Spiral tube decorations on garments: Restoring a lost technique

Riina Rammo, Jaana Ratas

Abstract

Spiral tubes made from coiled wire have been used as decorative elements on garments in Estonia for the last thousand years (from the 10th to 19th centuries). Decorations using this technique can be found in both archaeological and ethnographic collections. The tradition documented in Estonia is part of a larger phenomenon that spread across the eastern shores of the Baltic Sea (Finland, Northwestern Russia, Latvia, and Lithuania, in addition to Estonia) from the 6th century AD. Thus far, archaeologists have regarded spiral tube decorations mainly as a source for garment history, and not much attention has been paid to understanding their construction. This article focuses on the techniques used to make spiral tube decorations, from wiredrawing to constructing the ornaments.

The results from metal analysis prove that the main raw materials used in wiredrawing have been copper alloys, with additives being mainly zinc and tin, and in lesser amounts, lead and other elements. Woollen and linen yarn and horsehair have been used as materials for constructing patterns. The woollen yarns used are usually fine and of high quality. Two main techniques used to make the ornaments can be observed: weaving the spiral tubes into a tablet-woven band and the use of various types of braided mesh and bands. When considering this very long period as a whole, it is possible to discern many regional differences both in techniques and pattern combinations. Behind the archaeological examples, makers of different skill levels and with different purposes can be seen, from professional craftsmen to women who made spiral tube decorations at home for personal use.

Keywords: Spiral tube decorations, ancient craft, tabletwoven bands, archaeological textiles

Introduction

Decorations consisting of spiral tubes made from coiled wire or *vaselised* have a long history in the Estonian territory. From around the 10–11th to the 19th century they have been continuously used to decorate garments. Thus far,

This article was originally published as: Rammo, Riina, Ratas, Jaana 2015. Ühte kadunud tehnikat taastades: spiraaltorudest kaunistused rõivastel. – *Silmnähtav. Studia Vernacula* 6, 65–87.
Article translated by Anneli Külaots.

archaeologists have regarded the spiral tube decorations mainly as a source for exploring the history of clothing. A large number of spiral tube decorations has been discovered from burial sites where the way that the ornaments and bones were located has permitted researchers to draw conclusions about the garments of the dead (Laul 1981, 1985, 1996; Rammo 2005, 2006). Less attention has been paid to the construction of such patterns, especially concerning earlier archaeological finds. This article presents the conclusions of current research on spiral tube decorations and gives a survey of techniques used in the territory of Estonia. The aim is not to create precise reconstructions of the artefacts or techniques but rather to characterise a long-term technological tradition. How were the patterns made? Which techniques were used? As crafting objects is inseparable from the people and their surrounding environment, we are also interested in the makers of such artefacts, their skills and their status.

Context: time and space

Spiral tube decorations are not only characteristic to the Estonian territory. Spiral tubes made of coiled wire used as jewelry are geographically and temporally widespread (Blumbergs 1982: 9, 26). The present article mainly focuses on the eastern shore of the Baltic Sea, where spiral tube decorations can be found in archaeological excavations in a relatively large area also encompassing Finland, Northwestern Russia, Latvia and Lithuania (e.g. Hvoštšinskaja 1991; Hvoštšinskaja 2004; Lehtosalo-Hilander 1984; Riikonen 2003; Ryabinin 1987; Zariņa 1999; Vahter 1928; Volkaitė-Kulikauskienė 1997).

The most ancient finds date back to the 4th century and are located in the eastern part of Lithuania (Volkaitė-Kulikauskienė 1986: 150). From the 7th century on, copper alloy spiral tubes were used to decorate shawls in Latvia (Zariņa 1999: 36); similar finds in Finland date to the beginning of the 9th century (Lehtosalo-Hilander 1980: 243). Since the 10th or 11th century, the tradition can be observed in archaeological artefacts from the Livonian and Estonian territories (Laul 1985: 415; Zariņa 1988: 99).

The earliest spiral tube decoration fragments from Estonia come from the Raatvere cemetery burials in Kodavere Parish and date back to the 11th century. At that time, the practice of inhumation was spreading on the Estonian mainland and replacing the tradition of cremation, and as a result, these fragments were preserved and distinguishable. Small spiral tubes have also been found from earlier cremations, although their role as garment decoration remains hypothetical (Rammo 2005: 17–18).

Archaeologists have discovered spiral tube decorations mostly from burials in which they were part of the funeral dress. A large amount of spiral tube decorations has been found in burial sites dating back to the turn of the

Figure 1. Places and important archaeological sites mentioned in the text. *Graphics by Jaana Ratas.*

12th–13th century in Northern and Northeastern Estonia (Figure 1). Finds dating to the same period have been also been discovered in Saaremaa. Most of the medieval finds were located in southern parts of Estonia. Fragments of back aprons dating to the 13th–15th century discovered from village cemeteries, especially in Otepää, serve as examples (Laul 1981). An important site is Siksäslä cemetery in Vastseliina Parish, where textiles decorated with spiral tubes were used up to the 15th century.

The patterns and techniques of Siksälä are similar to those found further south in the territory of contemporary Latvia. Textiles with splendid metal decorations were not found from 15th century graves, but they reappear among archaeological finds from the second half of the 16th century in the context of hoards and deposits left in the ground during the Livonian War (1558–1583) and the Polish-Swedish War (see Figure 1, blue). Several such hoards also contain head decorations with spiral tubes, especially in southern areas of Estonia (Kiudsoo, Ratas 2005).

Evidence of rural women decorating their aprons and leg wrappings with brass wire can be found in written sources from the turn of the 16th to 17th century (Johansen, Mühlen 1973: 402–403). In his travel notes, Fjodor

Tumanski describes a newlywed Votic woman's apron from the 18th century made of blue woollen cloth and "embroidered with the cord-like copper ringlets" in addition to tiny glass beads and coins (Öpik 1970: 93). The last fragments of spiral tube decorations were collected by ethnographers during their expeditions in the 19th century (Kaljus 2009: 86–90; Manninen 1927: 246–247). A Finnish researcher, Axel Olai Heikel, obtained a adornment made of spiral tubes from South Estonia in 1902 (Tomanterä 2003: 42, Figure 66). This allows us to observe the use of spiral tube decorations as a continuous tradition through one thousand years. Implicit reproductions of spiral tubes can be found in several more recent handicraft techniques, such as certain decorations wrapped with yarn (Laul 1996: 745; Üprus 1969: 10).

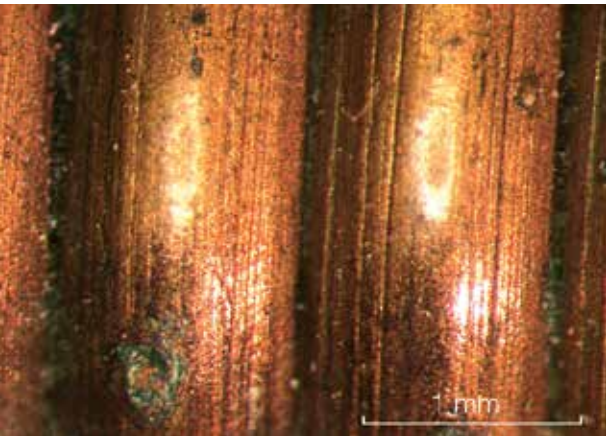
Making spiral tube decorations

Making decorations of spiral tubes has been a laboursome process and required a contribution from several people. In general the process can be divided into three phases: metalwork, preparing the auxiliary materials needed for patterns and constructing the decorations. It is probable that the makers of the spiral tubes and the yarn spinners were different persons who never actually met.

Research of the spiral tubes is also laboursome (see Paavel, Rammo 2013). The main source of information is decoration fragments of ready made items kept in archives which are observed with the help of microscopes in order to make assumptions on techniques which may have been used to produce them. The birch bark box (AI 4133: 2274) from Lõhavere stronghold in historic Suure-Jaani Parish was left in the ground during the troubled times at the beginning of the 13th century. The box contained in addition to jewellery also women's handicraft tools (weaving tablets, bandknife, bundles of bands), is a very unique source. The find assemblage also included necessary equipment for producing spiral tube decorations – bundles of fine blue two-plie yarn together with horsehair, long spiral tubes and small spirals cut from the long ones (Laul, Tamla 2014: 41–44).

Metalwork

Wire was needed to prepare the spiral tubes. The wire used for spiral tube decorations was mostly of a round cross-section and was obtained with the help of a draw plate. To achieve the result, a metal rod was pulled through a draw plate in which the diameter of the holes decreased gradually. The draw plate left slight scratches on the wire which can be observed with the help of a microscope (Photo 1a). Instead of a metal rod, a metal sheet rolled up into a tube could be used (Tamla 1998: 33). That method leaves a deep groove where the edge of



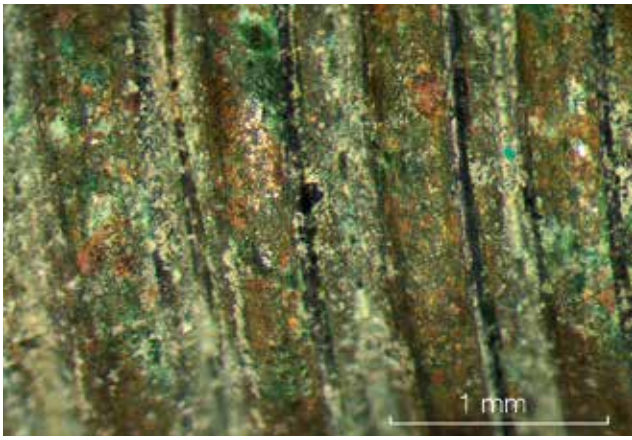


Photo 1.
a) Microscopic image of the surface of a spiral tube wire found in the Pada cemetery LXV burial (AI 5366; turn of the 12th–13th century);
b) Spiral tube wire surface from the Siksälä CCXX burial (AI 5101; 14th century).
Photos by Riina Rammo.

the sheet was (Photo 1b). The diameter of the wire was 0.7–0.8 mm on average, varying between 0.5–1.5 mm.

Relatively large amounts of wire were used – kilometers of wire were needed to create a more sophisticated decoration. The metalwork was probably done by a specialist such as a blacksmith who had the necessary skills, tools and raw materials.

The metal used had to be sufficiently soft and malleable to be suitable for wiredrawing and coiling. Various copper alloys were used. The copper content in analyzed wires was around 70–85% (Table 1). The most frequent additions to the alloy were zinc (tombak and brass) and tin (bronze), often both (gunmetal). Lead and other substances were less represented.

Although recycled scrap metal and other available materials were used for wiredrawing, the craftsmen of the time obviously picked the best alloy available. Brass is less malleable than bronze, but an alloy with a high tin content (20% and above) is not mechanically workable and is better used for casting (Tamla, Kallavus, Leimus 2002: 16). The fact that copper alloys have golden glitter was definitely an important factor when it came to choosing the metal.

The wire was coiled around a rod to obtain a spiral, which was then cut into pieces of the desired length. A bunch of long (30–40 cm) curved spiral tubes with slightly varying diameter (2.5–4 mm) were found at the bottom of the craft box unearthed in Lõhavere (Laul, Tamla 2014: 43). It is conceivable that the owner of the box had been intending to cut pieces of the spirals for a pattern at hand.

The slim wooden stick inside the tubes was not strong enough to twist the wire around it, but it may well have helped to maintain the shape of the spiral tubes. The diameter of spiral tubes often varies even within the scope of one pattern. The spiral tubes found in Estonia usually have a diameter of 3–4 mm. The diameter of the smallest tubes is 2–2.5 mm and that of the bigger tubes is approximately 5–8 mm.

At this point, it would be appropriate to bring up terminology. Curiously enough, parallel terminology has been developed in the fields of archaeology and ethnography – for example, "bronze spirals" (in Estonian *pronkspiraalid*) and "coppers" (in Estonian *vaselised*) correspondingly, the meaning being the same. The term "bronze spirals" may have been introduced into archaeological writing via translations from German and Finnish. "Coppers" (*vaselised*) is native to the Estonian language and emerges from the local linguistic tradition. Considering the terms in light of the analysis of metal composition, it has to be admitted that most of the spiral tube decorations are not made of bronze, in which tin would be the major alloying addition.

Auxiliary materials

In order to create spiral tube ornaments, woollen or linen thread and horsehair have been used as auxiliary materials. Woollen yarn is the most frequently used. Mostly, especially in openwork patterns, the red- and blue-coloured yarns used are fine and of very high quality (Photo 2). The dyeing process indicate the use of expensive raw materials that reached this region as a result of trade (Rammo, Matsin 2014). In those parts of Western Europe in the Middle Ages where fabric production was an important and developed branch of the economy, the cost of dyeing amounted to approximately 30 percent of the final cost of cloth (Oldland 2013: 95). There are also examples of thicker yarns (Photo 3). Most probably, the quality of patterns varied depending on the purposes and on the skills and possibilities of the maker. In the case of spiral tube decorations, as well as for ribbons and other accessories, plied yarn was used (zz/S).[1] Traditionally, it was the women's job to process wool and spin it. Spinning fine, dyed yarn demanded time and experience for preparation (sorting the wool, preliminary processing).

1 When spinning with a spindle you can turn it clockwise or counterclockwise. That determines the direction of the twist in the yarn. By spindle rotating clockwise, yarn with z-twist is produced and by spindle rotating counterclockwise s-twist is produced. zz/S means that two clockwise spun single yarns are plied (twisted together) counterclockwise.

No	Site	Catalogue no	Cu	Zn	Sn	Pb	Other	Source
1	Pudivere	AI 4194	78,2	12,6	2,4	5,2	1,6	Rammo
2	Pudivere	AI 4194	78,9	13	2,6	3,8	1,7	Rammo
3	Pudivere	AI 4194	79,9	11,3	2,2	5,1	1,5	Rammo
4	Pudivere	AI 4194	82,8	10,2	3,4	2,2	1,4	Rammo
5	Raatvere	AI 5295: XIV: 125	79	16,8	0	3,9	0,3	Rummi 1993
6	Raatvere	AI 5295: XXIV: 196	79	16,2	0,3	3,6	0,9	Rummi 1993
7	Raatvere	AI 5295: VIII: 104	85	10,9	0,5	3,6	0	Rummi 1993
8	Küti	AI 2731: 14	90,9	5,2	2,8	1,1	0	Rummi 1993
9	Pada	AI 5366: LXV	82,8	0,3	13,5	2,3	1,1	Rammo
10	Pada	AI 5366: LXV	73,2	1,9	19,1	4,2	1,6	Rammo
11	Pada	AI 5366: LXIX	81,6	0,7	15,7	1,9	0,1	Rammo
12	Kukruse	TÜ 1777: 3008	78,4	10,6	3,7	6,3	1	Rammo
13	Lõhavere	AI 4133: 2274: 4	81	14,7	3,3	0,5	0,5	Rummi 1993
14	Lõhavere	AI 4133: 2274: 4	84,3	1,4	13,7	0	0,6	Rummi 1993
15	Lõhavere	AI 4133: 2274: 48	91	2,8	5,2	0,6	0,4	Rummi 1993
16	Lõhavere	AI 4133: 2274: 48	92,7	0	7,3	0	0	Rummi 1993
17	Lõhavere	AI 4133: 2274: 48	91,3	0	7,2	1,4	0,1	Rummi 1993
18	Lõhavere	AI 4133: 2274: 48	79,8	13,7	2,1	4,4	0	Rummi 1993
19	Lõhavere	AI 4133: 2274: 67	82,9	4,7	5,3	7,1	0	Rummi 1993
20	Lõhavere	AI 4133: 2274: 73	88,2	3,6	5,1	3,1	0	Rummi 1993
21	Lõhavere	AI 4133: 2274: 73	83,1	3,8	4,3	8,8	0	Rummi 1993
22	Lõhavere	AI 4133: 2274: 73	80,6	9,2	2,1	8,1	0	Rummi 1993
23	Lõhavere	AI 4133: 2274: 101	74,8	3,3	18,7	3,2	0	Rummi 1993
24	Siksälä	AI 5101: CCXX: 14	81,2	12,4	3,3	2,3	0,8	Rammo
25	Siksälä	AI 5101: CCXX: ouf of coffin	74,3	16,8	3,6	2,9	2,4	Rammo
26	Siksälä	AI 5101: CXXXIX: 12	87	0	12,2	0,8	0	Rummi 1993
27	Siksälä	AI 5101: CL: 8	82	6,6	8,7	2,3	0,4	Rummi 1993
28	Siksälä	AI 5101: CCXLIX: 4	88	3,8	7,2	0,6	0,4	Rummi 1993
29	Siksälä	AI 5101: CCXX: 1	80	17,3	1,6	0,9	0,2	Rummi 1993
30	Siksälä	AI 5101: CCXXVII: 1	87	0	10,8	2,1	0,1	Rummi 1993
31	Virunuka	AI 4342: V9	88	7,4	3,4	0,6	0,6	Rummi 1993
32	Otepää	AI 3680: 20	71	19,3	8,7	0,3	0,7	Rummi 1993
33	Ervu	TÜ 2: 124	73,5	17,6	5	1,3	2,6	Rammo
34	Ervu	TÜ 2: 124	77,7	13,8	4,7	1,4	2,4	Rammo
35	Ervu	TÜ 2: 124	76,2	15,4	5,5	0,8	2,1	Rammo
36	Ervu	TÜ 2: 124	72,3	17	6,5	0,8	3,4	Rammo
37	Kivijärve	TÜ 2402	72,3	24,1	0,3	2,1	1,2	Rammo
38	Kivijärve	TÜ 2402	81,2	15,5	0,3	1,7	1,3	Rammo
39	Kivijärve	TÜ 2402	82,1	14,3	0,3	2	1,3	Rammo
40	Kivijärve	TÜ 2402	80,4	15,9	0,3	2	1,4	Rammo

No	Site	Catalogue no	Cu	Zn	Sn	Pb	Other	Source
41	Kivijärve	TÜ 2402	82,7	12,9	0,4	2,4	1,6	Rammo
42	Kivijärve	TÜ 2402	81	15,3	0,3	2	1,4	Rammo
43	Kivijärve	TÜ 2402	82,1	14,4	0,3	1,9	1,3	Rammo
44	Kivijärve	TÜ 2402	80,2	15,3	0,4	2,4	1,7	Rammo
45	Kivijärve	TÜ 2402	81,7	14,7	0,3	1,9	1,4	Rammo
46	Kivijärve	TÜ 2402	80,8	15,4	0,4	1,9	1,5	Rammo
47	Kivijärve	TÜ 2402	73,6	23,4	0,1	2,2	0,7	Rammo
48	Kivijärve	TÜ 2402	67,3	29,9	0,1	2	0,7	Rammo
49	Kivijärve	TÜ 2402	72,2	23,7	0,3	2,4	1,4	Rammo
50	Kivijärve	TÜ 2402	73,4	22,9	0,1	2,6	1	Rammo
51	Kivijärve	TÜ 2402	74,3	22,7	0,2	2	0,8	Rammo
52	Kivijärve	TÜ 2402	68,2	29	0,1	1,9	0,8	Rammo
53	Kivijärve	TÜ 2402	73,7	23,4	0,1	2	0,8	Rammo
54	Kivijärve	TÜ 2402	74,7	20,3	0,1	3,5	1,4	Rammo
55	Kivijärve	TÜ 2402	71,6	25,6	0,1	2	0,7	Rammo
56	Kivijärve	TÜ 2402	73,4	24,2	0,1	1,8	0,5	Rammo

Table 1. Composition of the alloy used for the spiral tubes. Riina Rammo used an XRF spectrometer for the analysis (Bruker Tracer III; settings: 40 kV; 10.7 μA; 10 sec; 12mil Al + 1mil Ti filter; CU1 calibration). Peeter Rummi (1993) described the method in his report.

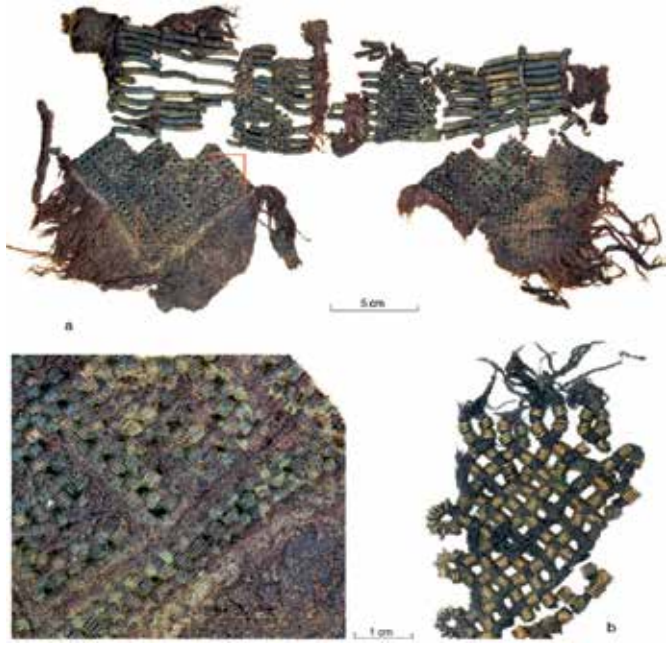


Photo 2. a) Remains of a back-apron found in the Virunuka rural cemetery (AI 4342: V9; 14th century); b) Endpiece of an open-work ribbon found in the Lõhavere box (beginning of the 13th century; AI 4133: 2274: 38). *Photos by Jaana Ratas*.

Photo 3. Tablet-woven band decorated with spiral tubes from the Küti cemetery (AI 2731: 15; turn of the 12th–13th century). *Photo by Jaana Ratas*.

According to the evidence collected so far, linen yarn has been used less often and mostly to craft certain items or during certain periods of time. In prehistoric times, linen cord made from many strands loosely twisted together was used to craft ornaments of thicker spiral tubes or ringlets (Photo 6), which were heavy and needed a material more resistant than wool.

In more recent history, linen yarn became the main braiding material – this can be seen in the ornaments originating from the Kivijärve (Laiuse Parish), Erreste (Halliste Parish) and Uniküla (Sangaste Parish) hoards (Kiudsoo, Ratas 2005: 115).

Thirdly, horsehair has been used for braiding. The strong and unyielding material made the ornament durable and stiff, thus keeping the item in shape. Ornaments made only with the help of horsehair have been found in the Siksälä cemetery.

The tradition of using horsehair continued in braids from the early modern period (Photo 5), and examples can be found in ethnographic collections. In the latter case, light-coloured horsehair have been combined with linen thread (Kaljus 2009: 87). In the 11th–14th century, using horsehair

Photo 4. Head jewelry from the Erreste hoard made of linen yarn as a tablet-woven band. The rhombic ornament on the edge that is made of small spiral tubes has been attached separately. (AI 739; turn of the 16th–17th century). *Photo by Jaana Ratas*.

together with woollen thread was widespread. Such a combination appears in the earliest ornament fragments found in Raatvere as well as in braided decorations from the Middle Ages. The technique will be elaborated on further below.

Photo 5. Fragment of an ornament braided with horsehair discovered from the Kivijärve hoard. (TÜ 2402; turn of the 16th–17th century). *Photo by Riina Rammo.*

Spiral tubes in a tablet-woven band

One option for crafting ornaments is to weave the spiral tubes into a tablet-woven band. In the course of weaving, the spiral tubes are strung on the weft so that they form a dense row with tablet-woven bands on both edges (Photos 3 and 6; Figure 2). That technique was especially preferred towards the end of prehistoric times (12th–13th century) in Northern and Northeastern Estonia, where several such fragments have been found. In most cases, only the row of spiral tubes has been preserved, whereas the tablet-woven band has perished completely (Rammo 2006: Figures 2 and 3). Based on a few textile remains and better-preserved finds, it can still be assumed that the spiral tubes had been woven into tablet-woven bands.

In the case of four burials, the tablet-woven bands with spiral tubes were over a meter long and these bands were found around the legs of the skeleton (Rammo 2005: 72–73). Most probably, they had formed the decorative edge of the outerwear. Aprons, which bottom edge is trimmed with such ca 45 cm wide band, are the most well-known (Rammo 2006).

The best-preserved examples of this technique are two textile fragments that have been found from the burial of a woman at Küti cemetery in Viru-Jaagupi Parish at the end of the 12th or beginning of the 13th century (Photo 3). The band is woven with six tablets, keeping three tablets on each side of the rows of spirals. Wefts of two different colours are used (Figure 2b). As compared to other known finds, thicker yarn was used to weave this particular band, and the finished object seems somewhat coarse. Thus, spiral tube decorations were not necessarily always fine art. Another rather well-preserved tablet-woven trim

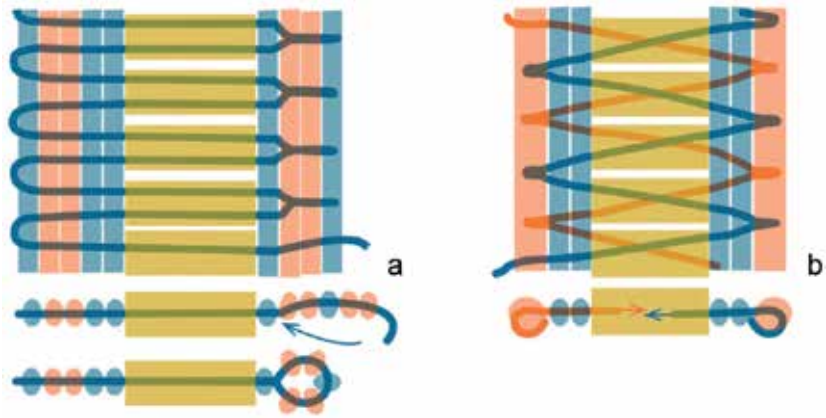


Figure 2. Weaving scheme of a tablet-woven band decorated with spiral tubes. *Drawing by Jaana Ratas.*

a) In the case of the trim at the bottom of the Kaberla apron (AI 4116: 151; turn of the 12th–13th century), the weft passes through each spiral twice, i.e. on its way forward and back. Each tablet has four threads, while all the threads of each tablet are of the same colour – blue or red. The pattern consists of blue and red longitudinal stripes. The tablets are turned all at the same time by one quarter turn. The edges of the band are different. One edge is woven in the "usual" way – the weft comes out of the shed and enters it at the border of the band. The bottom edge of the apron forms a "tube" 5 tablets wide, and the weft passes the shed in one direction only. The weft comes out of the shed at the edge of the band and enters the shed through the tablet nearest to the spirals.

b) In the case of the Küti ribbon (AI 2731: 15), two wefts of different colours interlace and pass through each spiral tube, mirroring each other. Visually, one of them seems to be blue and the other of some light colour. Both edges have been woven into a "tube" the width of one tablet – on the sides of the ribbon, no characteristic weft dots are visible.

of an apron dating back to the same period as the Küti find originates from Kaberla cemetery (Kuusalu Parish). That band is woven with 11 tablets. The weft has moved slightly differently as compared to the Küti example (Figure 2a). The tablet-woven band at the bottom edge of the Kaberla apron has an additional trim composed of metal ringlets strung on a linen cord.

Quite a separate issue while finishing a tablet-woven band is hiding the hanging ends of the warp. Several solutions have been used. In the case of the Kaberla example, the warp threads have been partly hidden into two bent spirals (Photo 7). That kind of technique is also known from Pada cemetery in Viru-Nigula Parish and Viira cemetery in Muhu Parish (Mägi 2002: Plate 128, No 9). A different finishing technique has been used in the finds from Kukruse cemetery in Jõhvi Parish. The bottom edge and corner of the two aprons found there are trimmed with thick spiral tubes that can easily accommodate thread ends (Rammo, Ratas 2014: Figure 2).

The third example of combining tablet-weaving and spiral tubes has been preserved in ornaments from hoards dating from the end of the 16th and

Photo 6. Bottom edge of an apron found at the Kaberla cemetery CLVI burial (AI 4116: 151). The band with spiral tubes (Figure 2a) has been woven separately and attached to the fabric by metal ringlets. The bottom trim of the band is decorated with metal ringlets strung on a linen cord. *Photo by Jaana Ratas.*

beginning of the 17th century. The band of the Erreste ornament was woven with 4 tablets, two at each edge (Photo 4). Unlike in earlier cases, here linen thread was used (Kiudsoo, Ratas 2005: 115). It is noteworthy that, although the spiral tubes have hardly changed over a thousand years, those used in the early modern examples are relatively long and thin, and, as such, their proportions differ from spiral tubes used in earlier times.

Photo 7. The finish at the end of a tablet-woven band composed of two bent spiral tubes that can be used for hiding loose thread ends. Kaberla apron from the CLVI burial. *Photo by Jaana Ratas.*

In the course of finishing, spiral tubes may be thrust onto the warp threads so that a row of them is formed at the edge of the fabric. The spiral tubes are then attached with a tablet-woven band so that the warp threads of the fabric act as weft threads for weaving the band (Matsin 2013: 70–71). The warp threads of the fabric will form fringes. Such a technique was used for medieval textiles found in Siksäla cemetery (see Photo 8). In the Siksälä case, the hanging end threads of the tablet-woven band may have been braided into cords ending with tassels, as can be seen in different kinds of shawls (Valk, Ratas, Laul 2014, see e.g. burial 158). The technique of finishing a fabric with spiral tubes is probably exceptional in the Estonian territory because the Siksälä cemetery textiles belong instead to the Latvian tradition in terms of their techniques and appearance (cf Zariņa 1970: Figure 39).

Braided ornaments

Another option is to braid the ornaments from spiral tubes and auxiliary materials and then attach them to the fabric or let them hang from the edge. The archaeological braids represent several local patterns and practices that characterise the tradition of the given place and time. Small variations are numerous, so only a general survey will be given, accompanied with some examples.

The most widespread braiding technique is openwork in which the "base" for the pattern is made by the interlacing auxiliary materials forming small rhombuses. Spiral tubes in the sides of the small rhombuses create a pattern. Horsehair and woollen yarn constitute the auxiliary materials. The spiral tubes used are small, with an outer diameter of 2–2.5 mm, and made of wire 0.5–0.6 mm thick. After the braid was ready, the openwork between the spiral tubes was sewn several times over (usually four times, two times from each side) in order to add to the shape and strength of the ornament (Photo 9).

The plied and dyed yarn used in those braids is one of the finest among the archaeological finds. The pattern is geometrical as a result of the technique. Besides playing with rhombuses, zigzags, snake motifs, triangles, crosses and swastikas can be seen in the patterns.

On the edges of the decorative ribbons, there are either spiral tubes bent into ringlets or sewn loops which serve to fasten the ribbon to fabric or attach it with the help of metal ringlets (Photo 6). Often the ribbon edges have been worked differently; for example, there are ringlets of spiral tubes at the one and loops of auxiliary materials at the other edge, which shows that they were probably fastened hanging to the edge of the cloth (the edge with loops was meant for fastening; e.g. Photos 9 and 10; Figure 3).

Sometimes a piece of birch bark may have been used as a base to which strings with spiral tubes could be attached and desired patterns formed (Photo 11). Then it was more comfortable to combine the parts of the openwork without spirals into a compact pattern. (Photo 9). This supposition was supported by an old lacework (ERM A 354: 6) attached to birch bark (Kurrik 1931: 115, Figure 84) that is preserved in the Estonian National Museum. Experiments have shown that this technique also proves useful for making openwork from spiral tubes.

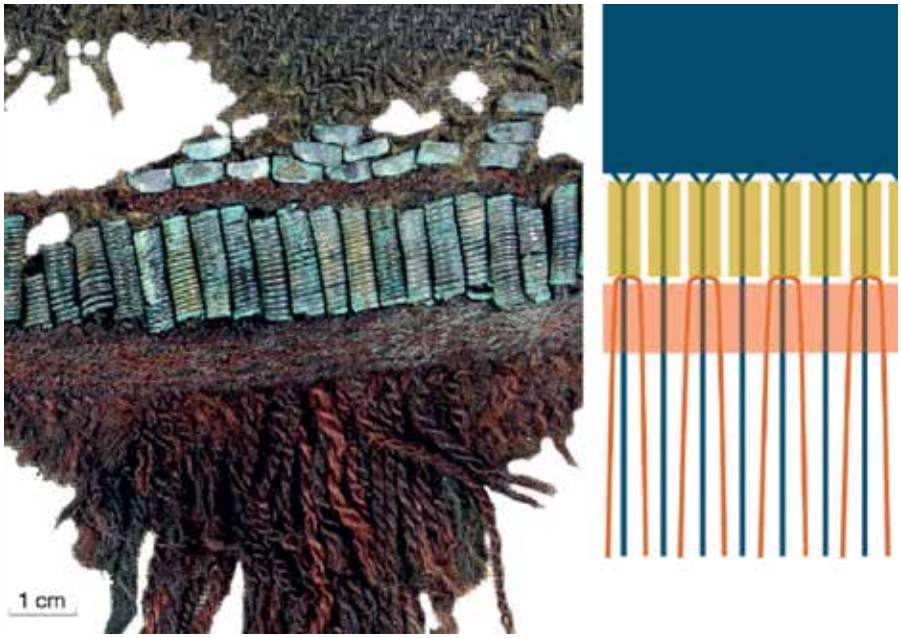


Photo 8. Shawl trim made with the help of spiral tubes strung on the warp threads of the fabric, as found in the Siksälä cemetery burial CLXXXVII (AI 5101). *Photo and drawing by Jaana Ratas*.

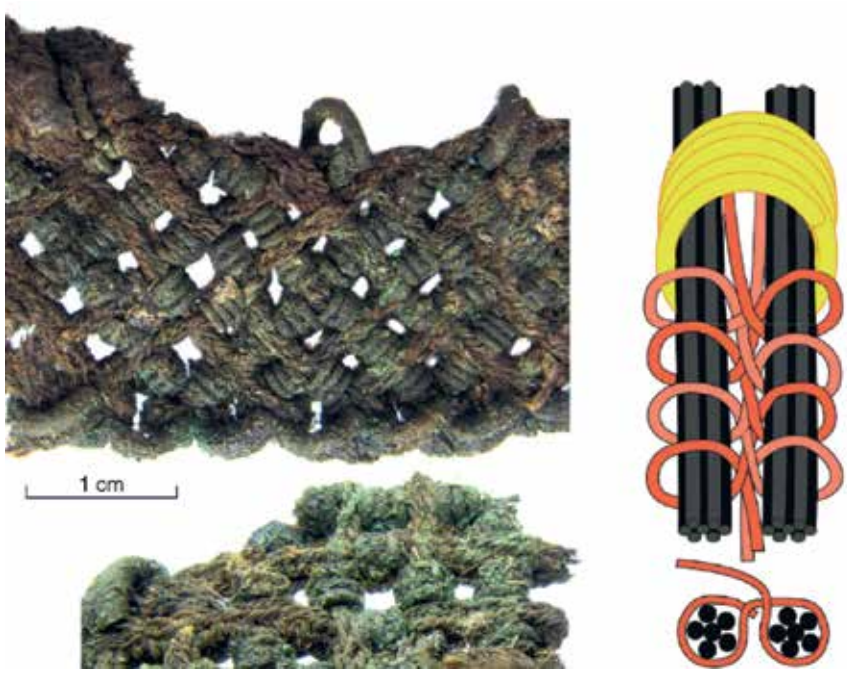


Photo 9. A fragment found in the Raatvere cemetery XXIV burial (AI 5295: XXIV: 196c) and scheme for the openwork. Spiral tubes are strung on a bundle of horsehair (approximately 10–12 hairs) according to the pattern. A pattern is formed from the rows of spirals and fastened to birch bark with an auxiliary thread (see Photo 11). Then the horsehair is divided into two bunches and sewn with a cable stitch that moves between both bundles. The most comfortable way is to use both hands and two needles simultaneously. The pattern is then worked on both sides; the other side is worked after detaching it from the birch bark. A similar braid can be observed in Finnish headware from the late Iron Age. The loose warp ends of the fabric have been worked together with a similar technique, which, in that case, is done only with the help of fingers, and no needle is used (Riikonen 1990: see Figure 17). *Photo and drawing by Jaana Ratas*.

One of the most remarkable finds in this particular context is the aforementioned Lõhavere box. The box contained braiding tools and, in addition, also some relatively standard decorative ribbons made of spiral tubes that were all rolled up (see Photo 10; Laul, Tamla 2014: 56–64). Six of them have been preserved as "readable", but there were originally more in the box. The longest preserved band is a little more than one meter long and three centimeters wide. Similar square ornaments (such as in Figure 3, in the bottom) were piled upon each other. All of the ornaments were unfinished, which can be seen from loose uncut threads tangling from the edges (Photo 2b). In the Lõhavere case, the threads were probably coloured dark blue with woad (*Isatis tinctoria L.*).

A similar technique was used to craft the earliest ornaments found in the Raatvere cemetery. The particular style is illustrated by the number of braided

loops at the edges of the ornaments and less-than-average symmetry in the patterns (see Figure 3). The preserved fragments give an impression that the geometric pattern on a ribbon may suddenly cease and be replaced by another. According to visual assessment, at least in some of the openwork objects, red yarn was used which probably was dyed with Northern bedstraw (*Galium boreale L.*).

Photo 10. Rolled up band from the Lõhavere box (AI 4133: 2274: 5). *Photo by Jaana Ratas.*

Special attention should be drawn to the rhombic ornaments of back aprons from the 13th–15th century in which the same technique was used. Six out of the ten finds originate from a medieval cemetery in Otepää. Another well-preserved specimen was discovered from the Virunuka cemetery in Rõuge Parish (Photo 2a). In the latter case, red yarn was used to stich the openwork. The edges of the two rhombic ornaments were trimmed with woollen tablet-woven bands and fringes.

A similar technique and design can be observed in headpiece tassels from the same era discovered from Siksälä cemetery – the horsehair braids have a

Photo 11. Reconstruction of an apron ornament from the Kukruse VI burial (TU 1777). A half-finished ornament sewn onto birch bark. *Photo by Jaana Ratas.*

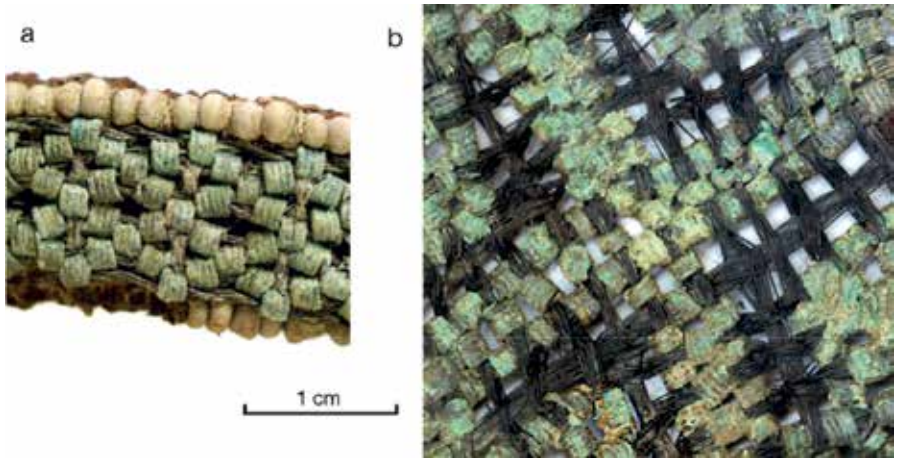


Photo 12. Band (a) and tassel (b) of a headpiece from the Siksälä CCXXXIII burial (AI 5101; 14th century). *Photo by Jaana Ratas*.

similar ornament with edges constructed of tablet-woven bands and fringes (Valk, Ratas, Laul 2014: e.g. burials 158, 180, 233). In the latter case, the openwork was not stitched through with a thread, so the rhombic ornament was formed only by crossing dark horsehair (Photo 12).

The braids of the Northern and Northeastern regions have their special features (Figure 4). Often a tight row of spiral tubes forms the centerpiece of the ornament, resembling the ones woven into the tablet-woven bands, which is the preferred method in those parts. On the longitudinal edge of the row, there is a rhombic pattern composed of tiny spiral tubes characteristic of openwork. On wider ornamented bands, a combination of such patterns can be found. For example, the 6.5-cm-wide braided ornament at the bottom edge of an apron found in the Kukruse cemetery burial was composed of two tight rows like those described above, but with S-shaped motifs in between. Similar ornaments have been found in Saaremaa, but they are characterised by the absence of the tight spiral tube row, which is replaced by long spiral tubes forming zig-zags in the central part of the ornament (Figure 4).

As for braiding techniques, the Siksälä cemetery finds differ from finds from other parts of Estonia, and the openwork resembles those from the Latvian tradition. Rhombic ornaments of small spiral tubes formed by braiding bundles of horsehair are the most common (Photo 12a). Women's headware is most lavishly decorated with spiral tubes. The techniques are described by Signe Rätsepso (2014) in a thesis which describes making a replica of such headpiece on the basis of remains found in burial CCXX.

Headware from the early modern period demonstrates how techniques used in prehistoric times were continuously practiced in slightly new combinations (Photos 4 and 5; Kiudsoo, Ratas 2005: 114–117). A design that seems to be especially common is a tight row of long spiral tubes in which the longitudinal edges of the rows are decorated with openwork bands of tiny spiral tubes. Astri Kaljus (2009: 86–90) gives a survey of ethnographic fragments found in South Estonia. They are known to consist of six items (Kaljus 2009: Photos 7 and 8; Leppäaho 1949: image 32; Manninen 1927: images 224 and 225; Tomanterä 2003: image 66). These are simple and look alike, which implies a perishing tradition that for some reason still holds on to that type of pattern. These fragments are braided with horsehair and linen thread.

Who crafted spiral tube ornaments?

Spiral tube ornaments are first and foremost associated with women's attire and therefore, most likely, with women's manual skills. Simpler ornaments were definitely crafted for one's own use. Thus, spirals left over from old ornaments could be used. Apron remains from North Estonia (Kaberla, Pada and Kukruse cemeteries) can serve as examples that, despite considerable similarities, still differ noticeably in detail. Each woman probably designed her apron ornament herself. On the other hand, there were more or less professional craftsmen who made decorations for sale and/or on order. The Lõhavere box could serve as a proof of the existence of such craftsmen since the contents of the box (standard, yet fine ornaments) imply mastery. Fine ornaments similar to those found in Lõhavere have been discovered almost everywhere that spirals were used to decorate garments: Finland, Russia, Estonia and Latvia (Riikonen 2003: 13). The owner of the Lõhavere box had definitely attained a certain level of mastery and status, which cannot be said of all ornament makers.

Between these extremes, several other types of craftsmen can be accommodated – for example, local village masters. The patterns found in cemeteries can be quite similar. In some places, even a craftsman or a "school" could be distinguished on the basis of style. For example, the sprial tubes discovered from two women's burials in Raatvere (XIV and XXVI) have an identical chemical composition (Table 1, rows 5 and 6) and could originate from one and the same wiredrawing lot. Similar designs and techniques were used to craft ornaments for the women's garments. Was it accidental, or does it actually point to a definite lot of wire which was made by one and the same blacksmith and/or that belonged to one and the same craftsperson?

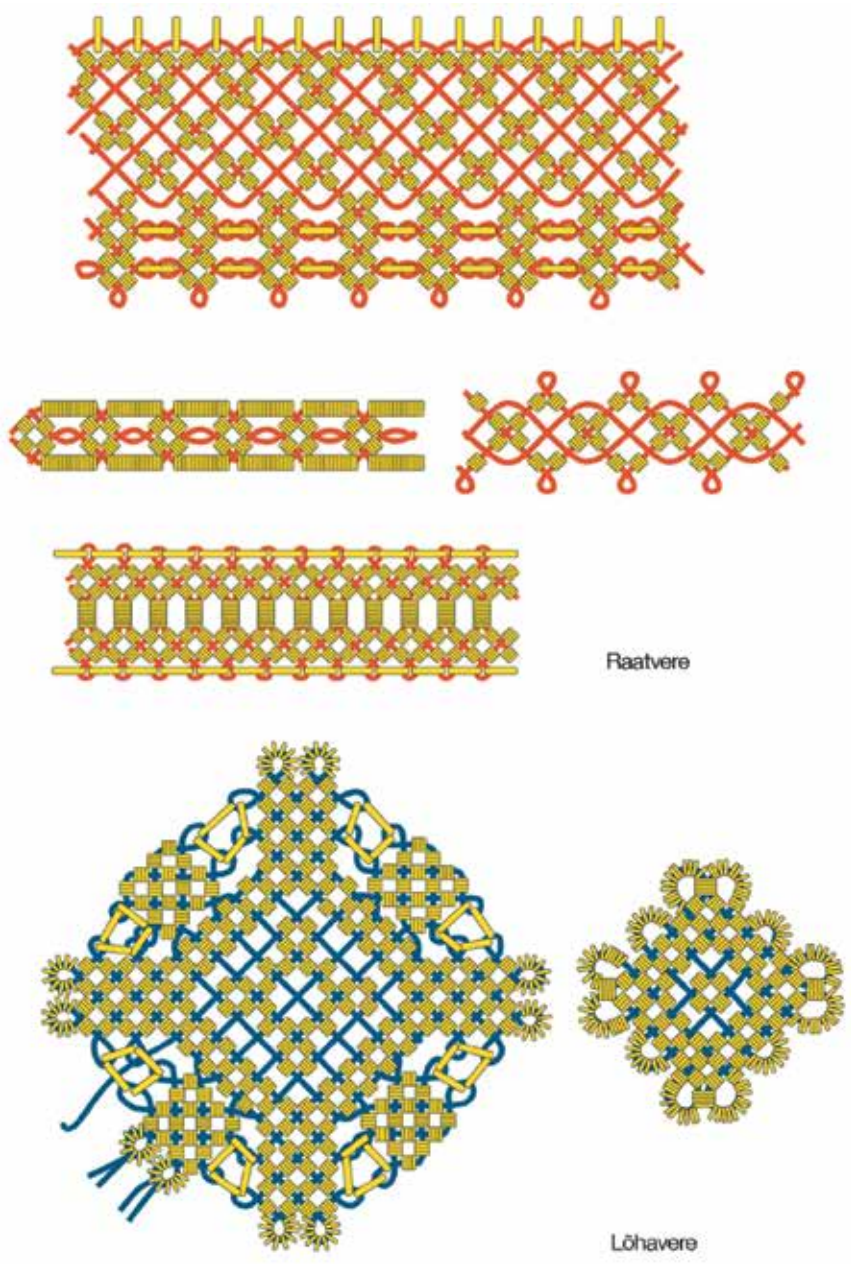


Figure 3. Pattern schemes of Raatvere (AI 5295) and Lõhavere (AI 4133: 2274) openwork.
Drawing by Jaana Ratas.

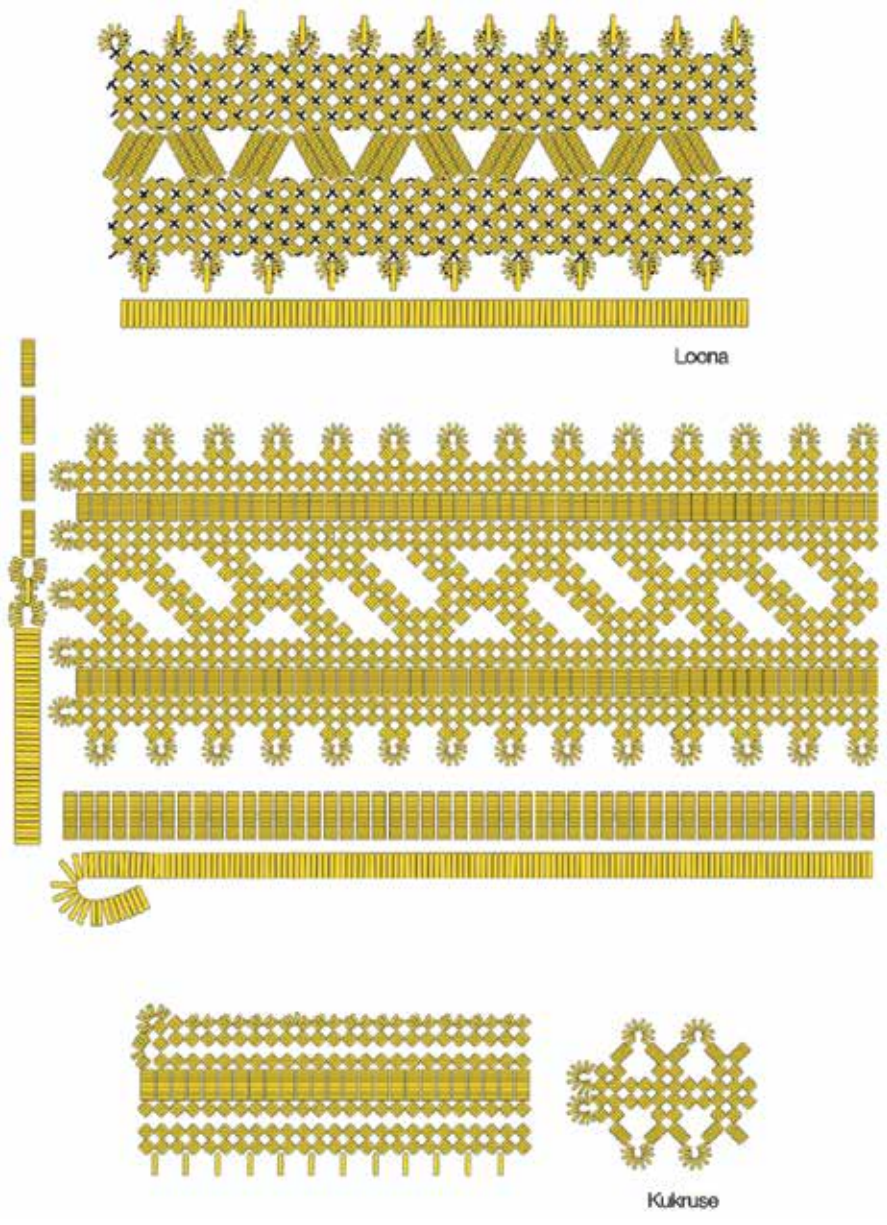


Figure 4. Pattern schemes of Loona (AI 4236) and Kukruse (TU 1777) cemetery.
Drawing by Jaana Ratas.

Conclusion

Although, when looking back, it may seem that the material of the past is unitary and clearly defined, cultural history is actually very diverse and rich in details. Therefore, detailed coverage of the making of spiral tube decorations is not feasible with one article. Taking a closer look at a tradition that may seem unitary reveals temporal and spatial diversity in terms of different ornaments, techniques, purposes, masters and their level of mastery. Each separate ornament fragment is worth a separate profound technical analysis and could disclose fresh knowledge about practices used and choices made. It should be stressed that crafting an item is not only about a sequence of movements but should be observed in its social context, as it is associable with interpersonal relations, beliefs and perceptions of the world. Technical skills and traditions persist first and foremost thanks to people and their transfer of knowledge. Despite the fact that the social context of making spiral tube decorations was intentionally omitted from this article, the issue is still there in the background. A sense of beauty, vanity, status and messages to others are all braided into the patterns, as are protection and fertility magic.

Sources

Blumbergs, Zaiga 1982. *Bronzebuckelchen als Trachtzier. Zu den Kontakten Gotlands mit dem Kontinent in der Älteren Römischen Eisenzeit. Thesis and Papers in North-European Archaeology* 12. Stockholm: Institute of North-European Archaeology.

Hvoštšinskaja, Natalja 1991. Textiles with Bronze Ornaments of the Eastern Baltic Region. – *Archaeological Textiles Newsletter* 12, 5–7.

Hvoštšinskaja, Natalja 2004 = Хвощинская, Наталия. *Финны на западе Новгородской земли (По материалам могильника Залахтовье)*. Санкт-Петербург: Буланин.

Johansen, Paul, **von zur Mühlen**, Heinz 1973. *Deutsch und Undeutsch im mittelalterlichen und frühneuzeitlichen Reval. Ostmitteleuropa in Vergangenheit und Gegenwart* 15. Köln, Wien: Böhlau Verlag.

Kaljus, Astri 2009. Rekonstruktsiooni valmistamine Paistu vaipseelikust. – *Eesti Rahva Muuseumi aastaraamat* 52. Tartu: Eesti Rahva Muuseum, 82–97.

Kiudsoo, Mauri, **Ratas**, Jaana 2005. Viljandimaa varauusaegsed peaehted. – *Viljandi Muuseumi aastaraamat* 2004. Viljandi: Viljandi Muuseum, 112–122.

Kurrik, Helmi 1931. Eesti pitsid. – *Eesti Rahva Muuseumi aastaraamat* 6. Tartu: Eesti Rahva Muuseum, 88–119.

Laul, Silvia 1981. Tagapõll muinaseesti naise rõivastuses. – *Eesti ajaloo probleeme*. Tallinn: Eesti NSV Teaduste Akadeemia, 76–89.

Laul, Silvia 1985. Ühisjooni läänemeresoomlaste muinasaegses rõivastuses. – *Keel ja kirjandus* 7, 412–419.

Laul, Silvia 1996. Über die frühgeschichtlichen Elemente in den estnischen Volkstrachten. – *Historia Fenno-ugrica I: 1. Congress Primus historiae fenno-ugricae*. Oulu, 733–753.

Laul, Silvia, **Tamla**, Ülle 2014. *Peitleid Lõhavere linnamäelt. Käsitöö- ja ehtevakk 13. sajandi algusest*. Tartu: Tartu Ülikool, Ajaloo ja Arheoloogia Instituut. www.arheo.ut.ee/docs/Peitleid-L6havere-linnamaelt.pdf (15.06.2015)

Lehtosalo-Hilander, Pirkko-Liisa 1980. Common Characteristic Features of Dress – Expressions of Kinship or Cultural Contacts. – *Fenno-ugri et slavi 1978. Helsingin yliopiston arkeologian laitos. Moniste* 22. Helsinki, 243–260.

Lehtosalo-Hilander, Pirkko-Liisa 1984. *Ancient Finnish Costumes*. Helsinki: Suomen arkeologinen seura.

Leppäaho, Jorma 1949. Räisälän Hovinsaaren Tontinmäen paja, sen langanvetovälineet ja langanvedosta (vanutuksesta) yleensäkin. – *Suomen Museo* 56, 44–93.

Manninen, Ilmari 1927. *Eesti rahvariiete ajalugu. Eesti Rahva Muuseumi Aastaraamat* 3. Tartu: Eesti Rahva Muuseum.

Matsin, Ave 2013. The 13th–16th century tablet-woven bands from Estonia. – *Ancient Textiles, Modern Science. Re-creating Techniques through Experiment. Proceedings of the First and Second European Textile Forum 2009 and 2010*. Toim. Heather Hopkins. Oxford, Oakville: Oxbow Books, 64–78.

Mägi, Marika 2002. *At the Crossroads of Space and Time. Graves, Changing Society and Ideology on Saaremaa (Ösel), 9th–13th centuries AD. CCC Papers* 6. Tallinn: Ajaloo Instituut.

Oldland, John 2013. Cistercian Clothing and Its Production at Beaulieu Abbey, 1269–70. – *Medieval Clothing and Textiles* 9. Toim. Robin Netherton, Gale R. Owen-Crocker. Woodbridge: Boydell Press, 73–96.

Paavel, Kristiina, **Rammo**, Riina 2013. Arheoloogia tubane pool – ühe leiukogumi väljapuhastamise lugu. – *Tutulus: Eesti arheoloogia aastakiri* 2013, 6–10.

Rammo, Riina 2006. Eesti arheoloogilistest põlleleidudest. – *Etnos ja kultuur. Muinasaja teadus* 18. Tartu, Tallinn: Greif, 249–265.

Rammo, Riina, **Matsin**, Ave 2014. Kangakudumine keskaegses külas Siksälä kalmistu leidude põhjal. – *Siksälä kalme* I: *muistis ja ajalugu*. Tartu: Tartu Ülikool, Ajaloo ja arheoloogia instituut, 335–353.

Rammo, Riina, **Ratas**, Jaana 2014. Mida annab välja lugeda paarist põllenurgast? – *Tutulus: Eesti arheoloogia aastakiri* 2014, 16–18.

Riikonen, Jaana 1990. Naisenhauta Kaarinan Kirkkomäessä. – *Karhunhammas* 12. Toim. Kristiina Korkeakoski-Väisänen. Turku: Turun yliopisto, Kulttuurien tutkimuksen laitos.

Riikonen, Jaana 2003. Arkeologiset tekstiililöydöt – tutkimusta ja tulkintaa. – *Sinihameet, kultavöyt: Suomalaisija muinaispukuja*. Toim. Helena Luoma. Tampere: Pirkanmaan käsi- ja taideteollisuus ry, 6–35.

Ryabinin, Elena. A. 1987. The Chud of the *Vodskaya Pyatina* in the Light of New Discoveries. – *Fennoscandia archaeologica* 4, 87–104.

Tamla, Ülle, **Kallavus**, Urve, **Leimus**, Ivar 2002. Hõbeaare Lõhavere linnuselt. – *Eesti Arheoloogia Ajakiri* 6 (1), 3–24.

Tomanterä, Leena 2003. Muinais-Hämeen tekstiilit. – *Sinihameet, kultavöyt: Suomalaisija muinaispukuja*. Toim. Helena Luoma. Tampere: Pirkanmaan käsi- ja taideteollisuus ry, 36–46.

Vahter, Tyyni 1928. Pronssikierukkakoristelun tekinillisistä menetelmistä. – *Suomen Museo* 35, 61–70.

Valk, Heiki, **Ratas**, Jaana, **Laul**, Silvia 2014. *Siksälä kalme II: matuste ja leidude kataloog.* Tartu: Tartu Ülikool.

Volkaitė-Kulikauskienė, Regina 1986 = Волкайте-Куликаускене, Р. Одежда литовцев с древнейших времен до XVII в. – *Древняя одежда народов Восточной Европы.* Ред. М. Г. Рабинович. Москва: Наука, 146–171.

Volkaitė-Kulikauskienė, Regina 1997. *Senovės lietuvių drabužiai ir jų papuošalai. (I–XVI a.).* Vilnius: Lietuvos Istorijos institutas.

Zariņa, Anna 1970. *Seno latgaļu apgērbs 7.–13. gs.* Riga: Zinātne.

Zariņa, Anna 1988. *Lībiešu apgērbs 10.–13. gs.* Riga: Zinātne.

Zariņa, Anna 1999. *Apgērbs latvija 7.–17. gs.* Riga: Zinātne.

Öpik, Elina 1970. *Vadjalastest ja isuritest XVIII sajandi lõpul. Etnograafilisi ja lingvistilisi materjale Fjodor Tumanski Peterburi kubermangu kirjelduses*. Tallinn: Valgus.

Üprus, Helmi 1969. Eesti rahvakunst kunstiajaloo aspektist. – *Etnograafiamuuseumi aastaraamat* 24. Tallinn: Valgus, 7–40.

Manuscripts

Rammo, Riina 2005. *Pronksspiraalkaunistused rõivastel Eesti haualeidude põhjal 11.–14./15. sajandil*. Seminar paper. Tartu: Tartu Ülikooli arheoloogia õppetool. Available at www.arheo.ut.ee/docs/Riina_Rammo_bakalaureus.pdf (15.06.2015)

Rummi, Peeter 1993. *Research report by a junior researcher Peeter Rummi from the Institute of History of The Estonian Academy of Sciences*. Available in the archive of Tallinn University research collection of archaeology.

Rätsepso, Signe 2014. *Rekonstruktsioon Siksälä naiste peapärjast*. Graduation thesis. Viljandi: Tartu Ülikooli Viljandi Kultuuriakadeemia rahvusliku käsitöö osakond. Available at the library of Viljandi Culture Academy of University of Tartu.

Tamla, Ülle 1998. *Hõbeesemete valmistamistehnoloogia Eestist leitud 9.–13. sajandi materjali põhjal*. Master's thesis. Tartu: Tartu Ülikool. Available at the University of Tartu Library.

Item sources

AI 739 – finds of Erreste hoard
AI 2731 – finds of Küti cemetery
AI 4116 – finds of Kaberla cemetery
AI 4133: 2274 – finds of Lõhavere box
AI 4236 – finds of Loona cemetery
AI 4342 – finds of Virunuka cemetery
AI 5101 – finds of Siksälä cemetery
AI 5295 – finds of Raatvere cemetery
AI 5366 – finds of Pada cemetery
ERM A 354: 6 – lace fragment on birch bark from the collection of the Estonian National Museum
TÜ 1777 – finds of Kukruse cemetery
TÜ 2402 – finds of Kivijärve hoard

Abbreviations

AI – Tallinn University research collection of archaeology
ERM A – the collection of artefacts of the Estonian National Museum
TÜ – the archaeological collection of the Department of Archaeology of University of Tartu

Riina Rammo, Jaana Ratas. *Photo by Jaana Ratas.*

Riina Rammo (b 1981) graduated from the University of Tartu in the field of archaeology in 2005. The topic of her Bachelor thesis was *Bronze Spiral Decorations on Garments on the Basis of Artefacts recovered from Estonian Burial Sites of the 11th–14th/15th Century*. She defended her doctoral thesis on medieval textile findings in Tartu at the same university in 2015. During her postdoctoral fellowship she visited Aalto University Nanomicroscopy Center to elaborate skills in microscopy and fibre studies. At present, she is working at the archaeology department of University of Tartu as a researcher and her focus is on archaeological textiles, ancient technology and the history of clothing. In addition, she is interested in issues related to preservation.

Jaana Ratas (b 1966) is an artist who graduated from the Estonian Academy of Arts in the field of ceramics in 1995. For many years, she has been active in exhibitions and publications on archaeology, she has worked for the Institute of History as an artist-restorer and has taken part in many archaeological excavations. She has reconstructed ancient textile techniques, garments and crafted a series of copies of archaeological objects. She has mostly experimented with textiles, ceramics and bone. Since 2011, she has conducted courses at the University of Tartu Viljandi Culture Academy on prehistoric and medieval textiles and garments. In 2016, she started her MA studies in native crafts.