

# From the Parochial to the Universal: Comparing Cloth Cultures in the Bronze Age

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*The aim of this research is to compare the cloth cultures of Europe and Egypt in the Bronze Age and New Kingdom. The comparison focuses on the fourteenth century cal BC and includes four geographically separate areas, including the oak coffin burials of southern Scandinavia, the Hallstatt salt mines of central Europe, Late Minoan Crete, and the tombs and towns of the later Eighteenth Dynasty of Egypt. The comparative approach can bring insights even when applied to unconnected cultures or regions. However, in this study I concentrate on a restricted chronological period and areas that were connected, directly or indirectly, by widespread networks of trade or exchange. The concept of cloth cultures is used to include both textiles and animal skins as these were closely related materials in the prehistoric past. Information was gathered according to the following categories: raw materials, including textile fibre, and species of skins; fabric structure and thread count (only for textiles); decoration and finish; and use and context. From this study, it is possible to recognize the universally shared principles of cloth cultures and the great versatility and creativity in the regional cloth cultures of the Bronze Age.*

*Keywords:* textiles, animal skins, Bronze Age, cloth culture, clothing

## INTRODUCTION

This research investigates and compares the cloth cultures of Europe and Egypt in the Bronze Age and New Kingdom<sup>1</sup> focusing on the fourteenth century cal BC. The concept of cloth cultures is used to include both textiles and animal skins as these were closely related materials in the prehistoric past. There are now many excellent research results in the field of textiles (Andersson Strand et al., 2010) with especially strong regional and diachronic studies (for example, see Broholm & Hald, 1940; Barber, 1991; Bender Jørgensen, 1992; Kemp & Vogelsang-

Eastwood 2001; Grömer, 2007, 2010). In addition, the importance of textiles is well recognized in syntheses of the period (for example, see Harding, 2000: 254–64) and in the context of clothing (Vogelsang-Eastwood, 1993; Sørensen, 1997; Kristiansen & Larsson, 2005: 271–73). Animal skin products – whether leathers or furs – are less frequently studied than textiles, but there are a growing number of good-quality datasets as well as chronological and regional studies (for example see Aner & Kerstein, 1973; Ryder, 1988; Barth, 1992; Driel-Murray, 2000; Veldmeijer, 2010). The integration of animal skin technology in general syntheses and their cross-cultural comparison is less well investigated.

Through considering cloth cultures rather than only textiles, this research

1. To avoid repeating that the different nomenclature Bronze Age for Europe and New Kingdom for Egypt, when I refer to the Bronze Age I am including the New Kingdom of Egypt.

brings together the evidence for textile and animal skins and questions the relationship between them in the Bronze Age. By focusing on a short period, this study seeks to compare cloth cultures that existed at the same time, rather than development over time. The originality of this research is therefore to bring these materials together both within regional studies and between them. A study like this is only possible because of the accumulation of regional data collected and published by many specialists and takes advantage of a remarkably fortunate situation in the archaeological record, whereby the fourteenth-century cal BC and the few decades preceding and following contain a number of sites with well-preserved organic materials and other sources of evidence. The evidence I will use and describe in the main body of this article comes from four geographically separate areas and includes the Period II oak coffin burials of southern Scandinavia; the Hallstatt salt mines of central Europe; Late Minoan Crete (LMII–LMIIIA); and the tombs and towns of the later Eighteenth Dynasty of Egypt. In addition to published sources, this research has been supplemented by study visits in Europe and Egypt. These examples are dated using absolute dating schemes that provide a good case for contemporaneity, although not all dating issues are fully resolved, notably the archaeological periods on Crete and their correlation to Egyptian dating schemes (Warren, 1996; Manning, 1999, 2006; Hornung et al., 2006c).

By taking a broad geographical view, I have chosen evidence which on the face of it appears to be scattered and unrelated. However, as other lines of archaeological evidence have demonstrated, the fourteenth century cal BC and several centuries preceding are a time of wide ranging interactions in Europe and around the Mediterranean (Sherratt, 1993; Harding, 2000: 415–30; Kristiansen & Larsson, 2005). Therefore,

despite being distinct and separate, with different cultural trajectories, these are not isolated areas and were interconnected, whether directly or indirectly. This is important for understanding how cultural attitudes to these materials varied between cloth cultures, as well as highlighting similarities.

### CLOTH CULTURE

The concept of cloth culture is based on the idea that all societies use cloth-type materials, but the way they do this is specific to each culture. By cloth-type materials, or more simply ‘cloth’, I refer to those flexible, thin sheets that can be wrapped, shaped, and folded and are used to clothe, cover, and contain (Harris, 2008, 2010a: 30). In the Bronze Age, textiles and animal skins (leather and fur) were significant materials and technologies used to produce cloth. The term cloth culture follows research by social anthropologist Hauser-Schäublin (1996). She compared the textile cloth cultures of Indonesia and to the Pacific non-cloth cultures of bark cloth, looped billum, and curtains of fronds to demonstrate the culturally embedded selection of appropriate materials and rejection of inappropriate materials and to show how technology is embedded in wider cultural beliefs and practices. From a theoretical perspective, this comparison draws on theories of style in technology (Stanley Smith, 1970; Lechtman, 1975) and technological choices (Lemonnier, 1993; Tite & Sillar, 2000). These question why techniques, materials, and material culture exist in the form they do and answer that this not only by invoking necessity, raw material availability, and technical knowledge, but also aspects of cultural identity and related aspects such as aesthetics, traditions, and values.

Cloth culture is not the same as clothing culture, where the focus is on clothing (see

Burnham, 1973; Pritchard, 2006). Certainly, cloth (whether from woven textiles, animal skins, or other materials) is the essential raw material for clothing. As clothing, cloth has a unique role in costume and therefore forming, communicating, and visualizing social identities (Wobst, 1977; Barnes & Eicher, 1993; Eicher, 1995; Sørensen, 1997). However, costume and clothing type are not the only means by which identity is formed through cloth and indeed cloth is not only used for clothing. It is this component material ‘cloth’ and its cultural expression in the fourteenth-century cal BC that I am interested in here.

#### ARCHAEOLOGICAL BACKGROUND

Chronological and regional studies demonstrate that, by the Bronze Age, producing cloth by weaving on a loom using linen fibres had been known and practiced for several thousand years in much of the Near East, Southern and central Europe (Barber, 1991: 11–15, 79–125; Allgrove-McDowell, 2003: 31–32; Bender Jørgensen, 2003: 61–62; Wild, 2003: 43–44; Rast-Eicher, 2005). The use of wool fibres is attested from at least the mid-third millennium BC, as an aspect of the ‘Secondary Products Revolution’ (Sherratt, 1981: 159, 180–81; McCorrison, 1997). Weaving was the main textile technique and will be the focus of this research. Minor cloth types such as netting, sprang, and plaiting are known from a number of contexts but will not be investigated here (Bender Jørgensen, 1992: 14; Wild, 2003: 24). Dyeing, here referring to any mode used for colouring cloth, is known from a number of sites in the Bronze Age of Europe (Hofmann-de Keijzer & van Bommel, 2009: 113; Burke, 2010: 34–39) and New Kingdom of Egypt (Vogelsang-Eastwood, 1992: 36). Researchers have

investigated the spatial distribution of textile fibres and weaving techniques (especially Barber, 1991; Bender Jørgensen, 1992).

Although textile studies have flourished, the study of animal skins in prehistory has developed more slowly and remains a smaller field. It has been enhanced since the discovery of preserved skins in frozen alpine environments (Spindler, 1995; Winiger, 1995; Schlumbaum et al., 2010). These have led to a re-evaluation of vegetable tanning in Europe and Egypt, which is now thought to be unlikely before the Classical period (Groenman-van Waateringe et al., 1999; Driel-Murray, 2000: 299–305). In contrast, in south, central, and northern Europe, the implicit assumption seems to be that in contrast to textiles, animal skin technology in the Bronze Age is static or of declining importance. One area of curiosity is the rarity of preserved animal skin clothing. Various suggestions for its diachronic demise or niche use have been suggested, such as the role of certain animal skin garments in rituals and ceremony (Sakellarakis in Kontorli-Papadopoulou, 1996: 91), as indicative of a social ‘other’ (Davis & Bennet, 1999), or declining in importance with the advent of wool textiles (Rast-Eicher, 2005: 124). In contrast, in Eighteenth Dynasty New Kingdom Egypt archaeologists recognize that animal skin products were more widely used than earlier periods, possibly due to the introduction of new weapon technology (Driel-Murray, 2000: 309–10).

The archaeological evidence points to the fourteenth-century cal BC as a time of wide-ranging interactions. In the east Mediterranean, goods were transported via sailing ship as demonstrated by the presence of foreign artefacts and vividly illustrated by the rich range of raw material and finished goods in the cargo of the Ulu Burun wreck dating to the fourteenth-century BC (Broodbank, 2009: 704–07).

Written sources of this time, such as the Amarna letters, document international gift exchange among the Egyptian and Mediterranean elite, including the exchange of fine textiles (Knapp, 1991: 21, 38; Burke, 2010: 40–41). Copper and tin must have been traded into metal-poor Scandinavia, potentially from the metal-rich regions of central Europe (Vandkilde, 2004: 72). The source for these metals after 1600 BC was most likely the east Alpine copper sources and Bohemia for tin (Sherratt, 1993: 31). More generally, connections between southern Scandinavia and central Europe are indicated by the shared social habits, ideas, and fashions of the ‘Tumulus Culture’ (Vandkilde, 2004: 73–74). The presence of Baltic amber in Greece identifies goods from the north being taken south (Harding, 2000: 190). In Egypt and the Mediterranean people of neighbouring regions met and interacted through warfare, the presentation of tribute or gifts to foreign dignitaries, sea-borne trade, and intermarriage (e.g. Bietak, 2007; Kendall, 2007; Steel, 2007; Tyson Smith, 2007; Wilkinson, 2007). Iconographic sources in Egypt and on the Greek islands represent regional stereotypes though cloth, costume, and phenotypic traits such as skin colour (Morgan, 1988: 118–20; Tyson Smith, 2007: 220–21). The relationship between north and central Europe, the Mediterranean and Near East have been perceived through models such as a Bronze Age core and periphery in a world system (Sherratt, 1993), major centres and local zones (Harding 2000: 415–30) or symbolic transmissions (Kristiansen & Larsson, 2005). The people of the fourteenth-century cal BC were influenced by their near neighbours and more distant connections, whether directly or indirectly. Therefore, the context of material culture, such as cloth culture, needs to be considered in terms of local and universal themes.

## METHOD

The comparison will be limited to approximately 100 years, centering on the fourteenth-century cal BC (1400–1300 cal BC) and where necessary drawing on a slightly longer time frame of 1450–1250 cal BC due to the nature of the evidence or dating precision. The dating is based on calibrated dendrochronology dates for southern Scandinavia and Hallstatt, relative phases within an absolute chronology for Crete, and calendrical dates for Egyptian evidence. A century sets the evidence in a time frame of three to four generations. For the archaeologist, one important advantage of following the social anthropological approach of comparing contemporary cultures over a large geographical area is that it provides a much larger pool of comparative data on this topic than is usually available. The comparative approach can bring insights even when applied to unconnected cultures or regions. However, in this study I concentrate on a restricted chronological period and areas that were connected, directly or indirectly, by widespread networks of trade. The benefit is that new insights for Bronze Age material are gained from cultures that existed within the same time frame, rather than drawing on analogy or ethnography. This brings added significance to the patterns of similarities and differences in the cloth cultures of the different areas.

The comparison of cloth cultures will focus on evidence for textiles and animal skins. Information is gathered according to the following categories: raw materials including textile fibre and species of skins; fabric structure and thread count (only for textiles); decoration and finish; and use and context. Identification of textile fibres (Walton & Eastwood, 1988: 3–4) and animal skin species (Haines, 1991; Groenman-van Waaterling, 1992) determines the raw materials, and evidence will

be considered in the light of differential preservation. Fabric structure describes the technical interlacing of threads (Emery, 1966: xv) and together with thread count, decoration, and finish has implications for material properties and appearance (Chandler, 1995: 119–28; Hammarlund, 2004). The textile structures are described in Table 1; variations are described in the text. The thread count is the number of threads lying parallel to each other in each system (warp or weft) and is averaged over one centimetre (Emery, 1966: 76; Walton & Eastwood, 1988: 4). Thread count relates in part to the fineness and coarseness of textiles. As a general principle, the more threads per centimetre, the finer the cloth. However, variations in the density and thickness of thread can create further visual and material differences (Chandler, 1995: 119–28; Hammarlund, 2004). Decoration and finish describe surface treatment. Pattern may be woven into textiles, as stripes or areas of colour. Either animal skins or textiles may be decorated with embroidery, applique, painting, beading, or dye. In addition, animal skins may be finished by retaining the hair (described as fur or hair-on) or removing the hair, and can be decorated with raised relief, cutwork, or scoring. The role of textiles and animal skins is used to describe the way these materials were used and includes observation of archaeological context, for example, in burials or in working environments. These categories focus on the type, context, and use of the materials rather than production and were selected as they could be compared across much of the dataset.

The time period of this study includes a number of exceptionally well-preserved sites and artefacts, thereby offering a remarkable opportunity to compare cloth cultures. However, the evidence is scattered, includes different preservation environments (wet, dry, salt, acidic) and contexts

(burials, iconography, settlement sites). Primarily, the poor preservation of these highly perishable materials means that the samples are frequently degraded and fragmentary, especially in comparison with inorganic materials such as pottery or metals. Certainly, this increases the likelihood of missing information and makes it difficult to be certain of the absence of particular techniques or materials. Differential preservation is an issue, especially in the acidic soils of southern Scandinavia. Dye and colour are especially vulnerable to degradation. For the most part, preserved archaeological textiles and animal skins cannot be sourced to their area of origin, therefore in this article these are treated as local in terms of deposition rather than production origins.

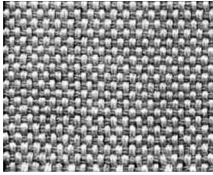
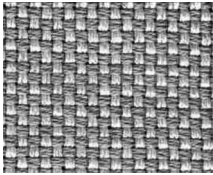
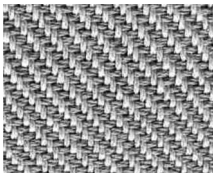
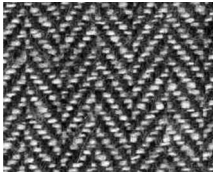
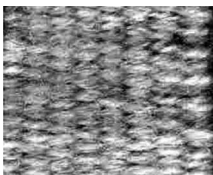
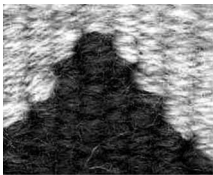
## CLOTH CULTURES: THE EVIDENCE

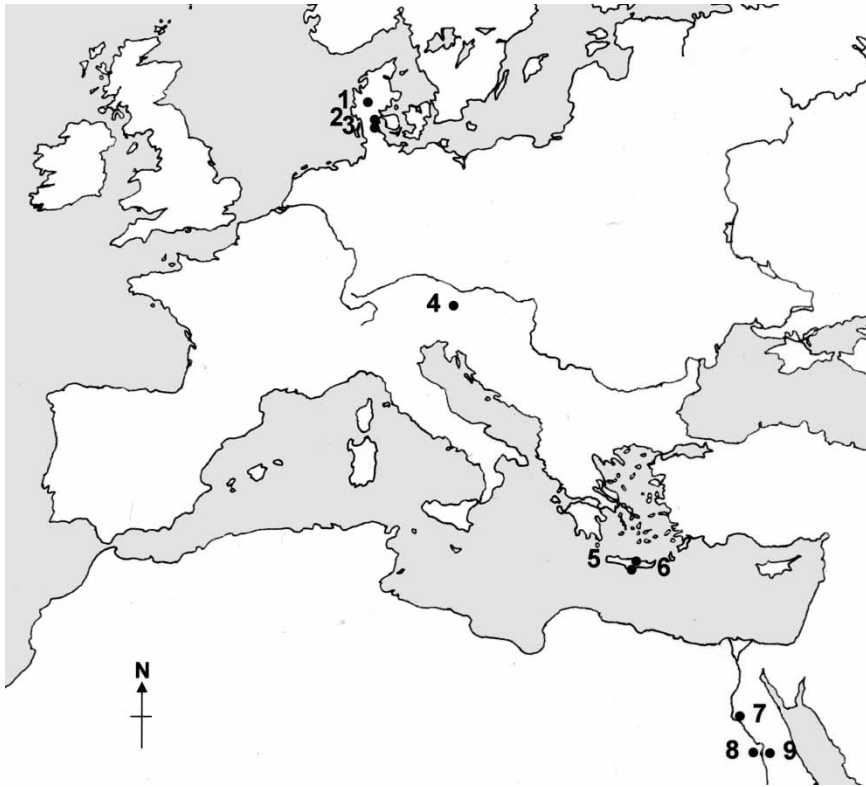
The evidence is presented below in four sections, ordered geographically from north to south (Figure 1).

### Southern Scandinavia

The southern Scandinavian cultural group is situated in Denmark, the provinces of Scania and Halland in Sweden, Schleswig and Holstein in North Germany (Bender Jørgensen, 1986: 289; Vandkilde, 2004: 72). Evidence for textiles and skins is preserved in the oak coffin burials of men, women, and children who were buried beneath earth barrows and has been well described (Aner & Kerstein, 1973 and subsequent volumes; Broholm & Hald, 1940; Bender Jørgensen, 1986; 1992; Boye, 1986; Randsborg, 2006). Typologically, many of the textile-rich burials date to Montelius' Bronze Age Period II, which ends around 1300 cal BC (Vandkilde, 2004: 73). Dendrochronology dating of

**Table 1.** The main fabric structures. The photographs show modern examples of weaving and are worked in a variety of wool and plant fibre threads of different thicknesses and densities.

	Photograph	Technical description	Appearance
Plain weave		Threads are interlaced one over, one under, alternating each row	Flat surface, smooth, or open depending on the density
Basket weave		Like plain weave, but with two threads worked together	Similar to plain weave, but double threads visible
Twill		Threads are interlaced one or more over, followed by one or more under; the sequence is staggered in subsequent rows. The figure is a 2/2 twill, referring to the two under, two over pattern repeat	Diagonal pattern or texture
Twill variations		Variations of twill use more complex sequences of interlacing. This photograph shows broken twill where the patterned effect is amplified by the use of different-coloured threads	Zigzag pattern or texture
Repp (warp or weft facing)		Like plain weave, but one set of threads is worked more densely. In this photograph, the dense threads completely cover the threads in the opposite direction	Slight or pronounced ribbed effect
Tapestry weave		Like plain weave, but coloured threads are woven in to create patterns and motifs. The photograph shows tapestry weave in repp	Patterns and motifs



**Figure 1.** Location map of key sites mentioned in the text. Southern Scandinavia: 1, Muldbjerg; 2, Egtved; 3, Trindbøj and Guldbøj; North East Alps: 4, Hallstatt; Crete: 5, Knossos; 6, Agia Triada; Egypt: 7, Amarna; 8, Valley of the Kings; 9, Thebes.

a number of well-preserved oak coffins shows that 19 fall between the years 1391–1344 cal BC (Vandkilde et al., 1996: 191; Christensen, 2006: 181). At this time, farming societies cultivated plants and kept herds of animals (Jensen, 1982: 132; Vandkilde, 2004: 77). They lived in large, two or three-aisled long houses accompanied by outhouses, a pattern that could represent single farmsteads or small clusters of independent households (Jensen, 1982: 148–49; Rasmussen & Adamsen 1993: 136–138). The evidence from the grave goods of the barrow burials has been used to demonstrate that this was a time of increasing social inequality, which may have been organized as chiefdoms, a warrior aristocracy, or tribal

system (views summarized in Vandkilde, 1996: 22–23, Figure 278).

The textiles from the southern Scandinavian oak coffin burials are made from fine sheep's wool (Ryder, 1988, 2005: 123). There are no preserved linen textiles, neither is there archaeobotanical evidence for flax cultivation in Denmark at this time – it is only known in the later Bronze Age (Henriksen, 2009). The simple fabric structure called plain weave is by far the most common (Bender Jørgensen, 1986: 289), whereas some textiles are finished with a fringe. Many textiles were fulled then cut (e.g. Broholm & Hald, 1940: 17, 27), a technique which meant that they resisted fraying. The majority of textiles have an average thread count of only



**Figure 2.** Wool textile gown and cloak from a man's burial at Muldbjerg, Denmark.

By courtesy of Roberto Fortuna/National Museum of Denmark.

three to six threads per centimetre of weaving, and only a few with six threads per centimetre or more (Bender Jørgensen, 1986: 18, Figure 6, 290–92). The result is a thick and coarse, but flexible, soft fabric (Figure 2).

In Period II burials with well-preserved clothing and blankets (or shrouds), it is possible to see that textiles were woven in

large pieces. The blanket spread over the young woman's body found at Egtved measures 250 cm long and 170–190 cm wide (Broholm & Hald, 1940: 82). A similar blanket from a man's grave at Muldbjerg measures 130 cm by 211 cm (*ibid.*: 22). The textiles include a number of long, narrow repp bands that were used as belts. Some belts end in fringes that form tassels, such as a man's belt from Trindhøj and Egtved (*ibid.*: 33–36, 86). An elaborate repp belt was found in a woman's grave at Borum Eshøj, over 250-cm long and just 3-cm wide and is woven to emphasize a central stripe of darker colour (*ibid.*: 73). A variation of repp forms is the waist band of the famous corded skirt from Egtved. Here, the skirt cords are formed by a fringe extended along the length of the repp band (*ibid.*: 86–87) (Figure 3). This is the only complete corded skirt, but textile fragments of several others have been identified (Bender Jørgensen, 1986: 289). Rows of small bronze tubes are believed to mark the hem of similar skirts in graves where no or few textiles survive (Broholm & Hald, 1940: 150; Randsborg, 2011: 149–52, Table 6).

Pile was sewn onto the surface of a few plain weave textiles, creating a furry surface effect (Broholm & Hald, 1940: 29). A coarse example of pile is found on



**Figure 3.** Wool blouse, foot wraps, and cloth in plain weave, corded skirt, narrow repp belt with tassel, all laid on a cow skin from a woman's burial at Egtved, Denmark.

By courtesy of Roberto Fortuna /National Museum of Denmark.



the cloak from a man's grave at Trindhøj, a Period III woman's grave at Melhøj (dated 1200 cal BC) and a grave from Emmedsbo Mark, Djursland (Bender Jørgensen, 1986: 291; 1992: 56–57). Fine pile of two to three wool fibres twisted and knotted together was stitched onto the surface of domed hats which are found in a number of men's graves (Bender Jørgensen, 1986: 289; Tidow, 1992). The waterlogged conditions inside the southern Scandinavian coffins have discoloured everything and most of the textiles are now dark brown. Research suggests that the sheep fleeces were mainly pigmented brown with a white underbelly, therefore providing naturally dark and light wool (Ryder, 1988: 140, 2005: 124, Table 22.1). White textiles were rare, a large beige (originally white) blanket was found in the man's burial at Trindhøj (Broholm & Hald, 1940: 37). Dye analysis has not yet been carried out on the burial textiles. Surface embroidery is rare and may date to a slightly later phase. Examples are known from Skrydstrup (late Period II/Period III, but an earlier date cannot be excluded), Melhøj (late Period III), and Emmedsbo Mark (not closely dated) (Broholm & Hald, 1940: 97; Figure 138; Bender Jørgensen et al., 1982: 56, 1986: 20–22, Figures 12 and 13; Randsborg, 2006: 11–13). Although completely discoloured, the embroidery stitches are similar to the visibly coloured embroidery on the textiles found with a bog body from Emmer-Erscheidenveen, the Netherlands (Comis, 2003), dated between 1500 and 1100 cal BC (Period II/III) (Bergerbrant, 2007: 54).

The textiles in the southern Scandinavian oak coffin burials were used for clothing and blankets. Clothing includes women's blouses, skirts, socks, belts, and corded skirts, men's kilts, caps, belts, socks, wrap-arounds, and cloaks (terminology of clothing from Bergerbrant, 2007: 50–58). It is unclear whether wear suggests

that the burial clothing was worn by people in life (Eskildsen & Lomborg, 1976: 21). Evidence for textiles from non-burial contexts is scarce, except for the textile fragments found with the Emmer-Erscheidenveen bog body (Comis, 2003) and several Swedish rock carvings show the outline of garments and shoe soles (Malmer, 1981: 54–55, 59–65).

The largest animal skin remains are cow skins (retaining the hair) on which the men, women, and children's bodies were laid or wrapped (Broholm & Hald, 1940; Boye, 1986; Randsborg, 2006: 24) (Figure 3). Skins from burials are generally badly preserved, but what remains show they were used in a number of ways. For example, the man at Muldbjerg was wrapped in a cow skin shroud, had a leather belt to fasten his textile gown, and a fur-lined sword sheath (Broholm & Hald, 1940: 19–26). The man buried at Guldhøj (grave A) was wrapped in a cow-skin shroud, the child's burial in the same mound was buried in what is described as a fine black-haired goat skin (Glob, 1974: 92). The man also had traces of leather footwear and the seat of the folding stool accompanying the burial has been identified as otter skin (Broholm & Hald, 1940: 42). Small leather remains are found in a number of burials, used to wrap metal objects such as knives (examples in Aner & Kerstein, 1973). Excluding shoes and straps, no large garments in skins or furs have been found in the burials. Margrethe Hald (1980: 344–50) suggested that the cut of the women's blouse originated from patterns for skin clothing. One possibility is that skin clothing existed alongside these textile versions, but was either not placed or not preserved in the burials. Skin garments were found with the Emmer-Erscheidenveen bog body, including a calf-skin cape, a sheep-skin hat, and a deerskin shoe (Groenman-van Waateringe, 1990; Comis, 2003: 194–95).

### Hallstatt, North-Eastern Alps

The most ample evidence for textiles and animal skins in the fourteenth-century cal BC in central Europe comes from the Bronze Age Hallstatt salt mines situated in the Hallstatt High Valley in the North-Eastern Alps, Austria. The construction timbers in the Christian Tuschwerk mine have been dated with dendrochronology and the end dates range from 1458 to 1245 cal BC (Grabner et al., 2007: 65–67). Little is known of the social organization of the miners, their settlements or burials (Reschreiter & Kowarik, 2009b: 70–71). Log-cabin-type constructions (*blochbau*) outside the mines are dated to the thirteenth/twelfth centuries BC (Reschreiter & Kowarik, 2009a). Alpine pasturing is known from the nearby Dachstein mountains (Mandl, 2009). The mines are contemporary with the end of the Tumulus culture in central Europe with its standard burial practice of inhumation under mounds (barrows) (Harding, 2000: 97). These communities practised mixed farming, cultivating crops (cereals, legumes, flax), and raising animals (cattle, sheep, goats, pigs, dogs, horses); in some areas pastoralism and transhumance seem to have been important (Szeverenyi, 2004: 25–26, 30). The grave goods in burial mounds suggest a warrior elite, possibly organized through loose alliances and without centralized leadership (*ibid.*: 29–30).

The mines are a complex of galleries and shafts full of waste left behind by the miners (Reschreiter, 2005). In the salty environment, all organic materials are preserved (Reschreiter & Kowarik, 2009c). The most recently excavated is the Christian Tuschwerk, a shaft where salt was loaded into bags and carried to the surface via a wooden staircase (Barth, 1994: 28; Grömer, 2005: 31; Reschreiter, 2005: 12–13; Grabner et al., 2007: 46). Animal

skins, wool, and linen textiles are preserved in the salty deposits (Barth, 1992; Harris, 2006; Grömer, 2007). The textiles have recently been studied and published by Karina Grömer (2007) whose research will be used here.

The vast majority of textiles from the Hallstatt salt mines are woven from wool fibres; from a total of 111 textile fragments, just two are from plant fibres that have been identified as linen (*ibid.*: 85). Although now discoloured, the wool fibres have a naturally light pigmentation and most are in plain weave (*ibid.*: 87, 95, 102). The majority of textiles are what Grömer defines as coarse textiles with 1–5 threads per centimetre or fall into a medium fine category at 6–10 threads per centimetre; a few are finer with between 10 and 15 (fine) or over 15 (very fine) threads per centimetre (Grömer, 2010: 120, Abb. 55) (Figure 4). There are examples of repp textiles, repp bands, and repp weaving borders (Grömer, 2007: 89, 100–11). There are three examples of 2/1 twill, one in wool from the Christian Tuschwerk area of the mine, and two in linen from the Grünerwerk mining area (*ibid.*: 98). Quite exceptional is 2/2 chevron twill with point repeat, made from fine double wool threads excavated from the Christian Tuschwerk; woven with 18–20 threads per centimetre it is also one of the finest textiles from the mines (*ibid.*: 89–99). This is some of the earliest evidence for twill fabric structure in central Europe (Grömer, 2009: 108). A brocade pattern resembling diamond twill is known from the early Bronze Age site of Molina di Ledro, northern Italy (Perini, 1970) and a thirteenth-century BC twill impression is recorded from Switzerland (Hundt, 1974: 50; Bender Jørgensen, 1992: 104).

A few textiles were dyed. Analysis shows evidence for red, blue, and yellow dye components and some were multiple dyed with yellow, red, and blue to create dark



**Figure 4.** Textiles showing a variety of fabric structures and weave densities, from the Bronze Age Hallstatt salt mines, Austria.

By courtesy of A. Rausch, Naturhistorisches Museum, Vienna.

colours such as brown or black (Grömer, 2007: 113–15; 2009: 107; Hofmann-de Keijzer & van Bommel, 2009: 113). As the textiles are only found in rags in the mine, it is difficult to determine their use and suggestions are made on the basis of type and context. One suggestion is that coarse textiles with filled surfaces and reinforced edges found in the Christian Tuschwerk are remains of hauling sacks used to carry the salt to the surface, whereas textiles found in other parts of the mine were possibly the remains of clothing (Grömer, 2005: 20, 2009:106).

The species of skins from the Hallstatt salt mines has not been fully analysed.

Looking at the Bronze Age and Iron Age skins together, Ryder identified that nearly 90 per cent of the animal species used for skins were from domestic species, including cattle, goats, and sheep; others were possibly from chamois, ibex, and small fur-bearing mammals (Ryder, 1990: 107; 1992: 63–64). The preservation of complete, or nearly complete, skin artefacts allows a good interpretation of their use in the mines. A conical hat with tassel, neatly sewn from several pieces of sheep-skin and worn with the hair facing inwards is the only complete item of clothing (Ryder, 1990: 107) (Figure 5). So far, five large carrying sacks have been recovered; these were



**Figure 5.** Conical hat with tassel and animal skin with the fur facing inward from the Grünerwerk area of the Hallstatt salt mines, Austria. By courtesy of A. Rausch, Naturhistorisches Museum, Vienna.

made from cow skin with the hair side facing outwards, stitched to shape and reinforced with wooden frames (Barth, 1992). A number of hand-leathers have been recovered from the mines. These are pads stitched together from oval pieces of haired animal skins and would have protected the hands (Reschreiter & Kowarik,



**Figure 6.** Bracelet or wrist strap with zigzag edge, cut work, and scoring from the Christian von Tuschwerkarea of the Hallstatt salt mines, Austria. By courtesy of A. Rausch, Naturhistorisches Museum, Vienna.

2009d: 56–57). Numerous skin straps and thongs have been recovered from the mines, some served to stitch together wooden planks to make mining equipment (Harris, 2006: 73).

Many of the animal skin artefacts are less easy to interpret and suggestions are based on their size, shape, and context. Two stitched tubes are interpreted as finger bandages and several larger ones as wrist straps or bracelets (Popa, 2009: 102). A large pad of two furs roughly stitched together may be a cushion for sitting or kneeling. There are many skin fragments and rags. The presence of fine stitching and seams, like those used on the conical hat, may suggest they were originally from clothing and contrasts with the large stitching on the hand-leathers and carry sacks associated with mining equipment (Harris et al., 2010). In terms of decorative and visual effects, many of the skins retain their fur including the cow skin carrying sacks, straps, hand-leathers, cushion, and numerous fragments. Depending on the species and natural variation in pelage, the fur ranges from dark to light brown, orange-brown, and cream (Ryder, 1990: 107; Harris, 2006: 72). There is only one example of surface decoration on the animal skin artefacts. One of the wrist straps has a zigzag edge and cut-out triangles surrounded by scored lines (Popa, 2009: 102) (Figure 6).

The skins were recovered in higher quantities and as larger pieces than the textiles. The carry sacks are around 80 cm tall, with an opening diameter of 35–40 cm (Barth, 1992) and the largest composite sheet of stitched skins recovered measures 108 × 154 cm. This contrasts with the textiles where many measure less than 20 cm maximum height or width and none are larger than 46 cm (Grömer, 2007: 389). Whereas whole skin artefacts and fragments were left in the mines, textiles were only left as rags, hence complete textile dimensions are not known from this evidence.

### Late Minoan Crete LMII–LMIIIA

With its large elite residences, officials, and thousands of workers receiving rations, Crete was home to a hierarchal society based on agriculture and the production of luxury goods (Fitton, 2002: 17, 97–99; Wardle, 1994: 226–27). At Knossos palace, changes in site use, pottery style, and the presence of tablets written in the Mycenaean script Linear B suggest that the previously Minoan palace was under the administrative control of the Mycenaean mainland Greece (Fitton, 2002: 180; Preston, 2008: 311–14; Burke, 2010: 69). The linear B script is considered Mycenaean, reflecting the change in administration (Burke, 2010: 69). A time of political upheaval, this is also one of the most complex phases of archaeology to understand and date on Crete.

Absolute dating in the Aegean is contested and complex. This is in part due to the dependence on relative chronology and in part due to conflicting high and low chronologies (Shelmerdine, 2008: 3–5). According to the high chronology which is based on calibrated radiocarbon dates the fourteenth century BC includes the relative phases later LMIIIA1 and the whole of LMIIIA2, whereas according to the low chronology which is based on synchronism with the Egyptian calendrical chronology, the fourteenth-century BC also includes the preceding relative phase of late LM II (Shelmerdine, 2008: 3–5, Figure 1.2). For the purpose of this research, relative phases LMII to LMIIIA2 will be considered, noting that this potentially includes the mid-fifteenth century BC forward. The epigraphic evidence from Knossos is dated by archaeological context to LM II, LM IIIA2 (c. 1450–1325 BC) and LM IIIB (c. 1325–1190 BC) (Del Frio et al., 2010: 338) and studied as a whole archive rather than according to separate phases. The wall painting fragments are also relatively dated

within this scheme (Immerwhar, 1990; Hood, 2005). Immerwhar's scheme will be followed as it is more extensive. The problems with dating coupled with the dearth of preserved textiles means the evidence presented here covers a wider timeframe than the fourteenth-century BC.

Few preserved textiles are known from Crete and to my knowledge there are no preserved animal skins. However, clothing and cloth artefacts of what appear to be textiles and animal skins are represented on wall paintings dating back to this period at Knossos Palace and Agia Triada villa (Immerwhar, 1990; Hood, 2005). As many wall paintings were over-restored, care has been taken to refer to the original features. Written evidence for textile fibres come from the Linear B tablets that record palace administration and attest to the importance of wool fibre to supply the weavers of Knossos and other parts of Crete (Killen, 2007: 52). Evidence on the tablets for linen cloth from flax is less well attested and less clearly interpreted, although the Knossos archive is believed to refer to a number of linen cloths or garments (Rougemont, 2007: 47–48; Burke, 2010: 77, 95). If linen and wool were the fibres of the palace economy, this does not exclude the use of other raw materials, as is demonstrated by the analysis of fibres from a narrow band from the Minoan site of Kastelli, Chania on Crete which have been identified as linen, nettle, and goat's hair (Moulhéat & Spantidaki, 2009).

Of the few preserved Bronze Age textiles, plain weave is evident from Mochlos (Möller-Wiering, 2006: 4). Repp is attested in a narrow band mentioned above from Kastelli, although here the technique is better described as plaiting (Möller-Wiering, 2006: 2). This band is less than 1 cm wide and has up to 10 threads per centimetre in the densely worked set (Möller-Wiering, 2006: 2). A plain weave textile from Xestè in Akrotiri, Santorini

Island dated to around 1600 BC has at least 20 threads per centimetre (Moulhérat & Spantidaki, 2007: 49–50). The Linear B tablets refer to a number of textile garments and textiles of different qualities (thick, heavy, finished, unfinished, fine) and many of them were coloured (summary in Burke, 2010: 74–78; Del Freo et al., 2010: 348).

The tiny fragment of plain weave from Xestè 3, provides direct evidence for a variety of decoration techniques, including weaving with supplementary threads (brocade), surface embroidery, seams finished with blanket stitch, and a knotted fringe (Moulhérat & Spantidaki, 2007: 50). The wall paintings depict colourful, patterned textiles with fringes. Stripes, zigzags, quatrefoils, and dotted patterns could have been created by using the

decorative techniques found on the Xestè 3 textiles, or other techniques such as tapestry weave, bead work, painting, and appliqué: some diagonal patterns may represent twill (Barber, 1991: 317–28; Trnka, 2007: 128). The female figure called ‘La Parisienne’ from Knossos is wearing a blue knotted scarf with red strips and fringe; the main area of her upper garment is white with blue and red vertical strips and has a patterned blue edge (Immerwhar, 1990: 95; Preziosi & Hitchcock, 1999: 166, Figure 104). Plain garments with yellow, blue, black, and white edges are represented on a sarcophagus from Agia Triada in southern Crete (Figure 7). The loincloths of the male and female acrobats on the ‘Taureador fresco’ and the ‘Cupbearer’ from Knossos are orange-yellow with patterns. The limited colour palette of the



*Figure 7. Male and female figures wearing patterned and textured clothing on a sarcophagus from Agia Triada, Crete. Four of the figures wear a hide or fleece skirt, with shaggy texture and shaped hem. A similar texture is shown on the upper surface of the figure on the far right. Two figures wear long, coloured tunics with striped edges and one wears a short-sleeved top with contrasting edges.*

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wall paintings should not be taken too literally as the actual colour of the textiles, although a yellow dye – saffron – is recorded with textiles on a tablet from Knossos (Rougemont, 2007: 46), and the early exploitation of the murex shell for purple dye may be related to the Minoan textile industry on Crete (Burke, 1999; 2010: 34–39; Milittello, 2007: 42).

If the coloured, patterned clothing represented in the wall paintings was made of textiles then this can be equated with male and female clothing, including sashes, loin-cloths, breechcloths, kilts, skirts, shawls, mantles, robes, capes, cloaks, tunics, and short-sleeved bodices (Marcar, 2005: 40–41). The palace wall paintings adorn the residence of the elite of this hierarchy and the men and women in the wall paintings are often interpreted as high status individuals such as priests, goddesses, or queens (Marinatos, 2010: 32–49). For example, the blue knotted scarf of ‘La Parisienne’ from Knossos may identify her as a priestess

(Immerwhar, 1990: 95). Other evidence for the high status of coloured cloth comes from epigraphic sources; Near Eastern records indicate that purple-dyed cloth was equally, if not more, valuable than gold and silver (Burke, 2010: 42; Wiener, 1987: 264). The patterned loin-cloths of the people from Keftiu in the Egyptian tombs of Rekhmire (Theban Tomb 100) and Menkheperaseneb (Theban Tomb 86) dated *c.* 1450 BC, could have been made up of narrow, patterned, woven bands, and panels sewn together (Davies, 1933; Barber, 1991: 336–37; 1997: 516–17) (Figure 8). However, the location of Keftiu is debated. Although often accepted as originating from Crete, the people of Keftiu may have been from Cyprus or mainland Greece (Barber 1991: 336–37). Indeed, the confusion may relate to political events at this time, including the destructions on Crete, the beginning of Mycenaean participation in trade (summarized by Burke, 2010: 41) and Mycenaean influence



**Figure 8.** Facsimile of a wall painting from the tomb of Menkheperaseneb (Theban Tomb 86), Thebes, Egypt showing foreigners in a procession. The text identifies the figures on the far right as from Keftiu. He wears a coloured, patterned loin-cloth, and carries a striped, tasselled textile across one arm and a bull's head. © Trustees of the British Museum.

on Minoan iconography at Knossos (Immerwhar, 1990: 78–83). There is also the question of the extent to which Minoan, Mycenaean, and Theran costume styles influenced one another (Morgan, 1988: 118–20).

The problem of dealing with representations is that flat areas of colour could represent textiles or animal skins. The materials can only be distinguished if the artist draws attention to their material origin. Wrist straps on the arms of acrobats in the Taureador frescos at Knossos bring to mind the animal skin wrist straps or bracelets found in the Hallstatt salt mines, but the materials in the Knossos painting cannot be identified. The shoes or boots with patterns around the ankles in this and other wall paintings (Davies, 1973: 23, pl. XX; Immerwhar, 1990: pl. 41–42) may be leather and textiles, but again the evidence is inconclusive. Those artefacts and garments believed to be made from skins are recognized through surface decoration and shape. Through direct comparison with live animals in the paintings, the dappling on shields at Knossos can be identified as cattle skin. The seat of the folding stool and the front of one garment in the Campstool fresco from Knossos is textured like a fleece or fur (Immerwhar, 1990: 95, 176; Preziosi & Hitchcock, 1999: 166, Figure 105). The chariots on the Agia Triada sarcophagus are dappled like animal skins (Immerwhar, 1990: pl. 52, 53), which is in keeping with the knowledge of leather chariot construction from Egypt (Veldmeijer, 2010: 26). The ‘Captain of the Blacks’ wears a hat that could be black goatskin (Immerwhar, 1990: 96). An infrequent, but interesting, garment is the hide or fleecy skirt depicted on the Agia Triada sarcophagus and other media dating between LM I and LM III (Kontorli-Papadopoulou, 1996: 91; Marcar, 2005: 35, 40). The lower edge of these skirts is curved and pointed like the

tail and flanks of a skin and the white surface is decorated with long, wavy tufts like sheep fleece (Immerwhar, 1990: 100–02) (Figure 7). A similar texture is seen on the full-body garment on the figure at the head of the procession on the Agia Triada sarcophagus, but the lower edge is not preserved. Interpretation of the iconography suggests that on Crete such skirts were reserved for ritual, ceremonial occasions (Kontorli-Papadopoulou, 1996: 91), and possibly worn by a priestess or queen (Marinatos, 2010: 43). In the Egyptian tomb of Rekhmire two of the figures from Keftiu are wearing loincloths that show the markings and shape of feline skins (Davies, 1973: 23, pl. XX, XIX), a garment not seen in the wall paintings on Crete. Other iconographic sources have been used to suggest lion pelts may have been foreign hunting trophies (Shapland, 2010: 285).

### Later Eighteenth Dynasty Egypt

Egypt in the Eighteenth Dynasty was a hierarchal, bureaucratic state with the Pharaoh as its governor and divine leader; the power of kings and gods was epitomized through the massive scale of architecture, whether pyramids, temples, or tombs (Kemp, 1989: 183–84). The cycle of the Nile was fundamental to the fertility of the soil which provided the sustenance for agriculture, horticulture, and animal husbandry (Brewer, 2007). People lived in houses made from dried mud bricks in villages and towns, varying according to status (Spence, 2007: 379). The Eighteenth Dynasty saw technological advances in the army and development of its administration (Spalinger, 2007: 123). Epigraphy and archaeological evidence show that Egyptian influence at this time – whether through administrative control, warfare, alliance, trade, or gift exchange – stretched from Nubia (south Egypt) through the Levant



and Mesopotamia (Near East) and the eastern Mediterranean (Bietak, 2007: 439–41; Kendall, 2007: 411; Steel, 2007: 469–73; Wilkinson, 2007: 454–56).

The Egyptian evidence for preserved textiles and animal skins comes from rock cut tombs and settlements with dry preservation conditions. Painted tomb scenes of wealthy, high status individuals show clothing and equipment used in everyday and ceremonial contexts. Dating in Egypt is based on the sequence of rulers documented in king lists that provide a relative chronology which is then calibrated against seasonal and astronomical events (Bierbrier, 2006: 41; Hornung et al., 2006b, 2006c: 47; Ryholt, 2006). According to this scheme, the fourteenth-century BC falls into the second half of the Eighteenth Dynasty of the New Kingdom and includes the reigns of Thutmose IV (1397–1388 BC), Akhenaten (1351–1334 BC), and Tutankhamun (1333–1319 BC) (Hornung et al., 2006a; Grajetzki & Quirke, 2000).

Majority of textiles in Egypt were linen (Hall, 1986: 9; Vogelsang-Eastwood, 1992: 1). Wool textiles in Egypt are rare, but not completely unknown. At the workmen's village of Amarna over 98 per cent of the fibre specimens are linen and only 1 per cent were wool; of these, most are of sheep's wool, but a few are from goat (Hall, 1986: 10; Kemp & Vogelsang-Eastwood, 2001: 27–52). The vast majority of textiles were plain weave, with examples of basket weave (half basket weave, full basket weave, warp and weft faced full or half basket weave), repp, and 'self-bands' added by weaving multiple threads in a single row of plain weave (Roehrig, 1996: 95–107; Vogelsang-Eastwood, 2000: 274; Kemp & Vogelsang-Eastwood, 2001: 95–109). Through variation in the thickness of threads and density of weave, both sheer and coarse textiles were produced from the finest gauze to thick canvas like cloth (Hall, 1986: 9;

Vogelsang-Eastwood, 1999: 22; Donadoni Roveri, 2001: 21; Kemp & Vogelsang-Eastwood, 2001: 95;) (Figures 9 and 10). These sheer fabrics are represented in tomb paintings. For example, the tunic worn by Nebamun is shown as semi-transparent and contrasts with the visually dense, white kilt (Figure 10). The tomb of Nebamun (Theban Tomb 63) dates stylistically to the end of the reign of Amenhotep III (1390–1352 BC). From the workmen's village at Amarna, the majority of textiles fall between 5 and 40 threads per centimetre, whereas the textiles from Tutankhamun's tomb in the Valley of the Kings range from 30 to 100 threads per centimetre (Vogelsang-Eastwood, 1999: 22, 100). This relates to written evidence which describes four grades of cloth,



*Figure 9. Dense, plain weave, linen tunic with coloured repp band from the tomb of Kha and Merit (Theban Tomb 8), Deir el Medina, Egypt. By courtesy of The Museum of Turin.*



**Figure 10.** Fragment of wall painting from the tomb of Nebamun (Theban Tomb 63), Thebes, Egypt. Nebamun is dressed in white, and sits on a chair with a dappled animal skin seat cover. His tunic is semi-transparent in contrast to the dense, white kilt showing the varied visual density of linen textiles.

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which can be translated as ‘royal linen’, ‘fine thin cloth’, ‘thin cloth’, and ‘smooth or ordinary cloth’ (Hall, 1986: 9). The coarse, ordinary cloth was the most common, cheapest type, and was also suitable for warm, evening clothing (Hall, 1986: 9).

Simple and elaborate fringes are represented on textiles in tomb paintings and engraved on statues (Roehrig, 1996: 22; Donadoni Roveri, 2001: 21–22). Although not common, there are examples of pile textiles either added during the weaving or stitched on afterwards (Roehrig, 1996: 22–24; Kemp & Vogelsang-Eastwood, 2001: 149–52). An example of linen bedding with knotted pile was placed in the rich and well-preserved tomb of the

architect Kha and his wife Merit at Deir el Medina (Theban Tomb 8) (Hall, 1986: 38–39; Roehrig, 1996: 24) and fragments of pile textiles have been excavated from the workmen’s village at Amarna (Kemp & Vogelsang-Eastwood, 2001: 147–52). Pleated linen cloth is known from extant garments, wall paintings, and statues of men and women, as well as the visual appeal, excess pleated fabric may have provided extra warmth (Hall, 1986: 22, 29, 32, 52; Vogelsang-Eastwood, 2000: 281).

The majority of preserved linen (and wool) textiles are shades of white: linen ranged from white through light brown to golden brown (Hall, 1986: 9). Bright white linen would have to be obtained by bleaching – a technique that is attested by a linen list from the tomb of Rekhmire (Vogelsang-Eastwood, 2000: 280). Patterned textiles may well have been confined to use by the royal household or high officials; labourers’ clothing was plain (Hall, 1986: 23–26; Vogelsang-Eastwood, 2000: 275). Textile colours include red, blue, yellow, green, purple, brown, and black (Hall, 1986: 10–11; Germer, 1992: 20–70). Examples of the labour-intensive tapestry weave and coloured, patterned repp bands are known from rich tombs including those of Kha and Merit (Figure 9), Thutmose IV and Tutankhamun, where these techniques were used to decorate tunics, mats, belts, arrow quivers, bedding, and cushions (Vogelsang-Eastwood, 2000: 275; Donadoni Roveri, 2001: 22). In these and other rich tombs embroidery, painting, appliqué, the application of beads and small gold platelets are known (Hall, 1986: 43; Vogelsang-Eastwood, 2000: 275–76). Warp-faced braids decorated the edges of high-quality textiles (*ibid.*: 276), and patterned, painted tomb ceilings may represent elaborate textile drapes (Barber, 1991: 340). Although the quality varied, linen textile was used for clothing by men and women, commoner, and elite alike (Hall, 1986: 9,



**Figure 11.** *Fine-mesh slit work, leather loincloth, Egypt.*

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62–64). In this period, typically, men wore triangular loincloths, bag-tunics,<sup>2</sup> wrap-around kilts of various lengths sometime layered one over another, triangular aprons, sashes, straps, and cloaks of a variety of styles (Vogelsang-Eastwood, 1993: 180). Women wore linen loincloths, bag-tunics, skirts of various lengths, wrap around dresses both in a simple and more complex knotted style, sashes, straps, wrap around shawls, and long cloaks (*ibid.*: 180). Textiles for domestic use include bedding sheets and covers, cushions, towels, table and jar covers, bags, lamp wicks, bandages, awnings, and mats (Vogelsang-Eastwood, 2000: 291–93; Donadoni Roveri, 2001; Hall, 1986: 38). They played a special role in religious ceremonies: as abundant mummy wrappings, shrouds covering shrine statues, and as sacred cloth offered to the gods (Hall,

2. A rectangular cloth with simple neck hole and sides sewn up to the armpit (Vogelsang-Eastwood, 1993: 180).

1986: 18; Vogelsang-Eastwood, 2000: 293–94).

Cow, goat, and gazelle skins were common, with exotic skins including leopard and cheetah (Driel-Murray, 2000: 302). Skins were both hairy and depilated. Alongside the naturally coloured and patterned skins, some were brightly coloured, often in red and green; and sometimes intricately decorated with bright floral or linear patterns in raised relief, open work, couching, and appliqué (Driel-Murray, 2000: 306, 311; Veldmeijer & Endenburg, 2007; Veldmeijer, 2010: 22–24). Animal skins such as goat were commonly used for shoes and sandals, tool lashings, bags, and goatskin water containers (Veldmeijer, 2010: 29). Animal skin products served a special role in armoury including as arrow quivers, shields, and arm guards (Driel-Murray, 2000: 310; Veldmeijer, 2010: 26–28). Scale leather armour lined with linen is known from Tutankhamun's tomb (Vogelsang-Eastwood, 1999: 109–10). Chariots, such as that from Thutmose IV's tomb in the Valley of the Kings, were lashed with and sheathed in rawhide (Veldmeijer, 2010: 26–28). Stool seats depicted in wealthy tombs sometimes had covers made from skins or laced thong, as seen in a cow-skin example painted in the tomb of Huy (Theban Tomb 40) (Davies & Gardiner, 1926: pl. XXIV; Driel-Murray, 2000: 312) and in the tomb of Nebamun (Figure 10). In Tutankhamun's tomb, an ivory seat was inlaid to appear like cheetah and dappled skins (Carter, 1933: 111–13, pl. XXXIII). Tomb paintings depict gifts of rectangular shields of leopard and cheetah skins (Davies & Gardiner, 1926: pl. XVI, XXIV, CVII).

Skins were not commonly used for clothing in Egypt with the exception of loin-cloths worn by men, including those simply cut from skins with or without hair and others with punched holes or numerous small slits (Vogelsang-Eastwood, 1993:

17–31; Driel-Murray, 2000: 302, 311). A fine mesh leather loincloth is known from Maiherpri's tomb in the Valley of the Kings – an official of part Nubian origin – dating to the reign of Thutmose IV, and slit work examples are known from Amarna (Vogelsang-Eastwood, 1993: 18; Veldmeijer, 2010: 29) (Figure 11). Such loincloths may have originated from Nubia in the south of Egypt where skin clothing for men and women was common (Hall, 1986: 34–35; Vogelsang-Eastwood, 1993: 20). Many tomb paintings show priests wearing leopard skin drapes. Two such garments were found in Tutankhamun's tomb: one an actual leopard skin decorated with the king's cartouches, the other a textile version shaped and embroidered to resemble a leopard skin complete with wooden head (Vogelsang-Eastwood, 1999: 27, 105–06, Figure 6:11; Driel-Murray, 2000: 302).

### COMPARING CLOTH CULTURES

The results above describe the evidence for cloth cultures from four areas according to the categories outlined: raw materials, the fabric structure, and thread count (textiles only), decoration and finish, use and context. These are summarized in Table 2. These categories bring together materials and use, and the evidence for textiles and animal skins is brought together across all areas.

Some of the general problems of research into organic materials were outlined earlier; more specifically there are problems with the evidence used here. Clearly, the sample size is varied. The Hallstatt salt mines are the most geographically limited sample, and Crete provides the least preserved remains, which contrasts with the quantity and geographical scope of the evidence from Egypt and Scandinavia. There are differences in context and deposition.

The southern Scandinavian burials, the wall paintings of Crete and the Egyptian tombs are all contexts of high-status individuals participating in elite display of one kind or another and contrast to the working environment of the Hallstatt salt mines or Amarna workshops of Egypt. This, no doubt, has affected the deposition of materials and their interpretation. Significantly, the evidence cited above includes epigraphic and iconographic sources which are processed in different ways from other lines of evidence; also the source-critical approaches of scholars working on these fields vary. The same can be said of the theoretical and methodological perspectives of scholars working in different regions, and relates to the problem of comparisons between societies with very different social organization. What, then, can we understand of these results from a comparative perspective? The following discussion address concepts of technological choices and style in cloth cultures, through aspects such as availability, climate, material properties, ideology, status, wealth, and value.

### Raw materials and economy

The main raw materials used for textiles and skins were obtained from the farming economy and show both widespread use and regional distinctions. Sheep's wool was used as a fibre for textiles in all four areas, but was proportionally more important in the southern Scandinavian burials, the Hallstatt salt mines, and as a fibre resource in the Knossos archive; wool is rare in the settlements and burials of Egypt. Linen is proportionally more important in Egypt, present on Final Palace period Crete and in the Hallstatt salt mines, but absent in the southern Scandinavian burials. Textile fibre distributions have been noted elsewhere (Barber, 1991: 9–30;

**Table 2.** Cloth cultures compared by materials and use. Dominant features are indicated with\*, features that are present but not common are indicated with\*\*, features suggested through inference are italics.

	Southern Scandinavian cloth cultures	Cloth cultures and the Hallstatt salt mine	Cloth culture in the Aegean	Cloth cultures in Egypt
Textile fibres	Sheep's wool*	Wool*, linen	Sheep's wool, goat hair**, linen, nettle**	Sheep's wool, goat hair**, linen*
Fabric structures	Plain weave*, repp, repp with extended fringe, plain weave with sewn pile	Plain weave*, repp, half basket weave, 2/1 twill, pointed twill	<i>Plain weave, repp, plain weave with supplementary warp or weft, twill, tapestry weave</i>	Plain weave*, repp, basket weave, half basket weave, tapestry weave, plain weave with knotted or looped pile**
Thread count	1.8–7.5 threads per centimeter	5–24 threads per centimeter	<i>10–20 threads per centimeter (wider range expected, see text)</i>	5–100 threads per centimeter
Decoration and finish on textiles	No dye analysis to date, differently pigmented wool, fringes on two edges, fulled surfaces	Colour: red, blue, yellow Twill textured effect, fulled surfaces	Colour: red, blue, yellow, brown, grey Fringes, stripes, patterned bands, motifs	Colour: red, blue, yellow, green, brown, black. Bleaching. Fringes on two to three edges, embroidery, appliqué, stripes, pleating
Species of skins	Cow*, goat, otter**	Cow*, sheep*, goat*, chamois, ibex, dog and other fur-bearing species	Cow, sheep, goat	Cow, sheep, goat, gazelle, leopard, cheetah
Decoration and finish on skins	Haired*, depilated	Haired*, depilated, cut work**, scoring	Haired, depilated	Haired, depilated, cut work, colour, appliqué, embossed
Use of textiles	Clothing, shrouds, blankets	<i>Hauling sacks, clothing, rags</i>	Clothing	Clothing, shrouds, mummy wrappings, statue wraps, ritual cloth, canopies, bedding, jar covers, sling shots, quivers
Use of skins	Shroud, shoes, straps, folding stool seat, sword sheath lining	Hat, hand leathers, carry sack, cushion, finger bandages, wrist bands or bracelet, straps, rags	Shields, folding stool seat, chariot component, <i>armour, greaves, wrist bands</i>	Shields, loincloths, footwear, arrow quivers, armour, straps, balls, stool seat, chariot components
Key bibliographic references	Bender Jørgensen (1986); Bergerbrant (2007); Broholm & Hald (1940); Ryder (1988)	Barth (1992); Grömer (2007), (2010); Harris (2006); Popa (2009); Ryder (1990)	Barber (1991):317–28; Burke (2010); Immerwhar (1990); Möller-Wiering (2006); Moulhérat & Spantidaki (2007)	Driel-Murray (2000); Kemp & Vogelsang-Eastwood (2001); Vogelsang-Eastwood (1992), (1993), (1999), (2000); Veldmeijer (2010)

Bender Jørgensen, 1992: 116–20). Nettle fibre has only been identified once on Crete along with goat hair, which is also known from Egypt. The majority of skins in all areas are from domestic animals, including sheep, cow, and goat. Skins from wild species were used and appear to

vary according to the regional fauna: otter in southern Scandinavia; possibly chamois, ibex, and other fur-bearing species from the Hallstatt salt mines (although this context includes Iron Age data); gazelle, leopard, and cheetah in Egypt. The domestic species (flax, sheep, goat, cattle) are

all based in Neolithic agriculture and were well-established resources in much of Europe, the Near East and Mediterranean. Only in Denmark does flax cultivation seem to be absent in the Neolithic (Henriksen, 2009). The exploitation of wool was a later technological development – part of the so-called ‘Secondary Products Revolution’ – which occurred well before the period studied here (Sherratt, 1981: 159, 180–81).

As the raw materials for cloth were mainly obtained from domestic species of plant and animal, their availability depended on the farming economy and use of the landscape. Animal skins are only obtained after the animal has been killed (primary product), whereas sheep (secondary product) or flax fibres can be harvested year after year. There was a continuous demand for textiles and animal skins. How this may have affected the quantity available, or who they were available to, remains unclear. In Egypt, cattle were expensive to maintain, so it is possible that the products of cattle were restricted to the upper classes (Brewer, 2007: 142). Brewer identifies these products as meat and milk, but as a primary product skins may be included. Egyptian tomb paintings of the Eighteenth Dynasty show men and women harvesting tall stems of flax (Vogelsang-Eastwood, 1992: 44), revealing the importance of this crop in an abundant afterlife. This may have been quite different for farming or pastoral societies in Europe where availability would depend on the frequency with which animals were slaughtered and may also have related to the status attached to herds. The cow skin shrouds of southern Scandinavia have been interpreted as the remains of funeral feasts (Glob, 1974: 40). If this was the case, maybe the slaughter of a cow or bull was a luxury reserved for funeral festivities for a society where wool fibres (secondary products) are the main form of preserved

cloth. This does not preclude trade as a source of raw materials. The Knossos archives demonstrate the great importance of flock management and textile production for the palace economy (Wardle, 1994: 227; Preston, 2008: 313), and at least some of these textiles were for export and are among the goods offered by the Keftiu in the tomb of Menkheperaseneb (Figure 8). Written sources such as the Amarna letters document the exchange of fine textiles (Knapp, 1991: 21, 38; Burke, 2010: 40–41). As noted above, the wild species of skins relate to fauna within the regional vicinity and were possibly a welcome supplementary source of skins, they may also have been a luxury associated with hunting. Textiles, feline skins, and cattle hides were offered as tribute in a number of the tomb scenes of Egypt, showing their value as commodities (e.g. Davies & Gardiner, 1926: pl. XVI, XXIV, CVII). It seems highly likely that textiles and skins would have been features of trade or exchange in Europe, although this is difficult to prove (see suggestions in Sherratt, 1993: 31, 36–37). Evidence for the circulation of textile fibres may be aided by future development of isotope analysis of wool (Frei et al., 2009). Therefore, raw materials were widespread, but with regional distinctions.

### **Clothing and climate**

One of the reasons for the regional distribution of raw material preferences could be climate. At this time, central Europe had a temperate Continental climate of cold winters and warm summers with precipitation throughout the year (Szeverenyi, 2004). Like today, this contrasted to Egypt with its hot, dry climatic conditions and dependence on the Nile for water (Moeller, 2007: 58). In central and northern Europe, it can be argued that wool

for textiles provided the warm, insulating material that could have replaced leather and fur for clothing, a substitution that could not have occurred in the Neolithic with its reliance on plant fibres such as linen or tree bast (Rast-Eicher, 2005: 124). Similarly, it is not surprising that Egyptians appreciated the cool feel of linen textiles and their ability to shed dirt and dust (Barber, 1991: 15). On the basis of certain material properties, this seems highly plausible: flax fibres are cool, crisp, and smooth to the touch, whereas sheep's wool feels warm to the touch and has excellent insulating properties (Harris, 2010b: 105). Similarly, animal skins with dense, fine underwool can be warm and insulating, as this is one of the ways some animals (such as otter) protect themselves from the cold (Kruuk, 1995: 184–202).

However, all areas experienced seasonal variation in climate and temperature change between the chill of night and heat of the day. These differences were not necessarily accommodated by change in raw material used for clothing. The shape of garments and cloth type are equally important. For example, in southern Scandinavia wool textiles were used to produce heavy, warm clothing (cloaks, skirts, caps) and blankets, but also lightweight clothing (corded skirts, blouses). In Egypt, thick and heavy linen textiles are interpreted as warm clothing – for example, Kha's heavy linen 'winter tunic' (Figure 9) and pile bedding from the same tomb; wearing ample pleated linen clothing may have been another way to keep warm (Hall, 1986: 32). Not all animal species rely on fur for insulation, some rely on blubber (Kruuk, 1995: 184). Skins with dense, fine underwool can be warm and insulating, as this is one of the ways some animals (such as otter) protect themselves from the cold (Kruuk, 1995: 184–202) and do not have a well-developed underwool and, therefore, the animal skin product would not be

insulating. Although there is a general assumption in Europe that one of the prime reasons for the skin clothing was for its warmth, this correlation is contradicted by the importance of skin clothing and leatherworking tradition in Nubia, southern Egypt (Driel-Murray, 2000: 300; Veldmeijer, 2010: 28). At 20–24° latitude, this is one of the hottest places on the planet. Here and in Egypt, leather loincloths were aerated through cut work and slit work. This shows that local needs were met through skill and versatility in the manipulation of cloth resources.

### **Material choices**

Fibres, skins, and cloth types have multiple properties that would have been important in different situations. Flax has a high tensile strength and resists abrasion (good for sails and sacks), wool is elastic and burns very slowly (good for clothing and pyrotechnic activities) (Harris, 2010b: 106–07). The useful properties of animal skins do not only reside in the hair or fur, but also the skin, and aspects such as the size, thickness, and resilience vary according to species, age, and area of the skin (Kellogg, 1984: 37, 108). The thickness, strength, and durability of mature cattle skin, for example, was universally appreciated. It was used for shields, quivers, and sandals in Egypt (Driel-Murray, 2000: 302), as carry sacks in Hallstatt (Barth, 1992), and possibly as shields and chariots on Crete (Immerwhar, 1990: pl. 49, 52, 53).

Choices in materials are not only made according to physical properties but also cultural beliefs and some of the evidence suggests this was the case in these examples. Animal skins with their hair on are visual keys to the species they originate from, an aspect unlikely to have been lost on the agrarian communities of the Bronze Age. Therefore, the shields and chariot at

Knossos may have been made from cattle skin due to its strength and resistance, but this visual reference should not be separated from beliefs attached to the bull on Crete and indeed throughout the Near East and Egypt (Marinatos, 2010: 116–20). A similar argument could be made for cheetah and leopard skins in Egypt. The low quantity of wool textiles in Egypt may be explained by claims in later written sources that Egyptians considered wool unclean, therefore unsuitable for burials. However, the validity of sources should be treated with caution for this early period (Vogelsang-Eastwood, 2000: 269). This contrasts with the dominance of wool in the burials of southern Scandinavia, showing diametrically opposed practice. van Wees (2005: 48–49) suggests it is only in the sixth-century BC in Greece that fleeces and goatskins became signs of rusticity and poverty, whereas in the earlier written sources of Homer and Hesiod, these materials did not carry such connotations. Colour adds another layer of potential symbolism that was probably important everywhere, which is difficult to prove. In Egyptian iconography, for example, white was associated with purity and the notion of light; black with the underworld, fertility, and regeneration; turquoise or lapis lazuli with the dark sky and rebirth of the sun (Robins, 2007: 362).

Local choices in materials may lead to regionally distinct cloth traditions and, in turn, create identities associated with places or people. The notion of ethnicity or ‘other’ is presented in Egyptian wall painting, and costume along with skin colour, nose shape, and hairstyle was used to portray Nubians, Egyptians, Libyans, Asiatics, and Keftiu (Tyson-Smith, 2007: 220; Davies, 1973: 23). Although their costumes are distinguished through garment shape and style, they are also distinguished by decorative types and raw materials. These stereotypes are artistic devices and

should not be taken literally; sometimes the painters seem to have confused these visual clues as if working from copybooks (Keeper and Staff of the Dept. of Ancient Egypt and Sudan, 2007: 251). However, other evidence suggests at least a superficial accuracy: the multi-coloured and intricately patterned loincloths of the men from Keftiu from the tomb of Menkheperaseneb and Rekhmire (Davies, 1973: 22–23, pl. XIX–XXI, XXIX) find a rough equivalent in the pattered loincloths of the ‘Taureador frescoes’ and ‘Cupbearer’ from Knossos. In the tomb of Rekhmire and elsewhere, Nubians are shown in dappled or pierced animal skin loincloths (Davies, 1973: 26–27), which may be associated with the leatherworking tradition of Nubia. It seems highly likely that such distinctions also existed in north and central Europe. For example, the early presence of twill in the Hallstatt salt mines (Grömer, 2009: 108), northern Italy, and Switzerland may indicate a regional speciality in these diagonally textured textiles, but the existing evidence is too scarce to prove this point.

### **Textile traditions**

In terms of size, whole preserved textiles show that weavers of the Bronze Age were able to produce large and small textiles. Fringes were used in all areas. The well-preserved textiles of southern Scandinavia and Egypt demonstrate that textiles of well over 2 m could be woven, as well as narrow bands, sashes, and belts (Broholm & Hald, 1940: 22, 82; Hall, 1986: 24–26; Kemp & Vogelsang-Eastwood, 2001: 440, Figure 11.2).

Plain weave and repp are the most common fabric structures and are found in all areas with a reasonable body of preserved textiles. With its long antiquity, plain weave is the simplest, plainest weave. It is also extremely versatile in terms of material



properties and appearance (Chandler, 1995: 119–28). Variety in plain weave is found everywhere. Textiles of the same fabric structure may look quite different and have different material properties. Quality in terms of fineness and coarseness is measured in part by thread count. As a rule of thumb, the higher the thread count, the finer the cloth. For example, a plain weave textile with five threads per centimetre is likely to have thicker threads and to be coarser than a textile with 30 threads per centimetre. For example, in the Hallstatt salt mines the most common textiles have thread diameters of 1–1.5 mm and a thread count of 5–10 per centimetre; of these the examples with the thickest threads (1.5–2 mm) and lowest thread count (5 per cm) are coarse and interpreted as possible hauling sacks (Grömer, 2005: 20, 2010: 120, Abb. 550). However, there are finer textiles from the mines with thread diameters ranging from 0.3–0.4 mm to 0.6–0.9 mm and thread counts of 6–10 per centimetre (Grömer, 2005: 28–29, Figure 14). Thread count is a rough indicator of quality, but fabric density or visual thickness varies according to the density of the cloth and diameter of warp and weft (Hammarlund, 2004: 8–9). On the basis of this visual thickness classification, Hallstatt textiles can be grouped according to whether they are visually dense or open (Grömer, 2007: 90–91). The linen textiles of Egypt have the widest range of thread counts, from the low thread count coarse cloth, to the finest cloth with up to 100 threads per centimetre in royal tombs (Vogelsang-Eastwood, 1999: 22, 100). There is also variation in visual thickness between dense and open. Fine, open textiles produced sheer or transparent textiles, as for example with the shawls occasionally worn by men in the New Kingdom (Hall, 1986: 21).

Technically, in terms of the fabric structures, repp, basket weave and tapestry weave are simple variations of plain weave,

where the weft passes under and over each warp, alternating in subsequent rows, although in basket weave the threads are doubled (Emery, 1966: 75–90; Chandler, 1995: 120–21). Weaving with supplementary threads to create patterns and pile is described as compound weaves (Emery, 1966: 140–49), but are technically still fairly simple variations of plain weave. Twill weaves are float weaves, where warp or weft passes over two or more units of the opposite element; twills are characterized by their diagonal patterns (Emery, 1966: 75, 92–107). Repp has a slight ribbed appearance, twill textiles are characterized by subtle diagonal lines, and basket weave is distinct from plain weave due to its double threads (Chandler, 1995: 120–29) (Table 1). Although each study area showed innovation in the basic plain weave, these innovations were different. In southern Scandinavia, repp with extended fringe was used for the corded skirts. Twill is known from the Hallstatt salt mines, but it could be argued that it may be represented in diagonal patterns of some of the textiles from the late Minoan palaces. Tapestry weave is so far found only in Egypt, but the patterns on the wall paintings of Crete suggest that it was also practised here, possibly along with weaving with supplementary warps or wefts to create coloured patterns. Pile was added to wool textiles in southern Scandinavia and for linen in Egypt, although the former were only stitched on afterwards and the latter were also added in the weave. Different fabric structures provided visual distinctions between textiles in the same cloth cultures, and for this reason had potential as visual markers of social role and status.

Colour, texture, pattern, decoration, and qualities such as fineness and coarseness demonstrate the visual value judgements and cultural choices inherent in technological styles (Jopling, 1975: 219–20;

Lecthman, 1975: 14–15). These cloth styles may form an aspect of social identities. As a repository for precious raw materials, dyes, and human labour (Schneider & Weiner, 1986: 2), cloth may be used to convey status and social position. In Egypt, the labour-intensive and colourful tapestry weave textiles are only found in the royal or wealthy tombs (Vogelsang-Eastwood, 2000: 275). Spinning is an incredibly time-consuming process, so textiles with a high thread count (more threads per centimetre) are substantially more time consuming to produce than textiles with a low thread count because they consume more thread (Andersson & Nosch, 2003: 198–99). As well as the ubiquitous low thread count textiles found in all areas of this study (from below five per centimetre), Egypt has preserved textiles with very high thread counts (up to 100 per centimetre). In Egypt, textiles with high thread counts are associated with wealth and status, and found in wealthy burials such as Tutankhamun's tomb (Vogelsang-Eastwood, 1999: 22, 100). This may be in part due to fineness, but also due to the centralized, hierarchal structure of Egyptian society allowing the patronage and production of such time-consuming cloth. In contrast, the southern Scandinavian textiles with an average of three to six threads per centimetre (Bender Jørgensen, 1986: 289–92) and the Hallstatt textiles with only a few examples above 15 threads per centimetre show a much narrower range (Grömer, 2010: 120, Abb. 55). It may be that the weavers producing textiles in these areas lacked the skills, knowledge, or centralized production to weave very fine textiles. However, the fineness and coarseness of cloth are relative and the absence of high thread count textiles need not be interpreted in terms of the absence of textiles perceived as high quality. On the basis of elaborate metal grave goods, the low thread count textiles of southern Scandinavia were clearly suitable

for the burial of wealthy individuals in this context.

### **Animal skin traditions**

The status attached to textiles has led to an assumption that in the Bronze Age animal skins were either of lower status or used in a purely utilitarian fashion. Of the evidence presented here, the burials of southern Scandinavia, the palace wall paintings of Crete, and Egyptian tomb contents and tomb paintings, are arenas where men and women presented their wealth and status through material goods, such as metal weapons, drinking cups, gold and bronze jewellery, and folding stools. Both textiles and animal skins are found in these contexts, demonstrating how both were part of the material status trappings of wealthy or high status men and women although they were used in different ways.

In clothing, for example, the men and women in the southern Scandinavian burials wore textiles for large and small garments (blouse, skirt, wrap-around, kilt, cloak, cap, socks) and blankets, whereas animal skins were used for small garments and artefacts (stool seats, straps, shoes, knife covers, lining for sword sheaths), with the exception of the large cow skin wraps. In the wall paintings on Crete, textiles appear to be the main material used for men and women's clothing, although there the rare hide or fleecy skirts were possibly reserved for ritual and ceremonial use (Sakellaraki in Kontorili-Papadopoulou, 1996: 91). In Egypt, textiles were the main cloth for clothing wealthy men and women as the evidence from the Theban and royal tombs testifies and there is sufficient evidence to demonstrate that textiles were worn by men, women, and children from all echelons of society but that the quality varied (Hall, 1986: 20–26). In Egypt, animal skins were not common as

clothing although there are several exceptions: the leather loincloths worn by men, particularly sailors, soldiers, craftsmen, and servants, found in tombs of high officials and pharaohs (Vogelsang-Eastwood, 1993: 17–31), and the Nubian tradition of skin clothing and the leopard skin drapes worn as a badge of priestly office. However, animal skins were used by high-status individuals whether as chariot trappings, bow cases, quivers, and shoes, and they were sometimes elaborately coloured and decorated (Driel-Murray, 2000: 306, 311; Veldmeijer, 2010: 26). When Carter opened Tutankhamun's tomb, he commented that there must have been considerable amounts of leather in the tomb as horse trappings, seats for stools and sandals but that most of it has turned into a brittle, pitch-like mass (Carter, 1927: 175–76). On a broad scale, the evidence suggests that while textiles seem to have been the preferred cloth for clothing for high status individuals, certain forms of clothing made from animal skins also fulfilled this role. Here, the species or context may have been important. The problem with much of this evidence is that there is not enough evidence of non-elite clothing. The Hallstatt salt mines and Egyptian evidence are most appropriate here, and, again, both show the possibility that textiles and animal skin clothing had their place, although in Egypt the preference was clearly for textile clothing.

There is a wall painting of the late fourteenth or thirteenth century BC (LHIIIB) on mainland Greece, which hints at a possible negative attitude towards certain types of animal skin clothing. At the palace of Nestor, Pylos, a warfare scene shows combatants duelling with daggers. Warriors in combat are shown in distinct clothing: the Mycenaeans wear a boar's-tooth helmet, baldric, and short white skirt overlaid with long blank triangles and white greaves. The skirt, greaves, and baldric may well

have been made of leather or sheet metal, although the artist gives no clues (Lang, 1969: 71). Their opponents are bare legged, shoeless, and wear ragged garments tied around the neck with black hair makings, which Mabel Lang identified as animal skin, possibly sheepskin (Lang, 1969: 71, 227). She, and later Jack Davis and John Bennet, have argued that, although we can take the scene at face value as showing well-clothed Mycenaeans fighting their bare-foot, skin clad enemies, it may also be a device to differentiate them from the 'other' (Lang, 1969: 22; Davis & Bennet, 1999). As the greaves, baldric, and skirt could be leather, it is possibly the hairy appearance and tailoring of the enemy's skin garments differentiates them rather than the animal skin content. Looking at another example, the Hallstatt salt mines show that hairy or furry animal skin was common in the mines. But was it desirable? The conical hat, two wrist straps (bracelets), and a finger bandage have the hair side facing inwards and the flesh side facing out. Was this because it was better to wear the hair side against the skin, or because it was better to show the smooth flesh side? Other whole artefacts in the mine such as the cow skin carry sacks have the hair side facing outwards (Barth, 1992). On a broad geographical scale, the association of textiles with elite clothing is strong but the contrary argument that animal skins were associated with low-status clothing or were low-status materials is not supported by the evidence considered in this article. Indeed, the evidence suggests there were different attitudes to animal skin clothing in the Bronze Age which need to be addressed at a regional or local level.

Even if they were not especially prized as clothing materials, animal skins were an important raw material and are found both in working environments – such as the salt mines – and as high-quality goods in contexts such as the royal tomb of

Tutankhamun. In the working environment of the Hallstatt salt mines, animal skins with the hair left on are common (Harris, 2006: 71–72). The bags, construction materials, bandages, and wrist straps support the argument that animal skins were preferred as hard wearing, working materials. However, this interpretation is potentially biased by preservation factors, as there is little direct evidence of animal skin use outside the mines. This is in contrast to the Egyptian material, where elaborate, decorative examples of animal skin products are known for shoes, weaponry, and chariots (Driel-Murray, 2000: 306, 311; Veldmeijer, 2010: 22–24). Evidence of decorated animal skins is rare outside Egypt, although they would be difficult to differentiate from textiles in the wall paintings on Crete. The single decorated example from the Hallstatt salt mine is insufficient to prove a wider tradition. However, as the research field grows and more finds are investigated this will be an interesting area to follow.

### CONCLUSION

Fragile organic materials such as textiles and animal skins provide a number of problems for the archaeologist. Primarily, their poor preservation contrasts with their economic, social, and visual importance in the past. There is therefore a need to approach these materials using methods that open up new ways of thinking and allow alternative interpretations of their past significance. Through a wide-ranging comparative approach, this study has brought together evidence of textiles and animal skins as the material components of cloth cultures from north Europe to Egypt, focusing on a short period of time in the Bronze Age. Its scope has necessitated the selection of principle points and categories of analysis, with the intention of

presenting a balanced view in the comparison of cloth cultures despite the diversity of preservation contexts, the unequal quantity of data, and contrasting deposition contexts.

From this study, it is possible to recognize that there are some universally shared technologically and socially defined cloth culture principles. All the cloth cultures investigated here are based on woven textiles and animal skins from largely domestic resources, from the oak coffin burials of southern Scandinavia, the Hallstatt salt mines of Austria, Late Minoan Crete to later Eighteenth Dynasty Egypt. Although this may seem obvious, cloth cultures also vary across time and space. The Pacific and Indonesian cloth cultures, for example, cited in the introduction (Hauser-Schäublin, 1996), are based on profoundly different technologies. The widespread similarities have their roots in the interconnected Bronze Age world. Both textiles and animal skins were used to produce large and small artefacts of many kinds. Our knowledge of these is often limited by the fragmentary nature of the finds, but this comparative method of data collection demonstrates the potential of animal skin in all aspects of life including working environments, burials, elite regalia, bandages, weaponry, and transport. Textiles were similarly versatile as bags, bandages, bedding, sails, or drapes, and were the most commonly used materials for clothing, but animal skins were regularly used in this role, although the purpose of this clothing varies in each body of evidence.

The social organization of each of these four study areas varied, but the desire to produce elaborate, varied types of cloth was found in all of them although how this was achieved varied. For example, tapestry weave is not known in central and north Europe, although colour was widely appreciated. Where there is comparable evidence, it is possible to see that values

attached to materials varied regionally, for example, the type of textile fibres found in burials. There was great versatility and creativity in the use of materials: thick linens were woven for warmer clothing, wool, and animal skins were adapted for light-weight cloth.

Although some of the results may have been readily anticipated, such as regional diversity in textile types, the comparative approach demonstrates some of the actual distinctions that are known from the current body of evidence. This study looked at four areas with relatively good sources of evidence. By doing this, it has only touched on a fraction of the local and regional studies of textiles and animal skins in the Bronze Age. Further studies will hopefully bring out the rich diversity of cloth cultures at this time and draw attention to the way these materials were part of the social life of the people of the Bronze Age.

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#### REFERENCES

- Allgrove-McDowell, J. 2003. Industries of the Near East and Europe in Prehistory. In: D. Jenkins, ed. *The Cambridge History of Western Textiles*. Cambridge: Cambridge University Press, pp. 30–39.
- Andersson, E. & Nosch, M.-L.B. 2003. With a little help from my friends: investigating Mycenaean textiles with help from Scandinavian experimental archaeology. In: K.P. Foster & R. Laffineur, eds. *Metron Measuring the Aegean Bronze Age. Proceedings of the 9th International Aegean Conference/9e Rencontre égéenne internationale New Haven, Yale University, 18–21 April 2002*, vol. 24. Liège: Université de Liège, Histoire de l'Art et Archéologie de la Grèce Antique, and Austin, TX: University of Texas at Austin Program in Aegean Scripts and Prehistory, pp. 192–206.
- Andersson Strand, E., Gleba, M., Mannering, U., Nosch, M.L.-B. & Skals, I. 2010. Old Textiles – New Possibilities. *European Journal of Archaeology*, 13:149–73.
- Aner, E. & Kerstein, K. 1973. *Die Funde der älteren Bronzezeit des nordischen Kreises in Dänemark, Schleswig-Holstein und Niedersachsen. Band 1*. København: Frederiksborg und København Amt Verlag Nationalmuseum København Karl Wachholtz Verlag Neumünster.
- Barber, E.J.W. 1991. *Prehistoric Textiles: The Development of Cloth in the Neolithic and Bronze Age with Special Reference to the Aegean*. Princeton, New Jersey: Princeton University Press.
- Barber, E.J.W. 1997. Minoan Women and the Challenges of Weaving for Home,

- Trade and Shrine. In: R. Laffineur & P.P. Betancourt eds. *Sixth International Aegean Conference. Techne: Craftsmen, Craftswomen and Craftsmanship in the Aegean Bronze Age. Proceedings of the 6th International Aegean Conference/6e Rencontre égéenne Internationale Philadelphie, Temple University, 18–21 April 1996*. Liège: Université de Liège, pp. 515–19.
- Barnes, R. & Eicher, J.B. 1993. Introduction. In: R. Barnes & J.B. Eicher eds. *Dress and Gender: Making and Meaning in Cultural Contexts*. Vol. 2. Oxford: Berg Providence, pp. 1–7.
- Barth, F.E. 1992. Zu den Tragsäcken aus dem Salzbergwerk Hallstatt. *Archaeologia Austriaca*, 76:121–27.
- Barth, F.E. 1994. Ein Füllort des 12. Jahrhunderts v. Chr. in Hallstätter Salzburg. *Mitteilungen der Anthropologischen Gesellschaft in Wien*, 123–124:27–38.
- Bender Jørgensen, L. 1986. *Forhistoriske tekstiler i Skandinavien: Prehistoric Scandinavian textiles*. København: Kongelige Nordiske Oldskriftselskab.
- Bender Jørgensen, L. 1992. *North European textiles until AD 1000*. Aarhus: Aarhus University Press.
- Bender Jørgensen, L. 2003. Europe. In: D. Jenkins ed. *The Cambridge History of Western Textiles*. Cambridge: Cambridge University Press, pp. 52–70.
- Bender Jørgensen, L., Munksgaard, E. & Stærnøse Neilsen, K.-H. 1982. Melhøj-fundet. En hidtil upågtet parallel til Skrydstrup-fundet/English Summary: Melhøj—an unheeded parallel to the Skrydstrup find. *Aarbøger for Nordisk Oldkyndighed og Historie*, 1982:19–75.
- Bergerbrant, S. 2007. *Bronze Age Identities: Costume, Conflict and Contact in Northern Europe 1600–1300 BC*. Lindome: Bricoleur Press.
- Bierbrier, M.L. 2006. Genealogy and Chronology. In: E. Hornung, R. Krauss & D.A. Warburton eds. *Ancient Egyptian Chronology*. Leiden: Brill, pp. 37–44.
- Bietak, M. 2007. Egypt and the Levant. In: T. Wilkinson ed. *The Egyptian World*. London: Routledge, pp. 417–48.
- Boye, V. 1986. *Fund af egekister fra bronzealderen i Danmark. Illustreret af A.P. Madsen. Med efterskrift af Mogens Ørnsnes*. Reprint. Aarhus: Wormianum.
- Brewer, D. 2007. Agriculture and Animal Husbandry. In: T. Wilkinson ed. *The Egyptian World*. London: Routledge, pp. 131–45.
- Broholm, H.C. & Hald, M. 1940. *Costumes of the Bronze Age in Denmark: Contributions to the Archaeology and Textile History of the Bronze Age*. Copenhagen: Arnold Busck, NYT Nordisk Forlag.
- Broodbank, C. 2009. The Mediterranean and its Hinterland. In: B. Cunliffe, C. Gosden & R.A. Joyce eds. *The Oxford Handbook of Archaeology*. Oxford: Oxford University Press, pp. 677–722.
- Burke, B. 1999. Purple and Textile Trade in the Early Second Millennium B.C. In: P.P. Betancourt, V. Karageorghis, R. Laffineur & W.D. Niemeier eds. *Meletemata: Studies in Aegean Archaeology Presented to Malcolm H. Wiener as he Enters his 65th Year*. Liège: Université de Liège, Histoire de l'Art et Archéologie de la Grèce Antique, and Austin, TX: University of Texas at Austin, Program in Aegean Scripts and Prehistory. *Aegaeum*, 20, pp. 75–82.
- Burke, B. 2010. *From Minos to Midas: Ancient Cloth Production in the Aegean and in Anatolia*. Oxford & Oakville: Oxbow Books. Ancient Textiles Series, 7.
- Burnham, D.K. 1973. *Cut My Cote*. Toronto: The Royal Ontario Museum.
- Carter, H. 1927. *The Tomb of Tut-Ankh-Amen Discovered by the late Earl of Carnarvon and Howard Carter*. Vol. 2. London: Cassell.
- Carter, H. 1933. *The Tomb of Tut-Ankh-Amen Discovered by the late Earl of Carnarvon and Howard Carter*. Vol. 3. London: Cassell.
- Chandler, D. 1995. *Learning to Weave*. Colorado: Interweave Press.
- Christensen, K. 2006. Dendrochronology Dating of Bronze Age Oak Coffins from Denmark and Schleswig. *Acta Archaeologica*, 77:163–242.
- Comis, S.Y. 2003. Aktuelles aus den Nachbarländern. In: L. Bender Jørgensen, J. Banck-Burgess & A. Rast-Eicher eds. *Textilien aus Archäologie und Geschichte. Festschrift für Klaus Tidow*. Neumünster: Wachholtz, pp. 193–204.
- Davies, N.M. & Gardiner, A.H. 1926. *The Tomb of Huy, Viceroy of Nubia in the Reign of Tut'ankhamun, (no. 40) Copied in Line and Colour by Nina de Garis Davies and*

- with *Explanatory Text* by Alan H. Gardiner. London: Egypt Exploration Society.
- Davies, N.M. 1933. *The Tombs of Menkheperasonb, Amenmosé, and Another (nos. 86, 112, 42, 226) with Plates* by Nina de Garis Davies and with an *Explanatory Text* by Norman de Garis Davies. London: The Egypt Exploration Society.
- Davies, N.D.G. 1973. *The Tomb of Rekh-mi-Re at Thebes*. New York: Arno Press.
- Davis, J.L. & Bennet, J. 1999. Making Mycenaeans: Warfare, Territorial Expansion, and Representations of the Other in the Pylian Kingdom. In: R. Laffineur ed., *POLEMOS. Le Contexte Guerrier en Égée à l'Âge du Bronze*. Liège: Université de Liège, Histoire de l'Art et Archéologie de la Grèce Antique, and Austin, TX: University of Texas at Austin, Program in Aegean Scripts and Prehistory. *Aegaeum*, 19, pp. 105–19.
- Del Frio, M., Nosch, M.-L. & Rougemont, F. 2010. The Terminology of Textiles in the Linear B Tablets, Including Some Considerations on Linear A Logograms and Abbreviations. In: C. Michel & M.-L. Nosch eds. *Textile Terminologies in the Ancient Near East and Mediterranean from the Third to the First Millennia BC*. Oxford: Oxbow Books, pp. 338–73.
- Donadoni Roveri, A.M. 2001. *The Art of Weaving*. Milano: Electa.
- Driel-Murray, C. 2000. Leatherwork and Skin Products. In: P.T. Nicholson & I. Shaw eds. *Ancient Egyptian Materials and Technology*. Cambridge: Cambridge University Press, pp. 299–319.
- Eicher, J.B. 1995. Introduction: Dress as Expression of Ethnic Identity. In: J.B. Eicher ed. *Dress and Ethnicity: Change Across Space and Time*. Berg: Oxford, pp. 1–6.
- Emery, I. 1966. *The Primary Structures of Fabrics: An Illustrated Classification*. Washington, D.C.: The Textile Museum.
- Eskildsen, L. & Lomborg, E. 1976. Giftetanker. *Skalk*, 5:18–26.
- Fitton, J.L. 2002. *Minoans*. London: British Museum.
- Frei, K., Skals, I., Mannering, U., Gleba, M. & Lyngstrøm, H. 2009. The Huldremose Iron Age Textiles, Denmark: An Attempt to Define their Provenance Applying the Strontium Isotope System. *Journal of Archaeological Science*, 36(9):1965–71.
- Germer, R. 1992. *Die Textilfärberei und die Verwendung gefärbter Textilien im alten Ägypten*. Wiesbaden: Harrassowitz.
- Glob, P.V. 1974. *The Mound People; Danish Bronze Age Man Preserved*. London: Book Club Associates, Faber & Faber.
- Grabner, M., Klein, A., Geihofer, D., Reschreiter, H., Barth, F.E., Sormaz, T. & Wimmer, R. 2007. Bronze Age dating of Timber from the Salt-mine at Hallstatt, Austria. *Dendrochronologia*, 24(2–3):61–68.
- Grajetzki, W. & Quirke, S. 2000. Digital Egypt for Universities [Online]. London: University College London [accessed 5 November 2010]. Available at: <<http://www.digitalegypt.ucl.ac.uk>>
- Groenman-van Waaterling, W. 1990. De Kledingstukken van Leder en Bont. In: W.A.B. van der Sanden ed. *Mens en Moeras. Veenlijken in Nederland van de Bronstijd tot en Met de Romeinse Tijd*. Assen: Drents Museum, pp. 174–80.
- Groenman-van Waaterling, W. 1992. Analysis of the Hides and Skins from the Hauslabjoch. *Jahrbuch des Römisch Germanischen Zentralmuseums*, 39(1):114–28.
- Groenman-van Waaterling, W., Kilian, M. & van Londen, H. 1999. The Curing of Hides and Skins in European Prehistory. *Antiquity*, 73:884–90.
- Grömer, K. 2005. The Textiles from the Prehistoric Salt-Mines at Hallstatt (Die Textilien aus dem Prähistorischen Salzbergwerk von Hallstatt). In: P. Bichler, K. Grömer, R. Hofmann-de Keijer, A. Kern & H. Reschreiter eds. *Hallstatt Textiles: Technical Analysis, Scientific Investigation and Experiments on Iron Age Textiles*. Oxford: Archaeopress, pp. 17–40.
- Grömer, K. 2007. Bronzezeitliche Gewebefunde aus Hallstatt – Ihr Kontext in der Textilkunde Mitteleuropas und die Entwicklung der Textiltechnologie zur Eisenzeit (unpublished doctoral dissertation, Institut für Ur- und Frühgeschichte, Universität Wien).
- Grömer, K. 2009. Rough Clothes and High Fashion. In: A. Kern ed. *Kingdom of Salt: 7000 Years of Hallstatt*. Vienna: Prehistoric Department, Natural History Museum Vienna, pp. 106–13.
- Grömer, K. 2010. *Prähistorische Textilkunst in Mitteleuropa. Geschichte des Handwerkes und Kleidung vor den Römern mit*

- Beiträgen von Regina Hofmann-de Keijzer zum Thema Färben, und Helga Rösel-Mautendorfer zum Thema Nähen.* Wien: Naturhistorisches Museum Wien.
- Haines, B.M. 1991. Skin Structure and Leather Properties. In: C. Calnan & B. Haines eds. *Leather: Its Compositions and Changes with Time.* Northampton: The Leather Conservation Centre, pp. 1–11.
- Hald, M. 1980. *Ancient Danish Textiles from Bogs and Burials: A Comparative Study of Costume and Iron Age Textiles*, 2nd ed. Copenhagen: The National Museum of Denmark.
- Hall, R. 1986. *Egyptian Textiles.* Aylesbury: Shire.
- Hammarlund, L. 2004. *Handicraft Knowledge Applied to Archaeological Textiles. Fabric Thickness and Density: A Method of Grouping Textiles.* *Archaeological Textiles Newsletter*, 39:7–11.
- Harding, A.F. 2000. *European Societies in the Bronze Age.* Cambridge: Cambridge University Press.
- Harris, S. 2006. A Report on the Examination of Animal Skin Artefacts from the Bronze Age Salt Mines of Hallstatt, Austria. *Papers from the Institute of Archaeology*, 17:69–76.
- Harris, S. 2008. Textiles, Cloth, and Skins: The Problem of Terminology and Relationship. *Textile: The Journal of Cloth & Culture*, 6 (3):222–37.
- Harris, S. 2010a. Cloth Cultures in Prehistoric Europe: Project Concept and Approach. *Archaeological Textile Newsletter*, 50:30–31.
- Harris, S. 2010b. Smooth and Cool, or Warm and Soft: Investigating the Properties of Cloth in Prehistory. In: E. Andersson, M. Gleba, E.B. Andersson Strand & U. Mannering eds. *North European Symposium for Archaeological Textiles X.* Oxford: Oxbow Books, pp. 104–12.
- Harris, S., Rösel-Mautendorfer, H., Grömer, K. & Reschreiter, H. 2010. Cloth Cultures in Prehistoric Europe: The Bronze Age Evidence from Hallstatt. *Archaeology International*, 12:22–26.
- Hauser-Schäublin, B. 1996. The Thrill of the Line, the String, and the Frond, or Why the Abelam are a Non-Cloth Culture. *Oceania*, 67(2):81–106.
- Henriksen, P.S. 2009. Archaeobotanical Evidence of Flax in Prehistoric Denmark. In: S. Karg ed. *Communicating Culture: Workshop Info. 1* [online]. Copenhagen: The Danish National Research Foundation's Centre for Textile [accessed 4 March 2010]. Available at: <[http://cms.ku.dk/hum-sites/saxo-sites/projekter/flax/workshop/FLAX\\_workshop\\_2009\\_Abstract\\_WS1.pdf](http://cms.ku.dk/hum-sites/saxo-sites/projekter/flax/workshop/FLAX_workshop_2009_Abstract_WS1.pdf)>
- Hofmann-de Keijzer, R. & van Bommel, M.R. 2009. Colour and Colouring. In: A. Kern ed. *Kingdom of Salt: 7000 Years of Hallstatt.* Vienna: Prehistoric Department, Natural History Museum Vienna, pp. 112–13.
- Hood, S. 2005. Dating the Knossos Frescoes. In: L. Morgan ed. *Aegean Wall Painting: A Tribute to Mark Cameron.* London: British School at Athens, pp. 45–81.
- Hornung, E., Krauss, R. & Warburton, D.A. 2006a. Chronological Table for the Dynastic Period. In: E. Hornung, R. Krauss & D.A. Warburton eds. *Ancient Egyptian Chronology.* Leiden: Brill, pp. 490–98.
- Hornung, E., Krauss, R. & Warburton, D.A. 2006b. King-Lists and Manetho's Aigyptiaka. In: E. Hornung, R. Krauss & D.A. Warburton eds. *Ancient Egyptian Chronology.* Leiden: Brill.
- Hornung, E., Krauss, R. & Warburton, D.A. 2006c. Methods of Dating and the Egyptian Calendar. In: E. Hornung, R. Krauss & D.A. Warburton eds. *Ancient Egyptian Chronology.* Leiden: Brill, pp. 45–51.
- Hundt, H.-J. 1974. Die Gewebereste von Gevelinghausen. *Germania*, 52:48–51.
- Immerwhar, S.A. 1990. *Aegean Painting in the Bronze Age.* London: Pennsylvania State University Press.
- Jensen, J. 1982. *The Prehistory of Denmark.* London and New York: Methuen.
- Jopling, C.F. 1975. Yalalag Weaving: Its Aesthetic, Technological and Economic Nexus. In: H. Lechtman & R.S. Merrill eds. *Material Culture: Style, Organization, and Dynamics of Technology.* New York: West Publishing Co, pp. 211–36.
- Keeper and Staff of the Dept. of Ancient Egypt and Sudan. 2007. *The British Museum Book of Ancient Egypt.* New ed. London: The British Museum.
- Kellogg, K. 1984. *Home Tanning and Leathercraft Simplified.* Charlotte, Vermont: Williamson Publishing Co.



- Kemp, B.J. 1989. *Ancient Egypt : Anatomy of a Civilization*. London: Routledge.
- Kemp, B.J. & Vogelsang-Eastwood, G. 2001. *The Ancient Textile Industry at Amarna*. London: Egypt Exploration Society.
- Kendall, T. 2007. Egypt and Nubia. In: T. Wilkinson ed. *The Egyptian World*. London: Routledge, pp. 401–16.
- Killen, J.T. 2007. Cloth production in Late Bronze Age Greece: the documentary evidence. In: C. Gillis & M.-L.B. Nosch 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: Oxbow Books, pp. 50–58.
- Knapp, B. 1991. Spices, drugs, grain and grog: organic goods in Bronze Age East Mediterranean trade. In: N.H. Gale ed. *Bronze Age Trade in the Mediterranean: Papers Presented at the Conference held at Rewley House, Oxford, in December 1989*. Jonsered: Åström. *Studies in Mediterranean Archaeology* 90, pp. 21–52.
- Kontorli-Papadopoulou, L. 1996. *Aegean Frescoes of Religious Character*. Göteborg: P. Åströms.
- Kristiansen, K. & Larsson, T. 2005. *The Rise of Bronze Age Society: Travels, Transmissions and Transformations*. Cambridge: Cambridge University Press.
- Kruuk, H. 1995. *Wild Otters: Predation and Populations*. Drawings by Diana Brown. Oxford and New York: Oxford University Press.
- Lang, L.M. 1969. *The Palace of Nestor at Pylos in Western Messenia: The Frescoes*. Princeton: Princeton University Press.
- Lechtman, H. 1975. Style in Technology: Some Early Thoughts. In: H. Lechtman & R.S. Merrill eds. *Material Culture: Style, Organization, and Dynamics of Technology*. New York: West Publishing Co, pp. 3–21.
- Lemmonier, P. 1993. Introduction. In: P. Lemmonier ed. *Technological Choices: Transformation in Material Cultures since the Neolithic*. London: Routledge, pp. 1–35.
- Malmer, M.P. 1981. *A Chorological Study of North European Rock Art*. Stockholm: Almqvist & Wiksell.
- Mandl, F. 2009. The High Pastures. In: A. Kern ed. *Kingdom of Salt: 7000 Years of Hallstatt*. Vienna: Prehistoric Department, Natural History Museum Vienna, pp. 80–81.
- Manning, S.W. 1999. *A Test of Time: The Volcano of Thera and the Chronology and History of the Aegean and East Mediterranean in the Mid Second Millennium BC*. Oxford: Oxbow.
- Manning, S.W. 2006. Radiocarbon dating and Egyptian chronology. In: E. Hornung, R. Krauss & D.A. Warburton eds. *Ancient Egyptian Chronology*. Leiden: Brill, pp. 327–55.
- Marcar, A. 2005. Reconstructing Aegean Bronze Age fashions. In: L. Cleland, M. Harlow & L. Llewellyn-Jones eds. *The Clothed Body in the Ancient World*. Oxford: Oxbow, 30–43.
- Marinatos, N. 2010. *Minoan Kingship and the Solar Goddess: A Near Eastern Koine*. Urbana: University of Illinois Press.
- McCorriston, J. 1997. The Fibre Revolution: Textile Extensification, Alientation, and Social Stratification in Ancient Mesopotamia. *Current Anthropology*, 38 (4):517–49.
- Militello, P. 2007. Textile Industry and Minoan Palaces. In: C. Gillis & M.-L.B. Nosch 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: Oxbow Books, pp. 36–45.
- Moeller, N. 2007. Urban Life. In: T. Wilkinson ed. *The Egyptian World*. London: Routledge, pp. 57–72.
- Möller-Wiering, S. 2006. Tools and Textiles, Texts and Contexts. *Bronze Age Textiles Found in Crete* [online]. Copenhagen: The Danish National Research Foundation's Centre for Textile Research University of Copenhagen [accessed 9 February 2011]. Available at: <[http://ctr.hum.ku.dk/research/tools/bronze\\_age\\_textiles\\_found\\_in\\_crete.pdf/](http://ctr.hum.ku.dk/research/tools/bronze_age_textiles_found_in_crete.pdf/)>
- Morgan, L. 1988. *The Miniature Wall Paintings of Thera: A Study in Aegean Culture and Iconography*. Cambridge: Cambridge University Press.
- Moulhéat, C. & Spantidaki, Y. 2007. Preliminary Results from the Textiles Discovered in Santorini. In: A. Rast-Eicher, R. Windler & J.-P. Wild eds. *North European Symposium for*

- Archaeological Textiles IX, 2005, Braunwald, Switzerland. Archäologische Textilfunde – Archaeological Textiles.* Ennenda: Archeo Tex.
- Moulhérat, C. & Spantidaki, G. 2009. Cloth from Kastelli, Chania. *Arachne*, 3:8–15.
- Perini, R. 1970. Una Decorazione sul Tessuto Dalla Palafitta di Ledro. *Natura Alpina*, 21(1):28–32.
- Popa, G. 2009. Leather, Fur and Skin – Critical Raw Materials for Prehistoric Mining. In: A. Kern ed. *Kingdom of Salt: 7000 Years of Hallstatt*. Vienna: Prehistoric Department, Natural History Museum Vienna, pp. 102–05.
- Preston, L. 2008. Late Minoan II and IIIB Crete. In: C.W. Shelmerdine ed. *The Cambridge Companion to the Aegean Bronze Age*. New York: Cambridge University Press, pp. 310–26.
- Preziosi, D. & Hitchcock, L.A. 1999. *Aegean Art and Architecture*. Oxford: Oxford University Press.
- Pritchard, F. 2006. *Clothing Culture: Dress in Egypt in the First Millennium AD. Clothing from Egypt in the Collection of the Whitworth Art Gallery, the University of Manchester*. Manchester: Whitworth Art Gallery.
- Randsborg, K. 2006. Opening the Oak-Coffins: New Dates, New Perspectives. *Acta Archaeologica*, 77:3–162.
- Randsborg, K. 2011. *Bronze Age Textiles: Men, Women and Wealth*. London: Bristol Classical Press.
- Rasmussen, M. & Adamsen, C. 1993. Settlement. In: S. Hvass & B. Storgaard eds. *Digging into the Past: 25 Years of Archaeology in Denmark*, trans. by J. Hines. Aarhus: Royal Society of Northern Antiquaries, Aarhus Universitetsforlag & Jutland Archaeological Society, pp. 136–44.
- Rast-Eicher, A. 2005. Bast before Wool: the First Textiles. In: P. Bichler, K. Grömer, R. Hofmann-de Keijer, A. Kern & H. Reschneiter eds. *Hallstatt Textiles: Technical Analysis, Scientific Investigation and Experiments on Iron Age Textiles*. Oxford: Archaeopress, pp. 117–31.
- Reschreiter, H. 2005. Die Prähistorischen Salzbergbaue in Hallstatt und ihre Textilreste. (The Prehistoric Salt-Mines at Hallstatt and its Textile Remains.) In: P. Bichler, K. Grömer, R. Hofmann-de Keijer, A. Kern & H. Reschneiter eds. *Hallstatt Textiles: Technical Analysis, Scientific Investigation and Experiments on Iron Age Textiles*. Oxford: Archaeopress, pp. 11–16.
- Reschreiter, H. & Kowarik, K. 2009a. Puzzling Buildings. In: A. Kern ed. *Kingdom of Salt: 7000 Years of Hallstatt*. Vienna: Prehistoric Department, Natural History Museum Vienna, pp. 72–73.
- Reschreiter, H. & Kowarik, K. 2009b. Puzzling Gaps. In: A. Kern ed. *Kingdom of Salt: 7000 Years of Hallstatt*. Vienna: Prehistoric Department, Natural History Museum Vienna, pp. 70–71.
- Reschreiter, H. & Kowarik, K. 2009c. The 'Heidengebirge'. In: A. Kern ed. *Kingdom of Salt: 7000 Years of Hallstatt*. Vienna: Prehistoric Department, Natural History Museum Vienna, pp. 36–39.
- Reschreiter, H. & Kowarik, K. 2009d. The Bronze Age Initiative. In: A. Kern ed. *Kingdom of Salt: 7000 Years of Hallstatt*. Vienna: Prehistoric Department, Natural History Museum Vienna, pp. 48–64.
- Robins, G. 2007. Art. In: T. Wilkinson ed. *The Egyptian World*. London: Routledge, pp. 355–65.
- Roehrig, C.H. 1996. Women's Work: Some Occupations of Nonroyal Women as Depicted in Ancient Egyptian Art. In: A. K. Capel & G.E. Markoe eds. *Mistress of the House, Mistress of Heaven: Women in Ancient Egypt*. New York: Hudson Hills Press in Association with Cincinnati Art Museum, pp. 13–24.
- Rougemont, F. 2007. Flax and Linen Textiles in the Mycenaean Palatial Economy. In: C. Gillis & M.-L.B. Nosch 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: Oxbow Books, pp. 46–49.
- Ryder, M. 1988. Danish Bronze Age Wools. *Journal of Danish Archaeology*, 7:136–43.
- Ryder, M. 1992. Iron Age, Haired, Animal Skins from Hallstatt, Austria. *Oxford Journal of Archaeology*, 11: 1, 55–67.
- Ryder, M.L. 1990. Skin and Wool Remains from Hallstatt. *Mitteilungen der Anthropologischen Gesellschaft in Wien*, 120:103–12.
- Ryder, M.L. 2005. The Human Development of Different Fleece-Types in Sheep and its

- Association with the Development of Textile Crafts. In: F. Pritchard & J.-P. Wild eds. *Seventh North European Symposium for Archaeological Textiles, 5–7 May 1999, Edinburgh, Scotland: Northern Archaeological Textiles*. Oxford: Oxbow Books, pp. 122–28.
- Ryholt, K. 2006. The Turin King-List or So-Called Turin Canon (TC) as Source for Chronology. In: E. Hornung, R. Krauss & D.A. Warburton eds. *Ancient Egyptian Chronology*. Leiden: Brill, pp. 26–32.
- Schlumbaum, A., Campos, P.F., Volken, S., Volken, M., Hafner, A. & Schibler, J. 2010. Ancient DNA, a Neolithic Legging from the Swiss Alps and the Early History of Goat. *Journal of Archaeological Science*, 30:1–5.
- Schneider, J. & Weiner, A. 1986. Introduction. In: A.B. Weiner & J. Schneider ed. *Cloth and Human Experience*. Washington, D.C. & London: Smithsonian Institution Press.
- Shapland, A. 2010. The Minoan Lion: Presence and Absence on Bronze Age Crete. *World Archaeology*, 42(2):273–89.
- Shelmerdine, C.W. 2008. Background, Sources, and Methods. In: C.W. Shelmerdine ed. *The Cambridge Companion to the Aegean Bronze Age*. New York: Cambridge University Press, pp. 1–18.
- Sherratt, A. 1981. Plough and Pastoralism: Aspects of the Secondary Products Revolution. In: I. Hodder, G. Isaac & N. Hammon eds. *Patterns of the Past*. Cambridge: Cambridge University Press, pp. 261–305.
- Sherratt, A. 1993. What Would a Bronze-Age World System Look Like? Relations between Temperate Europe and the Mediterranean in later prehistory. *Journal of European Archaeology*, 1(2):1–57.
- Sørensen, M.L.S. 1997. Reading Dress: The Construction of Social Categories and Identities in Bronze Age Europe. *Journal of European Archaeology*, 5(1):93–114.
- Spalinger, A. 2007. The Army. In: T. Wilkinson ed. *The Egyptian World*. London: Routledge, pp. 118–28.
- Spence, K. 2007. Architecture. In: T. Wilkinson ed. *The Egyptian World*. London: Routledge, pp. 366–87.
- Spindler, K. 1995. *The Man in the Ice: The Preserved Body of a Neolithic Man Reveals the Secrets of the Stone Age*. London: Phoenix.
- Stanley Smith, C. 1970. The Cover Design. Art, Technology, and Science: Notes on their Historical Interaction. *Technology and Culture*, 11(4):493–549.
- Steel, L. 2007. Egypt and the Mediterranean World. In: T. Wilkinson ed. *The Egyptian World*. London: Routledge, pp. 459–75.
- Szeverenyi, V. 2004. The Early and Middle Bronze Ages in Central Europe. In: P. Bogucki & P.J. Crabtree eds. *Ancient Europe 8000 B.C. – A.D. 1000: Encyclopedia of the Barbarian World*. New York & London: Thompson/Gale.
- Tidow, K. 1992. Wollengewebe aus dem Bronzezeitlichen Baumsargfund von Harrisleebai Flensburg. In: L. Bender Jørgensen & E. Munksgaard eds. *Textiles in European Archaeology: Report from the 4th NESAT Symposium, 1–5th May 1990 in Copenhagen*. Vol. 5. Copenhagen: Konservatorskolen Det Kongelige Danske Kunstakademi, pp. 31–36.
- Tite, M.S. & Sillar, B. 2000. The Challenge of ‘Technological Choices’ for Materials Science Approaches in Archaeology. *Archaeometry*, 42(1):2–20.
- Trnka, E. 2007. Similarities and Distinctions of Minoan and Mycenaean textiles. In: C. Gillis & M.-L.B. Nosch 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: Oxbow Books, pp. 127–29.
- Tyson Smith, S. 2007. Ethnicity and Culture. In: T. Wilkinson ed. *The Egyptian World*. London: Routledge, pp. 218–41.
- Vankilde, H. 1996. *From Stone to Bronze: The Metalwork of the Late Neolithic and Earliest Bronze Age in Denmark, with a Contribution by Peter Northover*. Moesgaard, Aarhus: Jutland Archaeological Society.
- Vankilde, H. 2004. Bronze Age Scandinavia. In: P. Bogucki & P.J. Crabtree eds. *Ancient Europe 8000 B.C. – A.D. 1000: Encyclopedia of the Barbarian World*. New York & London: Thompson/Gale.
- Vankilde, H., Rahbek, U. & Rasmussen, K.L. 1996. Radiocarbon Dating and the Chronology of Bronze Age Southern Scandinavia. In: K. Randsborg ed. *Absolute Chronology: Archaeological Europe 2500–*

- 500 BC. København: Munksgaard. *Acta Archaeologica* 67, pp. 183–98.
- van Wees, H. 2005. Trailing Tunics and Sheepskin Coats: Dress and Status in Early Greece. In: L. Cleland, M. Harlow & L. Llewellyn-Jones eds. *The Clothed Body in the Ancient World*. Oxford: Oxbow, pp. 44–51.
- Veldmeijer, A. & Endenburg, E. 2007. Amarna leatherwork in the Berlin Museum. *Egyptian Archaeology*, 31:36–37.
- Veldmeijer, A.J. 2010. *Amarna's Leatherwork. Part I. Preliminary Analysis and Catalogue*. Norg, The Netherlands: Druk Ware.
- Vogelsang-Eastwood, G. 1992. *The Production of Linen in Pharaonic Egypt*. Leiden: Textile Research Centre.
- Vogelsang-Eastwood, G. 1993. *Pharaonic Egyptian Clothing*. Leiden & New York: E.J. Brill.
- Vogelsang-Eastwood, G. 1999. *Tutankhamun's Wardrobe: Garments from the Tomb of Tutankhamun. With Illustrations by Martin Hense and Kelvin Wilson*. Rotterdam: Barjesteh van Waalwijk van Doorn & Co.
- Vogelsang-Eastwood, G. 2000. Textiles. In: P. T. Nicholson & I. Shaw eds. *Ancient Egyptian Materials and Technology*. Cambridge: Cambridge University Press, pp. 268–98.
- Walton, P. & Eastwood, G. 1988. *A Brief Guide to the Cataloguing of Archaeological Textiles*, 4th ed. London: Institute of Archaeology.
- Wardle, K.A. 1994. The Palace Civilizations of Minoan Crete and Mycenaean Greece 2000–1200 BC. In: B. Cunliffe ed. *The Oxford Illustrated Prehistory of Europe*. Oxford & New York: Oxford University Press, pp. 202–43.
- Warren, P. 1996. The Aegean and the Limits of Radiocarbon Dating. *Acta Archaeologica*, 67:283–90.
- Wiener, M. 1987. Trade and Rule in Palatial Crete. In: R. Hägg ed. *Function of the Minoan Palace: 10–16 June, 1984*. Göteborg: Åström, pp. 261–65.
- Wild, J.-P. 2003. Anatolia and the Levant in the Neolithic and Chalcolithic Periods, c.8000–3500/3300 BC. In: D. Jenkins ed. *The Cambridge History of Western Textiles*. Cambridge: Cambridge University Press, pp. 39–43.
- Wilkinson, T. 2007. Egypt and Mesopotamia. In: T. Wilkinson ed. *The Egyptian World*. London: Routledge, pp. 449–75.
- Winiger, J. 1995. Die Bekleidung des Eismannes und die Anfänge der Weberei nördlich der Alpen. In: K. Spindler, E. Rastbichler-Zissernig, H. Wilfing, D. Zur Nedden & H. Nothdurfter eds. *Der Mann im Eis: Neue Funde und Ergebnisse*. Vol. 2. Wien & New York: Springer-Verlag, pp. 119–88.
- Wobst, H.M. 1977. Stylistic Behaviour and Information Exchange. In: C.E. Cleland ed. *For the Director: Research Essays in Honor of James B. Griffin*. Ann Arbor: University of Michigan, Museum of Anthropology, pp. 317–42.

#### BIOGRAPHICAL NOTE

Susanna Harris did her PhD on 'Cloth in Prehistoric Societies. The social context of cloth in prehistory, with case studies from northern Italy and the Alpine region from the Neolithic to Bronze Age' at the Institute of Archaeology, UCL. She has recently completed a British Academy Post-Doctoral Fellowship at the same institution, researching 'Cloth Cultures in Prehistoric Europe', focusing on the relationship between textiles and animal skins. Her research interests include interdisciplinary approaches to research methods, experimental archaeology, and world-wide rock art. These are reflected in her co-organization of the conference 'Wrapping and Unwrapping the Body – Archaeological and Anthropological perspectives' at the Institute of Archaeology, UCL in May 2010 and the session 'Threads to the past: novel methods for the investigation of archaeological textiles and other organic materials' at the EAA annual meeting in The Hague, in September 2010.

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## De l'esprit de clocher à l'universalisme: comparaison de cultures de tissus pendant l'Âge du Bronze

*Le but de cette étude est la comparaison des cultures de tissus en Europe et en Égypte pendant l'Âge du Bronze et le Nouvel Royaume. Cette comparaison se concentre sur le 14<sup>e</sup> siècle BC et quatre régions géographiquement distinctes, incluant les sépultures dans les cercueils en chêne de la Scandinavie méridionale, les mines de sel de Hallstatt en Europe centrale, la Minoenne récente en Crète et les tombeaux et les villes d'Égypte de la fin de la 18<sup>e</sup> dynastie. L'approche comparative, même appliquée à des cultures ou régions non connectées, est toutefois capable de fournir des résultats. Néanmoins je me concentre dans cette étude à une période chronologique limitée et à des régions reliées, directement ou indirectement, par des réseaux de commerce ou d'échange. Le concept de 'cultures de tissus' est utilisé afin d'inclure aussi bien les textiles que les peaux d'animaux, dans la mesure où ceux-ci étaient, dans le passé préhistorique, des matériaux étroitement liés. Les informations sont rassemblées selon les catégories suivantes : matériaux bruts incluant fibres de textile et espèces de peaux, structure du tissu et tissage (uniquement pour textiles), décoration et finition, utilisation et contexte. Cette étude nous permet d'identifier les principes universellement partagés des cultures de tissus et la grande polyvalence et créativité dans les cultures de tissus régionales durant l'Âge du Bronze. Translation by Isabelle Gerges.*

*Mots clés:* textiles, peaux d'animaux, Âge du Bronze, culture de tissus, vêtements

## Vom Parochialen zum Universellen: Der Vergleich von Textilekulturen der Bronzezeit

*Das Ziel dieser Studie ist es, die Textilekulturen von Europa und Ägypten in der Bronzezeit und dem Neuen Reich zu vergleichen. Der Vergleich konzentriert sich auf das 14. Jh. v. Chr. und schließt vier geographisch unabhängige Gebiete ein, darunter die Baumsargbestattungen Südkanadaviens, die hallstattzeitlichen Salzbergwerke Mitteleuropas, die späte Minoische Kultur auf Kreta sowie die Gräber und Städte der späteren 18. Dynastie in Ägypten. Der vergleichende Ansatz ermöglicht Erkenntnisse selbst bei der Anwendung auf miteinander unverbundene Kulturen oder Gebiete. In dieser Studie konzentriert sich die Verf. jedoch auf eine begrenzte chronologische Periode und miteinander – direkt oder indirekt – durch weite Handels- oder Austauschnetzwerke miteinander verbundene Gebiete. Das Konzept von Textilekulturen wird für Textilien wie auch Tierhäute gleichermaßen genutzt, da diese in der Vorgeschichte eng miteinander verbundene Materialien waren. Für die folgenden Kategorien wurden Informationen erfasst: Rohmaterialien einschließlich Textilfasern und Arten von Tierhäuten, Faserstruktur und Fadenzahl (nur bei Textilien), Dekoration und Konfektionierung, Nutzung und Kontext. Durch diese Studie ist es möglich, die allgemein geteilten Prinzipien von Textilekulturen und die große Vielseitigkeit und Kreativität der regionalen Textilekultur der Bronzezeit zu erkennen. Translation by Heiner Schwarzberg.*

*Stichworte:* Textilien, Tierhäute, Bronzezeit, Textilekultur, Kleidung