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Textile techniques of the 1st millennium BCE in Central Europe

Técnicas têxteis do I milénio a.n.e. na Europa Central

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ABSTRACT: Iron Age textile techniques in Central Europe are rooted in Bronze Age innovations which evolved into a very diverse picture of weaving and patterning techniques in the Iron Age. Besides the main textile culture of the Bronze Age being based on more or less simple tabbies, weaving techniques like twill weaving, tablet weaving, patterning and sewing techniques are innovations in mid 2nd millennium BCE. Gold threads from sites in Austria, Bavaria and Hungary bring some glamour into the woven world. In Iron Age Europe, the first specialisation in textile craft can be seen, with a fully developed textile craft with artfully used dyes, diverse weaving and patterning techniques of amazing quality. Within the Early Iron Age, the interplay between textiles and attached metal objects reaches a high standard – in expressing wealth and beauty. Some methods of operation show the unique approach of the craftspeople to the textile resource, offering an insight into the creative way of thinking of the prehistoric craftspeople. Textiles from the salt mines of Hallstatt and Dürrnberg serve as the main case study. They display a large variety of techniques and provide insight into different parts of textile craft and in the development of textile craft.
KEYWORDS: Archaeological textile finds; Central Europe; Iron Age; Hallstatt; La Tène; Late Bronze Age.

RESUMO: As técnicas têxteis da Idade do Ferro na Europa Central têm as suas raízes nas inovações da Idade do Bronze, dando origem a um panorama diverso de técnicas de tecelagem e padrões. A par da cultura têxtil principal da Idade do Bronze, baseada em tafetás, técnicas de tecelagem como a tecelagem de sarjas e teares de cartas, padronagem e técnicas de costura são inovações do II milénio a.n.e. Os fios de ouro da Áustria, da Bavária e da Hungria acrescentam glamour ao mundo dos tecidos. Na Europa da Idade do Ferro assiste-se à primeira especialização do artesanato têxtil, apreciando-se uma arte completamente desenvolvida, com corantes habilmente utilizados, técnicas diversas de tecelagem e de criação de padrões

de enorme qualidade. Na Idade do Ferro, as conexões entre têxteis e objetos metálicos afixados aos mesmos alcança um nível muito elevado, expressando noções de riqueza e beleza. Alguns métodos mostram uma abordagem única dos artesãos aos recursos têxteis, oferecendo perspetivas sobre a criatividade dos artesãos pré-históricos. Os têxteis das minas de sal de Hallstatt e Dürrnberg servem como os principais casos de estudo, mostrando uma grande variedade de técnicas e oferecem informações sobre diferentes partes das atividades têxteis e do desenvolvimento deste artesanato.

PALAVRAS-CHAVE: Achados têxteis arqueológicos; Europa Central; Idade do Ferro; Hallstatt; La Tène; Bronze Final.

1. INTRODUCTION

The end of the second and beginning of the first millennium BCE in Central Europe was a time of many innovations. This did not only concern metallurgy in the transition from the Bronze Age to the Iron Age, but also many aspects of textiles technologies, making them major boosters of economic, social and cultural developments of that time.

During the Early Iron Age, creativity in textiles reached its peak, showing a specialisation in the crafts with many different techniques and patterns, which shows that patterns and quality were valued and must have carried meaning. The importance of textile production is also evidenced by pictorial sources from the Hallstatt period, for example a large ceramic vessel from Sopron (c. 700 BCE) (Eibner-Persy 1980: Pl. 17), showing both a spinner and a weaver working on a warp-weighted loom, along with by someone playing the lyre and dancers.

The mentioned Central European sites are mapped in Fig. 1.

2. CENTRAL EUROPE DURING THE 1ST MILLENNIUM BCE

To better understand the innovations of the Iron Age of Central Europe, one must also consider the previous period. Central Europe is broadly characterised by three major cultures during the first millennium BCE.

2.1. Late Bronze Age

Firstly, there is the Urnfield culture of the Late Bronze Age, lasting from around 1250 to 800 BCE, named after the widespread burial custom of cremation. Due to this tradition, less is known about placement patterns of dress components, such as pins, fibulae and belt elements. However, sometimes textiles survive in the cremation urns in specific environmental conditions or as carbonised remains. Recent experiments (Fig. 2) (Grömer 2020) have shown that the preserved textiles do not necessarily represent fabrics such as bags, which could have been used to gather the remains after the cremation. As a matter of

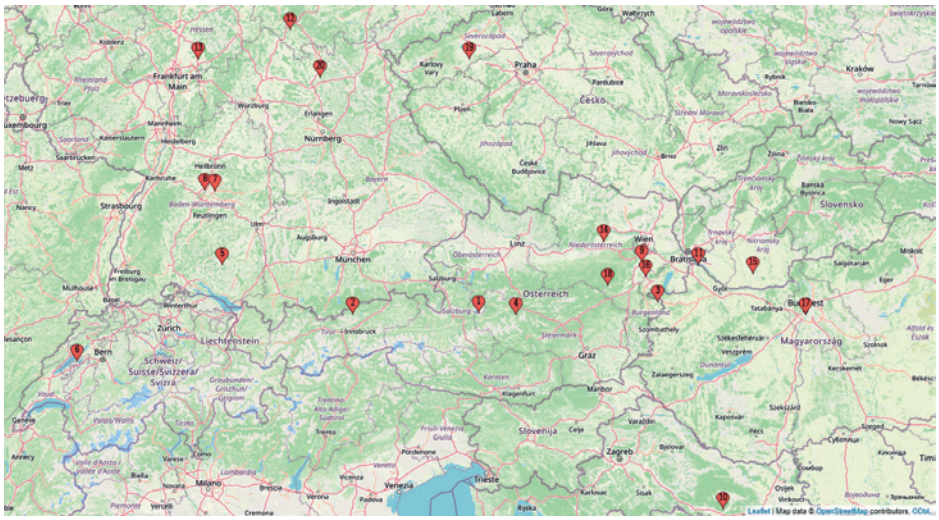

FIG. 1 Map of sites mentioned in this contribution. 1: Hallstatt; 2: Dürrnberg; 3: Sopron; 4: Mitterberg; 5: Heuneburg; 6: La Tène; 7: Hochdorf and Hohmichele; 8: Grafenbühl; 9: Vösendorf; 10: Požega; 11: Nové Košariská; 12: Schwarza; 13: Glauberg; 14: Franzhausen; 15: Nové Zámky; 16: Ebreichsdorf; 17: Óbuda; 18: Koppental; 19: Čeradice; 20: Grundfeld.

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FIG. 2 Experimental archaeology on cremation graves. Left: Charred tabby textile on a bronze buckle from the belt found after burning Right: Experimental burning of a fully dressed pig on a pyre (Photos: K. Grömer, NHM).

fact, textiles from the individual's clothing, shrouds, or other pieces that were burnt can survive the process and be placed into the urns as charred fragments. There are, however, remarkable sites where organic textile remains were found: the Bronze Age galleries of the salt mines of Hallstatt and the Mitterberg copper mines in Austria, where the conditions allow for the preservation of these organic remains.

Large settlements are known from this period, which were often strongly fortified centres of power containing a variety of workshops. Along with the fortifications and development of swords, many hoards point towards turmoil during this period.

2.2. Early Iron Age

The so-called "Hallstatt culture" was already established during the Late Bronze Age in Central Europe (Phases A and B), when mining in the Hallstatt salt mines was already taking place. The phases C and D are defined as the "Hallstatt period", or the Early Iron Age, from around 800 to 450 BCE. Many influences from the increasingly advanced Mediterranean cultures can be seen during this period (e.g. imported items, raw materials, influences in the decoration of metal artefacts), and an elite class in society is more visible than ever. An impressive example is the Heuneburg in Baden-Württemberg, south-eastern Germany, with a palatial building along with massive, Mediterranean-inspired walls, a quarter for craftspeople and large burial mounds in the surrounding area (Jung 2009; Fernández-Götz 2019). Though iron was the innovative material during this time, the clothing of this period still used many bronze accessories, allowing for clothing remains to be preserved in form of pseudomorphs on the inside of brooches or belts, for example. On the other hand, the Hallstatt salt mines are a major source of Early Iron Age textile remains, still showing vivid colours. Besides the name-giving innovation in metal, there were also major changes in textile technology.

2.3. Late Iron Age

The Central European Late Iron Age, also known as the La Tène culture or period, named after the site at Lake Neuchâtel in Switzerland, is dated to around 450 to 15 BCE, ending with the extension of the Roman Empire up to the Danube. Though ethnonyms are widely seen as controversial (Leskovar 2010: 127–129), this period is commonly associated with the "Celts", first mentioned by Hekataios of Milet around 500 BCE in Southern France. This period is characterised by more complex fortifications, such as the *murus gallicus* and the early urbanisations (*oppida*). In jewellery, bronze was still widely used, but iron fibulae became increasingly common. Another salt mine in Austria, known as the Dürrnberg near Hallein, contains a multitude of Late Iron Age textile remains due to the excellent preservation conditions, providing an interesting comparison to Hallstatt.

Increased industrialisation can be seen in this period, also made possible by innovations such as

the pottery wheel, wood turning as well as the use of shears.

3. RAW MATERIALS

Though sheep had long been domesticated in Europe since the beginning of the Neolithic, sheep's wool only became a common textile material in the Bronze Age in Central Europe, while bast fibres (especially flax, nettle and hemp) were the main materials during the Neolithic (Rast-Eicher 2005). Flax is among the fibres detected especially from La Tène period sites in Central Europe, e.g. in Slovakia (Belanová-Štolcová 2012).

Still, both flax and sheep wool remained to be the most important fibres throughout the Iron Age up to the Middle Ages.

However, innovations in the raw textile materials are visible when comparing Late Bronze Age and Iron Age wool fibres: Wool threads of the Bronze Age still contain coarser fibres than those of the Iron Age. This, on the one hand, can be attributed to a more time-intensive sorting of the fibres, and, on the other hand, more advanced selective breeding of sheep by the time of the Iron Age. This breeding process had advanced even further by the La Tène period during the first century BCE, as evidence from Switzerland shows (Rast-Eicher 2008).

Along with this, one can also observe less pigmentation of Iron Age wool fibres, which again could have been sorted better considering multi-coloured sheep-fur, but can also be traced back to breeding (Rast-Eicher – Bender Jørgensen 2013: 1233). The white hairs are more suitable for dyeing, which goes hand-in-hand with the advances in dyeing during this period (see below).

However, some less well-known fibres also came to use – with deliberate purposes: For example, during the Hallstatt A period of the Late Bronze Age, around 1100 BCE, gold threads with a flat-triangular cross-section were incorporated into textiles, creating glamourous fabrics through this luxurious metal. These were found recently in Ebreichsdorf (see below), but also occur in further Austrian, Hungarian and Bavarian sites. In the Early Iron Age, flat gold threads seem to have been used to decorate a woven textile from a grave in Grafenbühl, Southern Germany (Banck-Burgess 1999: 204). Silk, however, is not known from Iron Age Central Europe and only appears from the Roman period onwards (Bender Jørgensen 2013).

Seemingly unlikely materials are also known from the Iron Age: sorted, soft, spun badger-fur from Hochdorf, Southern Germany (Banck-Burgess 1999: 110), and horsehair from Hallstatt (Grömer *et al.* 2013: 55) and Dürrnberg (Grömer – Stöllner 2011: 113). The use of horsehair is especially interesting concerning the deliberate selection of this fibre, which is very thick, strong, and smooth. In these cases, it was used as a weft in ribbons, providing the benefits of more stiffness in the width (preventing the ribbon from folding) and a denser weft count, allowing for perhaps more appealing, less elongated and more robust bands.

4. THREAD QUALITIES

Thread qualities strongly differ during the periods of the second and first millennia BCE. First, the orientation of the fibres within the threads can be considered, which is more regular during the Iron Age than in the Bronze Age when observing the Hallstatt salt mine threads. This is due to a thorough and repeated combing of the fibres before spinning. This shows how much time and effort was put into textile production – even at the stages of preparation – to create a smoother but also more functional fabric, as this process made the wool textile more water-resistant (Grömer 2016: 70).

A further change in Iron Age textile technology concerns the thread diameters. During the Bronze Age, much thicker wool threads were produced, mainly ranging between 1 and 2 mm. In some cases, threads with different diameters and spin angles were deliberately used in warp and weft. Stronger, more tightly spun threads were necessary in the warp, preventing them from being torn during weaving by the weight of the loom weights. But less tightly spun, thicker threads (3 to 4 mm) could be used in the warp to create a soft and warming fabric (Grömer 2006: 39).

With thread diameters most commonly between 0.3 and 0.5 mm, the yarns of the Iron Age are significantly thinner. This corresponds with the many spindle whorls found in the area of the Hallstatt culture, for example, which are very small and light (8 to 12 g) (e.g. from Slovakia: Belanová-Štolcová 2012; for

FIG. 3 Spindle whorls from Slovenia (after Lau 2021: Fig. 31, © NHM Vienna).

Slovenia: Lau 2021; Potrebica – Kramberger 2020; for Austria: Grömer 2016: 85–91) (Fig. 3). Spindle whorls from the Bronze Age are comparably rare, but this might have to do with preservation in the case that they were made of wood (Grömer 2016: 85–87). In the La Tène period, one can observe a slight increase in thicker threads, though there is a large variety of diameters, the most common ones being 0.5 and 1.0 mm (Saunderson – Grömer – Formato 2022: Fig. 3). There is then a shift toward the Roman period in this region, with the textiles becoming finer after some while.

Both during the Bronze Age and the Iron Age single yarns were most common for weaving, though plied yarns sometimes occur in one system during the Hallstatt period, especially the Western Hallstatt area (Banck-Burgess 1999). The spin directions varied, especially during the Bronze Age, tending more towards z-twists during the whole Iron Age. Due to the abrasion and twisting of the threads during the process of tablet weaving, plies and tighter twists can be observed in these ribbons (Grömer *et al.* 2013: 58).

FIG. 4 Chevron twill from the Bronze Age parts of the salt mine Hallstatt, c. 1400–1100 BCE (Photo: A. Rausch, NHM Vienna).

5. WEAVING TECHNIQUES

5.1. Late Bronze Age

Tabby weaves, the most basic type of weave, are the most common in the Bronze Age in Central Europe, with basket weaves also occurring around 1200 BCE in Vösendorf, Austria, for example. However, some twills already appear during this period. Interestingly, two of the oldest known twills from this region were already woven in a more complex chevron pattern (Fig. 4), testifying to the use of multiple shafts on the looms (Grömer *et al*. 2013: 267, 307). A higher percentage of fulled fabrics is also a feature of Bronze Age textiles.

5.2. Early Iron Age

During the Hallstatt period, a large variety of weaving techniques can be observed, testifying to the weavers' skills and creativity (Fig. 5). Simple tabbies do still occur, which tend to be rather coarse. Basket and half-basket weaves are much finer, reaching up to 40 threads per cm. Twills are the most popular type of weave. Many different twills were woven, though the 2/2 diagonal twill was the most popular (Grömer *et al.* 2013: 62). The benefits of this weave are its increased warmth and elasticity, though its appearance was surely also a factor. Especially the more complex twills, such as diamond twill, exhibit finer threads and higher thread counts. In two cases in Hallstatt, the technique was even changed from basket weave to twill within the same fabric (Grömer *et al.* 2013: 384, 544). Also the

FIG. 5 Hallstatt period (800-400 BCE) textiles of different weave types and patterns of twill from the salt mine Hallstatt (Image: K. Grömer, Photos: A. Rausch, NHM Vienna).

tools needed for weaving, loom weights, have been found at various sites of the Hallstatt culture, e.g. Nove Kosariska (Belanová-Štolcová 2012: 312-314). Recently in the Požega Valley in Croatia, also a wooden structure has been found that could be identified as a loom (Potrebica – Files Kramberger 2020).

5.3. Late Iron Age

During the La Tène period in Austria and Slovakia, a standardisation can be observed in textiles that has been understood as a result of mass production (Kurzynski 1996: 35–36; Grömer 2016: 256–261). The threads are thicker than during the Hallstatt period, and tabby

weaves become more common, while some diagonal twills still occur, especially in Switzerland (Rast-Eicher 2008) until the middle La Tène period. Most weaves are woven with z/z-yarns and spin-patterns seem to go out of fashion.

6. RIBBONS AND SELVEDGES

There are generally two techniques in which ribbons were created during these periods: tablet-woven bands and warp-faced bands (usually tabby-woven). Tablet weaving already has its origins in the Bronze Age. There oldest possible evidence derives from a Middle Bronze Age burial in Schwarza, Germany (Farke 1993: 111), while a ribbon from Late Bronze Age Hallstatt shows the characteristic twists more clearly. However, it must be considered that the basic structure can also be achieved without the use of tablets. The oldest evidence of the tools used, the weaving tablets, are also known from the Late Bronze Age (Grömer 2016: Fig. 52). Tablet weaving reached its peak popularity during the Early Iron Age with a variety of patterns (see below) and techniques. In most cases, four threads per tablet were used (Grömer 2016: 186–192; Grömer – Ungerechts – Reschreiter 2021), but different structures and patterns were able to be created using two or three threads (Ræder Knudsen 2007; 2012). An impressively complex example derives from the La Tène period Dürrnberg salt mine, using three different-coloured threads per tablet, requiring the weaver to also change the position of the tablets (Grömer – Stöllner 2011). Though some mistakes are visible in the finished band, this example shows how skilled and specialised the Iron Age weavers were.

Though not categorised as woven, plaited bands also occur during the Bronze and Iron Ages.

A feature that we can see on a multitude of textile finds are narrow starting borders, finishing borders and selvedges. These had multiple purposes: Starting borders created an even spacing of the warp threads during their preparation for weaving on the loom. Selvedges on the sides facilitated weaving a consistent width. Furthermore, all of these borders – as they were woven or plaited quite densely – helped prevent the edges of the fabric from being damaged. Also, as their appearance deviated from the main fabric, they can be seen as a decorative addition, sometimes with patterns. In some cases, borders were only sewn on after the weaving process, especially tablet-woven bands (Grömer *et al.* 2013: 74).

7. DYES

Due to the excellent preservation conditions, dyes are often still visible to the naked eye on salt mine textiles, while also allowing for chemical analyses. Already in the Bronze Age mines of Hallstatt, some dyed textiles can be observed (Hofmann-de Keijzer 2016). For example, yellow, which can be achieved with a wide range of local plants (e.g. weld, *Reseda luteola*), and red, which probably derives from bedstraws (*Asperula* and *Galium* species) or madder root (*Rubia tinctorum*). The oldest blue dye of Central Europe derives from Bronze Age Hallstatt, dyed using woad (*Isatis tinctoria*), introduced to the region from the east, in vat dyeing technique. In the Iron Age, woad blue was one of the most popular dyes. From Dürrnberg, Glauberg, Hallstatt and Hochdorf, for example, there is evidence of the use of dye insects, kermes (*Kermes vermilio*) and cochineal (*Porphyrophora polonica*), which create a reddish-purplish colour. This demonstrates far-reaching trade networks, as these insects derive from the Mediterranean and modern Poland or Armenia (Hofmann-de Keijzer 2016: 141–163). Generally, a large increase in dyed textiles can be observed in the Iron Age, creating a large colour palette for this period (Fig. 5).

8. PATTERNS AND DECORATIONS

Decorations can be found on almost all materials in prehistoric cultures of Central Europe. On textiles, there is a wide range of techniques for creating a more appealing appearance of fabrics, reaching its highest complexity in the Early Iron Age, where half of the Hallstatt textiles are patterned (e.g. Grömer *et al.* 2013). As mentioned, borders were also a decorative feature of fabrics, attracting the eye to these areas.

The La Tène textiles, though still showing patterns (Stöllner 2005), were somewhat simpler than the Hallstatt period textiles. This may be connected to the

mentioned standardisation in the weaves, where creativity and time-consuming techniques were valued less than fast production.

8.1. Spin patterns

Spin patterns are already known from the Bronze Age, for example a repp-ribbon from Middle Bronze Age Mitterberg, Austria (Grömer 2006: 37), and Hallstatt (Grömer *et al.* 2013: 273). Spin patterning is one of the decorative techniques that can also be observed in mineralised textiles from graves which lack colour information (e.g. from Slovenia: Lau 2021; from Hungary: Bender Jørgensen 2005; from Switzerland: Rast-Eicher 2008; from Southern Germany: Banck-Burgess 1999). This sorting of z- and s-spun threads reached its peak popularity in the Early Iron Age. This method of patterning, creating "twisted" structures, discreet stripes or chequers, demonstrates the attention to detail that was paid by the craftspeople but also their consumers and viewers.

8.2. Colour patterns

A well-known technique of patterning is the use of different colours. This is already visible in the Bronze Age, though rather rare. For example, an Early Bronze Age headdress from Franzhausen, Austria, exhibits dark and light stripes (Grömer 2006: 28). There is also a striped pattern among the Bronze Age Hallstatt finds on a (probably) tablet-woven border, alternating between light brown and dark blue (Grömer *et al.* 2013: 310). Colour was also commonly used to create chequered patterns during the Hallstatt period, sometimes creating different effects through the use of twills. During the La Tène period at Dürrnberg, however, stripes were again more popular, sometimes using three colours (Stöllner 2009: Tab. 2–8).

Narrow repp bands of the Hallstatt period also commonly exhibited simple patterns using alternating colours, thus creating chequerboard patterns (Grömer 2016: 184–186).

Decorative colour was also added through sewing using contrasting lines of threads in Bronze and Iron Age Hallstatt (Grömer *et al.* 2013: 88). Embroidery is rather rare during the first millennium BCE, though an example derives from Nové Zámky, Slovakia, where the remaining holes in a fabric suggest an embroidered cross-pattern (Belanová 2005: Figs. 3–4). Some embroidered finds may also derive from Dürrnberg (Stöllner 2005: Fig. 12).

8.3. Woven patterns

Twills can themselves be viewed as woven pattern structures. However, motifs can also be woven into fabrics in a variety of methods. For example, tablet weaving allows for the creation of complex geometric patterns, e.g. including the use of different-coloured threads, turning the tablets back and/or forth in specific sequences. A range of motifs such as triangles and meanders – generally popular during the Iron Age – can be found in Hallstatt, Hochdorf (Banck-Burgess 1999) and one in Dürrnberg, for example. On tabby-woven bands, floating warp threads could also be used for creating a chequerboard pattern (Grömer *et al.* 2013: 85).

8.4. Soumak

Though it can appear similar to embroidery, the soumak technique is applied using additional threads during the weaving process. This technique is known from multiple textiles of the Hallstatt period from elite burials in Southern Germany – Hochdorf and close by Hohmichele – where decorative geometric motifs were added in soumak (Banck-Burgess 1999).

8.5. Metal threads

Metal appliques sewn onto textiles are known from the beginning of the use of metals. However, incorporating them into the weave of a fabric represents something more permanent. It is a process that needs to be planned before weaving the textile and cannot be simply removed by cutting a thread.

From between 1200 and 1000 BCE, there is also evidence of metal – gold – threads that were incorporated into textiles, e.g. from Ebreichsdorf (Austria: Saunderson – Grömer 2023), Koppental (Austria: Gruber 2008: 177) and Óbuda (Hungary: Barth 1989: 157), among others in Austria, Hungary and Bavaria. Though the organic threads of the textiles are not preserved, the courses of the metal threads indicate that they were once part of a woven structure. These are all quite similar: repeated parallel threads and coils.

The find from Ebreichsdorf is unique: At least three textiles were folded and wrapped tightly and then held together with a gold wire. This indicates a ritual deposition of these textiles – probably as a hoard

FIG. 6 Gold thread bundle from Ebreichsdorf in Austria, c. 1100 BCE (Photo: A. Rausch, ÖBB/Novetus/BDA/NHM Vienna).

together with other gold objects – as the structure of the gold threads was destroyed when wrapped so tightly (Fig. 6). It seems as though the textiles were completely covered in gold, as the bundle is extremely dense. Thus, this might have been an assemblage of gold-glimmering garments, reserved for a political or religious elite.

9. SEWING

Already with the Bronze Age textiles of Hallstatt we can observe many traces of cutting, sewing and stitching (Rösel-Mautendorfer 2016). At the cut edges, seams were added using different techniques, such as overcast and hemstitches, among others. Some

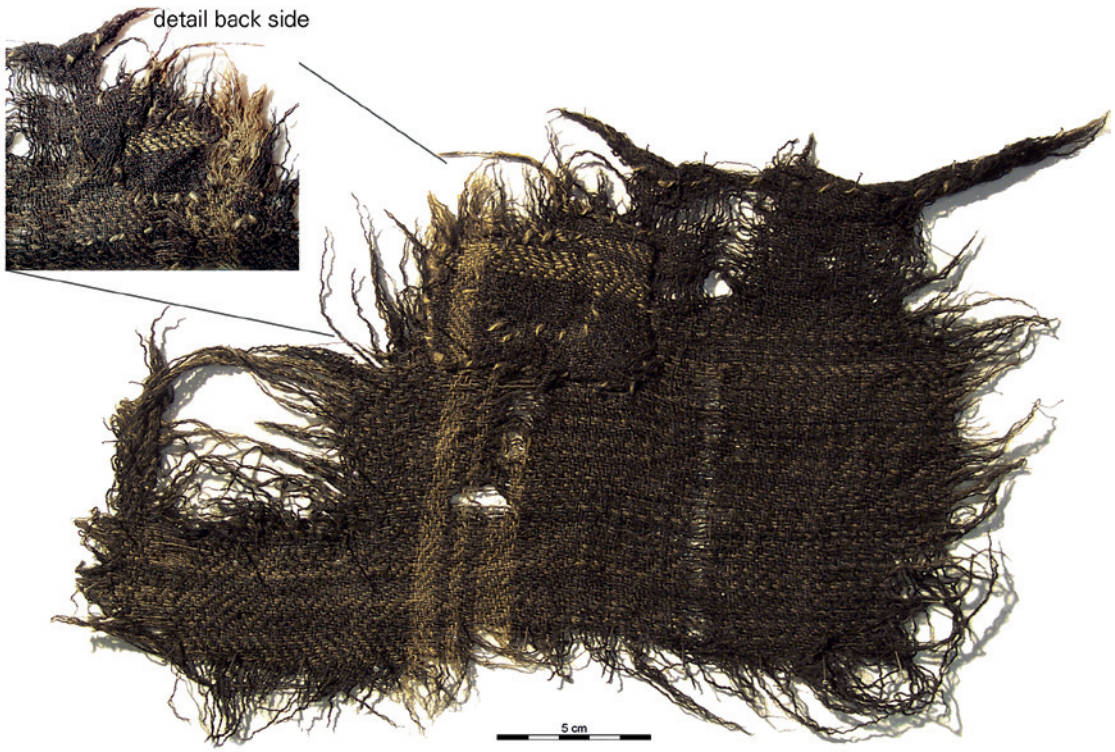

FIG. 7 Textile from Hallstatt with a patch, repair work (Image: A. Rausch, NHM Vienna).

stitches were added as repairs or for repurposing textiles (Grömer 2006: 41). Quite commonly, multiple patches, sometimes of different fabrics, were sewn together. This might be as repairs (Fig. 7), repurposing or adjusting of textiles, e.g. lengthening, or simply due to the utilisation of smaller fabric pieces, which may have been left over from previous sewing activities.

Some of these may indicate clothing, though no finds clearly indicate specific garments. Sewing threads differ from weaving threads, as they are usually plied for additional strength.

10. FUNCTIONS

It must be noted that these textile features certainly depended on the function of the fabric. For example, practical textiles used as carrying bags from the salt mines (Grömer *et al.* 2013: 121–125, Fig. 40) served completely different needs than clothing. A simple, but strong undyed tabby cloth was sufficient for this purpose. Clothing textiles served a wide range of needs and could vary greatly. It can be worn in layers – comfortable linen on the skin and coarser thick wool on the outside. Textiles can protect one from the elements – cold, wind, rain and sun – but also harm from rough terrain or tools and weapons, whereby different textile characteristics can be utilised for different purposes. Further, non-physical human needs cannot be overlooked: aesthetic needs and the feeling of belongingness, for example. People wanted to adorn themselves in things they found beautiful and fashionable. They wanted or needed to show off their status – what they were able to afford or which social group they were associated with. This could be done in several ways using textiles, with colours, patterns, cuts and garments representing specific social groups, or more complex patterns as well as rarer and finer materials showing wealth, for example (Roach-Higgins – Eicher – Johnson 1995; Bender Jørgensen 2007).

However, given that most finds from Bronze and Iron Age Central Europe are fragmentary, the exact function of the textiles is often unclear. Especially for the finds from the salt mines, which represent waste or lost items as opposed to deliberately deposited textiles in burials. It is interesting to note, however, that at Hallstatt the characteristics of the Early Iron Age salt mine textiles correspond with those of the cemetery (Grömer *et al.* 2013: 50–51).

A further category of textile functions – household textiles – was surely significant in everyday life but unfortunately not available in the archaeological record due to preservation conditions in settlements. We can, however, assume that textiles for beddings, technical uses, mats, curtains, cleaning, medicinal uses, etc. were utilised during these periods (Banck-Burgess 1999: 97–124; Stöllner 2009: Tables).

An interesting, more unusual use for textiles has been observed for the La Tène period, where probably reused textiles are sometimes found stuffed in hollow bronze bracelets and anklets (Belanová-Štolcová 2012). These textiles were used to stabilise the shape of the thin bronze sheet or perhaps also aid the production process.

10.1. Salt mine textiles

For most salt mine textiles, their exact functions are unknown. The ratio of wools compared to plant fibres is very high, both in the Bronze Age and the Iron Age mines of Hallstatt in contrast to e.g. textiles from burials, which might have to do with the properties of wool being preferred in the salt mines. However, the Late Iron Age salt mines of Dürrnberg exhibit a higher percentage of linen textiles (Stöllner 2005: Fig. 9).

One can assume that textiles could be important implements in the salt mines, such as mats for sitting, cleaning rags, packaging, etc. Carrying sacks for transporting salt have been suggested for sturdy cloths from Bronze Age Hallstatt (Grömer *et al.* 2013: 122–123). Multiple strips of textiles in Hallstatt were knotted, perhaps indicating that they held something together (Stöllner 2005; Grömer 2016: Fig. 165). In Late Iron Age Dürrnberg, smaller pieces of (probably recycled) fabric were found wrapped around a tool handle and also as a small wound bandage (Stöllner 2005: 161–174).

Though it could not be evidenced as of now, ritual or symbolic textiles can also possibly be identified for the pieces found in the mines, which could be considered a special space set apart from everyday life – at least compared to that of most prehistoric people, where perhaps textiles could have been part of some ritual depositions (Rösel-Mautendorfer *et al.* 2021). Some textiles could also represent fragments of clothing of the people working in the mines (see below).

10.2. Burial textiles

Burials are one of the common contexts for textile finds (e.g. Banck-Burgess 1999; Rast-Eicher 2008; Gleba 2008; 2014; Lau 2021), which had a multitude of functions. First, one can consider the clothing of the deceased – both worn on the body and sometimes as well as sometimes placed elsewhere in the burial. Here the question arises whether this was everyday clothing or garments for special occasions, which surely depended on the social standing of the buried individual.

Burials are in and of themselves rituals. Textiles that do not derive from clothing could likely be connected to multiple rituals or beliefs revolving around burials. Especially during the Iron Age, burial goods were wrapped multiple times in cloth (Gleba 2014). This could be understood as a "packaging" or "separation" for the world of the dead (Banck-Burgess 1999: 19–21), or also protection, connected to beliefs or practical purposes such as from pollution or oxidation. This wrapping practice is especially apparent in the elite ("princely") burial of Hochdorf, Germany, of the Late Hallstatt period, where the many goods were probably fully wrapped in woven textiles – even a wagon (Banck-Burgess 1999: 21–28).

FIG. 8 Sword with textile material wrapped around the hilt, from Late Bronze Age Čeradice, Czech Republic, Late Bronze Age (Image: NHM Vienna).

One can also assume that the bodies themselves were often wrapped in cloth, though archaeological finds of these are often difficult to differentiate from clothing given the proximity to the body. Rituals are surely connected to this practice, but its purpose can well also be hygienic and psychological. The use of wrapping textiles, or rather bags, must also be suspected for cremation burials. At the Hallstatt cemetery, where ceramic urns were not in use, this can be deduced by the fact that the piles of remains are very compact, which is only possible with the use of some organic container. Recently, in 2023, remains of such a coarse textile bag containing the burnt remains were found.

Weapons found in graves also sometimes exhibit adhering textile remains, such as a sword from Late Bronze Age Čeradice, Czech Republic (Fig. 8), of which the hilt was wrapped with a fine plied yarn (Grömer 2006: 43). This wrapping is purely functional, though, providing comfort and grip on the hilt. From the Hallstatt and La Tène period burials in Hallstatt, wrappings of the blades of daggers and swords are also known (Grömer 2016: Fig. 157–158).

Blankets, carpets, pillows, mattresses, etc. must also be considered in burials, though they can rarely be identified. The rich burial in Hochdorf shows another interesting use of textiles, namely as decorative wall hangings (Banck-Burgess 1999: 193).

10.3. Clothing

Up until today, textiles are excellently suited for clothing, and we must assume this to be the case during the Bronze and Iron Age. Observing the case of Hallstatt, where the find contexts usually do not indicate clear functions of the textiles, the fragments themselves can sometimes offer indications. An intriguing example derives from the Bronze Age mines, where gores were added during the weaving process. Rather than a correction of an unbalanced weave, these inserted threads have been interpreted as intentional in order to widen one side of the fabric (Grömer *et al.* 2013: 67). This would be coherent with garments such as tunics or dresses that are wider at the bottom part. We know many examples of these from historical periods, though here the triangular gores are sewn in, but also from a further salt mine – Chehrābād in modern day Iran. One of the complete garments dating to the Sassanian period (224–651 CE)

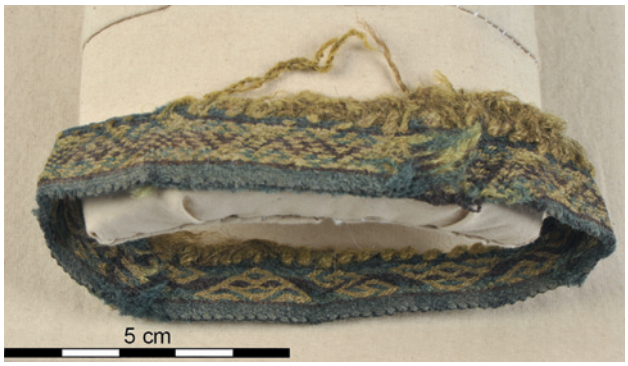

FIG. 9 Part of a sleeve, salt mine Hallstatt, 800–400 BCE (Photo: Natural History Museum Vienna, A. Rausch).

FIG. 10 Reconstruction of Hallstatt period female dress based on a grave from Statzendorf (Photo: S. Dupper).

Iran was a tunic with sewn in gores on the lower part and also the sleeves (Grömer – Aali 2020). Though the other known examples are far away on a geographical and chronological scale, they nonetheless show that these are common and basic elements of tailoring. Possible Iron Age gores also derive from Hallstatt (Rösel-Mautendorfer 2016: Fig. 138), though one must keep in mind that fabrics were patched using many different shapes and also reused.

Definite evidence of clothing is rare in the salt mines, but it can be assumed for the fragments with intricate designs. Two tailored pieces can, however, be attributed to clothing with high certainty due to their shape: small remains of a sleeve with a sewn-on tablet-woven border, from Hallstatt (Rösel-Mautendorfer 2016: Fig. 132) (Fig. 9) and from Dürrnberg (Grömer – Stöllner 2011).

A clear indicator of the use as clothing are the nits of body lice (*Pediculus humanus humanus*). These have been found attached to multiple textiles from the Hallstatt salt mines (Grömer *et al.* 2013: 127–128, Fig. 41), whereby the closeness to the human body would have created their ideal environment.

An interesting piece of direct evidence of a wide Late Bronze Age belt derives from a burial in Grundfeld, Germany, which was woven and attached to a stronger, organic base in order to carry the heavy bronze fittings (Bartel – Voß 2005).

Experimental archaeology helps to give an impression on how Hallstatt period clothing might have looked like – based on evidence from placement patterns of fibula, belt fittings and jewellery in Hallstatt graves, pictorial sources and the textiles known from that period (Fig. 10).

11. CONCLUSIONS

Due to the preservation conditions in the Austrian salt mines, our knowledge of Late Bronze Age to Iron Age textiles is quite vast, allowing for insights into raw materials, thread production, weaving techniques, dyeing, decoration and sewing. As there is only a small chronological overlap between the utilisation of the salt mines in prehistory, this enables insights into the innovations of the periods – from the Late Bronze Age to the Hallstatt culture to the La Tène culture, showing distinctive features for each period. The Late Bronze Age mines show many unique finds, evidencing that more complex techniques such as vat dyeing with woad and chevron twills were already in use. The Early Iron Age textiles display the widest range of textile techniques with elaborate designs, demonstrating many colourful designs and patterns with the finest threads. The complexity was more reduced during the Late Iron Age, though colourful designs were still in use.

However, one can grasp an increased "mass production" of textiles, which were more often woven with thicker threads in the tabby technique, which was less time consuming.

Overall, while these sites are of major importance and have been able to change our view on prehistoric textiles, one must consider that these were special spaces in prehistory, where the uses of the textiles are not always clear. This also means that the clothing worn in these spaces (in this case, as miners in a salt mine) may have differed from other contemporary garments and of course from festivity clothing. For this reason, it is necessary to also incorporate textiles from other sites and compare them, such as from the burial grounds. In the case of the Hallstatt period burials, the textile qualities (e.g. Bender Jørgensen 2005; Rast-Eicher 2008; Lau 2021) correspond with those of the salt mines. However, the Early Iron Age people working and being buried in Hallstatt were exceptionally wealthy through the salt trade, which would have also been reflected in the textiles they used. Further major sources for Hallstatt period textiles derive from princely burials from Southern Germany (von Kurzynski 1996; Banck-Burgess 1999), which surely also contained the costliest fabrics.

Even if these are the most elite textiles, they still demonstrate the technological possibilities and creativity of the time.

Bibliography

BANCK-BURGESS, J. (1999) – *Hochdorf IV. Die Textilfunde aus dem späthallstattzeitlichen Fürstengrab von Eberdingen-Hochdorf (Kreis Ludwigsburg) und weitere Grabtextilien aus hallstatt- und latènezeitlichen Kulturgruppen.* (Forsch. u. Ber. Vor- u. Frühgesch. Baden-Württemberg, 70). Stuttgart.

BARTEL, A. – VOSS, H. (2005) – Modisch in der Urnenfelderzeit: Zur Kleidung einer Frau aus Grundfeld. *Das Archäologische Jahr in Bayern*, 2005: 44–46.

BARTH, F. E. (1989) – Zum Goldscheibenfund von Óbuda. *Mitteilungen der Anthropologischen Gesellschaft in Wien*, 118/119: 155–158.

BELANOVÁ, T. (2005) – The state of research of La Tène Textiles from Slovakia and Moravia. In BICHLER, P. – GRÖMER, K. – HOFFMANN-DE KEIJZER, R. – KERN, A. – RESCHREITER, H. (eds.) – *Hallstatt Textiles – Technical Analysis, Scientific Investigation and Experiment on Iron Age Textiles.* (British Archaeological Reports International Series, 1351). Oxford: 175–189.

BELANOVÁ-ŠTOLCOVÁ, T. (2012) – Slovak and Czech Republic. In GLEBA, M. – MANNERING, U. (eds.) – *Textiles and Textile Production in Europe from Prehistory to AD 400.* (Ancient Textiles Series, 11). Oxford: 306–333.

BENDER JØRGENSEN, L. (2005) – Hallstatt and La Tène Textiles from the Archives of Central Europe. In BICHLER, P. – GRÖMER, K. – HOFFMANN-DE KEIJZER, R. – KERN, A. – RESCHREITER, H. (eds.) – *Hallstatt Textiles – Technical Analysis, Scientific Investigation and Experiment on Iron Age Textiles.* (British Archaeological Reports International Series, 1351). Oxford: 133–150.

BENDER JØRGENSEN, L. (2007) – The World According to Textiles. In GILLIS, C. – NOSCH, M.-L. (eds.) – *Ancient Textiles. Production, Craft and Society. Proceedings of the First International Conference on Ancient Textiles, held at Lund, Sweden, and Copenhagen, Denmark, on March 19–23, 2003*. Oxford: 7–12.

BENDER JØRGENSEN, L. (2013) – The question of prehistoric silks in Europe. *Antiquity,* 87(336): 581–588. DOI: https://doi.org/10.1017/S0003598X00049140

EIBNER-PERSY, A. (1980) – *Hallstattzeitliche Grabhügel von Sopron Ödenburg*. Eisenstadt.

FARKE, H. (1993) – Textile Reste von Dietzhausen und Schwarza. In FEUSTEL, R. (ed.) – *Zur bronzezeitlichen Hügelgräberkultur in Südthüringen.* (Alt-Thüringen, 27). Thüringen: 53–123.

FERNANDÉZ-GÖTZ, M. (2019) – Die Heuneburg-Vorburg: Besiedlung und Befestigung. In: HYE, S. – TÖCHTERLE, U. (eds.) – *UPIKU:TAUKE. Festschrift für Gerhard Tomedizum 65. Geburtstag*. Bonn: 147–158

GLEBA, M. (2008) – *Textile Production in Pre-Roman Italy.* (Ancient Textiles, 4). Oxford.

GLEBA, M. (2014) – Wrapping Up for Safe Keeping: "Wrapping" Customs in Early Iron Age Europe. In HARRIS, S. – DOUNY, L. (eds.) – *Wrapping and Unwrapping Material Culture.* (Institute of Archaeology Publications, 64). London: 135–146.

GRÖMER, K. (2006) – Textilien der Bronzezeit in Mitteleuropa. *Archaeologia Austriaca*, 90: 31–72. DOI: https://doi.org/10.1553/archaeologia90s31

GRÖMER, K. 2016: *The Art of Prehistoric Textile Making – The development of craft traditions and clothing in Central Europe.* With contributions by Regina Hofmann-de Keijzer and Helga Rösel-Mautendorfer. (Veröffentlichungen der Prähistorischen Abteilung, 5). Vienna. URL: https://library.oapen.org/handle/20.500.12657/32825

GRÖMER, K. (2020) – Wieviel Textil bleibt übrig bei einer Brandbestattung? Experimentelle Kremationen. Inzi 18 und Inzi 19. In: SCHÖBEL, G. (ed.) – *Experimentelle Archäologie in Europa. Jahrbuch 2020.* Unteruhldingen: 68–82.

GRÖMER, K. – AALI, A. (2020) – How to Make a Sassanian tunic? Understanding Handcraft Skills based on a Find from the Salt Mine in Chehrābād, Iran. In QUILLIEN, L. – SARRI, K. (eds.) – *Textile Workers. Skills, Labour and Status of Textile Craftspeople between the Prehistoric Aegean and the Ancient Near East. Proceedings of the Workshop held at 10th ICAANE in Vienna, April 2016.* (Oriental and European Archaeology, 13). Vienna: 59–74.

GRÖMER, K. – KERN, A. – RESCHREITER, H. – RÖSEL-MAUTENDORFER, H. (2013) – *Textiles from Hallstatt – Weaving Culture in Bronze Age and Iron Age Salt Mines.* (Archaeolingua, 29). Budapest.

GRÖMER, K. – STÖLLNER, T. (2011) – Ein abgerissener Ärmel aus dem Salzbergwerk Dürrnberg – Neue Erkenntnisse zur Brettchenwebtechnik in der Eisenzeit in Mitteleuropa. Mit Beiträgen von Lise Ræder Knudsen und Helga Rösel-Mautendorfer. *Jahrbuch Römisch-Germanisches Zentralmuseum*, 56: 105–156. DOI: https://doi.org/10.11588/jrgzm.2009.1.16613

GRÖMER, K. – UNGERECHTS, S. – RESCHREITER, H. (2021) – Knowledge sharing: a newly found 2,700-year-old tablet-woven band from Hallstatt, Austria. *Archaeological Textiles Review*, 63: 115–125.

GRUBER, H. (2008) – Schätze aus Gold die urnenfelderzeitlichen Depotfunde vom Arikogel und aus dem Koppental. In: *Schätze, Gräber, Opferplätze. Traunkirchen 08. Archäologie im Salzkammergut. Katalog zur Ausstellung im ehemaligen Kloster Traunkirchen 29. April bis 2. November 2008.* (Fundberichte aus Österreich Materialhefte A, Sonderheft 6). Vienna: 72–77.

HOFMANN-DE KEIJZER, R. (2016) – Dyeing. In: GRÖMER, K. – *The Art of Prehistoric Textile Making – The development of craft traditions and clothing in Central Europe.* (Veröffentlichungen der Prähistorischen Abteilung, 5). Vienna: 140–169

JUNG, M. (2009) – Anmerkungen zur sozialhistorischen Interpretation der Lehmziegelmauer der Heuneburg. In: TREBSCHE, P. – BALZER, I. – EGGL, C. – FRIES-KNOBLACH, J. – KOCH, J. – WIETHOLD, J. (eds.) – *Architektur: Interpretation und Rekonstruktion. Beiträge zur Sitzung der AG Eisenzeit während des 6. Deutschen Archäologie-Kongresses in Mannheim 2008.* (BUFM 55). Langenweißbach: 109–117

KURZYNSKI, K. von (1996) – *"...und ihre Hosen nennen sie braccas". Textilfunde und Textiltechnologie der Hallstatt- und Latènezeit und ihr Kontext.* (Internationale Archäologie, 22). Espelkamp.

LAU, R. (2021) – Mineralisierte Textilreste aus hallstattzeitlichen Gräbern in Slowenien. In GRÖMER, K – KERN, A. (eds.) – *Prähistorische Forschungen Online 11*. Vienna: 6–15.

LESKOVAR, J. (2010) – Alte Kelten – Neue Druiden. Archäologie, Neuheidentum und der Keltenbegriff. *Oberösterreichische Heimatblätter*, 64: 119–134.

POTREBICA, H. – FILES KRAMBERGER, J. K. (2020) – Early Iron Age Textile Tools from the Pozega Valley, Croatia. *Archaeological Textiles Review*, 62: 83–100.

RÆDER KNUDSEN, L. (2007) – "Translating" Archaeological Textiles. In GILLIS, C. – NOSCH, M.-L. (eds.) – *Ancient Textiles. Production, Craft and Society. Proceedings of the First International Conference on Ancient Textiles, held at Lund, Sweden, and Copenhagen, Denmark, on March 19–23, 2003*. Oxford: 103–111.

RÆDER KNUDSEN, L. (2012) – Case Study: The Tablet-Woven Borders of Verucchio. In GLEBA, M. – MANNERING, U. (eds.) – *Textiles and Textile Production in Europe from Prehistory to AD 400.* (Ancient Textiles Series, 11). Oxford: 254–266.

RAST-EICHER, A. (2005) – Bast before wool: the first Textiles. In BICHLER, P. – GRÖMER, K. – HOFFMANN-DE KEIJZER, R. – KERN, A. – RESCHREITER, H. (eds.) – *Hallstatt Textiles – Technical Analysis, Scientific Investigation and Experiment on Iron Age Textiles.* (British Archaeological Reports International Series, 1351). Oxford: 117–131.

RAST-EICHER, A. (2008) – *Textilien, Wolle, Schafe in der Eisenzeit in der Schweiz.* (Antiqua, 44). Basel.

RAST-EICHER, A. – BENDER JØRGENSEN, L. (2013) – Sheep wool in Bronze Age and Iron Age Europe. *Journal of Archaeological Science*, 40: 1224–1241. DOI: https://doi.org/10.1016/j.jas.2012.09.030

ROACH-HIGGINS, M. E. – EICHER, J. B. – JOHNSON, K. K. P. (eds.) (1995) – *Dress and Identity*. New York.

RÖSEL-MAUTENDORFER, H. (2016) – Sewing and tailoring. In GRÖMER, K. – *The Art of Prehistoric Textile Making – The development of craft traditions and clothing in Central Europe.* (Veröffentlichungen der Prähistorischen Abteilung 5). Vienna: 216-240.

RÖSEL-MAUTENDORFER, H. – HEES, M. – ÖLLER, A. – RESCHREITER, H. (2021) – Du gehst morgen in den Berg, vergiss das Stoffstück nicht. Überlegungen zu Ritualen rund um Salz ausgehend von den Textilfunden aus dem Salzbergwerk Hallstatt. In WEIDINGER, A. – LESKOVAR, J. (eds.) – *Interpretierte Eisenzeiten. Fallstudien, Methoden, Theorie. Tagungsbeiträge der 9. Linzer Gespräche zur interpretativen Eisenzeitarchäologie.* (Studien zur Kulturgeschichte von Oberösterreich, 51). Linz: 247–266.

SAUNDERSON, K. – GRÖMER, K. (2023) – Die Goldfäden von Ebreichsdorf – den Textiltechniken auf der Spur. In GRÖMER, K. – BINDER, M. – KRENN-LEEB, A. (eds.) – *Gold. Die Geschichte des Goldfundes von Ebreichsdorf*. Vienna: 103-109.

SAUNDERSON, K. – GRÖMER, K. – FORMATO, L. C. (2022) – Missing Link: Early Roman textiles and Norican-Pannonian female dress from Potzneusiedl, Austria. *Archaeological Textiles Review*, 64: 28–38.

STÖLLNER, T. (2005) – More than old rags – Textiles from the Iron Age Salt-mine at the Dürrnberg. In BICHLER, P. – GRÖMER, K. – HOFFMANN-DE KEIJZER, R. – KERN, A. – RESCHREITER, H. (eds.) – *Hallstatt Textiles – Technical Analysis, Scientific Investigation and Experiment on Iron Age Textiles.* (British Archaeological Reports International Series, 1351). Oxford: 161–174.

STÖLLNER, T. (2009) – *Der prähistorische Salzbergbau am Dürrnberg bei Hallein II. Die Funde und Befunde der Bergwerksausgrabungen zwischen 1990 und 2000.* (Dürrnberg-Forschungen, 3). Rahden/Westfalen.

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O principal objectivo desta revista é a publicação e divulgação de trabalhos com manifesto interesse, qualidade e rigor científico sobre temas de Pré-História e Arqueologia, sobretudo do território europeu e da bacia do Mediterrâneo.

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EDITORIAL POLICY

Objectives
Ophiussa – Revista do Centro de Arqueologia da Universidade de Lisboa started under the direction of Victor S. Gonçalves in 1996, with the edition of volume 0. After Volume 1 (2017) it became a printed and digital edition of UNIARQ – Centro de Arqueologia da Universidade de Lisboa (ISSN 1645-653X / E-ISSN 2184-173X).
The main objective of this journal is the publication and dissemination of papers of interest, quality and scientific rigor concerning Prehistory and Archeology, mostly from Europe and the Mediterranean basin.

Periodicity
Ophiussa – Revista do Centro de Arqueologia da Universidade de Lisboa will publish an annual volume. The submission period will always occur in the first quarter of each year and the edition will occur in the last quarter.

Journal sections
The journal is divided into two sections: scientific articles and bibliographic reviews. Exceptionally, texts of an introductory nature may be accepted, in the context of specific tributes or divulgations, which will not be submitted to peer-review evaluation. Exemptions from this evaluation are also the bibliographic reviews.
Authors / editors wishing to submit a book for review should send two copies to the direction of Revista Ophiussa: one to the author of the review who will be invited for the purpose and another to the Library of the School of Arts and Humanities of the University of Lisbon. Spontaneous proposals are also accepted.
Papers written in Portuguese, English, Spanish, Italian and French are accepted.

Peer review process
Submitted articles are subject to a double blind peer-review evaluation process.
All submissions (articles and reviews) will be considered, in the first instance, by the Editorial Board, regarding its formal content and adequacy in face of the editorial policy and the journal editing standards. Articles that meet these requirements will subsequently be submitted to a blind peer-review process (minimum of two reviewers). The Scientific Council, constituted by UNIARQ direction and external researchers, will follow the editing process.
This stage will be carried out by qualified researchers, and their feedback will be delivered within a period of no more than two months. The reviewers will carry out the evaluation in an objective manner, in view of the quality and content of the journal; their criticisms, suggestions and comments will be, as far as possible, constructive, respecting the intellectual abilities of the author(s). After receiving the feedback, the author(s) has a maximum period of one month to make the necessary changes and resubmit the work.
Acceptance or refusal of articles will have as sole factors of consideration their originality and scientific quality.

The review process is confidential, with the anonymity of the evaluators and authors of the works being ensured, in the latter case, up to the date of its publication.
Papers will only be accepted for publication as soon as the peer review process is completed. Texts that are not accepted will be returned to their authors.
The list of reviewers will be published in 3-year cycles, indicated at the end of *Ophiussa* (printed and digital version).

Publication ethics

The Journal Ophiussa follows the guidelines established by the Commitee on Publication Ethics (COPE, the Ethics Committee Publications): https://publicationethics.org/
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The editorial process will be conducted objectively, impartially and anonymously. Errors or problems detected after publication will be investigated and, if proven, corrections, retractions and / or responses will be published.
The following ethical principles will be considered:

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Ophiussa through its editors and authors has the absolute responsibility for approval, condemning all bad practices of scientific publication.

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Ophiussa will seek to detect manipulation and falsification of data, plagiarism or duplicity, with the appropriate detection mechanisms.

3) Editorial policy and procedures:
a) Authors must have participated in the research process and in the review process, and must ensure that the data included is real and authentic and are obliged to issue retractions and corrections of errors of published articles;
b) Reviewers must carry out an objective and confidential review and have no conflicts of interest (research, authors or funders), and must indicate relevant published works that were not cited;
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