209). Due to its stature and the hair texture, the Przewalski horse correspond very well with Iron Age horses and serve as a comparable species for comparison. Through scanning electron microscope images and fibre analysis, the hairs on the ring could be clearly identified as horsehair due to their characteristic scale structure (Rast-Eicher 2016: 210).

Five different hair samples were taken from the reference Przewalski horse hide (head, mane, neck, flank, and tail). Hair from different parts of the body were analysed under the microscope, which indicated that the head best corresponded to the samples taken from the archaeological find. The results from the head of the Przewalski horse showed significant similarities to the original sample (Figure 5). It is plausible that all of the rings were actually part of the horse harness, which was buried just half a metre above the human remains. Due to erosion and collapsing cavities, it is possible that the harness has moved after the burial.

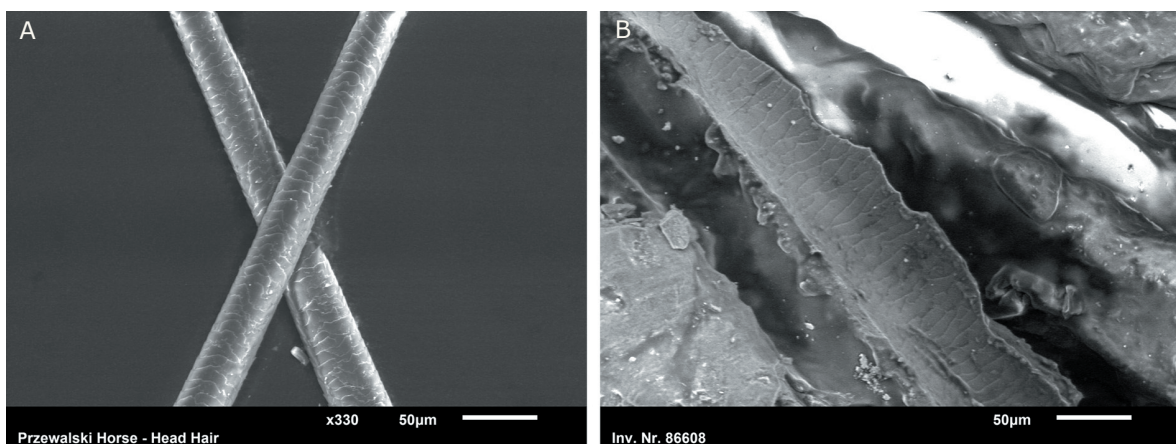


Figure 5. A) SEM image of two hair samples from the head of the Przewalski horse. (Image: A. Rudelics) B) SEM image of a negative impression of Find 86608. (Image: Ronja Lau)

Currently no clear conclusions can be drawn about the condition of the horse skeleton nor the horse breed found in Tumulus II, Grave 57. The zoological material from the excavations is available in the Natural History Museum Vienna, but no proper record of this grave was made during the handover in 1978. Therefore, the horse bones do not have an inventory number and could not be found. Other horse bones from the graves in Magdalenska Gora were only labelled as “domestic horse” (*Equus caballus*) (Natural History Museum Vienna 27. 02. 1978).

27.4. Results and Discussion

The collected data from all of the textiles from Magdalenska Gora, Brezje, and Podzemlj are preliminary results, open to discussion and interpretation. Slovenia is part of the so-called eastern Hallstatt territory, which can be compared with other sites. Since there are only 26 textiles (Figure 6), only a statistical trend can be compared with the 296 textile finds from the Hallstatt salt mine in Austria, also dating to the Hallstatt period (Figure 7) (Metzner-Nebelsick et al. 2014: 160). The similarities are probably no coincidence, as the consistent use of twill, twist patterns, and overall quality are consistent throughout the eastern Hallstatt regions.

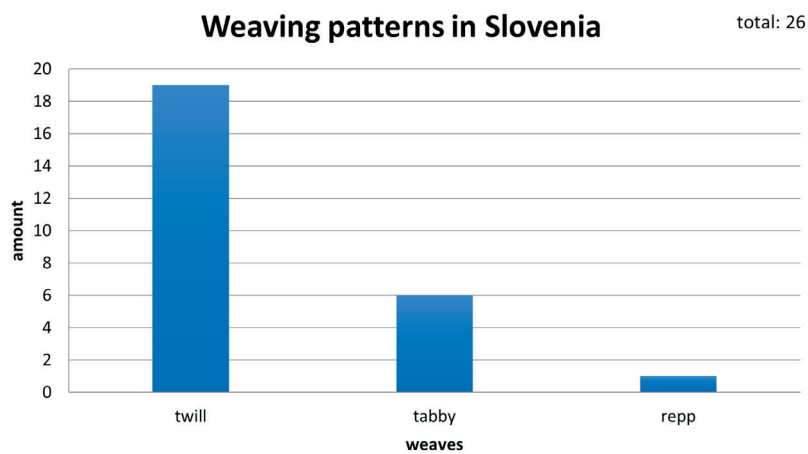


Figure 6. Weaving patterns of textile finds from Magdalenska Gora, Brezje, Podzemlj.

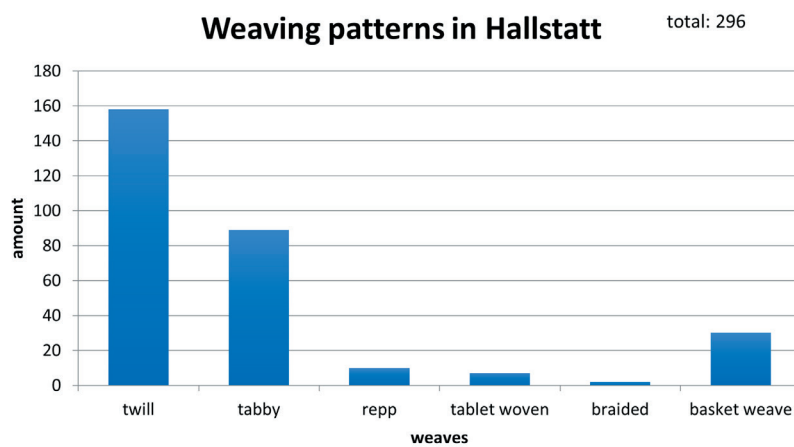


Figure 7. Weaving patterns from the Hallstatt salt mine as reference. (Grömer et al. 2013)

Another interesting observation is the existence of plied yarn in woven textiles at the three Slovenian sites. Just a few fragments build a connection to the western Hallstatt region, where plied yarn was frequently used. Sites like Hochdorf and Hochmichele (Germany) are western Hallstatt examples of textile preservation (Riek 1962; Banck-Burgess 1999; Biel 1999). Textiles in the West Hallstatt area often have plied *Szz*-twisted warp threads and *s*-twisted yarns for the weft thread. Plied yarns are more complex to produce than plain spun yarns, as more fibres are needed for the spinning and more time is required. However, this extra effort increases the durability and presumably also the value of this textile (Banck-Burgess 2012: 107).

Compared to the western Hallstatt area, the textiles in the eastern areas differ significantly based on the spun threads. The fine to very fine individual yarns were not plied, but nevertheless served as the basis for large-scale fabrics (Grömer 2016: 91), which were woven on the warp weighted loom in various weaves (plain weave, twill weave, Panama weave) (Grömer 2016: 92). Precious plied yarn fabrics could have been part of a contact and exchange network from west to east, and were therefore placed in wealthy burials.

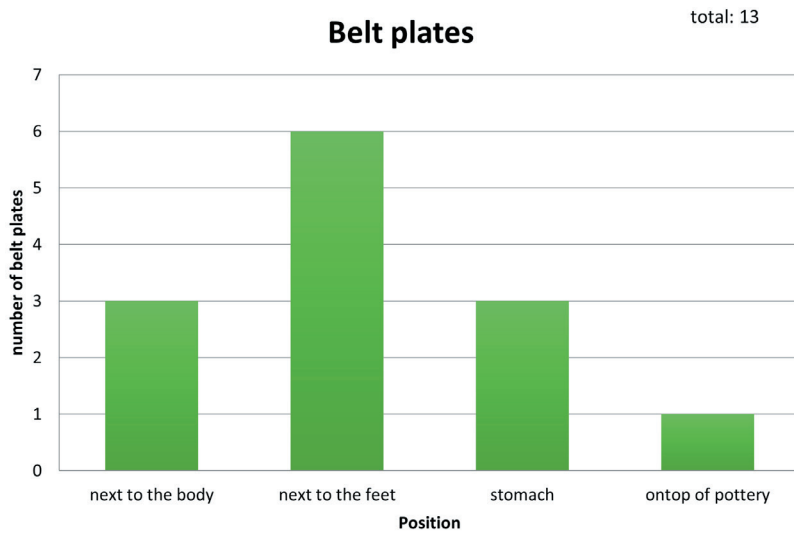


Figure 8. Belt plate position of Magdalenska Gora, Brezje, Podzemlj, Molnik, and Stična.

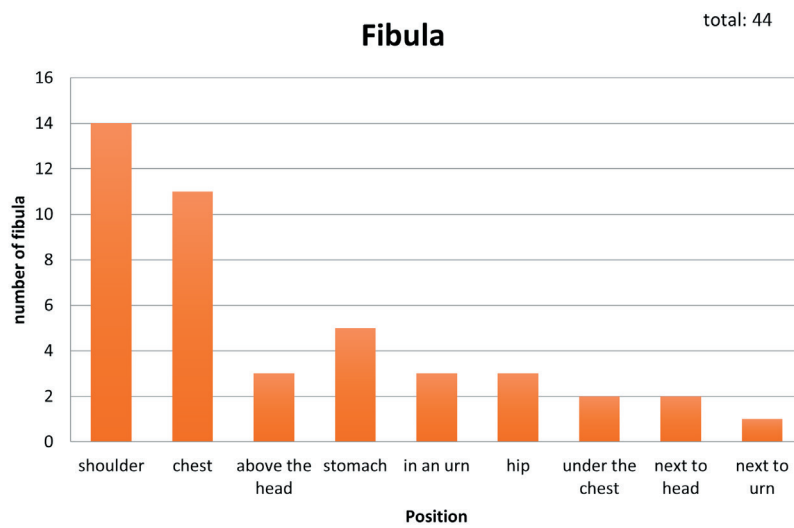


Figure 9. Fibula positions in graves from Magdalenska Gora, Brezje, Podzemlj, Molnik and Stična.

The small textile fragments from the Slovenian burials cannot be used to construct a whole garment, but the object placement within a grave provides a basis for interpretation. As Magdalenska Gora, Brezje, and Podzemlj lack sufficient documentation, other sites like Stična and Molnik were used as corroborative evidence to the position of objects in the graves (Gabrovec 1994; Tecco Hvala 2017). The belt plates represent a surprise, as such items are commonly seen positioned on top of the pelvic bones or abdomen (Tecco Hvala et al. 2004: 47, 146), but this was not the case in these contexts (Figure 8). Multiple belt plates were laid at the feet of the deceased or beside the body remains. Belt plate (Find 86602) is one example of a belt plate placed next to the feet (Tecco Hvala et al. 2004: 136). The reverse of the belt plate is also covered with different high-quality textiles.

Textiles from burials or other contexts are usually interpreted as clothing, but fabrics suit different purposes, for example as a blanket, shroud, container, or simply a grave goods itself. Identification of the purpose as a textile grave good can be difficult and has only occurred a few times, for example in Hochdorf. The belt plates with mineralised textiles hint that these materials were used for other purposes than for clothing. Objects like *fibulae* (brooches), buttons, belts or needles are connected with dress when found in a typical position (Figure 9) and therefore textiles are also connected to it. But if those objects are found somewhere else, other interpretations are possible and should always be considered.

27.5. Conclusion

Woven fabrics of all kinds have always been part of prehistoric, historic, and present societies. While this may seem trivial it is necessary to emphasise the pervasive nature of textiles in society, as these materials are often neglected in archaeological training and mindsets. One of the goals of this work is to strengthen the perception and acknowledgment of textile archaeology and archaeological finds from old excavations. It is not only modern excavated material that can be meaningful; finds from the late 19th century are also worth re-examining. The methods applied here, from microscopy, microstratigraphy, and fibre analysis to the consideration of find contexts, provide useful data even for old finds.

Interdisciplinary work is necessary in research to analyse and interpret organic finds, especially when these methods combine humanities and the natural sciences. As archaeologists, learning and understanding natural science methods is necessary, but not sufficient to understand the full potential of these materials. Another important aspect is the use of uniform terminology and guidelines for all analyses, and providing other researchers the opportunity to work with the material, including understanding the working methods and developing new questions to investigate. Scientific results should not be kept by one researcher, as knowledge is best fostered in a wider research community.

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Ronja Lau is a textile archaeologist from Berlin with a Master's degree in Prehistoric Archaeology. She is currently a PhD student at the Ruhr-University-Bochum. Her research focuses on textile finds from the Iron Age salt mine Dürrenberg, Austria. A recent publication discussing mineralized textile remains from Hallstatt graves in Slovenia (Mineralisierte Textilreste aus hallstattzeitlichen Gräbern in Slowenien) was published open access in December 2021 in the online series of the Natural History Museum Vienna.

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