

LILLI FRANSEN, ANNA NØRGAARD AND ELSE ØSTERGÅRD

# MEDIEVAL GARMENTS RECONSTRUCTED

*Norse Clothing Patterns*





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By Lilli Fransen, Anna Nørgaard and Else Østergård

# Preface

The 'cut' and 'fit' of a garment are terms that we use today in connection with the cutting and sewing of clothes. We know what size we use and we expect that a garment is cut and formed so that it fits our body.

In the Early Middle Ages the cutting and production of a piece of clothing was associated with a great deal of mystery, and how the Norse, who lived on the edge of the world's society, so to speak, could carry out this profession under such primitive conditions is just as mysterious.

As the photographs and measurements in this book illustrate, several of the Norse garments are sewn to fit closely to the body, but with a large fullness at the bottom of the garment and sleeves with 'set-in' sleeve seams that are formed to give ease of movement. The practical liripipe hoods with shoulder cape, and stockings (either with or without feet) resembled the prevailing fashion further south in Europe. In the Patterns Section of the book, the 800 year old garments are spread out side by side with the more recently sewn reproductions.

*MEDIEVAL GARMENTS RECONSTRUCTED – NORSE CLOTHING PATTERNS* is the result of a cooperation between three textile experts: Pattern Constructor, Lilli Fransen, MSc Clothing Product Development; Weaver, Anna Nørgaard; and Conservator, Else Østergård. Because of our different backgrounds, each of us has of course taken a different approach to the Herjolfsnes garments, but common to us all is the joy of working with these garments.

Our gratitude goes to the National Museum's Department of Conservation in Brede, which, among other things, has contributed economically to the photography in the book. Our thanks must also go to photographer Robert Fortuna from the Department of Conservation for an inspiring cooperation and for taking splendid photographs of the new garments. Also, museum conservator Irene Skals deserves much thanks for her illustrative material. We are indebted to TEKO Design and Business School in Herning for their generosity in sponsoring the fabric to be used for the sewing of the many new garments, hoods and stockings; and to specialist-teacher Ingrid Andersen, who has sewn the named garment parts. We wish also to thank photographer Werner Karrasch from the Viking Ship Museum in Roskilde. And, last but not least, we are extremely thankful to Chief Curator and the Clinical Faculty, Shelly Nordtorp-Madson, from the University of St. Thomas in St. Paul, Minnesota, USA, who has had the rather awesome task of translating the text from Danish to English.

Lilli Fransen, Anna Nørgaard, and Else Østergård  
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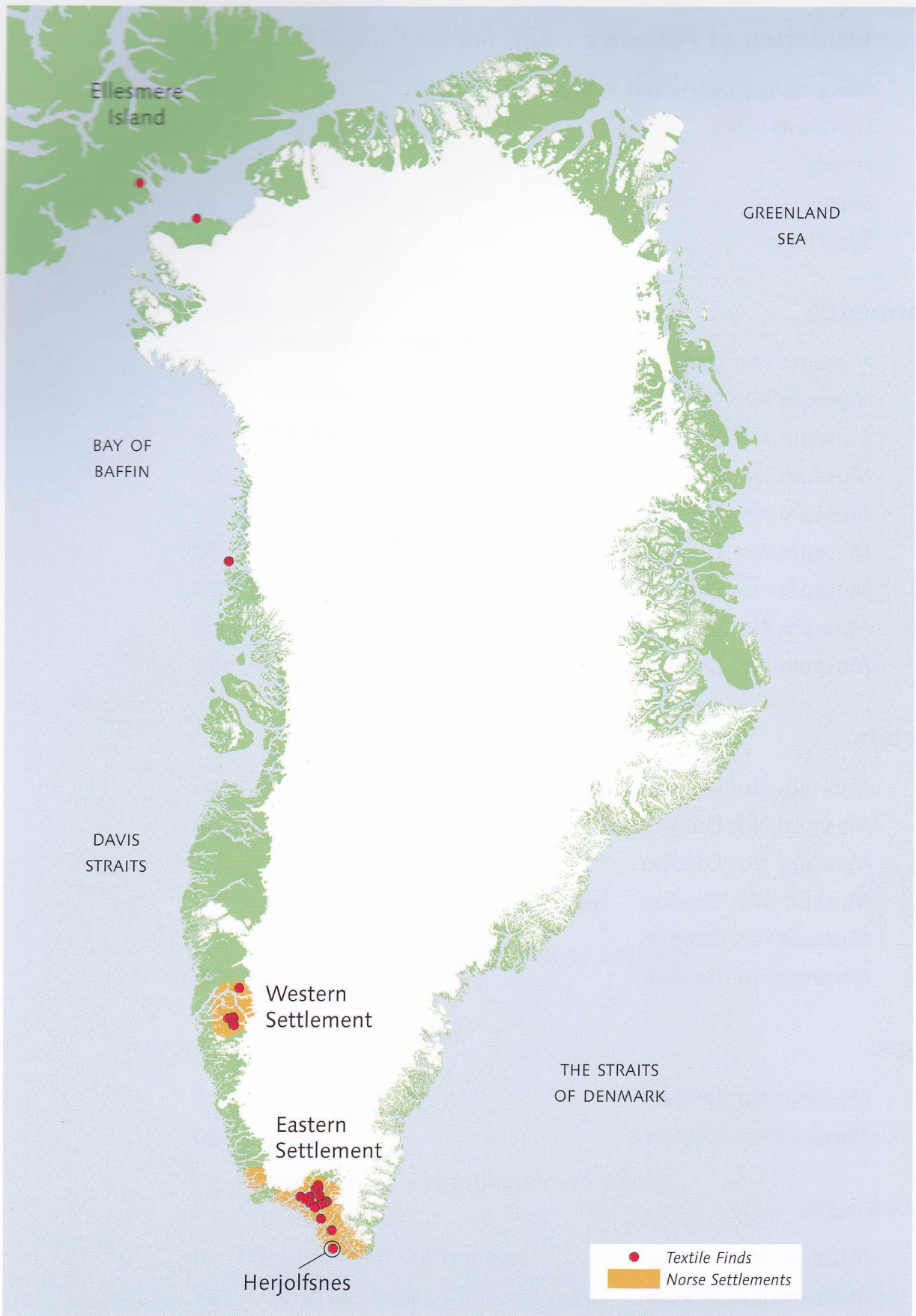
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*Kalaallit nunaat is the Greenlandic name for Greenland. It means the land that belongs to the people who call themselves kalaallit.*

# Introduction

By Else Østergård

The many garments, hoods, and stockings described in *Woven into the Earth: Textiles from Norse Greenland*, (Aarhus University Press, 2004), were discovered during an archaeological excavation at the site of Herjolfsnes in Greenland nearly 100 years ago. At that time the find was described as the single-most greatest historical textile event in Europe. Here in the far north European fashion was followed, just as it was in the far south of Europe. With the finds from Herjolfsnes it became possible to see well-preserved examples of medieval clothing and gain an insight into how children and adults had dressed 800-900 years ago.

Readers of *Woven into the Earth* have, since its publication in 2004, made it clear that they desired additional pattern drawings, with instructions on how to produce a garment either as an exact reconstruction or as an adapted reconstruction. Therefore, in this latest work, *Medieval Garments Reconstructed: Norse Clothing Patterns*, which contains significantly more measurements and illustrations, we have endeavoured to meet these requests.

To produce a garment as an 'exact reconstruction' means that the garment must be constructed of hand-spun and hand-woven wool, and sewn with the kind of stitches used in the original garment. However, should one wish to sew a garment as an 'adapted reconstruction', one is free to choose both cloth and production methods.

Instructions are included for reconstructing one of the Herjolfsnes garments: the pattern pieces must be laid out and cut from the hand-woven cloth to be sewn by hand. The result is a very durable garment – just as the originals were. There are also instructions for machine-sewn garments in other types of fabric: linen, for example, which when constructed in the "Norse Greenland Style", can become an accurate-looking copy.

The pattern book can be seen as a supplement to *Woven into the Earth*, but can also be read and utilized without previous exposure to it.

## The historic textile discovery

It was archaeologist Poul Nørlund from the National Museum of Copenhagen who made the momentous discovery in the summer of 1921. He had been chosen to lead an excavation at the ruined church at Herjolfsnes, which lies in the southwestern part of Greenland in Nanortalik Municipality. The ruin was about to be lost to the encroaching sea, and a large portion of the cemetery had already vanished, leaving behind human bones and textiles that from time to time were gathered up from the beach below the ruins.

Nørlund's excavation was not, however, the first at that site; digs were conducted as early as the 1830s after a garment was found on the beach, which was believed to be the jacket of a sailor lost at sea. It was not until Nørlund's 1921 excavation however, that it was discovered that the so-called jacket did not belong to a modern, drowned sailor.<sup>1</sup>

The background of the above excavations is found in the *Icelandic Sagas* as well as other medieval manuscripts, which tell how the Vikings braved the dangerous journey of exploring Greenland's coasts. We know of Erik the Red and Herjolf Bårdson, who in 981 sailed southwest from Iceland to Greenland, to settle permanently with their households and livestock. Their descendants, later known as Norse Greenlanders, lived there for nearly 500 years. And it was not just a small group of expatriates who survived;<sup>2</sup> at the beginning of the 14<sup>th</sup> century, when the population was at its largest, there were at least 3,000 people residing in Norse Greenland.

Fig. 1

A find from the "Farm Beneath the Sand" in the Western Settlement shows that in addition to sewing clothes the Norse had many other skills: here is an example of a coiled basket probably made of willow root. The original height was c. 30 mm and the diameter c. 60 mm. Greenland National Museum and Archive. Photo: Erik Holm.



Written chronicles and the oral tradition, as well as more or less trustworthy sources, have kept alive the romantic history of the Norse people living in Greenland. It has continued to fascinate people around the world, particularly the mystery of their disappearance in the 15<sup>th</sup> century, which incited subsequent explorers to seek the answers for themselves.

## The Herjolfsnes garments are sent to Denmark

Poul Nørlund concluded his excavation of the Herjolfsnes cemetery in August of 1921, and all the textiles were sent from Greenland to Denmark on the last ship to leave that year. In Copenhagen, the garments were prepared for exhibition, while Nørlund began work on the manuscript *Buried Norsemen at Herjolfsnes*,<sup>3</sup> which was published three years later. The book is an exciting account of how the deceased Norse Greenlanders had been interred in their everyday clothing because there was not enough timber for coffins. He describes a difficult excavation that was only possible because sun and rain thawed the permafrost, turning the dig site into one big mud mire; and of how one piece of textile after the other was lifted carefully from the mire. In all, seventy articles of clothing were recovered, including complete outer-garments, hoods, pill-box caps, and stockings. Other pieces were too fragmentary to be preserved and had to be abandoned.

Poul Nørlund's book about the Herjolfsnes garments was never translated into Danish. It was, in part, because of this that the original book, *Som Syet til Jorden: Tekstiltfund fra det Norrøne Grønland*, was written. To reach a wider audience, the book was translated into English and released simultaneously under the title *Woven into the Earth: Textiles from Norse Greenland*. Additionally new technical methods of analyzing textiles, now considered commonplace, have made it possible to 'tease' surprising amounts of new data from the Herjolfsnes find. As an example, the examination of sewing and weaving techniques resulted in tangible evidence of medieval construction methods that had been hitherto unknown, and which gave indication of a sophisticated textile tradition.

## The study

In preparation for *Woven into the Earth*, each and every textile, however fragmentary, was measured and examined. Small thread samples were taken for analysis of possible dye traces and determination of fiber type. Additionally, samples were taken for radiocarbon dating, which in the case of archaeological textiles first became practicable in the 1980s with the advent of the AMS-technique<sup>4</sup> (Accelerator Mass Spectrometry). With this process it is possible to date textiles with a very small amount of fiber – only about 1 mg. pure carbon. The Herjolfsnes garments have existed for at least 800 years and have been subjected to significant amounts of wear, use as burial shrouds directly in the earth, alternating freezing and thawing, excavation, cleaning, and lining (attached by gluing and sewing). At the museum they were on display both inside cases as well as outside without protection against dust and “investigating fingers”. The finest of them were exhibited almost constantly from their exhumation in 1921 until just a few years ago. It was therefore crucial that the fabrication techniques used were documented as accurately as possible, since it was possible that it was the last time such a thorough investigation would take place.

All of the garments and fragments were photographed, and many details of these unique textiles are now documented photographically as well as with technical drawings. The textiles, being fragile, are equally damaged by daylight or artificial light, and lessons were learned from many years unfortunate experience.



Fig. 2

In a niche in the northern wall of the “Farm Beneath the Sand” a cirlet made of hair was found. The hair is from a fair-haired Norse Greenlander. Two by two twisted strands of hair follow parallel, crossing each other in an “over-under” pattern. An exception to this can be seen in some few places as in “ply-splitting”. Greenland National Museum and Archive. Photo: Peter Danstrøm.

Fig. 3  
Buckle made of walrus tooth. Note  
the attractive carvings on the 27 mm  
wide buckle. Qaqortoq Museum.  
Photo: Geert Brovad.



## The Norse Greenlanders' patterns – the medieval garments' silhouettes

The garments' cuts have been measured as precisely as possible under the circumstances. The woven cloth had been stretched through usage; it had alternately been frozen and thawed throughout the centuries it had lain in the ground. The roots of plants had grown through the upper layers of clothing, as well as microbial breakdown of the wool. The removal from the excavation in Greenland was difficult and damaging to the textiles. On their arrival in Copenhagen, the garments were cleaned and lined with sateen, which has remained since the 1920s and has maintained the shape that the garments were given, after they were cleaned and their style interpreted in the first quarter of the 20<sup>th</sup> century. The condition of the textile material must be respected when handled. A few garments are exceptionally well preserved, while others are so fragile, that the fibers, and therefore the individual threads nearly disintegrate with the lightest touch. As it was a foregone conclusion that it would not be possible to stretch or straighten the weave so that the warp and weft threads could once more run perpendicular to each other, *this was not attempted*.

Patterns have been drafted for only the most well-preserved garments, but there is also information regarding the cutting and sewing techniques of others that one might use as inspiration for garments not included, but that one might wish to reproduce, even though precise measurements are not in this volume. There are other items which are in such poor condition that it was impossible to draft reliable patterns. Therefore those garments have been excluded.

The authors hope that the large audience of medieval enthusiasts, who will sew apparel based on that period, will find gratification from the measurements and descriptions

that are assembled here and are presented as: *Medieval Garments Reconstructed: Norse Clothing Patterns.*

### Technical information

The Norse Greenlanders wove with single-ply wool yarn, hand-spun of wool from sheep they brought to Greenland. This type of sheep belongs to the "Northern Short-tail", a breed that also includes Norwegian Spælsau, Swedish Landrace, and a number of others.<sup>5</sup> However, goat hair and hair from various non-domesticated animals – the arctic hare, among others – were used for weaving cloth. There is also weaving done in linen, a material otherwise not expected to have been cultivated in Greenland; but it could, of course, be imported.

Why is all the Herjolfsnes clothing brown? That is a question that a countless number of interested guests at the National Museum of Copenhagen have asked, as they stood alongside the exhibition cases containing the apparel. That question was answered in connection with the new technical investigations that were recently completed. Most of the colors come directly from the fleece: natural white, gray, brown, and black colors, which

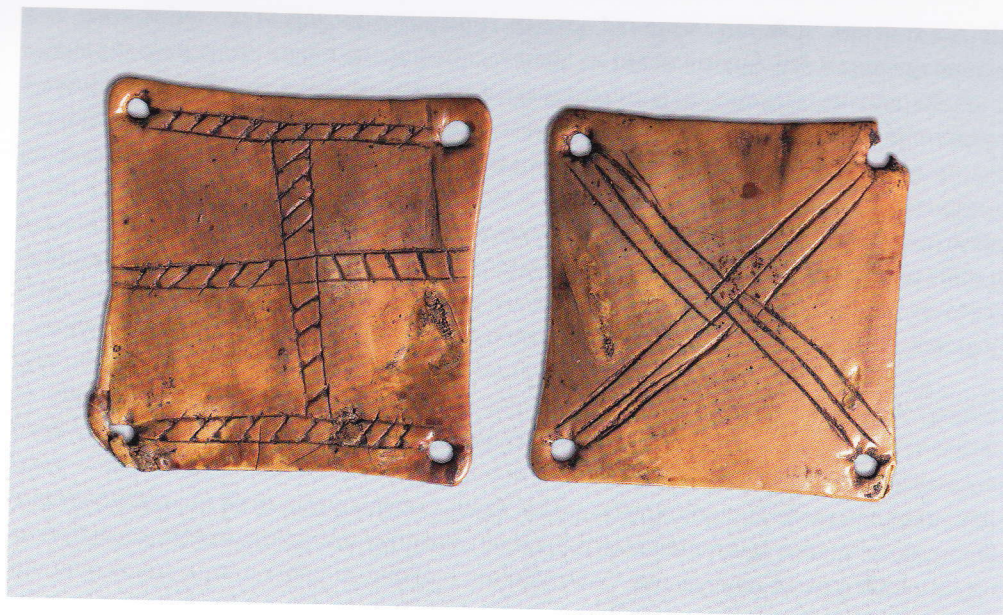


Fig. 4

Decorated four-hole weave-tablets made of bone (50x50 mm) for tablet weaving. In Greenland tablet-weaving has not yet been found, but an independent woven piped edging on garments has been registered. Greenland National Museum and Archive.

Photo: John Lee.

Fig. 5

Buttons made from the same Greenlandic *vadmel* as garment D10583, with which they were found. The buttons measure 10-12 mm in diameter. They are formed so that the upper surface is smooth, while the cloth is gathered on the bottom surface. One can see that the buttons have had small stitches in concentric circles. The thread has disappeared, but the holes from the stitching are still there. National Museum, Copenhagen.

Photo: John Lee.



the Norse women used to provide many color variations. It was not a surprising result, although the analysis showed that some of the garments had also been colored with a dye either before or after weaving and sewing. The Norse Greenlanders had, for the most part, a limited number of natural dye-stuffs to choose from. Of the raw materials that were easy to find locally were the many lichen varieties found on Greenland, and which produce red-violet colors. One can mention *Evernia* and *Ochrolechia* among other possibilities. Red dye madder, which derives from roots of the plant *Rubia tinctoria*, was very common in medieval Europe, but in Greenland it is represented by only two examples, one is a fine diamond twill, which is clearly an import and the other is an edging on a gown (D10594). But also the blue colors – from woad or indigo – are registered, but only on small fragments. The woad plant (*Isatis tinctoria*) is most likely the plant they were able to obtain, even though it probably did not grow in Greenland. Finally, a non-organic coloring agent has been identified – derived from iron, apparently found in high concentration, which in this case has been given a red-brown nuance. The brown color that the garments have today is caused by tannins that are found naturally in the soil and that have produced the color changes that have occurred throughout the many centuries the clothing has been interred.<sup>6</sup>

Analysis of the weaving shows that the warp threads – with few exceptions – are all Z-spun, very tight, and thin; however, since it was spun from the long hair of the so-called double-coated sheep, the yarn is consequently quite strong. The weft threads are spun in the opposite direction – S-spun – of the wool, that had been separated from the rougher long hair during combing. This produces a softer yarn, which, in this case, is slightly thicker, as it is also spun more loosely than the warp yarn.<sup>7</sup> The loom that was used was an upright, warp-weighted loom, sometimes known by its Norwegian name, *oppstadvev*: a loom leaning against a wall, where the weaver performs the work while standing.

The finished cloth, called Greenlandic *vadmel*, or frieze, usually has a thread count of 8-10 threads per cm in the warp and 10-12 threads per cm in the weft, which is the op-

posite to most other medieval weaving. Frequently the weft completely covers the warp and, when newly woven, must have been thick and warm.

Only one garment (D5674) is not completely lined, therefore making it possible to get some idea of its original weight, even though the piece has a sleeve missing and one of its gores was replaced in the 1920s by a sateen lining. Its current weight is ca. 500 grams. An unlined hood weighs approximately 125 grams. Both the outer garment and the hood have presumably weighed more, when they were new and the wool was fresh (not dehydrated).

Nearly all the Greenlandic weavings are done in 2/2 twill, but both 2/1 and tabby weave are found. Many of the pieces have significant width along their bottom hems, but it has not been possible to find even one single length of cloth with two intact selvages, so the actual width of the weaving is unknown. During the excavation of "The Farm Beneath the Sand" (*Gården under sandet*) in Greenland, an intact loom beam was found, which measured 188 cm in its complete length.<sup>8</sup> From that measurement, it is possible to calculate that a cloth width of about 120 cm was probably the largest measurement that could be woven, since the warp must necessarily end at appropriate length from the side beams. None of the panels that make up the gored skirts of the garments measure more than 95 cm at their bottom edges, so it is possible to hypothesize that cloth at Herjolfsnes was woven in approximately 1 meter breadths.

The clothing is sewn using several different stitches and sewing techniques. Hidden seams that are only visible on the inside, are sewn differently than those that are discernable on the outside. The visible seams have a double function: they are most often both decorative as well as reinforcing, and are found along edges that have been subject to significant wear, such as a neck opening, a pocket slit, or along the hemline. Finally, there are also different "decorative edges" that are a combination of sewing and weaving, or in one example, perhaps a combination of sewing and twisting (see Fig. 26). Both finishing approaches are ideal as a solution to the technical difficulty of turning under and sewing a curved edge in such a thick, coarse frieze, but the Norse woman solved this problem in her own elegant manner.

## Garment types

The selected items – those that are most well-preserved and therefore most adaptable for reconstruction/copying are garments: D5674, D10580, D10581, D10584, D10585.1, D10586, D10587, D10593, and D10594.

Hoods: D10596, D10597, D10600, D10602, D10605, D10606 and D10608.

Caps: D10608 and D10610.

Stockings: D10613 and D10616.

The above named items are listed by type, a classification that follows Poul Nørlund's organization in his book: *Buried Norsmen at Herjolfsnes* and also used in *Woven into the Earth: Textiles from Norse Greenland*.

### Garments

Type 1a describes an outer garment that is pulled on over the head with identical front and back widths, as well as side pieces; all of them are slightly outwardly curving, which gives them a moderate width at the hem. There are set-in sleeves eased into the armhole, as well as gussets at the underarms. The neckline is oval, with its greatest depth at the front.

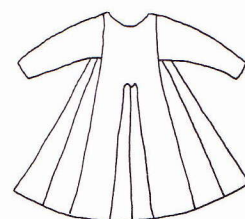
Type 1b is a closely fitted outer garment that is pulled on over the head. These garments feature slits in both front and back where two-piece gores are sewn in, as well as four to eight triangular side gores that give an outward curving fullness from approximately the waist downward. There are set-in short or long sleeves which are eased into the armholes, as well as gussets at the underarms. The neckline is either oval or round, and



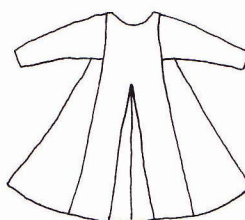
Type 1a



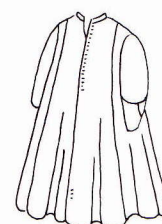
Type 1b



Type 1c



Type II



is cut most deeply in the front. On a few of the garments, of which one is only partially preserved, there is a slit in the front of the neck line with a button closure.

Type 1c has almost the same shape as Type 1b, but it is not as closely fitted, as the side gores slope outward from chest height. There are set-in short or long sleeves which are eased into the armholes and gussets at the underarms. The necklines are either round or oval and cut most deeply in front. A garment for a child between the age of 8 – 10 is also found under this type. Children's clothing is cut and sewn in the same manner as that of adults.

Type II is the designation for two garments with button closures, of which only one is relatively well preserved. It has eight gores, each having one straight grain and one bias side, which together give the garment a particularly pleasing drape, as can be seen in reconstructions. The width curves out gently from the shoulder seam. Along the tightly-fitted neckline is a small, stand-up collar, a so-called Mandarin Collar. Both garments are open in front with button holes in the left side. The buttons were sewn on the exterior of the right side, but they are not preserved.

### *Hoods*

Type I describes liripipe hoods with shoulder capes. The capes are so large that they cover the shoulders completely. There are four of this type, of which one is cut on the bias. The hoods are meant to be pulled over the head.

Type II. Under this type are the short hoods with liripipes. The hoods are short and terminate at the shoulder. They are meant to be pulled over the head.

### *Caps*

These are small pill-box hats with rounded crowns that are used by both children and adults.

### *Stockings*

There is a pair of over-the-knee stockings and a footless stocking.

## **Notes**

- 1 Østergård 2004, pp. 21-27.
- 2 Arneborg 2004, pp. 221ff.
- 3 Nørlund 1924.
- 4 Østergård 2004, pp. 253-255.
- 5 Walton Rogers 2004, pp. 79-89.
- 6 Walton Rogers 2004, pp. 89-92.
- 7 Østergård 2004, pp. 53-57.
- 8 Østergård 2004, p. 30 & pp. 58-60.

# Producing a hand-made reconstruction

By Anna Nørgaard

There can be many reasons to create a reconstruction of an historical garment, so before one begins this kind of project, it is important to be completely sure what the garment will be used for. This is crucial in order to know how accurate the garment needs to be in relation to the original.

In the case of the textile finds from Norse Greenland, i.e. the Norse Greenlanders' clothing, there are three reconstruction possibilities. One can choose to create a garment as it looked:

1. when it was excavated
2. when it was interred in the cemetery
3. when it was completely new, and worn for the first time by its owner

Thirty to forty years ago, the possibility of doing a color and fiber analysis did not exist as it does today. Therefore, the garment reconstructions done before that time, including those, for example, by Margrete Hald (1897-1982) for the exhibition at the National Museum of Copenhagen, were often sewn of cloth of the same brown color that the originals had on excavation.

Today, with the help of fiber analysis, it is possible to see whether the clothing is made of wool, linen, or something completely different, making it feasible to come much closer to the original appearance of the individual garments. It is also viable to determine what the initial colors were.

As the original garments have lain in the ground for several hundred years, much of the material has degraded, resulting in finds of many incomplete pieces: there might be a missing sleeve, a front piece, etc. In such cases, when producing a reconstruction, one must assume that both sleeves, for example, were identical. There is nothing, however, that we know with certainty; we do not know the people for whom the clothing was sewn; we do not know if they were fat or thin, or if both their arms were the same length.

When producing a reconstruction, one's point of departure must be the person(s) who will be wearing the garment, with as few deviations from the original cut as possible. If the garment is to be used in a museum exhibition, it is crucial that the reconstruction is as close to the original as possible.

When the pieces of clothing were interred along with the dead, many of them were extremely worn, having been patched and mended. Are these repairs something that should be included in a reconstruction? These signs of wear and tear are, as it were, 'traces' of the individuals who had worn the original garments, whereas those who will be wearing these reconstructions lead a completely different life and therefore the signs of wear on *their* clothing will also be different.

The making of a reconstruction that resembles the original as closely as possible when it was new must be the optimal goal for anyone who desires a historically correct garment, and there are indeed great possibilities to achieve this today. However, there are a number of other questions that must be taken into consideration:

- Should the yarn be spun on a spindle, or on a spinning wheel, and woven on an upright warp-weighted loom, or a horizontal treadle loom?

Fig. 1

Raw wool staples from "The Farm Beneath the Sand". The longest staple is 150 mm. At the top of the three staples to the left, soft underwool that is mixed with hair can be seen. The long hair on its own becomes evident further down.

Photo: John Lee.



- Should one purchase machine-spun yarn and weave the cloth on an upright warp-weighted loom or a horizontal treadle loom?
- Should the fabric be hand-woven on a horizontal loom and the garment hand-sewn?
- Should one purchase a piece of fabric and hand sew the garment?
- Should one purchase a piece of fabric and sew the garment on a sewing machine?

The answers to these questions are often dependent on how much the individual can afford to spend on the project. It is a time-consuming process, and requires experienced artisans to create a reconstruction that is as close as possible to the original, with hand-spun yarn and fabric woven, for example, on an upright warp-weighted loom – which is the type the Norse Greenlanders used and one which would provide the greatest satisfaction. If the garment is to be used in an educational context – especially if the audience is children and the budget is limited – it can be advantageous to purchase machine-woven fabric and sew the garment

Fig. 2

Start combing with hand-held combs, where the wool is placed in the supporting comb. The free comb should be pulled down through the wool in front of the teeth of the supporting comb, and drawn through the wool as many times as may be necessary to ensure that all the impurities and knots are removed. Under this process all the wool fibers will be divided evenly in both combs.

Photo: Roberto Fortuna.





*Fig.3*  
When the wool fibers are combed into a uniform mass, they are first carefully pulled out of the one comb, and then out of the other, in two long, thin, identical bands, where the hair comes out first.

*Photo: Roberto Fortuna.*

by hand. It is not particularly difficult to find a commercially woven fabric that resembles hand-woven, but there is no way of duplicating hand-sewing with a sewing machine.

## Treatment of the wool prior to spinning

The fabric for the original articles of clothing that are shown in this book is all woven from one-ply yarn, spun from wool from 'Northern Short-tailed' sheep. This breed of sheep is still found in a number of places such as the Faroe Islands and Iceland and is also related to the Norwegian Spelsau and Swedish Landrace breeds. This type of sheep has a fleece consisting of two types of wool: a very soft and fine underwool that keeps the sheep warm, and an outer coat of long-stapled hair, smooth, and considerably longer than the underwool. This hair helps to keep the sheep clean and dry (Fig. 1).

Before the wool is spun, the wool and the hair are separated, either by hand, which is a lengthy process, or with the help of woolcombs. Woolcombs with both one row and two rows of teeth have been recovered from archaeological finds.<sup>1</sup> Hand cards are irrelevant to the discussion, as they were first introduced to Scandinavia at the end of the medieval period.

Woolcombs are used in pairs (Fig. 2). An abundant amount of fiber is placed between the teeth of one comb, which can be fixed to a solid surface, such as a table. The teeth of the other comb are pulled downwards in front of the teeth of the stationary comb containing the fiber, drawing out and straightening out the fiber. By repeating this process the fiber becomes divided evenly onto the teeth of both combs and is combed smooth, so that dirt and knots are eliminated. If the combs are small enough to be hand-held (rather than having one comb fixed to a surface), it can be advantageous to switch hands several times during the combing process. When all the dirt and knots have been removed, and the wool in the teeth is in a uniform mass, the fiber is pulled out with the fingers in a long, thin, continuous band, where all the fibers lie parallel. One will now see that the hair comes out first (Fig. 3), and this long, thin band of hair fibers can be spun directly with no further treatment.

After the hair has been removed, the underwool is removed from the combs and is gently 'teased' apart. It is now ready for spinning.

Along with the wool from sheep, there are other yarn types found in the Norse Greenlandic materials. These include yarn spun from the fur of the arctic hare, and the hair of

Fig. 4

Soapstone spindle whorls and wooden spindles from farms in the Western settlement. The large weight, of which only a half is preserved, is from Abel's farm in the Eastern Settlement and it has been used as a weight for flywheels in drills and not for spinning.

Photo: John Lee.



dogs/wolves. These yarn types appear as stripes in the weavings. These alternative yarns are found so infrequently in the extant textiles that it is difficult to determine how common their use was.

## Spinning/yarn

The yarn for the Norse Greenland garments was spun on spindles, a time-intensive method; it might therefore be a good idea to use a spinning wheel for a modern recon-

Fig. 5

Yarn can be spun either to the right = Z-spun or to the left = S-spun. The twist-angle in the yarn tells us how hard the yarn is spun and it can be measured with the help of a diagram like this. You place the yarn on top of the diagram, so that the direction of the fibers in the thread is the same as the line which marks the angle of the protractor. The warp-yarn in the original costume from Norse Greenland is almost all spun with an angle of about 45 degrees and Z-spun. The weft is S-spun with an angle of about 35 degrees.

Drawing: Irene Skals.

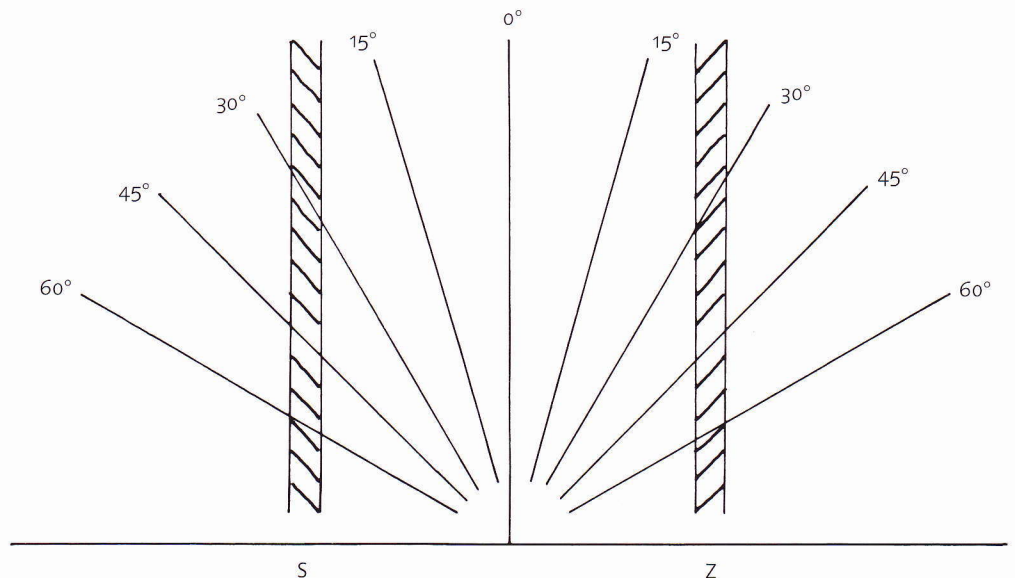




Fig. 6

*In a part of this textile a harder spun yarn has been used for the weft than in the rest of the textile. This makes the textile wrinkle when it is washed or merely put in water.*

*Photo: Anna Nørgaard.*

struction. The spindle has the advantage that it is inexpensive to make and can be taken anywhere like other handwork (Fig. 4).

All of the warp threads for the weavings are spun from the long band of hair, which produces a smooth, firm, and strong yarn with a spinning twist of 40-50°. This is almost always right-twisted = Z-spun.

The weft yarn is spun from the teased underwool, with a spinning twist of 30-40°, i.e., a little looser and with fewer twists per centimeter than the warp threads. These are always left-twisted = S-spun (Fig. 5).

If one chooses to spin the yarn oneself, it is important that the yarn has a consistent thickness, but it is even more crucial that there are the same number of twists per centimeter throughout. If the number of twists per centimeter is irregular, there can be some nasty surprises when the cloth is taken off the loom and placed in a water bath to take out the stiffness, or when the fabric needs to be washed. I have personally seen cloth with a width of 80cm that has shrunk up to 10cm in width. When this shrinkage is dispersed over the entire woven cloth, it is not only the width that is reduced in size, but the textile is wrinkled over its entire surface (Fig. 6).

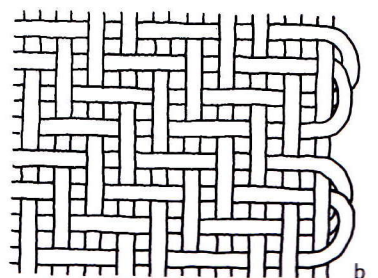
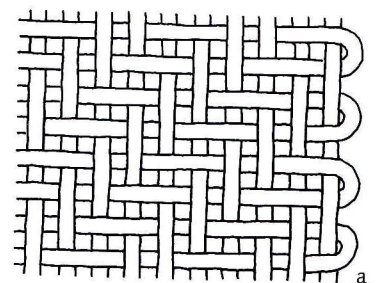
This problem can be alleviated by weaving with two shuttles, where each shuttle holds yarn from each spinning. With this weaving process the weft threads cross each other in the selvages. A number of textiles from the middle ages have this type of selvedge. Of the ten selvages that are registered among the garments from Herjolfsnes, seven have crossed selvages<sup>2</sup> (Fig. 7a + b).

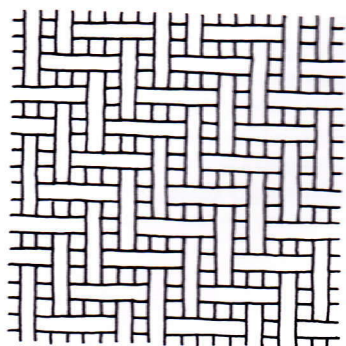
It is not the intention to elaborate on spinning techniques, but instead, the reader is referred to some of the many books written on this topic.<sup>3</sup>

Clothing woven from yarn spun from wool, which contains both hair and wool, is very long-wearing and warm, but since yarn containing hair can also be quite stiff, most

Fig. 7a and b

*Selvages on the textiles in 2/2 twill. The weft threads turn one after the other, (ordinary turning), and a turning with crossing weft threads at the edge. Drawing: Irene Skals.*





^  
^  
Fig. 8a  
Textile in 2/2 twill, the most commonly used weave in Norse Greenland.  
Drawing: Irene Skals.

^  
Fig. 8b  
The characteristic diagonal structure is emphasised by the dark warp threads and the light weft. Fragment from "The Farm Beneath the Sand".  
Photo: John Lee.

modern people would consider the apparel made from such wool to be uncomfortable and scratchy. If one therefore chooses to use yarn spun from soft wool, the garment will be more comfortable, but it will never have the same drape as the original.

If one decides to purchase machine-spun yarn, there are several spinning mills in Norway that specialize in yarn spun from spelsau wool, including Rauma and Norsk Kunstvevgarn A/S. However, one can also check on the net and search under *weaving yarn* (*vævegarn*, *vevgarn*) as there are undoubtedly many more yarn companies with appropriate types of wool. Today, when weaving goes in and out of fashion with considerable frequency, new spinning mills appear while others close.

## The fabric's quality

The quality of woven fabric is broadly determined by two things: the thickness of the yarn and the thread count per centimeter. If, for example, a yarn that is 1mm thick is used in both the warp and weft, and both warp and weft have a thread count of ten threads per centimeter, the finished cloth will be very tightly woven. If, on the other hand, the yarn is only ½ mm thick and the cloth is still woven with ten threads per centimeter, the finished fabric will be very loose and open, almost like gauze.

With regard to the yarns used in the garments that are discussed here, most of them are very close to an average of 1mm thick, with the maximum of 2mm (the weft threads for stockings D10613) and minimum of .7mm (the weft threads for hood D10602). The thread count per centimeter, on the other hand, has a greater variation, although there are always more weft than warp threads in the same piece of textile. With six warp and eight weft threads per centimeter, D10613 stockings, is the garment with the thickest woven cloth. The stockings are also woven with the thickest yarn, while the short-sleeved, garment D10581, has the finest, with 11 warp and 15 weft threads per centimeter (see Table: *Color and thread*, p. 36).

It is characteristic of all the Norse Greenland textiles that they are very tightly woven, and the clothing made from them, when new, must have been stiff and inflexible. They are also almost all woven in the weave called 2/2 twill. In this weave, each weft thread goes over and under two warp threads, with a shift by one warp thread with each new weft row. This gives a diagonal striped effect, which can be enhanced if one color is used for the warp and another used for the weft (Fig. 8a + b).

It can almost be impossible to attain these exact measurements, both in terms of yarn thickness and the density of the weave. If one chooses to purchase machine-spun yarn, Norsk Kunstvevgarn A/S carries a single-ply yarn that runs 7,000 meters per kilogram = 7/1, which is tightly spun and therefore quite heavy in relation to its thickness. It is available in both S- and Z- spun versions. It is recommended for textiles with a thread count of over 10 threads per centimeter. An alternative could be a weaving yarn of either number 12/1 or 9/1, or possibly a worsted yarn 16/2 or 20/2, even though these are two-ply.

Cloth with fewer than 10 threads per centimeter can be woven with 6/1 or 5/1, which is a quality that most yarn companies that produce weaving yarn carry.

## Dyeing/colors

The reason the original Norse Greenland garments appear today in a range of brown colors is due to the chemical processes that have taken place in the ground in which the garments were lying for many centuries. Contemporary color analyses show that the majority of the garment pieces were originally woven in two colors, where the darkest had a brown warp and a light – in many cases, white – weft. The colors derive from the fleece's natural white, gray, brown, and black colors.

This combination could be due to the use of wool from the same sheep. Wool, for example, from a gray sheep of the Nordic Short-tailed breed is usually composed of black



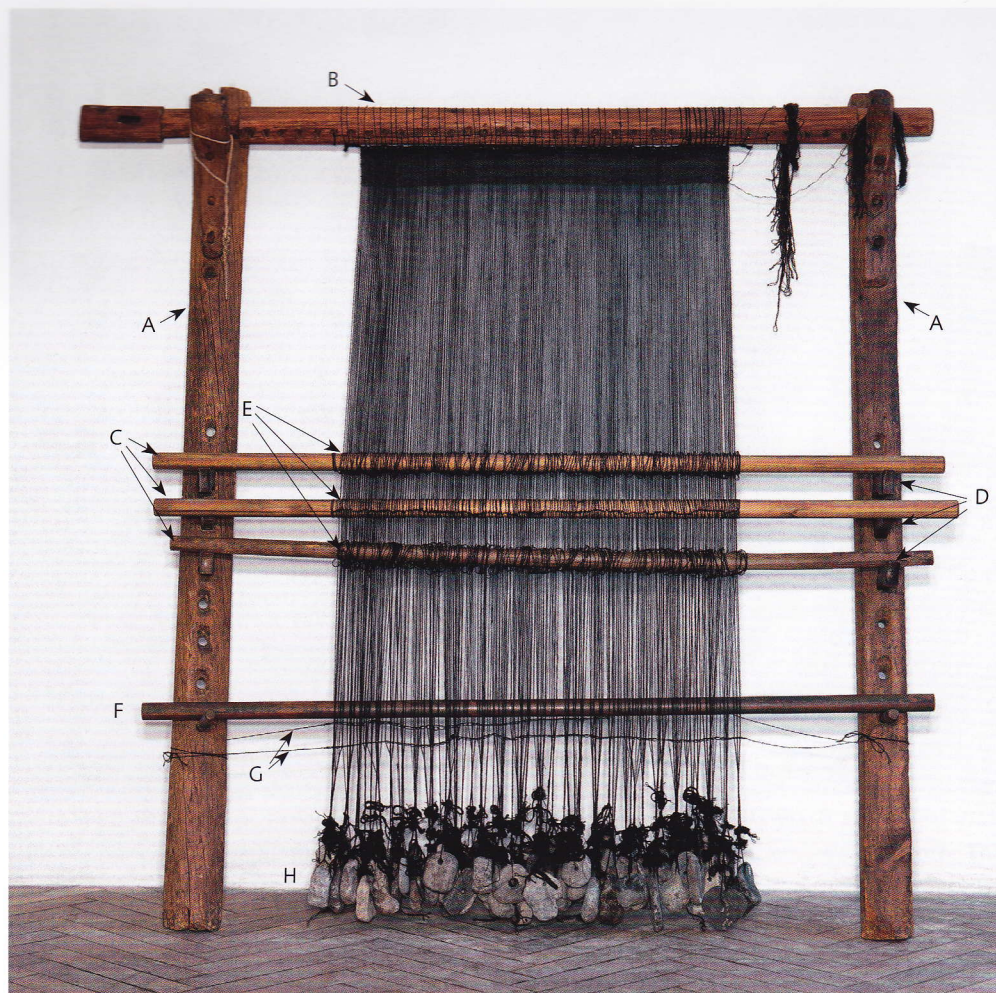
Fig. 9a  
Wool from Norwegian Spelsau. Note the different colors after the gray fleece is separated into 'almost'-white underwool and black hair.  
Photo: Roberto Fortuna.



Fig. 9b  
This small garment for a child is a reconstruction of D10593 woven on a horizontal loom from hand-spund yarn. The different colors of the yarn in the warp and weft accentuate the twill-weaving.  
Photo: Roberto Fortuna.

Fig. 10

Diagram of the vertically-slanted, upright warp-weighted loom: A=uprights, B=cloth-beam, C=heddle-rod, D= heddle-rod bracket, E=heddles, F=fixed shed-rod, G=spacing cords, H=loom weights. This loom is from the Faroe Islands and belongs to the National Museum of Copenhagen. Photo: Niels Erik Jehrbo.



hair and white underwool. When the hair has been combed out, what remains is a white underwool, possibly with a few short, black hairs, which, when mixed, give the appearance of light gray. When the hair is used for the warp and the underwool is used for the weft, an automatic color contrast appears with a dark warp and lighter-colored weft (Fig. 9a + b).

There are also traces of an unidentified brownish coloring agent with a significant tannin/tannic acid content. This dye has often been used over already natural-brown wool, which might, at first seem odd, but since natural black and brown wool fades appreciably when exposed to light, it might have been done to avoid this loss of color. It could also have been that the "raw" wool was very uneven in color, and over-dyeing mitigated the difference. Garments D10581 and D10584 are woven with a natural-brown warp yarn over-dyed with a tannin-rich color, and a completely white weft yarn. In hood D10597 it is the weft yarn that is over-dyed with tannin.

This combination has made the 2/2 twill effect in the weaving very obvious (See Fig. 8). Garment D10594 is woven with brown hair and underwool in both the warp and weft. All of the yarn has been over-dyed with tannin, although it is unknown if the fabric was over-dyed before or after it was woven.

Even though most of the garments were made in brown, gray, white, or black wool, there are a few examples where the Norse Greenlanders used other colors. A small fragment from Narsaq shows traces of indigo (*Indigofera*), but whether it was dyed with woad (*Isatis Tinctoria*) or imported indigo is not known.<sup>4</sup>

A decorative border that is sewn along the front edge of the buttoned garment D10594 is dyed red with madder (*Rubia tinctorum*), a well-known dye plant. This piece is woven in a 2/1 twill, and the yarn is Z-spun in both warp and weft, which is extremely atypical for the Norse Greenland textiles, so it is highly probable that it was imported.<sup>5</sup>

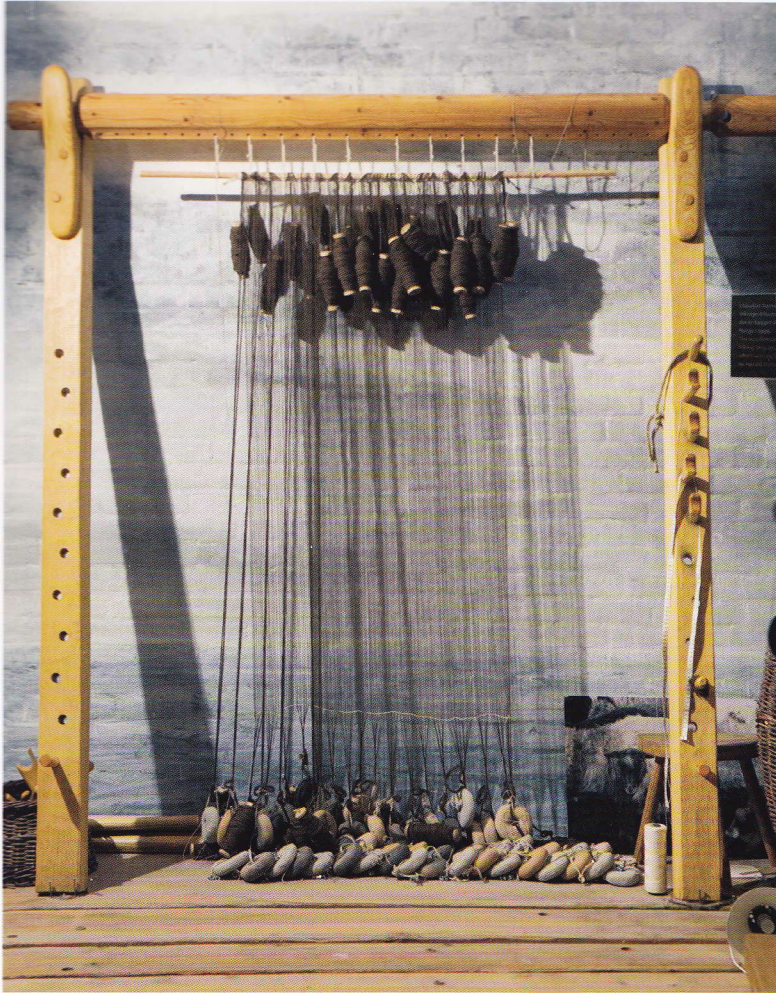


Fig. 11  
*"Dressing" the warp-weighted loom: The warp is either sewn to the cloth-beam or to a "helping" stick. Loom weights are mounted with the required number of warp-threads to each weight: first in the back layer, and then in the other layers. This warp-weighted loom is a reconstruction made from wooden implements from one or more looms found at "The Farm Beneath the Sand". The loom belongs to the Viking Ship Museum in Roskilde.*  
 Photo: Werner Karrasch.

Aside from the above-mentioned dyed pieces, there are seven textile fragments from Narsaq that show a red-violet color extracted from lichens. The same color is also seen on a pile weave from Narsarsuaq. The child's cap D10608 from Herjolfsnes has traces of the same color, but in a small concentration. Since many of the lichen types that grow in Greenland contain this red-violet color, it is likely that these textiles are locally dyed. It should be mentioned that this color is highly sensitive to light, and becomes quickly "fugitive"; i.e. it fades, and in the old textiles, appears as an odd muddy-gray color.

For a Norse Greenlandic reconstruction one needs to consider whether it should be in the original color or if one's point of departure should be in the colors from textile finds in the area where the garment will be used. In the same vein, one must also decide if the reconstruction should be dyed with plants from Greenland, or from suitable plants that grow in the environs where the garments will be worn. In looking at the various church frescoes from the Middle Ages, it appears that colored garments were far more common in the rest of Scandinavia and Europe than in Greenland, even though the cut of the garments was very similar.

Should one wish to dye one's own reconstruction, a number of good books on plant dyeing are available, although most of them are not of current date. In these books, therefore, it is not unusual to find chemicals mentioned for the pre-treatment and mordanting of wool (before the actual dyeing), that are so poisonous that they are no longer available through retail outlets. It is therefore recommended that, if a mordant is needed, that alum be used.<sup>6</sup>



Fig. 12a

When all the warp-threads are mounted on the weights, they are secured to the heddle-rods by heddles (loops). Different sheds in the weave are obtained by lifting the heddle-rods. For a 2/2 twill, for example, three heddle-rods are needed. The opening of the fourth shed is achieved by hanging the warp-thread for this shed in front of the fixed shed-rod, at the bottom of the weave = the natural shed. When the loom is in use it has to be placed vertically slanted, for example against a wall.

Fig. 12b

The heddles should be made from a firm, smooth thread, as they become worn during weaving. A three-ply worsted-thread, spun from long hairs, is used here. An extra knot around the heddle-rod between each heddle is also useful to prevent the heddle from turning around during weaving.



Photo: Werner Karrasch

## Weaving

The fabric for the Norse Greenland garments are woven on an upright, warp-weighted loom (in Scandinavia, the Norwegian term, *oppstadvev*, is generally used) (Fig. 10).

During the excavation of "The Farm Beneath the-Sand" (see the Introduction), remnants of an upright loom were found in Room number 1. This room was in use from the beginning of the 13<sup>th</sup> century to the end of the 15<sup>th</sup> century. Apart from this incomplete loom, many loom weights made of soapstone – that have had a hole bored out for hanging the loom weights up – have been found in the Norse Greenland excavations.

Weaving on an upright warp-weighted loom is extremely time-consuming, but the advantage is that the loom does not take up much space, which may be one of the reasons that it remained the preferred loom type in Iceland right into the 19<sup>th</sup> century.

The upright warp-weighted loom consists of two uprights, between and above which the cloth-beam is placed. There are holes drilled into the uprights along their entire lengths. Mounted with wooden pegs, these holes can be used for measuring the length of the warp threads. During the weaving process they are used to hold the heddle-rod bracket. Between the uprights at the bottom of the loom there is a fixed shed rod.

The warp is sewn to the cloth-beam at the top, and the threads are divided in two layers: one layer hangs vertically from the beam and the other is brought in front of the fixed shed rod. Loom weights are hung from the bottom of the warp threads in each of the two layers (Fig. 11). These weights hold the warp threads in tension. The number of threads tied to each weight is dependent both on how heavy the individual loom weight is and the thickness of the threads. The majority of loom weights found in Denmark are made of clay, which has the advantage that the clay can be formed into a consistent size and weight. If each loom weight has the same mass and weight, it is possible to gather



Photo: Werner Karrasch

Fig. 13a

A good swordbeater is indispensable when the wefts have to be beaten together, which is done in small parts all the way along the edge of the woven fabric and after each weft. A swordbeater with a long handle, where the weaver can place the hand between the blade and the handle, is a great help. This makes the sword work like a lever and spares the wrist. The swordbeater in the photo is a reconstruction of one found in an excavation near Löddeköpinge in Sweden, and is dated to around the year 1000.

Fig. 13b

Under the excavation of Norse Greenland, pieces of swordbeaters were found which were made of whalebone (also known from Norway). This swordbeater was made in Norway from the jaw of a whale and has a weight of 384 grams – only 6 grams less than my swordbeater from Löddeköpinge.

Fig. 14a

A useful tool when weaving is a little comb that is employed to press the wefts tighter together, and also to keep an even-distance between the warp-threads. It should be no bigger than the palm of your hand. The comb here is round, like the bone from which it has been made, but fits the dimensions of the weaver's hand. Most of the combs that have been excavated are flat and made of bone or antlers.

Fig. 14b

The small bone-comb in use when the weft is placed up against the woven fabric before a new shed. The teeth on the comb do not have to be very long and it is an advantage if the comb has a slight curve upwards but actually an ordinary fork for eating can just as easily be used as long as it has a smooth surface.

the correct number of threads for each weight from the beginning of the warping process. It is crucial that all the warp threads have the same number of grams per thread or the woven fabric will have raised indentations. When using weights made of soapstone or other form of natural stone, each loom weight must be separately weighed to determine how many threads should be tied to it.

When the weights are fitted, heddles/loops had to be tied around the warp threads that, in sequence, are lifted to produce the weaving pattern: here a 2/2 twill. The heddles are secured to the heddle-rods, which, when they are lifted together with the heddles and laid into the heddle-rod brackets, help form the shed through which the weft is

Fig. 15a

A 'singling' seam is used for reinforcing and is found on many finishing edges. The stitches are pulled 'flat' into the textile and are invisible from the right side.

Drawing: Irene Skals.

>

Fig. 15b

Magnified section of the bottom edge of the garment D5674, reverse side. The singling, for reinforcement, is seen as bows of thread 10-12 mm in height, drawn through the textile from the edge inwards. The edge has been finished with decorative stitching.

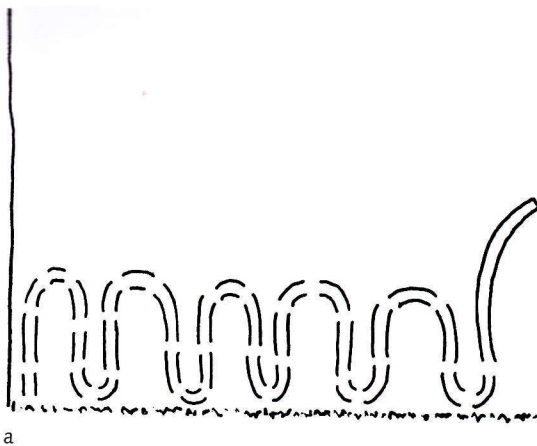
Photo: Peter Danstrøm.

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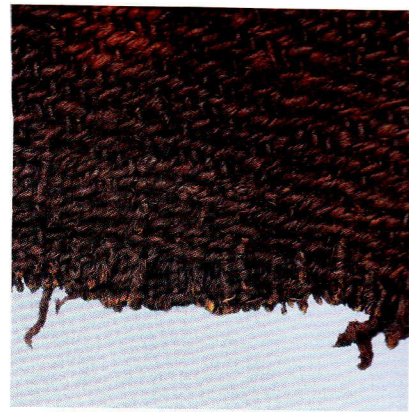
Fig. 16

Long seams were probably sewn from the right side and usually with small invisible stitches, and the seam allowance was sewn down to the cloth with tight overcast stitches.

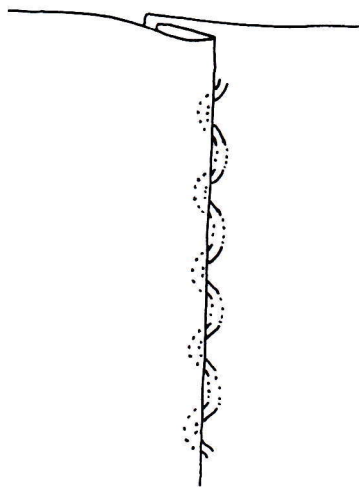
Drawing: Irene Skals.



a



b



passed. The weaving can begin after the heddles are tied. (Figs 12a and b)

When weaving, it is important to use a good sword beater for beating the weft threads together. For fine weaves, a wooden sword is sufficient, but for thicker and tighter weaves, such as those used in the Norse Greenland garments or for sailcloth, a heavier sword is needed. There are several archaeological finds of sword beaters made of whalebone from Norway and Greenland. When I weave, my preferred sword beater is one that is reconstructed from an iron sword beater found in Löddeköpinge, Sweden (dated to c. 900-1050).<sup>7</sup> It weighs 390 gr. (13.82 oz.), while my whalebone sword weighs 384 gr. (13.54 oz.), and my wooden sword is nearly 200 gr. (7.05 oz.) lighter. (Figs. 13a

and b) The iron sword beater's long handle gives a good balance when it is held at the juncture of blade and handle, and only a small wrist movement is necessary to beat the weft upwards.

Another essential weaving tool is a small comb made of bone [Figures 14a and b]. I carry this on a cord around my neck; it is used to move the weft threads up to the level of the weaving – before the shed is changed – and pounded into place with the sword beater. The comb is also useful for extra force along the weft threads and to keep an even distance between the warp threads. Instead of the comb, a pinbeater – a small, pointed stick made of wood or bone – can be used; it is particularly known from Iceland.<sup>8</sup>

There is a significant difference between weaving on an upright warp-weighted loom and a horizontal treadle loom, and it isn't only that for the first one stands up and for the latter one sits down. Since there isn't a reed to hold the warp threads in place on a warp-weighted loom, the weaver has to be aware of where the warp threads are at all times. The width of the weaving must not change; it must not become wider or narrower. It requires a great deal of practice to weave on an upright loom.<sup>9</sup> It is therefore probably easier to use a treadle loom if a hand-woven fabric for a reconstruction is desired.<sup>10</sup>

## Sewing

In looking at the entirety of the excavated Norse Greenland textiles, the level of professionalism is impressive. The spinning is perfect, the weaving is perfect, but nothing is as beautiful or well-executed as the stitching; in the needlecraft, nothing is left to chance. The sewing alone shows what value the textiles and garments had for their owners. As an example, there is not one stitch longer than five mm.

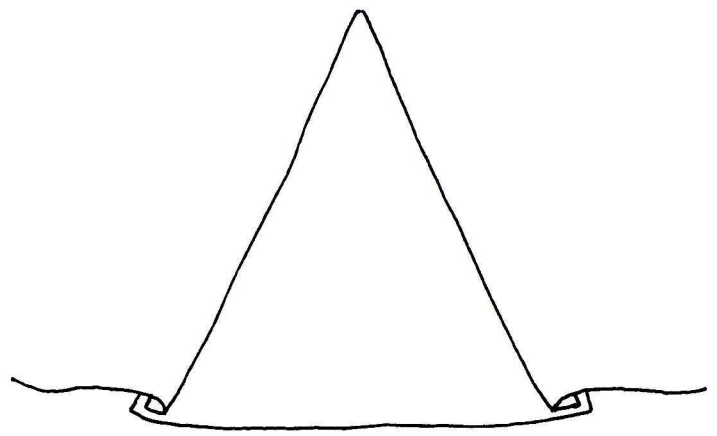
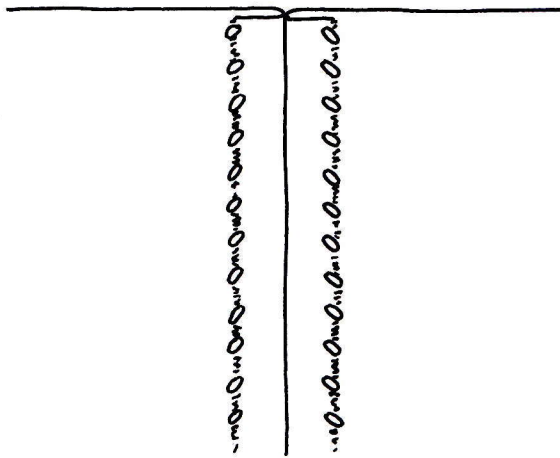


Fig. 17  
Shoulder seams are often finished in this way.  
Drawing: Irene Skals.

Fig. 18a  
Gussets on sleeves and hoods are inserted to lie under the cloth in such a way that the seam allowance is folded away from the gusset. The seam is the same as the long seams on the garment. b: The panels on the garment (D10584) are sewn to each other so that the seam allowances face towards/away from each other. On the middle gusset seams, as well as the side seams, the seam allowances face 'inwards'. In order to clarify the principle, the drawing shows unevenness in the width of the seam allowances, but in reality they have the same width.  
Drawing: Irene Skals.

The sewing threads in the original garments were specifically made for stitching. They were S-twisted of two Z-spun threads and are rarely over one mm in diameter. They are spun from fine-combed hair that was undoubtedly singled out expressly to be used for sewing thread. The thread might have been waxed before using, but this has not been proven.

It is virtually impossible to purchase this kind of thread for sewing a reconstruction. Alternatively, excess warp threads can be used, if one is weaving the fabric oneself. If the fabric is purchased, one could perhaps unravel some threads from the textile to be used for stitching. But wool embroidery yarn whose threads have been separated into the appropriate thickness will also work. All three types of yarn will require extra finger twisting in order for it to be smoother and stronger. Rubbing the thread with wax will also smooth and strengthen it.

Today, after the garment pieces have been cut out of the woven fabric, one would either machine zig-

Fig. 19  
A false seam has no function but is solely for the purpose of giving the garment symmetry, so that the number of panels is even. Right side.  
Drawing: Irene Skals.

Fig. 18b

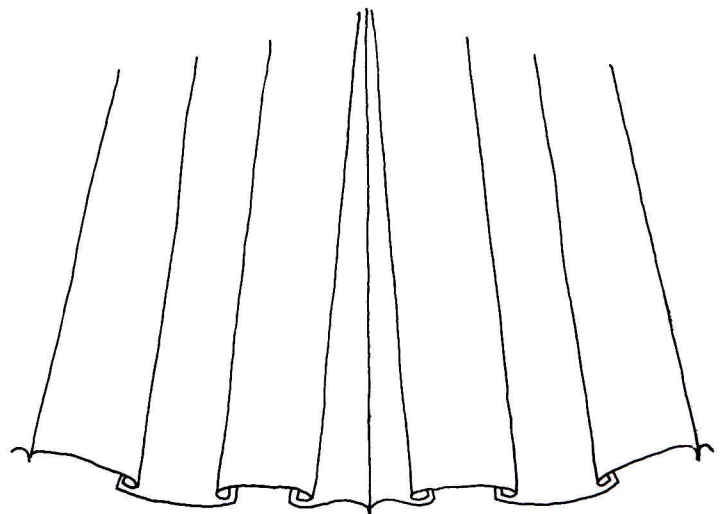
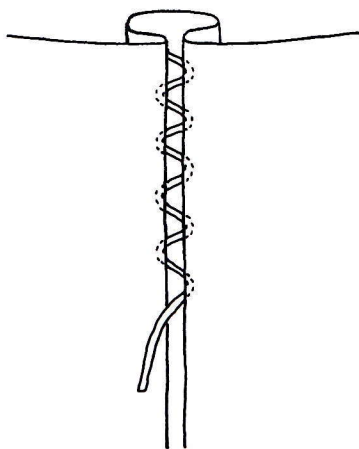


Fig. 15a

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Drawing: Irene Skals.

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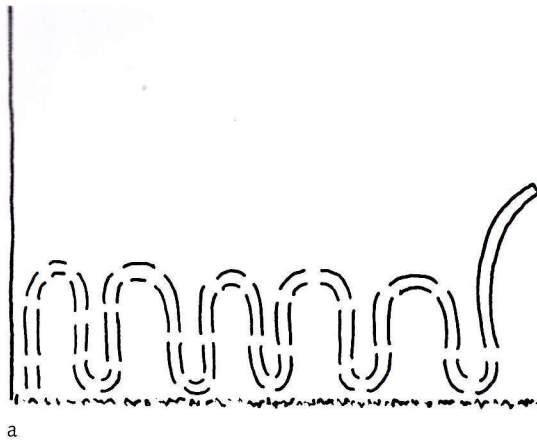
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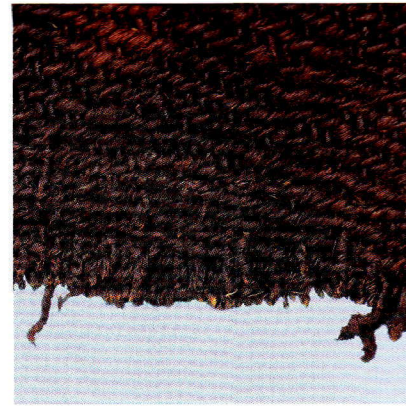
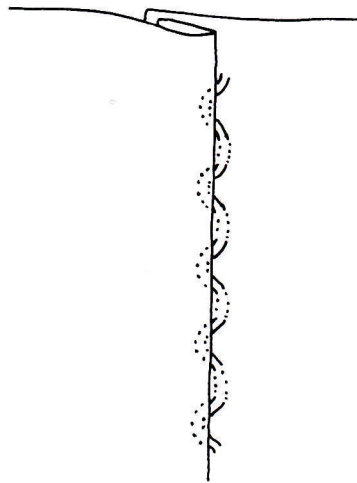
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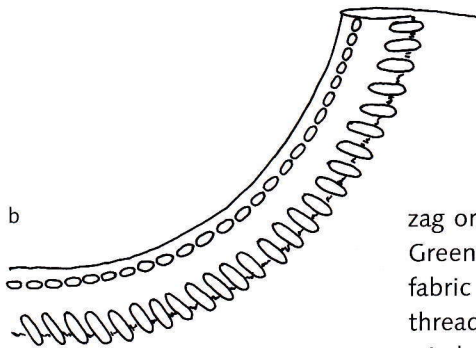
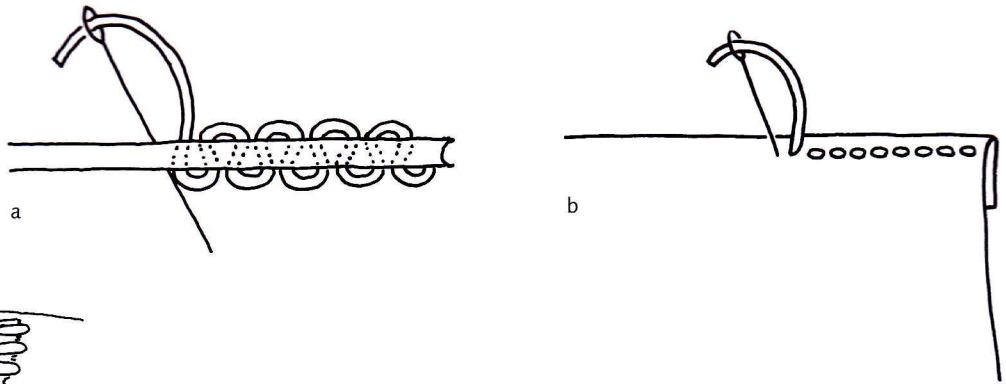
## Sewing

In looking at the entirety of the excavated Norse Greenland textiles, the level of professionalism is impressive. The spinning is perfect, the weaving is perfect, but nothing is as beautiful or well-executed as the stitching; in the needlecraft, nothing is left to chance. The sewing alone shows what value the textiles and garments had for their owners. As an example, there is not one stitch longer than five mm.

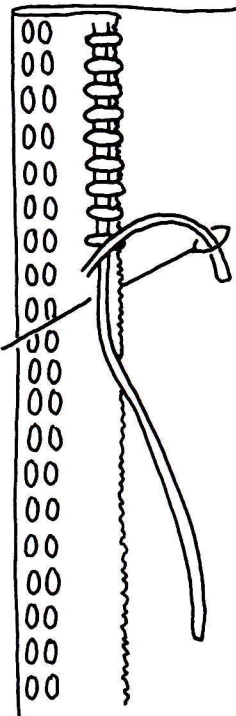
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Fig. 20a og b  
Stab stitches seen in cross section and from the right side. This stitching is found mostly along seams at the top of garments – probably to mark the cut, and as reinforcement for the finishing edges.

Drawing: Irene Skals.



b



a

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Fig. 21a og b  
A turned back hem, with overcast stitches sewn on top of one or several (filler) threads that cover the raw edge, was prevalent in Norse Greenland. This type of needlework can be found around face-openings on hoods, and in neck-openings; almost always seen together with one or two rows of stab stitches placed some few millimetres from the outermost edge.

Drawing: Irene Skals.

zag or cast the raw edges over by hand to prevent fraying. This is a problem the Norse Greenlanders solved by using an almost invisible stitching on the reverse side of the fabric – so-called *singling* (Fig. 15a + b) – that is sewn with a tack-stitch between the threads in the outermost layer of the fabric, and which is not visible on the right side. The stitches are laid in curves one to two centimeters from the outside edges and towards the body of the fabric. The stitches are never longer than 3 mm.

Many of the seams show evidence of being sewn from the right side (Fig. 16). The stitches are sewn into the fold and are therefore invisible, which might be difficult to see on the illustration, since it has been enlarged to make it more comprehensible.

On the reverse side it is most common that both seam allowances are turned the same way except for the shoulder seams (Fig. 17). To prevent unraveling there are tight overcast stitches over the outer edges of the fabric, which are sewn down into the garment but are invisible on the right side of the garment. On the panels of the garment the seam allowances are sewn together so that they are turned alternately towards and away from the next set of seams (Figs 18a + b).

Aside from the seams that are laid into the fabric, there are seams where the two raw edges are overcast with very close overcast stitches, but instead of lying flat, the edges stand up.

A great deal of attention has been paid to symmetry in the garments, and to this end a number of the pieces of fabric have been "divided" with a false seam since the facing panel on the opposite side is sewn of two pieces of cloth and therefore have natural center seams. A false seam is created by making a pleat down the middle of a gusset or side piece, which is sewn together with small, invisible stitches (Fig. 19).

All of the seams described until now are invisible on the right side of the garment parts. It is something entirely different with stab-stitches (Fig. 20a + b). Stab-stitches are used on all edges that are turned over, such as at the wrists, the neckline, at the bottom of the garment, and at the edges of the hoods. The stitches are very tight and close together and are never more than three mm. In a number of cases there are two rows closely adjacent. The choice of one or two rows does not adhere to a specific system, but it is clear that these rows of stab-stitching help to strengthen the edges. The amount of fabric turned under is never greater than seven mm.

In connection with the stab-stitching, particularly at the neckline of the garments, a thread or two is laid on top of the fabric on the reverse side – but under the overcast-stitches (Fig. 21a + b). This gives a decorative 'fullness', and, as these threads are not sewn down by the overcast-stitches, they can be pulled tightly. This has the effect that a border that is curved, such as at the neckline, is stabilized and does not stretch, but lies flat especially where the seam lies on the bias (Fig. 22).

Stab-stitching is common on the Norse Greenland garments, since it is also used as a decorative stitch several places along seam lines. Button garment D10594 appears to have had all seams decorated with stab-stitching on the sides where the seam-allowance is



*Fig. 22*  
The hood is a reconstruction of D 10606, woven from hand-spun yarn on a horizontal loom. On the bottom edge by the shoulder, and on the outer-side of the hood's face-opening, stab stitches are visible. Inside the hood the turned-in hem with overcast stitching is visible.  
Photo: Roberto Fortuna.

folded (Fig. 23). The stand-up collar also has stab-stitching where it attaches to the body of the garment, and the front edge, where the buttons must have sat, is also decorated with stab-stitching.

It might seem strange that there are many blank squares in the table: "Seams and stitching", page 36, particularly those squares that show the *flat and stand-up seams*, because there must have been seams! Unfortunately, records of the sewing techniques are not preserved in many cases. As examples: the sleeves of the button garment D10594 were removed from the body and wrapped around the feet of the deceased. Another garment was cut up the back for convenience in use as a burial shroud. As many of the sewing threads used on the seams had perished, many of the garments were, in connection with the exhibit in 1923, first cleaned with water; holes were patched; and the garments re-sewn, and completely lined.

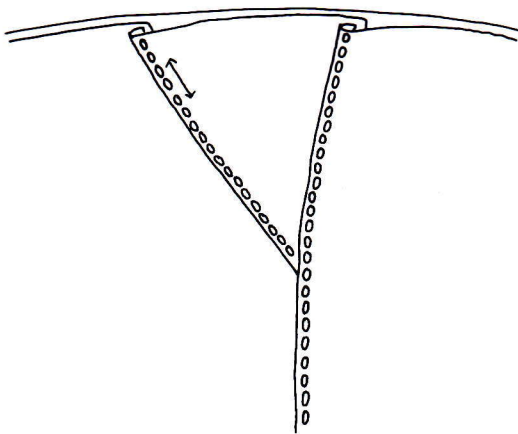


Fig. 23

The gussets of the sleeves, when sewn in, were laid under the front part of the sleeve where stab-stitches can be seen. The hindmost gusset seam (on the grain, marked with an arrow) lies on top of the sleeve. On the opposite sleeve the insertion of the gusset and the sewing are laterally reversed. Drawing: Irene Skals.

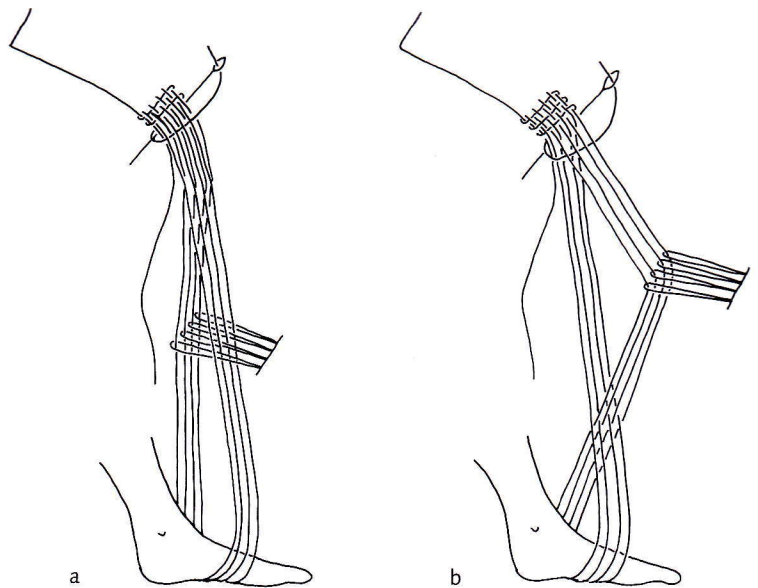


Fig. 24a and b

Footweave or "slynging" is a combination of weaving and sewing, where the weft thread in the weave is also the sewing thread that secures the woven edge down to the cloth. On the right side, the footweaving can be seen as a tabby weave. On the reverse side, only the cross-threads can be seen.

Drawing: Irene Skals.

In the 1980s some of the articles of clothing were "re-conserved". In several instances, the condition of some of the pieces was so poor that the conservator did not dare remove the cotton linings that had been sewn into the garments and hoods in the 1920s. The old linings are still inside many of the garments, and because of this their seams are hidden by the linings. Therefore we can observe today that there are seams, but not how they were sewn.

Those places where there are notes in the table's squares are those where investiga-

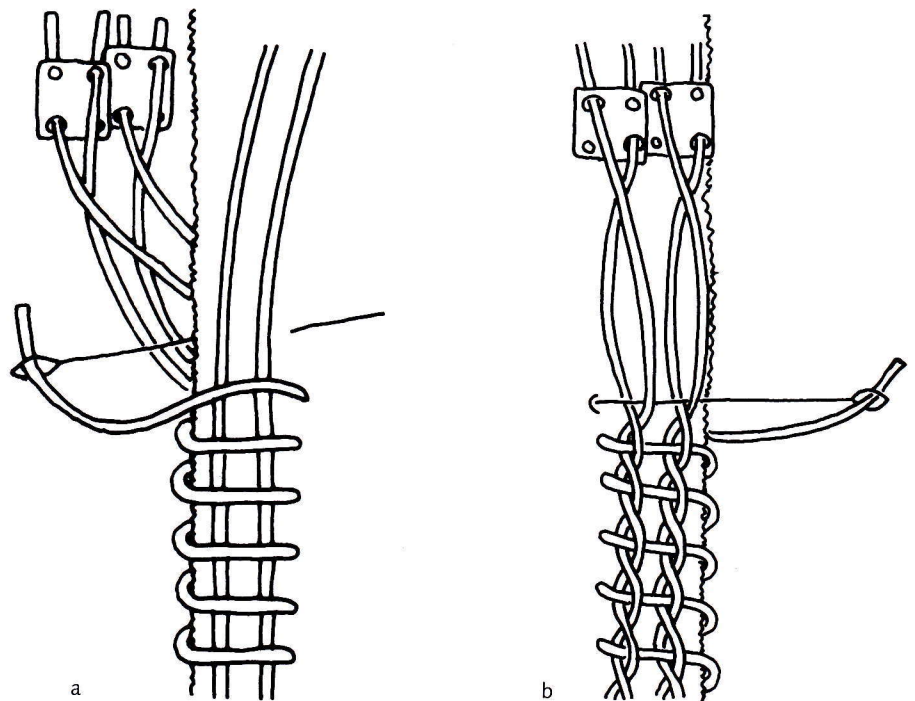
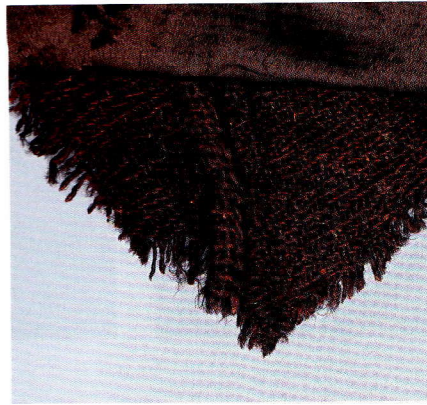
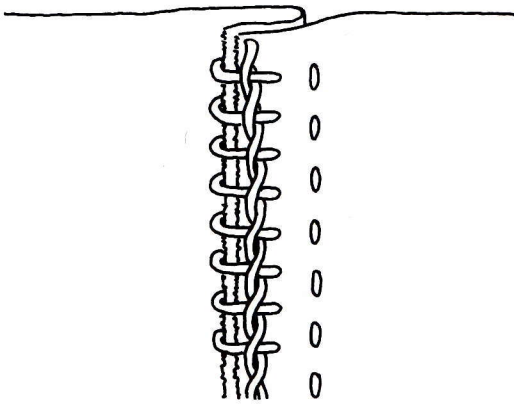


Fig. 25a and b

Schematic presentation of tablet-woven piped edging. This is a combination of tablet weaving and stitching where the weft thread in the tablet weaving is also the sewing thread that secures the edging to the cloth. On the reverse side (a) only the cross-threads – possibly with filler threads underneath – can be seen. On the right side (b) the edging can be seen as parallel-lying cords, while the weft thread is invisible.

Drawing: Irene Skals.



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Fig. 26

A seam allowance secured with a tablet-woven piped edging. Two threads – probably turned around each other with the help of a two-hole tablet – produce a cord that is sewn down with overcast stitches. Alternatively, this can be achieved by twisting two threads together with the fingers at the same time as the overcast stitches are sewn. On some of the longitudinal seams the cord is seen innermost, at other times, outermost.

Drawing: Irene Skals.

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Fig. 27

From garment D 10585.1. Section of the sewing on the middle gusset seen from the reverse side, back. The sewing is either tablet-woven piped edging with two threads in a tablet, or sewing where two threads are twisted together using the fingers, simultaneously with the overcasting of the raw edge. The twisted thread is seen outermost on the seam.

Photo: John Lee.

tions of the seams by The National Museum of Copenhagen were possible. The table only deals with those garments described in this book, but it should be mentioned that there are many other pieces that are so damaged that it is impossible to reconstruct the full garments. Of course, these fragments also have seams, tablet-woven piping, and footwoven borders, all of which tell us that these sewing techniques, braids, and weaving methods were widespread.

## Footweaving and tablet-woven piping

Two types of sewing/weaving that the Norse Greenlanders used as decoration and to stabilize edges are called footweaving (or "slynging") and tablet-woven piping.

"Slynging" is still used today in Iceland.<sup>11</sup> It can be made with the help of a foot – with tabby weaves – where the foot is placed in one of the sheds. The other shed is created with the help of heddles, tied one at a time to the warp threads that are lifted to form the opposite shed. The weft threads are inserted through the shed in the weaving with a needle, which is then stuck through the fabric and around the back of it. The "woven" band lies flat on the right side of the fabric, where only the warp threads are visible. On the reverse side of the fabric, only the weft threads can be seen (Fig. 24a + b).

The other way of creating an edge resembles footweaving to a certain degree, in that also here the weft threads are inserted through the shed with a needle, which is then stuck through the fabric and around the back of it. In this case, however, two warp threads are wound two-by-two around each other, for each weft (Fig. 25a + b). It is not known if the threads are twisted solely by using the fingers or hands, but the easiest method would be to insert the threads through two holes in a weaving tablet and to turn the cards in the same direction after each weft, hence the name, "tablet-woven piping". With this method it is also the case that the warp threads are so compact that the weft threads are only visible on the reverse side of the fabric. On garments D10585.1 and D10587, tablet woven piping – here, though, with only two twisted threads – has also been found in several places in connection with the overcast stitching of the turned-under areas of seams (Fig. 26 and Fig. 27).

The tabby-woven "slynging" can also be achieved with the aid of weaving tablets with two threads in each tablet, but in this case the tablets must be turned in opposite directions after each weft, so that the warp threads come to resemble tabby weaving. A number of weaving tablets have been found in Greenland (see Introduction, p. 13, Fig. 4), so this is a tool that the Norse Greenlanders knew.

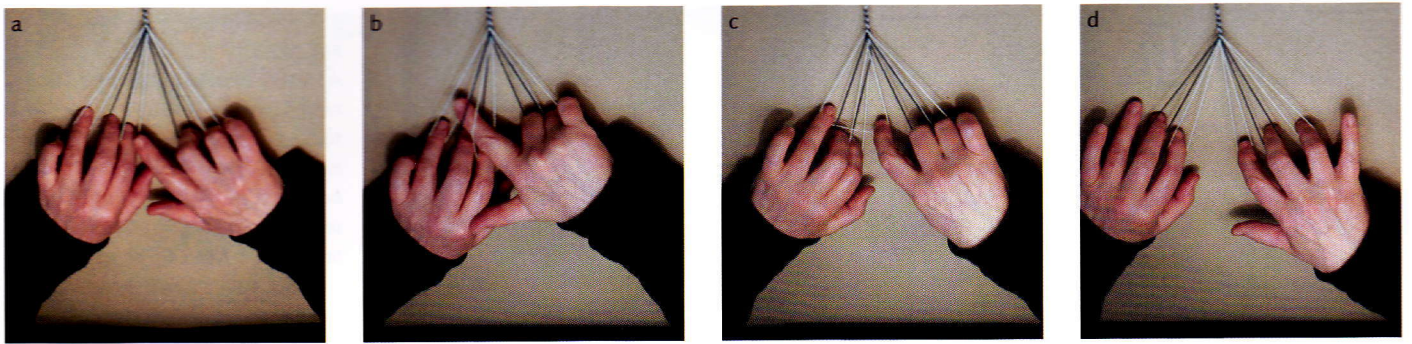


Fig. 28

a) There are three loops on the fingers of the left hand and two on the fingers of the right hand. The right hand's index finger is without loops and is moved downwards from above through the loop on the left hand's index finger. b) The right hand's index finger is then conveyed from above through the loop on the middle finger. c) The right hand's index finger is inserted into the loop on the third finger and pulls this loop back through the two loops on the long finger and index finger. d) There are now three loops on the right hand and two on the left hand. These two are moved over to the third finger and middle finger, so the left hand's index finger is without loops. Now the left hand's index finger is conveyed through the loops on the right hand fingers, as described under Figs a and b: i.e. the whole process is repeated, but this time from the opposite side. Each time a loop has changed hand, both arms must be stretched as far out to each side as possible, preferably 90 degrees in relation to the braided band, so that the braids become tighter. Photo: Andrea Otterstrøm Nørgaard.

## Braided cords

This technique is also called Faroese cords. These types of cords are used in several places on the garments, both as decoration and reinforcement. The cord is braided with strands held by separate fingers; you need at least three strands to make a braid, five is the most common, but there are examples from other parts of the world where the plaits have so many strands that two or three people must have sat in a row and passed the strands back and forth to each other. The braided cords on the Norse Greenland garments are square and generally made from four, five, or seven strands.

A five-strand square cord is plaited as shown in Figure 28. The strands must be of equal length; they are gathered into one bundle and are attached to a fixed point at the opposite end of the strands.

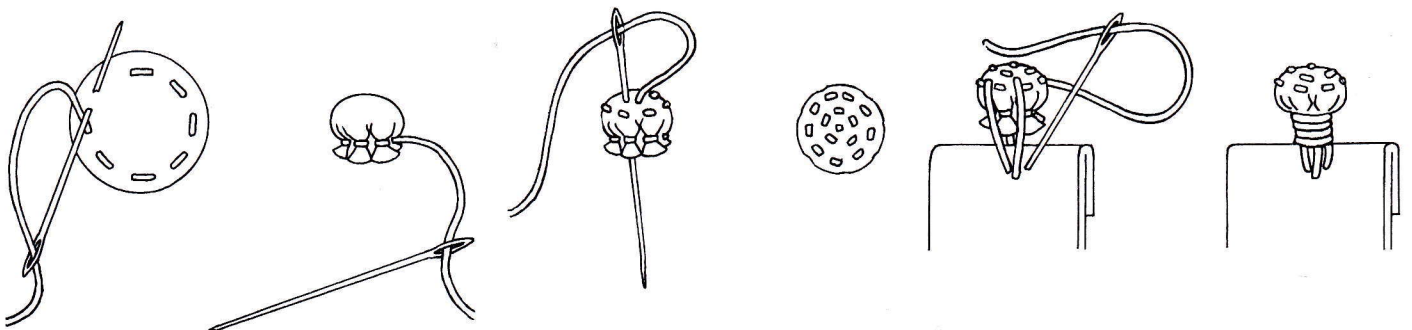
(a) The strands are brought around three fingers on one hand: the third finger, the middle finger, and the index finger. On the other hand, the strands are brought around the middle and ring fingers; the index finger carries no strands at this time.

(b) This bare index finger is now brought from above, down through the strands on the opposite hand's index finger, and again from above, through the strand on the middle finger, and subsequently through the strand on the third finger.

(c) The bare index finger is now crooked like a hook around the strand on the third finger and pulls this strand back through the strands on the middle and index fingers. When the strand has moved onto the opposite hand's index finger, it is removed from the third finger.

Fig. 29

Method by which the buttons could have been made and also how they could have been attached to the edge of the garment. The buttons are very flat and under 10mm in diameter. Drawing: © Museum of London/Christina Unwin.



(d) Now there are two strands on the hand that previously had three; they are moved to the ring and middle fingers so that the index finger is bare. Then, the entire process is repeated, but from the opposite side.

Each time a strand crosses from one hand to the other, the arms are spread out to their full extent, so that the braiding is pulled tight.

If one is working alone, it is a good idea that the strands are no longer than the span of one's own arm; otherwise it is difficult to tighten the plaits. If the cord needs to be longer, a helper is essential to tighten the braiding at the fixed point so it is firm and even.

## Buttons and buttonholes

The only garment with buttonholes that is mentioned in this book is number D10594. It is open down the front and has buttonholes along the left edge. There is nothing remaining of the thread that was used to reinforce the buttonholes against unraveling so they could tolerate the stress of the buttons as closures. Therefore, we cannot know what kind of stitch was used around the buttonholes, or from what material the thread had been spun.

Two other garments with buttonholes are excluded from this book since they are rather fragmentary and therefore not suited for the production of a satisfactory pattern: D10595, a buttonhole garment like D10594, but less well-preserved, along with D10583, which has buttonholes on the sleeves from the wrist upwards to ca. 27cm. There are no stitches or thread preserved from these buttonholes either.

D10583 is the only garment where buttons are retained, with seven remaining (see p. 35, fig. 5). The buttons are sewn from the same fabric as the garment. The sewing thread that held the buttons has disappeared. It is impossible to determine if there was something put inside the buttons to make them more stable, but they are sewn through the fabric layers with small, tightly spaced stitches in concentric circles, and the sewing thread here is 2-ply, but very thin<sup>12</sup> (Fig. 29). The buttons are rather flat and under 10mm in diameter. Buttons made of bone or walrus tusk have also been found in the remains of the Norse Greenlandic settlements.

## Using the tables

The two tables, "Color and thread" and "Seams and stitching" are conceived as a summary in which the reader can find information about the individual garments for such things as making weaving patterns or techniques for the hand-sewing of garments. The pattern for the garment can be found in the next part of this book.

### Table: Color and thread

The table shows the garments for which there are patterns drafted in this book, with museum inventory numbers and garment type in the first two columns. In the subsequent four columns, the numbers or words on the left side of the slash refer to the fabrics' warp threads and those that are to the right of the slash refer to the fabrics' weft threads.

As an example, the textile with inventory number D5674 is a garment/gown, whose warp is light gray and weft is white. The fabric is woven with 10 warp threads and 11 weft threads per centimeter. The warp threads are a little more tightly spun with a grade of 40° in comparison to the weft threads that are spun with a grade of 35°. The warp thread has a diameter of 1.00 mm, while the weft is a little thicker, with a diameter of 1.5mm.

Since all the warp threads in the garment are spun to the right = Z-twist, and all the weft threads spun to the left = S-twist, there is no column designating spinning direction.

Inventory Number	Garment Type	Color warp/weft	Number of threads per centimeter warp/weft	Gradation of twist in the treads warp/weft	Diameter of threads in mm warp/weft
D5674	Garment	Light gray/White	10/11	40°/35°	1.0/1.5
D15080	Garment	Dark gray/Light gray	10/14-16	45°-40°/35°	0.9/0.8
D10581	Garment	Medium Brown-tannin/ White	11/15	45°/35°	1.0/0.9
D10584	Garment	Dark Brown-tannin/Dark brown	8/9	40°/30°	1.2/1.0
D10585.1	Garment	Medium Gray/Light Gray	10/13	45°/35°	1.0/0.9
D10586	Child's Garment	White/White	8/9	45°/35°	1.0/1.2
D10587	Garment	Dark Brown/Dark Brown	9/8	40°/35°	1.0/1.2
D10593	Child's Garment	Light Gray/White	7/9	40°/30°	1.2/1.0
D10594	Button Garment / Decorative Border	Black-tannin/Black-tannin White – Madder red/White – Madder red	8/10 11/11	40°/35° 40°/40°	1.0/1.0 0.9/0.9
D10596	Hood	Brownish Black/Brownish Black	8/9-10	40°/30°	1.0/1.2
D10597	Hood	White/White-tannin	8/11	45°/30°	1.0/0.9
D10600	Hood	Dark Brown/ Dark Brown	9/10	45°/35°	1.0/1.0
D10602	Hood	Light Gray/White	8/14	45°/35°	1.2/0.7
D10606	Hood	Light Gray/White	9/12	40°/35°	1.2/0.9
D10608	Child's hood	White/White	10/12	45°/35°	1.0/1.0
D10608	Cap				
	Crown	Medium Gray/Light Gray	9/21	40°/25°	1.0/0.5
	2 side-pieces	Medium Gray/Light Gray	8/9	45°/35°	1.1/1.0
	2 side-pieces	Medium Gray/Light Gray	7/10	45°/35°	1.0/1.0
	Whole cap over dyed with <i>korkje</i> (lichen purple)				
D10610	Cap	White/White	10/14	55°/40°	1.0/0.8
D10613	Stocking	Black-brown/Black-brown	6/8	45°/50°	1.0/2.0
D10616	Footless stocking	White/White	8/9-10	40°/30°	1.0/1.0

**Table: Seams and stitching**

Museum no.	Singling	Abolished long seam	Upright long seam	Stab-stitching	False seams	Braided cords	Tablet weaving	Foot weaving
D5674 Garment	At the bottom			One row at the neck	Right side seam			
D10580 Garment	At the bottom	yes	yes	Two rows at the neck Two rows at the sleeves One row at the side widths	Both side-widths on the back	Neck Sleeves Pocket slits	At the bottom with three braids [cords]	
D10581 Garment		yes		One row at the neck One row on the sleeves One row at the gussets on the back One row at the bottom	Left side seam		Pocket slits with one braid	
D10584 Garment	At the bottom	yes		Two rows on the sleeves One row on the slits A row at the bottom	Right side seam	Neck Pocket slits	At the bottom	

Museum no.	Singling	Abolished long seam	Upright long seam	Stab-stitching	False seams	Braided cords	Tablet weaving	Foot weaving
D10585.1 Garment		yes		Two rows at the neck One row on the sleeves One at the side-widths One at the top, on the back middle gusset One row at the bottom			Middle gusset on the back, with one braid	
D10586 Child								
D10587 Garment		yes	yes	One row at the neck Two rows at the pocket slits One row at the bottom	Three on left side Two on the right and middle gussets on the back	Sleeve	Long seam with one braids [cords]	
D10593 Child					Back			
D10594 Buttoned garment		yes		One row at all seams One row at the bottom of the collar One row on the right front edge One row at the bottom			At the bottom	
D10596 Hood				Two rows at the face-edge				
D10597 Hood								
D10600 Hood								
D10602 Hood								
D10606 Hood				Two rows at the face-edge Two rows at the shoulder-edge				
D10608 Hood	Shoulder-edge	yes		Two rows at the face-edge				At the shoulder 1cm. wide
D10608 Hood								
D10610 Cap								
D10613 Stockings				One row at the top, on the hem				
D10 616 Stockings								

## Notes

- 1 Walton, 2007, p. 16.
- 2 Østergård, 2004, p. 65.
- 3 Warburg, 1974; Crockett, 1977; Brown 1979; Ross 1988; Walton, 2001.
- 4 Østergård 2004, p. 90.
- 5 Østergård 2004, p. 69.
- 6 Brown 1979; Henningsen 1983.
- 7 Andersson 1999, p. 28.
- 8 Guðjónsson 1990.
- 9 Hoffmann 1964; Nørgård 2009.
- 10 Brown 1979; Henningsen 1983.
- 11 Magnússon 2006.
- 12 Crowfoot 1992, p. 171; Østergård 2004, p. 102.