

# The aprondress from Køstrup (grave ACQ)

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A small graveyard in Køstrup, Fyn in Denmark was excavated in 1980-1981, revealing a grave, referred to as ACQ, where several textile fragments had been preserved. In addition the grave held the remains of a small casket with ironwork and a lock, two tortoise brooches, six glass beads, two quartz beads, an iron knife with sheath, and an iron key that was too large to fit the lock of the casket. The style of the brooches indicate a date between 850-1000. The black bead is dated by Lindblom ([1993](#)) to 960-990, placing the grave in the tenth century. Delvaux ([2017](#)) reclassifies the bead, concluding with a date for the grave between 850-860.

Odense Bys museer very kindly allowed me to examine these textiles in 2012 and 2015.

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## The archaeological remains

Most of the textiles were found in connection with the tortoise brooches. One of them (**x505**) had a lump of textiles inside. The other (**x501**) had turned in the grave so that the underside pointed upwards and had preserved less material ([Wielandt 1980](#)).

### The aprondress (smokkr)

Inside brooch x505 was a relatively large fragment (**x541**) of a smokkr. It consisted of several pieces of woollen tabby, woven with 26/10 threads per cm ([Wielandt 1980, 199](#)) and had been dyed blue ([Rasmussen & Lønborg 1993](#), 175).



Photograph: Odense Bys Museer and Hilde Thunem, x541 and seam 585, [large version \(1.1 MB\)](#)

The upper edge of the smokkr had been created by cutting the fabric parallel to the weft, folding 4-5 mm of the cloth over and overcasting. The remains of a vertical seam (**x585**) join two pieces of the fragment along their selvages by overcast stitches ([Wielandt 1980, 193](#)). This seam is currently ca 1.9 cm long, although it originally probably ran from the top to the bottom of the smokkr.

To stykker lærreds- eller rettere trendrepsvævet uldstof med hver sin egkant er syet trådlige sammen med kastesting (x585). Der er derefter klippet en kant trådlige med islættet. Kanten er bukket 4-5 mm om og der er kastet over sømmen ([Wielandt 1980, 193](#)).



Photograph: Odense Bys Museer and Hilde Thunem, seam x585, [large version \(820 KB\)](#)

## Pleating



One end of the smokkr fragment had been pleated with tiny pleats, 2-3 mm deep and 3 mm wide. The pleated part is currently approximately 7.6 cm long. The longest pleat is torn 4.3 cm from the top of the smokkr,

making it uncertain whether the fabric was just pleated near the top, or if the pleats ran further down.

Photographs: Odense Bys Museer and Hilde Thunem, details of x541, large version [left \(530 KB\)](#), [right \(2.1 MB\)](#)

The pleating starts 11 cm from the vertical seam (Wielandt 1980, 193). Rasmussen and Lønborg (1993) suggest it was created by drawing the cloth together in pleats by a single linen thread. However, if that was the case, the thread must have deteriorated in the grave, as Wielandt (1980) explicitly states that there is no gathering thread.



I selekjolefragmentets ene ende ses resterne af et gauffreret stykke, der har siddet midt mellem fiblerne, velsagtens for at give kjolen vidde.

Gaufreringen ser ut til at være fremkommet gennem en simpel rynkning med en hørtråd (Rasmussen & Lønborg 1993, 176-177).

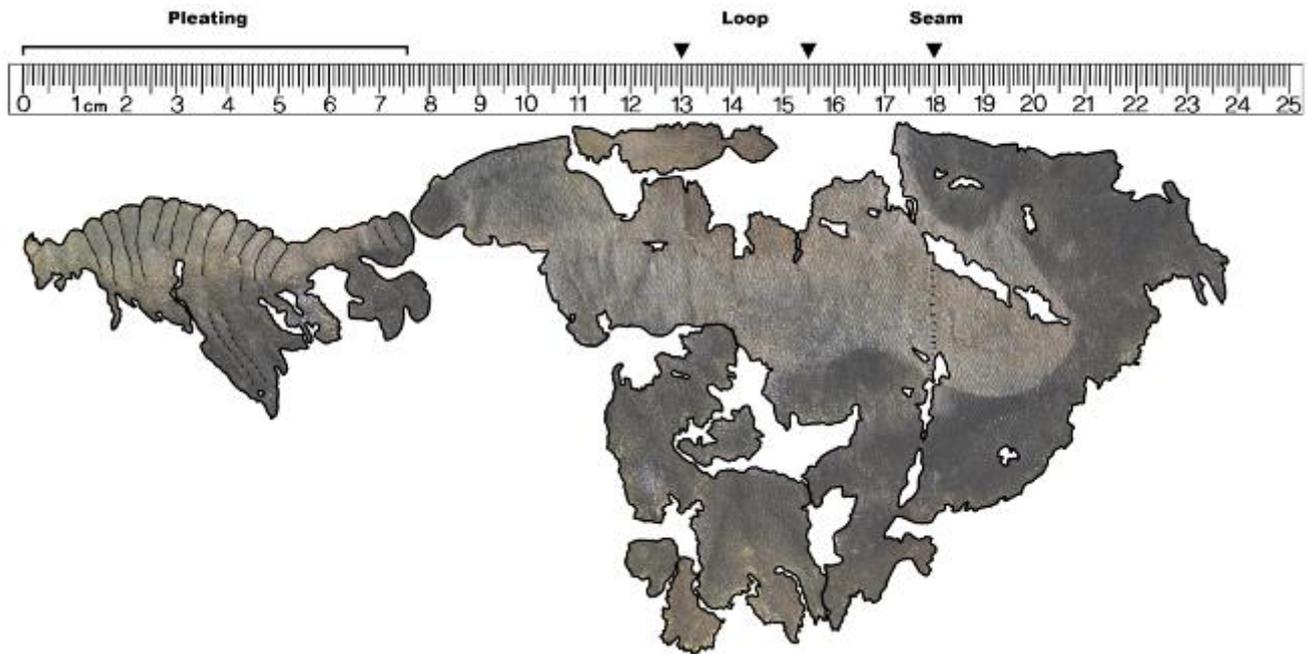
Dessuden var tekstilet rynket eller måske rettere plisseret, da der ikke fandtes nogen rynketråd, i den ene side (Wielandt 1980, 199).

## Overall shape of the fragment

Just below the top of the smokkr were two holes, respectively 2.5 cm and 5 cm from the vertical seam, indicating that the front loop had been fastened here (Wielandt 1980, 193).

11 cm fra sømmen ved egkanterne langs ombukningen begunder en tæt rynkning, der fortsætter fragmentet ud. Mellem sømmen og rynkningen (henholdsvis 2,5 cm og 5 cm) fra sømmen ved egkanterne er to huller under den ombukkede søm. Her sad en strop (x569), der på dette sted var så nedbrudt, at der ingen bindinger var intakte (Wielandt 1980, 193).

Using the information given by Wielandt, and later photographs of how the smokkr fragments are puzzled together by the museum (Ewing 2006, plate 4 and Rimstad 1998, fig. 37), it is possible to create a sketch of how the fragments relate to each other and to the loop. The smokkr piece is roughly 25 cm long, running from the middle of the dress, under the left brooch and down under the arm. It reaches only 10 cm down from the edge, and so gives no information on the length of the smokkr. As mentioned above, the pleating starts 11 cm from the vertical seam.



*Fragment x541 and seam x585, illustration by Tor Gjerde and Hilde Thunem*

## Woollen smokkr loops

Four woollen loops were found, two inside each brooch. All were identified as belonging to the woollen smokkr (Wielandt 1980).

### Brooch x505

#### Upper loop x570

Woollen tabby, 24/14 threads per cm, Z/Z (Wielandt 1980). According to illustrations included in the current find documentation, this loop has a linen core.

*Photograph: Odense Bys Museer and Hilde Thunem, x570, [large version \(771 KB\)](#)*



#### Lower loop x569

Woollen tabby, 22/15 threads per cm, Z/Z. The loops were attached to a decorative band (Wielandt 1980).

The original loop would have stretched from the top of the smokkr, past the tablet woven band and around the pin inside the brooch. Currently, the loop is heavily deteriorated at the end that would have been fastened in the smokkr (the longest surviving piece is 3.9 cm) and no part of the loop survives above the band. The loop strap is 1.0 - 1.3 cm wide.

*Photograph: Odense Bys Museer and Hilde Thunem, x569, [large version \(1.6 MB\)](#)*



## Brooch x501

### Upper loop x518

Woollen tabby, 22/18 threads per cm, Z/Z. The strap was created by folding a piece of fabric 2-3 times towards the middle, and then once around the middle, making the final result 6-8 layers thick (Wielandt 1980).

The loop strap currently appears to be 1.1-1.4 cm wide and torn at a length of 3.8 cm.

*Photograph: Odense Bys Museer and Hilde Thunem, fragment x518, [large version \(1.2 MB\)](#)*



### Lower loop x543

Woollen tabby, 22/10 threads per cm, Z/Z, upper part of the loop (Wielandt 1980).

The loop is broken in two and has a x-number for each part

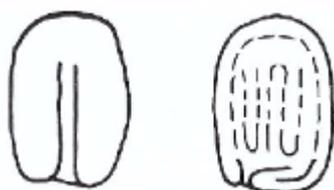
### x520

Woollen tabby, 21/13 threads per cm, Z/Z, lower part of the loop (Wielandt 1980).

*Photograph: Odense Bys Museer and Hilde Thunem, fragment x520 and x543, [large version \(1.2 MB\)](#)*



Rasmussen and Lønborg (1993, 176) give more details on the construction of each loop.



Two of the loops had been made of strips of the same fabric as the smokkr, that had been folded so that no cut edges were visible and overcast along the side (as shown leftmost in the illustration).

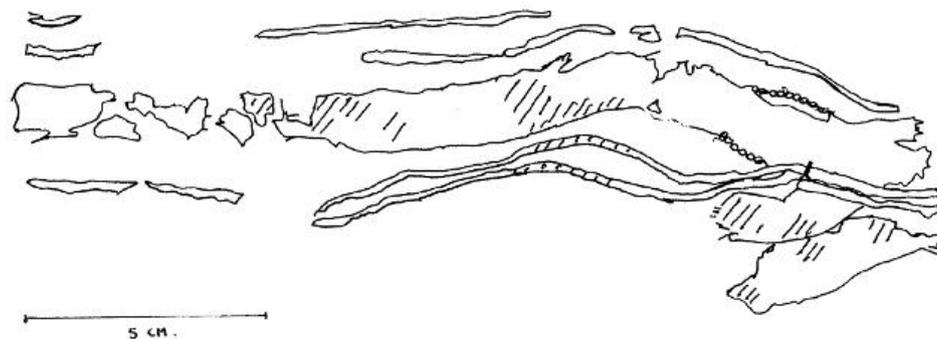
Then there was one loop (x570) with a linen core of folded linen fabric. The smokkr fabric had been folded around the core and overcast along the side (rightmost in the illustration).

*Illustration: Rasmussen & Lønborg (1993, 177)*

The last strap was folded and overcast along the side, but was made from a less finely woven woollen tabby than the smokkr. Unfortunately, Rasmussen and Lønborg do not refer to the x-numbers in their report, making it hard to ascertain which one this was.

## Decoration

The main decoration appears to have been a tablet woven band (**x584**), surrounded by a pair of woollen strings on each side. The largest fragment that remains is 13.3 cm long and 13-14 mm wide. In addition, there were a few small fragments clearly belonging to the band.



Overview of fragments of tablet woven band: Odense Bys Museer, unknown artist.

The tablet woven band was constructed using a two-hole tablet weave technique. Several decorative figures had been created by brocading with wool yarn in different (but so far unidentified) colours (Rasmussen & Lønborg 1993, 177). The warp consisted of 14 threads in a two-ply (Z/S) wool yarn that had been dyed in a dark blue colour. The colour was attempted identified via thin-layer chromatography, with no results (Wielandt 1980, 194). Wielandt identifies the weft as a two-ply (Z/S) wool yarn in a yellow-brown colour. Rasmussen and Lønborg state that the weft is missing, and thus presumed to be linen. It is probable that Wielandt is talking about the wool yarn used to create the pattern, and that there thus is no real discrepancy between hers and Rasmussen and Lønborg's statements. However, I am not sufficiently skilled in tablet weaving to confirm this.

The band was fastened to the front loops (but not the smokkr itself) by overcast stitches, and was probably approximately 20 cm long (Rasmussen & Lønborg 1993, 177).

Mellem fiblene, langs selekjolens vandrette søm, har et mørkeblåt, ca 14 mm bredt mønstret brikbånd af uld været anbragt, oprindeligt ca 20 cm langt. Brikvævningen er udført som tohulsbrikvævning med totrådet ultråd i trenden, mens islætten, der i dag ikke kan iaktages, har sandsynligvis vært av hør. Mønstrene der er fremstillet i uldbrochering, er udført med forskellige tråde i forskellige farver, der desværre ikke kan bestemmes, men som i dag fremtræder i rødlige, brunlige og gullige nuancer. Båndet har været hæftet med kastninger til selekjolens forreste stropper (Rasmussen & Lønborg 1993, 177).



Photograph: Odense Bys Museer and Hilde Thunem, x584 (outside of garment), [large version \(610 KB\)](#)



Photograph: Odense Bys Museer and Hilde Thunem, x584 (details, start of band), [large version \(1.6 MB\)](#)

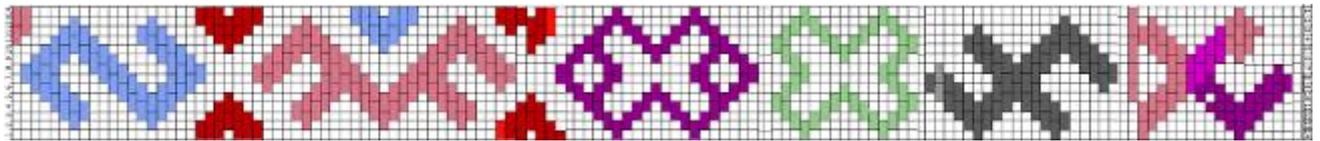


Photograph: Odense Bys Museer and Hilde Thunem, x584 (details, start of band), [large version \(3 MB\)](#)



Photograph: Odense Bys Museer and Hilde Thunem, x584 (back of band), [large version \(1.6 MB\)](#)

The original dyes have faded into brownish, yellowish and reddish shades, and it is no longer possible to determine the original colours. However, it is possible to see that some of the figures was differently coloured than their neighbours. Thus, while Wielandt (1980) identifies the pattern, Rasmussen and Lønborg (1993) elaborate it by giving separate symbols to each of the different colours they observe in the fragment. All of them, however, leave out the small separated fragments of the band from their suggested pattern.



Pattern by [Agnes Raanes](#), based on the pattern by Rasmussen and Lønborg.

The few separated fragments of the tablet woven band are too small to make it possible to determine their order, orientation or position on the original band. Some of them may have been connected to the end of the remaining band, or there might have been additional fragments in between that are currently missing.



Photograph: Odense Bys Museer and Hilde Thunem, loose fragments from x584, [large version \(1.6 MB\)](#)

The pattern below shows the different pieces of figures that can be gleaned from the fragments. They have been placed in the same arbitrary order used in the earlier sketch of the tabletwoven band. This should not be taken as a proof of either the original order of the fragments or their orientation.



The largest fragment has a piece of a figure that shares some similarity with both the second figure on the left and on the right of the existing band. It is not identical to any of them however. It is also possible to identify an arrow-shaped motif that looks similar (but not identical) to the hearts/arrows surrounding the second figure from the left on the large band. In addition, one fragment has a piece of a figure that appears to have been made of two different colours. The final two fragments are so small, that the only thing that can be determined is that they each have a very small part of a decorative figure.

Pattern by Tor Gjerde and Hilde Thunem.

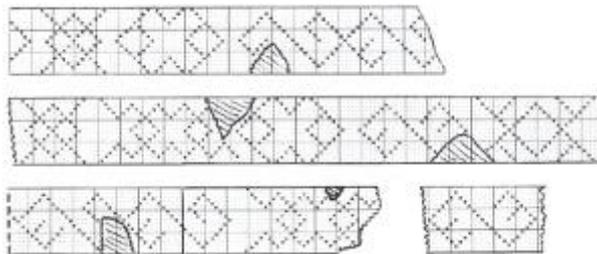
While the specific combination of figures used in the Køstrup band is unique, there are similarities between parts of it and other tablet woven bands from the period. A woman's grave from the 10th century at Birka (grave 965, [Geijer 1938](#)) contained several tablet woven

bands. One of these bands has several figures similar to the one leftmost on the Køstrup fragment, while another band from the same grave has an "unfinished swastika" similar to the Køstrup figure found in second position from the right.



*Illustration: Geijer 1938, 82 - 83*

In addition, the central figure in the Køstrup band can be found in a woollen band worn by the man buried at Mammen in 970-971 ([Ræder Knudsen 1991](#)).



*Illustration: Ræder Knudsen 1991, 149*

This woollen band had been woven in a 3/1 double-faced broken twill using 17 tablets. At first glance it appeared to have been created by threading four wool threads through the two outermost tablets and two wool threads through each remaining tablet. However, a closer examination showed gaps in the pattern, due to deteriorated vegetable threads. Thus, the conclusion was that the fifteen tablets in the middle had been threaded with two woollen *and* two vegetable (e.g. linen) threads, and that the vegetable thread would have been the one creating the pattern, twisting above the woollen background weave (Ræder Knudsen 1991).

Båndet fremstår i dag med 38 trendtråde. Der har været en kantbrik yderst i hver side trådet med 4 nu rødlig brune uldtråde, herefter fra begge sider 5 brikker med 2 tråde i hver af samme garn som kantbrikkerne. De resterende 5 brikker i midten af båndet har været trådet med 2 nu gulligtgrønne brune tråde i hver. Uden for mønsteret ligger trådende bundet i en uregelmæssig 3/1 dobbeltkiper, i mønsteret går trendtråden om bagpå båndet og islætstråden ses tydeligt. Langs mønstrene i båndet ses huller efter nu nedbrudte og forsvundne vegetabiliske tråde. Selv om båndet nu fremtræder som to-trådsbrikning, er det altså oprindeligt vævet med 4 tråde i alle brikker (Ræder Knudsen 1991, 149).

While this is not the same as the Køstrup band, where the brocading thread still remains, it shows that linen and wool yarn could be used within a single tablet woven band.

### **The woollen strings**

Two wool strings were running along each side of the tablet woven band. The strings on one side were S-twisted, while the ones on the other side were Z-twisted (Wielandt, 1980, p 194). However, it is unclear to which degree they were fastened to the tablet woven band. According to Wielandt, they were "sewn to the band" with stitches remaining in two places, while Rasmussen and Lønborg state that "stitches in the two lower strings and the smokkr" indicate that they were stitched to each other and to the smokkr in just one place.

Pyntebåndet består af et mønster-vævet midterstykke og to par snoede bånd, der er påsyet midterstykket. <...> De påsyede snorer af uld er i den ene side s-tvundet og i den andre side z-tvundet. De har været syet på

midterbåndet med en uldtråd (2 z-spundne tråde er s-tvundet). To steder er disse sting bevaret (Wielandt 1980, 194).

Langs begge sider af brikbåndet er anbragt to uldsnore, fastsyet med kastesting til stropperne, men hvis eventuelle fastgørelse til brikbåndet er usikker. Sting i de nederste snore og i selekjolen indikerer dog, at disse snore et enkelt sted har været hæftet sammen, både indbyrdes og med selekjolen (Rasmussen & Lønborg 1993, 177-178).

## Beads

Eight beads were found in the grave, two made of quartz and the rest of glass. Five of the glass beads were barrel shaped: one reddish-brown, one white, one orange, one red/white mix and one black bead. The last was a square green bead (Lindblom 1993, 155).



Photographs: Odense Bys Museer, glass beads from grave ACQ, [large version \(8.5 MB\)](#)

There were no traces of thread on the beads themselves, although there were a couple of threads found in the near vicinity. A thick linen thread (x545, x546) was lying loose within brooch x501 and a thick wool thread (x571) was lying loose within brooch x505 (Wielandt 1980, 193).

## Other remains

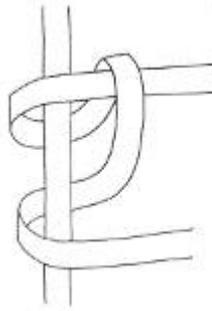
### Linen loops and other linen fragments

A strip of linen tabby (22/22 threads per cm) had been folded so the resulting band was four layers thick and 0.4 cm wide. This band loops twice around the pin at the bottom of brooch x505, and was clearly put on before the woollen smokkr loop (x569) was threaded onto the same pin (Wielandt 1980, 200).

Rasmussen and Lønborg (1993, 177) give further details, stating that the band is blue and have been overcast along one side. Their illustration of the looping of the band around the pin shows that this is not an ordinary smokkr loop.

Smal tekstilstrop. Stroppen er snoet en ekstra gang om nålen i spænde x505. Der rent faktisk to stropper - en i hver ende. Man kan i den ene endetydeligt se at den smalle strop må først have været sat om nålen i fjederenden inden den brede strop x569. Analysen viste at stroppen består af et stykke lærredsvævet stoff af hør, der er lagt

4-dobbelt så stroppen får en bredde på 0.35 cm.  
Trend: 22 z-spundne tråde/cm og islæt: 22 z-spundne tråde/cm - målt over 0.25 cm (Wielandt 1980, 200).



I fibel x505's ene side er bevaret dele af et ca. 5mm bredt, blåfarvet hørbånd, fremstillet af 4 lag ombukket lærred med en kastning langs den ene side, der tolkes som rester af et bærebånd til ophængning af nøglen og kniven (Rasmussen & Lønborg 1993, 177, illustration p. 178).

*Photograph: Odense Bys Museer and Hilde Thunem, x572, [large version \(200 KB\)](#)*

Wielandt describes another narrow linen band, found at the tip of the pin in brooch x505, which is not mentioned by Lønborg. The tracking of these two linen bands through the excavation reports is made more difficult as it is unclear which x-number refers to which fragment. Wielandt always position fragment **x703** at the bottom of **x505**, but the description of how the loop was folded twice around the pin is sometimes attributed to **x703** and sometimes to **x572**. Moreover, the couple of drawings of the loop folded around the pin (by an unknown artist) consistently marking the fragment as **x503** only add to the confusion.

Currently, the linen band marked **x572** by Odense Bys Museer has fragmented to a degree where it is impossible to see how it once was fastened around the pin, while there is no fragment **x703** in the list of available textile remains.

In addition to the linen band(s) there were three sets of fragments of fine linen tabby (18-24/18 threads per cm). The first were some tiny, completely mineralized fragments (**x542**) innermost in brooch x505, underneath the fragments of the woollen smokkr. In addition there was a fragment (**x525**) on top of brooch x505 and some tiny, mineralized fragments (**x544**) within brooch x501 (Wielandt 1980, 198-199).

## Wool and feathers

There were two layers (**x524/x548** and **x527**) of wool tabby (18/8 threads per cm) with a layer of down and feathers (**x523/x547**) between them. This wool and feather "sandwich" was found on top of brooch x505, with fragment **x524** beside the linen fragment **x525** (Wielandt 1980, 194, 198).

Finally, Rasmussen and Lønborg (1993, 178) describe a small iron fragment with a round hole and some attached textiles, that was found roughly 2 cm from the right brooch. Two layers of tabby (8/8 threads per cm, probably wool) are preserved on top of the iron fragment. Above these is a small tabby fragment (26/29 threads per cm, probably linen) and fragments of two narrow woven bands (warp 4 threads, weft 24 threads per cm).

Endelig blev der ca. 2 cm NV for fibel x501 fundet rester af et lille stykke jernblik med et rundt slået hul. I rusten var flere stykker tekstil med spredte sting bevaret. På jernblikkets ene side ses to lag totrådet lærred, sandsynligvis uld, med et trådtal på ca. 8/8 pr. cm. Ovenpå dette ses et lille fragment af entrådet, lærredsbundet hør? Med et trådtal på 26/20 pr. cm. Ovenpå udlærredet ses ligeledes rester af to vævede band, der er lærredsvævede over fire trendtråde, mens islættens trådtal ligger på ca. 24 pr. cm. De vævede bånd kunne være et stykke af en kantning af en kappe og det lille stykke jernblik kan have været fastsyet på kanten og være en del af et lukketøj (Rasmussen & Lønborg 1993, 178).

## Interpretation

Although the fragments from grave ACQ at Køstrup provide significant information about the smokkr, there is still a lot of room left for interpretation, as illustrated by Wielandt (1980) and Rasmussen and Lønborg (1993) each having their separate theories.

### Interpreting the different layers

Wielandt (1980, 193-194) interprets the linen innermost in the brooches as a smokkr, with a tabby woven main part of which only fragments (x542 and x544) survive, and narrow linen loops (x572 and x703). The linen (x525) on top of brooch x505 may come from the smokkr or from a shawl. Thus, her conclusion is that the woman in the grave were wearing two smokkr; a wool smokkr (with wool loops) worn next to the body, and a linen smokkr (with narrow linen loops) worn on the outside. On top of the body there was a kind of duvet with two layers of wool enclosing a layer of down and feathers.

Rasmussen and Lønborg (1993, 175-176) interprets the find very differently. They propose that there was an undyed linen underdress (serk) worn *inside* a blue woollen smokkr.

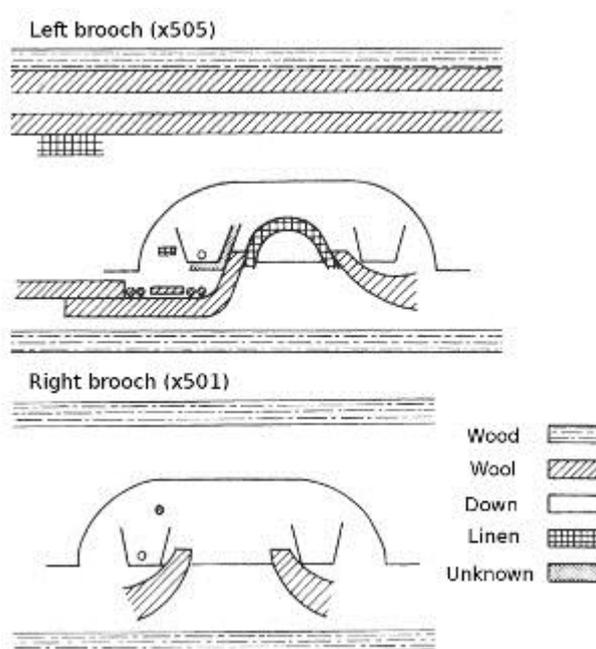
The stratigraphy inside brooch x505, where the wool is closer to the body than the linen, works against this interpretation. However, they believe that the pin of the brooch was stuck through the serk, resulting in a piece of serk linen being pushed into the brooch. The woollen fragments of the smokkr could then be folded on top of it during the decomposition.

*Illustration (slightly modified) from Rasmussen and Lønborg (1993, 176)*

While piercing the serk with the brooches isn't normal practice, evidence of it has been found in two graves in Haithabu (Hägg 1991). Hägg suggests that the purpose was to keep the brooches stable when the dead women were carried to their graves, fully dressed and on display.

Som exempel på egenheter som har med gravskicket att göra, kan slutningen nämnas två kvinnograver. Här hade spännbucklornas nålar trätts genom framstycket till underliggande plagg, dvs särken (...). På så sätt hölls spännen med pärlsnoddar och annat på plats i dräkten trots att den döda befann sig i liggande ställning. Detta arrangemang är nödigt om det var meningen att den döda bare skulle placeras liggande i graven men inte om hon bars dit påklädd och synlig för alla (Hägg 1991, 278).

Rasmussen and Lønborg go even further and suggest that the clothing in grave ACQ may have been made solely for the funeral, referring to the description of a Rus (Swedish Vikings) funeral, by Ahmad ibn Fadlan, where an important man was buried in a set of garments made for the occasion.



Having explained the small fragments inside the brooches (x542 and x544) as part of the serk, Rasmussen and Lønborg (1993, 177) propose that the linen band at the bottom of brooch x505 was a tool-band, used to carry the knife and the key. This fits better with the unusual folding of the band around the pin than assuming it was a smokkr loop. The other linen band isn't mentioned by them at all, but the confusion around the x-numbers in Wielandt's report *could* be an indication of a similar mix-up of the fragments, meaning that the fragment might have gone missing or never existed in the first place.

Rasmussen and Lønborg further interpret the layers of wool, down and feathers and the linen fragment on top of brooch x505 as a duvet or a cloak of some kind. They suggest that the small iron fragment with two layers of wool(?), a layer of linen(?) and two fragments of bands on top could be from a cloak decorated with the woven bands and with some kind of closing mechanism made of iron (1993, p. 178).

Charlotte Rimstad (1998) supports their interpretation of the linen as a serk, commenting that it is unlikely that the dyed and pleated woollen smokkr would have been hidden beneath an undyed linen smokkr. She proposes that the linen fragment on top of brooch x505 is from the serk (folding itself over the brooch as the body deteriorated) and not from the duvet (p. 19-20).

While it is not mentioned by either Rasmussen and Lønborg or Rimstad, there have been finds of Viking outer garments filled with down and feathers. Thus an alternative explanation of the layers on top of brooch x505 could be that the body was dressed in such a garment, perhaps with a partial lining of linen, and woven bands as a part of the closing mechanism. If so, it would have had to be a cloak or open jacket of some kind, as Wielandt (1980, p. 194) mentions that there are impressions of the wool fabric in the rust on an iron key lying ca. 40 cm from the brooches.

## The smokkr

There is agreement that the woollen tabby inside brooch x505 and the four woollen loops are from a smokkr. However, Wielandt (1980) believes the pleating was placed *on the side* of the smokkr, while Rasmussen and Lønborg place the pleating *in the middle*, between the brooches.

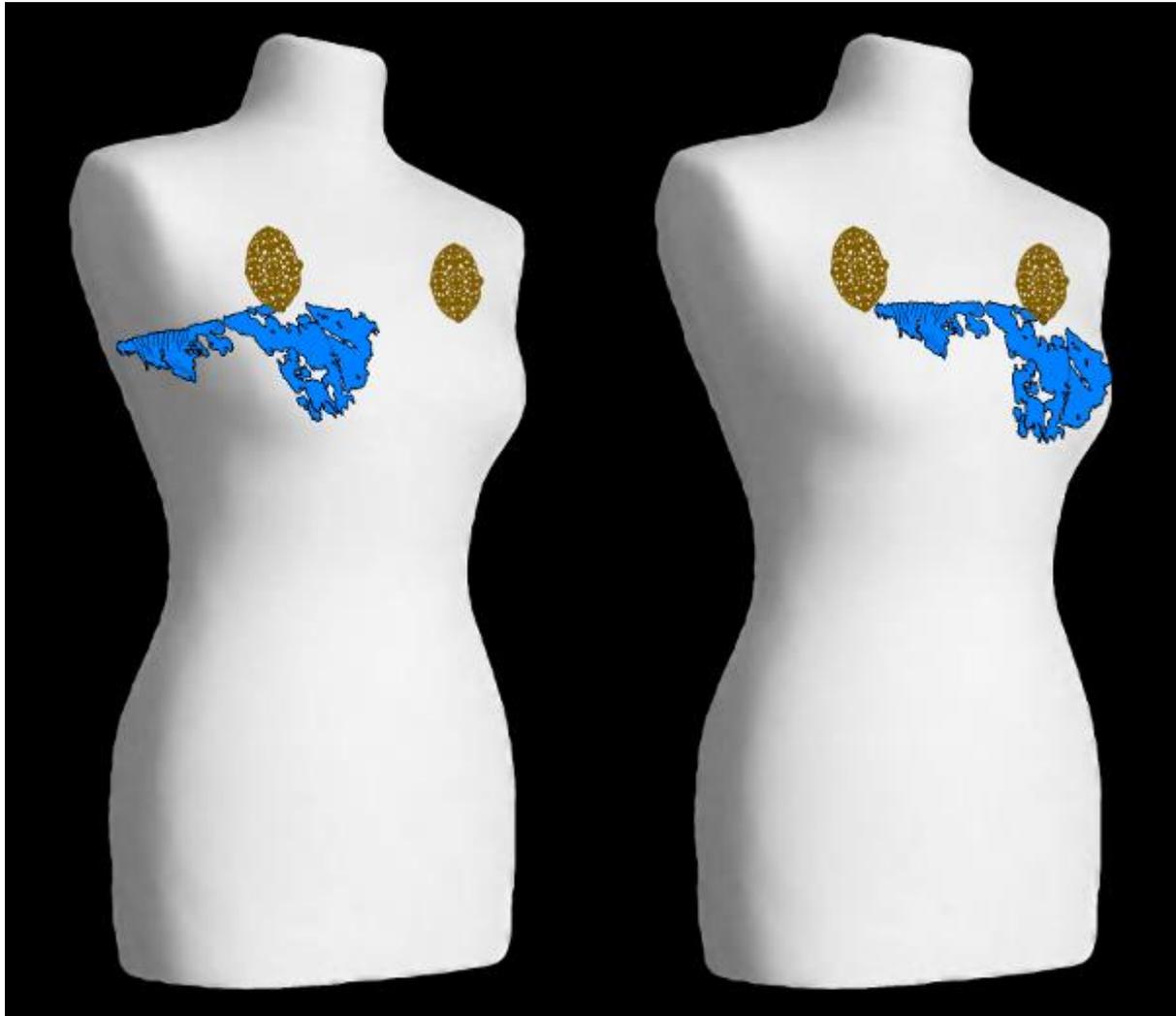
Although none of them explain their reasoning, it has to depend on how they choose to orient the large fragment (x541) on the body. While it can be difficult to differentiate between the outside and inside of the pleated fragment, the inside of the rest of fragment x541 is identified by the stitches that run along the folded upper edge of the smokkr. Thus there can be no disagreement regarding which side of the fragment that was worn towards the body.

*Photograph: Odense Bys Museer and Hilde Thunem, x541 detail, [large version \(380 KB\)](#)*



The only other reason I can see for the two different conclusions is if brooch x505 is placed on different sides of the body. If the brooch is placed on the right, the pleating runs beneath

the arm, as suggested by Wielandt (1980), while if it is placed on the left, the pleating will end up in the middle of the smokkr, as suggested by Rasmussen and Lønborg (1993).



*Illustration of alternative placements of brooch x505 by Hilde Thunem and Tor Gjerde.*

So what is the correct placement of brooch x505? First of all, brooch x501 had turned in the grave, meaning that at least one of the brooches had moved. This could be due to normal decomposition of a body placed on the back, but it could also indicate that the body was placed on the side. Thus, there is an inherent uncertainty in regards to which brooch was originally on the left and which was on the right of the body.

During the excavation, the piece of earth containing both brooches, textiles and glass beads was removed from the grave and "excavated" off the site ([Lorentzen 1980, p. 170](#)), adding further possibility that the orientation of the brooches may have gotten mixed up.

Mellem skrinet og gravens centrale del optoges et præparat (x494), dettes omfang samt placering i graven fremgår af T133. Præparatet inneholdt fragmenter af trekisten, to skålspænder med isiddende tekstiler, glasperler m.m (Lorentzen 1980, 170).

Wielandt (1980) doesn't mention brooch placement at all in her report. Rasmussen and Lønborg (1993) on the other hand explicitly places brooch x505 on the left and brooch x501 on the right. The brevity of their article means that there is no explanation of how they

reached their conclusion. The only clue is a comment by Lønborg in the documentation held by Odense Bys museer, stating that Wielandt's excavation sketches are mirrored. Unfortunately the photographs from the excavation are missing, making it impossible to do a new analysis of the evidence.

There is however, general agreement that the Køstrup smokkr was closed, and enclosed the body (Wielandt 1980; Rasmussen & Lønborg 1993; Rimstad 1998; Ewing 2006).

Unfortunately, the fragments of the smokkr are too small to give more information on the shape of the garment, e.g. whether it originally was a simple tube, sewn together with a single seam, or consisted of several pieces, possibly cut to fit the body, as in the find Hägg ([1984](#)) describes from Haithabu.

### **Other evidence for pleated smokkr**

Grave ACQ is not the only instance of a pleated smokkr. Several fragments of tabby wool, whereof three were pleated (2-3 mm deep pleats) were found along with several unpleated fragments of the same tabby in a woman's grave in Vangsnes in Norway ([Holm-Olsen 1976](#)). The plain fragments may be explained by the pleating disappearing in the grave, or by the garment only being partially pleated, like at Køstrup.



Tre fragmenter av et toskaftstoff, B 5625 Vangsnes, er plisserte. Plisseringen er jevn og regelmessig og tilsvarer helt den Agnes Geijer har beskrevet fra Birka. Foldene er to-tre mm dype, og de framstår i tversnitt som en sammenpresset bølgelinje (Geijer 1938, 16). <...> De øvrige fragmentene av toskaftstoffet fra B5625 Vangsnes viser ikke spor av plissering. Om dette kommer av bevaringsforholdene, eller om bare en del av stoffet opprinnelig var plissert, er vanskelig å avgjøre (Holm-Olsen 1976, 201, illustration p. 202).

In addition, there were fragments of a finely pleated (4-5 mm deep pleats) woollen smokkr in grave C at Kaupang ([Ingstad 1979](#)). Unfortunately, the Vangsnes and Kaupang fragments are too small to shed further light on the shape of these smokkr.

### **Woollen smokkr loops**

The construction of the smokkr loops is interesting, because it indicates that the person creating the dress found it aesthetically more pleasing with loops made of the same fabric. While two of the loops are wholly made from the same fabric as the smokkr, one of the back

loops has a linen core with an outside of smokkr fabric. It is possible that this was a way to use the very last of the fabric and get a loop that looked the same as the others from the outside.

The last loop was made of coarser wool, possibly because there was no more smokkr fabric left. It was found in brooch x501, but Rasmussen and Lønborg (1993) doesn't mention whether it was a front loop, more or less hidden beneath the brooch, or a potentially visible back loop.

The front loops were longer than what is usual from other smokkr finds, in order to have room for the tablet woven band.

## **Decoration**

### **Tablet woven band and strings**

The tablet woven band was fastened to the loops, but not the smokkr (Wielandt 1980, 193-194). This is markedly different than e.g. Birka, where the decoration was stitched along the top of the smokkr.

The band had two strings running along on either side, stitched to the loops. There are two theories regarding the further fastening of the strings; they may have been stitched to the tablet woven band (Wielandt 1980), alternatively, the lower strings were stitched to each other and the smokkr in a single place (Rasmussen & Lønborg 1993), and the upper strings may have been arranged similarly.

### **Beads**

What is certain is that eight beads were found in the grave, two of quartz and six of glass, and that all of them were examined for thread, with no results. From there on, things become more unclear.

According to Rasmussen and Lønborg (1993) there were fragments of a thick thread around the pin or pin-holder (top of the brooch) in brooch x501 and fragments of the same type of thread on the upper loop in brooch x505. Rasmussen and Lønborg poses the possibility that these are the remains of the thread used to string the beads between the brooches (p. 177).

Endelig ble der omkring den ene fibels nåleholder/jernnål (x501) fundet rester af kraftig tråd. Fragmenter af samme type tråd optræder på stroppen fra fibel x505's nåleholderende. Disse trådrester kan være rester af den tråd (...) der har været anvendt til ophængning af perlene mellem de to fibler (Rasmussen & Lønborg 1993, 177).

One problem with the theory is that the only two thick threads described by Wielandt, is a *linen* thread in the right brooch and a *wool* thread in the left (Wielandt 1980, 193), and thus cannot be fragments of the same thread. Another problem is that while Rasmussen and Lønborg describe fairly precise positions for both thread fragments, it is not clear where that information comes from. According to the report Wielandt wrote when removing the textile fragments, both thread fragments were lying loose inside their respective brooches. It is possible that photographs from the excavation supply the information cited by Rasmussen and Lønborg, but that is not possible to confirm.

This is unfortunate, because Rimstad (1998) builds on the thread positions suggested by Rasmussen and Lønborg. She proposes that the beads were suspended *above* the tablet woven band by a thread fastened at the holder for the point of the pin in each brooch. In this manner, the beads are kept clear of the pleating, so that both decorative elements are displayed to maximum effect (Rimstad 1998, 20). The uncertainty surrounding the threads means that there is no longer a clear support for her theory from the evidence. However, there is nothing in the evidence that contradicts it, and the reasoning behind her theory remains unchanged.



*Illustration by Charlotte Rimstad (1998, cover page)*

## My interpretation

The Køstrup smokkr has fascinated me since I first heard of it, and after reading the available reports and being lucky enough to get to study the actual fragments, I decided to make my own reconstruction. In fact, this article started as an attempt to collect all available information in a single place so that I could consider it when deciding on my interpretation.

I have concentrated on reconstructing the woollen smokkr, and have left the interpretation of the outer garments/duvet for later. However, I agree with Rasmussen and Lønborg (1993) and Rimstad (1998), that it is unlikely that the pleated and dyed woollen smokkr was covered by an undyed linen smokkr.

### Deciding on a shape

As shown above, the preserved fragments from grave ACQ are not large enough to give a definitive picture of how the smokkr looked before it deteriorated. Thus, any reconstruction involves a fair amount of educated guesses.

### A dress that encloses the body

There were no traces of the body in grave ACQ, with the exception of enamel from the teeth. While this makes it impossible to find the exact position of the tortoise brooches in relation to the body, evidence from other graves indicate that such brooches were worn on the upper area of the chest ([Hägg 2009](#)), and there is no reason that grave ACQ should be different in this respect.

There are several competing theories regarding the generic shape of smokkr, all originating in diverging interpretations of archaeological evidence from Birka. Agnes Geijer (1938, paraphrased in [Hägg 1974](#)) interprets smokkr as rectangular pieces of cloth wrapped around the body, leaving an opening at one side. Inga Hägg (1974) proposes that smokkr were closed around the body, while [Flemming Bau \(1981\)](#) believes that they were open in the front.

Fortunately, the smokkr fragment from grave ACQ at Køstrup has several key features that provide information about the shape of this particular smokkr. The preserved 10-13 cm of the upper edge on either side of the loop excludes the possibility of a frontal opening in the smokkr. It also makes it unlikely that the smokkr was open at the side that is preserved. Even more important is the vertical seam 2,5-5 cm from the loop. After all, Geijer's belief in a side opening is premised on a perceived lack of seams in the existing Birka material. The presence of a seam connecting two selvages clearly argues against such an interpretation for the Køstrup smokkr, as there is no reason that one would sew together two (or more) pieces of fabric and then leave one of the sides open.

In conclusion, the archaeological evidence from grave ACQ clearly indicate a smokkr that enclosed the body of the woman wearing it, with no openings either in the front or sides.

### **Position of the pleating**

Due to the uncertainty regarding which tortoise brooch was worn on the left and which on the right, the archaeology cannot provide a definitive answer to whether the pleating ran along the front or along the side of the body. However, another way to resolve the placement of the pleating is to approach the logic behind it. According to Wielandt (1980, 193-194) and Rasmussen and Lønborg (1993, 176), the purpose of the pleats was to increase the width of the garment.

Mellem spændet og sandsynligvis hele vejen under armen har spenceren været rynket for at give lidt vidde forneden (Wielandt, 1980, 193-194).

I selekjolefragmentets ene ende ses resterne af et gauffreret stykke, der har siddet midt i mellem fiblerne, velsagtens for at give kjolen vidde (Rasmussen og Lønborg, 1993, 176).

However, although we lack the entire garment, the preserved fragments indicate that the smokkr was only *partially* pleated. Most of the 25 cm long fragment is in fact left unpleated. Considering the tiny size of the pleats (2-3 mm deep and 3 mm wide), the partial pleating appears more as a decorative element than a way to significantly increase width in the garment. While we should take care to not use modern aesthetics to interpret Viking clothing, in my opinion it makes more sense to place a decorative element according to maximum visibility, namely between the brooches, instead of hidden under the arms. A placement in the front have the added benefit that the increased width created by the pleating is placed where it is most useful during pregnancy. In conclusion, I believe that the pleating was placed in the front (as suggested by Rasmussen & Lønborg 1993) instead of in the side (as suggested by Wielandt 1980).

There is 6-8 cm from the front loop to the start of the pleating. While we do not know the size of the smokkr in this particular grave, there are a couple of finds of smokkr fronts with 20 cm between the front loops (Bj.597; Hägg 1974 and B6228; [Lukešová 2011](#)). Using this as a starting point, I get a smokkr front with roughly 8 cm pleating surrounded by 6 cm unpleated fabric on both sides.

According to the archaeological evidence, the pleats would have been at least 4.3 cm long. While they could in theory have run the entire way down to the bottom of the smokkr, I decided on a length of 23 cm as an ideal compromise between making the decorative element sufficiently large to be well visible, and the work involved in creating it. In addition, on me this means that the pleating ends at the point where the stomach increases during pregnancy, something I find practical. It is of course pure speculation whether the woman in grave ACQ would have agreed with me.

*Photograph by [Ingrid G. Aune Nilsen](#). The smokkr is made from a finely woven woollen diamond twill instead of the tabby found in the grave. The twill was dyed using woad (although I cheated and used chemicals instead of urine).*



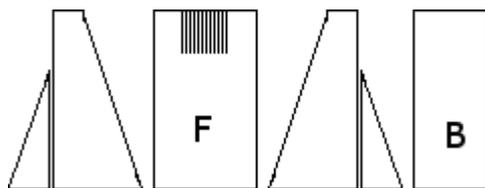
### Proceeding from a small fragment to a whole garment

Aside from the small part of the front of the smokkr, all that the archaeological evidence can tell us is that there was a vertical seam in the side, 2.5-5 cm from the front loop.

One alternative when reconstructing a garment where so little is known is to make the unknown parts of the smokkr as "neutral" as possible, e.g. creating it as a simple tube of fabric enclosing the body, sewn together in one side and pleated in the front. However, the tiny pleats and partial pleating allows for the possibility of a more shaped smokkr, and I wanted to experiment with how such a garment could have looked.

10th century textile finds from Haithabu show the existence of clothing with a more advanced cut. Among the finds were fragments from a smokkr constructed from several pieces and fitted to the body (Hägg 1984). Being from the same time period and roughly same geographic area as the Køstrup finds, it is a useful point of departure when filling out the missing pieces of the smokkr from grave ACQ.

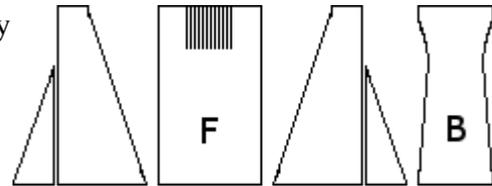
I decided on a rectangular front piece, keeping the side seams parallel with the pleating in the upper part of the smokkr. This fits with what we can deduce from the Køstrup evidence.



For the rest of the smokkr, I decided to use two pieces based on the Haithabu evidence as side-pieces of the smokkr. While Inga Hägg (1984) identifies the Haithabu fragments as possibly belonging to a back piece, several later reconstructions, e.g. by [Carolyn Priest-Dorman](#) and [Peter Beatson and Christobel Ferguson](#) place the fragments at the side of the smokkr.

The front piece is wider than the back piece, in order for them to have the same width at the top after the pleating. Finally, I added side gores, similar to the ones found at Haithabu (Hägg 1984, fragment 55A; Hägg 1991, fragment S29).

The fitting of the smokkr was to a large degree done by shaping the back piece. This meant that some of the fabric was lost. However, as the rest of Haithabu evidence show, the tailoring techniques had grown more advanced and the fabric was not solely cut into geometric pieces any longer (Hägg 1984).



While the Køstrup smokkr fragment reaches only 10 cm down from the top of the smokkr, other finds (e.g. Bj. 464, Hägg 1974, 39-40) indicate that the smokkr was at least hip-length. Aside from that, we only have the pictorial evidence, which unfortunately is inconclusive. In the absence of other evidence, I decided on the probably-below-the-knees-but-above-the-ankles look shown on the Låbro picture stone.

Picture stone from Låbro, Sweden. Ewing 2006, p. 37.

The resulting smokkr is a practical garment, well suited for at least the early stages of pregnancy.

Photograph by [Ingrid G. Aune Nilsen](#)



## Creating the pleating

Unfortunately, it is not clear from the evidence how the pleats were created. In spite of being tiny, they have remained very regular in shape even though there are currently no traces of threads holding them in place (Wielandt 1980). With that in mind, I see three alternative ways of creating pleats, further detailed below.

### **Alternative 1: Drawing the fabric together with thread(s)**

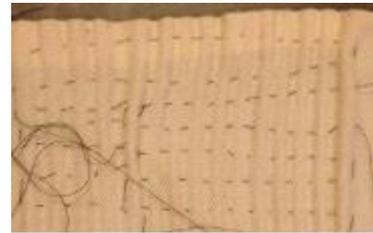
Rasmussen and Lønborg (1993) suggest the pleats were created by gathering fabric with a single linen thread. However, the problem with this method is that it only creates a pleated section in the immediate area around the thread. Using this method to create evenly distributed pleats that are at least 4.3 cm long is challenging, to say the least.

However, using several parallel threads creates more stability. This method allows for longer pleats that have a greater tendency to stay evenly distributed than what can be created with a single thread. In order to explain the lack of evidence for such threads in the find, they would have to be made of linen, or some other material that have deteriorated in the grave.

However, even if the threads have disappeared, there should be needle holes left in the fabric. Moreover, while the holes after a single linen thread may be missed or have disappeared, it is less likely that many threads have disappeared without a trace.

### **Alternative 2: Pleating with the use of steam**

This alternative first requires creating evenly distributed pleats, by using several threads in parallel to draw the fabric together. The pleated area is then treated with steam, by holding it over boiling water for several hours. Afterwards, the threads are removed, leaving regular pleats that keep their shape.



The method would explain why there are no threads found holding the pleating in the Køstrup fragment in place, without requiring the thread to have deteriorated without a trace.



One of the drawbacks is that woad dyed fabric appears to lose some of its lustre when being steamed (further experiments are necessary to determine whether this will always happen, or whether there are factors that make it more likely). Whether this would have deterred a Viking woman from using the method is of course anybody's guess.

Pleating and steaming the fabric *before* it is dyed cause the pleats to lose some of their structure during the dyeing. In addition the dye will tend to be more concentrated in fabric that has been treated with steam, which may create colour differences in the different parts of the smokkr even though they are all dyed in the same dye solution. Again, it is uncertain whether this is only a problem seen through modern eyes.

### **Alternative 3: Anchoring the pleats in place by sewing**

Just like the second alternative, this alternative first requires creating evenly distributed pleats by using several threads in parallel to draw the fabric together. Support seams are then sewn along or perpendicular to the pleats so that they anchor them. Afterwards, the threads drawing together the fabric may be removed, so that only the support seams remain.

While I am not aware of Viking age finds showing clear evidence of this technique, it is found in later finds from Uvdal ([Vedeler 2007](#)).

The drawback when using this method to explain the Køstrup fragment is the same as for the first alternative, namely that it requires a significant amount of stitches to have disappeared without a trace. Even if the thread was made of linen, there should be needle holes left behind.

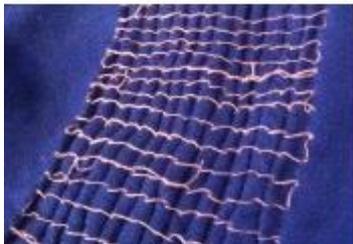
### **Creating the pleats on my smokkr**

Due to the lack of gathering thread or anchoring stitches in the Køstrup fragment, I first attempted to create the pleating by using steam. However, I was not satisfied with the result of steam treatment on dyed fabric, nor the result of first steaming the fabric and then dyeing it. As I have very limited facilities for woad dyeing, I decided to use another alternative, instead of experimenting further with steam treatment.



I preferred anchoring the pleats instead of simply drawing them together, as I wanted the added stability considering that the pleats were to be more than 20 cm long.

In my first attempt at this method (example at the top in the illustration to the right), I overcast along the back of each pleat and sewed it to a base of linen. This created very stable pleats.



However, adding the base of linen meant introducing more fabric that had to be explained away in order to match the evidence. Thus, I later removed it and the overcasting stitches and instead chose anchoring stitches perpendicular to the pleats, as found in Uvdal. This pleating is more flexible than my first attempt.

### **The woollen smokkr loops**

While the original find had one loop made from a coarser fabric than the rest, I decided that I did not want to go that far in copying it, and made all my four loops out of smokkr fabric.

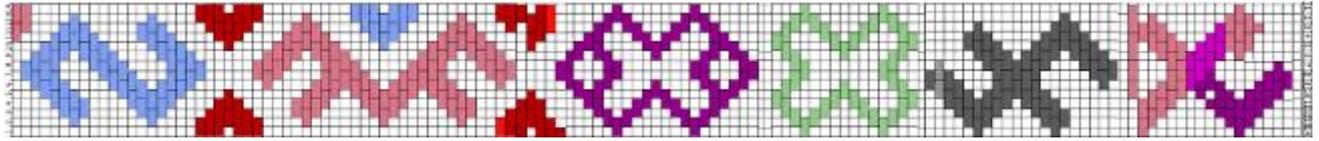
My front loops were created by folding the fabric and overcasting along the side, similar to the technique used to make three of the four original smokkr loops. The back loops were made according to the technique used to make the last Køstrup loop, by surrounding a linen core with a strip of smokkr fabric. It does not require as much smokkr fabric as the folding and overcasting, and so may have been chosen because there was not enough smokkr fabric left for anything else. However, I wanted to use it for both back loops, because it strengthens them (and they could otherwise be a bit liable to stretch and tear).

Both sets of loops were 1-1.2 cm wide, matching the width of the original loops.

### **Decoration**

I wanted to recreate the arrangement with a tablet woven band sewn to the loops, in order to judge its practicality.

There appears to be a couple of weaving errors in the large fragment of the tablet woven band. It is plausible that the small figures beside the second large figure from the left were meant to be mirror images of the hearts/arrows used on the opposite side. In addition, the first figure from the right looks strange. Is the unfinished vertical line at the left side intentional? Was the figure originally made out of several threads with different colours, or are the different colours we currently observe a result of the preservation process?



*Pattern of the original band, including possible weaving errors*

I decided on a reconstruction where the weaving errors in the possible hearts/arrows were fixed. However, I kept the rightmost figure identical to the find as a reminder that sometimes, what we find is not what we expect.

The largest fragment from the tablet woven band is 13.3 cm. In order to get a total length of 20 cm I had two options. I could scale up the existing motives until they covered 20 cm, so that the band matched the evidence from the grave, except being wider and with larger figures. Alternatively, I could keep to the original scale of the band, but then I would have to invent figures for the missing 6.7 cm.

Part of my goal was to better judge the practicality of the decorative arrangement, something that required a band that behaved close to how the original band would have. Thus, having the correct scale had the higher priority. This left me with the task of designing the look of the missing 6-7 cm. There is little apparent symmetry in the existing fragment. If the original band was 20 cm, as suggested by Rasmussen and Lønborg (1993), the current fragment passes the midpoint without repeating a single of the large figures. I wanted to keep this unsymmetrical look, and at the same time not introduce too many new elements by inventing new figures.

At the time of the reconstruction, I had not examined the separated fragments from the tablet woven band, and thus could not use their limited information about missing figures. Instead my compromise was to repeat some of the figures from the original band, but to pick them from within the fragment instead of starting over from the start of the pattern. I also decided to introduce one new figure; an interpretation of what the strange rightmost figure might have been meant to look like.



*My reconstruction pattern. Everything to the left of the red lines is pure conjecture.*

The basic weave was done in woad-dyed wool, as in the case of the original. The rest of the colours are faded, and we do not know what plants have been used for each of them. I picked plant dyed wool in colours somewhat matching what is found in the band, using madder red for the most reddish of the figures etc., but this is almost pure guessing.

I enlisted the very talented [Hanna Johansson](#) to actually do the work. She dyed the yarns and discussed colours and weaving with me. I originally wanted a linen weft (as Rasmussen and Lønborg propose), but Hanna could not get that to work to her satisfaction and so used a dyed silk yarn instead. The result fit very well between my front loops.



*Photograph by Hilde Thunem*

I chose not to add the two woollen strings on each side of the band. The two interpretations on how they were fastened would presumably give very different results in regards to practicality, and I decided to postpone experimentation on this until at least after my kids grow out of the grabby stage.

What surprised me was how easy this arrangement was to wear. My first impression when I read about it was how hopelessly impractical it would be. However, perhaps due to its slimness, the tablet woven band stays in position and is not caught in things. The woollen strings might of course add complexity, but currently my Køstrup smokkr is no less practical than other smokkr I have. The only difference is that the placement of the tablet woven band makes it a bit more difficult to pull the smokkr down in order to allow breastfeeding.



*Photograph by Skjold Haugstad*

In regards to the beads, I decided to place them at the top of my brooches, in accordance with the theory advanced by Rimstad (1998). As there is no archaeological evidence either way, I may as well go with a theory that appears logical, even not knowing whether the woman in grave ACQ would have shared that logic.

The beads were made by [Thomas Risom](#) based on the description given by Lindblom (1993) and the photographs from Odense Bys museer. A relatively short linen string keeps them clear of the tablet woven band. Unlike beads hung from the bottom of the brooches, this arrangement does not swing out from the body when I lean over, and thus is less likely to get tangled with or caught on items nearby. The drawback is that the beads have a greater tendency to slide to one side, than if they hung on a longer string. In addition, having the beads at the top of the brooches is impractical when wanting to open the brooches regularly to allow breastfeeding.

## Conclusion

While large in relation to most smokkr fragments, there are definitive limits to the information the fragments in grave ACQ can give us. However, the tiny size of the pleats and the partial pleating opens up for the possibility of a more fitted smokkr. My reconstruction is an experiment in how such a smokkr could have looked.

Using fragments from the finds at Haithabu to fill out the missing pieces of the puzzle results in a rather practical garment. The partial pleating allow for an increasing stomach, whether from pregnancy or other reasons. This, combined with the use of shaped sidepieces and gores, creates a smokkr that hugs the upper body (which does not snag easily on things nearby), while having a large enough lower circumference to allow for walking.

The arrangement of the tablet woven band and beads does not give easy access for breastfeeding, but aside from that, it is surprisingly practical. In conclusion, there is nothing in the design or decoration of the smokkr that requires it to have been created solely for the funeral.

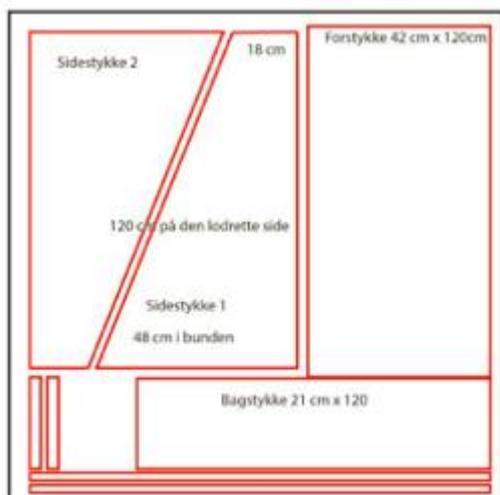
However, comparing the fragment (white outline in the photograph) with the reconstructed smokkr provides a sobering reminder of how much of it that remains guesswork, and how uncertain it is that the woman from grave ACQ would recognize my garment as a smokkr, much less as a copy of her own.

*Photograph by [Ingrid G. Aune Nilsen](#). Illustration by Hilde Thunem and Tor Gjerde*



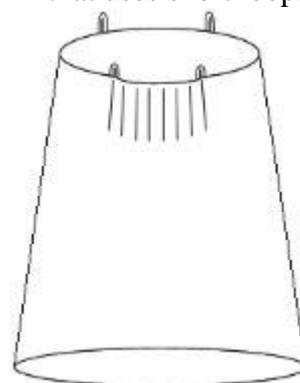
## Other reconstruction patterns

As mentioned above, there are definitively more than one way to interpret the limited archaeological evidence from grave ACQ.



[Sara Heil Jensen](#) suggests a pattern (on the right) similar to the one I have used, except with no shaping of the back piece and no extra gores. This results in a layout that uses the fabric very efficiently, while managing to get a side seam where two selvedges meet.

A very different alternative is provided by [Shelagh Lewins](#), who has created a reconstruction pattern (on the left) for the Køstrup smokkr that uses short loops for both the front and the back of the smokkr. She argues that the loops found in the graves are always short, as only the area near



the metal has been preserved. Thus, while most reconstructions assume that the upper loops were long, the evidence isn't conclusive.

The reconstruction she suggests builds directly on the Huldremose dress and other peplos dresses, and just adds the loops. The entire front has been pleated.

The suggested front loops are too short to allow for the arrangement with the tablet woven band, but could be made longer if one wishes.

**More about the Viking apron dress (smokkr):**

[urd.priv.no/viking/smokkr.html](http://urd.priv.no/viking/smokkr.html)

**Museum reconstructions of the Køstrup smokkr:**

[urd.priv.no/viking/kostrup-recon.html](http://urd.priv.no/viking/kostrup-recon.html)

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