1

Unraveling the Fabric of the Past
Interdisciplinary Approaches to Archaeological Textiles

Margarita Gleba

COPYRIGHTED MATERIAL

Textiles are rarely preserved in archaeological contexts, often leading to an incomplete and even biased picture of their role in past cultures. When textiles do survive, however, a wide range of interdisciplinary methods and approaches can be applied to them, leading to information regarding their date, raw materials, and provenance. Indirect evidence consisting of archaeological textile tools, written sources, iconography, as well as archaeobotanical and archaeozoological remains can provide additional evidence about textile production, use, and economy of the resources. These empirical data obtained from the extant archaeological textile finds inform cultural aspects, such as the role of gender in cloth manufacture, long-distance trade in textiles, and the use of textiles for signaling identities.

Introduction

Textiles represent one of the earliest human craft technologies and have been a fundamental part of subsistence, economy, and exchange for millennia. Knowledge of textile history is hence key to our understanding of a multitude of human issues. Textiles can tell about social, chronological, and cultural aspects of past societies and at the same time give us a unique opportunity to come very close to the individual people in their capacity as both users and makers of textiles. This chapter reflects on the contribution of interdisciplinary approaches to studying archeological textiles and, in particular, highlights the more recent focus on the cultural dimensions of early textiles.

Although technically the word *textile*, which comes from the Latin *texere* ("to weave"), refers exclusively to cloth woven on a loom, for the purposes of the following discussion all fabrics constructed by interlacing fibers or threads are included under this term, because during the larger part of their history textiles were not

A Companion to Textile Culture, First Edition. Edited by Jennifer Harris.
© 2020 John Wiley & Sons, Inc. Published 2020 by John Wiley & Sons, Inc.

produced on looms. Textile use goes back to at least the Paleolithic[1] with the use of strings and simple fabrics documented by the so-called Venus figurines of the Upper Paleolithic, that is, by 27 000 BP (Soffer et al. 2000). The earliest direct evidence comes from the Czech site of Pavlov, where imprints of twined fabrics have been found on clay (Adovasio et al. 1996). During the following millennia the string technology spread across Eurasia and, with the arrival of humans to the Americas, throughout North and South America. By the Neolithic period, there is a veritable explosion of textile craft with direct evidence present in the Levantine area, Anatolia, and Europe (Barber 1991). During the last 10 000 years of human history, textiles increasingly took over as the primary material for clothing and many other utilitarian purposes.

Textile preservation largely determines the extent to which we can push back textile history. Like all organic materials, textiles are subject to a much more rapid decomposition than materials such as ceramic, stone, or metal. Nevertheless, textiles survive in archaeological contexts much more frequently than is commonly believed and, although unevenly distributed and very dependent on environmental conditions, the quantity of material is constantly increasing, particularly thanks to improved excavation and conservation procedures. Dry conditions, the presence of salt, waterlogging, and temperatures below 0 °C preserve textiles almost unaltered. In contrast, charring and mineralization in the presence of metals (in particular copper and iron) or calcium substantially alter the physical and chemical structure of the organic material. Preservation conditions thus affect the analytical procedures that can be applied to a particular find and the quality and quantity of data recovered from them.

Although the further back in time we look, the fewer textiles survive, even the few extant examples allow us to trace back the history of textile production and use through long chronological periods and across large geographical areas. Archaeological textiles can be subjected to a wide variety of analytical techniques, which result in important discoveries regarding their materials, date, and provenance, thereby providing data about their function, movement, meaning, and role in past societies (Good 2001; Andersson et al. 2010). The objects can be studied for themselves and for the information they carry about their makers and users. The manufacture of textiles, like few other materials, requires both conceptual, abstract knowledge and practical or procedural know-how, and therefore includes both social context and technology. The makers and the users may both be multiple: different stages of making are evident especially if textiles are made up into pieces of clothing. Extensive reuse of textiles in preindustrial societies also gives an indication of their value for those who made and used them.

Structural and Material Analysis: Textile Cultures and Identity

Much of the basic textile analytical work is done with a simple hand lens or a low-power microscope. Textiles have a precise structure that can be very accurately described, and over the last half a century an internationally agreed terminology has been established so that when a textile is described as a tabby in z/z, we know that is a fabric in simple binding where each weft alternates in going under and over each warp, and with warp and weft spun in a clockwise direction (Emery 1966; Barber 1991; Seiler-Baldinger 1994; Grömer 2016). Structural analysis of a textile includes

determination of raw material (wool, flax, silk, etc.); thread parameters such as diameter of warp and weft (expressed in mm), thread twist direction in warp and weft, and tightness of twist angle (hard, medium, or loose); and weave characteristics such as the type of textile weave or binding (plain weave/tabby, twill, satin, etc.), thread count in warp and weft (expressed in number of threads per cm), presence of edges, weaving mistakes, and other diagnostic features. These empirical features can inform our understanding of cultural aspects of textile production and use and, from close study of many individual examples, much wider conclusions can be drawn about regional and chronological trends.

For example, the analysis of hundreds of textile fragments provided for the first time a much more detailed definition of textile cultures in Italy and Greece during the first half of the first millennium BCE, a period of considerable socioeconomic changes that led toward social stratification, urbanization, and unprecedented long-distance interactions (Gleba 2017). Thus, although Italy and Greece shared similar technologies during the Iron Age – the low-whorl drop spindle for spinning yarn and the warp-weighted loom for weaving cloth – Italy mostly shared the textile culture of Central Europe characterized by the use of twill and tablet weaving, whereas Greece largely followed the Near Eastern traditions of textile production, which produced weft-faced tabbies (see Figure 1.1a,b). Production of these different textile types would have had aesthetic but also organizational and labor implications, as the resources, time, and labor consumed by the various stages of the operational chain would have differed when producing different types of cloth. These new data help us to understand the choices in technology made within these regions and show cultural similarities with other broader areas, as well as providing a *longue durée* view of technological developments.

Defining textile cultures is also essential for our understanding of local and regional identities of the past. Dress and its construction reflect the identity of an individual or a group of peoples more than most other aspects of material culture, because it combines both the technological achievements and aesthetic values of the society. Most past societies used dress as an indicator of gender; age; social, economic, political, and

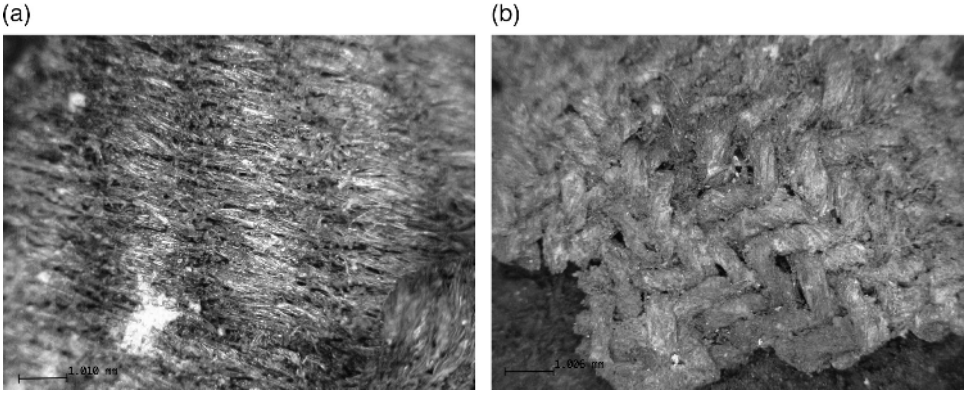


FIGURE 1.1 (a) Example of mineralized weft-faced tabby weave cloth from Greece, early first millennium BCE. (b) Example of twill weave cloth from Italy, early first millennium BCE. Source: Images courtesy of the author.

legal status; occupation; rank; religion; and ethnicity. Textiles have been used as the primary material for making dress articles in many cultures since at least the Neolithic. With most garments being "off the loom," that is, woven to shape on the loom rather than tailored, textiles often were the garments. If we go back to the different textile traditions of first millennium BCE Italy and Greece, it is clear that the different weaves – twills with tablet-woven borders in Italy and weft-faced tabbies in Greece – allowed for a different aesthetic expression of identity in dress in these geographical regions. Yet, when Greek settlements start appearing along the littoral of Southern Italy from the seventh century BCE onwards, we see weft-faced tabbies appearing in several of the indigenous sites that had close connections with these colonies. In certain situations, contact with the weft-faced, tabby-based Greek textile culture gave way to the creation of new expressions, such as a weft-faced tabby cloth with a tablet-woven border at the indigenous south Italian site of Ripacandida – a hybrid of the Italian and Greek traditions and a result of the creation, through interaction and negotiation, of new transcultural identity (Gleba et al. 2018).

Although archaeological textiles often survive as brown or colorless rags, it does not always follow that they looked this way when made. Addition of color in the form of dyes has been an integral part of textile making. Dye degradation, however, is rapid and dye and mordant identification usually requires sophisticated chemical analyses. The most advanced method for natural organic dye analysis is currently high or ultra performance liquid chromatography (HPLC or UPLC). The identification of colorants in archaeological textiles, in combination with a rigorous examination of their find context and wider cultural-historical background, is key to the understanding of dyeing technology, dye exchange, as well as aesthetics, value, and meaning of color in identity signaling (Cardon 2007).

In one instance, systematic dye analysis of numerous samples from Early Iron Age bog textiles found in Denmark showed that 80% of the samples had traces of one or more dye components (Vanden Berghe et al. 2009). The results clearly indicate that most Scandinavian peat bog textiles were originally dyed and that already during the first millennium BCE, the populations in Scandinavia were familiar with dyeing technology – a conclusion that contrasts sharply with the previously prevailing idea that dyeing was introduced in Scandinavia by the Romans only in the Common Era. These new results allow us to add color to ancient Danish dress, which certainly carried an important social meaning.

In another example, dye analysis provided a much more nuanced understanding of the status a specific color carried in antiquity. Shellfish or true purple has always been regarded as one of the most precious and prized dyes of antiquity. Yet, recent identification of shellfish purple in textiles found in specific archaeological contexts indicates that, by Roman times, purple-dyed textiles became easily available not only to royalty, aristocracy, and high priesthood but also to commoners. Undoubtedly, fully purple-dyed textiles would have been extremely expensive, but small quantities of thin purple yarn could go a long way to satisfy what Roman encyclopedist Pliny the Elder called the "purple mania." In one case, three fragments of shellfish purple-dyed textiles were found in a quarry workers' cemetery at Strozzacapponi in central Italy, dated second-first century BCE (Gleba et al. 2017). In another case, more than 17% of purple textile decorative elements found at the Roman military fortress Didymoi, located in the Eastern desert of Egypt and dated to the first century CE, tested positive for shellfish purple (Cardon et al. 2011, p. 200). This suggests that Roman quarry

workers and provincial low-ranking officers, and even soldiers, had access to and could afford to use shellfish purple in their garments. At the same time, because of the high desirability (and probably value) of shellfish purple, it did not take long before it started being imitated using other dye sources, in particular, a combination of red dye from the roots of madder and blue dye derived from the woad plant (Wouters et al. 2008). Given the popularity of the purple color and the variety of shades available, it was probably not always easy to distinguish between real shellfish purple and its adulterated version. Thus, at Strozzacapponi, one of the richest tombs contained a textile dyed with adulterated purple, whereas the finest shellfish purple-dyed cloth was found in a humble coarse-ware ossuary (Gleba et al. 2017). To what extent the consumers could (or cared to) distinguish between "true" and "fake" purple is a different matter, as long as the presence of the color purple in their garment signaled the desired status.

Structural Analysis: Technological Choices and Innovations

An understanding of technological developments in textile production in the past sometimes takes decades of research, new approaches, and working against assumptions that have been entrenched in scholarship. One example is the recent research into splicing. It has been long assumed that the technologies of making thread in plant bast fibers have differed in Europe/Near East and East Asia/Pacific: draft spinning in the first case and splicing or knotting in the second. In draft spinning, retted and generally well-processed fibers[2] are drawn out from a mass of fibers usually arranged on a distaff and twisted continuously using a rotating spindle. In splicing, strips of fibers are joined in individually, often after having been stripped from the plant stalk directly and without or with only minimal retting. Yet, the earliest textile finds from the Levant and Egypt, which are all made of plant bast fiber, are spliced. Recent examination of a variety of European and Near Eastern plant bast fiber textiles across a wide chronological and geographical spectrum using scanning electron microscopy resulted in the identification of splicing in all of them, including the multiple examples dating to the first millennium BCE (Gleba and Harris 2018; Leuzinger and Rast-Eicher 2011). Beyond Europe and the Near East, splicing continued to be the primary technique for plant bast fiber thread production in East Asia and the Pacific even longer, with many indigenous communities in Korea, China, Japan, and the Philippines still practicing it today. Furthermore, recent research on early South American bast fiber textiles from La Yerba (6000 BP) determined that these finds were spliced, too (Beresford-Jones et al. 2018). All these new data indicate that splicing was the original technology for making thread across the world. Draft spinning was almost certainly a later technological innovation needed for the making of thread from short fibers such as sheep wool in the Old World and camelid wool and cotton in the New World.

The discovery of more widespread evidence for splicing than previously believed has a number of important implications for how we interpret the archaeological evidence of plant bast fiber technologies, and their role in ancient civilizations. For example, the shift from splicing wild bast fibers to spinning cotton on the north coast of Peru led to increased quantities of production that precipitated revolutionary social changes leading to the rise of complex societies in South America (Beresford-Jones et al. 2018). Meanwhile, in Europe, splicing of bast fibers and draft spinning of sheep

wool coexisted for several millennia before the spinning technology was transferred to flax around the middle of the first millennium BCE, at the time of developing urbanization in the Mediterranean, when trade and transport powered by textile-driven sailing ships demanded intensification of production.

Characterization and Provenance Studies: Trade and Exchange

In order to use textiles, one has to have them and the acquisition of textiles has been an economic necessity since the Neolithic period, and although various cultures have found different solutions to the problem, most have combined production and exchange to varying degrees. Whereas much of textile manufacture happened on a household level, some textile products were traded over long distances in the form of raw materials, semifinished items (e.g. combed wool or yarn), cloth, or finished items such as garments. The desirability of the traded goods was often determined by their raw material and/or its quality. When sufficiently well preserved for fiber identification and dye analysis, archaeological textiles can further our understanding of the local textile materials and techniques, as well as the mechanisms through which various communities developed and adapted new textile materials and technologies to fit local cultural and economic needs.

Sheep wool has been and still remains one of the major fibers for textile making. It derives from the coat of domestic sheep and has properties that differ markedly from plant materials (ability to felt and become wind- and waterproof, insulation against cold, elasticity, easy to dye), which explains its quick popularity soon after its adoption. Yet, although the sheep domestication process commenced in the Fertile Crescent approximately 10 500 calibrated radiocarbon years BP, the direct evidence for the use of wool fiber in textile production can be dated back no earlier than the fourth millennium BCE. Some of the earliest textile remains made of sheep wool come from Shahr-i Sokhta, Eastern Iran, and date to c. 3100–1800 BCE. In the following millennia, wool became an important and, in some areas primary, textile material. The reason for this relatively late adoption of wool as a textile material is the fact that the early domesticated sheep did not look anything like the modern animals and produced very little usable fiber (see Figure 1.2a and b).

Michael Ryder established an evolutionary scheme for wool development based on fiber diameter measurements of fleeces of numerous modern sheep breeds and archaeological wool textile samples (Ryder 1964; Ryder 1983). Early varieties of sheep had coats containing mostly coarse hair and kemp and very little wool. Ryder demonstrated that, over the course of time, selective breeding has produced increasingly finer and more uniform wool. The ever-increasing number of analyzed samples demonstrates that Bronze Age (third to second millennium BCE) sheep had fleeces with extremely fine underwool and coarse hair and kemp but, by the Iron Age (first millennium BCE), more homogeneous fleeces were achieved through selective breeding of sheep (Rast-Eicher 2008; Gleba 2012). Furthermore, these developments happened earlier in some areas than others so that when large sets of textiles are analyzed, distribution patterns permit the identification of fleeces that do not fit the general pattern and may therefore be identified as of nonlocal origin. Thus, a recent publication of the Bronze and Iron Age wools from Hallstatt, Austria noted some unusual Bronze Age fleeces with dyed, naturally nearly white wool and fiber diameter measurements

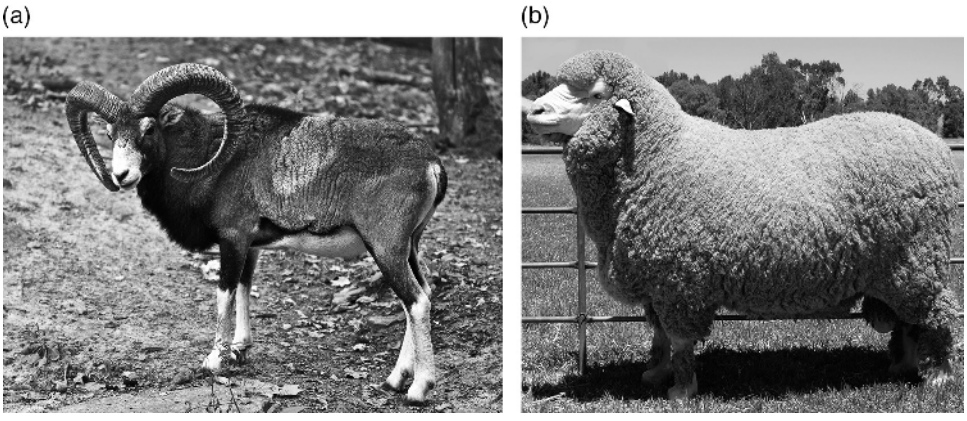


FIGURE 1.2 (a) European mouflon ram (*Ovis orientalis musimon*), Chemnitz, Germany. © Jörg Hempel. (b) Poll merino ram. © C. Goodwin.

that did not correspond to the typical Bronze Age fleeces found in the salt mines (Rast-Eicher and Bender-Jørgensen 2013, p. 1231). These wools were either some of the very few white Bronze Age wools available locally, or they had been imported to Hallstatt (Rast-Eicher and Bender-Jørgensen 2013, p. 1234). This could be the first evidence for wool trade in Bronze Age Europe.

Despite such tantalizing evidence, identifying the provenance of archaeological artifacts in absolute terms is often difficult, if not impossible. This is especially true of archaeological textiles, which, made with widespread and long-lasting techniques and materials, may defy typological classification and lack visible reference to their origin. Strontium (Sr) isotope ratios have recently been shown to be a useful indicator for wool fiber provenance in some cases. Strontium analyses of some Danish Iron Age textiles found in bogs demonstrate that not all of them had a local origin (Frei et al. 2009a). In the case of the so-called Huldremose "peplos," a large tubular garment, only 6 of the 11 samples analyzed were local, whereas others came from two distinct locations outside Denmark (Frei et al. 2009b). Because wools with different strontium signatures are present in the same textile, which otherwise looks very homogeneous, it is clear that raw material was traded rather than textile. This suggests that we can no longer assume that production of Iron Age Danish textiles was local – some of the raw material at least has come from far away.

In addition to strontium, combined carbon, nitrogen, and hydrogen isotopes can also be used in archaeology to establish geographic origin. Gradients in stable isotopes identified in modern studies of European sheep meat and wool have now been successfully applied to medieval archaeological wool samples from Iceland, the United Kingdom, Germany, and Sweden (von Holstein et al. 2016). Analysis has shown the isotopic composition of wool and bone collagen samples clustered strongly by settlement, demonstrating the feasibility of provenancing keratin preserved in anoxic waterlogged contexts.

Sometimes, however, long-distance trade is indicated by the presence of clearly exotic materials. Such is the case of the textiles preserved by the dry climate and high altitude at an elevation of 4000 m above sea level in a shaft grave at Samdzong, Upper Mustang in Nepal, dated between 400 and 650 CE (Gleba et al. 2016). One of the

objects recovered from the elite Samdzong five tomb complex was composed of wool fabrics to which copper, glass, and cloth beads are attached and probably constitutes the remains of a complex decorative headdress, which may have been attached to a gold mask. Liquid chromatography analysis permitted identification of a variety of organic dyes used to color the various textile components of this composite object, including Indian lac and munjeet, which are native to the Indian subcontinent, as well as the inorganic pigment cinnabar. Two other textiles recovered from the grave were made of degummed silk and one was colored with cinnabar. There is no evidence for local silk production, suggesting that Samdzong was inserted into the long-distance trade network of the Silk Road. Characterization of textile fibers and dyes in the Samdzong textiles thus permitted the identification of an entirely new branch of the Silk Road.

Textile Implements: Textile Production, Gender, and Mobility

Looking at the other side of textile acquisition – by means of their production, an important subfield of textile archaeology concerns the study of implements used in textile manufacture. Until relatively recently, textile tools have rarely been given attention in archaeological literature beyond general observations or, at best, the publication of an object catalog. Yet, unlike the textiles themselves, textile implements are ubiquitous on many archaeological sites. Spinning and weaving implements constitute the single most important and plentiful type of evidence for the assessment of the scale of production and the technology of the textile industry in the past. Spindle whorls appear as early as the sixth millennium BCE, indicating the use of suspended spindles, and can be used to hypothesize about the level of textile production. Likewise, the series of loom weights found in situ in rows on the floors at various sites suggest the presence of a vertical warp-weighted loom.

The great number of implements associated with textile manufacture can be used to study the craft and its technological and economic aspects. Furthermore, many textile tools have been found in burial and votive contexts, providing another interpretative framework. In the last few years, a number of important studies have been carried out. A large-scale project on textile tools of Bronze Age Eastern Mediterranean provenance has recently been completed at the Centre for Textile Research (CTR) in Copenhagen (Andersson Strand and Nosch 2015). The new methods developed at CTR allow researchers to calculate the range of textile qualities obtainable using specific tools – an indispensable tool in the absence of actual textiles on many sites.

Textile tools were symbolic of the female sphere of life in many Mediterranean cultures (even goddesses weave in Homer's *Odyssey*), and women likely took their tools along when moving far away from home. Archaeological evidence indicating long-distance movements of loom weights exists in the Bronze Age Aegean. Small but consistent numbers of nonlocal discoid loom weights have been noted at several Aegean sites, for example, Miletos on the Ionian coast of Turkey, Ayia Irini on Keos, and Nichoria on the southern Greek mainland (Cutler 2012). This type of loom weight is generally associated with Minoan culture and its presence has been regarded as an indicator of the adoption of Cretan weaving technology throughout the Aegean (see Figure 1.3). Because it is generally believed that textiles were produced by women



FIGURE 1.3 Bronze Age discoid loom weight from Miletos, Turkey. Source: Image courtesy of the author.

in Minoan society, it has been suggested that the presence of nonlocal loom weights indicates that there was some degree of mobility among women in the Aegean (Cutler 2012). Whether the mechanism of this mobility was intermarriage, migration, or slavery is impossible to determine, but the fact remains that textile equipment allows us to track women's movements as well as the diffusion of textile technologies and fashions.

Paleoenvironmental Data: Textile Resources

The study of textiles and tools can be enriched by the investigation of plant and animal resources used in textile production. Archaeobotany and archaeozoology can provide important information about the availability and exploitation of these resources.

Plants represent one of the most important and earliest resources in textile production, providing fiber, for example: flax, hemp, or cotton; dyestuffs, for example: woad, indigo, weld, madder, safflower, saffron, and bedstraw; and washing agents such as soapwort. The plant remains most commonly retrievable archaeologically include seeds, pollen, and/or phytoliths. The earliest evidence for the cultivation of flax comes in the form of linseed from the eighth millennium BCE at Tell Aswad in Syria. Flaxseeds can be used as a proxy for documenting the spread of domesticated flax from the Levant across to Anatolia and Europe, whereas subsequent divergence in flaxseed size during a period may be indicative of the diversification of oil and fiber flax varieties.

Archaeozoological evidence in the form of sheep bones permits analysis of slaughter patterns, which may indicate whether animals were kept for wool or meat. A predominance in the flock of adult animals, in particular castrated males, generally indicates wool production. The study of bone assemblages, landscape, and transhumance

patterns can give valuable information about the development of society's strategies in wool production and identify sites and regions with specialized production, or assist with examining the spread of different sheep varieties. For example, a recent archaeozoological study has demonstrated a distinct and significant change in the size of domestic sheep in southern Italy following Greek settlement (Gaastra 2014). This change could have resulted either from the translocation of Greek domesticate varieties to the colonies or from the local development of "improved" varieties (Gaastra 2014, p. 495).

Another archaeozoological material important for textile and dye studies consists of muricid shells found on Mediterranean sites, where large accumulations of them evidence the production of one of the most celebrated dyes of antiquity, shellfish purple.

A more integrated study of archaeobotanical and archaeozoological assemblages, as well as geological and paleoenvironmental data, can help in locating and mapping the areas of exploitation of textile resources in time and space, thereby advancing our knowledge of not only textile production but also of agriculture, animal husbandry, and resource exploitation.

Alternative Sources: Written Evidence and Textile Economies

Many geographical areas and chronological periods have left us very little direct archaeological evidence of textiles. This is where interdisciplinarity in the textile research field becomes more relevant than ever. Written sources have been essential for our understanding of the Bronze Age Eastern Mediterranean and Near Eastern textile industry (Michel and Nosch 2010). An array of ancient written texts contains information on textile materials, technologies, uses, and trade and are among the most extensive in the ancient world. In the Near East and the Aegean area, textiles are frequently mentioned in administrative texts related to temple and palatial economies, providing detailed data on textile production organization, or in legal documents, such as marriage contracts, dowry lists, and inventories of household items. These sources provide us with terms for types of textiles, dyes, garments, quantities of raw materials needed for their production, and quantities of finished products being traded.

Thus, the royal archives of Ebla, dated to the third millennium BCE, describe textiles produced, used, and exchanged in Ebla itself, throughout Syria and in Mesopotamia, including for example monthly accounts of textile deliveries to the palace. From the end of the third millennium BCE, many thousands of the cuneiform tablets from the Ur III Dynasty preserve information on textile production, exchange, and tribute in Sumer. Among the most detailed and best studied are the records of the Old Assyrian traders found in the Anatolian city of Kaneš, dated to the nineteenth to eighteenth centuries BCE. The traders imported to Anatolia vast quantities of woolen textiles woven in Assyria and the records found in Kaneš document the daily realities of the trade and associated legal transactions. Meanwhile, the Linear B tablet archives found on Crete and on the Greek mainland provide us with extensive information about textile production in the Late Bronze Age Mycenaean kingdoms. One of the striking aspects of the Mycenaean textile industry is its extreme specialization. These archives present an extraordinary documentation of the centralized scale of textile industry during the Bronze Age in the Aegean and the Near East. Considering that extremely few textile fragments survive from the

Bronze Age Near East, written sources provide our only window into the complexities of its textile economy and remind us once again that, throughout human history, textiles were the drivers of civilization.

Alternative Sources: Iconography and Textile Use

After written sources, iconographic material has been the most frequently cited source of information on ancient textiles. Art encompasses one of the most interesting and informative collections of visual material from the ancient past. The proliferation of textiles on reliefs, paintings, statuary, and other media has been noted by numerous scholars. This vast corpus of representations of textiles has been used particularly in studies of ancient dress, since direct evidence of archaeological textiles is usually too fragmentary to allow a meaningful reconstruction of garments. In combination, these two sources of evidence often provide significantly greater amounts of information than each individually.

Etruscan tomb paintings help us understand what a particular type of linen armor used in antiquity looked like, while a surviving linen greave from the Roman site of Dura Europos in Syria provides some understanding of the technique of its construction (Gleba 2012). From Roman times, the breathtakingly realistic Fayum portraits help us to understand the meaning and function of usually fragmentary textiles recovered from the contemporary Roman sites throughout the Mediterranean. In one particular case, it was possible to reconstruct a golden hairnet, of which only a jumbled mass has survived, based on a portrait.

In addition to garments represented on people, iconographic sources show a variety of utilitarian textiles, such as awnings, canopies, parasols, carpets, and nets, which are greatly underrepresented when it comes to their survival in archaeological contexts. Depictions of elaborately ornamented carpets and textiles, for example, are known from Assyrian reliefs and wall paintings. They have been compared to the carpet and textiles found in a fourth-century BCE Scythian burial in Pazyryk, Siberia, and confirm that iconography can be a reliable source of information about ancient textiles, provided that stylistic and medium limitations are taken into account (Albenda 2005).

Iconography is also of great importance to our understanding and reconstruction of textile technology. For example, the ancient Greek red-figure vase by the painter Amasis, dated to the sixth century BCE, represents an entire textile production chain: wool sorting and weighing, spinning using a suspended drop spindle, and weaving on a warp-weighted loom (see Figure 1.4). The scene illustrates details that cannot be retrieved from purely archaeological evidence, for example, the method of loom weight attachment to the warp threads, the fact that all textile workers are women and that two women are weaving on the loom simultaneously, showing that textile making was a communal and social activity.

Conclusion

Throughout the human past, textile manufacture was practiced at all levels of society and was one of the most labor-intensive of all occupations. Textiles had great cultural and social importance and should be factored into any balanced assessment of the past.



FIGURE 1.4 Terracotta oil flask (Lekythos) depicting women weaving at a vertical, warp-weighted loom, c. 550–530 BCE. Attributed to the Amasis painter (sixth century BCE). H. 6 3/4 in. (17.15 cm). New York, Metropolitan Museum of Art. Fletcher Fund 1931. Acc. No.: 31.11.10 © 2019. Source: Image © The Metropolitan Museum of Art/ Art Resource/Scala, Florence.

Over the last few decades, textile studies have developed into an important new field of archaeological and historical research. The accumulation of data and the constant development of analytical techniques are permitting a more synthetic approach to the history of textile art and technology, demonstrating how much we can learn about the culture, society, technology, and economy of the past through textiles. Structural and raw material analyses permit us to define and trace past textile cultures chronologically and geographically and have important implications for reconstructing the various identities of people. Such analyses also trace technological choices and innovations that had profound consequences for the ancient economies. Characterization and provenance studies of textiles are fundamental for our understanding of textile trade and exchange. Investigations of textile implements provide insights into the organization and scale of textile production, gender roles, and mobility of craftspeople. Paleoenvironmental data provides us with information about textile resources and their exploitation. Last but not least, iconography illustrates the diverse uses of textiles even when textiles themselves no longer survive, and written sources can provide important details of textile economies. This multitude of interdisciplinary approaches makes unraveling the fabric of the past an exciting and rewarding task.

Notes

1 DNA study of the evolutionary split between head and body lice concluded that people first began wearing clothes at least 190 000 years ago (Toups et al. 2011), although those early garments were most likely made of animal skins and hides, which continued to be used as cloth throughout history and to this day.
2 The process has been assumed to follow ethnographically recorded flax processing: retting, bracking, scutching, and heckling.

The research leading to these results has received funding from the European Research Council under the European Union's Seventh Framework Programme (FP/2007–2013 -312603), and was carried out within the scope of the project *Production and Consumption: Textile Economy and Urbanisation in Mediterranean Europe 1000–500 BCE* (PROCON).

References

Adovasio, J.M., Soffer, O., and Klima, B. (1996). Upper Palaeolithic fibre technology: interlaced woven finds from Pavlov I, Czech Republic, c. 26 000 years ago. *Antiquity* 70: 526–534.

Albenda, P. (2005). *Ornamental Wall Painting in the Art of the Assyrian Empire*. Leiden and Boston: Brill.

Andersson Strand, E. and Nosch, M.-L. (eds.) (2015). *Tools, Textiles and Contexts. Investigating Textile Production in the Aegean and Eastern Mediterranean Bronze Age*. Oxford: Oxbow Books.

Andersson, E.B., Frei, K.M., Gleba, M. et al. (2010). Old textiles – new approaches. *European Journal of Archaeology* 13 (2): 149–173.

Barber, E.J.W. (1991). *Prehistoric Textiles. The Development of Cloth in the Neolithic and Bronze Ages*. Princeton, NJ: Princeton University Press.

Beresford-Jones, D.G., Pullen, A.G., Chauca, G. et al. (2018). Refining the *Maritime Foundations of Andean Civilization*: how plant fiber technology drove social complexity during the preceramic period. *Journal of Archaeological Method and Theory* 25 (2): 393–425. https://doi.org/10.1007/s10816-017-9341-3.

Cardon, D. (2007). *Natural Dyes. Sources, Tradition, Technology and Science*. London: Archetype Publications.

Cardon, D., Nowik, W., Granger-Taylor, H. et al. (2011). Who could wear true purple in Roman Egypt? Technical and social considerations on some new identifications of purple from marine molluscs in archaeological textiles. In: *Purpureae Vestes III. Textiles Y Tintes En La Ciudad Antigua* (eds. C. Alfaro, J.-P. Brun, P. Borgard and R. Pierobon-Benoit), 197–214. València: Universitat de València.

Cutler, J. (2012). Ariadne's thread: the adoption of Cretan weaving technology in the Wider Southern Aegean in the mid-second millennium BC. In: *KOSMOS: Jewellery, Adornment and Textiles in the Aegean Bronze Age* (eds. R. Laffineur and M.-L. Nosch), *Proceedings of the 13th International Aegean Conference*, 145–154. Liège: Université de Liège.

Emery, I. (1966). *The Primary Structures of Fabrics. An Illustrated Classification*. Washington, DC: The Textile Museum.

Frei, K.M., Frei, R., Mannering, U. et al. (2009a). Provenance of ancient textiles – a pilot study evaluating the Sr isotope system in wool. *Archaeometry* 51 (2): 252–276.

Frei, K.M., Skals, I., Mannering, U. et al. (2009b). The Huldremose iron age textiles, Denmark: an attempt to define their provenance applying the strontium isotope system. *Journal of Archaeological Science* 36: 1965–1971.

Gaastra, J.S. (2014). Shipping sheep or creating cattle: domesticate size changes with Greek colonisation in Magna Graecia. *Journal of Archaeological Science* 52: 483–496.

Gleba, M. (2012). Linen-clad Etruscan warriors. In: *Wearing the Cloak: Dressing the Soldier in Roman Times*, Ancient Textiles Series 10 (eds. M.-L. Nosch and K. Galster), 45–55. Oxford: Oxbow Books.

Gleba, M. (2017). Tracing textile cultures of Italy and Greece in the early first millennium BC. *Antiquity* 144: 1205–1222. https://doi.org/10.15184/aqy.2017.144.

Gleba, M. and Harris, S. (2018). The first plant fibre technology: identifying splicing in archaeological textiles. *Archaeological and Anthropological Sciences* 11 (5): 2326–2346. https://doi.org/10.1007/s12520-018-0677-8.

Gleba, M., Vanden Berghe, I., and Aldenderfer, M. (2016). Textile technology in Nepal in the 5th-8th centuries CE: the case of Samdzong. *Science and Technology in Archaeological Research* 2 (1): 25–35. https://doi.org/10.1080/20548923.2015.1110421.

Gleba, M., Vanden Berghe, I., and Cenciaioli, L. (2017). Purple for the masses? Shellfish purple-dyed textiles from the quarry workers' cemetery at Strozzacapponi (Perugia/Corciano), Italy. In: *Treasures from the Sea: Sea Silk and Shellfish Purple Dye in Antiquity*, Ancient Textiles Series 30 (eds. H.L. Enegren and F. Meo), 131–137. Oxford: Oxbow Books.

Gleba, M., Heitz, C., Enegren, H.L., and Meo, F. (2018). At the crossroads of textile cultures: textile production and use at the south Italian archaic site of Ripacandida. *Journal of Mediterranean Archaeology* 31 (1): 27–52.

Good, I. (2001). Archaeological textiles: a review of current research. *Annual Review of Anthropology* 30: 209–226.

Grömer, K. (2016). *The Art of Prehistoric Textile Making – The development of craft traditions and clothing in Central Europe*, Veröffentlichungen der Prähistorischen Abteilung 5. Vienna: Verlag des Naturhistorischen Museums Wien.

Leuzinger, U. and Rast-Eicher, A. (2011). Flax processing in the Neolithic and Bronze Age pile-dwelling settlements of Eastern Switzerland. *Vegetation History and Archaeobotany* 20 (6): 535–542.

Michel, C. and Nosch, M.-L. (eds.) (2010). *Textile Terminologies in the Ancient near East and Mediterranean from the Third to the First Millennnia BC*. Oxford: Oxbow Books.

Rast-Eicher, A. (2008). *Textilien, Wolle, Schaffe der Eisenzeit in der Schweiz*, Antiqua 44. Basel: Archäologie Schweiz.

Rast-Eicher, A. and Bender-Jørgensen, L. (2013). Sheep wool in Bronze Age and Iron Age Europe. *Journal of Archaeological Science* 40: 1224–1241.

Ryder, M.L. (1964). Fleece evolution in domestic sheep. *Nature* 204 (4958): 555–559.

Ryder, M.L. (1983). *Sheep and Man*. London: Duckworth.

Seiler-Baldinger, A. (1994). *Textiles, a Classification of Techniques*. Washington, DC: Smithsonian Institution Press.

Soffer, O., Adovasio, J.M., and Hyland, D.C. (2000). The 'Venus' figurines: textiles, basketry, gender, and status in the Upper Palaeolithic. *Current Anthropology* 41 (4): 511–537.

Toups, M.A., Kitchen, A., Light, J.E., and Reed, D.L. (2011). Origin of clothing lice indicates early clothing use by anatomically modern humans. *Molecular Biology and Evolution* 28: 29–32.

Vanden Berghe, I., Gleba, M., and Mannering, U. (2009). Towards the identification of dyestuffs in Early Iron Age Scandinavian peat bog textiles. *Journal of Archaeological Science* 36 (9): 1910–1921.

von Holstein, I.C., Isabella, C., Rogers, P.W. et al. (2016). Provenancing archaeological wool textiles from medieval Northern Europe by light stable isotope analysis ($\delta^{13}C$, $\delta^{15}N$, $\delta^{2}H$). *PLoS One* 11 (10): e0162330. https://doi.org/10.1371/journal.pone.0162330.

Wouters, J., Vanden Berghe, I., Richard, G. et al. (2008). Dye analysis of selected textiles from three Roman sites in the Eastern desert of Egypt: a hypothesis on the dyeing technology in Roman and Coptic Egypt. *Dyes in History and Archaeology* 21: 1–16.