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# Fibre, dyes, seams and bands: Grave 41/2016 and the Ravattula costume reconstruction

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## Abstract

A woman's grave rich in textiles and likely dated to the early 13th century was found in 2016 at Ravattula Ristimäki cemetery in southwestern Finland. Fragments of woollen textiles woven in 2/2 twill revealed a new type of dress compared with previously excavated textiles from Iron Age graves. Wool fibre analyses indicated that the pieces of clothing were woven from hairy to coarse hairy wool types. The dye analyses (HPLC-DAD) presented blue dye which was detected in a shawl, an apron, and tablet-woven bands most likely originating from woad (*Isatis tinctoria* L). Madder (*Rubia tinctorum* L), which produces a red colour, was identified in the fulled cloth of the hose and fastening bands. The grave textiles represent both the older traditions of Iron Age costume with the blue, bronze-spiral-decorated apron and shawl, and some new elements of medieval fashions like the red hose and a dress sewn together from several pieces.

Keywords: Grave find, costume reconstruction, fibre analysis, HPLC-DAD, 13th century

## 7.1. Introduction

This chapter has two main objectives: First, to explore an archaeological costume from the early 13th century excavated in the Ravattula Ristimäki inhumation cemetery in 2016, and secondly, to interpret and briefly explain the craft choices and solutions made for the first version of the Ravattula costume reconstruction based on the grave 41/2016 finds. However, the result of this research is a preliminary description, with a more detailed and comprehensive account of this subject yet to be published.

In southwestern Finland, Christianity became a more prominent religion around the year 1000 AD when the tradition of cremation burials changed to inhumation ones. The custom of burying some individuals in full dress, occasionally with grave gifts, continued for 200 years, with the practice persisting in eastern Finland until the 14th century. Around 1200 AD, local chronology shifts from the Iron Age into the Middle Ages (e.g., Hiekkänen 2010: 340–341). Several ancient costume reconstructions, all of them female, have been made based on the textile fragments excavated from inhumation burials (see Lehtosalo-Hilander 1984).

The Ravattula Ristimäki inhumation grave 41/2016 offered an opportunity to create an ancient costume reconstruction dating to the early 13th century. An exceptional feature was discovered as part of this research; the dress has a longitudinal warp instead of a crosswise warp. Horizontally-set loom is characteristic for the dress fragments identified in earliest Iron Age graves (Lehtosalo-Hilander 1984: 54). The deceased's outer garment and the leg coverings – the hose – demonstrated the influence of new medieval fashion, which represents a unique phenomenon in the Finnish archaeological textile material of this era. This medieval-style dress, an apparent fashion innovation of its time, inspired us to make a costume reconstruction. The Ravattula costume is the tenth ancient costume reconstruction in Finland.

## 7.2. The grave find

The Ristimäki ('Cross Hill' or 'Hill of the Cross') inhumation cemetery dates to the Late Iron Age and Early Medieval Period (12th–13th centuries) (Figure 1). The site is located in southwestern Finland along the River Aurajoki, in Ravattula village in Kaarina town, near Turku. In addition to the cemetery, the site also contains the remains of the oldest known church in Finland. The church of Ravattula was built at the end of the 12th century, and services were held until the first half of the 13th century. The stone foundation of the church, a part of its surrounding stone wall, and 61 inhumations from nearly 400 graves were excavated between 2010 and 2016 by the Department of Archaeology at the University of Turku. Certain individuals were buried fully dressed, including metal items, while most of the excavated burials did not contain any artefacts besides iron nails from the coffins (Ruohonen 2017; 2019; Kirkinen et al. 2020: 45–47).



Figure 1. Ravattula Ristimäki cemetery is located near Turku, in southwestern Finland. (Map: J. Ruohonen)

The preservation level of organic material is low due to the soil acidity in Finland. However, metals and particularly items crafted from copper alloys remain better preserved. The oxidizing chemical reaction induced by metal objects better conserves the textile materials, which is the reason garments decorated with bronze spiral ornaments create a preserving microenvironment of oxidized copper on the textile surface. Textiles in Late Iron Age female graves usually accumulate around the chest and waist area (Lehtosalo-Hilander 1984: 2–4; Arponen 2008). In Ristimäki, woollen and some plant fibre textile fragments were found in seventeen of the 61 excavated graves. Unfortunately, most of the fragments were very small and poorly preserved. Twelve burials contained garments and accessories, and/or traces of furs and feathers (Kirkinen et al. 2020: 47).

Grave 41/2016 (TYA 933:853:1–26) is situated north of the church remains, and was excavated in the autumn of 2016. The deceased was 160–165 cm in height, and was interred with her arms folded at her waist (Figure 2). The deceased was largely covered in the remains of wool textiles. The textile fragments on the body's upper part preserved significantly worse than those near the legs on the left side of the coffin. The skeletal material was hardly preserved at all, and in the areas where the skull and feet had rested, a distinct darker colour of the soil indicated their position.

For more detailed scientific research, the grave was lifted in five large soil blocks, covering the area from the deceased's shoulders to calves. The intact blocks were X-rayed, then frozen for future laboratory excavation and research, with micro-stratigraphic excavation utilizing a stereomicroscope completed at the Museum Centre of Turku's conservation laboratory from 2017–2018.

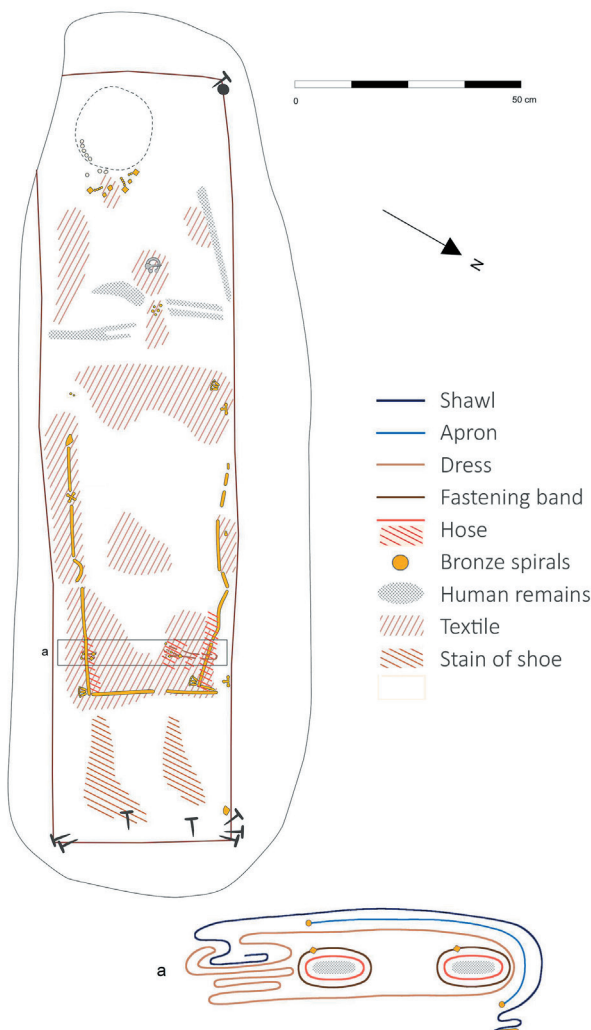


Figure 2. Ravattula Ristimäki Grave 41/2016 with a schematic cross-section. (Image: S. Tuomenoja and J. Riikonen)

Two vegetable-fibre tabby fragments a few millimetres in size were detected, along with a silver penannular brooch located in the middle of the deceased's chest. All other textile fragments in the grave consisted of woollen 2/2-twills, and have an S-plied warp and a z-spun weft. The AMS radiocarbon result (Ua-64904: 823+-29) dated the fulled fabric fragment to the late 12th or 13th century. The calibrated (calibration curve Intcal20: Reimer et al. 2020; program OxCal 3.10: Bronk Ramsey 2005) result with 1-sigma probability (68.2%) gave the years 1210–1265 calAD and 2-sigma probability (95.4%) years 1170–1275 calAD. The grave dates back to the early 13th century, as the site was abandoned by the mid-13th century at the latest.

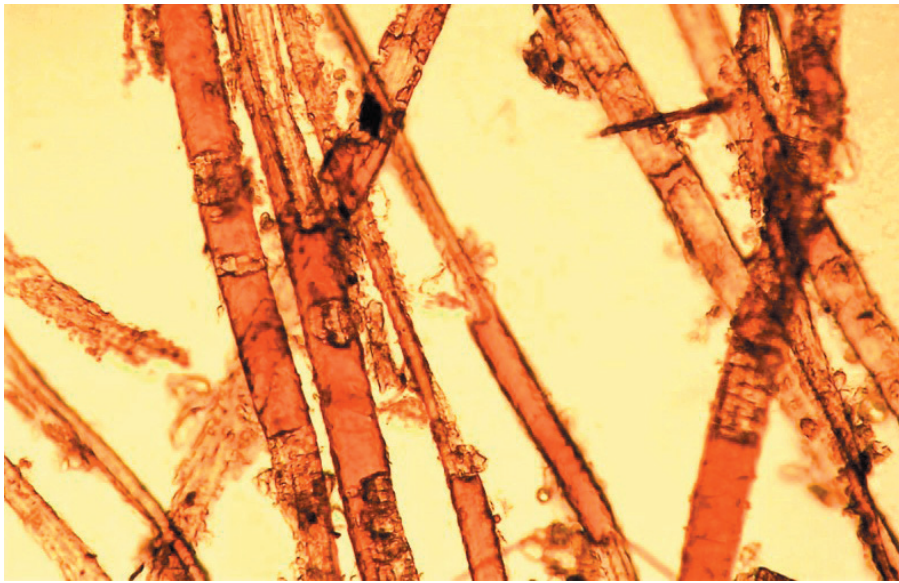


Figure 3. Fibres from the dress. (Image: H. Kirjavainen)

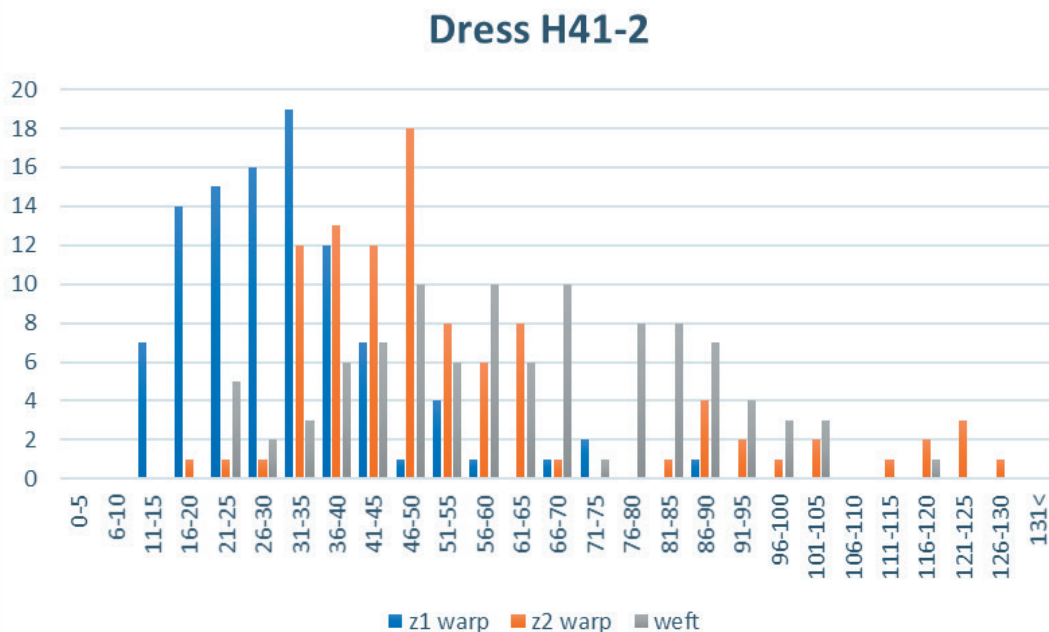


Figure 4. The fibre distribution of warp and weft yarns of the dress. Y: % 100 fibres; X: fibre distribution in micrometres ( $\mu\text{m} = 0,001 \text{ mm}$ ). (Image: H. Kirjavainen)



### 7.3. Textile research

The current research efforts indicated that the wool quality fell between coarse and very coarse fibre types (Figures 3–4). Yarns were spun from blends of fine under-wool and coarser wool types containing guard hairs, which conceivably originated from several local-origin sheep (Kirjavainen 2018). In order to identify the exact origin and/or breed of the sheep which produced the wool, an extensive isotope and aDNA analyses would be required, and a more detailed and comprehensive account of the subject is yet to be published. Both the wool and the resulting yarns have uneven and rough features. Wool selecting, sorting, teasing, and spinning was in the capable hands of the spinners who spun durable yarn despite the uneven and variable fibre material (Kirjavainen and Riikonen 2007: 171).

On the left side of the coffin under the spiral-decorated shawl and apron, there were several folds of fabric with the warp laid parallel to the coffin. This fabric had several parallel longitudinal flat-felled seams (Figure 5), and the selvedge edge of the fabric was not visible. The binding structure of the twill weave creates a visible colour effect in warp and weft: two light and two dark yarns alternate one after the other in the fabric. The textile fibres seemed to be reddish-brown under the transmitted light microscope, but dye analysis indicates that the wool was undyed (Vanden Berghe 2019: 24); as such the pattern was created using the wool's natural colour.



Figure 5. A flat-felled seam in the dress. (Photograph: J. Riikonen)



Figure 6. The reverse of a hemm inside the dress. (Photograph: J. Riikonen)





Figure 7. A starting border at the edge of the dress hem. (Photograph: J. Riikonen)

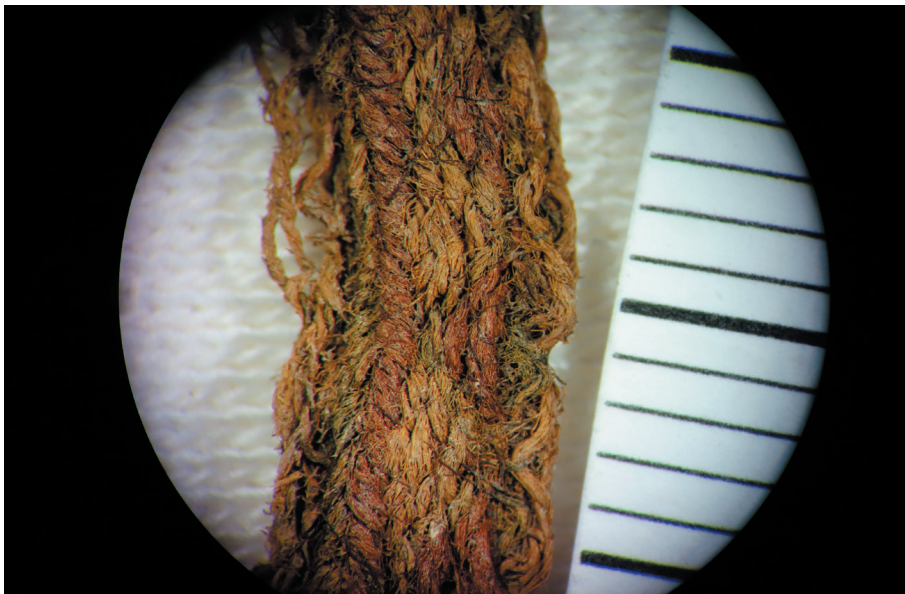


Figure 8. Triangles of the tablet-woven band. (Photograph: M. Karisto)

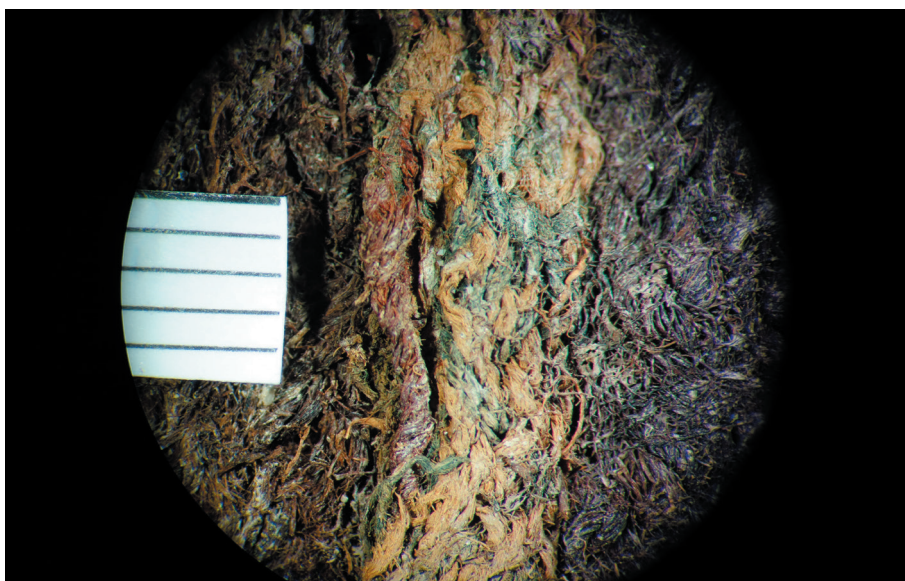


Figure 9. Diagonal stripes of the tablet-woven band. (Photograph: M. Karisto)

The clothing fragments were identified as part of a dress that was likely sewn together from six separate pieces. Two of the narrowest pieces are about 20 cm wide, while the widest one is 57 cm wide. The exact widths of the other three pieces are unknown, but fall in between those three mentioned above. The narrow gores are not wedge-like, although one of them seems to taper slightly towards the waist of the dress. Four of the dress's gores were turned onto the reverse side and hemmed (Figure 6); the other two pieces each have a starting border (Figure 7). The preserved part of the flaring hem is about 160 cm wide and over 70 cm long, and reached down to the calves. The fabric was strengthened by darning near the edge of the hem, indicating that the dress was not a new garment.

An 8 cm long patterned tablet-woven band was preserved between the dress's folds. The band was about 9 mm wide, and was folded twice lengthwise. The band's warp is wool, while the weft is an unidentifiable vegetable fibre. A tubular selvedge woven using three tablets lines both of the band's edges. Two different techniques were used in patterning the weave: first, triangle shapes were woven using three tablets and the threaded-in technique on the edge of the patterned part (Figure 8); second, light-hued diagonal stripes on a blue ground were constructed using eight tablets, and were located on the other edge of the band (Figure 9; Karisto et al. 2020: 8, Figs. 11–13).

When considering the material beneath the dress, attention focused on a piece of fulled wool fabric on the deceased's right shin (Figure 10). A closer inspection of the fragment indicated that the decision to full the fabric was made when selecting wool for the textile. The coarsest fibres (around 80-100  $\mu\text{m}$  in diameter) were missing from the fibre distribution, as thick and stiff wool fibres would have stuck out from the fabric surface. Overall, the peak of fibre distribution in this fulled fabric indicates the finest and most selective use of wool fibres in all the wool samples studied here (Kirjavainen 2018). The cloth resembles medieval fulled fabrics (FI: *sarka*), but its fibre distribution is much finer in comparison.



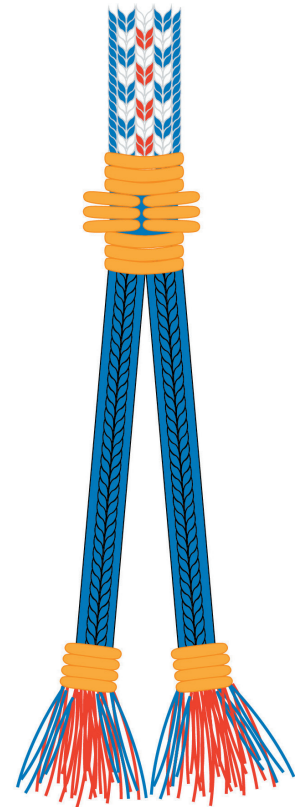
Figure 10. Plaited tassel ends of the tablet-woven band and fulled wool twill on top of the right shin. (Image: R. Saarinen, Museum Centre of Turku)





Figure 11. Fulled wool twill and patterned tablet-woven band under the right shin. (Photograph: S. Salminen)

Figure 12. Pattern of the tablet-woven band, and the plaited tassel end decorations. (Image: M. Karisto)



The fulled fabric was dyed red with madder (*Rubia tinctorum* L) (Vanden Berghe 2019: 17, 24). The fragment was found on both of the deceased's shins, and a narrow three-coloured tablet-woven band was tied around this fabric approximately 8 cm above the hem of the dress. It was interpreted that the deceased wore hose. A 6 mm wide tablet-woven band was tied around the right shin (Figure 11), with a 3 mm wide band around left shin woven in a similar technique, but using thinner yarn. A small, chequered pattern was constructed using eight tablets and the threaded-in technique, and the surface structure appears stitch-like. A tubular selvedge woven with one tablet on both sides of this narrow band was identified by inspecting holes and impressions left by an inserted weft on both edges of the band. The ends of both bands were finished with two tassels 20 mm long, and the plaited tassels were elaborately decorated with bronze spirals (Figures 10, 12; Karisto et al. 2020: 11; see Karisto and Pasanen 2020: 74–97).

Although dozens of dye samples were taken from the other textiles of female burials in Ristimäki, only the hose and the fastening band fragments in grave 41/2016 were dyed red with madder. The other fastening band colours were blue and natural white (Vanden Berghe 2019: 17). Cultivated madder does not yield ample crops, if any, in northern latitudes. Madder-dyed fabrics seldom appear in the local Iron Age textile material, and were most likely imported goods (Vajanto 2015: 51). Cultivated imported madder easily gives a fuller and richer shade of red than madder-related wild species like yellow bedstraw (*Galium verum* L) and northern bedstraw (*Galium boreale* L), which grow locally in Finland. The Ristimäki hose was most likely woven using local wool suggested by the fibre analysis, and the origin of the hose was defined as domestic production. The craft of dyeing with madder was influenced later by the medieval Central European tradition (Kirjavainen 2002: 348; Vajanto 2015: 51–52).

Traces of blue indigotin were also found in an apron, a shawl, and three tablet-woven bands (Figure 13). The source of dyestuff was most likely woad (*Isatis tinctoria* L) (Vanden Berghe 2019: 16, 25). Large-scale cultivation of woad flourished in Central and Western Europe from the 11th century onwards, and dried woad balls were imported to the Baltic Sea area, including Finland (Peets 1998: 307; Vajanto 2015: 58).

The blue spiral-decorated shawl has tubular selvages and a tubular tablet-woven band lines the long edges of the shawl (Figure 14). The ends of the shawl were not preserved, but originally, the band likely completely surrounded as it does in two other Ristimäki shawls. Additionally, preserved shawl corner fragments are also present in graves 37/2016 (TYA 933:804:4,5) and 38/2016 (TYA 933:819:3). The woollen warp yarn of the tubular tablet-woven band is blue, while the weft yarn is undyed (Vanden Berghe 2019: 25–26), and the band was made using eight weaving tablets. The warp yarn runs through all four of the individual tablets' holes, and are threaded with an alternate

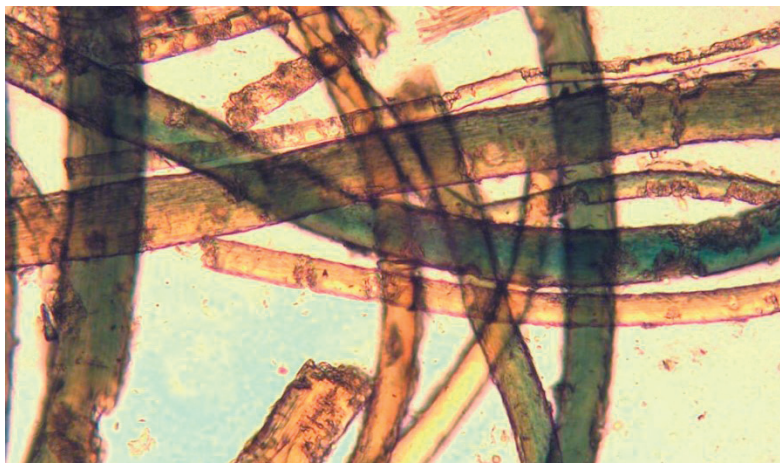


Figure 13. Blue fibres from the shawl. (Image: H. Kirjavainen)



Figure 14. A spiral decoration and a tubular tablet-woven band on the edge of the shawl. (Photograph: R. Saarinen Museum Centre of Turku)



Figure 15. Reconstruction (left) and the original (right) lower corner of the apron. (Photograph: J. Riikonen)





Figure 16. The spiral decorations threaded to the diagonal plaited braid. (Photograph: J. Riikonen)



Figure 17. The prototype of the Ravattula costume. (Photograph: J. Riikonen)

tilted position which make the band's surface structure stitch-like (Karisto et al. 2020: 9). A fragment of the loop for fastening the shawl is situated on the other long side. Altogether six of the shawl's cross-shaped spiral applications were preserved in the grave. Two of them were sewn on one edge, and four on another edge of the shawl.

The blue apron has tubular selvages and is lined with bronze spiral tubes. The corner ornaments were made by threading small spirals onto the warp thread ends at the start and end borders of the fabric (Figure 15). The garment rested quite low on the hips, and it is possible that the apron was placed over the body without the fastening bands – at the very least, they were not preserved.

Pieces of undyed (Vanden Berghe 2019: 26) diagonal plaited braid threaded with spirals were found around the deceased's neck (Figure 16). The ornament fragments most likely originate from so-called temple ornaments, and better-preserved examples of this type of headband are known from other southwestern Finnish graves (e.g. Appelgren-Kivalo 1907: Tafel VII:1, 2; X:1).

## 7.4. Ravattula costume reconstruction

The Ravattula costume reconstruction comprises of a knee-long linen smock, a woollen dress and a waistband, a pair of hose with fastening bands, an apron, a shawl, and a headcloth with temple ornaments (Figure 17). The pair of ankle thong leather shoes for the costume were created according to the information available about 11th and 12th century European shoe types.



The results of the fibre research indicated that ancient wool quality and fibre distribution of modern Åland sheep resembled the ancient fleece more closely than Finn sheep wool, although the latter breed has a slightly older genetic strain (Kirjavainen 2019). Åland sheep's wool was selected for the yarn of the first Ravattula costume. The actual mechanical spinning was completed in a small Estonian workshop owned by the Viljandi Culture Academy at the University of Tartu.

The blue wool yarns for the Ravattula dress, apron, shawl, and bands were dyed with true indigo (*Indigofera tinctoria* L) although the original garments were most likely dyed with woad (Vanden Berghe 2019: 16). Madder dyeing was used for the hose and fastening bands, which were the only pieces of clothing in grave 41/2016 which contained red dyes. The students of ancient crafts experimented with various techniques to find the most feasible method for dyeing the yarns.

#### 7.4.1. Linen smock

Small fragments of tabby cloth made of an unidentified vegetable fibre were found with the remains of a silver brooch. This fascinating find allowed us to sew a linen smock for the costume. The long smock reached the knees, and the long sleeves extending over the wrist were based on a smock pattern from traditional Finno-Ugrian folk costume. The seams of the cuffs, only 3 mm wide, were sewn based on the smock cuff (TYA 914:1316:1E) preserved in Ristimäki grave 20/2016.

#### 7.4.2. Hose

The hose were made of red fulled fabric, which extended over to the knee, and were fastened beneath knees using a narrow tablet-woven fastening band (Figure 18). No temporal counterparts of the hose have been identified in the Finnish or northern Baltic Sea Region archaeological textile material so far. Research on Iron Age burials in southwestern Finland indicates that leg bindings may also have been in use; fragments (TYA 993:214:29) of these garments were also found in grave 20/2016 in Ristimäki (Riikonen 2019: 180–181). Information about medieval foot and leg coverings in Finland is very scarce. In her research on 14th and 15th-century textiles from urban archaeological contexts, Heini Kirjavainen has not yet identified any fragments as hose.



Figure 18. Red hose of the Ravattula costume, tied with a tablet-woven band. (Photograph: J. Riikonen)



Figure 19. Linen shirt, woollen dress, and the waistband of the Ravattula costume. (Photograph: J. Riikonen)

#### 7.4.3. Woollen dress and a waistband

The woollen dress is sewn from pieces of fabric of different sizes, which represents a departure from earlier Finnish ancient costume reconstructions; earlier works all include a dress with a brooch on each shoulder. Yet, the seam fragments have occasionally been found in connection with dress fragments. The seams on earlier textile finds are parallel to the weft, and their sewing technique differs from the flat-felled seams seen in Ristimäki grave 41/2016 which already represents medieval sewing practices. The natural-coloured dress fabric includes a prominent colour effect in warp and weft, and was woven in 2/2 twill. Because the cloth was so decayed on the body's upper part, it was difficult to identify the correct design for the dress. Our interpretation of the pleat-like gathering under the armpits is one possible solution for the dress fit. A part of the V-shaped neckline edge was preserved near the brooch on the chest, and gave a shape for the reconstruction's neckline. A piece of the tablet-woven band was found between the folds of the dress, but we cannot be sure of the function of the band. The reconstruction interpreted this band as the waistband, and Maikki Karisto designed the pattern of the band based on the preserved motifs (Figure 19).

#### 7.4.4. Apron

The Ravattula costume's blue apron lined with bronze spirals and decorated with corner ornaments (Figure 15) is a link to old Iron Age traditions (see Lehtosalo-Hilander 1984: 60). The apron fabric of the costume prototype is the only piece in this project woven on a warp-weighted loom. Because the apron's fastening bands were not preserved in the grave, the apron bands were prepared based on a diagonal-plaited apron band fragment (TYA 933:864:6A) found in Ristimäki grave 44/2016.

#### 7.4.5. Spiral decorated shawl

The blue shawl reconstruction has tubular selvages like the one in the grave. The shawl ends were hemmed and edged with the tubular tablet-woven band. Two spiral decorations were sewn on one edge of the shawl, with four extant ornaments along the other edge. It is likely that the



latter originally included six ornaments. This kind of spiral applications have counterparts in other southwestern Finnish shawls from the 11th and 12th centuries (e.g. Appelgren-Kivalo 1907: Tafel VI, XII; Hirviluoto 1973; Lehtosalo-Hilander 1984: 24, 63). Distinctive features of the Ravattula shawl are that it has no fringes, and is edged with a tubular tablet-woven band. Because a small silver penannular brooch found in the grave is too light for fastening a large and heavy shawl, a woollen braid was made to fasten the shawl instead.

#### 7.4.6. Silver penannular brooch

The brooch in grave 41/2016 was probably attached to the woollen undyed fabric, the purpose of which remains unclear. We decided to make a woollen headcloth for the costume and fasten it with the brooch, although a linen headcloth is also an alternative. Because the silver brooch was poorly preserved, the brooch ornamentation for the Ravattula costume was based on another silver brooch (TYA 993:214:3) found in Ristimäki grave 20/2016.

#### 7.4.7. Temple ornaments

Spirals threaded on the diagonal plaited braid were found on the deceased's neck and likely belonged to a temple ornament. Veronika Paschenko reconstructed the ornaments after better-preserved spiral decorations of the same type identified in the graves at Yliskylä in Perniö (Appelgren-Kivalo 1907: Tafel VII:1, 2; X:1a), Moisio in Nousiainen (KM 10146:104), and Ristinpelto in Lieto (Vahter 1945: 216–217). Originally these types of spiral ornaments were interpreted as a diadem-type of decoration for the forehead, with the threaded spirals in the middle of the braid (Appelgren-Kivalo 1907: 31–32, 47–48, Tafel X:1b; Lehtosalo-Hilander 1984: 25, Figs. 14, 15). Later, Pirkko-Liisa Lehtosalo-Hilander



Figure 20. Woollen headcloth fastened with a small silver brooch. Temple ornaments hang on each temple. (Photograp: J. Riikonen)

studied the fragments of the ornaments more closely and noticed that the spirals were threaded in the ends of the braid, not in the middle of it. The Ravattula costume temple ornaments consist of a long woollen band with a branching pendant composition of small spirals. The braid is tied around the head, and the spiral ornaments hang from each temple (Figure 20).

## 7.5. Imports and impulses from western Europe

Grave 41/2016 in Ravattula Ristimäki dates to the early 13th century, a time of great societal and religious change in southwestern Finland. The influence of the Swedish monarchy and the Catholic Church grew, and the connection to western European cultural contexts became stronger. Located on the shore of the Baltic Sea, and downstream from the River Aurajoki, the Turku region was a centre of growth: as early as the 1230s it was the new home for the bishopric, which attracted many people. Active markets and trade connections helped spread innovative goods and ideas. Later, around the year 1300, the town of Turku was founded closer to the mouth of the river (Harjula et al. 2018: 319).

The spiral decorated apron and shawl dyed blue with imported woad, and the skillfully woven bands preserved in grave 41/2016 represent the old Iron Age tradition and fashion of a wealthy woman. The patterned tablet-woven bands highlight the advanced know-how and craft skills required to create these items. For example, today it takes about a week for a skilled band weaver to finish the Ravattula waistband. One can guess how expensive the band could have been when it was bought as a finished item in ancient markets! While the only jewellery worn by the deceased was a small silver brooch, it was of a highly fashionable piece made of a valuable metal. Most of the other brooches found from the Ristimäki graves were cast in bronze.

When western European women's fashion reached 13th century Finland, only some elements of clothing were adopted by the wealthiest in the society, such as the madder-dyed textiles and certain pieces of garments: the hose and a new type of dress. Gradually, the traditional Iron Age dress was completely abandoned and some of the old craft techniques were forgotten. The deceased's woollen dress, sewn from different-sized pieces of fabric indicates a garment that deviated from the traditional Late Iron Age Finnish woman's peplos-dress fastened with brooches on the shoulders. Red hose sewn from fulled fabric was also a new fashion. The madder-dyed fabric was woven from local wool, and the import of this rare and expensive red dyestuff dates back to the early 13th century in the Turku region (compare Kirjavainen and Riikonen 2007: 172). The use of madder became more common during the later Finnish Middle Ages (Kirjavainen 2002: 348).

The elaborate items and textiles found in grave 41/2016 express the wealth and fashion consciousness of a rural woman buried beside the church wall in Ravattula village. The Ravattula ancient costume reconstruction addresses modern people and shows how it was possible to combine research data and the integrated possibilities of multiple varieties to create a tangible interpretation of an ancient costume to be shared with fellow researchers and the public.



## Acknowledgements

The Ravattula costume project was conducted from 2018 to 2021. It was a part of a larger *Ravattula Ristimäki* -research project organized by the Department of Archaeology at the University of Turku. The prototype of the Ravattula costume (Figure 17) was actualized in the autumn of 2020 by the voluntary collaborative work between textile researchers in archaeology and craft specialists, enthusiasts, and students of ancient crafts. The delayed public release of the prototype and two other versions occurred on the 19th of September 2021 due to the COVID19 pandemic.

**Costume prototype team participants:** Sue Salminen: Organizing the project, weaving and making the hose and the shawl; Helena Honka-Hallilla: Weaving and sewing the woollen dress; Tuija Hukkanen: Teaching the students of ancient crafts at RASEKO (Raisio Regional Education and Training Consortium), making the apron; Hanna-Leena Juhola: Providing Åland sheep wool bred at the farm of Ali-Unki; Maikki Karisto: Research on bands, weaving the waistband and the garters; Heini Kirjavainen: Research on wool fibres, expertise in medieval textile and costume; Susanna Koskelo: Sewing the linen shirt; Hannele Kögäs: Expertise in wool, spinning, weaving and vegetable dyeing; Salla-Mari Latvala: Making the temple ornaments; Toive Lehtinen: Spinning the trial yarns, wool sorting; Anne-Mari Liira: Osteological research, photographing the costumes; Mizuki Miyoshi-Nissilä: Making the silver brooch; Minna Paavola and Kristiina Juvas: Making the leather footwear; Veronika Paschenko: Research on the spiral decorations; Janita Palomäki, Annina Helmi Rokka: Yarn dyeing; Jaana Riikonen: Laboratory excavation of the grave textiles, expertise in the Iron Age textile and costume; Juha Ruohonen: Leading the Ravattula Ristimäki research and an administrative leader of the Ravattula costume project; Siiri Tuomenoja: Grave descriptions and maps, modelling the Ravattula costume.

Chromatographic dye analyses following the High Performance Liquid Chromatography and photo Diode Array Detection (HPLC-DAD) method were completed by Ina Vanden Berghe at the Royal Institute for Cultural Heritage KIK-IRPA Textile Research Laboratory in Belgium.

**Maikki Karisto** is a weaving teacher and textile conservator who has expertise in archaeological bands and their weaving techniques. Numeral publications on Late Iron Age grave textiles validate her mastery over ancient band weaving.

**Heini Kirjavainen** is a doctoral researcher and textile archaeologist at the University of Turku. She is specialized in medieval and modern textiles and costume history, wool fibre research, and the structures of the medieval textile production environment.

**Jaana Riikonen** is an independent archaeologist at the University of Turku. Her research interests are Finnish Late Iron Age grave finds and textiles.

**Juha Ruohonen** is an archaeologist and university teacher at the University of Turku. His research focus is on the Late Iron Age, the Middle Ages, Church Archaeology and graves.

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### *Abbreviations in the text*

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