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Margarita Gleba and Ulla Mannering

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Introduction

Re-examination of old finds with new methods can often lead to surprising results. Recently, fascinating new evidence for the use of plant fibre textiles during the Early Iron Age came to light. The discovery came during analysis of a prehistoric bog body found in Denmark in the late 19th century: The Huldremose Woman. The research was done as part of the research programme "Textiles and Costumes in Danish Bronze and Early Iron Age Collections", conducted at the Danish National Research Foundation's Centre for Textile Research in Copenhagen.

Bog bodies have attracted the attention of archaeologists for a long time, both because of their spectacular preservation and the reasons for which they ended up in a bog. It is still debated whether bog people were sacrifices, executed criminals or simply unlucky travellers. The best preserved bodies have been found in Denmark and Northern Germany and date to the Scandinavian Early Iron Age (500 BC-AD 400) (van der Plicht *et al.* 2004; Mannering *et al.* 2010).

The Huldremose Woman was found during peat cutting in north-east Jutland in 1879 (Fig. 1). Almost 130 years after its discovery it remains one of the best preserved and best dressed bog bodies. The body was dug from the bog by the local authorities and brought to a nearby farm. At first it was suspected to be a crime case, so the chief police officer, the district medical doctor and a pharmacist were summoned. As the body was undressed, however, it became clear that it was quite ancient. The costume was very well preserved and included two skin capes and a wool scarf and skirt (Fig. 2). In the inner cape a pocket contained a horn comb, a leather thong and a narrow woven band (Fig. 2). It is important to stress that the large tubular garment, often referred to as the Huldremose peplos (Hald 1980) and now called Huldremose II tubular garment, is a single find not connected to the Huldremose female body (Huldremose I) (Mannering and Gleba forthcoming).

The body was buried in the local churchyard while the garments were kept by the local doctor. After a few days, however, on request from the National Museum in Copenhagen, the body was unearthened again and sent to the museum with all the costume items. Before the textiles were shipped to Copenhagen, they were washed and hung to dry, attesting to the extraordinary preservation of the cloth and making the 21st-century conservators and archaeologists cringe with horror.

The costume

The costume of the Huldremose Woman offers fascinating insights into Scandinavian Pre-Roman Iron Age dress design and technology. The items removed from the body in 1879 consist of two skin capes, a scarf and a skirt (Hald 1980, 47ff; Nørgård 2008; Mannering and Gleba forthcoming). According to the archaeological find description (Brothwell 1990), the outer cape was placed with the furry side out - the opening probably placed to the right. The inner cape had the furry side turned inwards and - according to the description - it did not cover any of the arms. Therefore, one may assume that it was placed with the opening to the left. In order to remove the inner cape from the body it was necessary to cut it open - today these cuts are difficult to locate, as the top part of the cape is quite damaged.

In the find description it is further stated that a horn comb, a leather thong and a narrow woven band were found sealed in a pocket in the outer skin cape. These items were wrapped in a bladder. An X-ray examination of the capes has revealed the presence of the pocket in the inner rather than in the outer cape. Inside a large three-dimensional patch, which is now cut open, small pieces of the leather thong can still be observed.

The scarf was placed around the head or neck of the woman. In order to get the scarf off the body, it was necessary to cut it in two halves. Only then was it



Fig. 1. Huldremose Woman as she survives today (© Roberto Fortuna, National Museum of Denmark).

recognised that it had been fastened with a bone pin underneath the left arm. The lower part of the body was covered by a long skirt and the feet were bare. According to the find description, the long red hair was tied at the neck with a wool cord, which was also wound several times around the neck. The hair is now missing.

In spite of having been subject to quite a rough retrieval and more that 130 years of storage in the National Museum of Denmark, the costume items are very well preserved. The two skin capes are made from well prepared, curly fleeces. The outer cape measures 82 cm in height and 170 cm in width. It is constructed of five primary, rectangular skin pieces, with two minor triangular pieces under the yoke. Most pieces are of dark sheepskin, but on the fur side the cape has an insertion of four light goat skin pieces. On the flesh side it has an upper front lining of dark sheep skin, which is a unique detail.

The inner cape is slightly smaller, measuring 80 cm in height and 150 cm in width. It is constructed of 7-8 primary sheep skin pieces, mostly rectangular and 22 secondary patches of goat and deer skin. Both capes have an asymmetrical design with a slanting neckline.

The wool scarf measures 139-144 cm in length and 49 cm in width. It is made in plain, 2/2 twill with tubular tabby selvages. It is woven with a tubular warp and has closed fringes at both short ends. The yarn is s-twisted and there are 6-7 threads per cm in both thread directions.

The wool skirt measures 220-252 cm in length, which is the circumference of the garment and 81-84 in width, which is its length. It is woven in plain 2/2 twill. The yarn is s-twisted and the weave has 7-10 threads per cm in both thread systems. The skirt is woven in such a way that one of the selvages constitutes the garment's waist band. The other selvedge is tubular tabby. As the ground weave and the waist band are made in different bindings, twill and rep tabby respectively, and with a different thread density, it required significant technical know-how to make the waist band and the ground weave fit together seamlessly while weaving. It would definitely have been much easier to sew a separate ribbon onto the fabric once the weaving had been completed. The skirt was woven with a tubular warp, probably as a tube with a closing cord/stick. The weaving was not continued right to the end, as is seen in many other Danish bog textiles (Mannering and Gleba forthcoming). Instead the lock of a cord/stick was removed, creating a rectangular fabric, and the remaining warp ends were cut off and the edge hemmed. Afterwards the skirt was sewn together with regular feather stitches.

The narrow band found inside the inner cape measures 74 cm in length and 1.5 cm in width. It is a tabby with simple selvages in s-twisted yarn. It was woven with a tubular warp and has closed fringes at the two short ends. Two cords (S2z2z) attached perpendicular to the length of the band are 77 and 78



Fig. 2. Various costume items belonging to the Huldremose Woman. Top: the inner cape seen from the flesh side and a close up of the plant fibre weave adhering to the woman's back. Centre: The outer cape seen from the fur side and the objects placed in the inner cape. Bottom: The skirt and the scarf (© Roberto Fortuna, National Museum of Denmark).

cm long respectively. This item could have been used as a hair band.

Fibre analysis of the wool used in the Huldremose textile and skin costumes has demonstrated that their makers had access to very high quality raw materials. Judging by the fibre diameter ranges in the samples, it is evident that great attention was paid to the selection and sorting of the wool before spinning and weaving. The wool from the textiles is surprisingly fine and has given the textiles a nice drape and soft handle. Likewise the wool used in the textiles matches the fleeces in the skin costumes; thus it can be concluded that the same sheep variety was used for textiles and skin costumes (Mannering and Gleba forthcoming).

A very characteristic feature of the Huldremose scarf and skirt is that they are woven in checked patterns of darker and lighter yarn. Furthermore, recent dye analyses have demonstrated that the textiles were also coloured with plant dyes (Vanden Berghe *et al.* 2009; 2010). In the scarf, two warp threads had no dyes detected, while the other three had different combinations of two unknown dyestuffs (unknown 3 and 5), which would have given a red hue, in one case supplemented with rhamnetin, a yellow dye ingredient. The same applies to the weft threads. The skirt is checked in a regular pattern with the same light and dark natural pigmented threads in warp and weft. The light threads contained luteolin, indigotin and an unknown dye component (unknown 5), which lies in the spectrum of red dyes. The dark warp has the same dye combinations, whereas the dark weft only contained luteolin and unknown 5 (Vanden Berghe *et al.* 2009; 2010). How this combination of yellow, blue and red dyes may have looked like is difficult to determine. As luteolin, in contrast to the other dyes, is present in all threads, it is likely that this was the last applied colour, possibly used to refresh or change the appearance of the colour. The mentioned dye sources represent both mordant and vat dyes, and therefore it is not possible that the dyes were applied in one process. Furthermore, the Huldremose skirt tested positive for three dyestuffs, which would have given distinctive colours to the textile separately but are unlikely to have been used together in one process, as the resulting hue would have been a variety of brown. One possible explanation may be that as the textile lost its bright colour due to exposure to the elements, it was over-dyed with a different colour.

The new costume item

While the above mentioned costume items were kept in the National Museum of Denmark, in 1904 the

body was given to the Anatomical Institute, University of Copenhagen where it lay forgotten until 1976, when it was 're-discovered' in a box under a table. The body was then returned to the National Museum, but first it was carefully examined and x-rayed (Brothwell *et al.* 1990). At the same time, samples of peat for pollen analyses were taken from the body. The first ¹⁴C-analysis, which was performed on samples from the body, dated the body to somewhere between 200 BC and AD 350 (Tauber 1979, 76). The new ¹⁴C-analysis performed in 2007 on the textiles has provided a more precise result due to the improved analytical methods, and demonstrates that the Huldremose Woman lived and died sometime in the period 350-41 BC (Mannering *et al.* 2010), which corresponds to the Scandinavian Pre-Roman Iron Age (500-1 BC).

In 2007, the peat samples, kept in glass tubes, were re-examined and in some of the glass tubes fragments of a thin spun thread of plant origin were found (Frei *et al.* 2009b). There could be no doubt that the thread had been part of a weave since it preserved the wavy shape usually acquired by yarn when it is locked into a fabric structure. But was the thread ancient? Why did no one notice it before? Were the threads intrusive - perhaps contamination from packing material? After all, while a bog environment is conducive to the preservation of animal or proteinacious materials, such as wool, skin and fur, plant materials such as linen, nettle or hemp have not been preserved. In fact, the only prehistoric items in plant fibre that had been found in the bogs are cords and ropes made of tree bast. Until now, that is: examination of the threads under a microscope indicated that they are ancient since the fibre surface was severely degraded. The DNA analysis of a small sample led to the same conclusion: there was no DNA surviving in the sample, which is usually the case with material that was buried in a bog.

This tiny thread was thus the first indication that a textile of plant fibre formed part of Huldremose Woman's costume. It was imperative that the body was examined for additional remains of the precious thread. The first surprise came when distinct imprints of textiles were located on the chest and the shoulders of the body – something that had not been noticed in previous examinations. Most of these turned out to be twill impressions, most likely from the scarf, but some of the imprints were made by a tabby textile. Since both the scarf and the skirt are woven in a twill technique entirely different in structure and texture from tabby, these imprints confirmed a possibility that a third textile garment was present on the body originally. When the body was turned around and its



back examined, there was an even greater surprise: not only were imprints of a tabby present, but also several small but unmistakable fragments of a tabby textile still adhered to the lower back (Fig. 2). This discovery means that there can be no doubt that in addition to the wool scarf and skirt and the two skin capes, the Huldremose Woman had worn some sort of undergarment in plant fibre next to the skin which covered at least the upper part of the body. The tabby weave is made from z-twisted threads with 9-10 threads per cm in both thread directions. Advanced microscopic analysis will hopefully in the future be able to reveal which kind of plant was used for this textile: flax, hemp or nettle (Bergfjord and Holst forthcoming).

Provenance

The reason for examining peat samples, which lead to the discovery of plant fibre thread, was to conduct strontium isotopic tracing analysis of the Huldremose garments. The ratio of the strontium isotopes is a good indicator for provenance of archaeological textiles. A recent PhD research project conducted by Karin Margarita Frei at the University of Copenhagen has developed the methodology for strontium isotopic tracing of wool textiles, but other materials such as plant fibres and skin have also been tested (Frei *et al.* 2009a). Samples from the Huldremose scarf, the plant fibre textile, peat collected on the Huldremose Woman's body and a piece of her skin were analysed. The results indicate that the wool scarf has a local provenance, while the plant fibre textile and probably the Huldremose Woman herself have a non-local origin (Frei *et al.* 2009b). This means that the Huldremose Woman and her tabby inner garment came from an area geologically different from Denmark with a Precambrian terrain. The closest area with this geological composition is middle and northern Sweden, Norway and the island Bornholm in the Baltic Sea.

Conclusions

The results of the investigation of the Huldremose I find demonstrate the usefulness of re-examining old finds with new techniques, analytical methods and information available. Thus previously, it was believed that textiles from the Pre-Roman Iron Age in Denmark were not dyed (Bender Jørgensen and Walton 1986; Walton 1988), and that the patterns in the fabrics were made only by combining various shades of naturally pigmented wool: white, black, grey and brown. The new dye test results challenge this perception, and show that Danish Iron Age textiles and garments were much more colourful than

previously thought.

The non-local provenance of some of the items in the Huldremose I find, together with similar results for the Huldremose II find, based on strontium isotopic tracing, opens up new interpretations regarding exchange and circulation of raw materials, in these cases wool and plant fibres, in a period and area where self-sufficiency and local production is generally expected. No other characteristics in the analysed costume objects would have provided information on their provenance. It forces archaeologists to look more carefully into cultural connections and exchange routes over much larger distances than previously anticipated.

Finally, the discovery of the plant fibre thread has major implications for our interpretations of bog bodies, since it raises the possibility that other bog bodies may have been dressed in plant fibre textiles, too. For example, the two most famous Danish bog bodies - Grauballe Man and Tollund Man (Ashing and Lynnerup 2007; Fischer 2007) - have little or no clothing associated with them. The fact is, however, that the vast majority of Danish bog bodies have been found together with textile and skin garments and accessories, indicating that garments played an important part in the deposition ritual. Thus, the naked bodies are exceptional and now we must ask if perhaps originally they were not naked either? Could it be that, underneath his leather belt, Tollund Man also wore a plant fibre garment which did not survive burial in the bog? We may never know the answer to this question but at least we must consider the possibility that prehistoric people were better dressed than previously thought. A little thread may sometime lead to a big change in our understanding of the past.

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