CHAPTER 26

# CRAFT PRODUCTION: CERAMICS, TEXTILES, AND BONE

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## Introduction

The Bronze Age witnessed an unprecedented flowering of craft activity. Throughout the period there were developments in decorative motifs, techniques, and skill with distinctive emphasis on the pleasing aesthetic through intricately elaborated objects made of a wide range of contrasting materials. These include metal, clay, bone, textiles, wood, bark, horn, antler, ivory, hide, amber, jet, stone, flint, reeds, shell, glass, and faience, either alone or in combination. Yet this period precedes the development of the state and urbanism, in which the creation of art became recognized as a distinct activity.

Although the Bronze Age was a period of common cultural values across Europe, crafts were performed in regionally specific ways leading to diversity of practice. Local developments in metalworking are well understood, but a frequent emphasis on metalworking has often been to the detriment of other crafts, some of which played a major role in everyday life. This chapter examines craft production in three contrasting materials that would have been widespread in the Bronze Age: ceramics, textiles, and bone. These were used throughout Europe, although they were differently articulated over time and space in ways that exploited the different properties and potentials of the individual materials to different degrees, and that responded to the varying needs of local communities.

## Ceramics

Ceramics are the most prevalent of all Bronze Age craft items in archaeological contexts. Clay was a familiar medium in the Bronze Age (Michelaki 2008; Sofaer 2006) and there is an

enormous range of objects made from fired clay. These reveal the use of a wide range of resources, manufacturing techniques, and decoration, reflecting the complexity and dynamism of Bronze Age ceramic craftsmanship.

## Types of Objects and Contexts of Use

The majority of ceramics are vessels used for serving food, drinking, storage, or food preparation, but there is also a range of other objects including spoons, loom-weights, spindle-whorls, roof-weights, portable ovens, perforated clay slabs, briquetage and other ceramics related to salt production, anthropomorphic and zoomorphic objects, abstract shapes including stars or crescents, models such as carts or house urns, as well as miniature replica vessels (thought of variously as toys, practice pieces, or votive objects). There are also clay objects used in metalworking such as tuyères and crucibles, as well as clay moulds for casting metal objects, although many of the latter were probably fired through the heat produced in pouring metal.

In the majority of locations in Europe, pottery is found in both settlement and cemetery contexts. In only a few cases, such as in the Early Bronze Age of the Rhine Valley, is it restricted to the domestic domain. In many areas, however, the relationship between settlement and cemetery material is poorly understood, as ceramics have traditionally been analysed on a site by site basis and comparative work is lacking. Nonetheless, cross-over between domestic and mortuary forms has frequently been observed. In some places domestic vessels may be reused in mortuary contexts, including making offerings to the deceased as observed at Pitten in Austria (Sørensen and Rebay 2008). In other contexts, however, specific forms or soft, low-fired facsimiles may have been made specifically for deposition in graves, such as at Dunaújváros-Kosziderpadlás in Hungary (Budden 2008).

In settlements ceramic vessels were used for storage, preparation, cooking and serving of food and drink. In some regions they were also deployed as prestige items used in display or in cult activities. In several Middle Bronze Age groups in the Carpathian Basin, fine-ware bowls with motifs on their base were designed to be hung on walls, indicating the value placed on ceramic craftsmanship (Sofaer 2006; 2010). It has been suggested that the increased elaboration of pottery represents the transfer of a prestige ideology from metal to ceramics (Vicze 2001). By contrast, in other regions, such as Iberia, the predominantly plain pottery has been seen as a deliberate attempt to hide otherwise well-established social inequalities (Diaz-Andreu 1994).

## Regional and Temporal Variation

From the Early to Late Bronze Age there is a great deal of temporal and regional variation in ceramic forms and prevalence. This enormous variability has been used to develop chronologies and distinguish local and regional cultural groups. A strong typological emphasis and focus on understanding local chronological sequences means, however, that comparative work on pottery is relatively under-developed. National traditions sometimes insist upon different names for what may, in some cases, be rather similar pottery types crossing modern borders. Furthermore, in many parts of Europe a historical emphasis on the analysis of pottery from graves (which is frequently more complete than material from

settlements) has guided the development of local and regional typologies and has led to problems of terminology. For example, the term 'urn' suggests a vessel found in burial contexts used to hold cremated bone, but typologically similar storage vessels found on settlement sites can also be called urns.

In general, the range of ceramic objects increases in a north-west to south-east gradient across the continent. Thus in north-west Europe, Scandinavia, and Iberia the range of ceramic forms is rather restricted compared to central, southern, and eastern Europe. In Britain and Ireland, Early Bronze Age forms are simple bipartite and tripartite vases and bowls often known as Food Vessels, as well as a variety of urn forms showing regional trends (Gibson 2002) (Fig. 26.1). Middle Bronze Age forms are dominated by urns of bucket, barrel, and globular form, with a few smaller vessels such as cups. In the Late Bronze Age some areas, in particular Ireland and Wales, are almost aceramic, but in southern England the range of vessels increases, including tall jars and bowls. In Scandinavia the quantity of pottery increased considerably from the earlier to later Bronze Age, although this change in abundance may reflect changes in disposal patterns (Sofaer 2010). The range of vessel types remained rather narrow and relatively consistent throughout the Bronze Age. Forms include biconical or cylinder-necked urns of various sizes and different domestic vessels, including storage and cooking vessels, with a few strainers and pot lids added late in the Bronze Age. There are also some small bowls and drinking cups, found more frequently in burials. There are no plates, although large open forms

FIG. 26.1 Early Bronze Age collared urn. Stourhead Collection.

Photo: Wiltshire Heritage Museum, Devizes.

sometimes occur in the Late Bronze Age as vessel shape categories became more distinct. In Iberia pottery forms are generally rather simple throughout the period, with carinated bowls, shallow open dishes, cups, and baggy storage vessels of various sizes, although more technically difficult forms are represented by *pithoi* (large jars) and chalice-shaped vessels such as those found in the El Argar B burials. In the Late Bronze Age of north-east Spain, cylinder-necked urns and other forms relating to the urnfields of southern France are known.

In central and eastern Europe there is much greater development in ceramic types through the course of the Bronze Age. Early Bronze Age forms are initially relatively simple with one-handled cups and polypod bowls, such as at Straubing, Bavaria. In general, vessels change from globular shapes to more angular conical and carinated forms at the height of the Early Bronze Age, a typical example being the Únětice 'hour-glass' cup. Other forms include jugs, small shallow bowls, storage vessels, sieves or strainers, and hanging vessels. Middle Bronze Age Tumulus culture pottery is marked by a range of complex very fine wares including vessels with globular bellies and cylindrical or conical necks, related urn forms, jugs, and pedestalled bowls, expressed as many local forms. The widespread Urnfield pottery of the Late Bronze Age includes the urn itself—often with a biconical body, cylindrical neck, and everted rim—cups, low conical bowls, and sometimes plates. These general forms are also interpreted in local ways and become more complex and angular over time.

Developments in the Carpathian Basin and east to the Black Sea show a tendency to extraordinary elaboration and exaggeration of forms, some of which are very angular or highly stylized (Fig. 26.2). The range of vessel types is wide and varied, representing the work of accomplished potters capable of producing a range of technically complex forms. Basic Early Bronze Age types include cups, bowls, jugs, hanging vessels, pedestalled vessels, and storage vessels as the core of the assemblage. At the transition from the Early to Middle Bronze Age the range of forms within individual vessel types increases and new types are

FIG. 26.2 Middle Bronze Age Koszider period bowl, Százhalombatta, Hungary.
Photo: Matrica Museum, Százhalombatta.

introduced, resulting in a wide assemblage that includes small cups, sieves, fish-dishes, deep domestic bowls, small domestic bowls, cooking jars, storage vessels, fine-ware bowls, jugs, globular and biconical urns, and ember covers. The range of vessel forms contracts at the end of the Middle Bronze Age, but there is noticeable embellishment and exaggeration of existing shapes; shared basic forms were explored within a proliferation of local potting traditions. In the Carpathian Basin, Late Bronze Age vessels are less abundant and have been comparatively little studied. There are new fine-ware shapes with everted rims and high strap handles, bucket and cylindrical neck urns, as well as a marked distinction between the coarse and fine-ware repertoires, which seem to mark a break from previous traditions. In some parts of the region there is an increase in large storage jars, while other areas display local variations on the Urnfield pottery.

Similarities between the pottery of the north Italian *terramare* and that found on Hungarian tells, in particular the exaggerated 'horned' handles of fine-ware jugs and cups, has frequently been observed (Pearce 1998). The abundant and elaborate pottery of the Apennine culture, found through much of the Italian Peninsula, displays a wide variety of shapes, although these are remarkably homogeneous throughout the region, with well-defined size ranges (Lukesh and Howe 1978). The *capeduncola* (one-handled cup or bowl) is particularly common, while other types include cheese strainers and milk boilers.

## Materials Selection and Manufacturing Processes

Although ceramic production was guided by the availability of local resources, potters' technical decisions were not confined to the environment, raw materials, and tools, but were also socially and culturally defined. Throughout the production process, from procurement of clay through to firing, Bronze Age pottery represents a wide range of technological choices. In many places, however, potting techniques were not substantially altered over the course of the Bronze Age. Instead established techniques were deployed in new ways, combinations, and with changes in technical skill, resulting in contrasting ways of designing objects, surface treatments, and decoration.

Treatment of clays is complex and highly variable, with a full range of deliberately added tempers that frequently cluster in temporal and spatial groups. These include grog, small pebbles, crushed flint, granite, limestone, shell, and sand, either on their own or in combination. Compared to earlier periods there is relatively little evidence for organic tempers. Very fine wares made from well-prepared clay and no added inclusions are also found. Despite the emphasis of modern ceramic studies on the functional reasons for the addition of tempers to clays, in particular their role in modulating the thermal dynamics of vessels, this does not always appear to be the case for Bronze Age vessels. For example, the deliberate inclusion of quartz pebbles in Early Bronze Age pottery in Denmark risks such vessels cracking during firing. Middle Bronze Age cooking and storage vessels from Hungary are tempered with grog but in smaller quantities than required to benefit the thermodynamics of the vessel. Here pottery of the same colour and fabric as the new vessel may have been targeted for reuse as grog, suggesting that the making of pottery may have been imbued with symbolic significance (Kreiter 2007).

Throughout the continent the vast majority of ceramics are handmade. They were constructed using a range of vessel-forming techniques including coiling, slab and

ring-building, pinching, and paddle and anvil techniques. There is little evidence for the use of moulds, although some very fine wares, such as those of the Szeremle group straddling Hungary and Croatia, have walls only 2–5 mm thick. In some regions, such as northern Poland, vessel-forming techniques appear to have remained the same throughout the Bronze Age despite changes in vessel form, and to have been locally specific; vessels that look the same were made in different local traditions (Dąbrowski 2004). In other regions, such as in the Carpathian Basin, vessel-forming techniques were deployed in expedient combinations depending on vessel size and shape (Budden and Sofaer 2009). In central and south-east Europe, particularly in the Late Bronze Age, modelling techniques were used to create innovative and complex shapes such as the zoomorphic vessels of the Lausitz group, Urnfield vessels resembling boots in Lower Austria and Hungary, or the model chariot from Dupljaja in Serbia (see Fig. 45.5b). Representational modelling declines the further west one goes; it is rare in Scandinavia (although there are a few anthropomorphic urns), and is absent in Britain. In the Late Bronze Age the potter's wheel was adopted in southern Italy and Iberia. In the former this is associated with Mycenaean influence, while in the latter there is some evidence for an independent local tradition of wheel-turned ceramics prior to Phoenician colonization (Almagro-Gorbea and Fontes 1997; Tanasi 2005).

There is a wide range of decorations and surface finishes, ranging from technically very simple to highly complex and elaborate, that may cover all, part, or none of the vessel. As with variation in ceramic types, there is a north-west to south-east gradient in the elaboration of ceramic vessels, with greater use of the vessel surface towards the south-east. This may reflect differential emphasis on pottery as a creative medium. An exception to this distribution is the pottery of the British Early Bronze Age where decoration is technically simple but can be ornate, with abstract geometric patterns made up of lozenges, hatching, zigzags, and herringbone designs made by twisted cord and comb impressions, stab, stab-and-drag, and false-relief techniques (Gibson 2002). In Scandinavia, few vessels were decorated and decoration was rather simple with incised lines, criss-cross lines, parallel stripes, and, in the Later Bronze Age, occasional horizontal cordons. In earlier Bronze Age Jutland clay was deliberately and unevenly applied to some vessel exteriors in a form of rustication that shares traits with the Middle Bronze Age ceramics of the Netherlands (Bakker et al. 1977). Tempering with small pebbles visible on the vessel surface may have acted as a decorative medium. In Iberia, much of the pottery is plain or has limited decoration. Argaric ceramics, for example, are burnished but rarely decorated except for finger impressions on the rims and applied buttons. Where pottery is decorated this is frequently linked to high-quality surfaces, and may indicate a marked difference between luxury vessels, perhaps with ceremonial significance, and coarser domestic ones (López-Astilleros 2000). A notable exception to the lack of decoration is the Las Cogotas pottery of the Meseta, which displays various combinations of decorative techniques, including incised, impressed, stabbed, *Kerbschnitt* (incised decoration resembling lattice work), and so-called 'boquique technique' (a series of small interrupted marks impressed on a continuous incised line).

In central, southern, and eastern Europe, in the Middle and Late Bronze Age in particular, certain classes of pottery, such as fine wares, are particularly striking in their visual qualities and appeal, requiring great technical skill for successful production, and significant investment of time. Exaggerated embellishments and elaborately decorated surfaces combined a variety of finishes and decorative techniques. In some areas, such as in the Otomani group, this resulted in a 'baroque' effect. Complex surface designs may be applied to the vessel,

sometimes over its entire surface or in specific zones, including swirls, lines, circles, or triangles. Applied decorations such as bosses and cordons resulted in three-dimensional vessel surfaces. The Tumulus phase in central Europe is marked by the development of rich and complex decoration applied to a range of fine-ware jugs, urns, and pedestalled bowls. *Kerbschnitt* decoration is a particular feature. The black, burnished ware of the Apennine culture pottery is also very striking, being decorated with incised spirals, meanders, dots, and bands of dots. The rilled or fluted decoration on vessel bodies and 'turban decoration' on the rim that is characteristic of Urnfield pottery throughout large parts of Europe also has the effect of creating a three-dimensional surface that draws the eye across the surface of the pot. Significantly, despite the widespread nature of this decorative device, not all vessels are decorated; decoration varies in its positioning on the pot and in execution. Thus, while general principles of decoration were adhered to, a general notion of aesthetics may have been important rather than faithful copying.

Colour may also be deployed to create effects. In the Transdanubian Encrusted Pottery culture and Gîrla Mare culture, a striking feature is the use of white inlay on a black (or occasionally red/brown) vessel body. The inlays are made from calcareous and, intriguingly, bone mixtures (Roberts, Sofaer, and Kiss 2008). The application of metal to ceramic, while relatively rare, also creates distinctive surface colour contrasts seen, for example, in the Late Bronze Age vessels decorated with thin tin strips from the settlement site of Hauterive-Champréveyres in Switzerland. In contrast to developments in the Aegean, painting was rarely used, although graphite-coated pottery is known from the end of the Late Bronze Age in, for example, the Swiss lake villages and the eastern Iberian Peninsula.

The emphasis on surface qualities and finish is also reflected in some regions in the use of distinct colour effects achieved through control over firing. The black burnished wares of the Tumulus, Terramare, and Vatya cultures were produced through complete reduction of the clay, a process requiring great skill and knowledge of fuel and firesettings. This may have been assisted through the use of kilns enabling air regulation during firing such as those found at the sites of Basilicanova, Italy (Cattani 1997), and Herzogenburg, Austria (Willvonseder 1937: 338–41, Taf. 13–15; Neugebauer 1994: 159, Taf. 92, 4–9). However, compared with the quantity of Bronze Age ceramics, excavations of kilns are relatively rare and their use was probably confined to particular regions. Even where kilns were in use, other firing strategies may also have been deployed for specific kinds of pots; large storage vessels or urns are too big to have been fired in the excavated kilns and may have been pit-fired, while coarse wares may have been bonfire-fired. In the rest of the continent almost all pottery conforms to the characteristics of bonfire firing, displaying smudging and colour variation in cross-section. The majority of European Bronze Age ceramics were fired at relatively low temperatures (600–800° C) (see Dąbrowski 2004; Gibson 2002; Maniatis and Tite 1981).

## Organization of Production

Despite the ubiquity of pottery, direct evidence for its production is relatively rare. Interpretations are based largely upon the qualities of pottery itself and correlations of these with ethnographic studies. The latter have shown a range of production modes and the potential complexity of Bronze Age pottery production strategies has been both highlighted and subject to scrutiny (Hamilton 2002). In general, however, simple coarse wares made from local materials are considered to be the products of non-specialist household production, whereas

high-quality fine wares with complex form and decoration are considered more likely to be the product of specialists. Based on this distinction, production strategies can be considered to vary across Europe following the north-west to south-east gradient in form and decoration described above. Thus in Britain, for example, pottery production is generally thought to have taken place within the domestic domain for local use, although particular fine- ware forms may have been made in workshops or by part-time specialists on a seasonal basis (Gibson 2002; Hamilton 2002). By contrast, in the Carpathian Basin the role of specialist potters may have been more prominent, although here too a mixture of different production strategies may be identified with both specialist and non-specialist potters at work (Budden 2008). In those few areas where the wheel was adopted in the Late Bronze Age, this has been associated with the development of craft specialization linked to elites, although recent work on the adoption of the wheel in the Aegean hints that the picture may be more subtle and complex (Berg 2007).

More recently, studies of skill in Bronze Age pottery production have emphasized the learned nature of pottery making and have aimed to explore general assumptions about pottery production in more detail (Michelaki 2008; Budden and Sofaer 2009). At the Vatya tell settlement of Százhalombatta in Hungary the most technically complex vessels (fine wares and urns) show the least technical error, those that are moderately difficult to make (domestic vessels) show modest error, and those that are technically easiest (cups) show the most faults. In a system of casual household production where potters are not specialists, one might expect more complex vessels to be most error-prone and simplest forms to suffer least. The pattern at Százhalombatta, however, indicates a range in potting proficiency associated with a structure of apprenticeship and lower tolerance for faults in more elaborate forms; less skilled potters learned on easier pieces before progressing to more complex forms produced by experts (Budden 2008; Budden and Sofaer 2009). At Százhalombatta the consistently high quality of firing compared to the execution of other technical variables suggests that there may have been specialists in this aspect of production. Vessels may therefore have been the product of multiple authors, something that has also been suggested for British Collared Urns on the basis of a detailed study of their decoration (Law 2008).

## Links to Other Crafts

Bronze Age ceramics from across the continent have frequently been linked to other crafts through skeuomorphism (the sharing of the formal qualities of objects in order to deliberately evoke an object made in one material in another). Most commonly skeuomorphism has been identified between pottery vessels and objects made out of metal and basketry. The exaggerated 'horn' handles and high surface sheen of the black burnished wares of central Europe and north Italy have been considered imitative of metal forms and surface finish (Sofaer 2006), while some British Bronze Age vessels have been identified as basketry skeuomorphs (Hurcombe 2008). In the case of the latter, recent experimental work has shown that rather than being true to one particular type of basket, pottery skeuomorphs were generalized rather than specific renditions (Hurcombe 2008). The influence of leather and wood objects on ceramics has also been identified (Manby 1995).

In some places, rather than deliberate imitation, decorative motifs on ceramic objects seem to have drawn inspiration from other materials. Some of the intricate and elaborately decorated inlaid vessels found in Croatia may have been inspired by stitching or embroidery patterns in textiles. Similar inspiration has been suggested for the decoration on Cogotas

I pottery in Iberia (López-Astilleros 2000). Some ceramics also appear to borrow decorative techniques from other materials. For example, *Kerbschnitt* decoration is reminiscent of wood-carving. Decorative designs may also be shared between materials, such as the sun motif that is found on both pottery and metal objects.

Cross-fertilization between crafts is also evident in some technical elements of ceramic manufacture that may involve the use of tools or techniques drawn from other crafts. This can include the use of bone tools for incising and impressing decoration, twisted cord for decorative impressions, and textile wrappings to support thin wet clay during the building up of the pot or thinning of the wall. In the case of the latter, textile impressions may also act as a deliberate symbolic visual reference to other materials (Hurcombe 2008), and have been observed in a range of Bronze Age ceramics including the Lausitz and Trzciniec cultures in Poland (Klosinska 1991; Dąbrowski 2004). Very rarely imprints of bronze objects have been observed on ceramics (Dąbrowski 2004). Such observations imply either exchange between craftspeople or multi-skilled potters who are able to work competently in more than a single craft (Sofaer 2010). In some cases technical solutions may be shared between potters and other craftspeople. For example, in the Nagyrév and Vatya cultures of Hungary the method of attaching handles to ceramic vessels using a kind of peg joint echoes rivets in metal and mortice and tenon joints in wood (Sofaer 2006). In the Iberian Late Bronze Age the use of the lathe and the drill in metalworking and jewellery manufacture may have been influential in the development of a local wheel-turning tradition (Almagro-Gorbea and Fontes 1997). This transfer of know-how from one medium to another requires direct familiarity with other craft practices and the development of social networks among craftspeople (Sofaer 2006, 2010).

# Textiles

Textiles, and the making of them, were important aspects of Bronze Age life. In the form of clothing, soft furnishings, and other household textiles, tents, sacking, and animal trappings, textiles served a wide range of practical as well as symbolic functions. Colours, texture, and decoration of textile items contributed to inform observers of the owner's rank, wealth, and identity. The manufacturing process involved many stages, different skills, and considerable consumption of time in every household, and played an important role in the organization of society. Textiles are, however, organic materials and decompose easily. Major archaeological finds are therefore rare. The main bodies of Bronze Age textiles in Europe derive from sources with freak conditions of preservation: the oak coffins of Denmark, the alkaline lakes in the Alpine region, and the salt mines of Austria. Samples, chiefly in the form of textile fragments, have been found in most parts of Europe. They derive from graves, depositions (particularly in wetlands), or as impressions in pottery. Textile tools (where they can be properly identified) form another important source that help in establishing an overview of textile crafts in the European Bronze Age.

## Types of Objects and Contexts of Use

The most conspicuous items of Bronze Age textiles are the complete sets of clothing recovered from oak coffins in Denmark (Broholm and Hald 1940; for a recent overview see

Bergerbrant 2007). Four male and three female costumes are on display in the National Museum of Denmark. Whether they represent only the ritual dress of an elite or also the daily wear of an average Bronze Age man and woman is an open question, but they certainly offer us some very welcome and vivid glimpses of Bronze Age clothing. The men were laid to rest in wrap-around kilts of various lengths, large oval or kidney-shaped cloaks, footwear consisting of simple hide shoes, strips of cloth, and in one case a cloth shoe with the sole sewn on. Headwear obviously was an important item and appears in two different forms: a semi-globular, piled hat made of several layers of cloth and finely sewn, and a simpler, taller version, sewn from a single layer of cloth without decoration. Some graves contained both types, indicating that they held a different meaning. In addition, a few further items of male clothing have been found in other graves. A tongue-shaped piece of cloth found with a collection of objects for magical purposes bears close resemblance to loin coverings depicted on figurines, presumably ritual garments. An oak coffin in southern Jutland contained a complete, as yet unidentified garment. Rectangular, 97 cm long and 9.5 cm wide, it is a strap rather than a belt, and may, perhaps, represent another ritual garment.

The women were buried wearing blouses of almost identical form, with elbow-length sleeves. All three females also wore belts, long bands of woven material ending in a fringed tassel. Two of the women were wrapped in large pieces of cloth sewn together to form a tube, interpreted in a variety of ways: as a long skirt, as a draped garment covering the body in different ways, or simply as a burial shroud. The young woman in the Egtved oak coffin wore a short skirt constructed from cords that caused quite a sensation when it was found in 1921. It was worn hanging on the hips, some 20 cm below the blouse; similar corded skirts depicted on figurines indicate that they were sometimes worn as sole garments, presumably in ritual contexts. Several graves have been found to contain rows of bronze tubes as decoration for corded skirts. Producing jingling sounds and flashes of golden metal as the wearer moved, this added to the garment's symbolic significance. The blouse of the Skrydstrup woman is decorated with embroideries. Fragments of similar decoration in several other graves show that this was not a unique feature. Headgear also formed an important part of women's attire, in various forms such as bands, hairnets, and a quite elaborate 'bonnet'. Footwear appears in the same forms as in the male graves.

The salt mines of Hallstatt in Austria form the second major source of Bronze Age textiles in Europe (Grömer 2007). The roughly 250 items recovered so far are fragments, presumed to be mostly the remains of clothing. Some have been put to secondary uses as working clothing, mats or knee-pads; some show repairs after heavy use, or have been used as patches. Some, however, are interpreted as the remains of carrier sacks for salt, and represent primary uses. The textiles from the salt mines offer limited information on the types of object they represent; instead, they form a rich source for the study of textile craftsmanship, design, and technology in Bronze Age Europe.

## Regional and Temporal Variability

The Bronze Age brought a series of textile innovations, but also regional and chronological variations (Bender Jørgensen 1986, 1992; Rast-Eicher 2005). Differences are reflected in fibre,

yarn, weave, density, textile, and various forms of decoration. The bast fibres and basketry techniques of twining, coiling, netting, and knotless netting that formed the staple of Neolithic textile traditions were replaced by flax, wool, and woven fabrics. Flax was introduced to south and central Europe during the sixth millennium BC, while wool does not seem to have been an aspect of sheep husbandry before *c.*2800 BC. Both fibres, however, remained relatively marginal until the Middle Bronze Age.

The main variable of Bronze Age textiles is yarn types. Yarn may be twisted clockwise (z) or counter-clockwise (s), and appear as single yarns or as plied. Further, different yarns may be used for warp and weft, or even within one of these systems. Fibre, weave, density, finishing processes, dyeing, and other forms of decoration add further variability.

In Scandinavia and the north European lowlands, almost all Bronze Age textiles are made of relatively thick wool yarns. They show a preference for s-spun warp and z-spun weft in the Early Bronze Age; this changed with Period III towards using s-spun yarns in both systems. Most are woven in tabby or plain-weave in rather coarse qualities (2–6 threads/cm). Bands and belts appear in tabby variations such as repp. Some of the garments seem to have been subject to fulling; decoration is seen in the form of embroidery, elaborate tassels, long pile on fabrics intended for cloaks, stripes obtained by yarn spun in different directions, and applied bronze decoration. Patterns could also be created by combining wools of various natural colours; evidence of dyeing has not yet been found in the north. A single example of twill is dated to Montelius Period VI. Evidence of textiles made from vegetable fibres is almost non-existent, but this is presumably due to adverse conditions of preservation. A fine fabric of nettle cloth from the princely grave of Lusehøj on Funen (Period V) is as yet the main example.

In west and central Europe, linen tabbies made from plied yarns seem to remain standard throughout the Bronze Age, although a series of changes in loom-weights, spindle-whorls, and sheep bones suggest that another fibre—presumably wool—had also become important (Rast-Eicher 2005). In Britain and the Iberian Peninsula, z-plied yarns were common, whereas central Europe seems to have preferred s-ply. In east-central Europe, wool fabrics gained importance with the beginning of the Middle Bronze Age, and were increasingly made from single, s-spun yarns.

Twill first makes an appearance in the Middle Bronze Age (Grömer 2007). It is especially suited for wool, enhancing properties like insulation and flexibility, and also offered a series of entirely new options for Bronze Age weavers in the form of textures, woven patterns such as chevrons and rhomboids, and specific effects when combined with different spun or coloured yarns. Basket weave appeared in the Urnfield period, offering further variables. To these may be added applied decoration such as different forms of needlework, including patterns created from sewn-on seeds.

## Materials Selection and Manufacturing Processes

Textile production consists of a long series of work processes, starting with the procurement and preparation of raw materials, primarily flax and wool. Hemp is first found in Hallstatt period contexts. Gold makes a first appearance as a textile material in an Austrian grave of the Urnfield period. Each fibre requires separate processes of procurement. Flax needs to be

grown in well-fertilized soils; when ready, the plant is pulled out of the ground, dried and rippled to remove the pod. Then retting, drying, breaking or pounding, scotching and heckling follow, to extract and prepare the fibres for spinning. Wool is obtained from sheep. Bronze Age sheep had a double coat, with long, coarse hairs and fine bottom wool, and was harvested by plucking or rooing. Afterwards the wool was sorted into categories, cleaned, teased, combed, and drawn into slivers or rovings before spinning. Shearing was first introduced in the La Tène period.

Spinning and weaving are the next steps in the process of textile production. Spindle and distaff were the main spinning tools, applicable for flax as well as wool fibres, although spinners usually employed different variants for each fibre, as well as for warp and weft yarns. Spindle-whorls indicate that the drop spindle was commonly used in most parts of Europe. Their weights offer further information on the range of yarn types, as heavy whorls were used for thick yarns and lightweight whorls for thin yarns. In Scandinavia, few or no Bronze Age spindle-whorls have been found, suggesting that spinning was carried out on spindles without whorls, perhaps made entirely out of wood. Often z-spinning is associated with the drop spindle, s-spinning with supported spinning or by rolling the spindle down the spinner's thigh; most spindles can, however, be twisted in both directions, although one of them seems to have served as a norm in most societies. This remains the case even today, as s-spun yarns for weaving are very difficult to acquire!

Weaving required a loom. Loom-weights and details such as starting borders in extant textiles indicate that the warp-weighted loom was the most common type in Bronze Age Europe. Again, little evidence is available from Scandinavia, suggesting that a different loom may have been used here. Several alternatives such as the back-strap loom, the ground loom or the two-beam loom are possible. Tools for weaving also comprise weaving swords and weaving combs (Bazzanella et al. 2003). Tabby is the main Bronze Age weave, with variations such as repp, where the yarns of one system are so dense that they cover the other. The Middle Bronze Age saw the introduction of twill. It appears in several varieties and requires the addition of sheds to the loom. This may be done by adding one or two heddle rods (rods to which cord loops or 'heddles' are attached, separating the warp threads and making a path for the weft), or by manipulating continuous heddle loops. Rather than a different loom, twill weaving demanded more technical skill, as did the introduction of woven and applied decoration. Woven decoration is constricted by the basic framework of the two yarn systems, favouring simple geometric patterns like stripes and checks, but the skilled weaver can create a rich variety of these, including forms that appear rhomboid or curvilinear. The insertion of pattern wefts or band techniques such as tablet weaving may produce almost any type of motif, while embroidery and other forms of stitching offer no restrictions at all.

The art of dyeing was introduced to Europe during the Bronze Age. A richly decorated fabric from Pfäffikon-Irgenhausen in Switzerland, dated to the transition from Early to Middle Bronze Age, is one of the earliest. Further evidence derives from the salt mines of Hallstatt where analyses have shown dyeing with woad (*Isatis tinctoria*), weld (*Reseda luteola*), tannins, some unidentified yellows, and a red dye, possibly of the madderworth family (*Rubiaceae*). One of these textiles was piece-dyed, the others presumably in the fleece (Grömer 2007).


FIG. 26.3 An example of the Bronze Age textiles from the salt mines of Hallstatt.
Photo: Natural History Museum Vienna.

## Organization of Production

Written sources from Mycenaean Greece, early second millennium BC Anatolia and Mesopotamia, and Pharaonic Egypt show highly specialized textile production, workshops, and division of labour (Trolle-Larsen 1987; Kemp and Vogelsang-Eastwood 2001; Killen 2007). Infrastructures in northern and central Europe hardly allowed such organization, but evidence for contacts across the continent, such as Baltic amber found in Greece, indicates some reciprocal knowledge. At first glance, the coarse woollen textiles of the north European Bronze Age do not appear to bear any evidence of specialized production. On the contrary, irregularities due to uneven warp tension and weaving faults give the impression that weavers were far from professionals. Still, the texture of these textiles remains homogeneous throughout the Bronze Age, suggesting that this was in fact how they were designed. Details like the piled hats, embroideries, and tassels prove that Bronze Age textile craftspeople did not lack skill. Since context as well as the peculiar nature of some of the items suggest that they served ritual purposes, we may, perhaps, see them as the products of specialists at the household level. The Bronze Age textiles from Hallstatt show a similar mixture of skilled and less skilled work, but with much more variety and reflecting primary uses along with recirculation (Fig. 26.3). They may reflect household production on a scale beyond the needs of the producers.

## Links to Other Crafts

A patterned textile from Molina di Ledro has a close parallels in anthropomorphic stelae found in the Alpine region, indicating that the stelae are indeed statues of clothed people, displaying fashions at the transition to the Bronze Age (Rast-Eicher 2005). As described above, several links can be found between items of clothing from the Danish oak coffins and bronze figurines. At the end of the Bronze Age we find depictions of textile work on pottery as well as bronzes.

# Worked Bone

People remained reliant on bone tools to carry out many day-to-day tasks until well into the Late Bronze Age in most of Europe. Although social networks must have ranged well beyond the confines of the household, the bone tools suggest that individual settlements still remained an important frame of reference. At the same time, the worked osseous material was implicated in far-flung trade connections. These bone tools probably spread rapidly with horsemen across broad areas of Europe, and so the Middle and Late Bronze Age is also characterized by the production of decorative antler objects produced with a variety of metal tools by semi-specialists. Two contradictory social tendencies are thus expressed in the worked osseous materials: technical conservatism at the household level and production of new, sophisticated objects, largely meant for display of rank and social position.

## Types of Objects and Contexts of Use

Many bone tool types from the earlier periods continue to be made throughout the Bronze Age. Some new types were introduced including certain leather-working tools, elaborate projectile points, and paired skates, as well as ornamented antler objects. Ordinary household bone tools were conceived in a less complex fashion, enabling rapid, self-sufficient production from food refuse. This simplification does not mean the tools were not curated or that the crafts where they were used were less important, only that the attention given to their production became less formalized.

The two most important types of equipment in Bronze Age households were awls and bevel-ended tools (Fig. 26.4). Until the Late Bronze Age both were made from animal bone waste extracted during food processing or, like ribs or whole bones, selected at the time of primary butchering. Compared to Neolithic bone tool production, these bone objects tend to be based on spiral fractures that occurred when long bones were broken for their marrow. The classic prehistoric awl based on metapodials, grooved along the diaphysis and split, was still made but was generally quite rare in Middle and Late Bronze Age bone tool assemblages. The know-how still existed to make them but was only infrequently employed.

Recent use-wear analyses on Middle and Late Bronze Age tools from tell sites in northern Greece and Albania provide hints on how these pointed tools and bevel-edged tools may have functioned in small-scale household crafts (Christidou 2008). More than half of the points from the Middle Bronze Age Albanian site of Sovjan seem to have been used in piercing hides and leather. The remainder of the pointed tools, especially needles, display wear commensurate with contact with plant-based materials for sewing, weaving, and coiled basketry. Bevel-edged tools based on fractured long bones of large ungulates were often used for splitting wood or as bark-peelers and cutters, as were many of the rose and beam-based heavy-duty antler tools with a bevelled active end (Christidou 2008) (see Fig. 26.4). There is evidence that tools from fractured long bones and complete ribs were also used to extract ore in mines (Antipina 2001).

From the Balkans up into the Hungarian Plain, one group of caprine tibia-based bevel-edged tools were certainly used as hide scrapers. Rib-based scrapers with a defined edge at their distal end also characterize bone tool assemblages of the period in the same region. The macro-wear analyses on these rib tools mostly suggest use on soft pliant animal materials (Choyke 1984,

2000; Christidou 2008). Rib scrapers are also found in Late Bronze Age levels at Biskupin (Drzewicz 2004). Some rib tools worked along the distal and medio-lateral sides but without sharp defined edges may have been used to smooth large clay surfaces in Middle to Late Bronze Age contexts in northern Greece and Albania (Christidou, pers. comm.). Similar rib tools have been found in some Early Bronze Age Bell Beaker and Makó culture contexts in Hungary.

Finally, the Neolithic tradition of using split boar tusks as scrapers remains widespread across Europe until the end of the Middle Bronze Age, with only the size and shape of these tools varying somewhat between regions. Use-wear studies of such objects from the final Neolithic of France at the site of Chalain in the French Jura show they were used to scrape wood and peel bark (Maigrot 2005). 'Smoothers' made from phalanges and/or astragali with abraded flat surfaces, made from caprines, cattle, red and roe deer, and horse (depending on availability), may be found on Middle and Late Bronze Age sites in Hungary, the Balkans, and within the *Terramare* material as well (see Fig. 26.4). Whether these are actually gaming pieces, or burnishers of some kind, or both, is unclear.

Some simple tools, probably for leather-working, appear for the first time in Bronze Age contexts. Based on use-wear studies (Olsen 2001), leather thong-smoothers from the Early Bronze Age (*c.*2800–2500 BC) were first identified on Early Bronze Age sites in Kazakhstan. Made from horse mandibles, they were notched around the area of the third molar. Similar objects from slightly later Early Bronze Age contexts in Slovenia and Middle Bell Beaker contexts have been studied by Alice Choyke (1984), and examples have been reported from the Czech Republic (Kyselý, pers. comm.). Probable thong smoothers, this time with polished, rounded wear on the oral portion of the cattle mandible, were produced in Early Bronze Age, Bell Beaker Csepel group and Makó culture settlements in Hungary. Caprine mandibles were used to manufacture the same type in the Middle Bronze Age in the Carpathian Basin.

Another specialized tool, often incorrectly published as skates (Gerškovič 1999), spread rapidly over large areas of central and eastern Europe at the end of the Middle Bronze Age. Such tools are even found in Late Bronze Age Biskupin in Poland (Drzewicz 2004). Made exclusively from complete radii of red deer, wild and domestic cattle, horse, or even roe deer, domestic pig and caprines, they have a facet running down the length of the dorsal surface of the radius and may be perforated in a medial-lateral direction above the distal epiphysis.

Where red-deer antler was not in good supply as in the Baltic region, certain bone-based objects were carefully manufactured—more in the manner of antler tools and ornaments elsewhere. In Estonia, some barbed and tanged arrowheads with a triangular cross-section, a type widespread at the beginning of the Late Bronze Age in Europe, were mostly made from bone as opposed to the more usual antler. Socketed spearheads in neighbouring Lithuania were made carefully, exclusively from caprine and pig-tibia diaphyses (Luik and Maldre 2007).

The best-documented class of antler tools are perforated, heavy objects incorporating the burr and beam of the antler rack (see Fig. 18.3). The rose portion often displays some kind of battering while the other end may be bevelled in an axe or adze-like manner. Although it has been assumed that these tools were used in agricultural activities, use-wear studies suggest that such items functioned rather to split wood (Maigrot 2005; Christidou 2008). Another rose and beam tool that co-occurs with the axe/adze over wide areas of Europe in the Bronze Age was used as a sleeve with a hole for a separate blade at the end opposite the rose. Red deer antler tines were frequently made into a variety of small picks or handles. These sleeves, although mostly simple, can also be ornamented and polished on Middle Bronze Age Hungarian sites.


FIG. 26.4 Characteristically simple bone tools from Hungary: 1. Awls, Százhalombatta-Földvár. 2. late Middle Bronze-early Late Bronze Age radius-based faceted tool, Százhalombatta-Földvár; 3. Assorted faceted phalanges and astragali, Jászdozsa-Kápolnahalom; 4. Bevel-ended tools, Jászdozsa-Kápolnahalom; 5. Mandible with facet on buccal surface along long axis, Jászdozsa-Kápolnahalom.

Photos: A. Choyke or K. Kozma on behalf of A. Choyke.

From the Middle Bronze Age, special purpose objects, often part of complex multi-media artifacts, begin to be widely made from antler. They include single-point harpoons, projectile points, line guides perhaps for netting, polished and decorated handles, buttons, toggles, pins and pin-heads, various bridle fittings (Fig. 26.5), and decorative boxes.

Animal canines, most notably bear, wild pig, and dog or wolf, were drilled through the root and used as ornaments. Plaques of drilled boar's tusk either for suspension or with multiple holes—possibly for some kind of decorative helmet armour—appear in small numbers but in many different places. They represent a widespread type associated in coeval sites in Anatolia with helmet or armour decoration and reinforcement. There is little use of shell compared to previous periods.

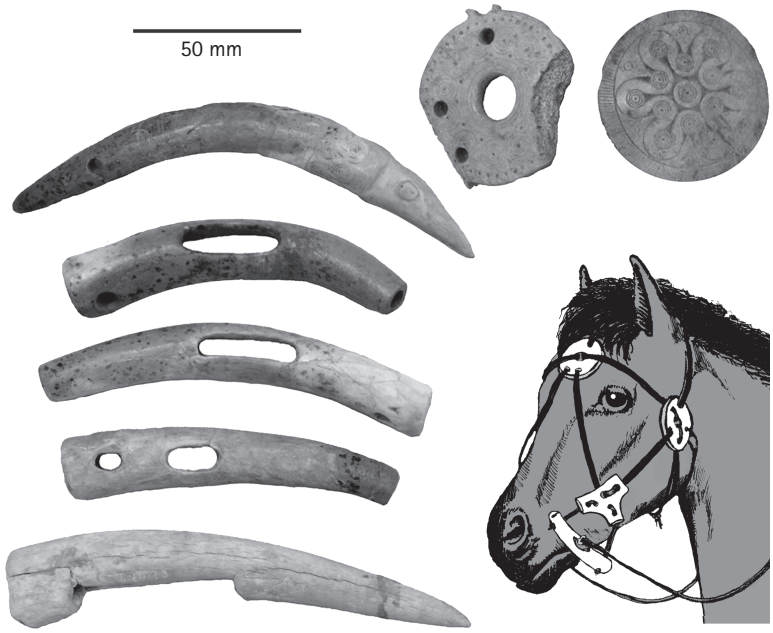


FIG. 26.5 Horse harness antler fittings produced by part-time specialists, Százhalombatta-Földvár.

Photos: A. Choyke, reconstruction drawing: L. Bartosiewicz, after: Choyke 2009.

## Regional and Temporal Variability

It is difficult to compare Bronze Age worked osseous materials on a Europe-wide basis. Besides chronological disconnects, far too little work has been published and many of the older works contain little detailed information on raw materials and details of the production sequence. What data does exist, however, suggests that bone tools tend to be less well made than objects in other materials, with production geared towards speed rather than slower, cognitively more complex, multi-stage work with strongly selected raw materials.

Red deer antler becomes the material of choice for producing rose and beam wood-working tools and elaborate ornamental objects from the Middle Bronze Age onwards throughout most of Europe and the Balkans. In the Baltic area, Late Bronze Age antler is apparently less available and bone is often substituted for the production of spearheads, pins, buttons, and decorated handles (Luik and Maldre 2007). Conversely, Noelle Provenzano (2001) reports that 70 per cent of the worked osseous material in the *Terramare* derives from antler, mostly worked with a full range of bronze tools. Antler-working had an especially strong and long-lasting tradition in the *Terramare*.

Hungary lies somewhere in between these two extremes of production, with red deer antler being unevenly available across the area. Antler may even have been traded between regions. Despite clear evidence that antler was sectioned using bronze axes in the Hungarian and Balkan material, access to metal knives, saws, chisels, and awls was limited to part-time specialists until the Late Bronze Age in this region. Thus, availability of red deer antler and access to a full range of metal objects also affected the sophistication of antler objects present in a given assemblage.

The manufacture of a variety of projectile points in antler and more rarely in bone, while hardly new, is a special, widespread marker of tool manufacture from the end of the Middle Bronze Age. Paired skates, with binding holes produced by a metal awl and cut into shaped metapodials from small equids, appear on Urnfield sites throughout Transdanubia (Hungary) for the first time. The elaborate, decorated antler objects represent more of a real innovation. Antler inlay in dagger hilts and pinning to hold box bases in place is part of this trend. Examples are known from Hungary and north Italian *Terramare*, although such materials surely appear elsewhere as well.

## Materials Selection and Manufacturing Processes

Local and regional continuity in raw material choice for certain simple household objects is evident in the archaeological record across Europe, demonstrating that while sociopolitical systems were transformed, life and rules of the production of goods at the household level remained fairly constant. Identification of regional manufacturing trends depend on species and skeletal element selection, the degree and manner in which abrasion and scraping with stone tools was employed, as well as recognition of when metal tools were employed to work osseous materials at a given settlement.

After the Final Neolithic there is a striking diminution in the amount of energy and time put into the production of most household equipment (Choyke 1984; Luik and Maldre 2007; Provenzano 2001; 2003). These simplified local rules of household production for bone tools, made mostly from domestic species, depend on the species availability, physical characteristics of particular skeletal elements, food processing traditions, and culturally ascribed qualities (Birtalan 2003).

While most points and bevelled-edged tools in the *Terramare* material from the Po Valley were quickly made, mostly from the bone refuse after food processing, metal tools are often used even in bone tool manufacturing, suggesting that such tools were widely available within the population (Provenzano 2003). In Hungary and the Balkans, while antler was sectioned using bronze axes, the remainder of the worked osseous objects in households were still made using flint and abrasive stone technologies until the Late Bronze Age. Bone objects from Estonia in the Late Bronze Age continued to rely heavily on the flint and abrasive stone of earlier times due to the difficulty of obtaining metal (Luik and Maldre 2007). For the most part, however, it is patterned selection by species and skeletal element, and the choices of how to process bone using the old Neolithic technologies, that differ by region.

The refined appearance of the new classes of antler-based decorative objects is in stark contrast to the household tools, suggesting that in many places they were manufactured for an emerging elite by part-time artisans with specialized technological knowledge and access to a range of metal tools beyond simple axes. The four- and six-spoke wheel pinheads of the *Terramare*, for example, were made by people with specialist knowledge in the use of bronze axes and chisels to shape the rough-outs and blanks of these objects from the pedicle and beam of hunted red deer, and then create the fine polished surfaces and delicate, incised decoration found on some of them. Chisels were needed to establish a small, deep notch in the antler surface, which could then be widened to create the spaces between the spokes (Provenzano 2001).

Within the Carpathian Basin, stretching south into the Balkans, and in Late Bronze Age Estonia, traditions of bone and antler manufacturing in the household continued directly

from the Neolithic and Chalcolithic periods into the Bronze Age with few modifications in technique. Flaked stone tools and abrasion were sometimes still used in household production well into the Late Bronze Age (Luik and Maldre 2007). The apparent widespread access to metal tools among the people at the *Terramare* is much less typical of Bronze Age technologies elsewhere in Europe, where bronze only becomes important in manufacturing patterns of simple bone and antler objects from the beginning of the Late Bronze Age (Provenzano 2001; 2003; Christidou 2008; Drzewicz 2004).

## Organization of Production

While bone tools and the heavy-duty rose- and beam-based antler tools are certainly the products of household-based crafts on Hungarian and Balkan sites, the refined and beautiful antler pieces from Hungarian and *Terramare* assemblages were made using a variety of metal tools and required talented, individual *savoir faire* to produce. The most beautiful pieces were surely made by part-time specialists. There may even have been functioning workshops on *Terramare* sites (Provenzano 2003).

## Links to Other Crafts

Bone tools were made for a variety of craft activities especially related to hide, basketry, and clay-product production. Many decorative objects were used in conjunction with other materials such as wood, leather, cloth, and metal in complex objects. Imitation of bronze ornamental types such as buttons and clothing pins in antler and bone is not only related to scarcity of bronze. Bone and antler may have been valued in their own right, not only for their white colour (contrasting nicely as fittings on dark clothing) but also for the attributes ascribed to the animals from which they derived. The wheel and disc heads of pins from the *Terramare* began to be copied from antler into bronze (Provenzano 2003) as a way to enhance their basic message, which must have been closely intertwined with the raw material coming from the pedicle and beam of the antler rack of hunted red deer stags.

# Conclusion

In the Age of Bronze, ceramics, textiles, and bone objects were a vital part of daily life throughout Europe. They literally created the fabric of existence by bringing shape, colour, and texture to Bronze Age lives. Nonetheless, the spatial and temporal variability evident in the expression of each craft reflects a differential emphasis and investment placed on them by different communities. Regional attitudes to innovation in form, manufacturing techniques, and decoration are visible in developments for each material, with contrasting attempts to explore these reflecting both conservatism and experimentation in craft production in all three media. Relationships between crafts evident in all three materials suggest that Bronze Age craftspeople were potentially open to a range of influences, as well as influencing the work of other craftspeople. Furthermore, not only was the production of craft

objects in regional styles part of the construction of local identities, but ceramic, textile, and bone objects were important in articulating other social values, including prestige, through their everyday use and display.

We have some insights into the developing role of specialists and different models of production in different media, but who these craftspeople were remains something of an open question. Were they, for example, young or old? Women or men? New research on skill and learning in craft production is adding another dimension to our understanding of the social dynamics of craft production (Michelaki 2008; Budden and Sofaer 2009), while further recent work highlights that even in societies where craft production is highly gendered, it involves negotiation and cooperation between gender and age groups (Sørensen 1996; Sofaer and Sørensen 2002). Assumptions regarding the roles of women and men in prehistoric craft production that see ceramic and textile production as predominantly female, and bone tool production as predominantly male, may therefore benefit from re-examination.

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