

Viking Women: Aprondress

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This article focuses on the garment that was worn by Viking women together with the characteristic oval brooches. While it has been called many things by researchers over the years (e.g. trägerrock and hängerock), I will use what is currently thought to be the old Norse name for the garment ([Ewing 2006](#), p. 37), namely "smokkr".

Just as for other Viking garments, the archaeological evidence is fragmentary, and the scholars do not agree on the interpretation of what little evidence exists. My intention with gathering different archaeological facts and interpretations is to make my own best guess, which of course may differ from yours :-)

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Facts: Archaeological evidence

Birka

The excavation of Birka was mainly conducted in the 1870s by Hjalmar Stolpe. Although Stolpe made fairly accurate drawings of the different graves, textiles was not considered to be important at the time, and was omitted from the drawings. The textile fragments were later analysed by Agnes Geijer (in 1938) and reanalysed by [Inga Hägg](#) (in 1974 and 1986). I have only had access to the analysis written by Inga Hägg in 1974 and a few of her later summaries.

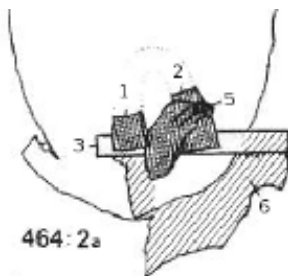
The material found in Birka is from the 9th and 10th century. Of the 128 graves with "tortoise" brooches over a hundred contained fragments from the smokkr. Unfortunately the "hard facts" of the archaeological evidence is nowhere near as hard as we would like it to be when it comes to the smokkr. The main difficulty lies in identifying which fragments definitively belong to the smokkr and not to a mantle, or a dress worn between the serk and the smokkr, or some other garment worn by the buried women. Thus there is a certain amount of interpretation even when sorting out the "facts".

The majority of the clearly identifiable smokkr fragments are remains of small fabric loops that once were used to fasten the smokkr to the brooches. Attached to a few of these are fragments that must be from the body of the dress itself. Most of the loops are unattached however, and in these graves identification of smokkr fragments (aside from the loop) must be made based on *where* the fragment is found in relation to the different layers in the grave. Geijer and Hägg differ in their willingness to do this.

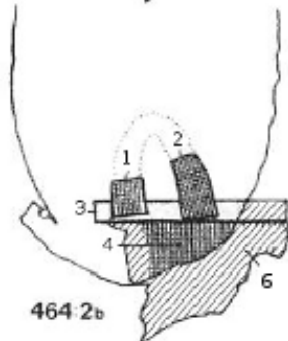
Lining

There is some evidence indicating that the smokkr could have been lined.

One of the graves containing such evidence is grave 464 (fig. 464:2b). Attached to the remains of a linen loop (1-2) was a fragment of fine dark blue wool (6). The wool had a linen fragment (4) lying against its inside and a silk band (3) had been folded over the top of both fragments (like a bias tape). The woman in this grave was probably wearing a blue woollen smokkr, lined with linen and decorated with a silk band along the top of the dress. A small fragment of linen from the serk (5) was lying on top of the loop, indicating that at least in this case the smokkr had been worn directly over the serk (fig. 464:6). The top of the silk band, and thus the top of the smokkr, reached about 2 cm up into the brooch. This means that the front loops of the smokkr was fairly short and would have been completely covered by the brooches.



464:2a

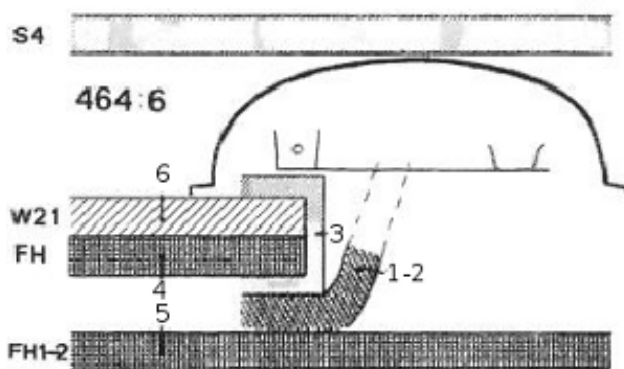


464:2b

464. På flera ställen i spännet fanns slätt linne från särken. Vid nålfästet fanns en linneögla (mitten saknas) från kjolens framstycke. Under öglans fästepunkter skymtade ett sidenband (3). Öglans ena fästepunkt (2) var delvis täckt av ett löst, lätt hoprynkat särklinnefragment (5). Fragmentet, som var hårt av rost, mjukades upp i svag EDTA-lösning och destillerat vatten, varefter det kunde lyftas så att hela det bevarade sidenbandet blev synligt, 464:2 b. Detta visade sig kanta ytterligare linnefragment (4) upptill. Under hele 4 låg ett ansenligt stycke (6) av fin, blåsvart yllekypert, W21, med avigsidan in mot linnefragmentet och rätan ut mot dräktens and framsida. Yllekyperten fortsatte ensam en bit ut över brättekanter. Den avslutades uppåt av en mot avigan vikt, ca 4 mm bred kant.

Sidenkantbandet tycktes, så långt det var bevarad, ligga vikt också kring kypertstyckets övre kant så att kanterna till linnefragmentet (4) och kypertfragmentet var samlade under ett och samma kantband av siden. I och genom detta band var hängselkjolens ögla (1-2) fäst. Det hophållna stycket av sidenband, linne(-foder) och yllekypert har nått ca. 2 cm upp bakom spännbucklan.

Det större av de fragment (utenför spännbucklan), som Geijer beskriver, har två vikkanten, som bildar ett hörn, medan övriga sidorna är avnötta eller avslitna snett mot vävens riktning. Den övre av dessa oavslutade kanter passar ganska exakt mot den kant, som yllekyperten under höger spännbuckla vänder utåt, 464:5. Hörnstycket har tydligan legat uppvikt ett par, tre centimeter runt högra brättkanten mot spännbucklans skal.



Hängselkjolens linneögla kring nålfästet i ena spännbucklan var alltså fäst i ett linnefodrat, sidenbandskantat stycke av fin, treskaftad yllekypert (W21). Detta stycke bör då rimligen vara en rest av själva kjolen, eller, rättare sagt av ett av de ögleförsedda stycken, som bars utanpå särken. Ytterligare fragment från denna kjol finns bevarade, några tillsammans med ock närmest inntil rester av den bronskedja, i hvilken kniven var upphängd. Kedjan bör ha legat direkt mot (särkens och) kjolens bröststycke (464:6).
Inga Hägg: Kvinmodräkten i Birka, p.39-40, illustrations p. 121

Av de fragment från framstyckets övre kant, som har bevarats, finns troligen ett enda hörnstycke, nämligen det från grav 464. Ca 4 cm utanför spännbucklans kant har detta stycke slutat med en vertikal kant. Om den enbart varit nedfällad mot avigan eller om den anslutit till ett annat stycke (bakstycket), framgår inte av fragmentet.

Inga Hägg: Kvinmodräkten i Birka, p.54



464:5

The grave contains several other fragments of the dark blue wool. One that seems to have been torn off from the brooch fragment is folded along two sides, creating a corner about 4 cm outside of the edge of the brooch (464:5). It is unclear whether the vertical edge of this corner was hemmed or if it was fastened to another piece of the smokkr.

There are loose stitches on this and other fragments that probably used to fasten a lining, strengthening the indication that this smokkr was lined. Fragments of the dark blue wool were also found attached to a bronze chain and knife hanging from the brooches, indicating that the

smokkr at least was long enough to reach to the hip.

The evidence for lined smokkr is very limited. This could indicate that few smokkr were lined, but the scarcity of evidence could just as well be explained by the difficulty in deciding whether the fragments belong to a lining, an inner smokkr or a serk. Also, a lining is closer to the body and thus more likely to deteriorate.

Of the more than 100 graves with smokkr fragments, Inga Hägg describes 36 in detail in "Kvinnodräkten i Birka". Several of these graves contain fragments that probably stem from an inner dress or lining in addition to remains of a woollen smokkr. Almost all of the inner dresses or linings were made from linen (grave 464 is an example), but one grave (973) had a broken lozenge twill smokkr with a lining of repped wool. Here the twill and the repped wool lay parallel until they met at the edge of the smokkr and the seam was covered by a string. There is also one grave (954) that contained a woollen smokkr fragment with loose stitches which both Agnes Geijer and Inga Hägg interpreted to mean that the smokkr originally was lined, but there are no traces left of the lining itself.

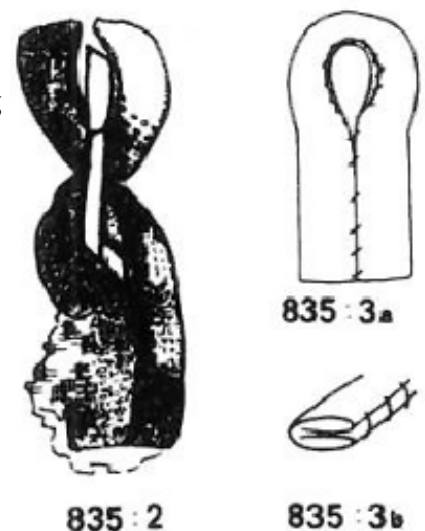
The fragments of lining are too small to ascertain whether the smokkr was fully or just partially lined, although Geijer leans towards a partial lining.

Fabric loops

The smokkr was fastened to the brooches with loops made from folding a strip of cloth and stitching over the edges. Unfortunately the loops at both top and bottom of the brooches tend to be torn at the edge of the brooch or at the top of the loop. Thus the archaeological material doesn't tell us how long they were. Nor does the report from Inga Hägg give any details on their width.

The stitching could run along the side or the middle of the loops. The loops from grave 835 were stitched along the side (fig 835:3b), while grave 465 (illustration below) contains at least one loop with stitching along the middle. Hägg points out that side stitching might result in a stronger loop, because the fabric is folded in four layers instead of the three layers of a middle stitched loop. Sometimes the loops contained an inner core of a stronger fabric. This is the case for several of the silk loops where the silk is covering a linen core.

The loops that have been found attached to smokkr fragments are open from the part that lie around needle until the base at the edge of the smokkr. The one exception is the front loops (at the bottom of the brooches) in grave 835 which were sewn closed, except for a couple of cm at the end (fig. 835:2 and 3a). The back loops were torn, and so we don't know whether the same treatment was given to the loops that once ran over the shoulder.



835. Långa sidsömmade öglor av yllerips, W22, upptill och nedtill i båda spännbucklorna. De från kjolens framstycke är sammansydde mitt fram till verkliga hängslen och enbart ett par centimeter har lämnats som öppna öglor.

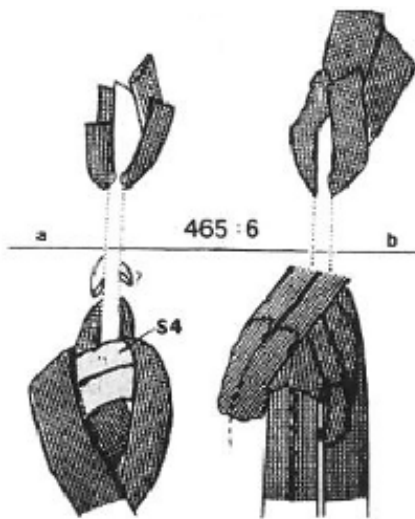
Inga Hägg: Kvinnodräkten i Birka, p.45, illustration p.130

I de bevarade exemplen är kjolens öglor öppna från den del, som ligger kring nålen, ned till basen, där kjolen tar vid. Ett undantag från denna regel är ylleripsöglarna i grav 835.

Inga Hägg: Kvinnokläder i Birka, p.54

Loop fragments are found in 105 graves in Birka. The majority of the loops were made from linen. Only 14 graves contain one or more woollen loops and 22 contain one or more silk loops.

Unlike grave 464 with its single linen loop at the bottom of one brooch, the large majority (70 of 105) of the graves have at least one brooch with several loops at either the top or bottom of the brooch, or both. One example of such a grave is 465. Each brooch in this grave has 2 loops at the top. One of the brooches has 3 linen loops at the bottom; the other has 2 or possibly 3 linen loops plus 1 silk loop (S4) at the bottom. The longest of the linen loops at the bottom of brooch I (465:6 b) continued down to the edge of the brooch. Inga Hägg believes that this and the silk loop at the bottom of brooch II was used to hang tools like scissors or other decorative items from the brooches, and thus was not part of the smokkr. This still leaves two loops at the top and two at the bottom of each brooch.

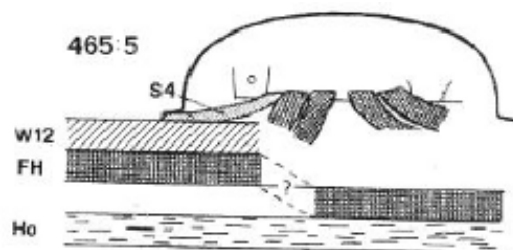


465. Spännbuckla I, 465:6 b: innerst kring nålhållaren sitter en ögla av relativt grovt linne och utanför den en annan av finare linne. Kring nålfästet finns minst tre linneöglor, varav en med tydlig mittsöm. Spännbuckla II, 465:6 a, har 2 linneöglor kring nålhållaren, den ena av (numera) blått linne. Vid nålfästet finns 2-3 (?) linneöglor hårt inkapslat i korrosion samt ett sidenband.

Från graven kommer ett par lösa fragment av yllekypert, W 12. Ett stort stycke av samma W 12-kypert finns bevarat i utsprungligt läge, pressat mot förmultnade trärester från gravens botten, 465:1. Trästycket form visar tydligt, att det med vidhäftande textilier ursprungligen legat under ena spännbucklan. Detta stycke yllekypert, avslutat med en rak vikkant, är på mitten täckt av en kraftig rostutfällning av samma slag, som den över och runt nålfästet i spännbuckla II. Om man passar in yllekypertfragmentet under spännbucklan efter formen på trästycket, kommer rostutfällningarna

att täcka varandra, 465:1. Kypertfragmentet hamnar med vikkanten ca 3 cm upp i spännbucklan i samma läge, som kypertfragmentet från föregående grav. I själva verket måste ylletyget även i detta fall härröra från kjolens framstycke, 465:5.

En linneögla kan, liksom i grav 464, antingen ha varit fäst i ett foder eller eventuellt direkt i kypertstycket. Den längsta av öglorna kring nålfästet i spännbuckla I, 465:6 b, bör ha fortsatt över brättekanten på kjolens framsida, där det förmodligen burit upp sax, kniv och/eller kam. Sidenbandet vid nålfästet i den andra spännbucklan är antagligen också bärband för ett redskap, eventuellt för den pryl som fanns i graven.



De övriga två öglorna nedtill i varje spännbuckla korresponderar mot nålhållarsidans två öglor och torde därmed ganska säkert kunna antas komma från kjolen. Den ena av dessa öglear hör då rimligen till den yttre kjolen av yllekypert (W 12), medan det andre paret möjligen kan sättas i samband med det linnefragment, FH, som skyntar under yllematerialet på 465:1. Det är givetvis också tänkbart, att linnet i detta fall härrör från serken.

Inga Hägg: Kvinnokläder i Birka, p.42-43, illustrations p. 121

Colour

The *woollen* fragments from the graves are currently fairly darkish in colour and discoloured by rust or by the decomposition of the body in the grave. Inga Hägg doesn't mention which tests (if any) has been used, but states that it is very difficult to identify what the original colours of the woollen fragments were. The two colours that can be identified is dark blue and dark brown (Inga Hägg 1974 p 52). In addition, one of the graves (1090) contains fragments of what might have been a woollen smokkr made from a striped fabric, with blue and reddish brown 5 mm wide stripes, and possibly decorated with a tablet-woven woollen band.

1090. Öglor kring nålhållare och nålfäste i båda spännbucklorna. Materialet i öglorna är tuskaftat ylle. Fragment av vad som kan vara en linneögla finns dessutom i den ena spännbucklan.

Från samma grav kommer lösa stycken av ylleväv. Båda yllesorterna är tuskaftada, den ena, W 28, är en mörkblå ripsväv. Den andra, W 33, beskrivs av Geijer som randig i två färger, blått och rödbrunt, ränder ca 5 mm breda. Till detta fragment hör enligt Geijer vad möjligen kan vara ett brickvävt prydnadsband av ylle. Spännbucklornas öglor ser snarast ut att vara av det senare slaget, W 33, och det är därför kanske rimligt att tänka sig, att det av Geijer beskrivna kulörta fragmentet med ränder och prydnadsband skulle vara en del av kjolen.

Utom dessa textilier finns även bevarade en del lösa linnefragment tillsammans med rester av revben. Det är dels kantstycken med fällvirkning och söm, dels delar av öglor. Dessa fragment skulle möjligen kunna härröra från ännu en kjol (öglor med rester av framstyckets övre fällkant under någon av spännbucklorna), nämligen den inre omlottkjolen, som då skulle ha varit av linne.

Inga Hägg: Kvinmodräkten i Birka, p.48

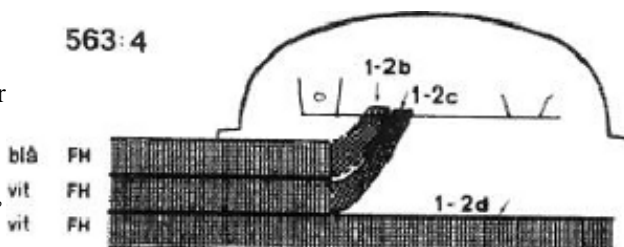
Most of the *linen* fragments appears to be undyed, but there is at least one exception. Grave 563 contains a blue linen fragment that has been folded and decorated with a red twined string. The appearance of blue and red on the same fragment, which thus has been exposed to the same discoloration, shows that the colours must be original instead of a result of metal corrosion.



563. I ena spännbucklan fanns linnefragment i flera lager (*fig 1-2a*). Sedda från dräktens framsida består dessa av blått linne i 3-4 skikt (troligen et avsnitt av kantfällan), det yttersta prytt med en röd snodd (*563:4 1-2b*). Fragmentet tväras av 3 å 4 efterstygn. Det blå linnen låg utanpå en ursprungligen vit (?), nu rostfärgad linneögla (*563:4 1-2c*), vars övre del fattas. I öglans nedre del fanns ett par nära nog upplösta stygn, som troligen anknutit öglan till kjoldelen, *563:1-2c*. Innerst låg et lite stycke rostfärgat, ursprungligen vitt (?) särklinge utan annen forbindelse med de övriga textilierna än själva korrosionen (*563:4 1-2d*).

Den andra spännbucklan har rester av samma blå linne, som lager 1 i foregående, här i en ögla. Över den, dvs innanför denna ögla i drakten, fanns rester av ljust, rostfärgat linne, av samme kvalité som (*den rostfärgate öglan i den andre spännbucklan*). Troligen rör det sig även här om resterna av en ögla.

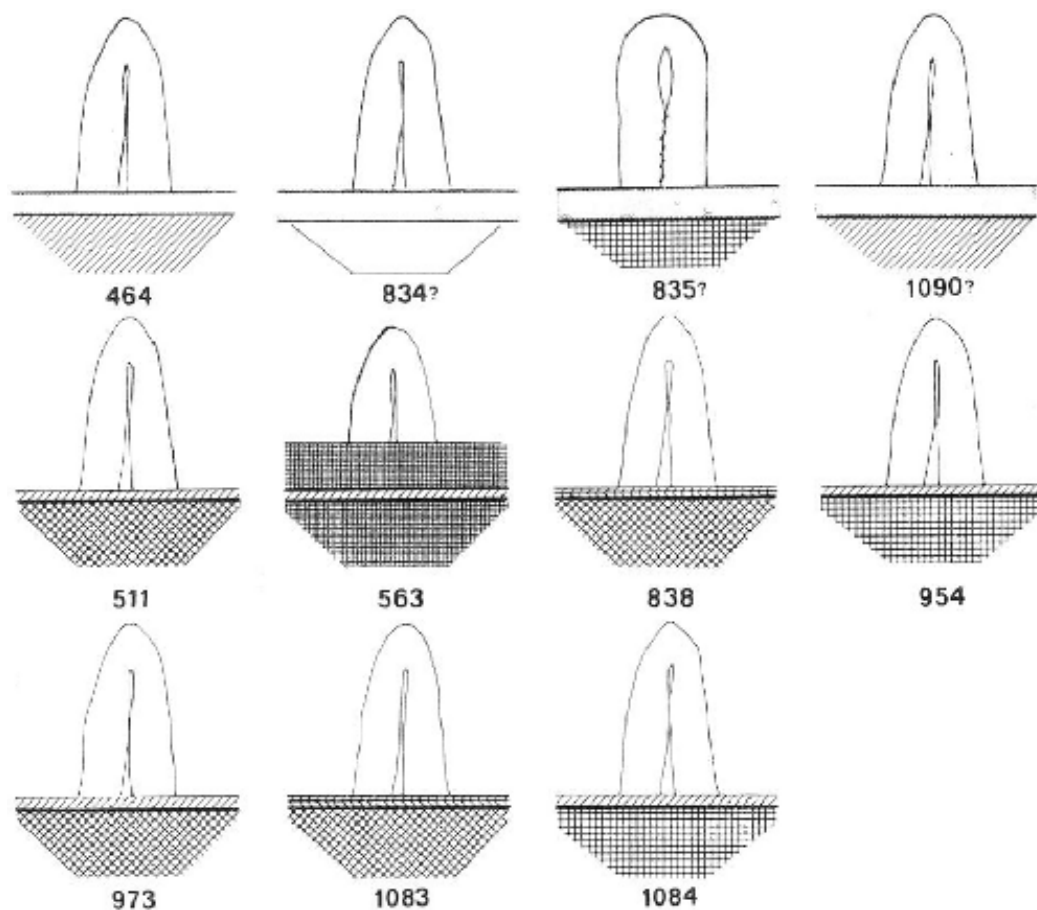
Inga Hägg: Kvinmodräkten i Birka, p.44, illustrations p. 125



Decoration

The top of the smokkr seems to have been finished by having 4-5 mm of its edge folded towards the inside of the dress and stitched in place. In addition 11 graves show traces of decorative bands of one type or another. The bands of the 9 woollen smokkr are folded over or lie along the top of the smokkr. The decorative band on the linen smokkr (563) is placed a bit beneath the top, where it covers both the stitches that keep the hemmed edge in place and the fastening stitches for the loops. Inga Hägg comments that the hemming stitches would usually be invisible on wool, but would show up clearly on linen. She believes that the reason that the band has been placed lower on the linen smokkr could be to cover the stitches.

There were no smokkr fragments attached to the loops in grave 834, and it is unknown whether the smokkr in this grave was made from wool or linen. Fragments of rough linen cloth were found around a scissor, but it is uncertain whether these stem from the smokkr. A decorative band lay unattached across the bottom of the needle in one of the brooches. It may have run along the edge of the smokkr as shown in the illustration below, but could also have been fastened further down.



- 464: woollen smokkr, a silk band folded over the top of the smokkr
- 834: unknown material in smokkr, a silk band is found at the bottom of the brooch, it may have been used to decorate the smokkr
- 835: woollen smokkr, remains of a silk band under the linen loop. Possibly decorating the top

of the smokkr, or possibly used to hang tools

- 1090: woollen smokkr, possible remains of a tablet-woven woollen band
- 954: woollen smokkr, a wool string
- 511, 973, 1083, 1084: woollen smokkr, a string (no info on whether it was made from linen or wool)
- 563: linen smokkr, a red string (no info on whether it was made from linen or wool)
- 838: woollen smokkr, a braided string (no info on whether it was made from linen or wool)

Inga Hägg: *Kvinnodräkten i Birka, illustration p.53*

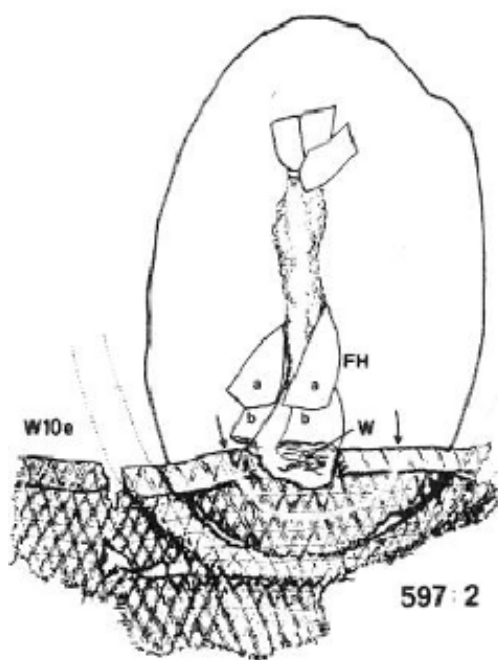
Shape

Unusually large fragments of woollen cloth had been preserved in grave 597.

There were woollen fibres on the lower of the linen loops found inside one of the brooches. One of the fragments of woollen cloth found in the grave had press marks and traces of wear from the edge of a "tortoise" brooch, indicating that it had been worn on the inside of the brooch and thus was a part of the front of the smokkr. The upper edge had been folded, and a piece was missing at the position where the loops would have been fastened (597: 2).

The fragment had been torn at both sides, but one of the tears fitted closely to another large fragment of the same cloth, together creating the largest preserved piece of a smokkr in the Birka material (597: 3). Its 22 cm long preserved edge would have run along the front of the smokkr, from one brooch to the other.

The grave also contained a piece of the same woollen cloth underneath remains of the body, probably from the back of the smokkr, if the layering of the grave has been interpreted correctly.



597. Öglor av linne kring nålhållaren i båda spännbucklorna och kring nålfästet i den ena. Vid änden på den undre av nålfästesidans öglor syns trådar och fibrer av ylle (W) från den vävnad, vid vilken öglan varit fäst, 597:2. I graven fanns för övrigt ovanlig store stycken av yllekypert. De har alla lossats från spännena ved tidligare tillfällen och i görligsta mån slätats ut, dock inte så att karaktäristiska veck, missfärgningar och nötningmärken gått förlorade.

Ett stycke diamantkypert (W10) är fargat av rost och har tryck och nötningsspår efter kanten på ena spännbucklan. Nära mitten på stycket fattas en del av fällkanten. När dette stycke passas in under spännbucklan, 597:2, kommer spännets undre linneöglor att hamna mitt för det ställe, där en del av fällkanten fattas. Antagligen är det just från detta ställe, som yllefragmenten nedentill på öglan härrör. Styckets läge under spännbucklan antyder, att det bör vara en del av kjolen framsida, 597:4.

Troligen i närheten av spännbucklorna låg, enligt Geijer, en klump med textilier och annat organisk material. Den innehöll förmultnade rester av kroppen och ett stycke W 10 av samme kvalitet som det i ena spännbucklan.

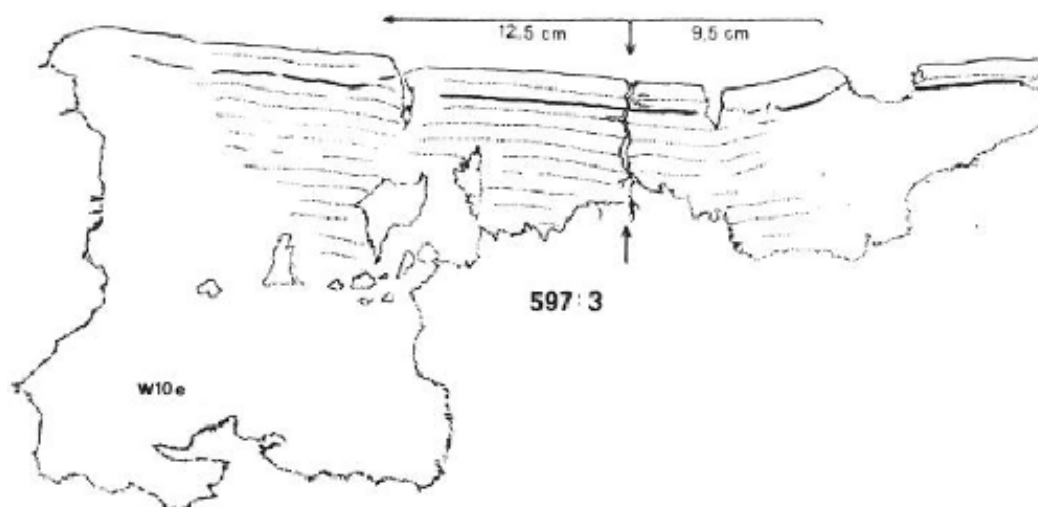
Därnäst följde lämningar av ett ytterplagg m.m. Lagerföljden visar - om den er rätt uppfattat - att det måste röra sig om ett avsnitt från dräktens rygg sida. Detta W 10-fragment bör alltså komma från kjolens bakstycke.

Det stora stycket diamantkypert, 597:3, t.v., torde vara identisk med det ena av de två fragment, som enligt Geijer täckte ovarsidan på den ena spännbucklan. En noggrann jämförelse mellan detta stycke och de andre W 10-fragmenten från graven visar, att det och kantstycket, 597:2, måste härröra från ett och samma plagg, alltså kjolen.

Material från kjolens framstycke har med andra ord kommit att hamna på skalet till den ena spännbucklan, och det bör ha skett på så sätt, at spännan under förmultningen sjunkit djupare ned än omkringliggande tyglager, i vilka de bäddades in. Särskilt om kvinnan legat något på sidan i graven, vilket läget på spännbucklar och pärlor eventuellt antyder, kan det känn ha inträffat, att en del av kjolens framstycke vikts in över skalet på ena spännbucklan.

En detaljgranskning av väven och dess söndertrasade kantar visar, att de båda styckena har passning som 597:3 visar. De utgör tillsammans det största bevarade avsnittet av kjolen i hela birkamaterialet med sammenlagt 22 cm.

Inga Hägg: Kvinmodräkten i Birka, p.44, illustrations p. 126



Haithabu

Various excavations of the former Viking settlement of Haithabu, near Schleswig Holstein in Germany, have yielded a large amount of 10th century textile material. A majority of the preserved fragments were found in the harbour, and had once been clothing that had been torn up, coated with tar, and used as ship's caulking ([Hägg 1984](#)). Excavations also uncovered textile fragments from the settlement and graves of Viking Haithabu ([Hägg 1991](#)).

Due to the presence of tar, Haithabu harbour yields unusually well preserved textile fragments. However, the harbour finds provide no information on the position of each fragment on the body. Thus, identification of which garments each fragment belong to are based solely on their shape. Each garment that can be identified however, provide a fascinating glimpse of how everyday clothing may have looked.

Many of the garments found at Haithabu appears to have been cut to fit the body. Hägg (1984, p.

214) points out that not only does each garment fill a specific function, but the tailoring craft have grown even more advanced. Patterns are no longer solely based on the rectangular fabric coming off the looms, but instead uses pieces cut on the diagonal, in curved shapes etc. in order to create garments tightly fitting the body. The many remnants of cut-offs confirms the impression of more sophisticated cuts and shaping.

De många efter kroppens former snävt skurna plaggen i Hedeby, t.ex. skjortan och byxan i mansdräkten eller tunikan och hängselkjolen i kvinnodräkten, visar att den dräkthistoriska utvecklingen nu nått en nivå, där dräktens olika delar genom tillskärning och sömnad givits olika, mycket bestämda funktioner. <...>

Klädesplagg, som huvudsakligen är sammansydda av större och mindre fyrsidiga tyglängder kan i och för sig vara funktionsbestämda, men kan inte betecknas som produkter av en avancerad tillskärarkonst. I sådana fall baserar sig mönstret på den i vävstolen givna formen. När emellertid inte de fyrsidiga och rätvinkliga tyglängderna bildar utgångspunkten för mönstret utan kroppens former, så att stoffytorna måste skäras till på diagonalen, i bågform, i kilstycken osv. uppkommer en i princip helt ny uppbyggnad av snittmönstret. De här analyserade mönstren vittnar om stor erfarenhet i tillskärningskonsten: såväl fastheten som elasticiteten, olika på tygets olika ledder, har utnyttjats maximalt i hängselkjolen, att döma av de bevarade fragmenten (Nr. 14A-B). <...>

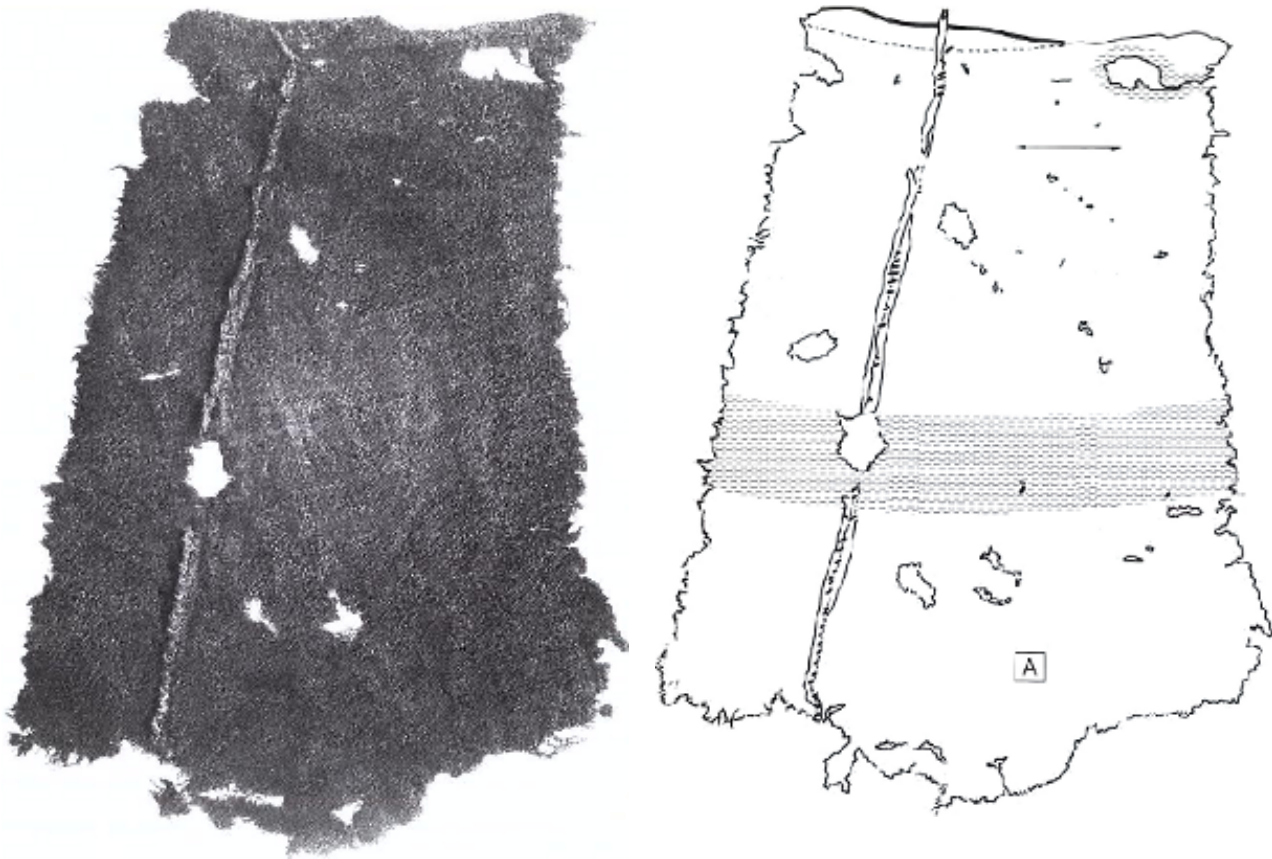
Exemplen av detta slag är många, de här anförda torde räcka till för att visa, att dräkten i Hedeby befunnit sig på ett högt utvecklat stadium. De många resterna av tillskärningsspill bekräftar detta intryck.

Hägg 1984, p. 214

The aprondress (smokkr) from the harbour

The harbour yielded two large fragments of fine repped wool that had been dyed brown (Hägg 1984, p. 38). These were identified as potentially belonging to a smokkr.

The largest fragment (**H14A**) is 30 cm high, 16-23 cm wide and 0.1 cm thick. The fragment is roughly wedge-shaped with one side that has been cut in a straight line, and one that curves slightly. Both sides have stitch holes, thus confirming that the fragment was originally attached along the sides to other pieces of the garment it was a part of.



Illustrations from Hägg (1984, p. 39)

The upper edge (16 cm) has been created by turning over 1 cm of the selvedge towards the inside and stitching it in place with "Ösenstich". There is a hole (2.5 x 1 cm) close to the top, surrounded by a felted area. The bottom edge (23 cm) is torn (Hägg 1984, p. 38).

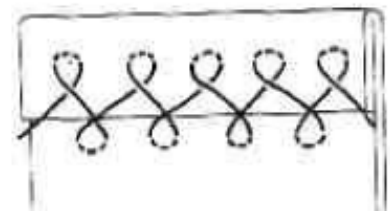


Illustration from Hägg (1984, p. 150)

A dart (26.5 cm long) runs parallel to the straight side of fragment A, from 7 cm below the upper edge down to the tear at the bottom. Unlike modern garments, the ridge of the dart appears to be on the outside of the smokkr. The width of the dart varies (2-5 mm), and the widest point is about 15 cm below the top edge. Here the garment shows traces of wear; the cloth is felted in a band across the garment and a hole has been worn through at the dart.



A thin piece of braid has been stitched in place on top of the ridge formed by the dart on **H14A**. The braid extends beyond the dart up to the top of the smokkr. It has deteriorated considerably but appears to be 1-2 mm wide, made of six two-ply threads (Z-spun, S-plyed), three red and three yellow (Hägg 1984, p. 38).

Illustrations from Hägg (1984, p. 39 and 41). Red line added to illustration of braid for emphasis.

The other fragment (**H14B**) is 12 by 25 cm and is torn at both the top and the bottom. One of the side edges has been preserved, complete with stitch holes (1). The other side is less preserved, and there is no stitch holes. Traces of the dart (2) remain, although not of the braid. This fragment is wider than **H14A**, leading Hägg (1984, p. 38) to postulate that it would have been positioned a bit lower on the body.



Other smokkr remains from Haithabu

Only 1% (16) of the examined graves at Haithabu graveyard contain "tortoise" brooches. This is a clear indication that while the smokkr was still in use, it was definitively not the only type of garment worn by the Haithabu women (Hägg 1991).

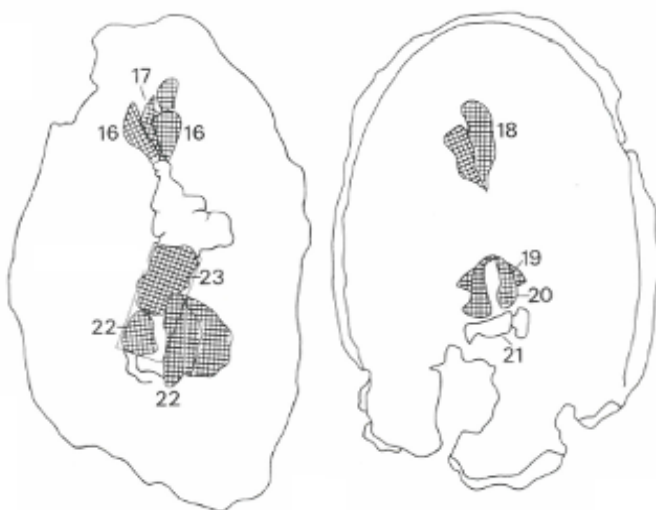
The only fragments from the Haithabu graveyard that can be clearly identified as belonging to a smokkr is the loops, usually made from a fine linen cloth (e.g. grave **159/1960** and **182-185/1960**). In addition grave **159/1960** contain fragments of a two-shaft woollen cloth that may have come from the smokkr, if the layering of the grave has been interpreted correctly (Hägg 1991).

Av hängselkjolen finns bara bandöglorna från hängslene bevarade (t.ex. grav 159/1960 og [182-185/1960](#)) och små fragment, om vilka man inte med säkerhet kan säga att de verkligen härrör från kjolen. Bandöglorna är mycket fina (...), i regel av linne. Av vilket material övriga deler av kjolen bestod är oklart. En ripsartad tuskraftsväv av ylle från grav 159/1960 (...) kan, av mikrolagerföljden att döma, möjligen härröra från hängselkjolen.

Hägg 1991, p. 277 (illustration numbers removed or exchanged for grave numbers)

Grave 159/1960

A girl was buried with two oval brooches, a rectangular bronze fibula and a knife with a leather sheath and wooden handle. There were several textiles in the grave, but here the focus will be on possible smokkr loops.



Both oval brooches had loops made from a smooth linen tabby and loops of a tabby with stripes made by alternating between z- and s-spin in the warp threads. There were at least three loops in each brooch, possibly more (Hägg 1991, p. 135-148).

Illustration Hägg 1991, p. 143

The right brooch had one thin loop of tabby-woven linen (18) at the top of the brooch and two at the bottom (19 and 20). There was a third band (21) that lay across the needle. However, this band is made of a material that is probably taffeta silk

(untwisted weft threads, dense weave and glossy surface), which together with the transverse position makes it likely that it was sewn along the upper edge of the smokkr as decoration. A loose fragment of an iron needle that probably belongs to the brooch has preserved a part of a linen band (**159:27**), with warp threads that alternate between z-spun and s-spun.

The left brooch had two thin loops of finely woven linen tabby (16 and 17) at the top of the brooch and a wide, particularly fine loop (22) from a fabric with warp threads that alternate between z- and s-spun, at the bottom of the brooch, underneath a fragment (23) probably belonging to a linen serk.

Finally, there are some loop fragments that have been detached from the brooches and stored separately. One of these (**159:25**) have remains of stitches along one side, another (**159:24**) have the same alternately z-spun and s-spun warp threads as mentioned above. However, it is uncertain which of the brooches these fragments belonged to.

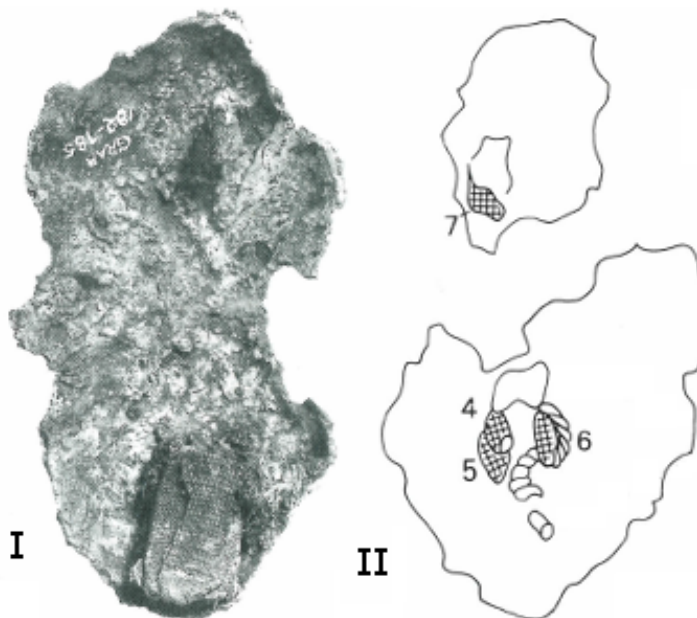
Grave [182-185/1960](#)

Woman's grave with two oval brooches. There were several textiles in the grave, but here the focus will be on probable smokkr fragments.

Brooch I has a loop (**182-185:3**) of very fine tabby weave at the bottom. Brooch II is very fragmented, but the bottom of the brooch has two remaining loops (4 and 5) of a similar fine weave, in addition to a cord (6) of 6-8 z-spun threads in s-ply that may have been used to hold beads. Traces of a strap (7) in tabby weave lie by the broken needle holder in brooch II (Hägg 1991, p. 148).

Illustration Hägg 1991, p. 149 and 151, slightly modified.

In addition, there is a part of a linen band detached from one of the brooches (**182-185:12**). The band is 7 mm wide and has seam along one side. The fabric is very fine, possibly blue, with tightly woven individual (currently) red threads in warp and weft, which together form a check pattern. A part of this band is rusted onto (**182-185:13**) a second, loose, needle fragment, on which there are also traces of shirt linen (**182-185:14**). Similar fabric remnants, small but recognizable, adhere to two other needle remnants.



Von einer der Fibeln abgelöst ist auch ein Bandrest (182-185:12; z 29 F/10 mm x z 8 F/5 mm) mit Seitennaht. Die Breite beträgt 7 mm, das Gewebe ist sehr fein, eventuell blaufärbig, mit engewebten einzelnen (jetzt) rotfarbenen Fäden in Kette und Schuß, die zusammen ein Karosmuster bilden. Ein Teil dieses Bandes ist an ein zweites, loses Nadelfragment angerostet (182-185:13, z 8 F/3 mm x z 4 F/2 mm), auf dem außerdem Spuren von Hemdleinen (182-185:14, z 8 F/4 mm x Z 6 F/5 mm) erhalten sind. Ähnliche Stoffreste, klein, aber doch erkennbar, haften an zwei weiteren Nadelresten.
Hägg 1991, p. 152

Køstrup

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. Among other things, the grave held two tortoise brooches, eight beads and an iron knife with sheath. The grave goods indicate that the grave is from the 10th century ([Lindblom 1993](#)).

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](#)).

Odense Bys museer very kindly allowed me to examine these textiles in 2012 and 2015. In this article I focus solely on the woollen smokkr, however more details of the find can be found in my [article on the Køstrup find](#).

The woollen 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 islæt. 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 gaufferet stykke, der har siddet midt mellem fiblerne, velsagtens for at give kjolen vidde. Gaufferingen 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).

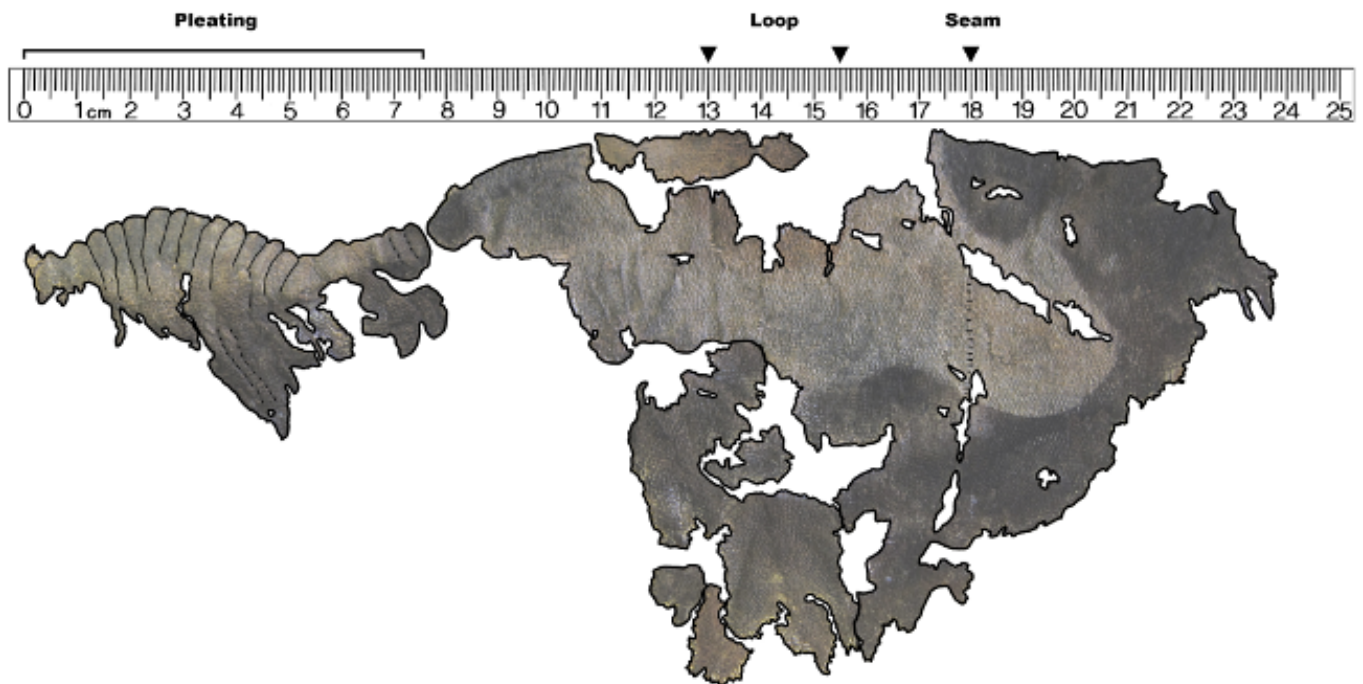


Overall shape of the fragment

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 **x520**
broken in Woollen tabby, 21/13 threads per cm, Z/Z, lower part of the loop
two and has (Wielandt 1980).
a x-number
for each part *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.

A linen band

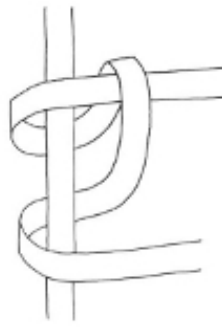
A strip of linen tabby (22/22 threads per cm) had been folded so the resulting band was four layers thick and 0.4 cm wide. This band loops twice around the pin at the bottom of brooch x505, and was clearly put on before the woollen smokkr loop (**x569**) was threaded onto the same pin (Wielandt 1980,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

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 (Wielandt 1980, 194).

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 iakttages, 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 \(610 KB\)](#)

Two wool strings were running along each side of the tablet woven band (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).

Pskov

A woman's grave from the mid-10th or early 11th century was excavated in Pskov by Elena A. Yakoleva. Later, Elena S. Zubkova, Olga V. Orfinskaya and Kirill A. Mikhailov published a [report](#) on the finds in 2010. As English is not the first language of the authors (or me), some of the details in the report are hard to interpret. Any errors in the summary are (as usual) my fault only.

The grave had been plundered and no traces of a body remained. However, a block of soil was recovered from under the floor of the grave, containing several textile fragments, two "tortoise" brooches and the remains of the base of a birch-bark container reinforced by wood. In all probability, the textiles had been stored inside this container before being placed in the grave. This had protected the textiles from the deterioration of the body, and allowed more than usual of the surface of the garments to be in contact with the preservative metal of the brooches. On the other hand, there was no information to be gleaned from the position of the fragments in relation to the body, something which makes it harder to determine what garment(s) they belonged to.

The report mentions that there were 11 fragments of thin blue linen tabby and silk (unfortunately it doesn't list them). Although the linen was heavily degraded and mostly present as a black crust, the archaeologists were able to determine that it had originally been folded in several layers and made up the main bulk of the fabric inside the container. The silk fragments were covered on the reverse side by a thin layer of degraded linen, with the exception of the tucked in edges and connecting seams. Together with traces of sewing threads, this strongly indicated that all the silk parts originally were sewn onto linen as decoration.

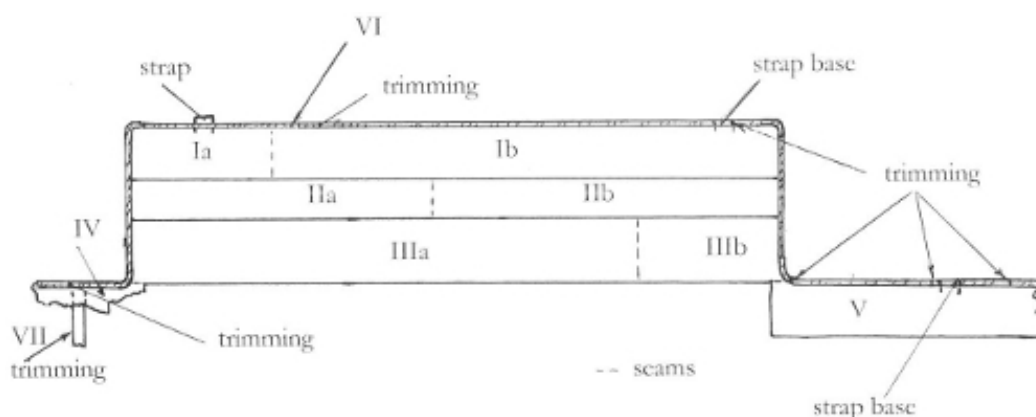
After examining the fragments, Zubkova, Orfinskaya and Mikhailov concluded that they had come from two separate linen garments faced with silk. In the following I will concentrate on the fragments that may have come from a smokkr or a smokkr-like garment.

The largest fragment from the grave had a total length of 1,5 m and a total width of more than 30 cm. It consisted of several strips of silk that had been stitched together. All of the silk strips were of the samite type, but there were three different qualities.



[Photograph of the Pskov fragment](#)

The upper (I) and lower (III) band, and the side bands (V and IV) were made of a samite with a golden-pink pattern on a blue background with green bands. The middle silk band (II) was made from a reddish-violet samite. A similar reddish-violet fabric was used for trimming the edge of the fragment, except for Ib that had been trimmed with an unidentified silk samite. In addition, there was a small strip of silk (VII) sewn onto one of the side bands. The colour was impossible to identify although the archaeologists theorize that it might have been made from the same reddish-violet samite silk as II. They believe that it might have covered a vertical seam.



Elena S. Zubkova, Olga V. Orfinskaya and Kirill A. Mikhailov: Studies of the Textiles from the 2006 Excavation in Pskov, p 294 and 295

When examining the golden-pink patterned silk strips, Zubkova, Orfinskaya and Mikhailov were able to recognize the pattern as part of a hunting scene showing Bahram Gur, who ruled Persia in the 5th century.

Fabrics with a similar (although not identical) motif are known from finds throughout Europe. In Russia, silk textiles with a similar design are known from Moshchevaja Balka and Nizhnij Archyz, two burial grounds in the northern Caucasus that were in use during the 8th and 9th centuries (which may give a place to start further work on discovering exactly when and where the Pskov silk piece was manufactured).

Whoever cut the Pskov silk strips appeared to have done so with no concern for the integrity and direction of the original fabric design (they probably just liked the look of the fabric). However, the different silk strips can be pieced together to form a larger piece. The longer silk strips (III a and I b) show that the hunting scene was repeated twice on this original piece. The piecing together of the existing fragments also allows us to extrapolate some of the less preserved silk strips (IV and V).

In addition to the large silk fragment there were some 4.5 cm wide reddish-violet samite strips. These had been trimmed at one side by the same method that was used to create the trim for the large silk fragment. The reverse side of these strips were covered by remains of linen, indicating that they probably had been sewn onto the hem of one of the linen garments. If so, this is one of the few instances of evidence we have for decoration of the bottom of a Viking Age garment.



Loops

It is unclear exactly how many linen loops were found during the excavation.

<...> a second bronze oval brooch was discovered. On its pins *straps* of linen and a fragment of a collar from a garment made from a similar linen textile were preserved.

Elena S. Zubkova, Olga V. Orfinskaya and Kirill A. Mikhailov: Studies of the Textiles from the 2006 Excavation in Pskov, p 292 and 297, (my emphasis)

However, at least one of the loops has been preserved. It is made from blue linen, and roughly 1 cm wide.



There was also evidence of loops on the large silk fragment. The base of a blue linen strap remained at one side of the top band (I), and there were traces of needle holes and sewing threads (where the distance between the sewing holes was equal to the width of the preserved strap fragment) at equal distance from the centre on the opposite side.

Additionally, 20 and 25 cm from where one of the side bands (V) was attached to the central piece, there were remains of sewing threads and traces of sewn on straps. Unfortunately, there is not enough preserved of the last side band (IV) to determine whether it had one or more loops in the same position.

Minor finds

The minor finds may not have the sizeable fragments mentioned above, but they still provide additional information on the smokkr. For example, there have been found pleated remains other than the Køstrup smokkr, and several of the minor finds have more than two loops in each brooch, proving that the appearance of multiple loops aren't limited to Birka.

Værnes, Tråstad and other finds

In 1940, two graves containing brooches and smokkr fragments were excavated at Værnes. The finds were sent to the Collection of national antiquities, and was later examined by Blindheim ([1945](#)).

Værnes

The grave with the most remains (**T 16136**) contained two "tortoise" brooches of type R-657, a type of brooches that are dated to the 9th century ([Petersen 1928](#), p. 51). In addition there were, a third brooch, 17 glass and amber beads and several textile fragments.



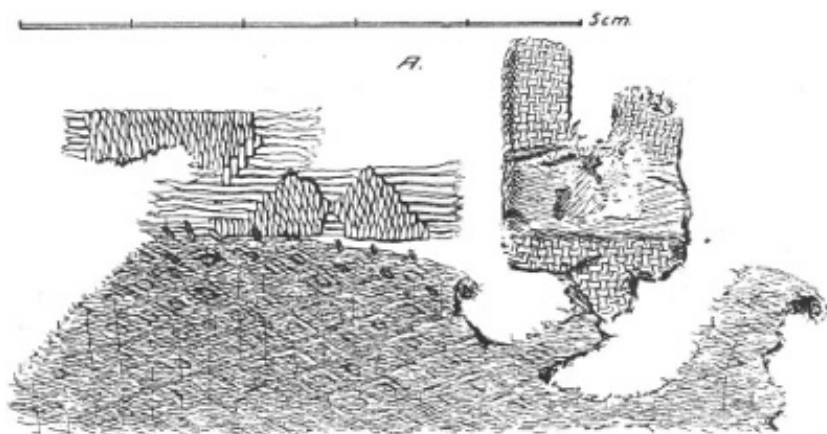
Photograph: [Universitetsmuseenes Fotoportal](#), textiles from T 16136, [large version \(1.2 MB\)](#)

Inmost in one of the brooches, there was a woollen string made from two yarn threads that had been twisted together. It had been looped around the bottom of the needle and tied around it. On top of it is another string, possibly of wool, that have been wound around the needle and tied near the needle house at the top. Further out there was a small piece of woollen diamond twill that had been folded over at one edge and hemmed, and a piece of rougher tabby, possibly linen, laying in a short loop around the bottom of the needle (Blindheim 1945, p. 144).

Illustrations: Blindheim (1945, p. 145 and PL X

In addition to the textiles still fastened to the brooch, Blindheim (1945) reports that there was a separate lump of fabric. It had two layers of diagonal twill, laid in folds, with the traces of a very rough weave inside some of them. The next layer contained several fragments of diamond twill (32 threads/cm). Two of these fragments were folded over along one edge, just like the diamond twill inside the brooch. One of these fragments had a woven band sewn to the hemmed edge by whipstitching.





This band appears to have been woven with the same technique as the tapestries from Oseberg. The full width of the band (1.1 cm, 14 threads) is preserved at one place. The weft that bound the band together has disintegrated in the grave (it was probably made from linen) and so the warp lies uncovered in places.

The pattern of the band was created by using a decorative weft in red wool which still remains, enabling us to see that the band once had some kind of geometric pattern. A similar band with a geometric motive is sewn to one of the Oseberg tapestries (Blindheim 1945, p. 144-146). A small piece of linen(?) possibly split into two narrow straps of some sort is also attached to the twill fragment.



Photograph: Universitetsmuseenes Fotoportal, diamond twill fragments from T 16136, [large version \(19.7 MB\)](#)

Lastly a lump of fabric lay on top of one of the brooches. This contained more fragments of the fine diamond twill, laid on top of diagonal twill. There was also a tiny piece of a very rough woollen fabric woven in a two colour check pattern.

Innerst mot spennens skall ligger en tvunnet snor, - nå delvis løs, men den har vært festet i en løkke om nålehodet og knyttet om dette. Snoren er tvunnet av to ullgarnstråder som begge består av fire totrådede, s-

tvunnete tråder. Tvingningen er jevn og fin. Litt lenger ute og nå helt fastrustet til nålehodet ligger det nok en snor. Om også den er av ull, kan en ikke si med sikkerhet. Den ligger som den første tråden, i en løkke om nålehodet, og endene er knyttet på oversiden av dette rett overfor nålekjeden. Utenfor disse snorene kommer det så en liten bite av et stoff som har vært brettet om og fallet, så det er tydelig at vi her har kanten av et eller annet plagg. Det er nok igjen til at en kan se at det har vært et fint ullstoff vevet i gåsøyemønster, men tetthetsgraden kan ikke avgjøres. Ytterst er det rester av et annet, noe grovere, toskaftet stoff, muligens et linstoff. Det ligger, etter det en nå kan se, i en kort løkke om nålehodet.

Den løse klumpen (*som lå inni en av spennene*) inneholdt i alt fire lag tøy, men to av lagene viste seg å inneholde ett og samme stoff - en diagonalbinding. Den lå dels i folder og inni disse lå det biter av et meget grovt stoff. Tett inntil det diagonalmønstrete stoffet lå rester av et fint ullstoff i gåsøyemønster. Tettheten er ca 32 tråder pr cm. På to av bitene er det i den ene kanten en smal fall, som den på det fine ullstoffet inne i spennen. Til det ene hefter det en liten stump av et vevet bånd som vevteknisk er ganske interessant. Det er på et sted bevart i full bredde, så denne kan fastslås, den er 1,1 cm. Som en kan se ligger renningen åpen på visse partier. Den har bestått av 14 tråder. Det er ikke bevart store biten av båndet, men nok til at en kan se at de åpne partiene kommer igjen så regelmessig at det må være gjort med hensikt. <...> Mønstret har tydeligvis vært rent geometrisk, men teknisk sett er det en vevnad av samme type som Osebergrevlene med to islettsystemer: et *bindeislett* som vel har vært av lin som nå er borte, men som ser ut til å ha gått gjennom hele båndet, og et *mønsterislett* av ull. <...>

Den tredje tøyklumpen, som skal ha ligget oppå den innerste av spennene, inneholdt flere stykker av det samme fine ulltøyet som den andre klumpen. Det største stykket lå fast presset oppå et stykke av en vanlig firskaftet diagonalkypert. Det er visstnok rester av det samme stoffet som lå i den løse klumpen. Tetthetsgraden er i hvert fall så vidt det nå lar seg avgjøre, den samme (ca. 13 tråder pr cm). Oppå disse to stoffene lå det så opprinnelig biter av en skinnfell med lange hår. Endelig lå det innerst mot spennens skall et ganske lite stykke av et meget grovt løst ullstoff - vevet i to farger i rutemønster.
Blindheim 1945, p. 144-147

According to Blindheim (1945, p. 157) the woman in T 16136 probably wore two smokkr. Due to the linen loop in one of the brooches, and the small pieces of linen found in the grave she believes the inner smokkr to be made from linen. The outer was in all likelihood made of the fine woollen diamond twill, and was held up by the twined strings and decorated with the band woven in Oseberg tapestry style.

Illustrations: Blindheim (1945, p. 145 and PL X

The other grave at Værnes (**T 16137**) contained only a pair of tortoise brooches. One of these brooches had preserved some textile fragments. Around the bottom of the needle there appears to be one or two strings, partly covered by a piece of fabric that might be a loop. However it is very hard to make out the details due to the rust.

Tråstad and other finds

The Værnes finds aren't the only ones where strings may have been used as loops for the smokkr. Blindheim (1945) examined evidence from Tråstad (**C 26936**) in Norway, where one of the brooches contained possible fragments of two straps looped around the needle in a figure of eight. One of the straps is made from fabric (linen?). On the outside of this strap are small fragments of a twined string. There is also a finer string that has been tied to the bottom of the needle.

En kan skjelve to stropper som ligger i en 8-tallsløkke rundt nålehode og stilk. En er av stoff (lin?), og



utenfor denne er det små rester av en tvunnet snor. I enden av nålehodet er det dessuten knyttet fast en meget finere snor. I graven fant en også små rester av ulltøyer i minst tre ulike kvaliteter, et fint og et grovere gåsøyemønster og en eller muligens to diagonalkyperter.

Blindheim 1945, p. 158

Blindheim also mentions that the find catalogue at the museum in Bergen describes two other Norwegian finds (**B 8953** Kirkeide, **B 9060** Hopperstad) with traces of strings that may have been used to fasten the smokkr. The finds from grave [B 9060](#) at Hopperstad is later analysed by Lukešová (2011). However, she does not mention what the numerous loops preserved inside the brooches are made from.

Unlike the finds described above, the find from Lammøya (**C 27220**) in Norway has no string mixed up with its fabric loops. One of the tortoise brooches found here has preserved several linen fabric loops. One is very well preserved, lying around the bottom of the needle. Around the needle itself there is fragments of one or two loops. There are also traces of linen at the point of the needle, indicating that the brooch held in total at least three loops, possibly more. The other brooch lacks the needle, but has traces of fabric at both ends of the brooch.

På den best bevarte spennen ligger det ved partiet omkring nålehodet rester av flere stropper av lin. En er meget godt bevart og knyttet fast til selve nålehodet. Rundt stilken ligger det rester av iallfall en, muligens to seler til. Her fins det dessuten linrester ved nåleskjeden. På den andre spennen mangler stilken, men inni nålehodet ligger det rester av noe som tydeligvis har vært en stropp (av lin?). Også ved nåleskjeden er det noen ubetydelige tekstilrester, men disse er for rustet til at en kan si om det er lin eller ull.

Blindheim 1945, p. 158

Finally Blindheim mentions two finds from Norway (**C 18436** Berven and **C 19179-85** Berg) that, according to the catalogue of finds, have tortoise brooches that pierces the smokkr fabric at one end of the brooch and has a loop at the other end. These finds are not available for Blindheim, as the museum's collections are closed, but she intends to study them later.

Det sees tydelig at Spænderne have været anbragte paa den Maade af en af Klædningsstykkets Fliger har været indstukket paa Naalen (gjennomstukket af den) og en anden fæstet ved Hjælp af en om Naalen indenfor Naleskjeden lagt Strop av andet Slags Tøi.

Blindheim 1945, p. 159. C 18436 Berven (find from 1896).

Det kan ogsaa her, ligesom paa enkelte andre i senere Tid indkomne Exemplarer iakttages at Naalen foruden at gaa igjennem et Stykke Tøi har baaret en Strop.

Blindheim 1945, p. 159. C 19179-85 Berg (find from 1898).

Vangsnes, Sandanger and other finds

In 1976 Inger Marie Holm-Olsen [reported](#) on the finds from 9 women's graves in western Norway.

Eight of the graves yielded in total 16 woollen fragments with traces of hemming. Holm-Olsen doesn't give any more details in regards to which garments the fragments might come from, but at least some of them are likely to be from a smokkr. The hemming technique is the same in all the cases; the cloth has been folded over twice, so that the hem consists of three layers of fabric.

One of the graves also yielded pleated fragments, and one grave had several preserved fabric loops, evidence of the presence of at least one smokkr.

Grave B 10720 at Sandanger

This grave have yielded several *intact* fabric loops of the kind used to fasten "tortoise" brooches. Three loops of woollen diagonal twill were found, all of them created by folding a strip of cloth several times and stitching it together.

One of the loops was fastened to a fragment of woollen diamond twill, and one was fastened to a fragment of the same diagonal twill that had been used to create the loop. The last of these loops had loosened from whatever fabric it had been stitched to and was laying alone.

Tre av hempene er av diagonalkypert, de består av flere lag sammenbrettet og sammensydd stoff. Den ene hempen er nå løs, de to andre er sydd fast til hvert sitt stoffstykke. Av de to siste er den ene sydd fast til et stykke av samme sort stoff, den andre er sydd fast til et ringvendstoff.

Inger Marie Holm-Olsen: Noen gravfunn fra vestlandet som kaster lys over vikingtidens kvinnedrakt, p 199, illustration p 200

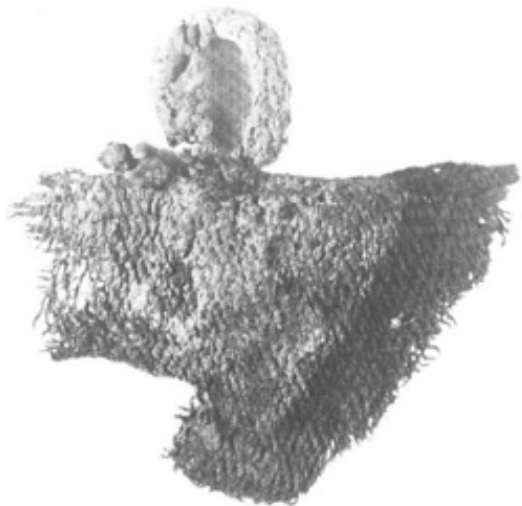


Hempene må skrive seg fra to forskjellige seleskjørt, den ene av diagonalkypert, det andre av ringvend. Skjørtet av diagonalkypert har hatt hempe og skjørt av samme stoff, skjørtet av ringvend har hatt en hempe av diagonalkypert. Sammen med den tredje hempen er ikke stoff av selve skjørtet bevart. Hempen er av diagonalkypert, av samme kvalitet som hempen på ringvendskjørtet.

Inger Marie Holm-Olsen: Noen gravfunn fra vestlandet som kaster lys over vikingtidens kvinnedrakt, p 203

Holm-Olsen interprets this as evidence that the woman in the grave wore two smokkr, one of diamond twill, the other of diagonal twill. Both smokkr had loops made of the diagonal twill.

Additionally there was a fourth loop in the grave. It is difficult to ascertain how this loop was made due to it being encased in rust, but according to Holm-Olsen it isn't made from a folded strip of cloth like the others. Instead she believes that it might be a cord created by twinning a string around a central core made from several strings. It has been fastened to a fragment of a third woollen fabric, but the report doesn't state what type of weave.



Holm-Olsen believes that this loop is too slender to carry the weight of a smokkr. Also, if it is from a smokkr it would mean that the woman in the grave was wearing three smokkr on top of each other, something she discounts as unlikely.

Den fjerde hempen er helt gjennomtrukket av rust og derfor vanskelig å analysere. Det er imidlertid klart at den ikke, som de andre, består av et sammenbrettet stoffstykke. Muligens er den laget på samme måte som den siste av de to snortypene [*en kjerne av flere*

tråder, med en tråd viklet rundt]. Den synes å være svært spinkel til å skulle bære et seleskjørt. <...>

Den fjerde hempen som B 10720 Sandanger inneholder, er som ovenfor nevnt svært spinkel. Charlotte Blindheim har imidlertid vist at seleskjørtet i enkelte tilfelle har vært holdt oppe av seler som bare bestod av tynne ulltråder. At den ikke er laget av stoff, behøver derfor ikke å bety at den fjerde hempen ikke har tilhørt et seleskjørt. Det er likevel enda et forhold som taler mot at den har vært en sele, den er festet til et

stoff av en annen kvalitet enn dem de andre hempene tilhører. Skulle også denne fjerde hempen være en del av et seleskjørt, måtte en tenke seg at kvinnen i denne graven hadde fått med seg tre slike.

Inger Marie Holm-Olsen: Noen gravfunn fra vestlandet som kaster lys over vikingtidens kvinneklær, p 199-201, p203, illustration p 201

She doesn't explain what kind of garment the loop and fabric could have come from if it isn't a smokkr, and writes nothing about *where* the different fragments were found in relation to the brooches in the grave. One explanation for the fourth loop that springs to my mind is that it could have been part of the closure mechanism for a caftan, or some other overgarment that closed across the chest. Such a loop wouldn't need to bear the weight of a full garment. Still, without more details from the find this is nothing more than wild speculation.

Holm-Olsen also mentions three fragments from grave B 10720 that have been decorated by different cords. She writes that two diamond twill fragments had a braided cord sewn to the edge, and one diamond twill fragment had been edged with a cord made by twining a string around a core made from several strings. This last type of decorative cord is also found edging a hemmed edge of a diamond twill fragment in another grave in Sandanger, B 10772.

Dette finnes på fire ringvendfragmenter fra funnene B 10720 Sandanger og B 10772 Sandanger. Snorene er av to typer. Den ene typen, som er representert ved to fragmenter fra B 10720, er flettet av flere tråder. <...>

Den andre typen, representert ved ett fragment fra B 10720 og ett fra B 10722, har en kjerne av flere tråder, om denne kjernen er det viklet en ny tråd. <...>

Snorene finnes fastsydd til henholdsvis sidejære, vevd begynnelseskant og fall.

Inger Marie Holm-Olsen: Noen gravfunn fra vestlandet som kaster lys over vikingtidens kvinneklær, p 199, illustration of B10722, p 198



Unless there are several diamond twill fabrics in grave B 10720, it is reasonable to assume that the fragments decorated with cords at the edge belong to the diamond twill smokkr from the grave. Holm-Olsen doesn't say so though, so unless further details from the find are made available, we won't know for sure.

Grave B 5625 at Vangsnes

This find was originally interpreted to be a serk, but has recently been suggested to come from a smokkr instead. I have included a summary of the original report, so that you can make your own decision as to how the evidence should be read.



A woman's grave at Vangsnes in Norway contained several fragments of a tabby wool, where three of the fragments were pleated (2-3 mm deep pleats). The rest of the fragments are plain, but it is uncertain if this is because the pleating has disappeared in the grave, or if only part of the garment was pleated.

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.

Inger Marie Holm-Olsen: Noen gravfunn fra vestlandet som kaster lys over vikingtidens kvinnedrakt, p 201, illustration p 202

At the time Inger Marie Holm-Olsen writes her report, there appears to be no reports on similar pleated woollen fragments, so she proposes that the fragments in grave B 5625 may possibly be from a woollen serk, mirroring the pleated serks from Birka.

Underkjolen er det i vestlandsmaterialet bare usikre spor etter. Det eneste i materialet som kanskje kan tolkes som rester etter et slikt plagg, er det plisserte stoffet fra B 5625 Vangsnes. Er dette restene av en underkjole, adskiller den seg fra underkjolene i Birka ved at den er i ull.

Inger Marie Holm-Olsen: Noen gravfunn fra vestlandet som kaster lys over vikingtidens kvinnedrakt, p 203

Some years after Holm-Olsen's analysis, the reports were made of pleated wool in [grave C](#) in Kaupang and [grave ACQ](#) at Køstrup. The pleated fragments from both these graves are interpreted to be part of a smokkr, *not* a serk. Based on these finds, Thor Ewing proposes that the Vangsnes find should also be interpreted as a smokkr.

If the pleated tabby at Vangsnes was from the serk, it is reasonable to expect the grave to also yield less deteriorated fragments from the smokkr, as it is closer to the preserving metal in the brooches than the serk. Unfortunately, because Holm-Olsen was summarizing the finds from several graves in her article, she gives no further details as to whether grave B 5625 yielded other fabrics in addition to the woollen tabby. However, if there were significant amounts of a different fabric, I would expect her to have mentioned it when interpreting the pleated fragments. Also, the Køstrup smokkr is pleated only between the brooches at the front. This supports an interpretation of the mix of pleated and plain tabby fragments from grave B 5625 Vangsnes as a partially pleated smokkr.

Thus I find myself agreeing with Ewing that these fragments are likely to have come from a pleated smokkr.

Kaupang

Kaupang is a Viking market place, and thus not a minor Viking find, but until I find evidence that more clothing was found than the meager fragments described below I will classify it as minor in textile terms. Two women's graves containing textiles were excavated in 1949 in the former Viking market centre Kaupang in Vestfold. The graves were somewhat damaged from the construction work that led to their discovery, and finds might have been moved out of their original context. [Anne Stine Ingstad](#) reported on the graves in 1979.

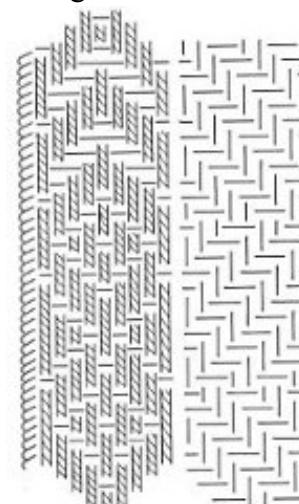
Grave B, from around 800 AD, contained three "tortoise" brooches and twelve textile fragments. One fragment consisted of a coarse woollen tabby (8Z/8Z threads pr sq. cm), the other eleven all derived from chevron twill (18-20Z/10Z threads pr sq. cm).

The most interesting of the chevron twill fragments is a piece that is 4.5 cm x 5 cm. It has been turned over twice at one edge and stitched in place, creating a hem three layers of fabric thick. A tablet woven band (0.6-0.9 cm wide) has been stitched to the edge of the hem with casting stitches, using a woollen thread. A wool string made from twining several woollen threads together has been stitched along the other edge of the tablet woven band.

Stoffet har en fall, som er bøyet inn to ganger, slik at tøyet der ligger i tre lag. Borden er sydd til kanten av fallen med jevne kastesting utført i totrådet S-ullgarn. Bordens bredde er noe ujevn - 0,6 cm - 0,9 cm, og den består av 9 dobbelte S-tvunnete ulltråder, som utgjør renningen, innslaget er Z-spunnet. Borden er vevet i mønster, som det fremgår av fig. 2. Til den kanten som ikke er sydd fast til stoffet er der med kastesting utført i totrådet S-tvunnet ulltråd påsydd en fast og jevnt tvunnet ullsnor, som består av flere dobbelte S-tvunnete tråder.

Anne Stine Ingstad: To kvinnegraver med tekstiler fra Kaupang p 158-159

According to Ingstad this fragment is similar to the diamond twill fragment with tablet woven band found at Værnes. The Værnes fragment came from a smokkr as evidenced by traces of the same fabric being found inside the brooches, and Ingstad therefore concludes that the chevron fragments in grave B is likely to derive from a smokkr as well.



The tablet woven band would have run along either the top or the bottom of the garment. Ingstad believes that the woollen string sewn to the edge of the band indicate that the band and string was placed at the bottom of the smokkr. She cites that similar strings have been used to protect against wear in Norwegian and Danish folk costumes.

Grave C, from 850-900 AD, contained more jewellery and more textile fragments than grave B. A total of ca 41 woollen fragments were found:

- 2 small fragments of a tabby (1/1)
- ca 5 fragments (some from loops) of diagonal twill (16Z/10Z threads pr sq cm)
- 7 fragments of lozenge twill (a) with a unique weaving pattern (40-44Z/14Z threads pr sq cm)

- At least 1, possibly 4 fragments of a second lozenge twill (b) (24Z/12Z threads pr sq cm)
- Ca 25 fragments of a third lozenge twill (c) (34-36Z/14-16Z threads pr sq cm)

Several of the fragments had a black crust on one side, indicating that a plant fibre fabric (probably linen) had been present in the grave.

According to Ingstad several loops were found inside the brooches at the time of excavation, but currently only one survives along with fragments of several others. Some of the loops were made from the diagonal twill, and Ingstad proposes that this twill was used in a smokkr.

Videre foreligger ca. 5 fragmenter av et diagonalkypertstoff med 16Z/10Z pr cm². Noen av disse skriver seg fra hemper, som har vært brukt til å feste et seleskjørt til de ovale spennene. De heftet opprinnelig til nålefestet, og da de ble funnet, ble der observert flere hemper til hver spenne. Nå foreligger det bare en nesten fullstendig hempe og noen bruddstykker av samme.

Anne Stine Ingstad: To kvinnegraver med tekstiler fra Kaupang p 160

The lozenge twill with the most fragments (c) was of fine quality and might have been pleated. One of the fragments seemed to have 3-4 pleats that were 0.4 - 0.5 cm deep. Another fragment of the same twill lay in several layers with a small hole (like that made by a needle) passing through all the layers.

When looking at the equal armed brooch found at the chest, and the bracelets on the arm that had lain on the body Ingstad finds that the diagonal twill seems to have been worn outside the pleated lozenge twill. Based on the fact that several loops originally were found inside the brooches she theorizes that the pleated twill was from a second smokkr worn inside the smokkr made from the diagonal twill. She proposes that the inner smokkr was longer than the outer, showing of the pleats.

The rest of the fragments are identified as either from a cloak or from a headdress and are thus not relevant when trying to collect evidence of the smokkr.

De fleste fragmentene - 25 - må skrive seg fra dette stoffet, til tross for noe vekslende trådtetthet fra stykke til stykke. To av fragmentene er sterkt oppsplittet i smale fliker, og flere andre er bare strimler. Ett fragment synes å ligge i tre-fire 0.4-0.5 cm brede plisser. Av dette er det nærliggende å slutte at stoffet kan ha vært plissert, og at den sterke oppsplittingen muligens kan skyldes slitasje i kanten av foldene. Videre foreligger et fragment i flere lag, og tvers gjennom lagene er der et ganske lite sirkelrundt hull som etter en nål.

<...>

Av funnopplysningene går det frem at det til de ovale spennene har vært festet ett eller to seleskjørt ved hjelp av hemper. Det ene seleskjørtet har vært av det diagonalvevete kypertstoffet.

<...>

Det er trolig at hun under den diagonalvevete stakken har båret enda et seleskjørt, da det opprinnelig heftet flere hemper til nålefestet på hver spenne. Kan hende har dette vært av det fine c-stoffet i ringvend, som muligens har vært plissert. Dette har trolig vært sidere enn overstakken, slik at plisseene har kommet frem nedenfor den.

Anne Stine Ingstad: To kvinnegraver med tekstiler fra Kaupang p 161-162

Adwick-le-Street

In January 2001, a grave was found in South Yorkshire with grave goods typical of a female Scandinavian burial of the Viking Period.

The oval brooches in the grave are typologically the earliest of the four pairs recovered from a grave in England, and the first to be excavated under archaeological conditions. The design and condition of the brooches suggest a date for the burial at the end of the 9th century. Isotope analysis of teeth from the skeleton indicates an origin for the woman in either Norway or possibly north-eastern Scotland. Penelope Walton Rogers [reported](#) on the artifacts in the grave, including the textiles.

...on both brooches lies a complex of textile loops and cords which pass round the brooch pin. The loops are made from a fine linen tabby, 24/Z x 24/Z per cm. Each loop seems to have been constructed as a cut strip folded lengthways, with the raw edges turned in and pressed flat, to give a neatly made strap 4 mm wide. In places the straps have a blue tinge, but analysis by absorption spectrophotometry has shown this to be from corrosion rather than dye. The loops and the coarser inner garment are likely to have been a natural white.

On brooch AB one of the loops passes around the hinge and the other passes around the tip. Behind the strip at the hinge there is a bundle of four or five Z-spun yarns which seems to form a second loop, mirroring the path of the first. On brooch AC, there is again a loop at both ends of the pin, but here there is also a second layer of the same material behind the first, which may represent a second set of loops. A series of coarse threads are entangled with the hinge end of this pin and from this emerges a plied cord (Z2S), approximately a millimetre thick, which follows an irregular path towards the edge of the brooch.

Greg Speed and Penelope Walton Rogers: A Burial of a Viking Woman at Adwick-le-Street, p 76

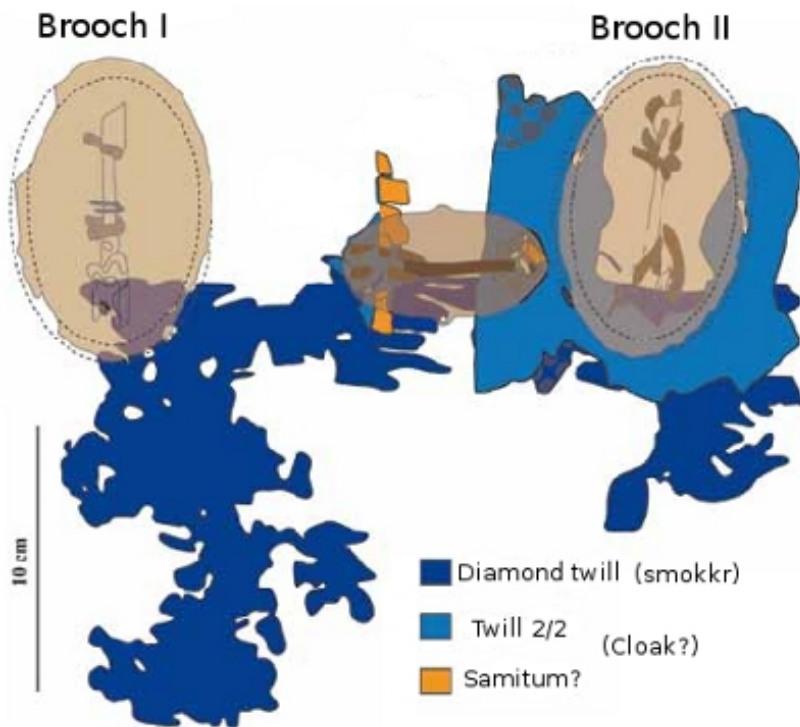
The smokkr itself was not preserved. Walton Rogers believe that the bundle of cords at the left brooch (AB) served as a replacement for a loop, presumably as a running repair. She interprets the plied cord at the right brooch (AC) as a tool band for a knife that was found in the grave. Thus her conclusion is that there were two loops at the bottom of each brooch, and one at the top.

Veka, Hopperstad and other finds

In 2011 [Hana Lukešová](#) describes a methodology for registering and interpreting the textile remains preserved in the many tortoise brooches stored by the museum. In her article she uses three graves from the west of Norway as examples when explaining her method. Unfortunately, the graves were excavated late in the 19th century or early in the 20th and the details are lacking. Also, some of the textile fragments were removed from the brooches in order to preserve them, without recording their original position. Lukešová positions them by using old photographs of the brooches with the textiles (where they exist) and the splotches made by the metal in shape of the different brooches.

Grave B 6228 at Veka and other finds in Voss, Hordaland

I have classified this grave among the minor finds, in spite of the size of the smokkr fragment, due to the lack of details in the report. The woman in this grave was wearing the traditional tortoise brooches, signalling the presence of a smokkr, and a smaller brooch.

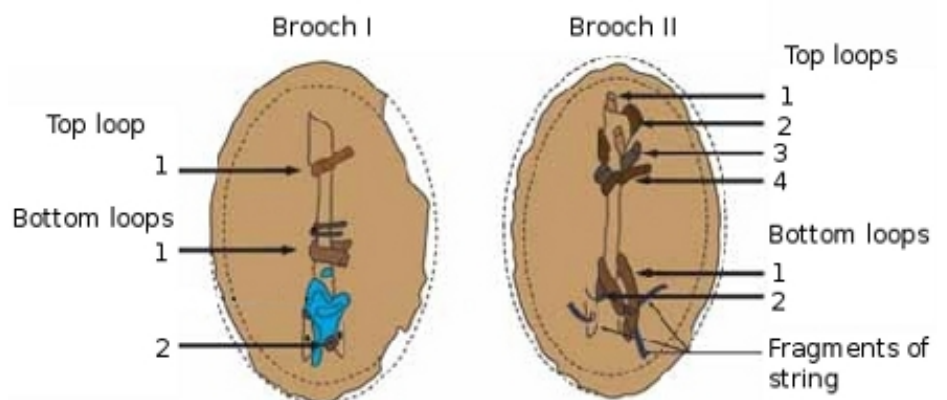


There were several pieces of woollen diamond twill that Lukešová interprets as fragments of a smokkr. Along the top of the largest piece the fabric has been folded towards the inside, creating an edge of which 27 cm still remains.

Currently there are no loops connected to the fragment, but Lukešová reports that there are stitch holes that probably stem from the fastening of the loops. If so, the brooches would have been 19.5 cm apart. A similar fragment from the front of the smokkr was found in [grave 597](#) at Birka, running from one brooch to another, although only 22 cm remains of this fragment.

Some of the diamond twill fragments have part of a selvedge. Lukešová believes that this selvedge ran along a side seam of the smokkr (thus indicating the existence of a side seam).

The right tortoise brooch had one loop at the top and two at the bottom, while the left had *four* loops at the top and two at the bottom. Lukešová doesn't mention any details regarding what materials the loops are made of, nor does she explain the number of loops.



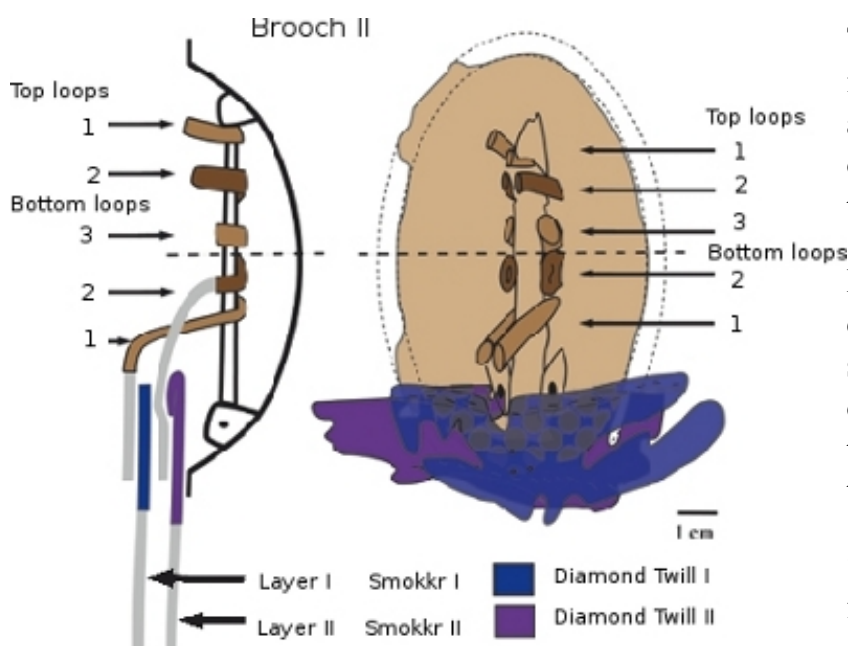
The four loops at the top of the brooch sharply deviates from the tendency from Birka (according to Hägg) to have more loops at the bottom of the brooches than at the top. Perhaps the brooch should be worn with the needle pointing downwards instead? Lukešová does not explain why she uses the orientation she does for the brooches, except for mentioning that like other researchers she believes that the brooches were worn with the needle pointing upwards. Without access to the report made by the archaeologist excavating the grave, I cannot tell whether she just assumes that the brooches were worn this way in all the

graves she reports on, or whether it is the positions that were recorded for this specific grave.

Funnet fra Veka inneholdt to ovale spenner samt en komplett tredjespenne (midtspenne). <...> Jeg mener det er rimelig å tro at det største stykket diamantkypert i dette funnet må tolkes som rester av en selekjole. Fragmentet har en bevart øvre fald med huller etter en søm på hver side, noe som jeg tolker som rester av en stroppesøm. Avstanden mellom nålene på begge spennene kunne måles til 19,5 cm, mens lengden på den bevarte kanten er 27 cm. <...> På andre fragmenter av det samme stoffet i funnet finnes det også en oppsetningskant. Denne oppsetningskanten har sannsynligvis dannet sidesømmen på en kjole.
Lukešová, Hana: Fragmenter av kvinnedrakter fra vikingtiden, p 156 - 159, illustration p 160, English text added by me.

Lukešová also mentions a grave find from Hyrt (grave B 4864) where two tortoise brooches were found, with one containing a single loop at the top, and the other containing two loops at the top and bottom. No traces of the smokkr itself remain.

Grave B 9060 at Hopperstad in Vik, Sogn og Fjordane



Two tortoise brooches were found inside this grave, one with three loops at the top and one at the bottom, the other with three at the top and two at the bottom.

Lukešová's illustration shows that the distance between top and bottom is small enough that it is possible some of the loops started on the other side of the dividing line before deterioration in the grave.

She reports that there were two fragments of diamond twill inside one of the brooches, one with a horizontal warp, the other with a vertical warp. Because the direction of the warp differs she interprets this as two different garments.

The fragment closest to the body (diamond twill I) is from the upper edge of the garment, with a warp running vertically. There are clear stitch holes from where a loop once was fastened, and she believes that this is a smokkr.

The second fragment (diamond twill II) is also interpreted as a smokkr. The warp runs horizontally and the upper edge is a selvedge. There is a seam running parallel to the top of the garment, 2-2.5 cm from the selvedge. As this smokkr would have been worn farthest from the body, she speculates whether this seam was meant to fasten a decorative band.

The second fragment (diamond twill II) is also interpreted as a smokkr. The warp runs horizontally and the upper edge is a selvedge. There is a seam running parallel to the top of the garment, 2-2.5 cm from the selvedge. As this smokkr would have been worn farthest from the body, she speculates whether this seam was meant to fasten a decorative band.

Funnet fra Hopperstad inneholder to ovale spenner. Spenne I har tre øvre stropper og en nedre stropp. Spenne II har tre øvre stropper og to nedre stropper. På grunn av tydelige flekker på to fragmenter av diamantkypert var det mulig å plassere disse helt nøyaktig på innsiden av spenne II. Siden renningen på disse to fragmentene går i forskjellig retning betyr det at de må være rester av to ulike plagg (selekjoler).

Det ene fragmentet (diamantkypert I) har tilhørt plaggets øvre kant. Stykket har tydelige huller etter søm for en stropp. Retningen på renningen er vertikal. Dette er mest trolig rester av en selekjole.

Det andre fragment (diamantkypert II) har en jarekant som øvre kant (retningen på renningen er horisontal) og representerer sannsynligvis en ytterligere selekjole. Sømmen på dette stykket løper parallelt med den øvre kanten med en avstand på 2-2,5 cm. Dette kan være sømmen som festet pyntebåndene til kjolen.

Lukešová, Hana: Fragmenter av kvinneklær fra vikingtiden, p 161, illustration p 161, English text added by me.

Peripheral finds

Because all we have are fragments of the smokkr, it may be relevant to examine other garments for inspiration. Caution *must* be used when extrapolating from such finds as they may be radically different from the smokkr, but they may still be useful in demonstrating which tailoring techniques and patterns were known to the Vikings.

Huldremose

This is the closest we get to a "proto-smokkr" and is perhaps the most relevant peripheral find in regards to interpreting the construction of the smokkr.

The woollen peplos from Huldremose in Denmark dates from 210-30 BC. It has been woven in a single piece on tubular loom, and forms a tube without seams, 168 cm long and 264 cm round. It is similar in design to the ancient Greek peplos, but would have been too long for the wearer unless the top part was folded down, or it was hitched up at the waist with a belt.

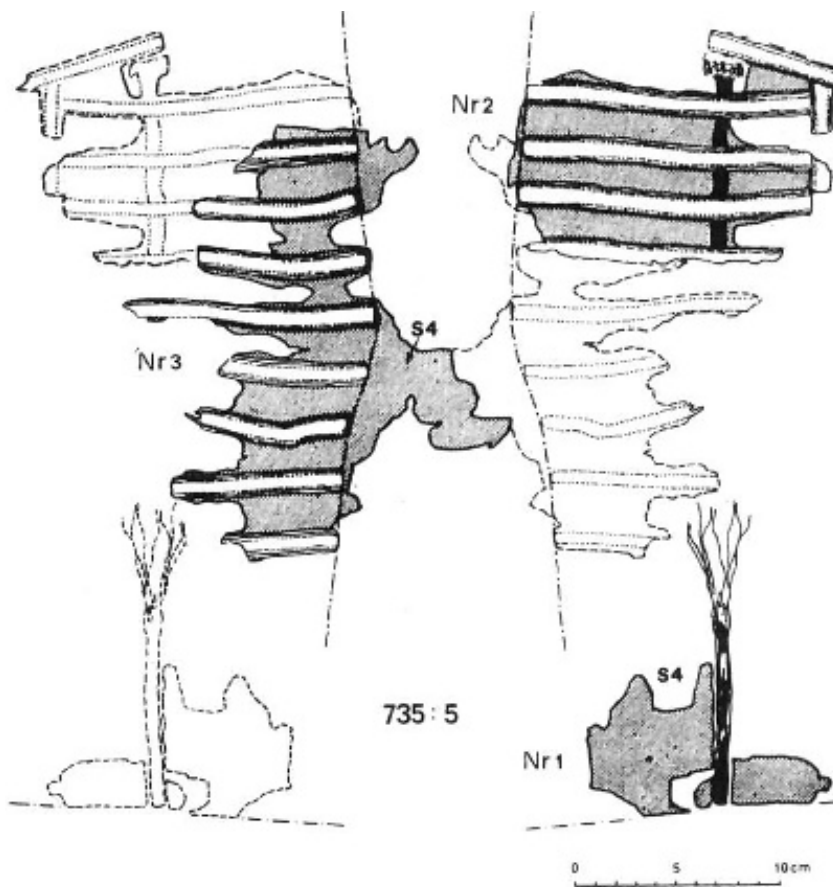
Dresses like this might be seen as precursors to the Viking smokkr.

Birka grave 735

There are several theories regarding what type of garments was found in this grave, from a man's tunic to a woman's smokkr. Either way it can be helpful to know exactly how the disputed fragments looked when making up your mind as to which interpretation to believe.

In grave 735 a man and a woman (possibly holding a small child) had been buried close to each other. The bones had deteriorated to such a degree that only the teeth of the two adult skeletons remained. This provides a challenge when trying to sort out which of the textile fragments belonged to the man and which belonged to the woman.





The grave contained large amounts of silver and gold tablet woven bands, silver thread embroideries and the largest pieces of silk twill that has been found in Birka. Because of the lack of skeletons it is unclear which textile fragments belonged to the man and the woman respectively.

Piece **nr 1** (figure 735:5 bottom right) consists of a tablet woven band between two fragments of silk twill.

The fabric along one edge of the piece has been folded towards the inside, and there are traces of wool on the fold. The direction of the weave in the silk twill indicates that the folded edge was either at the top or the bottom of the piece. The shape of the piece combined with the traces of wool lead both Geijer and Hägg to conclude that

the fold ran along the bottom of the piece and was probably stitched to a woollen cloth.

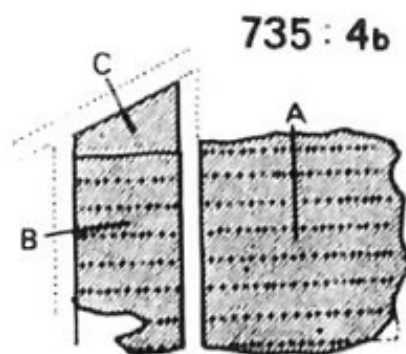
Stycke 1 (735:5) består av ett brickband, B18, mellan två sidenkypertstycken. Den nedre kanten har en enkelt vikning mot avvigan, och på vikningen finns lämningar av ett ylletyg, vid vilket stycket kan ha varit fastsytt.

Att döma av vävens riktning i sidenkypertdelarna bör stycket ha suttit med vikkanten uppåt eller nedåt i dräkten. Vikkanten med yllerester samt styckets disposition talar kanske snarast för att det skulle ha suttit som 735:5 visar, med den vikta kanten nedåt.

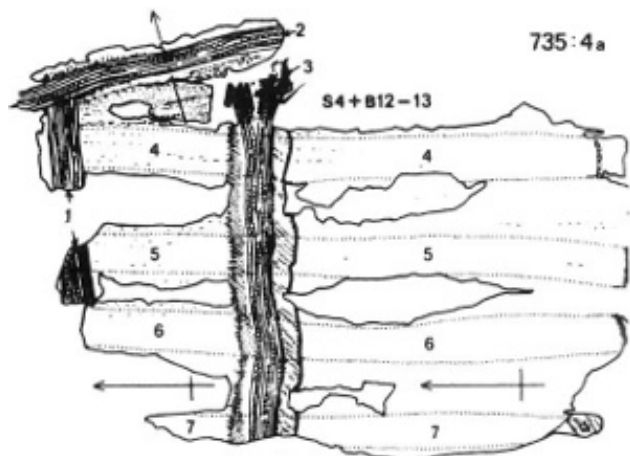
Inga Hägg: *Kvinnodräkten i Birka*, p 74, illustrations p 128

Geijer suggests a reconstruction where piece 1 is placed with the folded edge of the silk twill along the waist area of the person wearing the garment. The lower part of the garment would consist of wool stitched to the silk. She proposes that piece 1 was connected to another piece (**nr 2**, figure 735:5, right side).

Piece nr 2 consists of three separate pieces of silk twill, A, B and C (735:4 b). Between fragment A and B runs a tablet woven band (735:4 a, band 3) identical to the tablet woven band in piece 1. Along the edge of fragment B there is another tablet woven band (735:4 a, band 1). Additionally there is a tablet woven band running diagonally along the top of piece 2 (735:4 a, band 2). A gore of silk twill (fragment C) fills the space between fragment B and the band, but does not continue across the vertical bands. The three bands (1-3) seem to have been part of the *construction and shaping* of the garment.



The four tablet woven bands (735:4 a, band 4-7) that run horizontally across the piece seem to have had a mainly *decorative function*.



These bands lie on the outside of the silk twill, and crosses on top of the vertical bands. The decorative effect has been strengthened by varying the stitching so that every other band has been fastened with the same type of stitches. Thus half of the bands have been fastened by small, invisible stitches, the other half by blanket stitching.

Three of the horizontal bands are sufficiently preserved that the ends of the bands still remains. They have been folded and stitched in place on the silk twill (piece A) at one end. The other ends (that meet the vertical band 1) have also been folded and are kept in place by a seam.

Här är brickbandet B18 hopfogat med ett annat, vertikalt gående band, som hör till ett annat stycke, nr 2. Detta stycke (735:4 a-b) består av tre sidenkypertdelar, A-C, og sju brickband, 1-7. Sidenkypertdelarnas fogning framgår av 735:4 a, som återger avigsidan: de två större delarna A och B ramar in det vertikalt placerade brickbandet nr 3. Över hela det hopfogade stycket AB ligger på rätsidan fyra brickbandstränsar, 4-7, varav tre med ursprunglig avslutning i båda ändar. Åt ena hållet är bandändarna nedvikta och fastsydda mot sidentygets rätsida, åt det andra hållet möter bandändarna i rät vinkel et annat, vertikalt placerat band, nr 1, vid vilket de vikts ned och fästs med en söm.

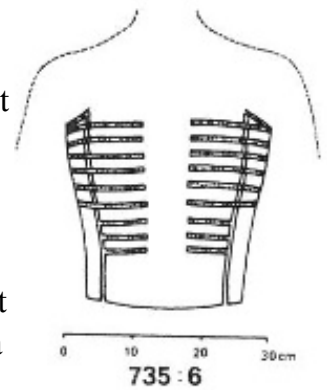
Den tredje sidenkypertdelen på detta stycke, del C (735:4 b), fungerar som en kil mellan det snedfogade brickbandet överst, nr 2, och övriga delar. Kilen måste ha upphört vid det vertikala band 3, eftersom stycke A på andra sidan om detta band fortsätter upp över det horisontala band 4.

Det är ovisst, om band 2 fortsatt över band 3 på detta ställe. Det är emellertid tydligt, att brickbanden 2 och 3 har haft *konstruktiva funktioner* i samband med hela styckets kilning och fogning (ev. gäller detsamma även band 1). De fyra horisontelt påsydda tränsbanden har främst *dekorativ funktion*. Som Geijer påpekat förstärktes den dekorativa effekten genom den teknik, med vilken banden applicerats på stycket: vartannat infattat med langettsöm, vartannat diskret fäst med osynlig söm.

Inga Hägg: *Kvinnodräkten i Birka*, p 74-75

Lastly there is another piece from the same garment, piece **nr 3** (figure 735:5, left side). This piece lacks the vertical bands and upper gore, but has more of the horizontal decorative bands left intact than piece nr 2. It is clear that piece 2 and 3 is designed to sit on opposite sides of the chest of the wearer.

The horizontal bands have been folded and stitched down on the silk twill at one end. The other ends of the bands are torn. The bands have been adjusted in order to follow the shape of the body, so the band in the middle of the chest is longer than the one at the waist. This seems to have been a garment that was fitted to the body of the wearer (735:6).



The distance between the pieces are unknown, but it would at least have covered ca 30 cm of the chest (piece 2: 15 cm + piece 3: 16,5 cm). The height of the garment is even harder to calculate. The suggested reconstruction has a height of ca 32 cm. The neck and shoulder part of the garment is unknown.

Detta stycke har flera av de dekorativa tvärträsarna bevarade än föregående men ingen likartad konstruktiv fogningsdetalj. Hela stycke 3 motsvarar ur funktionell synpunkt delen A på stycke 2 (735:4 b). De ursprungliga bandavslutningar, som finns kvar, är liksom där invikta åt ena hållet och nedsydda mot rätsiden.

Det är tydligt, att stycke 2 och 3 inte suttit på samma bröstorgshalva utan att de är parstycken. På nr 3 bör tvärträsarna liksom hos parstycket 2 ha varit avslutade invid et vertikalt placerat brickband (jfr 735:4 a, band 1) på den sida, där brickbanden saknar avslutning. Själva sidentyget bör ha varit hopfogat i sidled med et annat stycke, som korresponderar mot del B hos parstycket 2, jfr 735:5.

De nedfällade träsarna på stycke 3 slutar inte på en rak linje över varandra, vilket tydligt framgår, om man med ögat följer de vertikala trådarna i väven. De mellersta träsarna slutar längre ut på kypertyyget. Brickbanden har härmed anpassats efter bröstorgens välvning (jfr punkt-strecklinjerna på 735:5). Denna detalj, som går ut på at avpassa plagget efter kroppens former, bör ses i samband med kilskarvningen av stycke nr 2, genom vilken vidden i tyget ökades mot kroppens mitt.

När man altså adderar detaljerna hos de här beskrivna styckena 1, 2 och 3, vilka obestriddigen hör til samma plagg, får man den bild, som demonstreras på 735:5-6. Stycke nr 3 bör ha legat på höger sida av bröstet med de invikta og nedsydda bandändarna mot kroppsmitten, medan stycke nr 2 låg på vänster sida med kilskarven avsmalnande ut mot sidan. De inbördes avstånden mellan styckena är givetvis ganska ungefärliga. Tillsammans måste de emellertid ha täckt bröstet med ca 30 cm på bredden (stycke 2: 15 cm + stycke 3: 16,5 cm). Den sammanlagda höjden är svårare att beräkna; enligt den här föreslagna rekonstruktionen kan den ha varit ca 32 cm. Hur axelparti och halsöppning varit utformade är oklart.

Inga Hägg: Kvinmodräkten i Birka, p 74-75, illustrations p 128

Some interpretations

Geijer interpret the fragments of metal tablet woven bands and silk from female graves to be decoration of the smokkr. In the case of grave 735 however, she believes that all these fragments belonged to the man's clothing, based on where they were placed in the grave. Inga Hägg disagrees. According to her, all that can be inferred from Stolpe's original drawing of the grave is that the largest textile fragment covered the chest of one of the adults but that it is in no way certain which of them it was. They were buried so close to each other that their clothing may have intermingled during deterioration.

The tortoise brooches was found laying upright on their edges, a strong indication that the woman had not been placed on her back in the grave, but rather had been buried beside the man in a sitting or half crouched position (possibly with their knees touching). According to the drawing of the grave, one of the brooches lay with its inside towards the largest textile fragment (piece 3). Hägg comments that this could be interpreted in two different ways; *either* the textile fragment is from a garment that the woman wore beneath her smokkr, *or* the brooch has been turned around in the grave during

decomposition and lies on the man's chest, on top of the remains of a garment worn by him. Neither the grave drawing nor the layering of the fragments gives a clear indication of which alternative is correct. She therefore turns to the fragments themselves.

There are additional tablet woven bands in the grave. According to Hägg these appears to have been part of a fragment that looked similar to piece 2 or 3, but with richer and broader tablet woven bands, probably a separate garment of the same type, but of a larger size. She sees no reason that the man should be wearing two garments of the same type, and so concludes that Geijer was mistaken when deciding that all the decorated fragments were from a man's garment. Hägg believes that the woman and man were wearing similar garments - probably tunics. The smaller garment (piece 1, 2 and 3) with the slimmer bands was worn by the woman, while the one with richer bands and possibly also the silver embroideries belonged to the man.

Hägg believes that the garments are two out of several that were decorated with silk and metal tablet woven bands, and that all these tunics were imported to Birka from the Kiev-Byzantium area. She ([argues](#) that in addition to importing the tunics themselves, the Birka Vikings adopted the custom of using these garments as signifiers of rank within the royal court, from Kiev.

Thor Ewing on the other hand, believes that the fragments described above come from a smokkr. His theory is discussed in the chapter on the shape of the smokkr further down in the article.

Interpreting the facts

That is the end of the hard evidence, and we're entering the land of interpretations. No complete smokkr has been found, although the archaeological evidence contains some larger fragments. This means that when we want to reconstruct the garment we must combine the archaeological evidence with other (and less reliable) sources, like poetry or illustrations.

The construction and use of the loops

From the archaeological evidence we know that the smokkr, however it may have looked, was fastened to the "tortoise" brooches with fabric loops. It isn't the first time fabric loops appear in Nordic clothing. However, although one loop has been found attached to a man's garment from the Migration period, they seem to fall out of use in the Iron Age (Hägg 1974, p. 55-56). Thus, the appearance of loops on the smokkr isn't just a continuation of an existing clothing tradition.

According to Agnes Geijer, the fine cloth in the smokkr at Birka was probably imported from Syria (Geijer 1938, 1965, paraphrased in Hägg 1974, p. 55). The majority of the woollen smokkr fragments from Birka are fine twills (usually broken lozenge twill), although there are some fragments of repped woollen cloth and other tabby weaves as well. These fabrics are tightly woven and would not easily have admitted the 4-5 mm thick iron needles of the "tortoise" brooches without tearing threads (Hägg 1974, p. 52). Thus, there was a need for a way to fasten the smokkr without piercing the expensive imported cloth.

At the same time, some oriental garments were imported to Birka. These were fastened with a

combination of loops and buttons, and Hägg (1974, p. 55-56) theorizes this may have inspired the use of loops in the smokkr in order to protect the smokkr fabric.

Fabric and construction

The need to protect the expensive smokkr fabric from wear, may explain why it appears that the majority of smokkr loops at Birka were made of the tougher and presumably cheaper linen cloth, even in the graves where the smokkr itself was made of wool. Of the 105 Birka graves containing loop fragments, only 14 had one or more woollen loops, while silk loops were found in 22 graves (Hägg 1974, p. 103-105).

The same principle appears to apply in Birka grave [973](#), where the smokkr was made of a broken lozenge wool twill, while the loops were made of a repped wool cloth that also was used as a lining. Similarly, in grave [B_10720](#) at Sandanger (Holm-Olsen 1976) there were two smokkr, one of diamond twill, the other of diagonal twill, both with had loops of the (presumably simpler) diagonal twill. However, the opposite is the case for grave [ACQ](#) at Køstrup (Wielandt 1980), where three of the loops were made from the same fabric as the smokkr. It was only the last loop that was made of another, rougher cloth (possibly because there was no smokkr fabric left).

Most loops were made by folding thin fabric strips and either whipstitching them along the sides (Birka grave [835](#)) or along the middle of the strap (Birka grave [465](#)). Some had an inner core of a stronger fabric (Hägg 1974, p. 54). This is the case for several of the silk loops from Birka, where the silk is covering a linen core, and for grave ACQ at Køstrup, where one of the loops had a layer of woollen smokkr fabric around a linen core (Rasmussen and Lønborg 1993).

The width of the straps used to create the loops may have varied; the straps at [Adwick-le-street](#) were 4 mm (Speed and Walton Rogers 2004), while the Køstrup loops (Wielandt 1980) and the loop from [Pskov](#) (Zubkova et. al. 2010) are 1-1.5 cm wide.

The straps tend to lie in an open loop around the needle, only fastened at the edge of the smokkr. The exception to this is the front loops from Birka grave 835, that have been stitched to each other along the sides, leaving just a small opening for the needle at the top of the loop (Hägg 1974, p. 54).

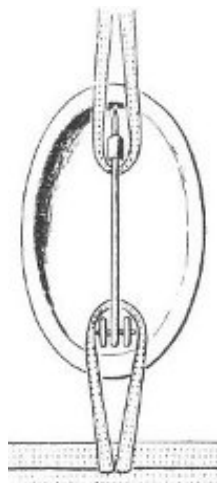
Number of loops in each brooch

The simplest constellation of loops in the brooches appear to be one at the bottom, holding up the front of the smokkr, and one at the top, holding up the back. However, there are many graves where the number of loops within the brooches exceed this.

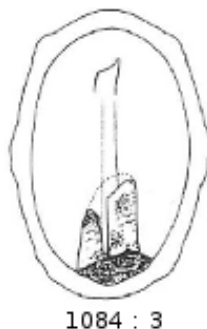
At Birka, 70 of the 105 graves examined by Hägg (1974) has at least one brooch where there is several loops at either the top or bottom of the brooch, or both. In addition, more than two loops per brooch are known from the graves at Sandanger (Holm-Olsen 1976), [Haithabu](#) (Hägg 1991), Adwick-le-Street (Speed and Walton Rogers 2004), and [Veka](#), Hyrt and [Hopperstad](#) (Lukešová 2011).

Length of the front loops

How long were the loops? Starting with the front loops we immediately run into diverging theories. Agnes Geijer (1938, paraphrased in Hägg 1974, p. 49) bases her interpretation of loop lengths on Birka grave 1084. Here, a loop was found sewn to the edge of the smokkr. The top of the loop is missing, but the part that remains is roughly 3 cm long. Geijer suggests that the loop is torn at the point where it met the bottom edge of the brooch, and that the preserved piece would have been hanging beneath the brooch. Thus according to her reconstruction the front loop was roughly 6.6 cm long.



Geijer's interpretation
Ewing 2006, p. 27



Hägg's interpretation
Hägg 1974, p. 134

Inga Hägg (1974, p. 49) looks at the same evidence, but interprets it differently. She draws attention to the slightly rounded edge of the bottom of the smokkr fragment, and postulates that this is due to the fragment decomposing along the bottom edge of the brooch.

From this, she concludes that the remains are the part of the smokkr and loop that were *inside* the brooch, and that the brooch in grave 1084 thus would have covered both the loop and 2-3 cm of the top of the smokkr.

Similar evidence can be found in Birka grave [597](#) and [464](#), where wear marks on the smokkr fragments in both graves indicate a position that places roughly 2-3 cm of the top of the smokkr inside the brooches. After examining several other graves at Birka, Hägg (1974, p. 50) concludes that this is the usual position of the smokkr in relation to the brooches, and thus that the front loops would have been short enough to be completely covered by the brooches.

grave-number	decor	smokkr	lining/ inner smokkr	loops	height in brooch (cm)	grave-number	decor	smokkr	lining/ inner smokkr	loops	height in brooch (cm)
464	band	W21	FH	FH	2	847	-	FH?	-	FH	-
465	-	W12	FH?	FH	3	849	-	W10?	FH	FH	2
466	-	W10?	FH	FH	2-3	856	-	W10?	-	W	2-3
507	-	W10i?	-	W	?	857	-	W19?	FH?	FH	1-2
511	string	W10	-	FH	2-3	860A	-	W10?	-	FH?	-
521	-	W14?	-	FH	-	901	-	FH?	-	FH	-
539	-	FH?	FH	FH	-	946	-	W22	-	W22?	-
550	-	W10	-	FH	2-3	954	string	W24	FH?	-	3-4
563	string	FH	FH	FH	1-2	959	-	FH?	-	FH	-

597	-	W10	-	FH	2-3	973	string	W10	W30	W25	3
602	-	W13?	FH?	FH	2	987	-	W22?	-	FH	-
606	-	W10?	-	FH	3?	1062	-	-	FH?	FH	-
731B	-	FH?	-	-	-	1083	string	W10	-	FH	-
834	band?	FH?	-	FH	2	1084	string	W	-	W30?	2-3
835	band?	W22	-	W22	2	1087	-	FH?	-	FH	2-3
838	string	W10	FH?	FH	2	1090	band?	W33?	FH?	W33	-
839	-	W29	FH	FH	3	1934,1	-	W10	FH	FH	2-3

Analysis by Hägg (1974, p. 50). W indicates wool, FH flax or linen. "Height in brooch" is how much of the top of the smokkr that was covered by the brooches.

While the loops Hägg (1974) examines appear to be missing the top, two fully intact loops, still stitched to smokkr fragments, were found at Sandanger. Unfortunately Holm-Olsen (1976) doesn't report their length.

One exception to the tiny front loops are the loops from the front of the woollen smokkr in grave ACQ at Køstrup (described by Wielandt, 1980). These loops would have been longer than normal, in order to allow for the tablet woven band to be stitched to the loops above the smokkr.

Length of the back loops

Having discussed the front loops it is time to look at the loops that once ran over the shoulders and were fastened to the back of the smokkr. Unfortunately, none of the loop fragments preserved at the top of the brooches have been found attached to smokkr fragments. Instead they appear to have been torn at either the upper edge of the brooch or inside it. Thus, we have no conclusive evidence regarding how long they were.

At Birka, there are several graves where the remains of an outer garment have been preserved both on top of the brooches and below the remains from the body. However, in these graves, although the layer below the body is preserved in the brooches, there is no trace of the back of the smokkr. Hägg (1974, p. 50) interprets this to mean that the back of the smokkr probably reached no higher than up to the shoulder blades of the person wearing it.

Många gånger finns det lämningar av ett yttre livplagg både ovanpå spännbucklornas skal och under förmultningsrester från kroppen - emellanåt med avigsidan (i den mån en sådan kan urskiljas) vänd uppåt = inåt. Delar av kjolens rygparti anträffas aldrig rakt under spännbucklorna; detta tycks inte ha nått högre upp än till skulderbladen.

Hägg 1974, p. 50

Shelagh Lewins, (2010) has a different approach. Her experience with the long loops used in most reconstructions is that they make the brooches pull down and the back of the dress ride up. As an alternative she has made a reconstruction using short loops both for the back and the front of the smokkr. Although this conflicts with the interpretation by Hägg, the evidence from Birka is circumstantial, and thus not conclusive, certainly not for all smokkr.

Tool bands

According to Hägg (1974, p. 49) there are several loops in the finds from Birka that have no smokkr fragments attached, and appears to have been torn at the edge of the brooch. These loops (e.g. the loop in grave 465) probably once continued beyond the brooch. However, Hägg argues that these loops are not part of the smokkr.

Her argument is that when one compares the total number of loops found at respectively the top and bottom of the brooches in Birka, there are significantly more loops at the bottom. There is more metal surrounding the needle in the lower part of the brooch, which increases the chances of conserving nearby fabric, but if this was the sole explanation the top and bottom loops should have the same fabric distribution. This is not the case.

Out of 22 graves with one or more silk loop, only *one* silk loop is found at the top of a brooch. This clearly indicates that the silk loops had a very specific function to fulfil on the *front* of the garment. Combined with the fact that remains of silk bands have been found attached to different tools, it seems likely that these silk loops were used to hang tools from the brooches. Hägg believes that some of the long linen loops found at the bottom of the brooches had the same function.

She concludes by saying that whenever the number of loops at the bottom of the brooch exceeds two, there is reason to believe that the remaining bands could have been used to carry tools. Such bands would have continued out from the brooch and down the front of the smokkr, but would not have been part of the smokkr.

Birka isn't the only place where tool-bands have appeared. At Køstrup there was a blue linen band that was believed to be a band for carrying tools (Rasmussen and Lønborg 1993). In Adwick-le-Street a plied cord found in the right brooch is also identified as a tool-band (Speed and Walton Rogers).

Although the majority of the loops are usually found at the bottom of the brooch, there are exceptions. At Veka there are four loops at the top of one brooch and only two at the bottom. However, as Lukešová (2011) are not reporting on the material(s) the loops are made of, one cannot tell whether these are more or less likely to be tool bands.

Alternatives to loops

It is possible that some brooches were connected to the smokkr by string instead of the usual fabric loops. While the bundle of yarn found inside a brooch at Adwick-le-street is believed to be a temporary repair (Speed and Walton Rogers 2004), Blindheim (1945) reports on several [finds with strings](#) inside the brooches. She believes that the strings was used instead of fabric loops to fasten the woollen smokkr in one of these (T 16136 from Værnes) and postulates a similar solution for the other finds.

However, all of the finds personally examined by Blindheim (T 16136 and T 16137 at Værnes, and C 26936 at Tråstad) have remains of (linen) fabric loops in addition to the strings. Thus, an alternative interpretation would be that the strings were part of the decoration of the smokkr (as in e.g. Birka graves [511](#), [973](#), [1083](#), [1084](#), and at Køstrup) or fragments from a bead string (similar to what is found in grave [182-185/1960](#) at Haithabu), and that the smokkrs were fastened by linen loops, some of which have deteriorated.

Blindheim does mention two other graves containing tortoise brooches with string; B 8953 Kirkeide, B 9060 Hopperstad. However, although the later analysis of the [Hopperstad](#) grave by Lukešová (2011) does not identify what the numerous loops are made of, there is no particular reason to think that she means "string" when she says "strap". I would therefore treat the evidence that Blindheim has gained solely from finds catalogues with some caution.

Finally there might have been cases where a «tortoise» brooch did pierce the fabric of the smokkr instead of using a loop. Blindheim (1945) refers to two finds from Vestfold (Berven and Berg) that are described as having one loop, and one end of the smokkr pinned directly to the brooch. Given the shape of the human body it is likely that the loop would have been running across the shoulders, and that it would be the front of the smokkr that was pinned to the brooch.

Unfortunately Blindheim hasn't had physical access to the finds, and the descriptions are from the 1890s, at a time when textile analysis was very little developed. Thus, there is a definite possibility that the evidence might have been misinterpreted. Blindheim expresses an intention to check these finds later, but there is to my knowledge no report of her doing so.

Shape of the smokkr

Although the fragments that survive from the smokkr are larger than what remains of the serk, the archaeological evidence is not sufficient to tell us exactly what the garment looked like. What we know is that it was held up by loops of fabric fastened by "tortoise" brooches, it reached at least to the hip and could be at least partially lined. The larger pieces found at Birka, Haithabu and Køstrup also gives some information about the shape of the smokkr.

It is highly likely that the shape of the smokkr varied according to time and place, so the smokkr worn by a 9th century woman in Birka would have looked different from the smokkr worn by a woman in 10th century Haithabu. Thus we can't just simply glue together the pieces from different finds (unless we want to create a Frankensmokkr :-), but we can with some caution draw on the different finds when chasing the underlying shape of the smokkr.

This is where the archaeologists part ways and end up with *very* different reconstructions. Partly this is due to some of them not having access to later finds when they made their theories, but it is also due to different interpretations of the same evidence.

The Birka material

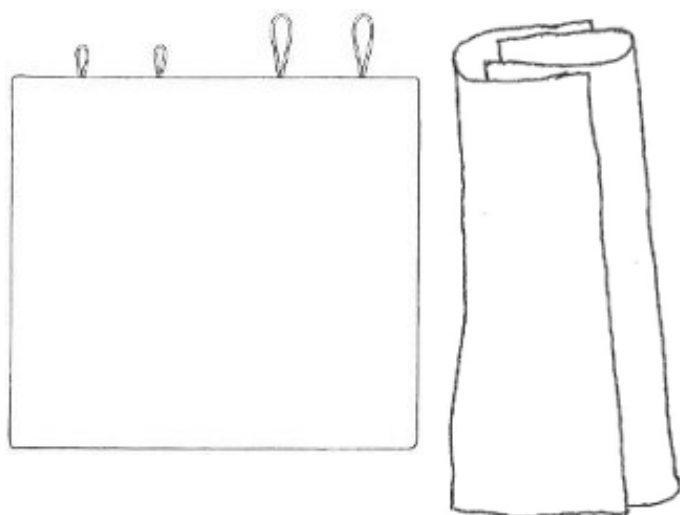
The main puzzle that arises from the Birka material is how to explain the multiple loops that is found within the brooches. Although evidence for multiple loops are found elsewhere as well (e.g. Adwick-le-Street, Sandanger, Kaupang, Veka and [Hopperstad](#)), Birka has the largest variety of loop combinations. The first reconstruction is advanced by Agnes Geijer.

None of the numerous smokkr pieces found at Birka show traces of having been shaped by cutting. There are large number of fragments of folded and hemmed edges. The edges have been folded on the grain, that is, with warp threads running vertically on the piece and the same is true for the lining whenever it is present. From this evidence Geijer concludes (and Hägg agrees) that the Birka smokkr

wasn't cut and shaped to fit the body. Instead the fabric was used almost unaltered after leaving the loom, the only modifications being:

1. hemming the edge,
2. adding loops for the brooches,
3. occasionally adding lining and
4. occasionally adding a decorative band on or near the top

When deciding on the shape of the smokkr Geijer drew on other dresses worn in the Baltic area, especially the hurstut dress. (*Inga Hägg: Kvinnodräkten i Birka, illustration p 53*)



She believed that the smokkr was constructed as a rectangle of linen wrapped around one side of the body, held up by short loops at the front and longer loops running over the shoulders to the back. Geijer postulated one set of loops per shoulder for each rectangle, unlike the hurstut dress which has a fastening only on one of the shoulders.

Illustration: Ewing (2006, p. 27)

The multiple loops found at the top and bottom of the majority of the brooches could be explained by the smokkr usually being worn in overlapping pairs, so that instead of showing the serk, the open side of the overdress revealed the inner smokkr.

As the inner loops in a brooch often are made from a rougher weave than the outer loops, she assumed that the inner smokkr usually were made from rougher linen than the outer. She believed the remains of the smokkr in grave [563](#) to be from such an overlapping pair, with a decorated smokkr made from dark blue linen, outside an inner smokkr of white linen.

Inga Hägg points out that unlike for the hurstut dress, the loops of the smokkr must have been placed at least some centimetres from the corners of the rectangle, as no loops at Birka have been found sewn directly to a corner. At the same time the upper edge of the smokkr remains horizontal across the width of a brooch, evidence that the sides of the smokkr were held close to the body instead of being allowed to hang freely. Hägg suggests that for the overlapping open linen smokkr this was probably achieved by wearing a belt made of textile materials.

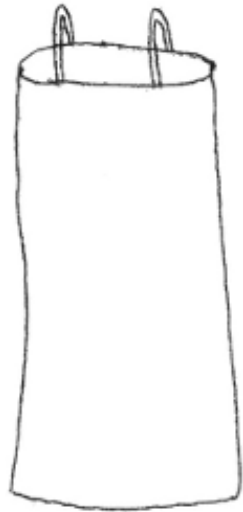
While Hägg seems to share Geijer's belief that the pair of linen smokkr could be reconstructed as overlapping rectangles, she argues that the *woollen* smokkr had a different shape.

The surviving fragments from the body of the woollen smokkr often come from within only one of the two "tortoise" brooches within a grave. This makes it necessary to examine



whether the woollen smokkr was asymmetrical in form, like e.g. the hurstut dress. In order to find out Hägg checked the number of loops in brooch I and II in all the graves where fragments from the body of the smokkr appear in only one brooch. She found variations from grave to grave, but not in a consistent pattern. Also, the graves with the best preserved material show almost total correspondence between the loops in brooch I and II. Thus Hägg concludes that the smokkr was symmetrical.

The upper edge of the woollen smokkr remains horizontal across the width of a brooch (just like the linen smokkr), indicating that the sides of the smokkr were held close to the body.



In addition surviving fragments from woollen smokkrs lie in a *single layer* around the body, instead of the *double layer* one should expect from a pair of overlapping wraparound woollen smokkrs. Based on this, Inga Hägg proposes that the woollen smokkr consisted of a front piece and a back piece sewn together at the sides. (I must admit that I cannot see why the lack of two woollen smokks on top of each other at Birka is an argument for an open smokkr. If so, the smokkrs at [Hopperstad](#) would have to be open in the side for no better reason than that there are two woollen smokkrs, one worn outside the other.)



More importantly Hägg points out that a smokkr formed as a closed tube would be a natural continuation of the woollen peplos that seems to have been in use during the Iron Age (as evidenced by the Huldremose find).

Some of the graves with woollen smokkrs also show traces of linen cloth and have a double set of loops inside the brooches, indicating that they may have had a separate linen smokkr of some sort worn inside of the woollen smokkr. Grave [464](#) on the other hand, is a clear example of a *lined* smokkr, where both the linen and wool cloth are sewn together and supported by a single loop.

Hägg notes that the decorative braided and tablet woven bands found in some of the Birka graves are sometimes found in the chest area, and that the brooches occasionally has sat upon a woollen garment. She interprets this as evidence for a decorated women's tunic worn beneath the smokkr, of which Birka grave [735](#) is an example.

In 1981 [Flemming Bau](#) reinterprets the Birka material yet again. His starting point is the different figurines and picture stones showing Viking female figures. He states that the serk is usually reconstructed as a long, train-like garment. According to him though, the figures **d** and **e** (both from the 8th century) are the only ones that support the theory of a trailing serk, and he interprets the trailing dress or train in the other figures as several different garments.

Interpretation by Bau:

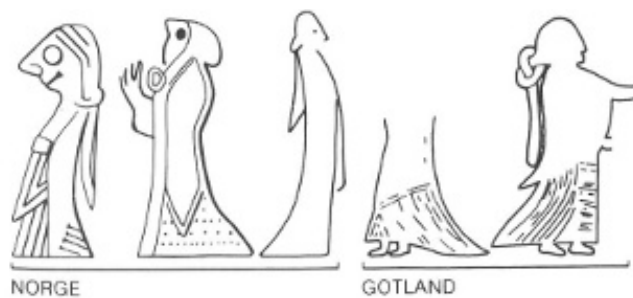
a. serk, apron and cloak

b. apron?, smokkr and cloak

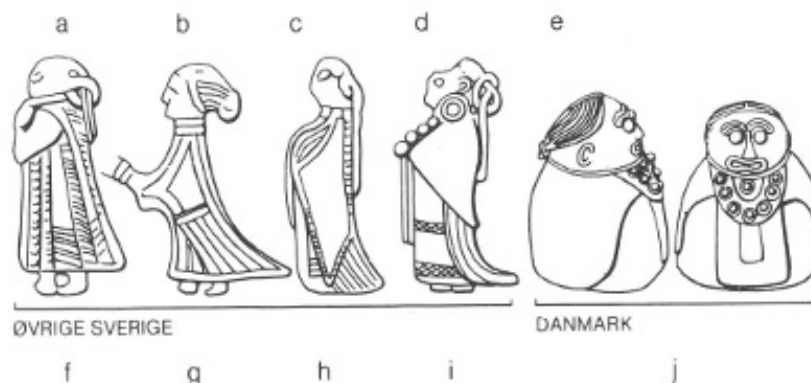
c. apron

d. serk, smokkr and caftan

- e. apron, smokkr and cloak
- f. apron, smokkr and train
- g. serk, apron?, smokkr and caftan
- h. apron, smokkr, train and cloak
- i. apron, smokkr, train and cloak
- j. apron, smokkr and cloak



Flemming Bau: *Seler og slæb i vikingetid, Birka's kvindedragt i nyt lys, illustration p 15*



In figure **d** and **g** unbroken lines run from the front of the woman to the back of the train, except for a small triangle in the front where the undergarment is visible. Figure **e** has a train and a hanging length of cloth in the front. The trains in **f**, **h** and **i** appears to have been fastened at the shoulders. Figure **f** has some kind of undergarment (shown at the sides) and a hanging length of cloth worn at the front. In the case of **h** and **i** there is a garment worn beneath the train, and a shorter length of cloth hanging down in front. This short "apron" seems to also be present in **c**, and a longer version appears on **j**.

Der er tydeligt slæb på alle figurer, bortset fra f, men det er tilsynelatende forskellige klædningsstykker, der danner slæbet. d og g viser ubrudte linier fra kvindens front og bagud i et slæb. Kun en lille trekant af den underliggende klædning lades synlig foran. Uden på disse to klædningsstykker bæres en slags trøje eller lignende. Ved figur e afbrydes de bagudrettede linier i slæbet med en hængende bane stof foran.

Ved figurene f, h og i hænger slæbet ned fra skulderpartiet og ikke fra kvindens forside, som ved de tidligere omtalte figurer. Sølvfiguren f viser tydeligt et skulderslæb, foran hænger en stofbane og en underliggende klædning skimtes. På figur h og i ses et slæb, der specielt for i's vedkommende tydeligt bliver båret uden på en anden klædning med mønsterborter. På begge, og tilsynelatende også på c, hænger et klædningsstykke ned foran, men ikke så langt ned som slæbet. Endeligt ses foran på guldspillebrikken j et hængende klædningsstykke.

Flemming Bau: *Seler og slæb i vikingetid, Birka's kvindedragt i nyt lys, p 14-15*

Bau takes **f**, **h** and **i** as evidence that there could be a *separable* train fastened at the shoulders, since the back in at least one of these figures (**f**) extends higher than what would be the case for the traditional interpretation of a smokkr with long back loops.

He argues that the trains in these figures are longer than the front cloths, and so they should not be interpreted as parts of the same garment. Instead the front cloth is a *separable* apron which is fastened on the woman's chest (**d**, **g**). While no fragments have been identified as part of a train in the Birka material, the figurines show lines running down the back that may indicate that the train was pleated.

Having introduced these two new garments in addition to the smokkr, Bau sets out to reinterpret the meaning of the number of loops found in the Birka graves (after the tool bands have been excluded).

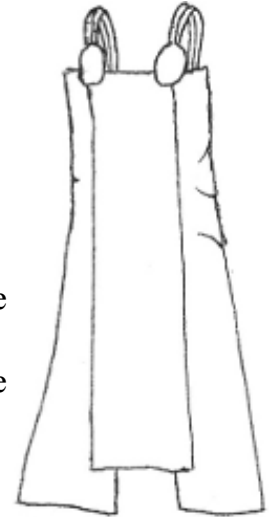
Inga Hägg introduced two combinations of smokkr loops:

- 1 loop at the bottom and 1 loop at the top of the brooches (a single smokkr)
- 2 loops at the bottom and 2 loops at the top of the brooches (2 smokkr worn together)

Most graves haven't got a full (and identical) set of loops in both brooches because of the deterioration of the fabric after the burial. Hägg thus attributes graves with asymmetrical loop numbers (e.g. a brooch with 2 loops at the bottom and 1 at the top) to poor preservation conditions.

Bau introduces two additional combinations of loops:

- 2 loops at the bottom and 1 loop at the top (a single smokkr plus a separable apron)
- 1 loop at the bottom and 2 loops at the top (a single smokkr plus a separable train)



The introduction of these combinations means that the total number of missing loops that have to be explained by poor preservation conditions decreases significantly, because an asymmetrical number doesn't necessarily mean that loops are missing.

A smokkr has the same number of loops independent of whether it is closed or it has an opening somewhere. Thus the combination of the closed smokkr reconstructed by Inga Hägg and a separable apron or train could explain the various number of loops found at Birka. Bau rejects the closed smokkr though. He argues that while the figurines show no evidence of a smokkr with a side opening, as envisioned by Agnes Geijer, it is entirely possible that it was open in the front. He also refers to the work of several ethnographic researchers that has illustrated some folk costumes from the 1700s that seems to have an opening in the front.

According to Bau, some of the tools hanging from the brooches must have been touching the serk directly since they show traces of linen from the serk, without an intervening layer of cloth from the smokkr. An open-fronted smokkr, with or without an apron that could slide aside in the grave, would explain how these knives and scissors came in contact with the serk.

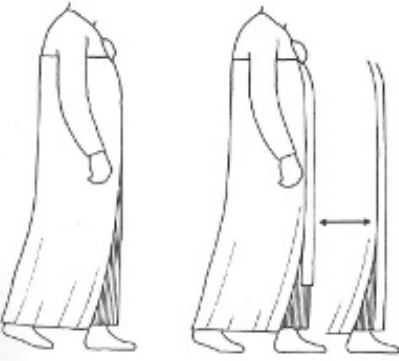
In addition, there are the decorated garments like the one found in grave [735](#), which Hägg interprets as a tunic that had been worn *underneath* the smokkr (she probably arrives at this conclusion because one of the "tortoise" brooches lay on top of one of the decorated fragments). Bau argues that if the smokkr was closed it would almost completely cover the highly decorated front of this tunic. An open-fronted smokkr on the other hand, worn without an apron, would show off the tunic underneath.

The open-fronted smokkr would also separate from the serk and apron when the woman was walking, creating a triangle as seen in some of the figurines (**d**, **g**).

Illustration from Flemming Bau: Seler og slæb i vikingetid, Birka's kvindedragt i nyt lys, p 25



One of Hägg's arguments for a closed smokkr is that the uppermost edge on all the smokkr fragments lies in a straight line along the width of the "tortoise" brooches. According to Bau only 10 graves have fragments with the edge running horizontally across the width of the brooch (and several of these are somewhat ambiguous) so Hägg's conclusion is built on very limited evidence. If the loop is fastened fairly close to the corner (as may be the case in grave [464](#)), the smokkr isn't required to be closed in order to avoid a large "flapping" piece of fabric, and the cloth would still run straight across the brooches.



With this in mind he concludes that the large fragment running from brooch to brooch (Birka grave [597](#)) was part of a separable apron. The fragment was found folded on top of one brooch, something which would happen more easily with a separable apron than the front of a closed smokkr.

Lastly, he argues that if a closed smokkr existed, it would fix the brooches and loops in place more firmly than the open-fronted smokkr. Thus the findings of brooches that have been turned upside down in the grave during deterioration and the loops that have been pulled out of position support his theory of an open-fronted smokkr.

He concludes that the smokkr was open in the front, and with this in mind he reinterprets the two loop combinations introduced by Inga Hägg. He believes that one loop above and below should be interpreted as an open smokkr (without an apron), and that two loops above and below would be an open smokkr plus a separable apron and train.

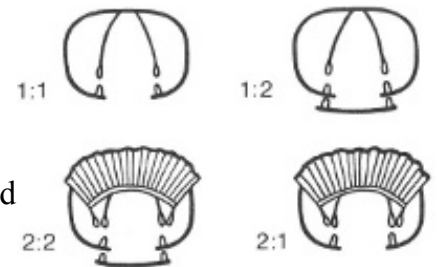


Illustration from Flemming Bau: Seler og slæb i vikingetid, Birka's kvindedragt i nyt lys, p 25

He argues that the back loops of the smokkr probably ran slantwise over the shoulders, like in modern dungarees, something at least one other researcher (Thor Ewing) agrees with.

Inga Hägg comments on Bau's interpretation on her website. She points out that Bau's interpretation is strongly influenced by the figurines of valkyries and other female entities in Viking art. The problem with this is that none of these figurines are clearly shown wearing a smokkr with "tortoise" brooches, and their clothing may be interpreted in several different ways.

While Bau's work as an illustrator has resulted in his interpretation being spread widely through his clear and colourful pictures, Hägg is unequivocal in her rejection of the proposal of an open fronted smokkr.

She states that roughly 25 graves in Birka contain significant fragments from the front of the woollen smokkr, including the fragment that runs from one brooch to another (Birka grave [597](#)) - which she obviously does not believe is a part of a separable apron.

She also refers to the Haithabu fragment (a find that was reported on after Bau's analysis) and "a host of other Scandinavian finds" that reaffirms that the smokkr did cover the front, and was closed around the body.

En omfattande spridning i handböcker och populärlitteratur fick den danske grafikern Flemming Baus färgstarka bilder av kjolen under 1980-talet och framöver (t.ex. Hvass, Jernalderen 1980 och Burenhult, Arkeologi i Norden 1999). Hans rekonstruktion var starkt påverkad av ett antal vikingatida framställningar av valkyrior och andra kvinnliga väsen i dräkter som kan tolkas på olika sätt, dock i inget fall visar de en hängselkjol med spämbucklor.

<...>

Förslaget om en öppning framtill kan avskrivas direkt. I Birka har ansenliga fragment från yllekjolens framsida bevarats i bortåt 25 av gravarna, ofta fixerade i ärg och rost under de ovala spämbucklorna. I ett fall har ett sammanlagt 22 cm brett stycke bevarats, därav 12-13 cm från partiet upptill på bröstet mellan de båda ovalspännena.

I Hedeby, Birkas handelspartner i det dåtida Danmark, har man funnit ett 30 x 23 cm stort stycke från sidan och ryggen till en yllekjol med vertikala fogsömmar och intagningar. Detta och en rad andra skandinaviska fynd stämmer med den tidigare för Birka vunna bilden, nämligen att yllekjolen täckt bröstet framtill och att det var slutet runtom i kroppens längdriktning.

[Hägg 2009](#) (visited 5th July 2010)

In his book *Viking clothing*, Thor Ewing also expresses his disagreement with Bau's interpretation.

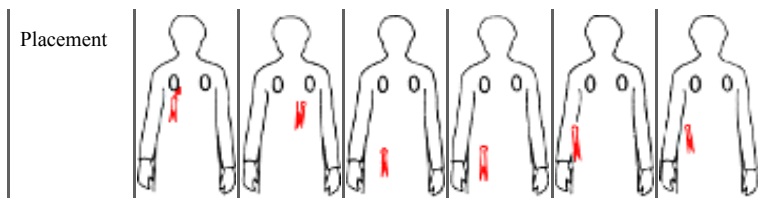
He accepts that an open smokkr could show off the tunic underneath, but since the decorated tunics seem to be fairly rare, the majority of open fronted smokkr would just expose the woman's underwear at precisely the areas one should expect to find covered. It would also be hopelessly impractical to wear without an apron, because the dress would tend to swing to the sides.

In addition Ewing argues that there is no evidence for an open-fronted garment worn *without an apron* in the ethnographical comparative material Bau presents (and if the apron was always present, it removes the whole point of the open smokkr because the apron covers the tunic underneath). Instead he cites Birka grave 597 and the Køstrup and Haithabu finds as evidence that the smokkr was closed.

He further argues that there is no need for Bau's open smokkr to explain the linen left on the metal implements hanging from the brooches. If a linen smokkr or a linen apron or forecloth was present, or the implement simply hung inside the smokkr, it would easily have come in contact with linen. (Also, when I look at Bau's drawing of the positions of the scissors and knives it seems to me that in several of the graves, the implements may easily have come in contact with linen from the sleeves of the serk.)

Smooth linen

Grave	464	465	515	550	637	1888 N
Tool	scissors chain	scissors knife	scissors	scissors	scissors	scissors



Pleated linen

517	597	703 B	791	834 B	838	943	978	980	1062	1084	1159
scissors	scissors	scissors or knife	scissors	chainlinks	scissors	scissors	scissors?	keys	scissors	scissors?	scissors

Flemming Bau: *Seler og slæb i vikingetid, Birka's kvindedragt i nyt lys, illustrations p 26, 27. Text translated and red colour added for emphasis.*

Finally Ewing refers to the description of the farmer wife in the poem *Rígsþula*:

Sat þar kona... sveigr var á höfði, smokkr var á bringu, dúkr var á halsi, dvergar á öxlum.
 There sat a woman... a sveigr was on her head, a 'smock' on her chest, a cloth was at her neck, 'dwarf'
 brooches at her shoulders.
 - *Rígsþula, translation by Thor Ewing: Viking Clothing p.37*

In the poem the dress that is held up by the brooches appears to be referred to as smokkr. The word is related to the verb *smjúga* (to creep through) and seems to reference the way the garment is put on, where the wearer creeps through the dress until arms and head emerges on the other side, another indication that the smokkr was a closed garment.

Ewing concludes that there were clearly possible variations in the style of the smokkr, just as there were in the style of the brooches; the Birka smokkr front seems to be unpleated (unlike the Køstrup find), and the various number of straps attached to the brooches suggest various combinations of garments. However, the assumption should be that the basic garment worn with the "tortoise" brooches was a closed dress of one form or another, and that these brooches would not have been worn without such a dress.

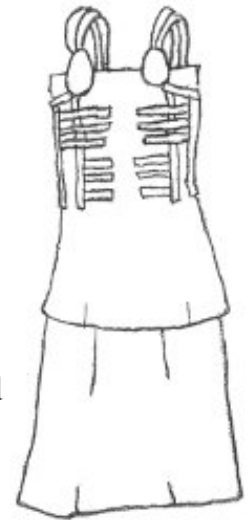
He shares Bau's scepticism towards Hägg's proposal of a highly decorated tunic worn underneath the smokkr, but introduces another explanation for this evidence. One of the arguments Hägg raises against Geijer's suggestion that the silver tablet woven bands and silk bands were smokkr decoration, is that the silver bands are also found in positions that would not have been covered by the smokkr. Ewing points out that this is true, but the bands seem to be found in two distinct areas, *either* near the shoulders *or* below the arms. When they are found in both positions (Birka graves 965 and 950) they differ in type from one area to another. Ewing takes this as evidence that the bands probably decorate *two separate garments*.

He proposes that the bands from the lower area could be decorating the smokkr, or a similar garment (i.e. another smokkr) suspended on top of it. If the closed smokkr could be worn in pairs, one on top

of the other, it would explain the presence of two loops at the top and bottom of the brooches in many of the Birka graves. In the case of some of these graves Inga Hägg has already raised the possibility that the traces of linen inside the woollen smokkr might derive from an inner linen smokkr instead of simply a lining. A short outer smokkr would give an opportunity for showing off fine fabric and decorative braiding at less expense than the longer main smokkr.

Based on his arguments above, Ewing interprets the decorations from Birka grave [735](#) to from a short smokkr instead of a tunic. He states that the bands appear to mirror the line of the Køstrup smokkr, down to having a gap in the middle between the decorations that could conceivably have been pleated.

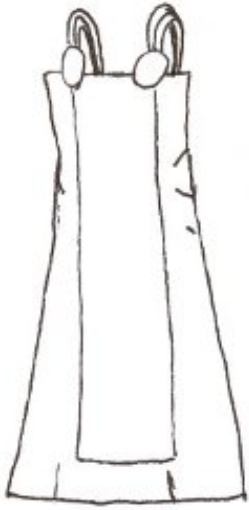
Looking at the evidence from grave 735 I can see Ewing's point. If the decorated silk twill fragments belong to a short smokkr, it would explain why one of the fragments lay beneath one of the "tortoise" brooches in the grave. The silk twill may have been mounted on a woollen smokkr as decoration. Alternatively, the top of the smokkr was made of silk twill which had been lengthened from the waist and down with woollen fabric. I find it unlikely that the gap in the middle between the decorative bands was pleated though, as the rest of the garment seems to have been painstakingly shaped to follow the body.



The interpretation of the decorated garment as a smokkr raises some questions however. Independent of whether it is a tunic or a smokkr, I find it challenging to reconcile the shaped tailoring of the pieces in grave 735, including gores and use of tablet woven bands as a structural part of the garment, with Hägg's and Geijer's belief in an unshaped smokkr. If these tailoring techniques were in use by the Vikings of Birka, why would the smokkr be an exception? Could it be that the Birka smokkrs were shaped somewhat as well, and that the lack of evidence for this is merely because so few and small fragments have been found?

Of course, if the garments in 735 were imported as Hägg believe, they may not reflect the domestic tailoring tradition in Birka. The smokkr seem to be unique for the Vikings, and so an imported garment is more likely to have been a tunic than a smokkr. Imported garments would not have been designed with the smokkr in mind (or vice versa), so it wouldn't be that strange if the decoration on an imported tunic ended up being partly covered beneath a domestic smokkr. The tunics could conceivably be worn on top of a underdress in wool or linen in normal occasions, and only end up under the smokkr at burials or other occasions where a Viking woman wanted to wear every costly garment in her possession at the same time. Also, while the garment might have been imported as a tunic, it might not have remained one. Ewing's theory regarding a decorated smokkr in grave 735 could still fit the evidence if the man is wearing a tunic and the woman is wearing a smokkr onto which the decorated front of a similar tunic has been appliquéd. After all, the piecing of silk and tablet woven bands create a shaped piece of cloth that could fit into the chest area of several garments.

Even if we disregard grave 735 altogether, there is still evidence that suggests the existence of double smokkrs, both at Birka and other places. Hägg raises the possibility of inner smokkrs at Birka and the finds at [Værnes](#), [Sandanger](#) (grave B 10720) and [Hopperstad](#) all provide evidence for two smokkrs being worn on top of each other. Finally, Ingstad interprets the evidence from [Kaupang](#) (grave C) to



indicate that a short smokkr was worn outside of a long pleated smokkr.

Although Ewing has concluded that the smokkr was closed, he agrees with Bau that an separable apron or train probably was worn occasionally. The possible combinations of smokkr, apron and train could conceivably explain all the variations in number of loops inside the brooches. Still, Ewing maintains that the inclusion of a double set of smokkr presents an additional possibility, especially in the cases where there are two loops at both the top and bottom of the brooches.

The Haithabu material

The [fragments H14A-B](#) from Haithabu harbour were found as part of a ship's caulking. Thus there were no accompanying tortoise brooches that could identify them as part of a smokkr. Instead, identification must be made based solely on their shapes.

According to Hägg, the shapes indicates that **H14A-B** are smokkr fragments. The hemmed edge would be at one end of the garment, as it could not have been stitched to another fabric piece. The wedge-shape would have been pointed with the slimmest part (16 cm wide) upwards. Additionally, the fact that the dart is deeper in the middle than at the edges, indicates that the fragments are not part of a completely different type of pattern, like a sleeve (Hägg 1984, p. 38-39).

Provided one accepts this identification, the fragments provide a wealth of information about the shape of the smokkr. Together, the two fragments form a wedge-shaped piece that once was stitched to other pieces along both sides, as indicated by the traces of seams.

Hägg (1984, p. 42) observes that the narrow cut and the dart indicate that the garment fit closely to the upper part of the body, and then flared out over the hips. In other words, this was a tailored garment. This places the Haithabu smokkr firmly among more complex garments with a defined function (Hägg 1984, p. 169). The tailoring makes it unlikely that it was left open, whether in side or in front, and thus strongly indicate that the smokkr was forming a closed tube around the body.

Photograph: Hilde Thunem, reconstruction at the Historical museum in Oslo.



The piece formed by the surviving fragments is only wide enough to have covered part of the body, e.g. the side or half of the back. According to Hägg (1984), a placement in front is less probable, as the dart is very shallow (p. 42). Due to the narrow cut, she believes there might have been an opening or slit, possibly closed by lacing, to allow the wearer to put the smokkr on (p. 170). Her reason for suggesting lacing as a possible solution is that according to old Norse clothing terminology, there was a type of tunic - dragkyrtill - that were "laz at siðu", that is, tied together along the sides (Falk 1919, quoted in Hägg 1984 p. 170). Finally, she suggests that the smokkr *may* have been constructed from four parts, although this is necessarily guesswork as there is no evidence beyond the two fragments **H14A-B** (Hägg 1984, p. 213).

Även resterna av en hängselkjol i tuskaftat ylle visar ett snävt snitt, som tillsammans med intagningarna kring livet starkt framhäver kroppens former. Plaggets slanka linjer betonas ytterligare genom en prydnadsfläta, som fästs över en av sömmarna i dess längdriktning. Kjolen, som förmodligen bestått av fyra separat

tillskurna tyglängder vidgade sig nedåt på samma sätt som tunikorna.
Hägg 1984, p. 213

She believes that the widest point of the dart was placed at the waist, and that the worn hole and the felted area indicate that a belt had been worn with the smokkr (Hägg 1984, p.40). While the fragments are torn at the bottom, making the total length of the smokkr unknown, the distance from the waist area to the bottom of fragment **H14B** is roughly 25 cm (Hägg 1984, p. 170).

The hole at the top, probably caused by wear, may have been used as a temporary mechanism to attach a strap, e.g. by passing it through the hole and tying it (Hägg 1984, p. 40-41). It is possible that the Haithabu fragment, while originally part of an upper class smokkr, would have been passed on to a servant or slave when it became worn. This second wearer of the garment would not have owned brooches, but would probably simply have tied a strap to the front of the smokkr ([Hägg 1996](#), p. 14).

Från detta fyndkomplex kommer ett hängselkjolfragment som säkert ursprungligen hört till en välsituerad kvinnas dräkt. Yllematerialet och väven är av utmärkt kvalitet. Men när kjolen blev nött och trasig har sannolikt en trälkvinna fått överta den. Kvinnorna på samhällets lägre nivåer ägde inga dräktspännen. <...> Hedebykjolen hade av sin andra ägarinna helt enkelt fästs över axlarna genom att hängslena knutit fast direkt i framstycket.
Hägg 1996, p. 14

The Køstrup material

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 of how the blue woollen smokkr would have looked.

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).

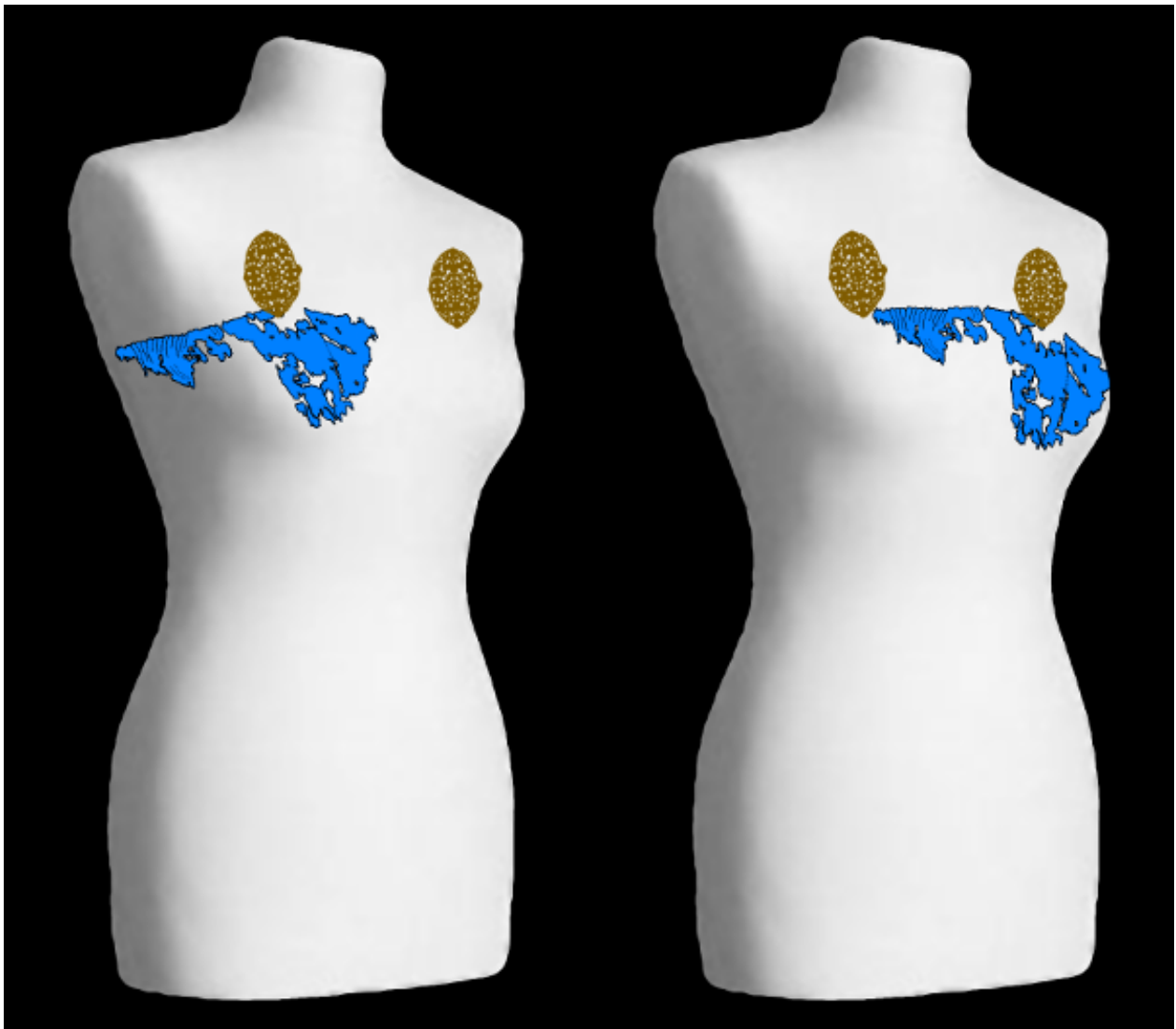


Illustration of alternative placements of brooch x505 by Hilde Thunem and Tor Gjerde.

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.

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).

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 ([Thunem 2015](#)).

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

This is supported by the fragment. 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 (Hägg 1974). 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.

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 from Haithabu (Hägg 1984).

Grave ACQ has the largest fragment of a pleated smokkr that has been found so far, but it is not the only one. Pleating (4-5 mm deep) is also known from smokkr fragments in [grave C](#) at Kaupang (Ingstad 1979), and probable smokkr fragments (2-3 mm deep pleats) in [grave B 5625](#) at Vangnes (Holm-Olsen 1976). Unfortunately, these fragments are too small to shed further light on the shape of such smokkr.

The decoration of the Køstrup smokkr was done in a manner unique to this find. 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.

Illustration by Charlotte Rimstad (1998, cover page)

Rasmussen and Lønborg (1993) 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.

The Pskov material

Although Vikings sometimes travelled to Russia, it isn't a given that the remains in the Pskov grave are from a Viking smokkr. It was found together with "tortoise" brooches though, and the preserved linen loop also seems to indicate a smokkr, or something very similar.

Zubkova, Orfinskaya and Mikhailov use the smokkr interpretations of Agnes Geijer and Inga Hägg when interpreting the Pskov evidence, and call the resulting garment a sarafan (a Slavic garment that may be akin to the smokkr).

According to their interpretation the sarafan or smokkr was made from fine blue linen tabby. The large silk fragment was sewn onto the linen as decoration. The part made out of three silk strips was worn in the front, while the single silk strip at each side of it served as trim for the side and back of the garment. Finally, it was not possible to conclude whether the 4,5 cm wide reddish-violet samite strips was used to decorate the hem of the smokkr or underdress.

The smokkr loops were made from the same blue linen as the smokkr. Unfortunately, with the exception of two loops on the central piece, it is very unclear from the report exactly how many loops there were. The archaeologists note that there are "remains of threads and traces of sewn on straps" on one side strip (V) 20 and 25 cm from where the strip is fastened to the central piece. They further state that the general symmetry of the large silk fragment suggests "the presence of the identical straps on its second narrow lateral strip" (IV). This might be read as an assumption that both side strips had more than one loop.

To make matters worse, the report doesn't say how many loops were found inside each brooch. Also,

the archaeologists question the presence of an extra apron or train (which would mean more loops).

Moreover, detailed examination of the inner parts of the brooches with the traces of a pair of straps on the pins have led us to question the presence of either a pinafore or a train as proposed in F. Bau's reconstructions.

Elena S. Zubkova, Olga V. Orfinskaya and Kirill A. Mikhailov: Studies of the Textiles from the 2006 Excavation in Pskov, p 298

At the same time, their reconstruction show only four loops, two at the front and two at the back of the smokkr. Nor have they included a separate apron or train.



The thing that strikes me as most peculiar with the Pskov smokkr is its dimensions. Provided that the scale in the photograph is correct, the part of the fragment that covers the front of the smokkr is roughly 1 m long. Unfortunately, we cannot see the traces of the loops in the photograph, which means that their position has to be estimated from the drawing (which is less precise). Here the front loops are roughly 10 cm from each side of the central piece, leaving about 80 cm between the loops. (That is a Viking Age lady of truly heroic proportions!)

Using the placement of all the silk strips in relation to the Bahram Gur pattern, we can estimate the maximum length of the less preserved strips (IV and V). If almost the entire Bahram Gur cloth was used as decoration, the smokkr would have had a circumference of roughly 2 m. Even if it wasn't, and the back loops were placed at a shorter distance from each other than the front loops (like on a dungaree skirt), the smokkr would have been very wide in front.

Zubkova, Orfinskaya and Mikhailov do not mention this issue in their report. However, before it was published, the authors temporarily published [a preliminary report](#). It contained two illustrations of alternative ways of wearing such a smokkr; either by letting the front fall in a large fold on the chest, or by folding the front in an accordion fold. As there was no discussion of either, we do not know which of them the authors found to be most likely, or why they chose to omit them in their final report.

Annika Larsson

In 2008 a new interpretation of the smokkr was proposed by [Annika Larsson](#). Her theory is mainly based on the Pskov find, but due to Pskov being situated on a trading route from Birka towards the east, she argues that the Pskov fragments are also relevant when interpreting the Birka evidence. Her reconstruction appears to combine elements of the Pskov find with elements from Birka.

As mentioned above, the large silk fragment believed to have decorated the top of the Pskov smokkr has a central "flap" (made of three silk strips) that is higher than the rest of the fragment. According to Larsson, if this is placed on *the front* of the smokkr, as Zubkova, Orfinskaya and Mikhailov suggest, the upper edge will be level with the throat. This would require the tortoise brooches to be

placed on top of the shoulders, which is unlikely. She also states that the width of the flap would leave it in folds down towards the stomach, something that would hide the string of beads that were hung between the brooches. (There is no mention of beads in the Pskov report - perhaps Larsson is thinking of Birka, where several of the graves contained beads?)

Instead Larsson proposes that the flap was placed at *the back* of the smokkr, reaching the neck of the woman wearing it. She proposes that it was pleated, decreasing the width into something reasonable at the top of the smokkr while leaving plenty of width at the bottom of the garment.

This is an interesting way of dealing with the extreme width of the Pskov smokkr. However, if the silk was pleated, shouldn't there be traces left of the pleats, or at least the stitches used to fasten them? (The stitch holes mentioned in the Pskov report are all tied to the presence of smokkr loops.) It is of course possible that they have deteriorated with time, but the lack of clear evidence weakens the theory of pleating somewhat.



Also, Annika Larsson's interpretation places the largest and most decorative part of the silk fragment at the back of the smokkr, where it may be hidden by hair, shawls or cloaks. This seems counterintuitive to me, even when keeping in mind that Vikings had a different approach to fashion than modern people.

... samt en näst intill komplett överdel från et hängselkjolsliknande plagg. Slående är att det inte handlar om någon tubliknande konstruktion, såsom tidigare hävdats, utan ett mycket brett plagg som inte alls varit lika högt fram og bak. Det skiljer faktisk så mycket som 30 centimeter mellan fram og bak, och man kan till och med skönja spår av en uttrigning i vardera sidan för armarna. De bevarade detalarna visar ett plagg helt utan sidsöm. <...>

Tolkningen är att plagget burits på det sätt som vi traditionellt brukar visa. Men här finns et stort problem - nämligen att det förmodade framstycket på det bevarade fyndet är hela 1 meter brett! Då det fästes i spännbucklorna bildas en drapering av tyg över magen som mera påminner om ett antikt ideal. Det är tiltalande tanke, men till detta skal läggas ett antal halsband som utgår från samma spännen, och som helt skulle försvinna in bland tygerna och antagligen inte synas alls. För att armrिंगningen på plagget ska fylla någon funktion innebär det dessutom at det förmodade framstyckets överkant hamnar högt upp i strupen. Det gör att några spännbucklor i realiteten inte får plats på framsidan av kroppen - möjligen mitt uppe på axlarna.

Det hela är altså en orimlig tanke när den prövas i verkligheten, hur trevlig den än kan tyckas vara på en teknad bild. Jag tror därför inte det är framstycket vi har att göra med - utan ryggstycket. Placerat i nacken som vilket annat plagg som helst, med det 1 meter breda tyget i lagda veck, bildas nämligen ett släp som motsvaras av ett antal bevarade vikingatida kvinnofigurerers klädsel.

Annika Larsson: Förbjöd kyrkan den vikingatida kvinnodräkten?, p 6, photo [Uppsala universitet](http://www.uu.se)

Larsson refers to the small valkyrie figurines and states that they show that the smokkr is open in the front (while she doesn't give any further reasoning for this, I assume that she is building on Flemming Bau's interpretation). Her interpretation of the Pskov evidence is of a garment that looks like the trains worn by some of these figurines. She suggests that decorative chains or strings with beads were strung across the frontal opening to keep the smokkr from slipping off the shoulders.

When she places the flap at the back of the smokkr, the rest of the trim ends up at waist-height, leading her to place each brooch on top of the breasts (instead of the usual position just below the clavicle). According to her, Hjalmar Stolpe's illustrations of the Birka graves show the brooches in this position, and Ibn Fadlan's account of how the Rus women wear a box on each breast supports this. She states that the traditional explanation that the brooches have ended up lower as the corpse rotted is a prudish interpretation.

Redan en blick på Hjalmar Stolpes gravplaner från 1800-talets utgrävningar i Birka, skvallrar om att de bågge ovala spännbucklorna som följt med de döda kvinnorna i graven, antagligen suttit mitt på värdera bröstet. Mot detta anför de traditionella tolkningsföreträdarna att spännbucklorna har fallit ned när liket ruttnat, och att det aktuella läget därför inte speglar spännenas ursprungliga plats, som anses ha varit under nyckelbenen. Detta förefaller vara en rett pryd tolkning.

Att spännbucklorna skulle ha suttit på bröstet styrks också av en samtida arabisk källa, som berättar at de vikingatida kvinnor hade dosor av järn, silver, koppar eller guld, fastsatt på bröstet, där en kniv var fästad. Alltefter rikedom bar hon också många halsbånd. Detta nedtecknades av Ibn Fadlan, en muslimsk resenär, då han år 921 mötte nordbor vid floden Volga under deras handelsresor österut. Beskrivningen är samtida med Birka, och den stämmer överrens med gravfynden.

Annika Larsson: Förbjöd kyrkan den vikingatida kvinnodräkten?, p 5

Inga Hägg is to put it mildly, [somewhat critical](#) towards this interpretation. Her arguments against Bau's open fronted smokkr are equally applicable to Larsson's interpretation. Hägg also notes other discrepancies between the Birka evidence and Larsson's reconstruction.

Hägg's comments regarding the Birka evidence	My comments regarding the Pskov evidence
<p><i>A smokkr open in the front:</i> The evidence argues against a frontal opening. Several graves contain fragments of the front of the smokkr. One of these (597) even has a 22 cm long piece of the front of a smokkr, including the 12-13 cm of fabric that ran between the brooches.</p>	<p><i>A smokkr open in the front:</i> The remains of the smokkr at Pskov were found inside a box inside the grave and thus give no information regarding where on the body it was worn.</p> <p>While the upper part of the smokkr hasn't been preserved in its entirety, it doesn't automatically follow that there must have been an opening somewhere.</p>
<p><i>Brooches:</i> The majority of graves in Birka and the rest of Scandinavia have brooches placed near the clavicles or high upon the chest. The grave finds Larsson refers to are a strict minority, and the position of the brooches near the breasts in these graves has been explained earlier. The decomposition of the body will have caused some of the brooches to move lower, helped by the fact that several of the bodies were buried in a sitting or crouching position.</p>	<p><i>Brooches:</i> The brooches at Pskov were found inside a box inside the grave and thus give no information on which position they were worn in.</p>
<p><i>Smokkr loops:</i> There is no evidence for the use of tablet woven bands as straps in the entire</p>	<p><i>Smokkr loops:</i> There is no evidence for tablet woven</p>

<p>Scandinavian archaeological material. Larsson refers to Agnes Geijer's description of the Birka finds, but what Geijer actually reports is that the tablet woven bands ran horizontally under the brooches, not vertically over the shoulders as straps.</p>	<p>bands in the Pskov find. The smokkr loops appear to have been made from the same blue linen as the rest of the smokkr.</p>
<p><i>Decoration:</i> Although the metallic tablet woven bands decorating the clothing of the women at Birka almost always were made from silver thread, the reconstruction uses golden bands. No bands have been found in a position lower than the hip at Birka, but the reconstruction still positions bands at the lower edges of the garments.</p>	<p><i>Decoration:</i> There is no evidence for tablet woven bands in the Pskov find, metallic or otherwise. The distinctive pattern of three strips of silk used at the top of the smokkr isn't visible in the photographs as they have been placed at the back of the smokkr.</p>
<p><i>Tunic and serk:</i> The decorated tunic has been placed <i>inside</i> the linen serk in direct opposition to the layering of the Birka graves.</p>	<p><i>Tunic and serk:</i> The Pskov find shows evidence for a blue linen serk with purple silk cuffs and possibly purple silk bands fastened to the lower edge of the dress. This has little in common with the two garments shown in the reconstruction, but perhaps the layers beneath the smokkr were not based on the Pskov evidence.</p>
<p><i>Headdress:</i> Skull fragments from Birka have metallic tablet woven bands that were sewn on to some kind of headdress, unlike the single band wrapped around the head worn in the reconstruction.</p>	<p><i>Headdress:</i> There is no evidence for a headdress in the Pskov find</p>

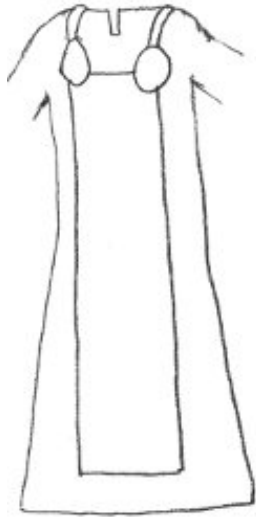
To summarize, Inga Hägg is not terribly impressed with the quality of the research underlying Annika Larsson's work. She demonstrates that Larsson has ignored significant parts of the existing research when making her reconstruction of the smokkr.

Hägg maintains that the smokkr was a closed garment, referring to the traces of smokkr fronts from the Birka material and to the clear evidence from Haithabu and other Scandinavian finds. The 27 cm long fragment of a smokkr front from [Veka](#) also supports Hägg's conclusion (although it was still in storage when Hägg wrote it, and so cannot have been included in her "other Scandinavian finds").

Two hanging panels

Lastly, there exists a suggested reconstruction where the smokkr consists of two separate hanging panels, worn over an underdress. The origin of this particular reconstruction is a bit unclear. I can't find any traces of it in the archaeological reports, instead it seems to originate with the illustrations by David Mallot in "Vikings in England" (1981). Since none of the archaeologists mentions it, I suspect that it could be the result of Mallot misinterpreting the evidence (the original archaeological reports in German and Scandinavian aren't all that accessible).

Despite its unclear origin, this reconstruction is the one that tends to appear in many of the coffee-table Viking books. Because it is so widespread, I decided to include it here along with my thoughts regarding to which degree it fits the existing evidence. You will have to make your own judgement of course.



Caution is required whenever we try to judge what the Vikings found practical, but to the modern mind this reconstruction is a fairly impractical garment. The back panel has a tendency to bunch up around the neck because of the pull of the brooches in front. The panels also give little protection against wind and cold, which for me personally is a significant drawback as I live in Norway.

When examining the archaeological facts it could be argued that the two panels might possibly fit the Birka evidence in the instances with a *single* loop above and below in each brooch. The numerous instances with multiple loops above or below in the brooches are harder to explain though, without resorting to some kind of additional garment worn with the panels.

To my knowledge there are no contemporary clothing traditions (like e.g. the hurstut dress or the peplos from Huldremose) that supports this reconstruction. The two-panel interpretation is also in direct opposition to the evidence uncovered in Køstrup and Haithabu.

Wool or linen?

When looking at the Birka evidence, Agnes Geijer chose to base her interpretation of the smokkr solely on the loops and whatever fragments that were attached to them. She concluded that the smokkr was usually made from linen. Inga Hägg takes a less conservative approach to the same evidence, and identifies several unattached pieces of woollen cloth as smokkr fragments, based on their layer in the grave, and their placement under the brooches. She concludes that the smokkr could be made from either linen or wool. Her conclusion is supported by the linen smokkr found at Pskov and the woollen smokkr found at Haithabu, Køstrup and several of the minor finds.

There is not enough evidence to tell whether linen or wool were the preferred fabric used in the smokkr. Although more than hundred graves in Birka contained fragments of the smokkr, Inga Hägg only lists 33 of them as containing remains from the body of the dress itself. Given that wool is more easily preserved than linen it is not surprising that the proportion of wool versus linen in these graves is 25 vs 8. In reality, linen might have been more common than these numbers suggests.

There is no clear chronological division of the linen and woollen smokkr of Birka, linen smokkr appear both in early graves from the 9th century and the later graves from the 10th century. Hägg also believes that the choice is unlikely to be a matter of status, because the grave goods that follow the two types of smokkr are of comparatively the same value. Perhaps both were used interchangeably, with linen smokkr in summer and woollen smokkr in winter? Or perhaps it was a matter of taste? All we know for sure is that both types existed during the Viking Age.

Decoration

The top of the smokkr was finished by folding 4-5 mm of its edge towards the inside and stitching it in place, or by folding it twice as evidenced by the finds from e.g. [Vangsnes and Sandanger](#).

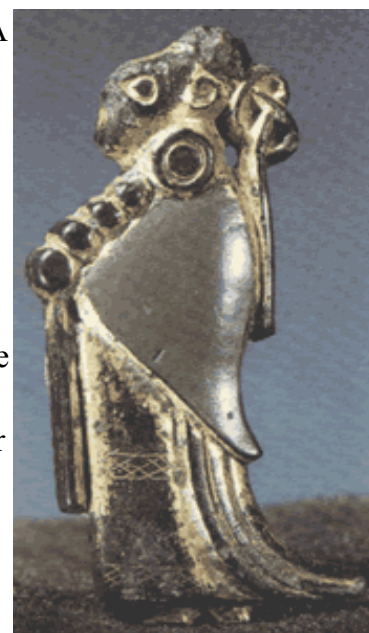
It could be decorated in various ways; folding a silk band over the top like a bias tape (e.g. Birka [464](#)), laying a string on top of the edge (e.g. Birka [973](#)) or along it, sewing a decorative woven band

along the top of the smokkr (e.g. Birka [1090](#)) or fastening it with blanket stitches to the edge of the smokkr (e.g. Værnes). It is possible that linen smokkr had their decoration placed roughly half a centimetre down from the edge in order to cover the stitches that kept the hemming in place (e.g. Birka [563](#)). Finally, the Køstrup smokkr diverges from all the other finds in that the tablet woven band and decorative strings have been fastened to the loops instead of the top of the smokkr.

So how long did the decorations tend to be? Did they only cover part of the top of the smokkr? While most smokkr fragments are too small to give us an answer, the silk decoration in the Pskov find appears to have run along the entire top of the smokkr. However, one sample is not enough to know what (if any) common practice might have existed. On one hand decoration might have been expensive and used sparingly, on the other hand tablet woven bands or other decoration might be used to protect the edge of the garment against wear (a theory advanced by Anne Stine Ingstad when interpreting the Kaupang finds). It might even be something as simple as a matter of taste. Unless we find significantly more samples we will never know.

It is also possible that the smokkr was decorated along the bottom edge. A fragment of a tablet woven band and woollen string from Kaupang may have been stitched to the bottom of the smokkr in order to protect against wear. And while we do not know whether the reddish-violet silk strips from Pskov decorated the hem of the smokkr or of the underdress, their presence demonstrates the existence of a decorated hem.

As Hägg states, the female figures on the figurines and picture stones aren't usually shown clearly wearing "tortoise" brooches. Thus we can't be certain that they are wearing smokkr. Nevertheless, the silver figurine from Tuna (see photograph) has decorative bands running along the lower part of her apron/dress/tunic, supporting the theory that the bottom edge of female attire could be decorated.

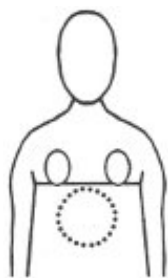


Silk strips could be appliquéd on the smokkr as decoration as demonstrated by the Pskov find. The Pskov smokkr with its entire front flap covered by silk strips also shows that there could be a significant amount of decoration at the top of the smokkr. And although the question remains of whether the garment in Birka grave [735](#) is a tunic or a smokkr, the heavily decorated front shows that several tablet woven bands were occasionally combined on a single garment.

The find at Haithabu demonstrates another decoration technique. Long vertical darts run along the back (and possibly the front) of the smokkr. Unlike modern clothes where the ridges of darts would be hidden inside the garment, the Haithabu fragments not only have them on the outside, but actively draw attention to them by the addition of a thin decorative braid on top of the ridge. The evidence also shows that the Vikings did not solely decorate the front of the smokkr.

Stitching could be used as decoration in and of itself like in grave 735 where half of the decorative bands are stitched in place using blanket stitch. To my knowledge no evidence of actual embroidering *on the smokkr* has been found so far, but the archaeological evidence is as stated earlier very limited.

According to Ewing, the smokkr could also be decorated by beads being sewn on to it.



Some graves from Birka (632, 843A, 791 and 825) had a perfect circle of beads on the woman's breast, which must have been stitched in place on one of her garments. These bead circlets occur in graves with oval brooches as well as those without, so they were probably simply sewn onto whatever garment was most convenient. As well as bead circles, there are also bead squares and bead ovals. Sometimes, a group of beads have been sewn in a tight group around a central brooch.

Thor Ewing: Viking Clothing, p. 65, illustration p. 66

To dye or not to dye?

Linen is very difficult to dye when you don't have access to modern chemical dyes, so it is not surprising that most of the linen loops and linen smokkr fragments appear to be undyed. The exceptions are Birka grave [563](#) and Pskov where there is evidence of blue linen smokkr. In addition, there are fragments of linen that may have once been dyed red in [grave 762](#) in Birka. They stem from a linen underdress, but they demonstrate the possible existence of red linen fabric.

Wool is fairly easy to dye using natural substances and many of the fragments of woollen cloth that has been excavated show traces of colour. Both the Køstrup smokkr and some of the Birka fragments were made of blue (or dark blue) wool. There is also evidence of brown smokkr. Inga Hägg reports that some of the smokkr fragments from Birka were dark brown, and the two fragments from Haithabu were dyed brown.

Not all smokkr was made of fabric in a single colour, as shown by the smokkr fragments with blue and reddish brown stripes found in grave [1090](#) in Birka. The question is could other patterned fabric also have been used in the smokkr? The main grave in Værnes contained a tiny woollen fragment woven in a two colour plaid pattern, and the [graves 27/1963 and 159/1960](#) in Haithabu contain fragments of linen plaid in blue and white, and blue and red, respectively. None of these fragments belonged to a smokkr, but they do demonstrate that plaid were known and used among the Vikings.

The problems when trying to identify what kind of colours the smokkr may have had are manifold. First of all, identifying the colour of the archaeological evidence is challenging, partly because it is difficult to separate colour originating from dye from rust or other discolouration, and partly because plant dyes decays in the ground. Secondly the archaeological evidence can only take us so far. The fragments are just too few to give a correct picture. Although the existing smokkr fragments are either blue or brown, I find it unlikely that *every* Viking woman through the ages wore variations of just those two colours in her smokkr.

Collecting and summarizing the different studies by textile archaeologists in regards to which dyes were likely to be known and used by the Vikings is a separate research project though, and not one I have had time to do (yet). On the other hand, [Carolyn Priest-Dorman](#) have done a thorough work on this in her article on colours in the Viking Age.

Some thoughts on the length of the smokkr

This is almost impossible to discover purely by archaeology, because the metal artefacts that preserves fragments of clothing seldom are placed at the lower edges of the dress. We know that the smokkr was at least hip-length, since there is at least one grave in Birka with fragments from the smokkr attached to a chain and knife hanging down to the hip of the body, and the Haithabu fragments would also have reached that far.

Turning to the pictorial evidence, most of the figurines and picture stones are hard to interpret in regards to a) if they are wearing a smokkr and b) if so, what exactly on the figures represents it.



Female figure from Oseberg tapestry.
Thor Ewing: Viking Clothing, p. 38



Picture stone from Låbro, Sweden. Thor
Ewing: Viking Clothing, p. 37.



Anglo Scandinavian carving
from Pickhill in England,
Thor Ewing: Viking
Clothing, p. 45.

Unlike many of the figurines and picture stones, the Oseberg tapestries show women wearing something that might be a "tortoise" brooch. They wear floor length garments, but their sleeves have the same colour and pattern as the trailing trains, indicating that this is a dress or underdress, not a smokkr. The smokkr could be hidden under the "cloak" that runs from their shoulders, but if so, it is short enough to leave the underdress visible beneath.

The Låbro stone shows a woman wearing some kind of an overdress on top of a long underdress. If the overdress is a smokkr, the carving indicates that the smokkr would have been short enough to show the underdress beneath it. Another possible interpretation could be that this is two smokkr worn on top of each other (e.g. like Kaupang grave C) with a pleated inner smokkr worn under a shorter outer smokkr.

Due to her shawl, it is not possible to tell if the silver figurine from Tuna (above) is supposed to be wearing "tortoise" brooches. As Hägg already has pointed out, this means that we can't know for certain whether she is wearing a smokkr or some kind of other garments. *If* she is wearing a smokkr,

however, it appears to be floor length, combined with a short apron in front and a long, pleated train in the back.

On the opposite end of the scale, Ewing refers to an Anglo Scandinavian carving from Pickhill in England that seems to show a woman wearing a very short suspended dress with a pair of brooches.

In summary, the pictorial evidence doesn't give any clear conclusion as to the length of the smokkr. Due to the lack of a Viking Age "smokkr control committee" traveling around and ensuring that everybody's smokkr were exactly the same length, we can safely say that some variation existed. We just don't know how much.

If smokkr were occasionally worn in pairs, the length might have varied depending on whether the smokkr in question was meant to be worn alone (or with a separable apron or train), or if it was designed to be worn on top of another.

It might also have been a matter of local custom, taste or temperature. Unless more evidence surfaces from the lower parts of the smokkr, which is highly unlikely, we will never know.

My interpretation

Fortunately, more has been preserved of the smokkr, than of e.g. the serk. However, the smokkr fragments are still too small to give us a definitive picture of how the garment was constructed. And as shown above, even the experts can't agree on a most likely interpretation.

As a consequence, those of us that don't want to glue fragments of fabric to our bodies and call it a reconstruction (not a very attractive prospect :-)) must guess when we create our clothing. Of course, I build upon the existing evidence and interpretations of it in my search for an actual wearable garment, but I refuse to delude myself into believing that my end result is anything else than guesswork.

Below are a set of assumptions I make before even beginning to reconstruct a specific smokkr.

Assumption 1:

The tortoise brooches were an integral part of the smokkr.

The tortoise brooches first appear at the beginning of the Viking Age. They are markedly different in shape, and thus function, than their predecessors; the "bow brooches" (designed to gather loose folds of fabric) and "saucer brooches" (fastened directly at the edges of the garment). Their domed shape makes them well suited to hold numerous fabric loops while lying flat against the body.

The presence of these characteristic brooches in a grave currently serves as a confirmation that the deceased was of Scandinavian origin or descent and was wearing a smokkr. As far as I know, there is no evidence that such brooches were ever used to fasten other garments. Combined with their specialized shape, this is an indication that they were designed specifically with the smokkr in mind.

But was the smokkr designed for them, or could it be worn without brooches? So far all smokkr fragments have been found together with tortoise brooches, with the sole exception of the fragments from [Haithabu harbour](#) (and the only thing we can conclude from that is that nobody in their right mind uses their jewellery for ship's caulking).

Unfortunately, as long as the tortoise brooches are *the* signifier of a smokkr, we may not be able to recognize a smokkr without them. (That is, provided that it exists in the first place, and have survived without the aid of the preservative metal salts.) Inga Hägg does speculate that the Haithabu smokkr could have been worn without brooches for a period of time (used by a servant or slave who tied a strap through the hole in the front), but even if this was the case, it would be a secondary use of the garment, and not its original function.

The absence of evidence is not evidence of absence, so we cannot *prove* that the smokkr was never worn without brooches. However, the numerous graves containing smokkr fragments and brooches strongly indicate that it was usual to wear the garment together with brooches. It is thus likely that the brooches were an integral part of the smokkr, and that the garment needed their practical function, in addition to their role as status symbols of some kind.

Assumption 2:

Viking women wore their tortoise brooches on the upper area of the chest.

According to Inga Hägg, the majority of the tortoise brooches are found in the upper area of the chest. There are a few exceptions, with the brooches on top of the breasts, but these are mainly graves where the deceased woman was buried in a sitting position. Hägg explains the lower placement of these brooches by proposing that they slipped downwards as the flesh beneath them deteriorated. Annika Larsson disagrees and calls Hägg's interpretation prudish. She believes that the usual position of the tortoise brooches was on top of the breasts (but does not mention the graves with brooches on the upper chest).

I am a firm believer in Hägg's placement of the brooches, as I see no plausible explanation as to how the *majority* of the brooches would have crept upward in the grave. (Also, wearing a metal bra would be impractical and uncomfortable, but that is another matter.)

Assumption 3:

More than two loops inside each brooch was a usual and widespread phenomenon.

Usually, trying to extrapolate what was usual in the Viking Age is a good way to make a statistician cry :-). However, the [Birka](#) evidence is more extensive than most. According to Hägg a total of 70 of the 105 Birka graves containing smokkr fragments have more than one loop at the top or bottom of the brooches. Clearly, whatever these loops were holding up, it was widespread within Birka.

Birka imported cloth and garments from Slavic areas and even as far as from Syria, if Agnes Geijer is to be believed. However, more than two loops per brooch also appear in western Norway ([Veka](#), [Hopperstad](#) and [Sandanger](#)) and in England ([Adwick-le-Street](#)), demonstrating that this is not solely a

Birka phenomenon, nor can be attributed to the eastern influence on Birka clothing. Thus, I assume that whatever caused the appearance of more than two loops was either an integral part of the basic smokkr or an accessory often worn together with it (at least when being buried). This is important because the attempt to explain the numerous loops is at the root of the various Birka smokkr interpretations.

Assumption 4:

All smokkr had the same underlying shape.

While the tortoise brooches vary in their artwork (this is used in order to date them), their basic shape and function stay the same during the entire Viking age. They always stay in the same position, indicating that the smokkr did the same, and that it kept needing the brooches in that exact position.

I believe this is a strong indication that the *general* function and shape of the garment worn with the brooches remained constant. This assumption is further strengthened by the phenomenon of more than two loops per brooch appearing in several places, indicating a similar construction of the smokkr in different geographic areas and time periods.

Although Hägg believes that the *woollen* smokkr was a closed tube, she allows that Geijer could be right in reconstructing the *linen* smokkr as overlapping rectangles. To me, however, it seems unlikely that a garment with sufficient resilience to stay around for more than 300 years was constructed differently depending on whether it was made from linen or wool (especially *within the same settlement*,). No one suggests that e.g. the patterns of Viking tunics or trousers are completely different depending on their cloth, so why should this be the case for the smokkr?

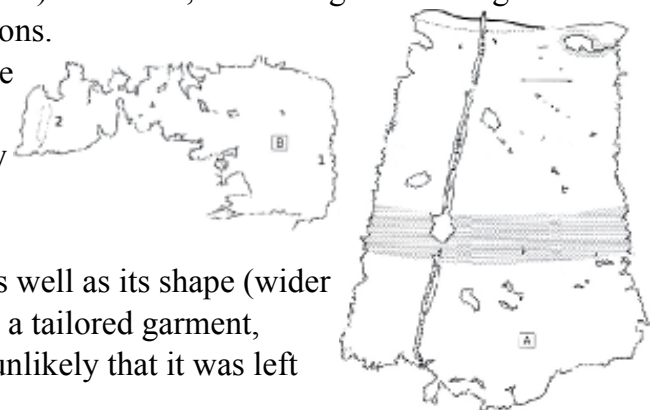
In conclusion, I believe that there are good reasons to assume that the general shape of the smokkr remained constant, not only within the settlement at Birka, but also throughout the Viking Age.

Assumption 5:

The underlying shape of the smokkr was a closed tube of some kind, held up by fabric loops that were connected to the tortoise brooches.

When chasing the general shape of the smokkr, we cannot simply glue together all the existing fragments (unless we want to create a Frankensmokkr :-). However, combining the existing evidence can help us exclude some of the possible reconstructions.

The two smokkr fragments from Haithabu harbour are perhaps the most significant pieces in regards to discovering the underlying shape of the smokkr. They are part of a wedge-shaped piece that once was stitched to other pieces along both sides. The top of the fragment was only 16 cm long, and its slimness as well as its shape (wider at the bottom than the top and) indicates that this was a tailored garment, probably with several panels. The tailoring makes it unlikely that it was left



open, whether at the side or the front. In other words, the Haithabu fragments strongly indicate that the smokkr was forming a closed tube around the body.

Further evaluation of the suggestion of an open front

Flemming Bau is the first to suggest that the Birka smokkr may have been open in the front. To be fair to Bau, the report on the Haithabu smokkr was not available at the time. However, even if we totally disregard the Haithabu fragments, there are significant challenges with his interpretation.

He introduces the open front mainly in order to reconcile Inga Hägg's findings of a heavily decorated tunic *beneath* the smokkr, with his argument that such a tunic would not have been hidden. However, if the pattern of loops are supposed to explain open-fronted smokkr (sometimes with separable aprons and trains), why are brooches with numerous loops also found in western Norway, a place where there is little reason to expect a Birka-style imported tunic requiring the smokkr to be open at the front?

More importantly, while the large pieces of the smokkr front at Birka ([grave 597](#)) and [Veka](#) could conceivably be explained as separate aprons, the [Køstrup smokkr](#) was clearly closed at the front. We don't *know* what the orientation of the [Pskov](#) smokkr top was, but unlike Annika Larsson, I find it reasonable to assume that the part with the most silk (the "flap") was worn on the front. If so, that makes another smokkr with a closed front.

Combining the evidence from Haithabu, Køstrup, and to a certain degree Veka, Birka and Pskov, I conclude that the smokkr was not open in the front.

I do however agree with Bau that the presence of a highly decorated tunic beneath a less decorated smokkr requires some explanation. At the very least, these tunics represented significant wealth. In addition, Hägg states that similar tunics were used in the royal court in Kiev. According to her, the Birka tunics were probably imported from the Kiev-Byzantium area and were used as signifiers of rank by the Birka Vikings. In other words, not the kind of thing you would ordinarily hide away.

Ewing tries to solve the dilemma by suggesting that the lower part of the decorations were not part of a tunic, but was sewn directly onto the smokkr. One problem with that theory is that the similarity with the Kiev tunics strongly indicates that the decoration at least originally belonged to a tunic. It is possible that the few Viking women who received such a tunic cut it into large pieces which were then appliquéd onto their smokkr and dresses for maximum visibility. As seen in the Pskov find, the Vikings were perfectly willing to cut and reuse pieces without regard for the original purpose or pattern of the cloth. However, Ewing's theory would also require Hägg to be mistaken when placing the upper and lower parts of the decorations on the same layer on the body.

I propose that an alternative explanation is that the tunic actually was worn under the smokkr (as Hägg's stratigraphy suggests), *even if it meant that some of the decoration was covered*. Being imported, the tunic would not have been designed with the smokkr in mind and could have had decorations in areas where a domestic tunic might not. Perhaps the tunic was normally worn together with a dress or skirt and only combined with the smokkr at burials, where custom might have dictated that the deceased should wear *every* costly garment in her possession? Either way, a frontal opening

is not needed for an explanation of the evidence related to the tunics, and bearing in mind the evidence for a closed front presented above, my conclusion remains the same.

Further evaluation of the suggestion of a side opening

The main challenge with using archaeological evidence to prove or disprove a side opening is that it requires both sides of the smokkr to be preserved. Because the brooches are worn at the front of the body, the sides are seldom preserved at all and there are, as far as I know, no finds where both sides remain. Nor has anyone found fragments that clearly belong to the vertical edge of a side opening (which would have proved its existence).



The closest we get to proof in favour of a side opening is [grave 464](#) at Birka, where two fragments of the upper hem of the smokkr are pieced together, making a larger fragment that ends in a vertical fold roughly 4 cm from the edge of one brooch. Unfortunately, it is not possible to tell whether this is indeed the upper corner of a side opening, or whether it is simply one side of a vertical seam that connects two pieces of a closed smokkr.

According to Hägg this is the only such piece found at Birka, which makes me favour an interpretation of it as part of a vertical seam. If there were side openings only a few centimetres away from the brooches, there should (in my opinion) be more corners in existence. (All it would take is to get the "flap" folded forwards over the top of the brooch during deterioration.)

The rest of the Birka evidence is even more ambiguous. There are several graves where sufficient fabric remains inside one of the brooches to judge the line of the upper hem. In all of them Inga Hägg found that the hem appeared to lie horizontally across the width of the brooch, indicating that it continued horizontally to either side.

Unfortunately, this doesn't help us differentiate between a closed smokkr and one with a side opening. If the smokkr was closed (and sufficiently fitted) it would have a straight upper hem along the front of the body, which would fit the evidence of a straight hem within the brooches. However, a smokkr with a side opening just 4-6 cm from the brooch could produce the same effect (the fabric sticking out from the brooch wouldn't be heavy enough to cause the hem inside the brooch to sag). Even if the side opening was further away, it would not necessarily affect the hem within the brooches, provided the wearer used a belt to keep the sides close to the body.

Fortunately, some of the finds outside of Birka provide a bit more information. The upper hem of one side of the Pskov smokkr has been preserved, clearly demonstrating that this side was closed. The large dimensions of the smokkr also argue against an opening. However, as the upper hem on the other side is torn roughly 24 cm from the front loop, we can't *prove* the absence of an opening.

The pleating on the front of the Køstrup smokkr makes it somewhat heavier than a straight front. It might hang or move unevenly if it has an open side, which could be taken as an argument for a closed smokkr (although we don't know if this would have mattered to a Viking woman.) The smokkr also has a partly preserved side, which has been torn 10-11 cm from the front loop. Even more

interestingly, there is a side seam on this part of the smokkr. This is an indication that the smokkr was closed (why sew two pieces together if you were going to keep one side open?), but just as for the Pskov smokkr, we can't really know.

Finally, there is the most compelling archaeological evidence against a side opening, namely the Haithabu smokkr. As mentioned above, this is a garment constructed out of several pieces and tailored to fit the body. It is very unlikely that such a garment was then left open at one side.

However, before concluding on the possibility of a side opening in the smokkr, I wish to look at what the reasoning behind the proposal was in the first place. It originates with Agnes Geijer, who is examining the Birka textiles (and naturally has no knowledge of the finds made after she publishes her report).

Geijer bases her reconstruction on the "ancient" Baltic clothing documented by Manninen in 1927, in order to explain the numerous loops found in the brooches. Keeping in mind how few and small the pieces she managed to identify as smokkr fragments were, I understand why she felt the need for something other than pure guesswork to use as a starting point.

Ideally one should only draw upon the evidence from the Viking Age when interpreting the clothing. Since this is not possible, at least not for the smokkr, the alternative is to also consider the garments preceding or following the smokkr. However, my understanding is that changes in shape and function tend to accelerate as more advanced tailoring techniques become available. Thus I find it more relevant to look back [800-1200](#) years, at the [Huldremose dress](#) (210-30 BC) and the tradition of wearing a pair of brooches at the shoulders that came before the smokkr, instead of looking forward [850-1100](#) years to the Hurstut dress.

In addition, I am very sceptical to the the assumption that there are "pure" folk costumes that have kept their identity from before the medieval period. The Norwegian folk costumes were created or altered as part of the romantic nationalism movement in the 18th century. The situation may be different in the Baltic area, but if so I will need to be convinced that this is the case :-)

Finally, one of the reasons that Geijer chooses the Baltic area (which is outside of Scandinavia) is the eastern influence found in some of the Birka garments. However, as previously mentioned, the phenomenon of numerous loops is not limited to Birka. And while one may argue that the Birka inhabitants were inspired by their Baltic neighbours, the argument becomes less convincing in regards to the Vikings in western Norway. The Huldremose peplos on the other hand, is found within the Scandinavian area.

In conclusion, I prefer the Huldremose dress instead of the Baltic dresses as a starting point for the reconstruction of the smokkr. In addition, while the archaeological evidence doesn't *disprove* the existence of a side opening, it (especially the Køstrup and Haithabu finds) does indicate a closed smokkr. Also, while I understand the need to explain the numerous loops found in the brooches, I don't see that one needs to introduce a side opening to do so.

Thus, my conclusion remains that the smokkr was closed at the sides as well as the front.

Assumption 6:

Although all smokkr were a closed tube, their detailed appearance varied somewhat depending on the time and place they were worn.

Even if they might have shared an underlying shape, it is likely that the appearance of the individual smokkr depended on the place it was worn, the time period and the status (and possibly the taste) of the wearer. Unfortunately, it is difficult to say *how much* variation there was.

For example, Inga Hägg envisions the Birka and Haithabu smokkr as quite different from each other, proposing that the Birka smokkr was a simple tube, while the Haithabu smokkr was tailored to fit the body. However, to my knowledge, the Birka evidence doesn't *disprove* tailoring. None of the existing smokkr fragments show traces of having been shaped by cutting, but since most of them were from the immediate vicinity of the brooches, this isn't really conclusive for the whole of the garment. Thus, in theory the variation between the Birka and Haithabu smokkr may have been much less than suggested by Hägg (although she may have evidence I am not familiar with, like the cut of other Birka garments, that supports her assumption).

The same argument can be made for the Køstrup find. While it might have been a wide tube reminiscent of the Huldremose peplos, as suggested by Shelagh Lewins, the tiny pleating doesn't exclude a semi-tailored garment reminiscent of the Haithabu smokkr. On the other hand, while its proportions leave a lot of questions, the remnants of the smokkr at Pskov clearly indicate that not all smokkr were tailored.

In conclusion, depending on how you look at the evidence, it can support an assumption of either large or small variations in the smokkr. With this in mind, I will use smokkr fragments from nearby areas when interpreting a find *unless there is clear evidence for that specific find having a different shape*.

Assumption 7:

The numerous loops within the brooches can be explained by tool bands, an extra smokkr and sometimes possibly separate aprons or trains.

No interpretation of the smokkr is complete without explaining why more than two loops inside each brooch appears to be a normal and widespread phenomenon. Hägg makes a convincing argument for why some of the loops (especially the silk ones) probably were used to fasten tools like scissors or knives. While not all of the extra loops can be tool bands, this explanation would account for why there tend to be more loops in the lower part of the brooches (the front of the smokkr), than in the upper part (the back).

In the cases where there are two loops at the bottom *and* two loops at the top of a brooch, one possible explanation is that the deceased wore two smokkr, one outside of the other. This is the explanation Inga Hägg proposes when examining Birka graves with more loops than can be explained by a single smokkr and tool bands. The same conclusion is drawn by Anne Stine Ingstad when she interprets [grave C](#) at Kaupang to have contained a long pleated smokkr worn inside a

shorter smokkr made of diagonal twill. The Kaupang find is a bit ambiguous, as only one of the "several loops" Ingstad states were present when the grave was found still remains.

A somewhat better preserved grave is [grave B10720](#) at Sandanger, where almost all the loops are found still sewn to fragments of the garments they originally were attached to. Here, there are two different fragments, one of diagonal twill and one of diamond twill, each with a loop of diagonal twill. Together with a loose loop of diagonal twill, this is a fairly strong indication of there being two separate garments suspended from the brooches. There is also a third fragment, of an undisclosed weave and with a thin loop. This is obviously not a tool band, but whether it is a third garment suspended from the brooches, or a separate garment (like a kaftan) that happened to be preserved with the brooches is hard to say from the current evidence.

Lastly, the grave at [Hopperstad](#) have two different diamond twill fragments with the characteristics of a smokkr (selvedge or hemmed at the top, positioned a few centimetres up in the brooch, with the top edge running horizontally along the width of the brooch). Like Sandanger, this is a clear indication that there were two separate garments suspended from the brooches. Unfortunately, the fragments are too small for us to be certain of whether this was two smokkrs or a smokkr and something else (with the same characteristics as a smokkr).

In summary, Sandanger and Hopperstad can, along with Kaupang and some of the Birka graves, be explained by two smokkrs being worn. An alternative explanation, at least for some of them is that one of the garments is a separate apron, and/or a separate train as suggested by Flemming Bau. After all, the smokkr doesn't have to be open in the front in order to have such accessories.

There is no clear archaeological evidence for such an apron or train, and some of the arguments against a smokkr with a side opening apply equally to these accessories (e.g. why haven't the corners of the apron been found?). At the same time, it could help explaining the sheer variety in the number of loops that are found, if you could have a separate apron or train in addition to one or two smokkrs.

I remain very sceptical of the way Bau [uses the figurines](#) to explain the smokkr, especially because only one of the figurines can be clearly identified as wearing tortoise brooches. However, I can certainly imagine several benefits to both a decorative apron (showing status without having to buy enough fancy fabric for an entire new smokkr) and a practical one (protecting your smokkr from dirt). And the existence of a separable train would give the wearer a similar silhouette to the figurines without having to wear it daily. Of course, that is my modern practicality speaking...

In conclusion, I have a fairly firm (well, as firm as anything pertaining to the smokkr can be) belief in two smokkrs being worn at times and a very uncertain relationship with the separable aprons and trains. If I ever get more time, I might try scouring Anglo Saxon, Germanic, Baltic and Slavic sources in search for the existence of a separable apron or train, preferably pinned to brooches at shoulders or chest. In the meantime, I will have to live with the uncertainty.

Case studies: specific reconstructions I have made

When talking about reconstructions different people mean different things. Is it a reconstruction *only* if the same measurements have been used, or can you adapt it to fit your own body better? What

about using different fabric? Or a different dye? Must it be worn and torn in the same places as the original to be a proper reconstruction? Use the same stitches?

All the practical issues aside, there is a larger one concerning how we reenactors and history nerds look as a group. If we all strive to our outmost to only copy exactly what is found, we will each of us be as historically correct as possible. Put us together however, and we will give the impression that the Vikings all wore uniforms. With that in mind, I study the evidence in order to understand the range of alternatives I have to play with, and then create my own garments inspired by the finds.



The aprondress from Haithabu harbour
<http://urd.priv.no/viking/haithabu.html>



The aprondress from Køstrup (grave AC)
<http://urd.priv.no/viking/kostrup.html>

Reconstruction patterns by others:

<http://urd.priv.no/viking/smokkr-patterns.html>

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