H. C. BROHOLM AND MARGRETHE HALD

COSTUMES OF THE BRONZE AGE IN DENMARK

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THE BRONZE AGE IN DENMARK

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COSTUMES OF THE BRONZE AGE IN DENMARK

CONTRIBUTIONS TO THE ARCHÆOLOGY AND TEXTILE-HISTORY OF THE BRONZE AGE BY

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IN FRIENDSHIP AND ADMIRATION

PREFACE

In the stirring pre-historic times of Europe the graph of cultural life went up and down, a flourishing period was succeeded by one of stagnation, a decline setting in would in time give way to a rise. Undoubtedly the South was ahead of the North in these interchanging epochs, and undeniably the high cultures of the Eastern Mediterranean basin held a prominent position throughout the infancy of historical culture in Europe. Still the antiquarians of Northern Europe have with perfect justice emphasized the importance and proper value of the Scandinavian cultures, and have described the Danish Bronze Age as a climax. Strange and even now full of mystery the "golden epoch" of the Danish Bronze Age is outlined through the finds in the earth, this epoch with its mild and favourable climate, its prosperous shipping trade, its far-reaching commercial connections, its highly developed technical skill at metal-workmanship and particularly at weaving. As to the latter it is a well-known fact that the Danish grave finds have yielded something quite extraordinary. Thanks to special stratification of the layers of earth in the grave mounds of Jutland from the Early Danish Bronze Age (the centuries immediately preceding the time when cremation with its unostentatious urn graves came to be the sole prevailing kind of burial) it has been possible to preserve right up to our day the oak coffins placed in these mounds and with them the garments of the dead persons. Not shrouds, as we know them from the mummy-cases of Egypt, but the clothes of ordinary daily life, — and surely nothing can make Antiquity and its life more vivid in our eyes than the very costumes themselves of the people of that time, that is to say not as models or scanty remnants, but in full reality. The Bronze Age costumes, which are more than 3000 years of age, occupy an exceptional place in the pre-historic period in Europe. They represent valuable documents in the history of the material culture. We know from Denmark altogether seven complete costumes, four from men's graves, three from women's graves, besides several more or less well-preserved garments. If ever a scientific material has deserved elaborate and conscientious publication, it must be this. Two skilled archeological scholars, one belonging to the greatest connoisseurs of the Danish Bronze Age, and the other for several years engaged in special studies on the history of the textiles, have here united in presenting these oldest costumes of Europe in a publication, of which the content and whole get-up is worthy of them, and which addresses itself equally to the scientific world and to the interested public. By presenting this book in a universal language and to a proportionally extended forum, I fulfill a pleasant promise. By its thorough and reliable method of workmanship it preserves the tradition of the Scandinavian antiquarianism — and that alone is no small thing!

Nationalmuseet, Copenhagen, February 1940

Johannes Brøndsted

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PREFATORY NOTE

More than any other material from the prehistoric times of Denmark the oak trunk coffin graves bring us in direct contact with the ancient people, and thus they are invaluable sources of information on the culture of the Bronze Age. As the vestments found in the Danish oak coffins are the oldest complete garments preserved from Europe, and as the finds give excellent examples of various textile techniques, their importance for the history of costumes and of the textile technique reaches beyond the limits of Denmark.

The present work is a revised edition of our work "Danske Bronzealders Dragter", published 1935 by the Royal Society of Northern Antiquaries (Nordiske Fortidsminder II, 5—6), augmented with a description of the Skrydstrup-find (H. C. Broholm og Margrethe Hald: Skrydstrupfundet, Nordiske Fortidsminder III, 2 1939) and an introduction on the funeral ceremony in Denmark during the Early Bronze Age. Where no source is indicated, the photographs are due to the Museum-photographer Mr. S. Bengtsson; the drawings signed M. H. are drawn by Miss Margrethe Hald.

We return our most respectful thanks to the Rask-Ørsted Fund which defrays the expenses of the publication, and to The Royal Society of Northern Antiquaries, which has allowed us to make use of the blocks from our previous treatises printed in the publication of that society.

Our warmest thanks are, however, due to the Director of the National-Museum Dr. Poul Nørlund and to the Deputy-Keeper of the Department of Danish Antiquities Dr. J. Brøndsted for the interest which they in the course of time have shown our work, to the artist Mr. Johannes Glob, who has allowed us to reproduce his drawing of the head of the Skrydstrup woman in this book also and to the artist Mr. Sikker Hansen, who has drawn the beautiful illustration for the cover.

Finally we want to express our sincere thanks to Mr. A. G. Drachmann, Librarian of the University Library in Copenhagen, for much valuable help, to Mrs. Petra Djurhuus, Thorshavn for her important information about the textile work on the Faroe Island and to Miss E. Aagesen, who has translated our Danish manuscript.

Also we want to thank the director of the Nyt Nordisk Forlag Mr. Arnold Busck and the printers of the Bianco Luno printing house for the care and interests they have displayed in setting up and printing the book.

Nationalmuseet, Copenhagen, September 1939.

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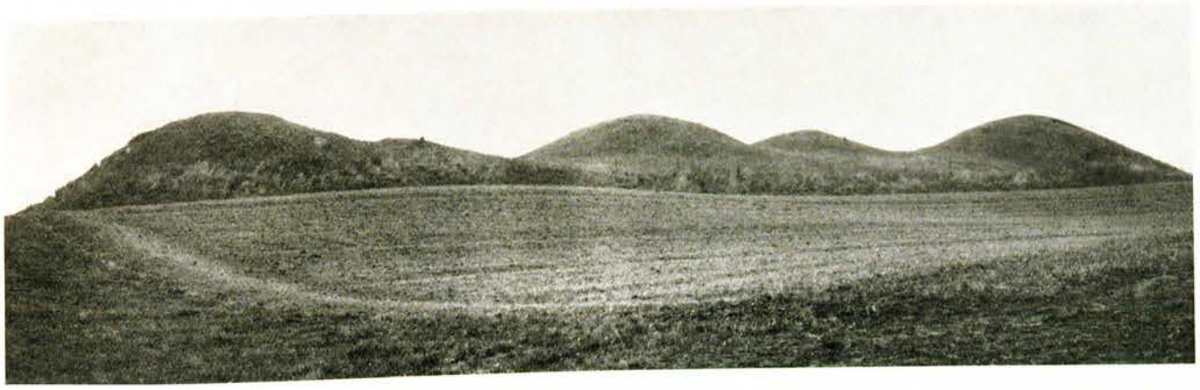


CHAPTER I

THE FUNERAL CEREMONY IN DENMARK IN THE FIRST PERIOD OF THE EARLY BRONZE AGE

The antiquities found in the Danish graves from the Bronze Age are generally more or less destroyed by humic acid, and the material is so one-sided that it gives a very imperfect idea of the grave and its contents at the time when the mound was raised as a memorial to the dead person (fig. 1).

In several cases, however, the arrangement of the grave in connection with special conditions of the soil in the places concerned have had the effect of preserving, not only the coffin's contents of inorganic materials but sometimes also the wooden coffin itself and the things of organic matter (wood and fabric) and even sometimes the dead person. The famous Danish oak coffin graves, the first of which turned up about 100 years ago, have yielded these finds.

Thanks to the oak coffin graves the Danish National Museum is now in possession of 4 complete men's garments and 3 whole women's garments from the first period of the Early Bronze Age, all brought to light in the peninsula of Jutland, and further larger or smaller relics of various pieces of garments found, partly in the Danish Islands, partly in Jutland.

As might have been expected the funeral ceremony in Denmark during the first epoch*) of the Early Bronze Age forms a continuation of the tradition created during the Late Stone Age and during the transition period between the Stone Age and the Bronze Age. The *cists* of the Bronze Age built *of thin stone slabs* and covered with flat slabs correspond exactly to the slab cists of the Late Stone Age, with the characteristic difference, however, that the Bronze Age cist was built for one person only, whereas the cist of the Stone Age generally was a common grave.

But side by side with the stone slab cist you may during the Late Stone Age find graves

*) I divide the Bronze Age of Denmark into three main periods, the Earliest, the Early and the Late Bronze Age, each dividable into several sub-sections. For the Early Bronze Age I use the term of the first part of the Early Bronze Age, on the whole corresponding to 3—4 periods according to Sophus Müller's chronological system (Débuts et première évolution de la civilisation du bronze en Danemark, Mémoires 1908, S. 1 ff.); and the second part of the Early Bronze Age, corresponding to Müller's 5—6 periods.

Fig. 1. Group of round barrows, "Dutterhøje", near Asnæs in North Seeland. (C. J. Becker.)

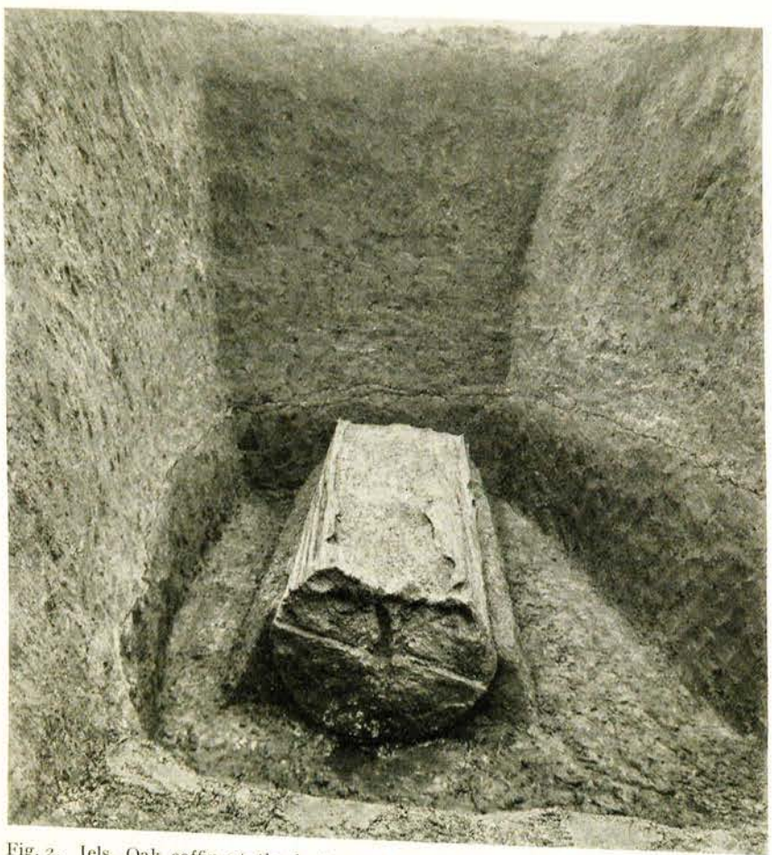


Fig. 2. Jels. Oak coffin at the bottom of the barrow. p. 10 & 43. (H. C. Broholm.)

in which the dead body was inclosed in a *wooden coffin* covered by a heap of stones. Although the wood of the Stone Age graves is but very seldom to be traced it is often possible by means of studying the stone coverings that have surrounded the wooden coffins to state that the latter have varied in form. Plank coffins or board coffins seem to have been common, and the proof of their existence is the fact that between the stones piled up on the sides of the grave and the pavement generally laid in the bottom of the grave is found a stoneless space indicating the thickness of the boards[1]). But the boards are by now entirely gone. Another shape of a grave is that of the *bole-coffin*, consisting of a split hollowed trunk in which the dead body was placed, and the application of this type of coffin is likewise to be proved during the Stone Age, there being often a trough-shaped cavity in the stone covering that has surrounded the bottom and the sides of the coffin[2]). As a rule these graves appear only as heaps or coverings or rows of stones; but there can be no doubt as to their nature.

From *The Earliest Bronze Age* (1—2 period according to Sophus Müller's chronological system) we know only 90 grave finds partly without information as to the arrangement of the grave; but even from this time *25 oak coffin graves*, all turned into mould, may be proved, evenly spread over Jutland and the Danish Islands[3]).

Also during the first part of the *Early Bronze Age* the oak coffin grave is the most common grave form; there is no doubt that the stone heaps, the pavement, or the stone rows found in the mounds have covered or supported wooden coffins. Of the about 1060 grave finds from this time at least more than one third proceed from oak coffins[4]). On the map fig. 6 is marked down 314 mounds which have all of them contained oak coffin graves and in 43 of these 2 to 4 oak coffins have been found. A great many other finds in the museums that are said to have been found in mounds together with stones probably proceed from graves of this kind. On being excavated by incompetent persons such graves are more exposed to negligence and to not being interpreted in the right way than the stone slab cists, the solid stone walls of which at once draw people's attention. From the first period of the Early Bronze Age we know only 68 finds of stone slab cists.

In most cases it is impossible to reach a clear conception of the appearance of the grave; but where this is possible, it is found that also the Bronze Age graves vary a great deal and their shapes show a close resemblance to those of the Stone Age; thus for instance plank

coffins have probably often been used during the Bronze Age. Three somewhat different forms will be mentioned here.

In *Skjoldhøj* a little north of Copenhagen was found a wooden coffin surrounded by stones. One end was of a hollowed oak trunk while the rest consisted of planks grooved together on the sides and in the bottom. The coffin of *Spidshøj* a few Danish miles west of Kolding was built of heavy oak-timber. At the west end was a heavy trunk with the bark left on, 1,30 m long; as side-pieces had been used two planks about 10 cm thick placed on edge along the sides of the grave and fitting into notches in the east side of the tail-piece; you could follow them as dark streaks as far as the east end of the grave, which has been disturbed in modern time. The space between the planks was paved with small stones as in certain Stone Age graves, but they do not seem to have been covered with wood. In *Bredhøj*, north of Holstebro, which contained 4 oak coffin graves, one, the man's grave B, was a coffin built of four oak planks about 32 cm broad. The coffin was 2 m in length. The outside of the planks were supported by 14 boards of oaktree (staves) up to 47 cm broad, the upper ends of which had rotted away so that it was impossible to determine the length. The bottom of the coffin had in this case been covered by a layer of wood. The construction is of importance, as it reminds us of wooden houses with stave-walls dug into the earth[5]).

Fig. 3. Egtved. Oak coffin standing on a layer of stones. p. 12 & 78. (Th. Thomsen.)

The best known shape of coffin is, however, the so called *bole-coffin* or *trunk-coffin* (fig. 2—3). Even if the wood has quite disappeared, it is often possible to prove the use of those coffins by means of the trough-shaped cavity in the stonebed on which the coffin stood and which surrounded the lower part of it (fig. 3—5). Evidently it is the most common type of coffin from the Bronze Age, used for grown-up persons as well as for children, and rather a great number of such coffins have been preserved. The bole-coffin occurs not only during the first part of the Early Bronze Age but is also found in the second part of the Early Bronze Age[6]) and is even used after the time when cremation has come into use; in the course of the Late Bronze Age, however, it is completely supplanted by the urn burial[7]).

The size of the bole coffins varies for grown-up persons from 2, 2,30 m to 3, 3,10 m, and one, which, however, is not preserved, is said to have measured 4,40 m. The size of the inside of the coffin varies likewise; generally it is between 2 m and 2,50 m. Sometimes the coffins have been covered by larger or smaller wooden boards in order to protect them[8]). *The Muldbjerg coffin*[9]) was covered by a huge hollowed oak trunk forming a barrel vault over it. In order to give further protection to the coffins they sometimes surrounded them with moss

and zostera[10]). In two cases the bottom of the coffin has shown a raised part for the dead person's head to rest on.

In more than half of the coffins preserved a square hole (about 5 × 10 cm) has been cut in the bottom of the lower part, in a few cases even two bottom-holes. The purpose of these holes is, however, not quite evident[11]). But certain arrangements on the outside of the coffins have probably had a practical purpose; thus in several cases handles had been cut, by which

Fig. 4—5. Skrydstrup. The coffin was covered by a cairn. Fig. 4 before, fig. 5 after the opening of the grave. p. 88. (C. M. Lund.)

to carry the lower part of the coffin, and sometimes the lid of the coffin was locked by a wooden stake at each end, driven into the earth through square holes in the lid and the bottom in order to prevent the coffin from being opened and overturned[12]). This arrangement possibly intended to resist violation of tombs. In some coffins other, somewhat different arrangements have been made to resist violation of the tombs[13]).

It is peculiar to notice that although the funeral ceremony has been rather uniform all over Denmark, the oak trunk with its bark left on is in some places so well preserved that when the grave was opened the wood looked quite fresh, while in other places a few centimeters' thickness of brown stuff is all that is left of the coffin. So there is no doubt that it depends on the conditions of the soil, whether the oak coffin is preserved or decayed; and a lucky interaction of several factors is required for preserving the oak coffin and its contents of organic matter in the barrow.

On being excavated nearly all the oak coffins have been full of water, and the moisture seems to have been of special importance for the preservation of the finds. Evidently the gathering of the necessary moisture at the bottom of the barrow can take place only provided that the place where the barrow is laid out is podsoled to such a degree that the downfall oozing down through the earth of the barrow is held up; but further it is of some consequence that in the earth of the barrows ferruginous layers are sometimes precipitated, which layers join the layer of pan at the bottom of the barrow (fig. 2); for these secondary iron precipitations contribute furthermore to keep in the water and bring about such conditions as are required for preserving organic matter, i. e. a constant low temperature and the exclusion of putrefaction bacteria and the oxygen of the air from the grave.

Where the earth is but slightly podsoled as f. i. in East Jutland or where there is no podsoling whatever, as is generally the case in the Danish Islands, the principal condition of pre-

servation is lacking. The downfall will ooze through the barrow and the grave down into the earth, and on letting in oxygen and bacteria it hastens the destruction of the coffin and its contents. The lack of water-checking layers under the bottom of the barrow must be the reason why the barrows of East Jutland and the Danish Islands have not yielded

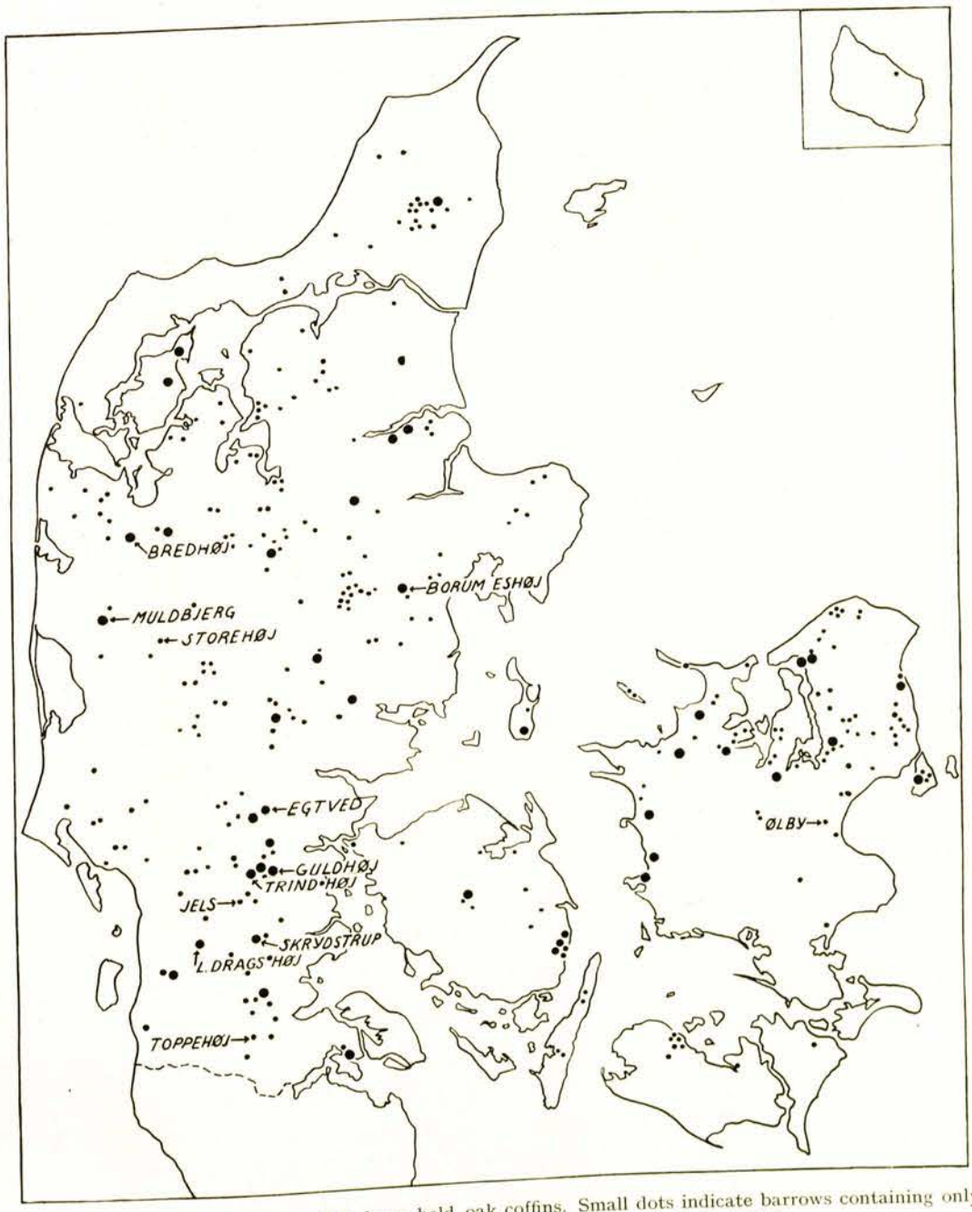


Fig. 6. Map showing the sites of barrows which have held oak coffins. Small dots indicate barrows containing only one coffin, large dots barrows containing several coffins. (H. C. Broholm).

well-preserved oak coffin graves, although they are built with as much care as those of West Jutland and South Jutland. Of great consequence for the preservation of the grave is probably also the nature of the earth of the barrow itself.

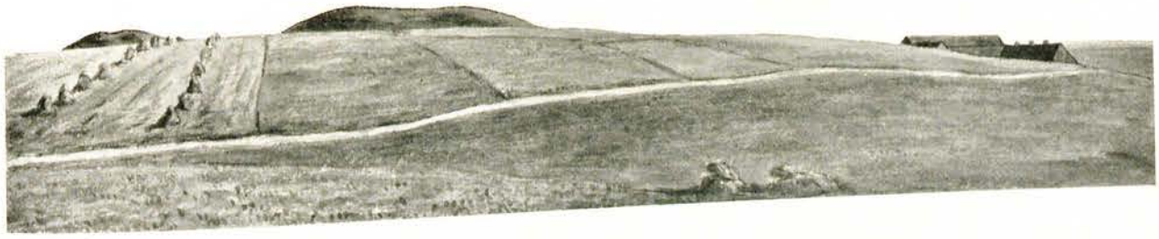
For instance, it can hardly be doubted that as the preservation of the dead bodies is extremely unequal, when we compare the different oak coffins, the chemical combination of the earth of the barrow must have been a concurrent cause. In *Borum Æshøj* west of Aarhus (p. 48 seq.), which contained 3 graves, the bones, the hair and the flesh of the bodies were particularly well preserved so that even now 60 years after the excavation one of the

skeletons is to a certain degree held together by the dried up muscles. The *Skrydstrup woman* was almost equally well preserved. But in all the other oak coffin graves only the hair, the nails, part of the brain and the skin of the body have been preserved, whereas the calcium of the bones had been washed out and changed into a bluish powder. In these cases the wet accumulated in the mound must have been acid, since it has been able to decompose the bones. When the *Egtved grave* was excavated it was proved[14]) that the coffin had been surrounded by a species of earth fetched from a lower place; and in other mounds the examinators have stated that the grave has been surrounded by potter's clay or bog-peat. Provided that these observations should be confirmed by new finds we must have a right to suppose that the people of the Bronze Age must have realized that certain species of earth had specially preserving effects on organic matter. But this conclusion cannot be said to have been confirmed by the two finds of 1935 from *Jels* and *Skrydstrup*[15]). For in both cases the examinations by the geologists have established that the barrow was of the same nature all through. Consequently the material does not allow us to reach a clear solution of these problems.

The examination of the construction of the Bronze Age barrows have shown that the latter, especially the considerable memorials, have been made little by little. An older mound already existing had often been made use of for later burials, and the filling up of earth in connection with these secondary entombments have enlarged the mound so that sometimes it has reached quite imposing dimensions, 6–8 m in height and 20–35 m in diameter.

Most often such secondary burials are separated from the primary grave by a considerable lapse of time so that it must be supposed that there is no connection whatever between the persons buried in the different graves. With the graves excavated from the large mounds, which have contained more than one oak coffin, it seems to have been otherwise. The barrows that have yielded well-preserved oak coffins date with a few exceptions from the first part of the Early Bronze Age, and the oak coffins excavated from each mound as a rule contain things that must have been very nearly contemporary. This fact seems to favour Mr. Boye's hypothesis that the buried persons were members of the same families and that the large barrows must thus be regarded as family barrows. This supposition is confirmed by a study of the finds. Often graves of a man and a woman are excavated from one barrow, probably the graves of man and wife, and both in *Trindhøj* and in *Guldhøj* children's coffins have been found standing so close to those of grown-up persons that we must be entitled to the conclusion that the children were buried together with their parents. In *Borum Æshøj* the connections are particularly clear and instructive (p. 48 seq.). Here the central grave contained the body of a man 50 odd years old, a secondary grave the body of a woman of an equal age, and a third grave a man 20 odd years old. This combination seems to argue that the parents and the son have found a common burial place in the large barrow, and the fact is further confirmed by the extraordinary resemblance of the skulls of the two men. Thus there are many things that speak in favour of regarding the oak coffin barrows as family burials; and there can hardly be any doubt that these graves have been the last resting places for the chieftains of the Bronze Age; for the oak coffin grave in connection with the large earth mound built of mould is a distinctly aristocratic type of grave. The following descriptions of each find will all tend to confirm this view.

H. C. Broholm.



CHAPTER II

A DESCRIPTION OF FINDS OF PRESERVED GARMENTS

1. MAN'S GRAVE FROM MULDBJERG, RINGKJØBING AMT

In 1883 Dr. phil. Henry Petersen and the draughtsman, Captain A. P. Madsen examined the Long Barrow of *Muldbjerg* north-east of Ringkjøbing (fig. 7). It was built up of two smaller round barrows lying close together and each containing a central grave. But later on when a coffin had been placed in the small interspace between the two, they had been gathered under a common cover of earth. The north-eastern one of the two original mounds contained a well preserved oak coffin grave[1]). On a bed of stones and covered by a huge split and hollowed oak trunk reminding one of a barrel-vault was the oak coffin, likewise made out of a hollowed trunk. In this was buried the unburnt body of a *grown-up man* (fig. 10).

The body which was in a rather decomposed state—only the hairs of the head and the nails of the right hand were well-preserved—seems to have lain on its back wrapped in a cow skin[2]). It had been buried fully dressed. A sword was the only weapon found.

THE CLOAK*). Under the cow skin lay folded lengthways a cloak reaching as far as the cap. The cloak, the shape and size of which is seen on illustrations fig. 8–9, is now brown, mostly of a medium brown; there are, however, found a few spots of a deeper, almost black colour especially at the rounding near the straight edge of the material at b, and also the fabric is much matted there.

The longitudinal threads of the edge and the warp are spun to the left, whereas the weft is spun to the right**). The side-edge a—b is a straight selvedge formed of 9 warp threads

*) In order to avoid superfluous repetitions the reader is requested to notice the following: Where nothing else is stated the material of the textiles described here is wool from black or brown sheep. In the materials we often find numerous coarse short hairs, the outer fur of the sheep (p. 106). Sewing threads and threads for finer textile works are made of woolen hairs freed from outer fur. The wool is simply twisted and the weaving is plain weaving. The fabric is often matted or fulled. The measures of the garments of which drawings are given are marked on the latter, and the analysis of the quality of the materials, i. e. the determination of the number of threads pr. square is arranged in forms. Certain details are explained in the text of the figures. An analysis of the textiles from Muldbjerg, see p. 161.

**) The wool used in the Bronze Age garments is generally differently twisted or spun in warp and weft. By right-spinning is understood the twisting which is the result of the spindle turning right i. e. turnning in the same direction as a screw or a corkscrew. Left-spinning occurs when the spindle is turned the opposite way. The terminology adopted by the international cotton committee (Paris 1937) applies the term of Z = openband = right-spinning, S = crossband = left-spinning, the diagonal lines of the letters illustrating the direction of the twisting.

Fig. 7. The Long Barrow of "Muldbjerg". Water-colour by A. P. Madsen.

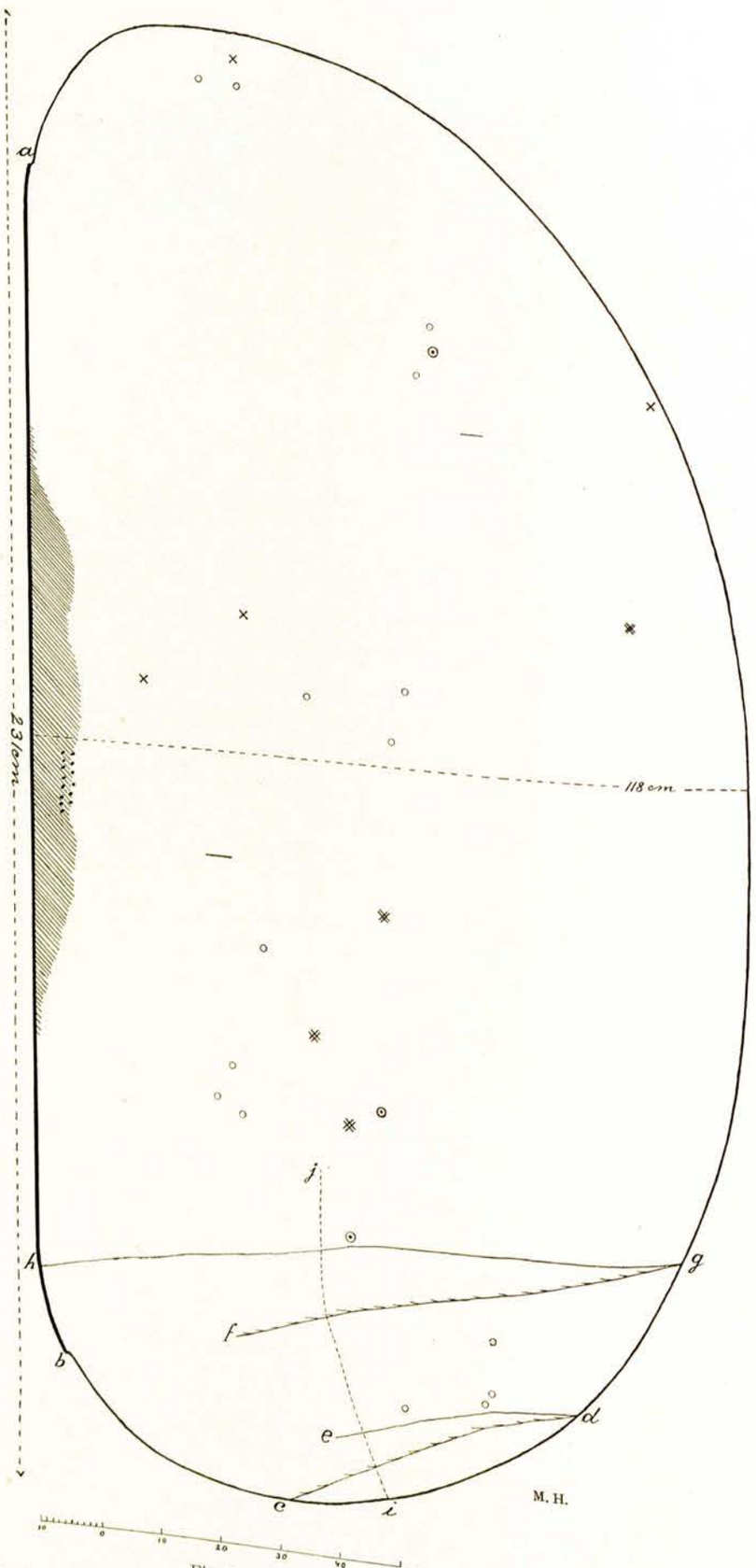


Fig. 8. Muldbjerg. The right side of the cloak. $^1/_{10}$.
o indicates a knot at the weft (wrong side) × a knot at the warp (wrong side). ⊙ a knot at the weft (front). ⁂ a knot at the warp (front). — that the weft thread is passing over several warp threads. p. 16.

Fig. 9. Muldbjerg. The right side of the cloak. 1/10. The cloak is now brown, but there are found a few spots of a deaper, almost black colour. Near the straight selvedge 2 two-piece fibulæ are seen. The cloak is regulary rounded by cutting after the fulling of the material. p. 147.

Fig. 10. The Muldbjerg coffin. Water-colour by A. P. Madsen.

lying in two packs so that the weft threads going outward pass under 5 warp threads and then over 4 warp threads, while on going inward they pass under 4 and then over 5 warp threads, as is illustrated on fig. 13, 1. Thus the selvedge is somewhat thicker than the material itself; it is also somewhat drawn and no longer quite even. The remaining border of the cloak is regularly rounded by cutting with a sharp instrument, and there is no trace of edge or sewing. However, the edge is everywhere smooth and well preserved, so that presumably the cutting has taken place after the fulling of the material[3]).

On both sides of the material are found a great many knots and loops. Those of them which we are able to determine are plotted on fig. 8 and marked with different signatures, indicating their places on the threads of the fabric; those that cannot be determined have been left out. On account of the close fulling of the fabric it has been very difficult to analyze; only in a few cases you can see that two threads have been joined; but in other cases the knots do not give the impression of being the result of joining of the threads but rather to be closed loops drawn up from the level of the cloth and then tied into knots. These knots occur mainly on the weft. A few loops on the weft threads have been twisted round the warp threads.

Irregularities in the weaving may be seen in a few places. Thus in two places weft threads make "skips" of 3–4 cm; on fig. 8 they are marked by a small horizontal line.

On the weft are found some over-crossings of the threads, a peculiarity that will be further explained below p. 121. Furthermore it is peculiar to remark several weaving gores in the cloth. By gores we understand a series of weft threads that traverse only part of the shed; there they turn and pass back through the part of the shed from where they came. There is an equal distance between the turning points, which fall back by steps thus forming the gore fig. 13, 2. The line c–d indicates a woven gore, and the line d–e shows the course of the through-going thread which ends the gore and vanishes in the much fulled part, found, as is mentioned before, in this place of the cloak. On account of the fulling, point f,

where the next gore is first seen, is likewise rather indistinct. In the interval between point f and the thread h—g 38 weft threads may be counted. If we imagine the thread g—f passed on to the edge, it will appear that the edge-line is lengthened by about 15 cm on account of the gore woven in. Fig. 13, 2 shows a diagram of the gores which, as will be seen below, are very common in Bronze Age fabric. The cause of their presence will be discussed later on.

Fig. 11. Muldbjerg. The outside of the cap. $^3/_4$. p. 18.

Fig. 9 shows the cloak from the side that is evidently the outside. The hatched part on fig. 8 shows a mark of wear on the side turned downwards, which side must be the inside of the cloak, and the approximate limit for a doubling up of the material near to the straight selvedge, where after the doubling up of the cloth in the Bronze Age, the old folds are still clearly visible. In this part we still find, as when the cloak was laid down in the coffin, 2 ornamental two-piece fibulæ of bronze. In fig. 21 it is to be seen that, when the cloak was worn, the heads were turned towards the left side and the points towards the right side. We are, however, not quite sure that this was really their place when the cloak was worn; but at any rate they must have been fastened on to this part of the cloak several times during the Bronze Age; for, as is indicated on fig. 8, 14 holes in 2 rows are found here. These holes are supposed to result from the pricking in of the pins. The mark of wear at the edge is, as mentioned before, most conspicuous on the inside, and certainly comes from the wearing of the cloak. If this part is bent down backwards so that it gets the shape of a roll-collar, as is shown on figs. 19—21, and the cloak is hung up, two large marks of wear, clearly visible

at the inside, fall exactly on the place of the shoulders. This proves with certainty that the cloak has really been worn in that manner. Also the small fold found on the left shoulder was there in the Bronze Age.

THE CAP. On the dead person's head was a cap, fig. 11. It consists of a sidepiece and a crown of several layers of cloth sewn together. The crown, which is circular and vaulted,

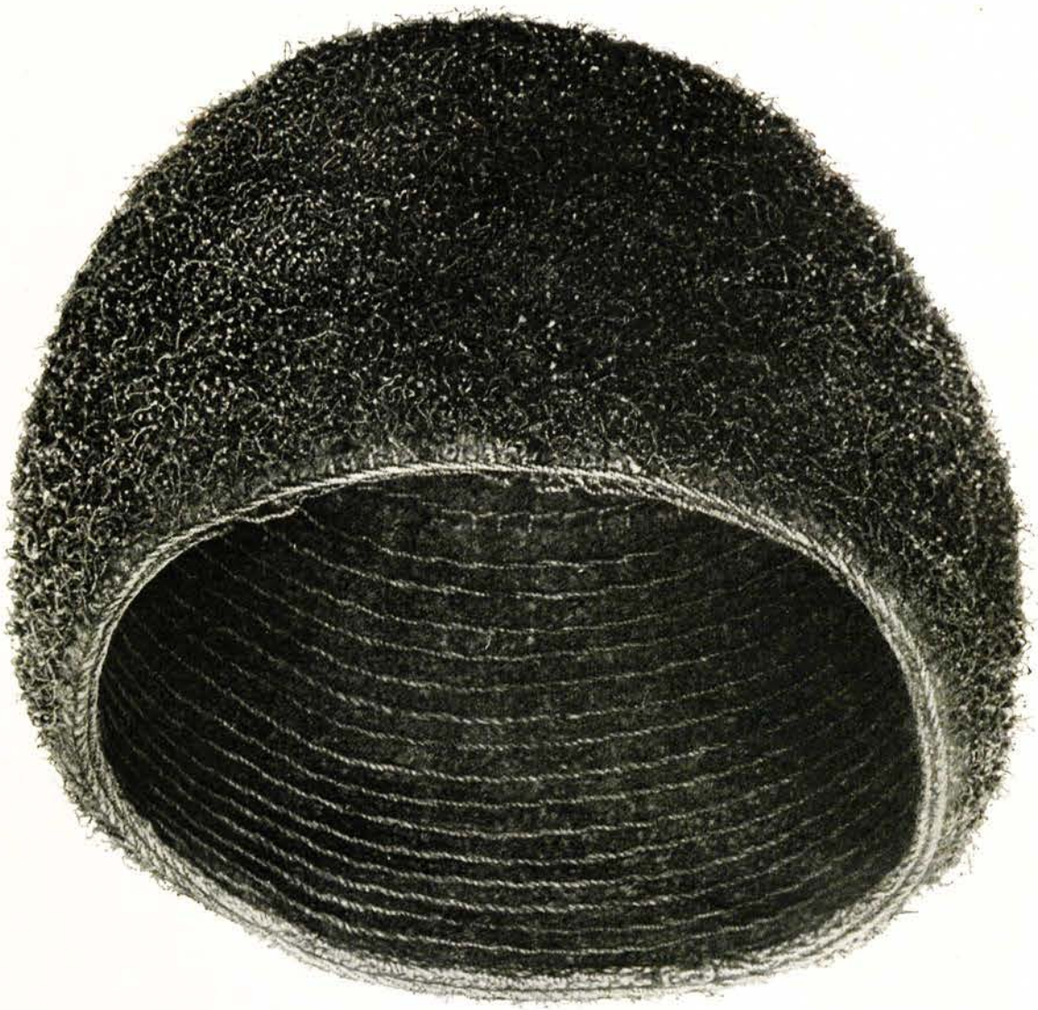


Fig. 12. Muldbjerg. The inside of the cap. $^3/_1$.

has been eked out by a small piece sewn on; at the inside of the crown we find slight traces of stitches, by which probably the layers of cloth have been held together. In the sidepieces we find 16 horizontal rows of stitches round the cap, performed in a similar way to those of the Trindhøj cap, fig. 28. The crown is sewn on to the sidepiece by a row of buttonhole stitches, performed from the right to the left. This sort of buttonhole stitches are generally called scallop stitches. The edge of the cap is sewn over with two or three rows of scallop stitches, likewise sewn from the right to the left. Two rounds of stitches, each with three threads, have been sewn in the scallop stitches, forming a cordlike edging. The method is shown fig. 28, 3, and in the photo fig. 12 we can see the effect of the different stitches. The outside of the cap is covered with a thick pile[4]), the threads of which are somewhat longer than the pile threads of the same kind of caps occurring in other finds. Threads in pairs

are fastened on the texture in one stitch so that there are four free ends of thread, and each of the four ends has one knot at the end and another knot further up near the stitch. The stitches lie in different directions and are of unequal length. This seems to tell us that we have here a kind of sewing, not a kind of weaving. On the outside of the cap a large knot is found in the fabric itself; it reminds us of the knots now and then seen in the cloths, f. i. in the cloak of this find. On top of this knot 3 stitches occur, which bind the pile. And it

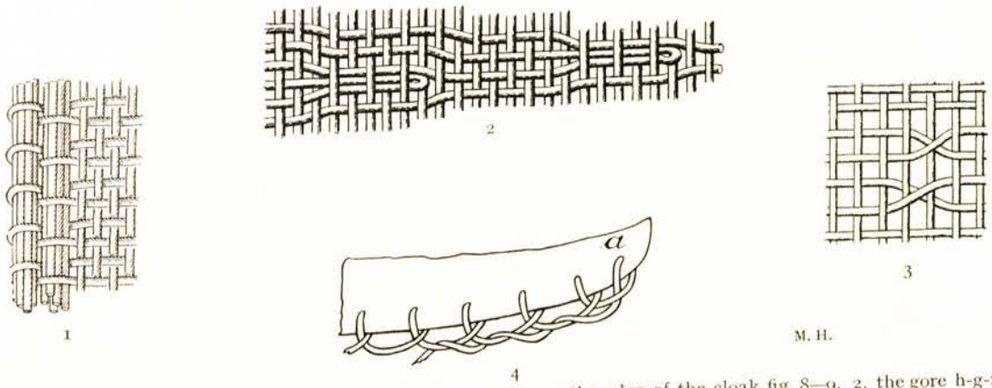


Fig. 13. Muldbjerg. Diagrams showing the position of the threads in: 1, the edge of the cloak fig. 8—9. 2, the gore h-g-f in fig. 8. 3, Crossings of the weft threads in fig. 18. 4, the corner a of the gown fig. 14.

seems hardly possible that those pile threads could be placed in that manner by weaving. The pile threads are two-ply, Z-spun and left-twisted; their size is about that of a sewing thread no. 50, as a comparison has shown us. The cap is 16 cm high, and its inside edge measures 56 cm.

THE GOWN. Round the body was a piece of garment, a gown, figs. 14—15, the lower border of which reached almost to the knees, fig. 10. It has been tied to the dead man by a 4 cm broad leather belt, now entirely decayed. The belt was fastened on the back by a double-button of horn. At the excavation obvious marks of the belt were seen on the cloth; but they can be traced no more. The upper part of the gown had sunk a little, but in spite of that it is possible to state almost with certainty, as will be shown below, how it has been worn. Somewhat below the place of the shoulder-blades lay on each side a *bronze tutulus*, fig. 23. Both of them lay with their loops turned upwards, and surely they have been fastened to leatherbands, now decayed, but which must have served as straps over the shoulders to keep the gown in place.

The shape, the state of perservation, and the size of the gown appear in the illustrations figs. 14—15, which show us its exterior. Its colour is brown with darker parts; on the whole it is very uneven.

We must say that the gown is destinctly shaped. Only the lower edge was originally a straight line (selvedge), while the upper edge and both side-edges seem to have been curved on purpose. Uppermost we find two straps sewn together lengthways. Probably the leather straps or braces, mentioned above, have been fastened to them. The gown is shaped by sewing together 9 different strongly fulled pieces of cloth, and the hems are whipped.

An analysis of the pieces of cloth mentioned has given the following result:

I. The largest of all the pieces has from a to b a selvedge made on the same principle as the selvedge a—b of the cloak (fig. 13, 1) and it must be a side-edge of the cloth. However, apparently the selvedge of the gown contains more threads than that of the cloak; but the fulling prevents us from counting accurately the threads, which are S-spun. The threads which in the material lie parallel to the line a—b are likewise S-spun and are probably the warp-threads of the piece; the transversing threads are Z-spun. Number of threads, see the analysis, sample 1.

II. This piece has no selvedge. The dotted line v shows the direction of the S-spun threads; the transversing threads are Z-spun. Number of threads, see sample 2.

III. Number of threads, see sample 3. The dotted line v indicates the direction of the S-spun threads.

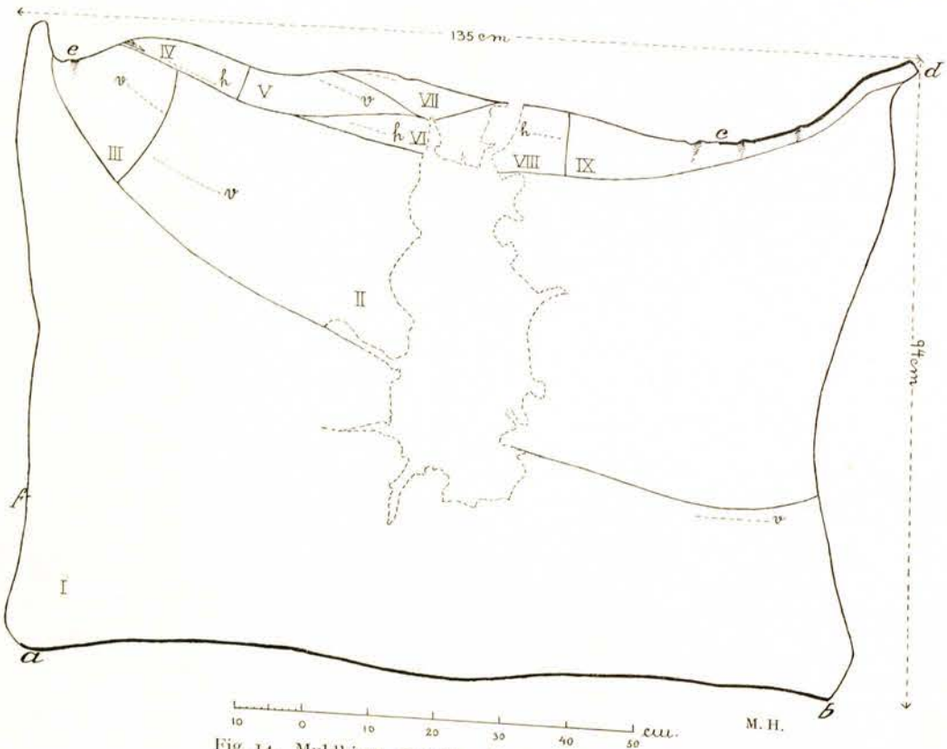


Fig. 14. Muldbjerg. Outside of the gown. 1/10. p. 147.

Fig. 15. Muldbjerg. Outside of the gown. 1/10. p. 158.

IV. The piece is much fulled and the number of threads cannot be stated with any certainty. The mark in the corner indicates a thickening in the material. It seems to be a fragment of a gore. Maybe the piece comes from the same material as the cloak. The dotted line h indicates the direction of the Z-spun thread.

V. The dotted line v indicates the direction of the S-spun threads. Number of threads, see sample 4.

VI. Number of threads, see sample 5; h indicates the direction of the Z-spun threads.

VII. The number of threads is indeterminable on account of the fulling of the material.

VIII. Number of threads, see sample 6. Most likely VI and VIII are one and the same piece of cloth, the decomposition having caused the parting.

IX. The wool of this piece is S-spun in both directions. Number of threads, see sample 7. So this piece is decidedly of a different material from the piece of cloth used for the rest of the gown.

Between c and d is found a selvedge, different from the selvedge of I. Unfortunately it is somewhat matted and indistinct, but reminds us very much of the selvedge of the material found in Lille Dragshøj, fig. 59, 1. The edge is slightly scalloped or provided with small curves at every 3 cm; in the middle of the curve there is a small hole. These holes indicate that in some way or other the fabric has been laced up; the edge is probably a starting edge. Other cases of a similar kind will be mentioned later on. The edge of piece IX is slightly folded. The upper edge is somewhat wider than the fabric itself, a natural consequence of the fact that a straight cloth edge must follow a rounding of the form in hand. As this feature recurs at e, it seems to be due to an intentional shaping of the edge of the gown in order that it may follow the lines of the body.

Apart from the two natural selvedges, the whole edge of the gown is oversewn with two-ply wool, which is S-spun and twisted to the right. The sewing thread is of a somewhat darker colour than the thread of the fabric. In a few places the edge is simply whipped over, as f. i. the straps at the top; but in the main part the stitches are performed as the inner row of fig. 13, 4; the same kind of stitches occur on the coat of the Borum Æshøj-find, fig. 87, 3. Mostly we find only the first row of stitches; but between a and f the edge has furthermore been whipped over on top of the previous sewing, as is shown fig. 13, 4. The end of the thread is fastened at f, fig. 14. As the outmost row of stitches must have been sewn last, the fastening tells us that the sewing has ended here. This feature shows us that the stitch does not lie in a manner that seems natural, when, as is usual in our days, we sew from the left to the right.

It seems most natural that the lower side of the cloth has been turned upwards during the sewing, which must have been performed from the right to the left. 17 stitches cover 10 cm. Only once in this gown we have succeeded in observing over-crossings of the weft thread. That was in the Z-spun threads (the weft threads) of piece I. The material is, however, now so matted that it is difficult to pick out each thread.

Fig. 16. Muldbjerg. The gown folded up such as we must suppose it to have been used; the long tip has passed under the left arm. 1/10.

From A. P. Madsen's drawing fig. 10 it appears that the gown has lain in the grave in such a way that the long strap has belonged to the left side, whereas the short strap has belonged to the right side[5]). The piece of garment must have been folded round the body of the dead person in the manner shown on fig. 16, the curved edge having lain along the right side, and the scallop-shaped rounding having been placed on the breast. The tutulus which has had its place on the left shoulder-blade and has held the leatherstraps mentioned, quite naturally gets its position there somewhat lower down than the right one, as the long strap of the gown is led under the left arm and then fastened to the leatherstrap, while the other tutulus is naturally to be found somewhat higher up on the back, as the short strap is led across the right shoulder. If the gown is placed in this way, we get a natural and even very beautiful garment, as figs. 19–21 indicate. The corner of the right side droops a little; but that is due to the lacking leather belt, mentioned in the account of the excavation. Most likely the belt has sat round the hips and kept the gown properly in place.

Such tutuli, which have kept the gown in place, are well-known from other finds. We will mention here one of those finds, a somewhat younger oak coffin grave. It was excavated in December 1930 from a mound near *Munkebo*, Munkebo Sogn, Odense Amt. Besides a palstaff and a sword, two tutuli were found of the same shape as those figured in Aarbøger 1909, fig. 81. The direction of the coffin was nearly East-West. A palstaff lay in its west end; a sword lay in the middle of the western half of the coffin. Its direction was East-West, with a slight turning towards North-east–South-west. Just north of the sword was found one tutulus somewhat slanting with its opening turned upwards and a little towards the

South. 28 cm north-east of that tutulus lay the other one with its opening turned upwards and its point turned downwards. The position of those tutuli correspond exactly to those of the Muldbjerg grave[6]).

FOOT-CLOTHS. Two strips of cloth (fig. 17) nearly alike in measure and shape were wound round the feet of the dead body. Their sizes are respectively 50 × 21 cm and 51 × 20 cm. The colour is very dark, almost black. Both these pieces have got one straight side provided with a selvedge, which must be the side-edge of a piece of cloth, and three cut or torn edges without hems. The warp threads of the selvedge are somewhat closer than those of the rest of the texture; but apart from that the analysis is the same in both cases, i. e. plain weaving, fig. 41, 6. The warp threads of the edge as well as the other threads parallel to them are S-spun, the weft threads are Z-spun.

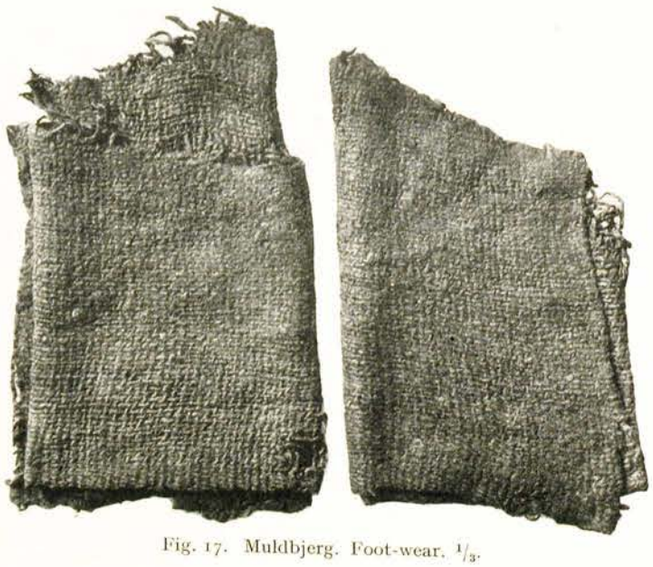


Fig. 17. Muldbjerg. Foot-wear. 1/3.

A SQUARE PIECE OF CLOTH. Under the cloak lay a rectangular piece of cloth, spread lengthways. Fig. 18 gives an idea of its size and shape.

In the cloth we find an irregular hole, while the rest of the piece is rather well-preserved. The colour is brown, certain parts are very dark, almost black. The two short sides of the piece have got selvedges, which must be the original side-edges of the material; accordingly the short threads of the cloth have been the warp threads, and the long threads the weft. This means that here we have to deal with a piece of cloth of a very unusual breadth. Determination as to the length and breadth of the cloth is furthermore verified by the number and spinning of the threads, and by over-crossings of the long threads, which shows that they must be the weft, fig. 13, 3. Generally the warp threads are S-spun and the closest lying threads of the fabric.

An analysis of the edge of the material shows us that it is 1 cm broad and contains 8–9 warp threads, that is double the number of the rest of the texture; beyond that the position of the threads is uniform. The upper edge (see the drawing, fig. 18) has been cut off, probably after the fulling of the material.

The lower edge is very indistinct on account of matting; but there is no edging or selvedge to indicate whether this border is the starting edge. A few cm from the right hand corner at the top is a weaving gore, beginning at the edge and tapering off towards the middle of the cloth. Further down is another gore pointing in the opposite direction.

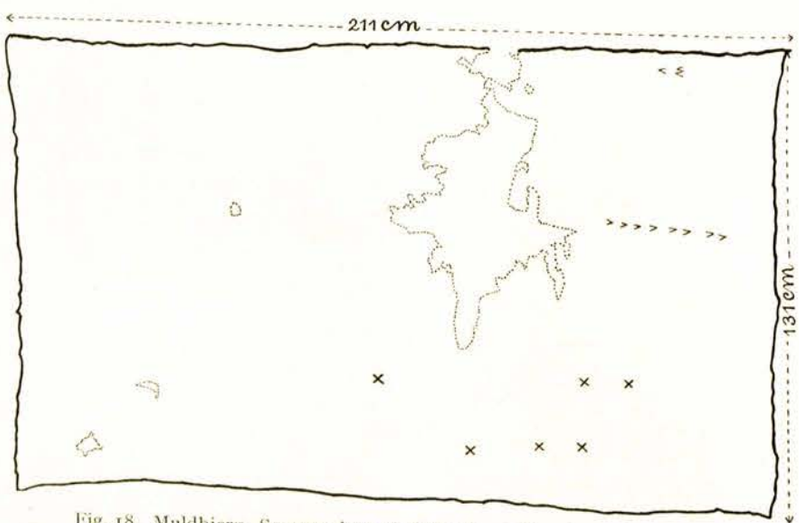


Fig. 18. Muldbjerg. Square piece of cloth. 1/20. × Crossings of the weft. M. H.
< Turning points of weaving gores. > Places where the weft runs back and forms a gore.

Fig. 19. The Muldbjerg dress. 1/5.

Fig. 20. The Muldbjerg dress. 1/5.

Fig. 21. The Muldbjerg dress. $^{1}/_{5}$.

In this piece of cloth we often find over-crossings of the weft threads. Unfortunately the material is so matted that the course of the weft threads is nowhere to be traced in its full breadth from edge to edge; but a partial examination was possible in the right half of the material, in the well-preserved part below the hole. Here we find at a distance of about 108 cm from the right side-edge a crossing of two weft threads, indicated in fig. 18 by the

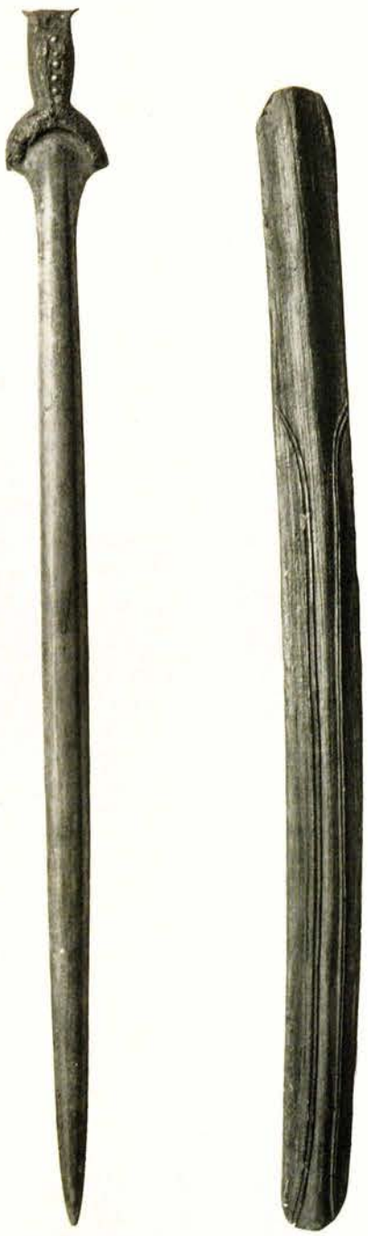
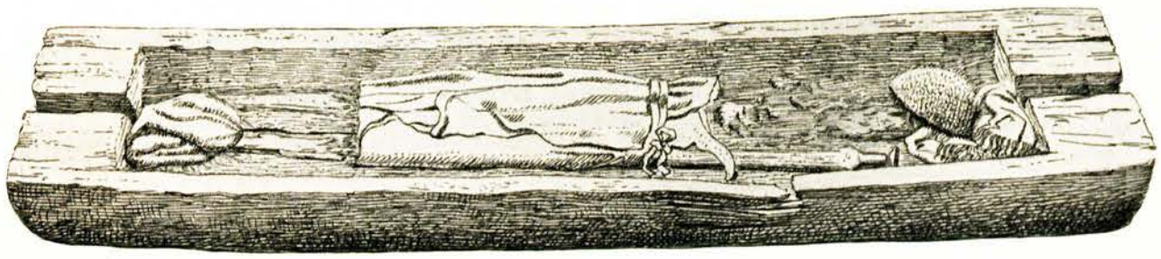


Fig. 22. Muldbjerg. The sword and the wooden sheath. $^1/_4$.

Fig. 23. Muldbjerg. Tutuli. $^1/_1$.

cross nearest to the centre. If we pursue one of these threads towards the right side-edge, it appears that this thread crosses the meeting thread twice. Similarly another thread further down shows three crossings on its way towards the matted part in the right corner, where it vanishes. Now we must suppose that a corresponding number of thread-crossings are found in the left half of the piece, which half cannot be examined. That again means that presumably there are 4 or 5 crossings across the full breadth, and accordingly 5 or 6 threads must have been in use at the same time on the loom. If the total breadth of the woven material is 211 cm, one thread must pass on an average through 35–42 cm between two crossings before it is succeeded by the next weft thread; however, the surface of the texture is not regularly divided. The drawing, fig. 18 indicates a case where two crossings are found with a distance of only 13 cm, which means an almost unnaturally short slip through the shed between the two intersecting points of the meeting threads. (See p. 122).

In the Muldbjerg-coffin there lay upon the dead body's breast a *sword* in a well-preserved *wooden sheath* (fig. 22) and at the lower end of the sheath were found the nails of the right hand. The sword, which belongs to a type that is rather common in man's graves from the Early Bronze Age, is sure to have been placed in exactly the same way in the grave of the Munkebohøj; but every trace of vestments and bones was lacking here. Sheaths of the same type as those excavated in Muldbjerg are found in other contemporary oak coffin finds, f. i. in one of the graves (B) in Borum Æshøj (fig. 77). It is made of two thin wooden plates glued together and on the inside covered with pelt with the hairs turned inwards. In a grave excavated in the mound of "Store Kongshøj" west of Kolding the sheath was decorated with carvings, which were different on the two sides. The date of the grave is given by the two *two-piece fibulæ*, both belonging to the roundheaded type; they are characteristic of the first section of the Early Bronze Age, and probably all the other things found in the grave are of the same date.



2. MAN'S GRAVE FROM TRINDHØJ, RIBE AMT

North of Vamdrup Mølle, between Hafdrup and Vamdrup towns, Ribe Amt, south-west of Kolding, there lay before the middle of the past century a very considerable group of 25 large mounds, many of which have yielded rich finds from the Early Bronze Age[1]). In the most south-western barrow, a very impressive one, named "*Trindhøj*" or "*Trenhøj*", an oak coffin was found already before the middle of the past century, and in 1861 again two oak coffins came to light by excavations in Trindhøj. The coffins were preserved, but their contents of vestments was completely destroyed through the inconsiderate treatment of the finds.

The excavation of these coffins occasioned King Frederik the Seventh to direct a commision of archæologists, Mr. J. J. A. Worsaae and Mr. C. F. Herbst together with the anatomist Professor I. Ibsen and the painter Mr. J. Kornerup, to Trindhøj in order to rescue the finds; but the destruction had already taken place. However, in October of that same year Mr. Worsaae and Mr. Herbst assisted by Mr. Kornerup[2]) succeeded in finding in the barrow another coffin, which they examined. The accounts by these scholars and especially Mr. Kornerup's drawing made on the spot, which are kept in the archives of the National Museum of Copenhagen, are the primary sources of information on the Trindhøj grave, and further Mr. Kornerup's drawings form the ground work of all the illustrations of the finds in scientific works[3]).

The grave found last (Mr. Boye's grave A) is probably the primary grave of the barrow, although it was situated about 1 m south-west of the centre. The coffin (fig. 24) stood in the direction West—North-west to East—South-east and contained the almost entirely dissolved body of a man, whose head lay towards West—North-west. The hair of his head, originally blond, was well-preserved[4]). There were no traces of a beard, but the pubic hairs of the dead man were preserved and lay in the middle of the gown. The dead man lay on a cow skin and was covered with a cloak, spread lengthways in the coffin. At one side it was tucked under the body and reached as far as the cap.

THE CLOAK*). The cloak, the shape, and state of preservation of which appear from the photograph fig. 25, is the largest one of all the cloaks known from the Bronze Age, 243 cm long, 126 cm broad. At one end it has been lengthened by a piece sewn on, as indicated by the line b—c. Over the line between a—b the cloak has an original side-edge, now much torn. Surely it is due to a misunderstanding, when Mr. Henry Petersen mentions a semicircular opening at the neck. The selvedge is formed on the same principle as that of the Muldbjerg cloak fig. 13, 1; but the number of threads is indistinct on account of the matting of the fabric. As to the rest of the cloak-edge, it has been cut off with a sharp instrument after the fulling. The shape of the Trindhøj cloak comes close to that of the Muldbjerg cloak.

*) Analysis of the textiles see p. 161.

Fig. 24. Trindhøj. The man's coffin. Drawing by Jacob Kornerup.

Fig. 25. Trindhøj. The right side of the cloak. $^1/_{10}$. p. 158.

Still it takes up an exceptional position among the Bronze Age garments, as it differs from them in respect of material. As it appears from figs. 25–26, one side (the outside) is provided with a lot of knots and thread-ends, which must originally have made a kind of pile, now but partially preserved. It is regrettable that the decayed state of the cloak and the strong matting of the material renders difficult the examination to such a degree that it is impos-

Fig. 26. Trindhøj. Part of the cloak with its pile threads; the needles show the position of the stitches.

sible to reach a definite and certain result as to the question of how the pile was made. It is, however, not likely that the detached threads have been put in during the weaving[5]). The distance between the stitches by which they are fastened does not present any traceable regularity, nor do they all lie in the same direction, as it appears plainly from the points in fig. 26 set off with needles. Often they lie lengthways, i. e. they go round the weft threads, which would be unnatural, if they had been inserted in the material during the weaving; at any rate it is usual to knot the pile round the warp threads. In the Trindhøj cloak the stitches do not, as already mentioned, lie all in the same direction, often they lie slanting or crosswise. As a rule the threads are fastened by two stitches on the fabric. The length of the threads that form the pile is indeterminable; their colour is somewhat darker than the threads of the bottom. There is no doubt that the piling should give the fabric the resemblance of an animal's pelt, as is also Mr. Sophus Müller's opinion[6]).

TWO CAPS. When the cloak had been taken away, the remains of the dead body became visible. On its head was the *round cap*, fig. 27. It is particularly well-preserved and beautifully made. Like the Muldbjerg cap it consists of two pieces, a sidepiece and a round crown. As the thickness of the fabric at the side-edge is about 1 cm, several layers of cloth must have been sewn together; it is impossible to make out how many layers, the cap being so well-preserved. The inmost layer of the sidepiece of the cap is made up of three different parts, one large and two small pieces; the joining vertical seams are plainly visible within.

The crown consists of two parts almost equal in size and joined together by a seam across the middle. The inside of the crown shows further a great many small stitches, made of a

Fig. 27. Trindhøj. Hemispherical cap. $^3/_4$.

coarse two-ply wool twisted to the right. There can be no doubt that these are the stitches by which the various layers of the crown have been joined together. Stitches corresponding to those mentioned are likely to exist in the sidepiece as well, but are hidden under the 15 horizontal rows of stitches placed in rings one above the other on the inside of the cap, as in fig. 12. This overcasting is very beautifully and regularly made; it looks like a row of cords and gives the impression of ornamentation rather than construction. It is difficult to decide with certainty the position of the stitches, as the rows are compact and close together; but there seems to have been applied two threads, which pass alternately under and over eachother, and which are fastened either in the fabric itself or by passing under the stitches by which the various layers of cloth have been sewn together, fig. 28, 1. The crown is sewn on to the sidepiece by 4 rows of stitches, or rather one row of stitches four times round, so that it forms a spiral. The sewing consists of two kinds of hole stitches or scallop stitches (fig. 28, 2) of the same kind as those mentioned before (fig. 13, 4)

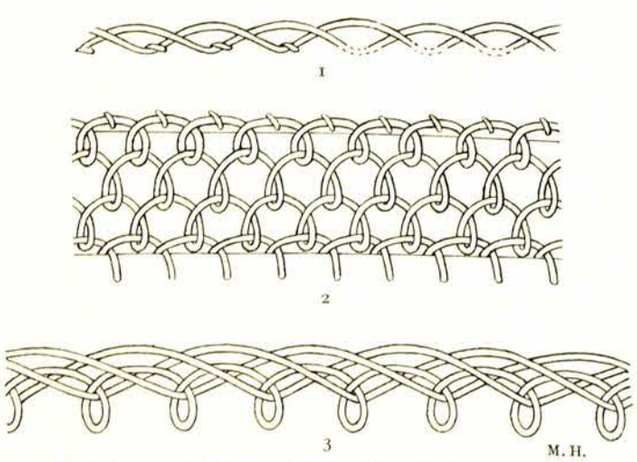


Fig. 28. Trindhøj. Diagrams showing different kinds of stitches used in the inside of the cap fig. 27. p. 93.

and here too, they are sewn from the right to the left. The stitches of the first row, the downwards turned row of the drawing, are fastened to the edge of the sidepiece, and the last row to the edge of the crown. However, as to the last row, as in fig. 28, 1, the fastening of the stitch to the cloth is somewhat indistinct. As regards the intervening stitches the sewing thread does *not* pass into the cloth, but only into the preceding row of stitches. Thus the seams are made elastic and yielding. The buttonhole stitches are whipped over with another row of stitches, which make the joining look like cords, three threads alternately crossing each other and passing down into the loop of the buttonhole stitches underneath, as is shown in the illustration fig. 28, 3. The edge of the cap is oversewn in exactly the same manner, first by a row of buttonhole stitches, and then by other stitches with three threads sewn on the same principle as shown fig. 28, 3. All these stitches form a cord-like edge. The two-ply sewingthread applied is twisted to the right and is unusually tightly twisted; it is bright and smooth all over. The outside of the cap is covered by a close pile, consisting of fine, short threads, which are S-spun and twisted to the right, and end in a knot. It is difficult to make out how this piling is performed. Formerly the general opinion was that it must have been made on the loom; but this supposition meets with certain difficulties. Thus it is peculiar that the seams are practically invisible at the outside. Only at one edge of the cap there are vague traces of a vertical seam in the sidepiece. And higher up we may barely see a seam, which at the inside holds the crown and the sidepiece together. Yet it is incomprehensible, how woven material, be it ever so well made and cut, could be joined together without more conspicuous traces of the seams. Besides it also seems out of the question that all the fine, small threads could have been woven into the fabric; for if we fancy that the pile had been woven in and thus wound round the bottom threads of the fabric, they must necessarily have followed the lines of these threads, and in that case we should in the texture be able to trace the direction of the threads of the bottom fabric, especially as the weaving of the Bronze Age textiles is always coarse. Also the closeness of the pile threads seems far too pronounced to correspond to the quality of the usual, coarse texture. Further the fact that the bottom fabric is much fulled goes against the supposition that the pile is woven in, because the pile threads are smooth and do not seem to have been subjected to fulling. So we must suppose that the pile has been inserted by sewing after the joining together and shaping of the cap, and thus the pile

Fig. 29. Trindhøj. Cap. 1/2. p. 33.

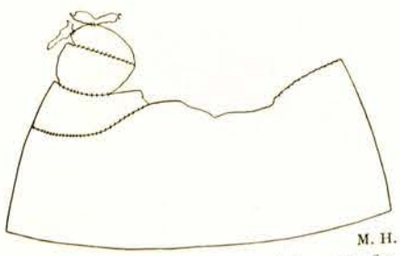


Fig. 30. Trindhøj. Pattern of the cap fig. 29. 1/10. p. 33.

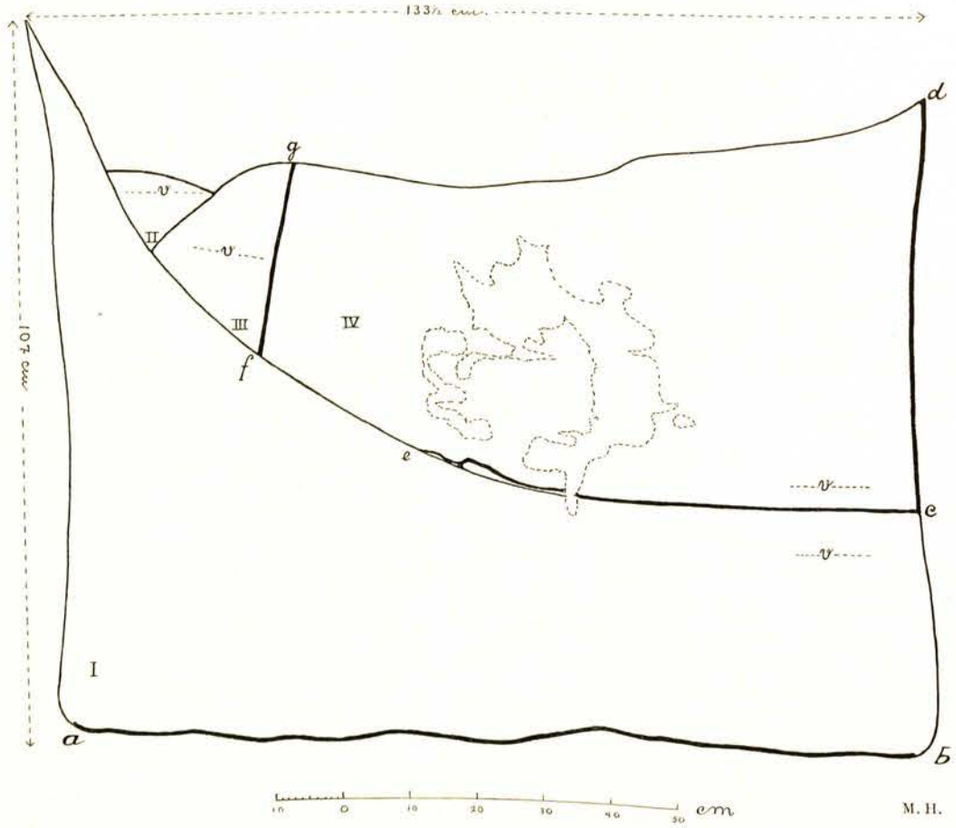


Fig. 31. Trindhøj. The inside of the gown. 1/10. p. 147.

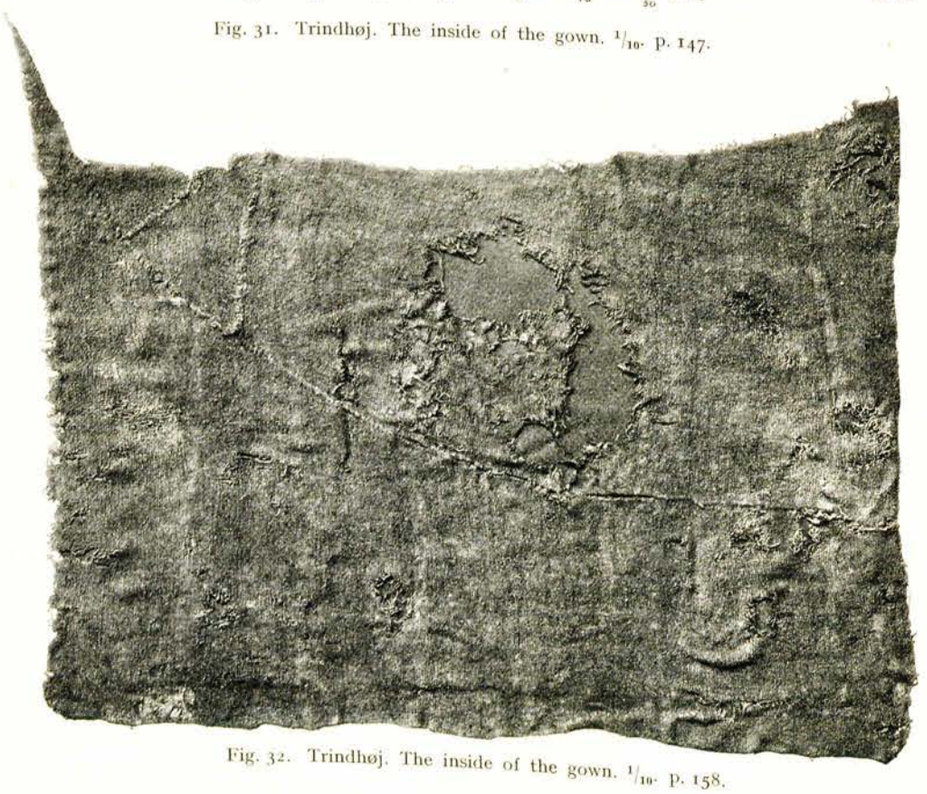


Fig. 32. Trindhøj. The inside of the gown. 1/10. p. 158.

has hidden the seams. As to the pile we may further remark that the threads lie in twos in the stitches into which they are fastened, and each of the four loose ends of the thread has a large knot at the end and a small knot further up the thread.

As a textile work the Trindhøj cap must be regarded as a masterpiece. The spinning of its pile threads is even finer than that of the other caps, and surely it must be accounted the most beautiful one of all. It shows us a technique so inconceivably exacting both in respect of time and accuracy. The mere spinning and twisting of the fine threads of the pile are admirably performed, which is so much more remarkable as the wool of the texture is otherwise rather thick, and even the sewing thread and the comparatively fine thread of the hair-net from Borum Æshøj are coarse in comparison. The cap is of a dull, black-brown colour; and although the pile, too, consists of wool, its surface has got a curious, suède-like appearance. The height of the cap is 15 cm, it is 17 cm in diameter, and its width round the edge is 55,5 cm.

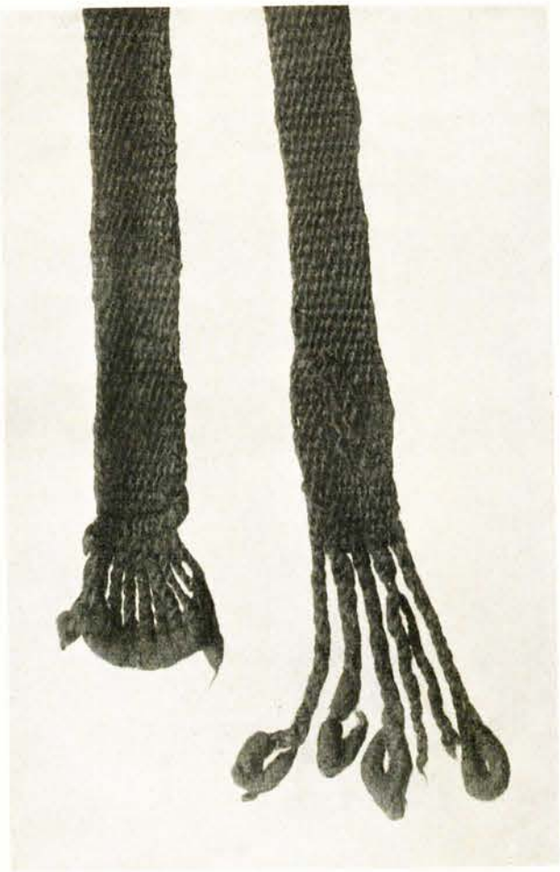


Fig. 33. Trindhøj. The end of the belt. $^1/_1$. p. 36 & 142.

In a rather large wooden box there was found a smaller box, in which lay *another cap*, figs. 29—30. The cap is made of a sidepiece and a crown, as shown in the pattern and the photograph. The sidepiece is a piece of cloth, joined together by a seam; but at the top near the crown we find a patch sewn on. Evidently it has been necessary to eke out the piece in order to make it fairly symmetrical. Here, as in many other cases, we have the impression that all the small patches have been utilized with great care and judgement, and everywhere we find the material used with great thrift; the crown is made of two small pieces sewn together. The threads parallel to the lower edge of the cap are S-spun, the transverse threads are Z-spun. The lower edge is straight of thread, but is now somewhat curved. The fabric is turned under once and hemmed with a row of stitches. The sewing thread is everywhere Z-spun and twisted to the left. The circumference of the cap is 56 cm.

Fig. 34. Trindhøj. The comb. $^3/_4$.

THE GOWN. The dead man was dressed in a gown, very much like that of the Muldbjerg find, mentioned above; also the measures agree very nearly. The gown, whose size, shape, and state of preservation appear from the drawing fig. 31, and the photograph fig. 32, which show its inside, is made up of 4 pieces sewn together.

I. The edge a—b is a natural side-edge of the piece of cloth; the selvedge consists of 10 S-spun threads and is made as illustrated in fig. 41, 6. The threads parallel to the edge of the fabric are S-spun and probably warp threads. The transversing threads are Z-spun and show the over- crossings characteristic of weft threads. Number of threads see sample 1.

II. Number of threads see sample 2. The Z-spun threads have crossings like those of the first piece.

III. In the line f—g this piece has a selvedge, which, because of its position parallel to the Z-spun threads, must be regarded as part of a starting edge. It seems to be made like the edge fig. 59, 1, but an accurate determination is impossible on account of the matting. The S-spun threads at a right angle with the edge must be warp threads. Number of threads see sample 3. In this piece, too, occur over-crossings of the Z-spun threads.

IV. The edge c—d is a straight selvedge. The threads parallel to it are Z-spun and on account of over-crossings they must be regarded as weft threads. The transverse threads are S-spun. Number of threads see sample 4. c—d

Fig. 35—36. Trindhøj. The man's dress. p. 147.

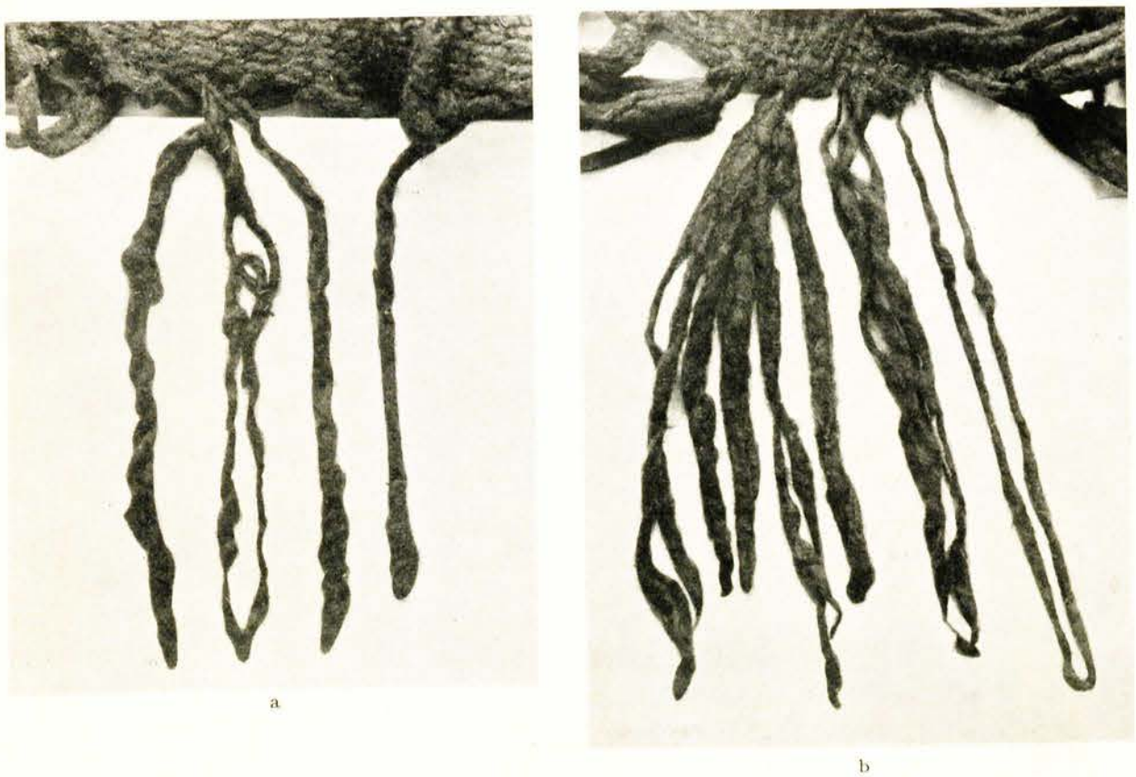
should be the starting edge of the fabric. As shown in fig. 59, 1 the threads lie two by two in sheds in such a way that a thread on going upwards passes through one shed, while on going downwards it passes through the neighbouring shed. By this weaving the threads are fastened so that they cannot be pulled backwards out of the selvedge, when the warp is stretched and while the work is being done. There seem to be 12 threads in the selvedge, which, however, is somewhat uncertain.

The edge is slightly scalloped, and at rather regular intervals small holes and strainings occur there, which suggest that in some way or other the cloth must have been laced up. From c to e the piece has preserved part of its natural side-edge, performed in the same way as the edge a—b and fig. 41, 6. From e—f the edge has been removed, the cloth being curved here.

As indicated in the drawing and the photograph the gown has various seams. The seams are made of a fine

wool twisted to the right. In one place only, at the incision between piece II and the tip of the strap, we find traces of whipping over of the edge. The other edges are raw and somewhat ragged. Only where the natural selvedges have been used, we may say that the edge is firm and neat.

The Trindhøj gown belongs to the same type as the gown of the Muldbjerg find, only the top of the right side lacks a strap, which has evidently been torn off. At the upper edge of the piece near to the long corner-strip a flat tongue is seen, corresponding to the one found



a b

Fig. 37. Trindhøj. Fringes of the shawl. a, at the starting edge. b, at the closing edge. $^1/_1$. p. 128.

at the Muldbjerg gown near to the broad strap. Probably, as mentioned before, the tongue was meant for covering the breast. When on this gown it is found at the opposite side of that of the Muldbjerg gown, the reason is that the Trindhøj warrior fastened his gown to the left and not like the Muldbjerg man to the right. This appears plainly from Mr. Kornerup's original drawing of the opened coffin fig. 24. The body lay on its back and was dressed in such a way that the edge with the missing strap was placed under the right arm. From there the gown was wrapped in front of the body, under the left arm, round the back, under the right arm, across the breast, and then by means of the long corner-strip it was fastened on the left shoulder. If the gown is fastened in this way the frontside of it reaches from the knees to the breast (fig. 35—36), like the Muldbjerg gown (fig. 19—21). When worn by a living man, it surely had to be kept up by leather straps or braces as described p. 21, but as the existence of such straps is not mentioned in the Trindhøj-account, it is possible that the gown was fastened on the dead man by the belt only, which was wound twice round the body. The result of this not very careful fastening was this that the garment, which was easily displaced, even with the braces to hold it, could now still easier slip down towards the abdomen, as is shown in Mr. Kornerup's drawing (fig. 24). Hence the Trindhøj gown has been regarded as a mere loin-skirt or loin-cloth similar to those in which the men of the Borum Æshøj graves were dressed; and that again has brought about that none of the former reconstructions are quite accurate,

neither that of Mr. Magnus Petersen[7]) nor that of Mr. A. P. Madsen[8]). If we start from the facts ascertainable by studying Mr. Kornerup's drawings, and from the marks of wear found at the pieces of garments preserved, we come to the conclusion that the Trindhøj garment must be arranged in the manner shown in figs. 35—36. The gown then has had its free edge to the left, whereas on the Muldbjerg garment it lay to the right; but there is nothing

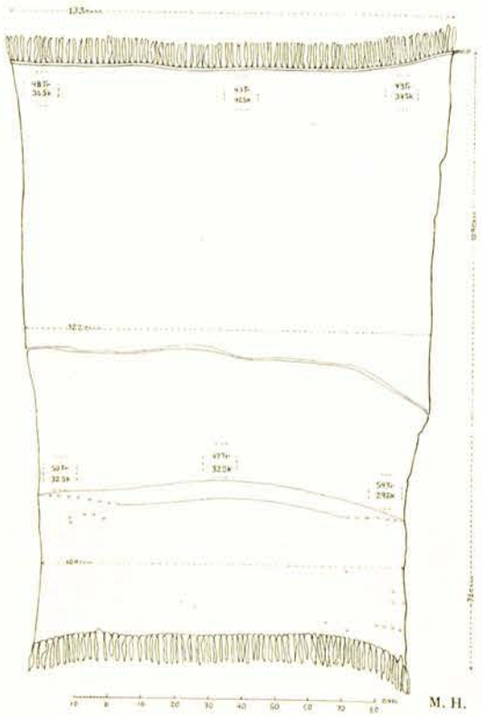


Fig. 38—39. Trindhøj. The blanket with fringes. 1/20. p. 128.

peculiar in that, because a piece of garment so primitive might easily be placed at will. The woven belt and the leather belt, which was often closed by means of a bronze belt-hook, served for holding the gown together and as a decoration of the garment, but not for carrying the sword, which was carried in a shoulder-belt.

THE BELT. Round the dead person was tied a belt passing twice round the body (fig. 35). The analysis of the belt shows us plain weaving of the type called rep; it is woven of 20 warp threads of one-thread, S-spun wool.

It displays a somewhat simpler making of the fringes than the Borum Æshøj belt (see below, p. 142), those of the former being made exclusively of the natural continuation of the warp; thus the coming out of the fringes from the belt is plainly visible. In one of the tassels at the ends of the belt, the fringe is made of two two-ply threads, i. e. each fringe consists of four simply twisted threads of the warp, and thus 20 warp threads make 5 fringes (fig. 33). The other tassel has 10 fringes, closing in loops. It has been attempted to find out, whether the turns of the warp remained in the closing rings of this belt, but this tassel being a unique, it is impossible to make sure of the question, because it cannot be subjected to a rigorous investigation, which would be necessary in order to make sure.

TWO PIECES OF CLOTH. Two pieces of cloth were wound round the feet, at which traces of now quite dissolved leather shoes or sandals were found. The pieces of cloth were

almost equal of shape and size, respectively 37 and 33 cm long, and both of them 9 cm broad. Both pieces have one natural selvedge, which is a side-edge, and three torn edges. The selvedge is made like the rest of the material and is hardly distinguishable from the latter.

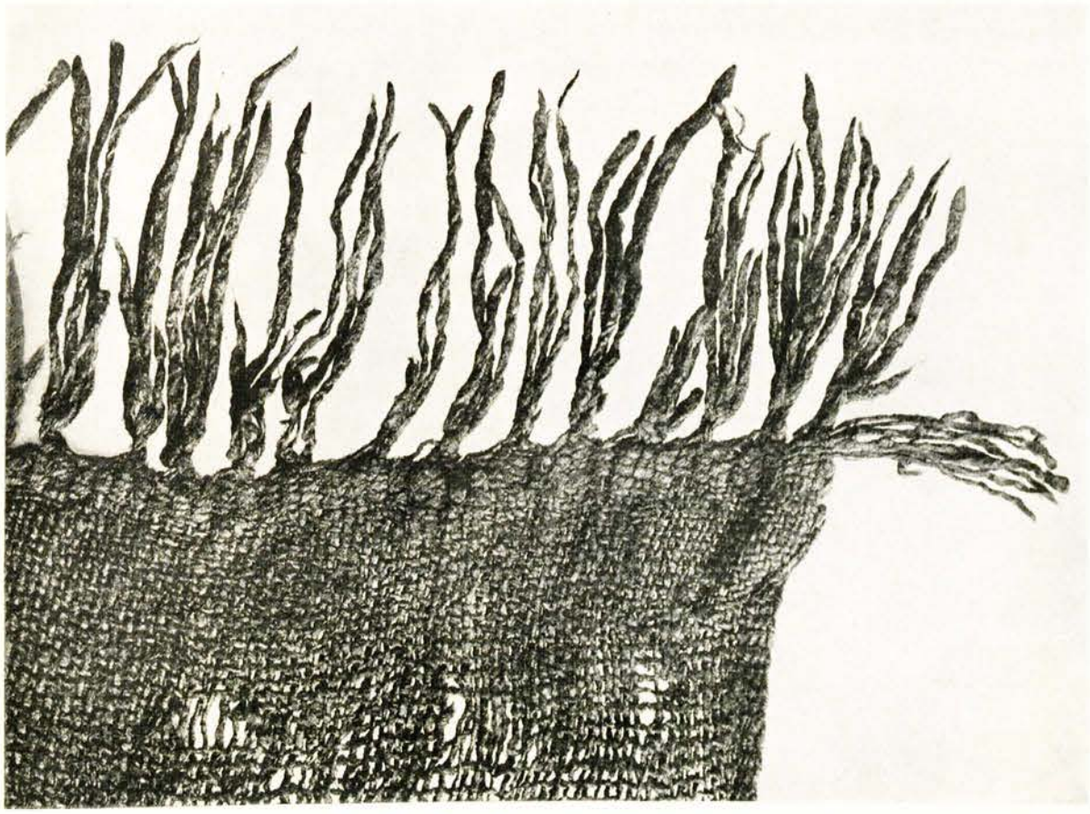


Fig. 40. Trindhøj. The right corner of the blanket. $^3/_4$. p. 128.

BLANKET. Of other textiles was found a blanket or a shawl, which had at the burial been parted into two almost equally large pieces. One, which had a selvedge, lay under the dead man's head, while the other was wound round his feet.

The shape and the size of the blanket appear from the drawing and the photograph figs. 38–39. It is woven of white sheep-wool and is the only piece from the Bronze Age for which white wool is used. Now it is of a medium brown colour with darker spots here and there.

The two separate parts of the blanket give the immediate impression of being of the same weaving and an examination of the material gives full certainty of the supposition. Further two weaving flaws in the fabric make possible an exact determination of how to join the two torn edges. The flaw consists in the warp threads lying double in two places; these flaws, which can be followed through the upper piece, continue in the lower piece as far as the closing edge. The torn side of the upper piece is somewhat ampler than the corresponding torn edge of the lower piece. However, it is not likely that any stuff should have been removed in the middle of the blanket, since the two cut borders are quite alike; it looks rather as if the upper piece were a little out of shape.

The cloth is much woven in—no less than 21 cm—by tightening of the weft thread. All in all 6 tests of the number of threads have been made; the result of these is indicated in the drawing and in the analysis at the places where the counting took place (fig. 38). The warp threads are S-spun, while the weft is Z-spun. At the upper edge of the blanket, various

peculiarities are found, arising from the starting of the weaving. As to these peculiarities we refer to Mémoires 1931, p. 404 and to that which is set forth p. 142.

Both borders of the blanket are provided with fringes; and at the end which must by the border be determined as the starting edge, the fringe consists of two parts, the warp loops coming out of the fabric making only the inner part. Later on lengthening threads have been knotted into the loops, as is shown in figs. 37 and 41, 1. But the curious thing is that

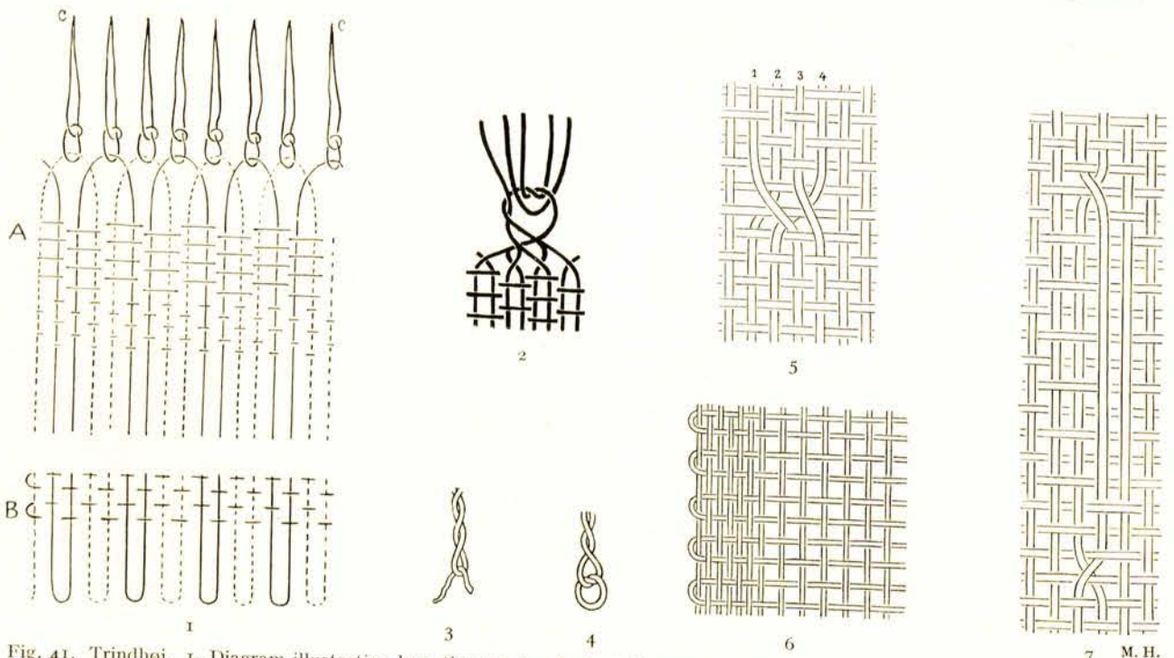


Fig. 41. Trindhøj. 1. Diagram illustrating how the weaving is started. 2—4. Fringes. 5. Crossings of the weft. 6. The selvedge. 7. Part where the weft passes over several warp threads. M. H.

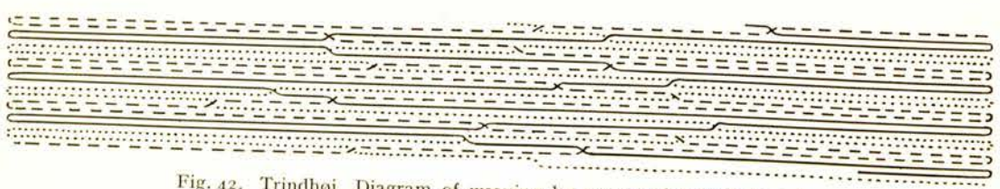


Fig. 42. Trindhøj. Diagram of weaving by means of 3 weft threads. M. H.

several of these fringe-ends look as if they were also closed; this, however, cannot be the case; because then the lengthening thread must have been connected and continous like a ring, and that can hardly be supposed. The connection must be due to the sticking, and the photograph fig. 37 and the drawing fig. 41, 1 show, how difficult it is to distinguish between the natural course of the thread and the secondary sticking. The fringe of the lower border is like the upper one made richer by inserting extraneous threads in the tassel. On account of the sticking it is difficult to see, whether the original warp threads have got closed loops, or whether the loops are cut. In one case only it was possible to find a loop, which seems to be original, fig. 37, b. A comparison between fig. 37, a and fig. 37, b shows, how difficult it is to judge of this fact with certainty. The question being of interest for determining the placing of the warp in the loom, it will be treated more in detail below p. 127 seq.

The long sides of the cloth have got ordinary selvedges, fig. 41, 6. Apparently the weft is quite normal in the side-edges. The thread passes out of one shed into the next, and the edge is regularly and beautifully made. Often, however, we may observe the peculiar over-crossings of the weft threads, mentioned several times.

The Trindhøj blanket is otherwise rather well-preserved, the selvedge is nearly everywhere intact, the weaving of the fabric is rather open, and there is hardly any matting. Thus it is much more fit for illustrating the course of the threads through the material than the coarse, fulled pieces, and by translumination we have succeeded in following the various threads and in marking them with different colours, so that it was possible to watch their interchangings across the fabric. This examination has made clear that the weavers have worked with several weft threads at a time.

A test made at a distance of 15 cm from the starting edge of the blanket, showed first the use of two different threads in one shed, then a third thread had been added in, and then came a piece where three different threads interchanged in the shed. Also another test made lower down in the material showed the use of three threads, fig. 42. The crossings are here drawn accurately so that we may see their distribution across the fabric, and the distance between the crossing-points.

In the lower half of the cloth near the closing border there are found some scattered extra wefts, which do not cover the whole breadth (in the drawing, fig. 38 marked with small arrows) and at a distance of about 50 cm from the row of fringes there is a double gore, in which there has been worked with two threads at a time. The crossings are almost in the middle of the gore (compare the diagram fig. 41, 5 and 7 and the explanation p. 121).

Fig. 43. Guldhøj. Cap shaped as a hood. 1/2. p. 40.

The weaving of the first part is performed very regularly and accurately; but towards the end tightening of the weft has worked so much, that it has been necessary to retrieve the border by means of a gore (Fig. 38). Figs. 41, 5 and 7 show two weaving flaws, occasioned by disturbances in the warp. At fig. 41, 5 the displacement has been discontinued gradually and the threads occupy their original places again. The flaw, fig. 41, 7 is in the lower half, but close to the cut border. Therefore we cannot decide how the flaw has arisen.

At the left side of the body lay a *sword*[9]) in a *wooden sheath;* it must have lain on the dead man's arm, for the place of the hilt was nearly over against the face. At the right foot outside the cloak stood the *wooden box*, mentioned above, in which was found the *small box* with the cap, a *razor*[10]) ending in a spiral, and a well-preserved fine *horn-comb* (fig. 34). By the sword the grave must be dated from the same time as the Muldbjerg grave.

3. MAN'S GRAVE FROM GULDHØJ, RIBE AMT

The large barrow of *Guldhøj*, belonging to the same group of mounds as Trindhøj, was examined 1891 by Mr. Vilh. Boye. It contained three oak coffins[1]). In the largest one of these there was made a good find of well-preserved wooden things; but the garments

found there were rather damaged. This coffin is like the Muldbjerg coffin a kind of double coffin, as it is surrounded by boards of oak. The dead body, which had been buried uncremated, was quite dissolved; only part of the hair of the head, originally blond, was preserved[2]).

Fig. 44. Guldhøj. Cap. 1/2. p. 40.

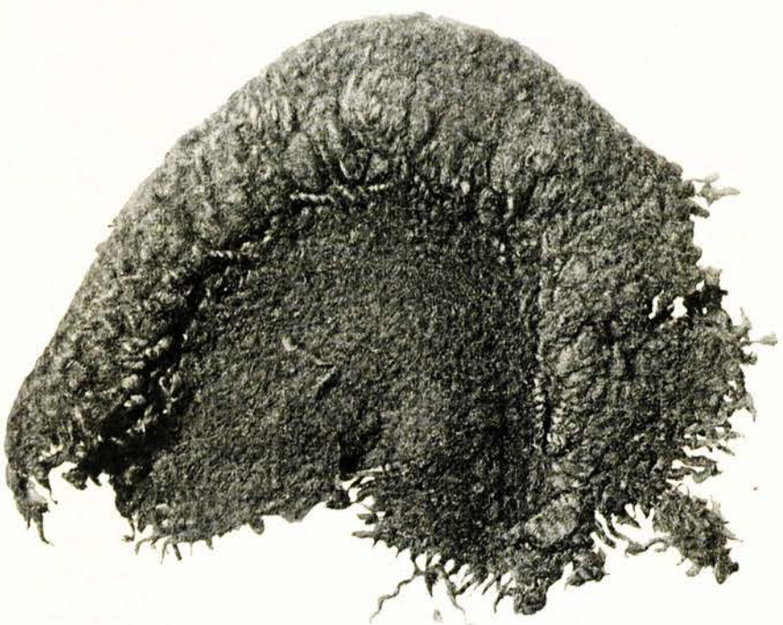


Fig. 45. Guldhøj. The toe of a shoe. 1/1. p. 41.

TWO CAPS. I. On the dead man's head had been a cap; probably it was originally like the other round caps*). But now by cutting off a piece of the edge, and because the material was somewhat drawn, it had got the shape shown in fig. 43, which reminds us of a *hood*. 37 cm of the edge of the cap are well-preserved, and there a regular overwhipping is seen, done in a rather coarse, two-ply sewing thread twisted to the right. 37 cm of the edge seem to have been cut; the fabric is ragged here, and there is no trace of whipping. Like the other caps the Guldhøj cap is made of a sidepiece and a crown. The sidepiece consists of a double layer of cloth, whereas the circular crown is of a single layer. On the outside we can see that the sidepiece is made up of several small pieces, and on the inside there are 6—7 different patches. The fabric applied is heavy and much fulled. On the inside we find the joining seams and a row of parallel stitchings, combining the two layers of the sidepiece. These stitchings are also visible on the outside of the cap, whereas on the better preserved caps of the finds at Muldbjerg and Trindhøj they are only visible at the inside. Probably the outside of the cap was originally covered by a pile like the other caps; but now only scarce remnants of it are found. However, there are some detached, fine threads[3]). The direction in which the pile is spun is indeterminable.

II. At the head of the coffin *another cap* was found, fig. 44. It consists of two parts, a crown and a sidepiece; the sidepiece is 10 cm high, and in circumference it measures 48 cm at the top and 57 cm at the bottom, the latter thus indicating the size of the head. The edge of the cap consists of the original side-edge of the cloth. The sidepiece is joined by a seam and

*) Analysis of the textiles see p. 161.

sewn on to the round crown, which is 14 cm in diameter and which is of a slightly domed shape. The fabric used is of plain weaving; the sewing thread is twisted to the right.

REMNANT OF FOOTWEAR. Moreover the toe of a shoe, fig. 45 was found near the head. The upper part as well as the sole are woven of a wool, the warp and weft of which are both S-spun. The upper piece is sewn on to the sole with a coarse, two-ply wool, which is S-spun and twisted to the right, and towards the sole it is pleated in order to give width. Further there were found remnants of shoes or sandals of leather.

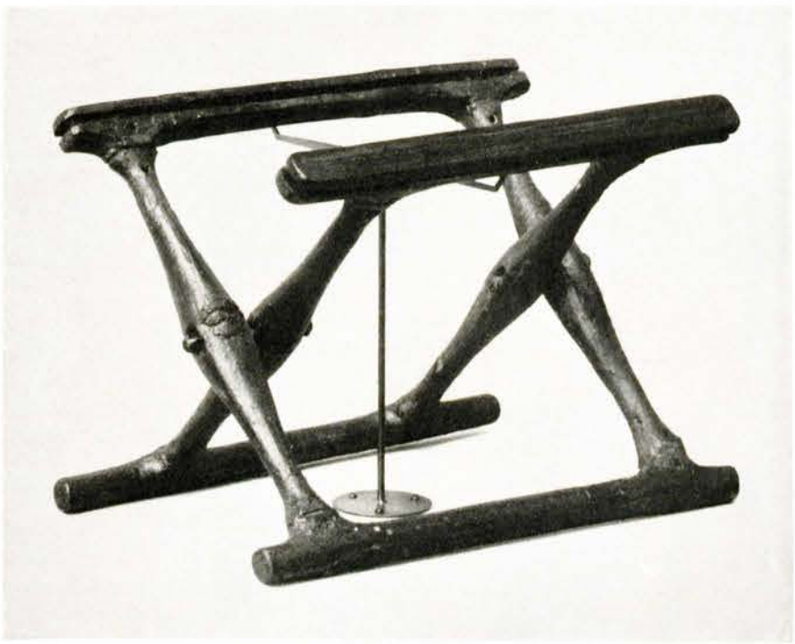


Fig. 46. Guldhøj. Folding-chair.

REMNANTS OF CLOAK AND GOWN. On account of the dissolution of the dead body and the extraordinarily decayed condition in which certain parts of the garments were found, we have but few words to say about them. According to Mr. Boye's statement a cloak lay spread over the dead body. Presumably the following pieces of cloth belong to *the cloak*:

A. An irregular piece of cloth 112 cm long, 109 cm broad. The colour of the fabric is now, like that of all the other Guldhøj cloths, dark, almost black. The material is matted and has

Fig. 47—48. Guldhøj. Bowl and box of wood.

probably been fulled. The wool is simply twisted, S-spun in warp as well as in weft. The number of threads varies in the different parts. In spite of the matting we may in some few places notice the usual overcrossings of the weft threads. In one half of the fabric a gore has been woven in, and a series of extra wefts occur, coming from the left side. At the turning the weft is drawn out into a loop, visible at one side of the material. This technical peculiarity entails a considerable displacement of the direction of the threads, and sets aside the square intersection of the weft and the warp.

B. A much torn piece of cloth 40 × 43 cm large has got along one side a plaited border 2 cm broad, which may be followed across a length of 41 cm. It is made on the same principle as that shown in fig. 59, 3 and several other borders. The fabric is much matted. The wool is everywhere S-spun, and this cloth seems to belong to the same piece as the first one. The threads lying parallel with the plaited border must be the weft threads; because they have the crossings characteristic of the weft. This observation accords with those made of other fabrics, where generally the warp threads lie closer than the weft. Besides the piece mentioned probably some smaller fragments belong to the cloak, but they are not very interesting.

Fig. 49. Fig. 50. Fig. 51.

Fig. 49—51. Guldhøj. Spoon of horn. — Bronze dagger and Sheath of wood. 1/3. — Palstaff with handle of wood. 1/4.

There are, however, two pieces of cloth which cannot belong to the cloak, but rather seem to come from a *gown*.

I. One piece measures 50 × 40 cm. It is irregular of shape. The fabric is much fulled. Both Z-spun and S-spun wool has been used. The usual over-crossings occur in the Z-spun threads, so they must be the weft. An edging is oversewn and a gore-shaped addition has been inserted in the fabric and sewn on with two-ply wool, twisted to the left. The material is very peculiar, tangled and rumpled, because the thread has been spun so tightly that it is able to tangle still. The fabric is not of the same kind as that of the cloak, and the use of Z-spun and S-spun wool shows us that we have here preserved a remnant of another piece of garment.

II. The other piece is also irregular. The fabric is much torn and certain parts are much matted, while in other places the threads may be seen clearly, the nap being lost. The fabric measures 89 × 52 cm. In one corner two selvedges, each of 35 cm, come together. The wool used is spun so tightly that still after weaving, wear, and decay it is apt to tangle. The threads lying lengthways are S-spun and probably the warp threads; because they are woven into a border-edge, which is a starting edge, as it corresponds to the diagram, fig. 59, 1. The other border-edge is matted and indistinct, but probably it is an ordinary side-edge.

The threads of both borders are S-spun. The weft threads are Z-spun and have the characteristic over-crossings of two threads changing shed.

From the pieces in hand it is, however, impossible to decide what the piece of garment looked like from which they come. The rounded edge of the former piece, which according to Mr. Boye was placed towards the neck of the dead body, and the seam suggest that it is a fragment of a gown. The other piece with the two selvedges is a remnant of one of the lower corners of that same gown.

Still two pieces ought to be mentioned, which were found in the grave. One is a *band or belt*, 16 cm long and 1,5 cm broad. Its warp threads are S-spun and very fine, the weft is two-ply and twisted to the right. On account of the decay the number of threads cannot be made out. The making of it seems to be of the same kind as that of the better preserved bands of Trindhøj and Borum Æshøj. The other piece is a loosely *twisted cord* of woollen threads, 12 cm in length.

The Guldhøj grave is dated by a *two-piece fibula* with a round head; it dates from the first section of the Early Bronze Age, thus being contemporary with the finds of Muldbjerg and Trindhøj. Of other things were found *a spoon of horn* (fig. 49), *a dagger* in a *wooden sheath* (fig. 50), a *palstaff* with a wooden handle (fig. 51), two *wooden bowls*, decorated with pins of tin (fig. 47), and a *box of bark* (fig. 48); most of these things are well-known from other finds of this epoch; further several sticks of wood of unknown use, and a well-preserved wooden *folding-stool*, which had had a seat of otter pelt (fig. 46).

4. MAN'S GRAVE FROM JELS

In the beginning of February 1935 an oak coffin was found in a barrow on a field belonging to Mr. Hans Overbech, a farmer, in Hennekesdam, *Jels* Sogn, Gram Herred, Haderslev Amt. The lower part of it was rather well preserved, while the lid had been partly destroyed[1]). The coffin (fig. 2), which is probably the primary grave of the barrow, was excavated by Dr. H. C. Broholm. It stood on the original surface of the field, almost in the middle of the barrow. This was at the time of the excavation 4 m high and about 20 m in diameter, but had originally been both higher and broader. The coffin was covered to a height of 1,25—1,50 m by a heap of earth, very humid like the earth of a bog and containing a great many well-preserved fragments of plants, which show that the whole mound was set up of sods of grass and heather. Under the coffin was a thick layer of pan; and in the inside of the barrow was found a thin layer of compounds of iron, enclosing its central part with the coffin as an air-tight box. The filling lying inside the layer mentioned was very wet, and water poured out of the coffin, when it was dug out. The coffin had been placed in the direction East-West; it did not stand on a foundation of stones, but in one place it was supported by a rather large stone. Measured at the outside its length is 3,10—3,25 m, its breadth at the west end 1,10 m; at the east end 0,98 m, and its bottom was 4 m under the present top of the mound. At the splitting the trunk has been divided somewhat slantingly. The hollowing out has been performed with a sharp instrument (an axe or a chisel) and the marks of hewing still stand out clear and plain in the lower part, which is well-preserved. The middle part of the upper half has rotted away, and only sidepieces and endpieces, where the trunk has its original thickness and has rested on the lower half, are better preserved. At the ends of the coffin, which had been hewn off quite straight, was found a white organic stuff, washed out from the coffin. The coffin contained an unburnt body, which seems originally to have been buried with its head towards the West and been wrapped in the skin of a red cow, as is generally the case in graves of this kind; a remnant of the skull was still there, the only thing left of the dead man. It was found about 30 cm from the east end of the coffin close to a square hole (about 6×9 cm) cut out in the bottom of the coffin about 24 cm from its east end. A few large and small patches of the cow skin were found lying aslant in the layer of sand that had filled up the whole cavity. Bits of the cow skin were also preserved at the bottom of the coffin, a fine layer of mud having settled on the top of it.

THE CAP. The cap figs. 53 was the only thing left of the garment that the dead man had worn. It lay towards the north side of the coffin, 67 cm from the west end. It is rather well-

Fig. 52. Group of Bronze Age barrows near Jels. Haderslev Amt. (H. C. Broholm.)

preserved, consisting of a round crown and a sidepiece, and its shape is very much like that of the cap fig. 29–30 from Trindhøj; but the cutting out is quite different, as is shown in fig. 54*).

The round crown, which is 12 cm in diameter, is sewn together of two almost equally large halves. The sidepiece, which is 18 cm high, is made of 6 wedge-shaped pieces.

Fig. 53. Jels. Cap. 1/2.

All the seams of the cap are sewn with simply spun wool, twisted to the left and of a somewhat darker colour than the fabric. The lower edge of the cap is oversewn with two rows of buttonhole stitches, sewn from the right to the left; in part of the edge we also find in the outmost row some whipping stitches like those indicated in fig. 13, 4. The whipping is made with fine two-ply wool, twisted to the right; about 1/2 cm from the edge two double-twisted threads have been drawn through, probably with the purpose of strengthening the edge and preserving the circumference, which is 56 cm.

I. The piece is cut in such a way that the threads meet the lower edge diagonally. Z-spun and S-spun threads are used irregularly in both directions.

II is indistinct on account of matting but resembles I and III.

III. An exact determination of the direction of spinning is impossible on account of matting. The left edge is possibly a selvedge, but this cannot be proved.

IV. The threads meet the edge almost at a right angle. The left side of the piece has a natural selvedge; but it is difficult to analyse on account of matting. Here too the direction of spinning is indeterminable.

V. Like I this piece also seems to have Z-spun and S-spun wool in the vertical direction; but determinations are uncertain on account of the matting of the fabric.

VI. The horizontal threads, i. e. the threads parallel to the edge are S-spun; the vertical threads are Z-spun.

In one half of the crown (VII) the threads are darker in one direction than in the other; the dark threads are S-spun, the light threads Z-spun. The cutting out of the piece is made in such a way that the threads meet diagonally the seam in the centre of the crown. The other half of the crown (VIII) has a natural selvedge in the seam. The direction of spinning is not clear.

The crown and the sidepieces I, II, and III are of a lighter colour than IV, V, and VI, and the immediate impression is this that I, II, and III are of the same quality. Similarly IV and V are alike, while VI seems to be coarser than the other pieces.

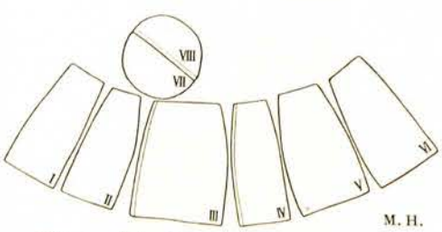


Fig. 54. Jels. Pattern of the cap fig. 53. 1/10. p. 146.

SANDALS. Almost in the middle of the coffin's bottom there lay a piece of leather, round which was wound a strap. Marks of wear on both sides of the leather show that the piece is a sandal belonging to the left foot (fig. 55). The sandal, the edges of which are somewhat damaged, is made of a piece of leather about 40 cm long and about 25 cm broad. It has been joined at the back by a seam like a shoe. The edge of the heel, almost as far as the ankle, is provided with a beautiful hem with a leather cord. The toe is rounded after the shape of the foot. At the toe and along

*) Analysis see p. 161.

the sides the edges are incised, small, wedge-shaped parts of the edge having been cut away. The ends of the flaps have small holes, through which a thin leather strap has passed. Some other remnants of leather, found scattered round in the coffin, probably belong to the other sandal.

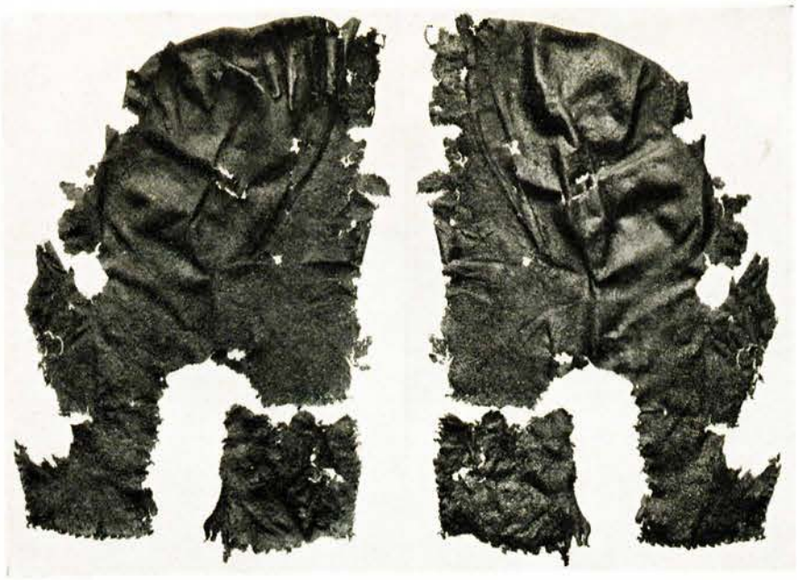


Fig. 55. Jels. Sandal. $^1/_3$. p. 147.

A little east of the middle of the coffin, also in this case at the bottom, several pieces of thin *slivers of wood* came to light. They come from a box sewn together and of a shape known from several specimens found in other oak coffins. A few centimeters east of the hole mentioned in the bottom of the coffin lay 2 well-preserved *bronze tutuli* (fig. 57), one halfway on top of the other. One had the point, the other the lug turned upwards. These two tutuli, which are rather flat and in shape and size like those found in the Muldbjerg grave, must have served for the fastening of leather straps placed across the shoulders in order to keep in place a gown of the same kind as the Muldbjerg gown, fig. 16. As mentioned p. 21 they occur

Fig. 56. Jels. Comb of horn. $^2/_3$.

Fig. 57. Jels. Tutuli of bronze. $^3/_4$.

in men's graves, and are worn on the back. Both pieces, ornamented with winding lines and hatched bands, date the grave to the first section of the Early Bronze Age and characterize it as a man's grave, which is also confirmed by the preserved cap, to which parallels are known from Trindhøj, fig. 29 and from Guldhøj, fig. 44. Thus the garment which the dead man has worn seems to belong to the same type as the garments of Muldbjerg and Trindhøj. A *third tutulus* of the same shape as the two former, but somewhat smaller (fig. 57), was found sunk through the hole in the bottom of the coffin. It cannot be made out with certainty where it belongs. 22 slender rivets with slightly rounded heads lay together with the tutulus. Under the rivet heads we find a row of short wire-tacks of bronze forming a narrow band. Probably they have acted as decoration of a horn *pommel of a dagger*, such rivets having been picked up in situ near a dagger, found in a grave from that time in Vesterlund, Vester Sogn, Vejle Amt. Finally a beautiful *horn comb* (fig. 56) was taken up from the coffin.

5. MAN'S GRAVE FROM LILLE DRAGSHØJ, HADERSLEV AMT

By excavations made 1859 and 1860 in the large barrow of *Lille Dragshøj* in Højrup Sogn, south-east of Ribe, an oak coffin was exhumed, in which had been buried the uncremated body of a grown-up man[1]). The body was almost dissolved, the bones reduced to a blue powder, and only small bits of the fibres of the heart, the brain, and the hair, now dark but originally blond, were preserved[2]). Unfortunately the excavation was undertaken by unskilled people, by which the things suffered considerably, and reliable information as to their places in the grave was lost. The dead body lay in an animal's skin, and as grave goods the dead man had a *dagger*, which had been passed into a *wooden sword-sheath* like that of the young man's grave at Borum Æshøj. The sheath and a double pommel of wood were totally destroyed. At the dead man's feet stood a *wooden bowl* decorated with tin pins, and in it lay a little *box of bark*. These things, particularly the dagger, date the grave to the first section of the Early Bronze Age.

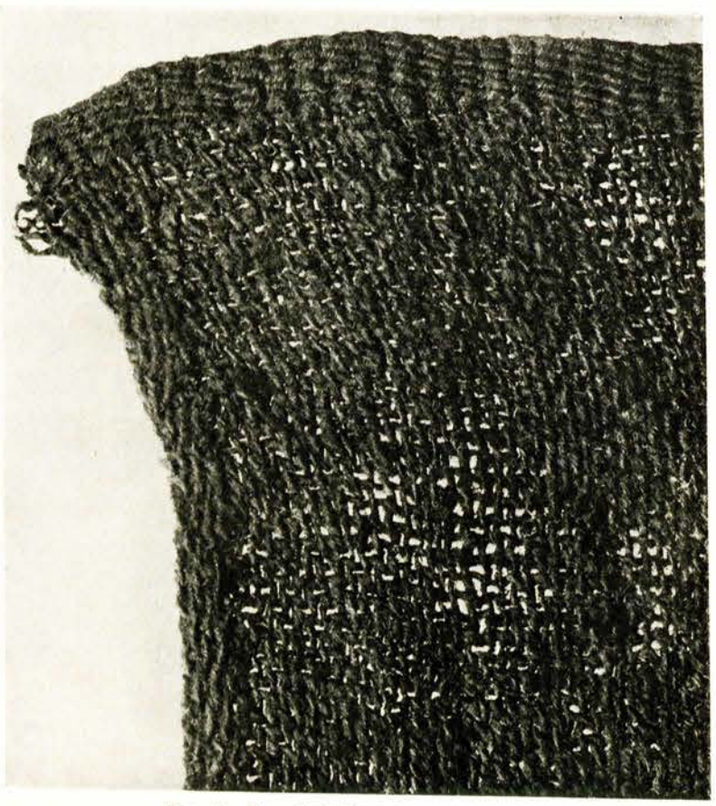


Fig. 58. Dragshøj. Fragment of the garment.

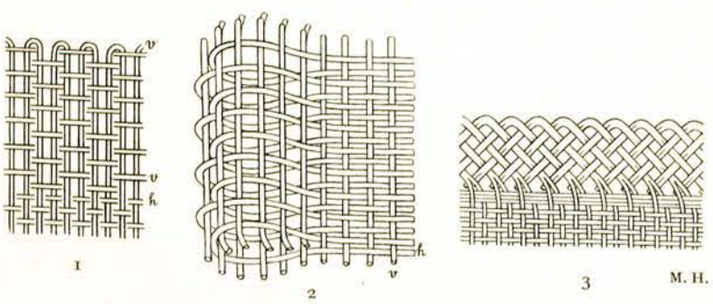


Fig. 59. Dragshøj. Diagrams illustrating details of the fabric.

Only a few remnants are preserved of the beautiful cloths in which the dead person had been dressed, and apart from a fragment of the cap it is impossible to make sure to what garments the remnants have belonged.

THE CAP. The largest measure of the cap is now 27 cm, and 21 cm in the other direction*). Crown as well as sidepiece have consisted of two layers of cloth. On the inside 8 different pieces of cloth may be counted, on the outside 3 different pieces; they seem to be casual fragments, unlike in size and joined indiscriminately; a cloth edge cut bias often meets a straight border. The seams are made with coarse, two-ply wool, which is S-spun and twisted to the right. The wool of all the different pieces that make the foundation is simply twisted, to the right in one direction and to the left in the other direction. The material is much fulled and only in a few places it was possible to count the threads. But the fabric that carries the pile, which has also

*) Analysis of the textiles see p. 161.

been present in this cap, is of the same nature and nearly of the same quality as the cloths in general.

The pile is now nearly lost; but the remnants show us that it has consisted of very fine threads, fastened in the fabric in such a way that the ends are free. Each thread has a rather large knot at the end and a smaller one further up the thread near the fastening in the stuff. The piece of cloth gives the impression of having belonged to a less well-made cap than the others. The edge is oversewn with buttonhole stitches, which seem to have been sewn from the right to the left.

FRAGMENTS OF THE GARMENT. Besides the cap the following pieces were found: A rather regular, rectangular piece, 48 × 30 cm large. Two of the adjoining edges of the fabric have a regular selvedge, as is shown in fig. 58, the other two have torn edges.

An examination of the material showed the use of S-spun and Z-spun wool. The Z-spun threads show the usual over-crossings, indicating that two threads interchange sheds on their way from one selvedge to the other. So they must be the weft-threads. The opposite threads, the warp, are woven into an edge, which has the peculiarities characteristic of a starting edge.

The selvedge mentioned (fig. 59, 1), which must be regarded as the starting edge of the cloth, is the longer of the two preserved selvedges. It is made of 12 S-spun threads, and the warp threads woven in lie in pairs in sheds, as the diagram shows. The principle is this that a thread going upwards turns round the outmost thread of the edge and then passes downwards in another shed. In this manner the warp threads are held strongly by the border-edge, when during the making of the material the edge has to lie laced to a beam in the loom and the warp is stretched tightly. The short side-edge, to the left in fig. 58, is woven as a closed hem and has 11 S-spun threads lying lengthways. The construction appears from the illustration fig. 59, 2 and is more fully mentioned p. 126).

An other piece is 20 cm square. At one side is a selvedge the three others are torn; warp and weft are S-spun. The weft threads have the over-crossings often mentioned, lying parallel with the border, fig. 59, 3. The border is plaited on the same principle as the plaited edge of the piece of cloth from Borum Æshøj, fig. 87, 1—2 and others. Between the plaited edge and the beginning of the weaving there is a three-ply woof. At the wrong side the ends of the threads are visible, some are torn, in a few places loops are found[3].

6. MAN'S GRAVE FROM TOPPEHØJ, AABENRAA AMT

Near the village of Bollerslev in Bjolderup Sogn there lay formerly a considerable group of mounds, to which belonged the large *Toppehøj*. In the year 1827 about half of it was dug away, by which an oak coffin was found inside it, 4,50 m from the outer circumference. The coffin stood in the direction of North-west—South-east. In the coffin was found earth and water together with some human hairs, a lock of which, originally blond, is preserved[1]). The buried person, a man, was fitted out with an unusually fine set of weapons, a *tanged sword, dagger, palstaff*, and a *comb*. Further there was found a *two-piece fibula* with a round head, which is, like the bronze things, characteristic of the first section of the Early Bronze Age. At the feet of the dead body a wooden vessel had been placed, but it was quite spoiled on account of the inconsiderate excavation, and only a few fragments of the well-preserved pieces of garments were saved.

A FRAGMENT OF A CAP, 5,5×9 cm large, consisting of three layers of coarse, plain-woven woollen fabric*). It is quite plain that the outmoust layer, that in which the pile threads are fastened, is of the same coarse weaving as most of the materials. The stitches binding the pile threads in pairs to the bottom lie in different directions. The pile is of a very fine two-ply wool twisted to the left. As far as can be seen immediately the size of the thread is about that of no. 50 of an ordinary sewing thread. The length of a pile thread is 1,5 cm. Generally two threads lie together in one stitch, in such a way that they are fastened to the fabric by their middle. This makes four ends of thread each ending in a knot. Now and then another knot is seen a little up the thread. The colour of the pile threads is very dark, while the bottom fabric is somewhat lighter[2]).

BORUM ÆSHØJ, AARHUS AMT

In the western part of Borum Sogn, west of Aarhus there was formerly found a group of four barrows; the most south-western of them, *Borum Æshøj*, is said to have been very impressive, 6 m high and 38 m in diameter. In the winter of 1871 an oak bole was laid bare by carting away of earth from the east side of the mound. The bole stood in the direction East-West; it was much damaged by carts passing over it, and in the course of the winter it was still more injured by the influence of the weather.

When in April it was removed, it appeared that the supposed trunk was a coffin made of a hollowed oak bole, which contained a woman's skeleton in fine preservation. Her ornaments and her garment were exceptionally well preserved. The find, was, however, much spoiled by brutal treatment, and the long rents in the pieces of cloth bear witness of the rough handling it has received. The skeleton is incomplete and the whole important find had no doubt been destroyed, if the Historical & Antiquarian Society of Aarhus had not received notice of the affair and by energetic intervention saved what could be saved.

Then (1875) an investigation of the barrow was commenced under the charge of Mr. C. Engelhardt and Mr. Magnus Petersen as a draughtsman, and further two oak coffins were excavated. Thus the National Museum of Copenhagen is now in possession of the contents of three oak coffins (A—C) from Borum Æshøj[1]).

7. THE OLD MAN'S GRAVE (Grave A)

In the centre and at the bottom of the mound there lay in the direction of almost East-West the central grave (grave A), an oak coffin about 3 m in length[2]). In the coffin (fig. 60) was buried the dead body of a man, who lay with his head towards the West. Although at the excavation it was not treated with the proper care, and although in the course of the 60 years elapsed since the exhumation it has suffered further damage, it is still well-preserved. A renewed investigation was undertaken in 1933 by Dr. K. Fischer-Møller, whose detailed description will appear elsewhere. Only the most important results will be communicated here:

"The *buried person* was a man, 50—60 years old. Not only the skeleton but also other parts of the dead man are preserved, the fleshy parts having been mummified, and in many

*) Analysis of the textiles see p. 161.

places muscles and ligaments hold the bones together (fig. 61—62), so that a closer anatomical examination of the skeleton is impossible, since the mummified parts of course cannot be cut up. Both the flesh and the bones are of a black colour, probably through the influence of tannic acid and humic acid.

The length of the skeleton or rather the stature of the individual is calculated at 170—171 cm, almost the same height as was measured by Mr. Magnus Petersen on the opening of the coffin. The breadth across the shoulders is 40—41 cm, and across the pelves it is 30 cm. The proportions of the body are good, only the thigh-bones are somewhat short in proportion to the other bones of the body. The head is short and broad with a length-and-breadth-index of 80 (fig. 61—62).

The back of the head is still covered by the hair, which is now dark, but which through a microscopic examination proves to have been blond, though darker than that of the woman[3]). There are found no hairs from a beard. The face is rather low, the teeth are worn, but strong and sound[4]). Hands and feet are delicate, long, and slender. The nails, some of which are preserved, are well cared for and nicely rounded. It seems that the dead man has suffered considerably from the gout, there being conspicuous arthritic deformations of the spinal column and the left knee-joint. But also the right knee-joint, the hip-joint, and the right wrist show symptoms of deforming arthritis."

An X-ray examination of the teeth (fig. 63), made 1939 by the dentist Mr. Einar Kristiansen, showed that the dead person has had a normal bit, and in the last molars a progressive marginal paradentitis, which has resulted in the loss of three wisdom teeth and an advanced atrophy especially of the upper jaw at the second molars. This should be explained as follows: Originally the man had a normal occlusion; but the abrasions have caused a gradual shifting in the mesial direction. Especially this shifting of the bit is the reason why the last molars are in part put out of action; but another reason is that only the teeth from the first molars on to the front teeth are used at the biting and tearing of hard and tough food. And this inactivity or dysfunction is the direct cause of the marginal paradentitis, which in its progressive form has resulted in the loss of the teeth[4]).

THE CLOAK. The dead man lay on his back on a cowskin (fig. 60), which is still preserved, and a cloak

Fig. 60. Borum Æshøj. The old man's grave (grave A). Water colour by Magnus Petersen.

was spread over him. The illustrations fig. 64 and 66 show its size, shape, and state of preservation. The wool is S-spun both in warp and weft, and some knots are found in the fabric*).

As the piece of cloth applied has not had the required length, there have been added two smaller pieces, very much like the large piece in colour and character. The addition in the line p—m is made by letting one piece overlap the other without any turning under of the fabric. The seam is about 2 cm broad with a row of buttonhole stitches at each edge. In the illustration the cloak is placed in such a manner that the larger piece I is the upper one and II is the lower one. The edge of piece I is cut off in a line that nearly follows the weft threads, the deviation being only a few widths of threads, and free ends of threads can be pointed out among the buttonhole stitches by which the two pieces of cloth are joined. The underlying edge of piece II has preserved a piece of natural selvedge, which seems to be part of a side-edge. The small piece III is cut bias and sewn on to II by a row of buttonhole stitches. Here the two pieces of cloth meet in the cut edges. The fabric is fulled and cut out in the roundings, only between a—c, f—g, and h—k the original selvedges are preserved. The curves cut out are much drawn, and the edge f—g is a starting edge with 8 S-spun threads. It is made as is shown in fig. 59, 1. The side-edge is about 1 cm broad and is plainly woven like the rest of the fabric, with the difference only that the warp threads lie somewhat closer, fig. 41, 6.

Fig. 61—62. Borum Æshøj. The head and the shoulders of the old man. 1/3. p. 12.

*) Analysis of the textiles see p. 162.

One edge has 14 longitudinal threads, the other 9.

As part of the selvedge is preserved at both sides of the cloak, and as further the fabric is rather clear, it is possible to follow the weft threads to their full extent across the middle part of the cloak. With a in the left edge of the cloak as a starting point a test has been made, which showed that a weft thread on its way through the fabric crosses only one meeting thread. Generally the over-crossings are found near the middle of the fabric in a vertical line. A diagram of the course of a weft thread in such a case is shown in fig. 65. (See p. 121 and fig. 167.)

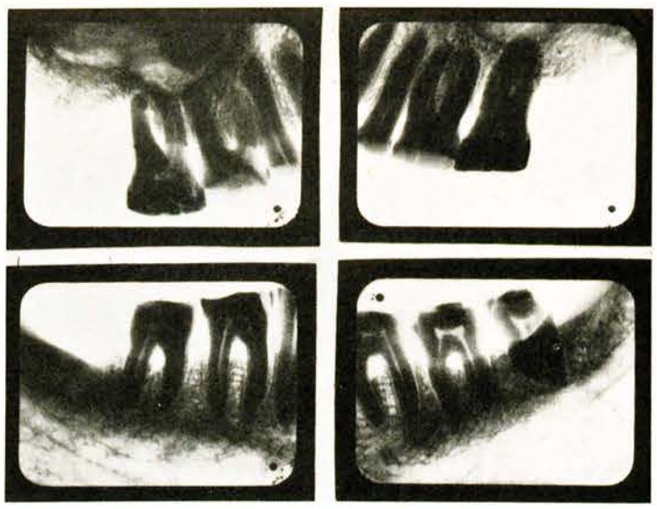


Fig. 63. Borum Æshøj. The old man. The X-ray picture shows loss of 8 + 8 and 8 + owing to progressiv marginal paradentitis. $^1/_1$.

When one thread leaves the shed at the left edge, another thread leaves it at the right edge, and in the next shed we find two corresponding threads entering one from each side. That is a natural consequence of using two threads, passing in different directions. Compare also p. 26 and fig. 42.

It is not too much to say that the making of the texture is more than usually irregular. There are found no less than two single gores and three double gores in the cloak, and to these we should really add still another gore marked off with small arrows near the indication of width at the drawing fig. 64; but this gore cannot be analysed closely, the fabric being matted and indistinct.

The gores e—h and b—j are single, which means that they taper only in one direction. The others are double gores, i. e. gore-shaped weavings-in, tapering at both ends. The two outer lines, marking the bounds of the gores, designate the last and the first through-going shoots; the small arrows indicate the turning points, where the threads stop and return.

In the gore e—h the usual over-crossings of the threads are visible; but in b—j they are not to be found. However, the cloth is so indistinct and matted towards b that an analysis is impossible. Where the gore ends, the crossings may be observed again. Two threads have been in use all the way through the double gore d—i, and the crossings are plainly visible. Fig. 65 gives a diagram of the position of the thread in the gore s—k where the crossings are also plain. It must, however, be remarked that the gore fig. 65 is rendered in such a way that the direction of weaving is from above downwards, whereas the cloak fig. 64 is shown in the reverse direction, the starting edge f—g being the lower edge. The gore l—r is somewhat indistinct; it cannot here be made out, whether there are two separate threads or not.

An examination of the number of threads in the different parts of the material likewise shows its irregularity, as it appears from the samples (analyses p. 162), which are all of 10 × 10 cm.

When we look upon all the gore-shaped weavings-in, the question suggests itself, how the weaving border-line would have looked, if the work had been continued without these gores, the object of which must have been to amend a drawn border line.

If we add together the measures of the gores and subtract the total from the full length of the cloth, we get the limit indicated by the line of dashes and dots ——————. There is not allowed for too much, the indistinct gore suggested near the indication of breadth of the cloak not being counted in, as it is not quite determinable; but still it is there. Thus

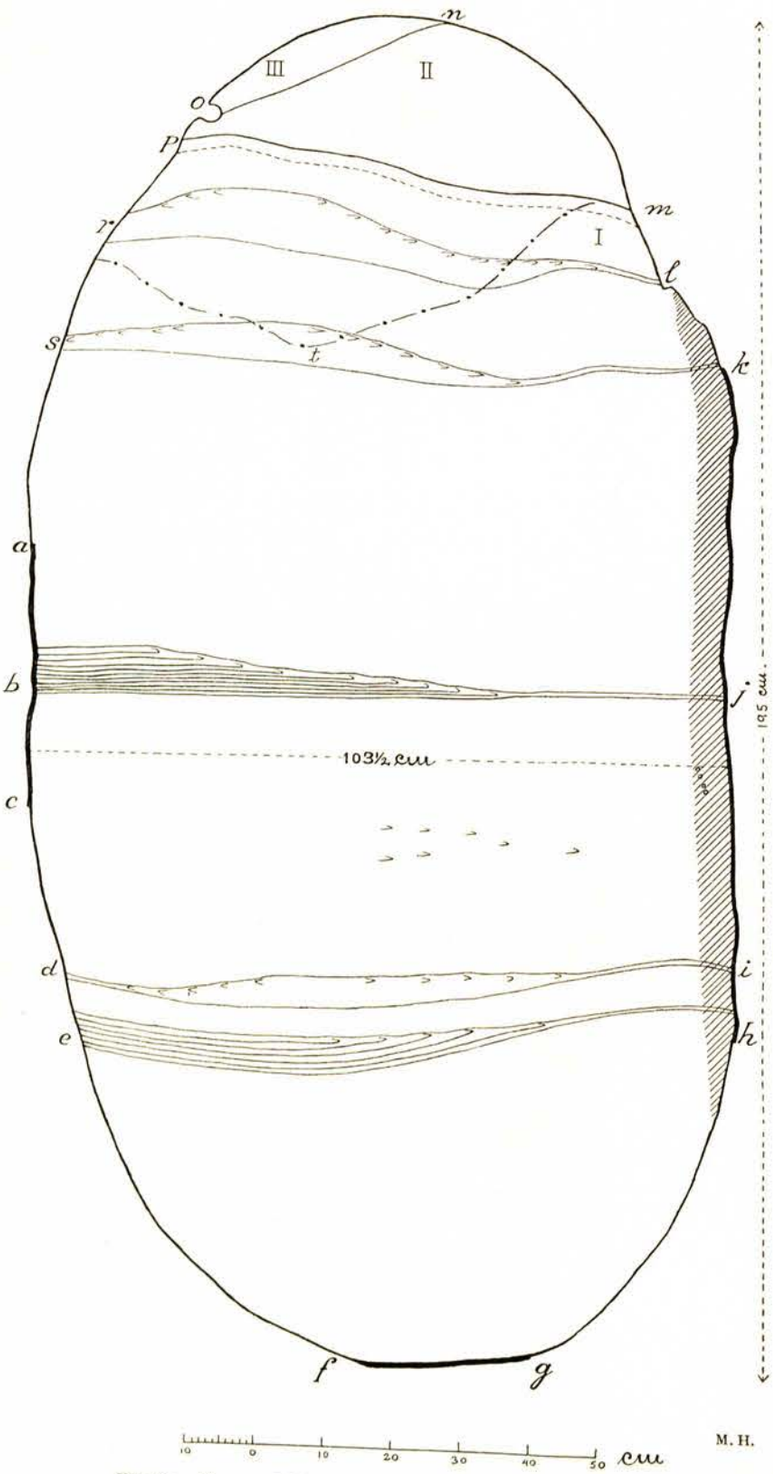


Fig. 64. Borum Æshøj, grave A. The inside of the cloak. $^1/_{10}$. p. 49.

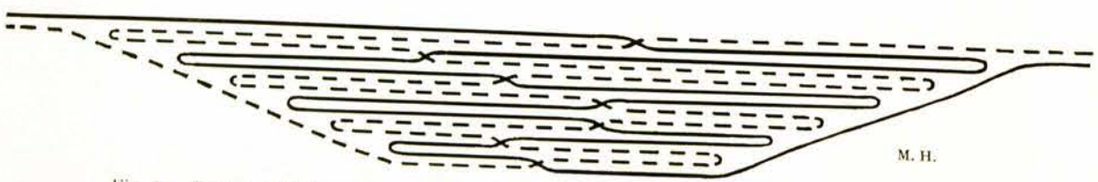


Fig. 65. Borum Æshøj, grave A. Diagram of the weft threads in the gore s—k Fig. 64. p. 51.

Fig. 66. Borum Æshøj, grave A. The inside of the cloak. 1/10. p. 146.

the imaginary line in question ought to be set back about 6 cm into the part, in which the indistinct gore is in force. As the line is now, the greatest deviation is about 29 cm between the actual border-line and the border-line that would have come out if the gores had not been woven in, i. e. the line ————. This is of course to be regarded as a purely theoretical view; but it is mentioned in order to show the proportions of the irregularities, and it is clear that they had to be met.

It is evident that if there are no gores, and all the weft threads pass from edge to edge, and the line is as ———— then the weft threads are beaten down most closely in the part

of the fabric, where the line is most retired, that is at t. Thus the weft threads are not quite so close together in the left side where the line ———— is only 18 cm from the actual border-line, and the material is most open towards the right edge, which is out of the reach of the gores. It is known by experience from weaving in general that in open warp the weft is easily beaten down, and on the other hand in a close warp it is difficult to beat the weft threads closely together. A close examination of the number of threads in the samples drawn gives the piece of information that the warp threads have been closest together at the borders of the cloth. Thus the left edge has 43 and 42 warp threads and 26 and 26 weft threads. In the vertical middle of the cloth there are 30 and 32 warp threads, to which correspond 35 and 23 weft threads. And finally the right edge has 43, 41, and 45 warp threads against respectively 25, 21, and 23 weft threads. Thus the right edge has the greatest number of warp threads, that is 45, and the smallest number of weft threads, that is 21. The middle part has the smallest number of warp threads that is 30, to which corresponds the greatest number of weft threads, 35. Even though the samples are inconstant and sometimes differ, as f. i. sample 5, generally it is as stated above. Probably the weft threads have often been pulled too tightly. The result is a closeness of warp threads which interferes with quick working. The influence of the tightening of the weft increases constantly, and 42 cm from the starting edge we find the resulting natural weaving borderline, that is a curve which near the middle of the cloth bends in the direction of the starting edge, because there the warp is the least close, and accordingly the weft threads beaten more together, compare the Trindhøj blanket fig. 38. The curve is straightened by means of gores; but if there does not follow a slackening of the weft threads, the same thing will happen again and new gores will have to be inserted in order to counteract this incovenience. Another cause of the inequalities of the texture may be an unequal tension of the warp and consequently an unequal closeness of the weft threads.

Fig. 67. Borum Æshøj, grave A. The cap. 1/2.

THE CAP. When the cloak was removed the buried man appeared. On his head there was a cap fig. 67. It belongs to the same type as those of the graves of Muldbjerg and Trindhøj, but it is neither so well made nor so well preserved. The cap, which at the inside edge measures 58,5 cm, is made of a sidepiece and a round crown of plainly woven material, held together by ordinary whipped seams, at any rate the sewings are less elaborate than f. i. those in the crown of the Trindhøj cap. Inside the sidepieces there are 10 horizontal rows of stitches similar to those of the other caps. The stitches are sewn with coarse, two-ply wool twisted to the right. The edge is only whipped over. The sidepiece of the cap has on the inside a gore-shaped addition, and the outmost layer of the crown is made of three pieces sewn together. Like the other caps this one has been covered by a pile, which is here of a fine two-ply wool, twisted to the right; it is, however, partly lost, especially on the crown,

on account of which we can easily see on the outside of the cap the seams by which the three pieces are joined together. The presence of the seams seems to signify that, like the pile of the other caps, the pile here has not been woven into the material; for if that had been the case, it would presumably have been better to avoid so many seams. All in all the round caps are so excellently made and represent so much labour that no doubt they were estimated accordingly and regarded as real ornaments. So it is difficult to understand an economy which manifests itself in piecing together three small patches into a crown. It is remarkable that they do not in the least give the impression of being cut with a view to shaping. But if the intention has been, after the shaping and fulling of the cap, to provide the whole surface with a pile, by which all the seams were covered, the economizing is easier to understand.

Fig. 68. Borum Æshøj, grave A. The inside of the loin cloth. 1/10. p. 146.

THE LOIN-CLOTH. Round the man's abdomen was wound a loin cloth, fig. 68, reaching from the knees up to the lowest rib and fastened by a cord. It was placed in such a way that the edge at the right side of the dead body overlapped the other edge. The knee and half of the thigh of the right leg were naked, the cloth having slipped down. The loin-cloth consists of an oblong rectangular piece of cloth with corners rounded off. Two side-edges or selvedges are preserved, woven on the same principle as shown in fig. 13, 1 but there are only three threads in each of the two groups of the threads making the edge, round which bends the weft. The piece measures now 123 cm from one selvedge to the other, and in the other direction at most 78 cm. Of the two longitudinal sides the one which in the grave lay turned upwards is cut off bias and not trimmed, whereas the other side, which is also cut off, is turned under and hemmed with coarse hem stitches.

The hem of the edge is quite simple; it has been turned under only once so that the raw edge is visible, and then it has been oversewn with a coarse, two-ply wool, S-spun and twisted to the right. The warp is S-spun and the weft is Z-spun.

It is a peculiar feature (see analysis p. 162) that the warp is closer in the centre than at the edges of the fabric.

In the part of the cloth which is 15—25 cm from the cut edge, we find from both edges some gores inserted tapering off towards the centre. As the original breadth of the material is indicated by the two preserved side-edges, and as the rest of the cloth is also well-preserved, we have succeeded in following the course of each thread across the whole texture. It appears that the weavers have worked with two threads simultaneously. The threads cross each other on the principle shown below at fig. 167. Suddenly, however, this weaving stops and is replaced by weaving with one weft thread. Further on we find again two crossing weft threads. It is difficult to see whether the material has been fulled or not. At any rate there is not much nap left.

CORD. The loin-cloth was held together by a woollen cord, figs. 70—71. The wool is S-spun and rather coarse. The spinning is somewhat uneven, and here and there the thread is very thick; but where the thread is thin, it is twined so tightly that it rises and forms a spiral. The cord consists of 6—7 simply spun threads, twined loosely together and tied in a bow. Two ends of the cord are torn. Probably the cord was originally in one piece, but

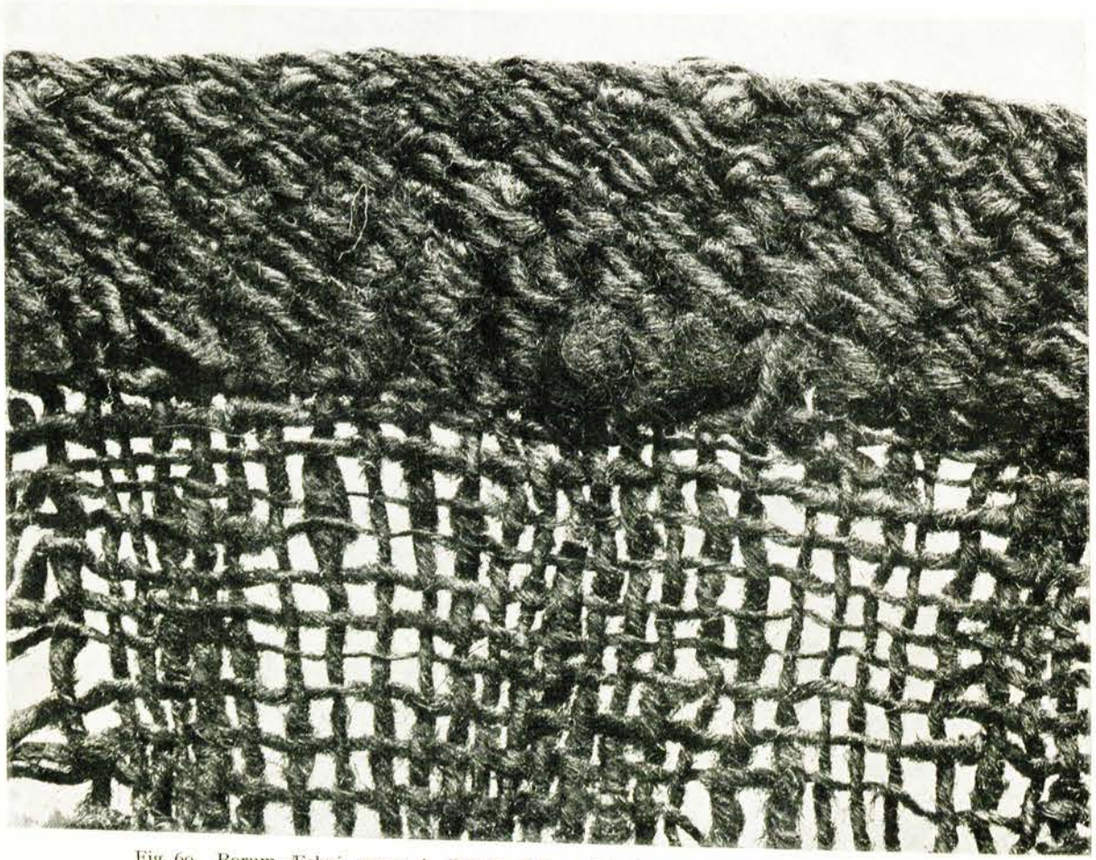


Fig. 69. Borum Æshøj, grave A. Detail of the plaited edge of the foot-wear. $^{2}/_{1}$. p. 123.

later it has been broken. In a third well-preserved end there are three detached loops; and the threads of the fourth end are oversewn or wound about with loosely twined wool, forming a knob or rather a ring, which reminds us of the rings on the belt from the woman's grave of the same barrow. Presumably the cord is made of a single thread doubled up three times. It is impossible to find cut threads at the ends of the cord, but a little above the ring of the last mentioned end we find a free tip of a thread.

FOOT-CLOTHS. The feet of the dead body were naked. But in the coffin two small pieces of cloth were found, probably a compensation for real foot-wear. They are of no small interest; fig. 69 shows part of one of them magnified to the double size. Both pieces have a 2,5 cm broad plaited border, but the other edges are torn. At right angles to the border both pieces measure 20 cm, and the edges of one piece measure 17 cm, while those of the other piece are 11,5 cm long.

The plaited border is very neatly executed on the principle shown in figs. 59, 3 and 87, 1 et al.; but the threads lie in regular curves meeting the edge-line in angles of about 45°. Some cut thread ends are seen in the line between the plait and the plain fabric. It is hardly possible to see whether there are any loops. The warp is S-spun. The weft consists of S-spun

Fig. 70. Borum Æshøj, grave A. The old man's dress. 1/4.

Fig. 71. Borum Æshøj, grave A. The old man's dress. 1/4.

Fig. 72. Borum Æshøj, grave A. The old man's dress. 1/4.

and Z-spun wool alternately, that is two consecutive threads are spun in one direction, and the following two in the opposite direction, and so on. At one place we may see 4 S-spun threads together. Further the figure shows how unequal the Bronze Age material can be both as to weaving and spinning.

At the excavation of both graves A and B of Borum Æshøj a careful draughtsman was present, and accordingly it is possible to find out with perfect certainty how the garment was worn. Mr. Magnus Petersen's drawing fig. 60 shows us that the loin-cloth was wound round the dead man in the following manner: From the left side it was passed behind the back to the right side, and from there it was pulled forward under the right arm and placed a little bias across the other edge. In this way the two lower edges come a little apart, so that the right knee, as is seen in the drawing, is bared, as the two corners droop. At the upper side there is still an old natural fold falling down over the cord, which was tied round the waist and knotted under the left breast.

At the side where the long selvedge is preserved the cloak shows a distinct fold dating back to the Bronze Age. It is due to bending back the edge to make a roll-collar. A plain wooden pin was fastened in the collar. If the collar is bent back in its old fold and the cloak hung up on a bust (figs. 70—72) two marks of wear, probably due to the use of the cloak during the Bronze Age, come exactly on the shoulders, indicating that the cloak has been worn in the manner illustrated.

The only object found was the plain *wooden pin* fastened in the collar. As the date of the find cannot be fixed by this pin, the age of the grave cannot be discussed, until the two other graves have been described.

8. THE YOUNG MAN'S GRAVE (Grave B)

The coffin of grave B, which stood about 7 m east of the central grave, measured about 2,50 m, and was placed in the direction of North—South. It contained the skeleton of a young man, lying with his head towards the South and his feet towards the North[1]). His right arm lay stretched out along his side, while his left arm lay bent across his breast. Dr. K. Fischer-Møller says the following of the dead man:

"The buried person is a young man, 20—22 years of age (fig. 73—74). The skeleton is of a black colour, all in all remarkably well preserved, and the fleshy parts are to some extent mummified. On the skull there are found remnants of the scalp with hairs, especially at the back-head, and bits of the eyebrows. The dried up brain is still found inside the skull. All the seams of the skull are open. The right wisdom-tooth of the lower jaw is not out; the other wisdom-teeth are out but not on a level with the rest of the teeth. The nexus between the processus basilaris of the occipital and the sphenoid is ossified. The cranium is brachycephalous of a type similar to that of the old man with a length-and-breath-index of 80, 3. The cranium as well as the other parts of the skeleton are typically those of a man. On the upper left side of the frontal bone there is a depression as big as a farthing with a partial erosion of the lamina externa cranii, probably a mark from a traumatic inflammation of the bone. All the bones of the skeleton are present except the twelfth left rib. The bones are slender, shapely and strong, yet without marked traces of muscles. The stature is, after Mr. Manouvrier's tables, measured by the 12 long extremity bones and calculated at 166 cm. Mr. Faye's method gives the same measure (166,3), Mr. H. A. Nielsen has calculated it at

165 cm. The measure (174 cm) given by Mr. Boye cannot be right; even after an allowance of 2 cm for the cadaveric height it is 6 cm too much. The breadth across the shoulders is about 37 cm and across the pelvis about 27 cm. On the whole the proportions of the body

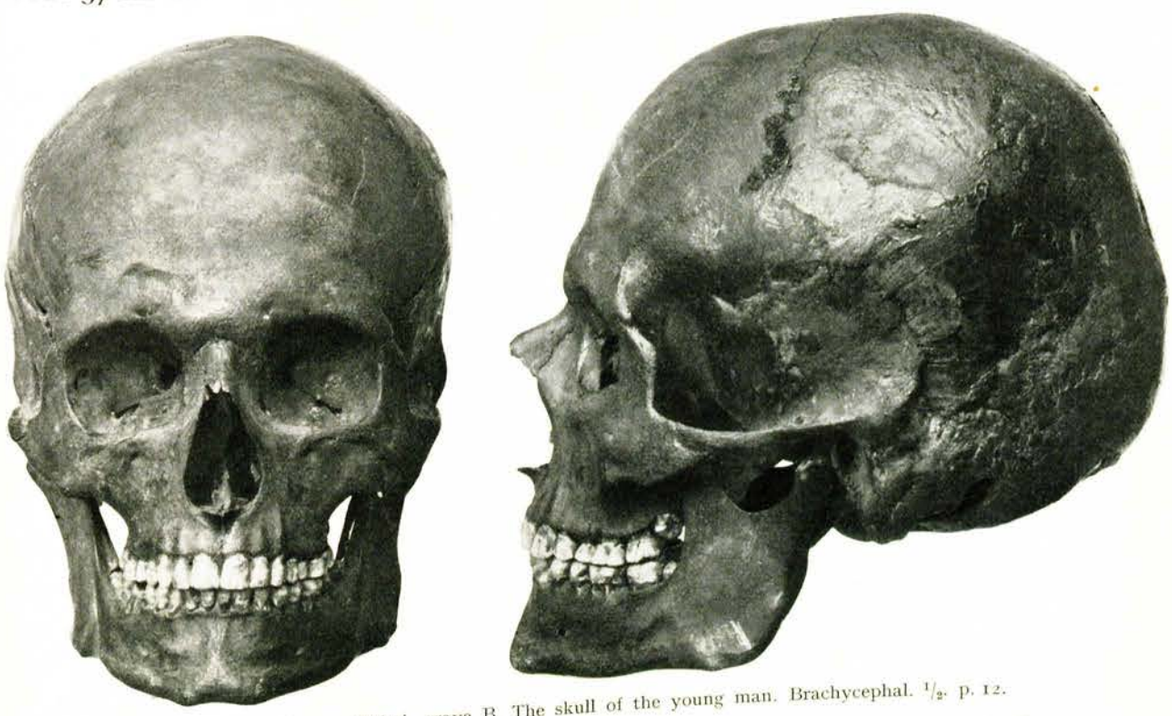


Fig. 73—74. Borum Æshøj, grave B. The skull of the young man. Brachycephal. $^1/_2$. p. 12.

are good, only the shin-bones are somewhat short compared with the measures from which Mr. Manouvrier's tables are calculated, and also compared with average measures of men from the Stone Age". From the dentist Mr. Einar Kristiansen's examination we know that the young man has preserved all his teeth. The 4 wisdom-teeth show different stages of growth (fig. 75). The occlusion is normal, and there is no trace of dental diseases[2]).

THE CLOAK. Like the old man the young man was covered by a cloak, 191 cm long, 108 cm broad, whose shape, and state of preservation are seen in fig. 76. At the left side on there is a natural selvedge, a side-edge made in the same way as shown in the diagram fig. 13, 1. In this case there are, however, only three threads in each of the two groups of the edge. The 6 threads of the edge are darker than the rest of the fabric. In the photo (Fig. 76) we see below a well-preserved piece of a cross-edge 2,5 cm broad plaited in a manner similar to that of the border of fig. 59, 3, the edge of fig. 69, and fig. 87, 1. The other edges are cut out. The warp is S-spun, the weft is Z-spun with the exception that the weft threads nearest to the plaited border are S-spun.

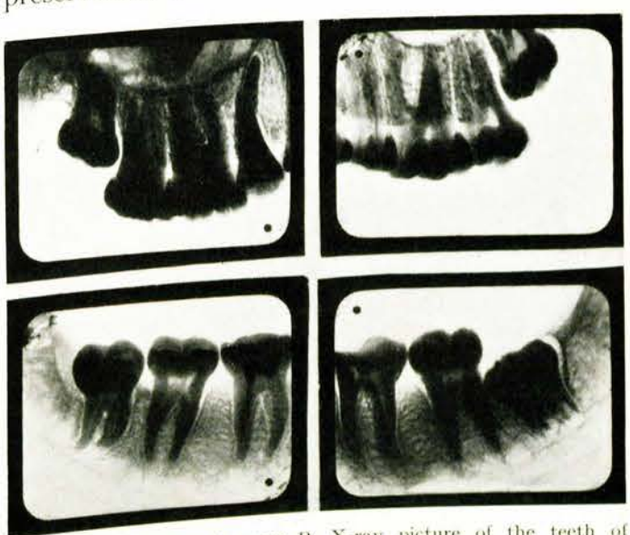


Fig. 75. Borum Æshøj, grave B. X-ray picture of the teeth of the young man. $^1/_1$.

Fig. 76. Borum Æshøj, grave B. The inside of the cloak. $^1/_{10}$. p. 146.

The part which is nearest to the plaited border is somewhat irregular. This may be due to the fabric having been drawn out of shape while in use, since the edge is only cut off; but it may also be due to irregularities in the weaving.

The analysis show that the closeness of the warp varies rather much, and also that in the right side the warp threads have gradually been much pressed together by tightening of the weft. The whole edge of the right side of the cloak is cut out, and thus the present edge lies within the original selvedge. As the closeness of threads is greater here than in the middle of the material it must be due to much tightening of the weft and a poor disposition of the work. The fact that the number of weft threads is greatest where the warp is closest seems to be contrary to the observation made before that the weft is open where the warp is close; in this case, however, we should not pay much attention to this apparent contradiction, as we find some extra weft threads coming from the right edge and turning in the left half of the fabric. It shows that the lopsidedness of the fabric has been counteracted deliberately. It is impossible to see how the fabric has gone awry and how great the irregularity has been, as the corners and the right edge are cut away. Uneven tension of the warp may have been a contributing cause.

As is shown in the analysis the smallest number of warp threads corresponds to the greatest number of weft threads, and vice versa. We still find folds in the longitudinal direction; they are decoloured, the cloak having been spread lengthways over the dead body. Whereas the collar of the Muldbjerg cloak was at the straight edge, it is likely that the curved edge

of this cloak has made the collar, for here are found 5 holes, marks of a plain wooden pin, which was stuck in here. By the way it is not improbable that cloaks of the oval shape found in Borum Æshøj could be worn either way so that either edge could make a collar; but the unsymmetrical cloaks belonging to the men in Muldbjerg and Trindhøj do not give the impression of having been worn upside down.

Over-crossings of the weft threads occur now and then, but the fabric being indistinct and matted, and even with holes in it, the changing number of weft threads has not been investigated. Originally the fabric was fulled but the nap is partly lost.

Fig. 78. Borum Æshøj, grave B. Comb of horn. $^2/_3$.

Fig. 77. Borum Æshøj, grave B. Wooden sheath in which is put a short dagger. $^1/_4$.

THE LOIN-CLOTH. Under the cloak lay the dead body, the upper part of which was naked. The loins of the man were wrapped in a simple, square piece of cloth (fig. 79), which was originally one rectangular piece; but on account of decomposition of the fabric along the back of the dead body, it is now in two parts of unequal size, and its original breadth cannot be determined exactly; but the approximate breadth is 115 cm. The length is 75 cm at the edge to the left in fig. 79 and 81 cm at the edge to the right. The three edges of the loin-cloth have preserved their original selvedges, the fourth edge is cut. The threads at a right angle to the open edge and to the lower selvedge are S-spun, while the threads parallel to the same edges are Z-spun and have the over-crossings characteristic of the weft threads. So the weaving direction is found, and the lower edge is made out to be the starting edge, which indeed it must be, as it adjoins the two selvedges.

The starting border is well-preserved in both corners, where the end of the warp threads are still to be seen as small compact lumps. Unfortunately it is impossible to make out where the starting edge begins and where it ends, it cannot even be determined whether the thread ends are cut off at one corner, or, respectively, how they are fastened. At the lower right corner there is found a small bit of an extraneous thread knotted to the edge, possibly a remnant of threads which have fastened the cloth to a beam and given occasion to the small holes and scallop-shaped drawings out occurring all over the starting border. This border consists of 8 S-spun threads at the edge, and, as far as may be observed for the matting, it is made in the same way as the edge of fig. 59, 1. The threads of the selvedges and the starting edge are somewhat darker than the rest of the cloth. The same is the case in other materials, and also the sewing thread is often of a colour different from the other threads. The loin-cloth is fulled, but on account of decomposition the nap is partly lost.

The side-edges of the cloth are made on the same principle as the edge of fig. 13, 1, a method applied also in other fabrics of the Borum Æshøj finds. The edge is made of two groups of threads each consisting of several thin threads. The number of threads is indeterminable on account of the fulling; but the edge is thinner than usual, there being apparently but three threads in each group.

There is no reliable information as to the way in which the loin-cloth was worn,

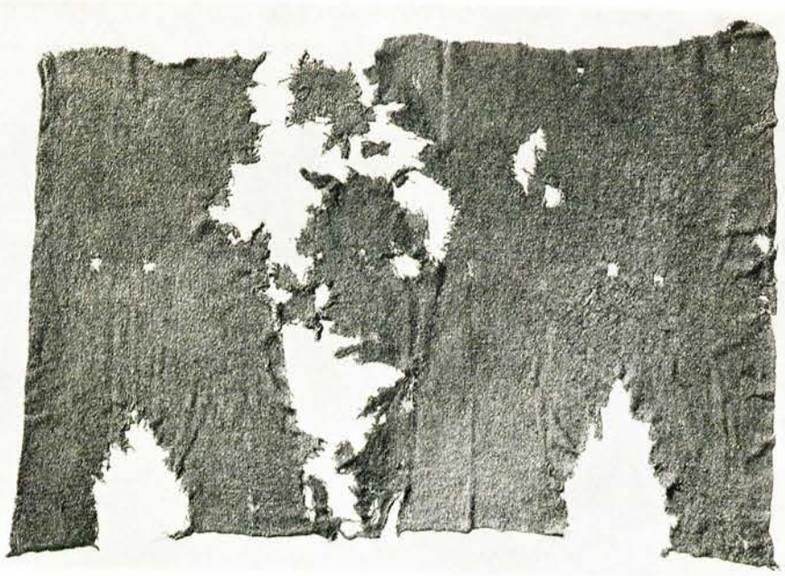


Fig. 79. Borum Æshøj, grave B. The inside of the loin cloth. $^1/_{10}$. p. 146.

but it seems most likely that it was worn in the manner shown in fig. 60, that is with the starting edge as the lower edge (compare the old man's cloth, Fig. 70), for at the inside of the cloth, the side shown in fig. 79, we have found considerable remains of the man's pubic hairs. They occur across a space 17 cm broad and 11 cm long. The centre of this space is 39 cm from the upper edge of the cloth, 36 cm from the lower woven edge, and 26—27 cm from the right side-edge. The right edge of fig. 79 was placed a little to the right of the middle of the body; from there the cloth was passed behind the body and forward under the right arm and fastened by means of a leather belt in which there was a double wooden button, as is indicated in fig. 70. The finding of the pubic hairs shows that the loin-cloth must have been worn directly on the body without any linen between.

On the left arm there lay a *wooden sheath* into which a short *bronze dagger* was put (fig. 77). Probably the sheath has been carried in a leather belt 6 cm broad, which from the right shoulder of the dead man has passed across his breast to his left hip. A *horn comb* (fig. 78) lay under the dead man's right shoulder. Above the right side of his head there was found a box of bark, and at his feet remnants of leather, probably foot-wear.

By the shapes of the dagger and the comb the grave must be contemporary with the graves already described and originate from the first section of the Early Bronze Age.

9. THE WOMAN'S GRAVE (Grave C)

It cannot be determined with absolute certainty, in which part of the mound this coffin (grave C), found 1871, has stood; but everything favours Mr. Vilh. Boye's hypothesis that it stood a few meters east of grave B, and that accordingly it has been placed there later than the two other coffins. The coffin measured 2,50 m and stood in the direction East—West. The head of the dead body was turned towards the West. The effect of the disgraceful treatment of the grave is this that the skeleton is incomplete. However, so much is left that a study of that which is preserved gives rather good information of the dead person. The following is derived from Dr. K. Fischer-Møllers' investigation:

"Some vertebræ, some ribs, the sternum, the right clavicle, the left ulna, the right tibia, the left perone, and all bones of hands and feet are lacking, except a single metatarsus bone. Further all the teeth have fallen out after the death, probably on account of the treatment of the skeleton at the excavation. The skull (fig. 80—81) is somewhat damaged, and especially the measures of the nose are uncertain no doubt on account of injuries inflicted during the excavation. The rest of the bones are on the whole well-preserved, of a black colour like the

others from Borum Æshøj. There is no doubt that the interred person is a woman. Both the pelvis and the other bones indicate the sex with certainty. She must have been 50—60 years old and about 156—157 cm high. In Aarbøger 1891, p. 106 her stature is stated as being 6 feet

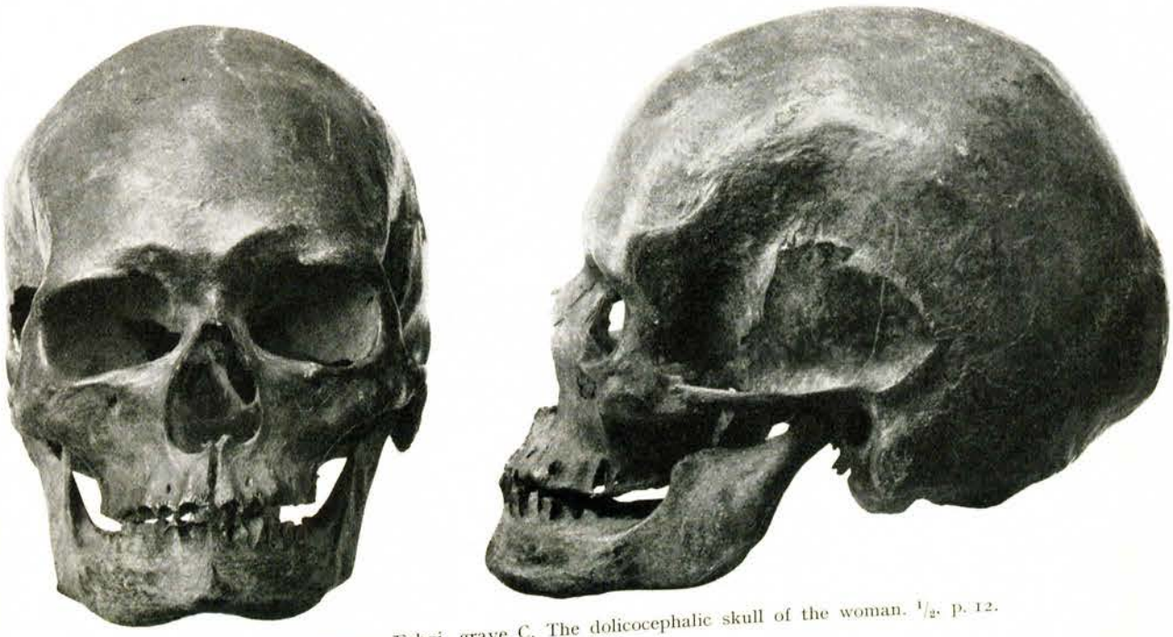


Fig. 80—81. Borum Æshøj, grave C. The dolicocephalic skull of the woman. 1/2. p. 12.

÷ 3 inch. or 69 inch. i. e. 180,5 cm, but it is impossible to see how this result is found[1]). According to M. Manouvrier's tables the stature is 156,4 cm calculated by the 8 preserved long extremity bones, the measures of which are quite certain. Mr. H. A. Nielsen[2]) puts the stature at 156 cm. According to Mr. Faye's method[3]) it is 156,5 cm. As on the whole the proportions of the body are normal, the height cannot possibly be more than 157 cm. The breadth across the shoulders has been about 35 cm and across the pelvis 28,3 cm. From the height of the foot, about 5,5 cm, the length of the tibia between the articular surfaces 32,8 cm, and the length of the femur in its natural position 40,9 cm + the distance between the femur knuckle (trochanterion) and the elbow-joint (radiale) about 11,5 cm, it has been found out that the waistline must have been about 90 cm from the ground.

A plait of her hair was found in the coffin. It is of a light-blond colour, lighter than the hairs of both the old man and the young man. Her head is dolichocephalic unlike those of the men, length-and-breadth-index 74,1. With her low face, her deep-set nose, and her low rectangular eye-sockets she is a representative of the Cromagnon-type, which is not uncommon, especially among Danish Stone Age skulls".

Fig. 82. Borum Æshøj, grave C. Clay-vessel. 1/2.

As mentioned before the fragile things, especially the cloths were much damaged by the rough treatment they had come in for. But even worse than these injuries is the fact that every reliable piece of evidence as to the position of the things in the grave was lost. Both Mr. Henry Petersen and Mr. Vilh. Boye have tried from records contemporary with the excavation to reconstruct a picture to show

what was the position of the dead woman in the grave. Some of the records do not appear reliable, however, so that for the determination of the use of the things exhumed and their

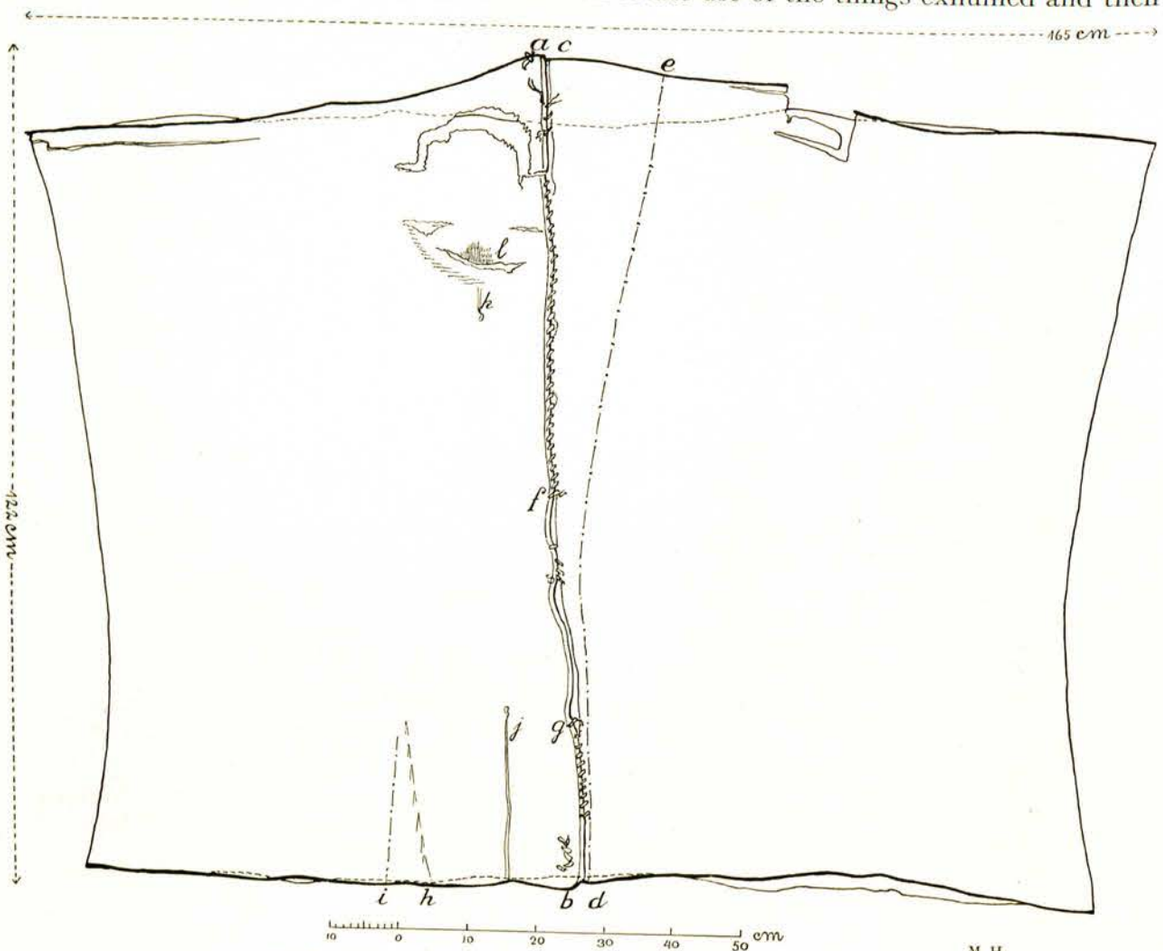


Fig. 83. Borum Æshøj, grave C. Piece of cloth sewn together. $^1/_{10}$.

positions on the garment we can rely only on records confirmed by a study of the objects themselves, and by a comparison with the Skrydstrup grave, excavated 1935, which seems to form a close parallel to the Æshøj grave.

The following objects were found in the grave[4]):

A black earthen *vessel* (fig. 82) made of a fine, much burnt clay-substance, further a *wooden box* which was completely spoiled by the plundering of the coffin, and a *horn comb*, which is said to have been placed in the hair, a statement which is not probable.

Fig. 84. Borum Æshøj, grave C. Torque.

Of bronze objects there was found a flat and ribbon-shaped *two-piece fibula* with a round head (fig. 86). It dates the grave with certainty to the first section of the Early Bronze Age, to which period the other things also belong. *A bronze belt-disc* and *two small tutuli* are specially interesting. A *bronze torque* (fig. 84), *two bronze bracelets* and three fragments of *bronze spiral fingerrings* were also found there besides a *dagger*.

The bronze objects now have a brownish patina, possibly because they were polished by the finders. In some of the textiles we have found traces of bronze oxide. The following textiles are preserved:

PIECE OF CLOTH SEWN TOGETHER. This peculiar piece of cloth, the shape of which appears from the drawing and the photograph figs. 83 and 85, is much damaged on account of having been picked up by non-experts. Both the edges and the bottom with their numerous

Fig. 85. Borum Æshøj, grave C. Piece of cloth sewn together. 1/10. p. 154.

rents and holes bear witness of the rough treatment it has undergone. The fabric is not much damaged by decomposition, on the contrary it must be said to be one of the best preserved cloths.

As fig. 83 indicates, the piece is about 2 × 165 cm long. At its broadest it measures 122 cm when sewn together; but if the seam was undone in the line a—b, it would be 130 cm broad; its minimum width is about 110 cm. There are three well-preserved, original selvedges, which enable us to determine the direction of weaving. The warp is S-spun, the weft Z-spun, and in a square of 10 × 10 cm we may count 44 warp threads and 30 weft threads. The material is so matted that even by translumination of the cloth it is often impossible to discern the single threads.

Fig. 86. Borum Æshøj, grave C. Two-piece fibula.

The two longitudinal selvedges are made in the same way as those of the Muldbjerg cloak, fig. 13, 1, but there are only 4 threads in each of the two groups round which the weft threads bend. These edges are S-spun and a little darker than the bottom fabric.

The double line, shown in the drawing between a and b, indicates the plaited border. Naturally it is not performed with the regularity of the drawing, fig. 87, 1. The threads do not always come at a right angle from the edge towards the bottom. Often they lie in curves

and meet the edge-line obliquely. Fig. 87, 1 shows the position of the threads at the corner by a, fig. 87, 2 that of the corner by b. The arrangement of the border threads at a is somewhat indistinct; the corner is rather damaged.

At the back-side of the cloth in the line where the plaited border and the texture meet there are found a row of loops, sometimes rather long, which show that the loom must have been set up with one continuous warp thread. It is reasonable to regard the side where the loops are seen as the wrong side of the garment because the loops are disfiguring. From the drawing it appears that the edge between a and b is 122 cm long, while the adjoining edge c—d measures 120 cm; the latter measure is right and corresponds to the actual width of the cloth, but the former measure is rather delusive; for the plaited border (a—b) is much gathered to fit in with the cut edge (c—d) in the seam. If a—b was free, the difference of length between the two edges would prove to be 7—8 cm, which means that a—b would be 130 cm long. From f to g the sewing is lost, and the photograph shows that the left edge bends, because it is too long to fit in with the edge to which it has been fastened. If we look at the line e—d, we may realize that it has been a difficult task to make a—b and c—d fit fairly together, and that the difficulties have only been solved by certain tricks. The line e—d shows the course of a thread through the fabric and it would have been natural to cut off the stuff along that line. Probably the weaving was irregular so that the width of the cloth has gradually changed. The result is that it has been impossible to make the original width fit in with the width measured further on in the work. Hence the stuff has been cut off along the line c—d, which is somewhat longer than e—d, and as a cut stuff-edge is also a little yielding, it has at length been possible to join the two edges together, presumably by stretching one (c—d) and gathering the other (a—b). The width of the stuff is at the plaited border 130 cm, but 25 cm from there it is only 113 cm, and across most of the cloth it measures but 110 cm. The measure varies, however, and at the cut border the width is about 118 cm. In view of the discussion whether the plaited border is placed at the starting edge or at the edge that finishes up the work, we shall here call attention to the fact that in this case the width of the fabric is greater at the plaited border than in any other part of the cloth, whereas the reverse is the case with the Egtved blanket, the width being there smallest at the plaited border. The edges are somewhat drawn out of shape. The stuff shows the same peculiarities as we have met with in other materials from the Bronze Age. Between i and h a woven gore begins similar to those described in the cloths of Muldbjerg and Guldhøj. The gore of the piece in hand is, however, indistinct, because the material is in holes and much matted.

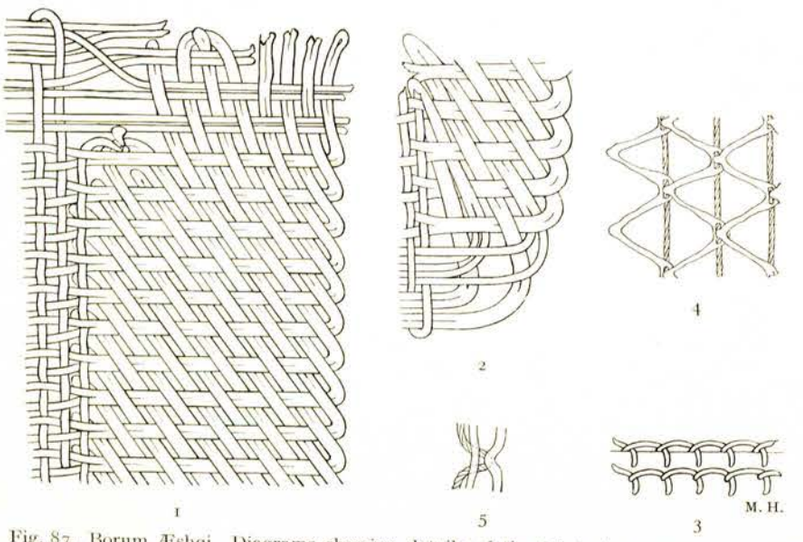


Fig. 87. Borum Æshøj. Diagrams showing details of the fabric in grave C. 1—2. The corner a—b of fig. 83. 3. Buttonhole-stitches of the neck-opening fig. 88. 4—5. Details from fig. 91.

Across the whole width of the material, especially near the plaited border some knots are found. In spite of the matting it is possible to determine some of them as turning points

for extra shoots proceeding from the selvedge some way into the fabric, where they turn and come back again. j and k show some knots of that kind. The weaving of this part of the cloth is altogether very irregular.

The seam by which the two edges are joined is very carelessly made. It is sewn with S-spun wool doubled up four or five times, and the threads are simply put together, not twisted

Fig. 88. Borum Æshøj, grave C. The jacket. 1/5. p. 148.

together. The stitches are irregular and there are 8—10 stitches per 10 cm. The seam is rather clumsily made compared with the sewings of other pieces of the garment. The thread is fastened in the cloth at b, and near a there are remnants of a thread tied in a knot round the edge. The obliquely cut edge c—d is neither turned under nor oversewn. It is only joined to the plaited border by the coarse, loose stitches mentioned.

The drawing shows that the upper edge of the piece is 2 × 165 or 330 cm measured on a straight line. But if we measure it along the selvedge and let the tape-line follow all the bends, the edge is somewhat longer, about 341 cm. The opposite edge of the cloth is 306 cm. These measures are not evident from the drawing, because the piece of cloth cannot be spread so as to lie outstretched properly. The over-crossings characteristic of the weft threads are also found here, but the fabric is too much matted for anything to be determined about their number in each shed. At 1 there is a green mark of bronze oxide corresponding in size to the belt-disc, which must at this place have been in touch with the fabric. On the photograph the mark is plainly visible as a light spot and in the drawing it is indicated by hatching. Further the drawing shows two damages of a roundish shape. These features will be mentioned again later on, but it is worth while remarking that the spots are found in the widest part of the piece of cloth.

JACKET. This piece of garment has close parallels in the graves of both Egtved and Skrydstrup, and so it must be regarded as belonging to a prevailing type of vestment. It appears from the photographs figs. 88—89 that the jacket is rather well-preserved; there is a hole, however, at the back near the left sleeve and the right sleeve is badly damaged. In fig. 90, which shows the pattern spread out, g—h indicates a line straight of thread. The

threads parallel to the line g—h must be the weft, as they are Z-spun, and as in a single place the usual over-crossings are found. The threads lying in the opposite direction are S-spun. The material is much fulled, and accordingly it is not everywhere possible to count the threads. At a spot where the material is worn 42 S-spun and 36 Z-spun threads may be counted across a space of 10 × 10 cm.

The principle of the fashioning is the same as will be seen below in the descriptions of the jackets of Egtved and Skrydstrup. The greatest width of the Borum Æshøj jacket from

Fig. 89. Borum Æshøj, grave C. The back of the jacket. 1/7. p. 158.

one edge of the sleeve to the other is 120 cm. The piece of cloth is cut out in the shape indicated at the drawing. The two lower flaps of the cloth, marked e and f, are bent towards each other and joined in a vertical seam along the middle line of the back, thus making "the bole". Then the fabric above the neck-opening is bent down backwards from a horizontal middle line and the meeting edges are joined by a horizontal seam across the back and continuing under the arms. Thus the sleeves and the yoke are shaped. A horizontal cut makes an oblong hole for the neck, and the lower edge of the jacket is lengthened by some strips of cloth sewn on. On a closer study the Borum Æshøj jacket presents certain peculiarities. Thus the cutting is not symmetrical, and in the drawn up pattern the line straight of thread shows that the jacket is cut a little bias. This obliquity has possibly been increased, because the fabric has been drawn out a little when worn.

From fig. 89 it is evident that the seams of the sleeves are not to be found at the bottom side where they ought to be; thus the seam of the right sleeve is on the back side, and that of the left sleeve on the front side. The border of the sleeve at the wrist is cut in such a way that the sleeve is shortest at the upper side; it is likely that this cutting out has been made after the sewing of the jacket; because otherwise the cuts would probably have been symmetrical. As they are now they are exactly so unlike that they make up for the oblique cutting of the sleeves. The neck-opening is made of a horizontal slit in the fabric. Under each end of the slit a small patch or gusset is sewn on, in order to prevent the fabric from fraying. The edge of the neck-opening is oversewn with two rows of buttonhole stitches of the type usually called scallop stitches (fig. 87, 3). The stitches seem to be made from the right to the left, like those of the Muldbjerg gown. It is quite possible to sew the stitches from the left to the right; but then the needle must be led from below up through the material in a way that seems awkward. The edges of the sleeves are oversewn in a similar manner, but the sewing is not so clear and the stitches less well-preserved. The 29 cm long slit at the front side of the jacket somewhat to the right of the vertical central line shows no oversewings of the edges, so probably it did not exist when the jacket was in use. Most likely

it has been cut after the woman's death to get the jacket more easily slipped on the dead body. It is said to have been closed by the two-piece fibula (fig. 86), and this seems to be true.

At the waist the jacket is lengthened by 4 pieces of cloth; the dotted line at the lower edge shows how they are sewn on.

Piece a is much matted and indistinct, so that the number of threads cannot be determined. All the edges are cut.

Pieces b and c have preserved the original selvedges at their lower sides. The edges are a little drawn out, but otherwise well preserved. The edge is like the selvedge of the piece of cloth sewn together and made like the selvedge of the Muldbjerg cloak fig. 13,1, except that the number of threads is not the same. They lie in groups of 4 threads in the edge, and these threads are somewhat darker than the rest of the fabric. All the threads of the edge and those parallel to them are S-spun, while the threads in the opposite direction are Z-spun, which means that the warp threads of b and c meet at a right angle the warp threads of the rest of the jacket. Piece b has 12 S-spun and 9 Z-spun threads across a square of 3 × 3 cm. All the edges of piece d are cut, like those of a; the S-spun threads lie vertically and the Z-spun threads horizontally, that is the opposite of b and c. The number of threads is indeterminable.

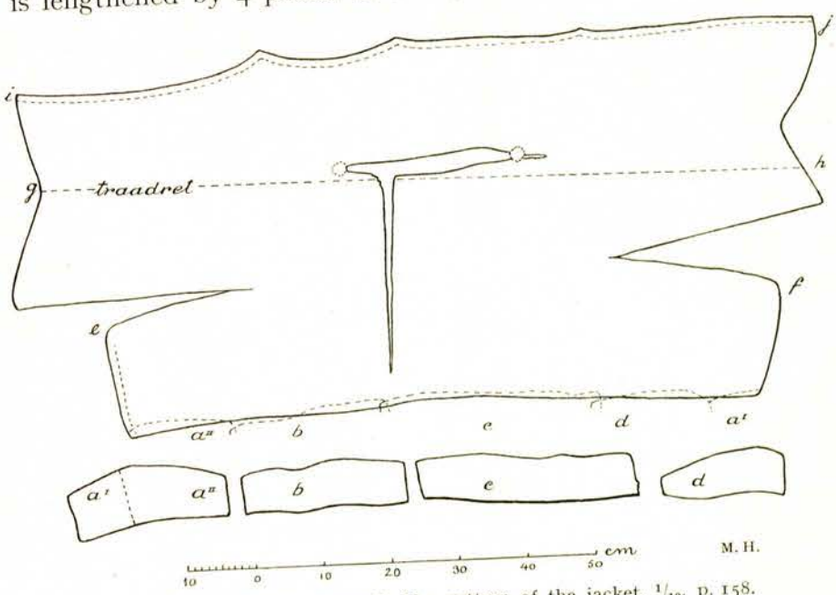


Fig. 90. Borum Æshøj, grave C. The pattern of the jacket. 1/10. p. 158.

These 4 small pieces are sewn on to the jacket by two rows of whipping; one row is probably made on the outside, the other on the inside of the fabric. The seams are well over one cm broad and very uneven. There is no turning under of the fabric, but the borders simply overlap each other and the whipping is made in both the cut edges. The back-seam and the seams that join the sleeves together are made in the same manner but more accurately. The dotted lines between i and j and from e vertically downwards show where the adjoining edges are sewn on to the wrong side of the stuff. The sewing thread, which is S-spun and twisted to the right is a little darker than the texture. There is accordance between the fabric of the jacket and that of the pieces sewn on both as to character and appearance.

FRAGMENTS OF A NETWORK. In the coffin, but it is uncertain where, there were found two fragments of a network, to which no counterparts are known from the other Bronze Age finds. The net is about 40 cm high. Fig. 91 shows it on a reduced scale, while fig. 92 renders part of it in its full size. The net, for which sheepwool is used, consists partly of two-ply threads, partly of loose twistings of wool. Inside the latter there are found small splinters, some of which have been examined by Dr. phil. Knud Jessen, Professor at the University of Copenhagen. Professor Jessen says as follows, "The wooden splinters have proved to consist of hard-wood and come from wood of rather big trees, because the marks of the annual circles come out as straight lines, while those of even small bits of twigs and

branches are distinctly curved. Accordingly the pieces must come from a big piece of wood. Unfortunately the state of preservation of the structural features on which the determination of genus and species depend is so bad that the splinters can only be specified as coming from finely pored hard-wood". When the net was made, the wool must have been wound round

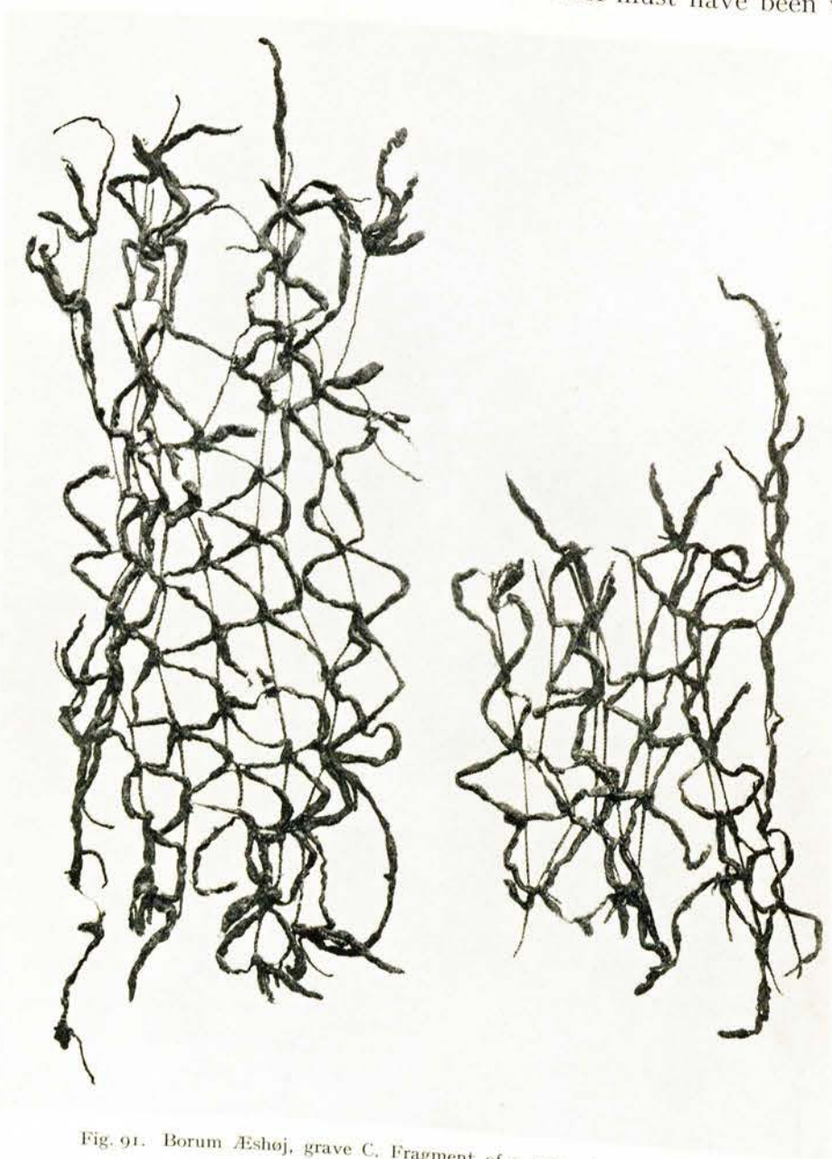


Fig. 91. Borum Æshøj, grave C. Fragment of a network. Ca. 1/3. P. 149.

these splinters, which are now for the greater part lost. But they have left tubelike hollows in the wool twines. If we draw out the twine we will find that it forms a spiral. Fig. 92 shows the best preserved parts of the net, and the drawing fig. 87, 4-5 gives a diagram of how the wool twines, lying in zigzag, are joined together by the two-ply threads. These threads lie all in the same direction and are made of S-spun wool twisted to the right.

VARIOUS PIECES OF CLOTH. Less interesting is a rectangular piece of cloth 27×48 cm big. It is much fulled so that it is impossible to count the threads. The cutting out or possible oversewing of the edges is quite indeterminable. Perhaps there is a small bit of a selvedge; but that is likewise indistinct. The piece has two oblique seams made with ordinary whipping. The colour is almost black[5]).

HAIR-NET. Of exceptional interest is the net pictured in fig. 93. Fig. 94 gives a diagram of the upper half of it. It is made of a rather fine two-ply wool, which is S-spun and twisted to the right; the spinning is unusually even; there are 158 longitudinal threads. Two thick cords are drawn through the edges of the net; they are made of six-ply S-spun wool, somewhat coarser and more uneven of spinning than that of the net itself, and are respectively 82 and 60 cm long. At the end of the former cord there is found a bit apparently torn off the adjoining cord, a fact which shows that the two cords must have been knotted together in this place.

The Borum Æshøj net is braided in a peculiar manner, the technical term of which in Danish archeological literature is most often "Sprang". It will be discussed again at p. 99 and p. 137.

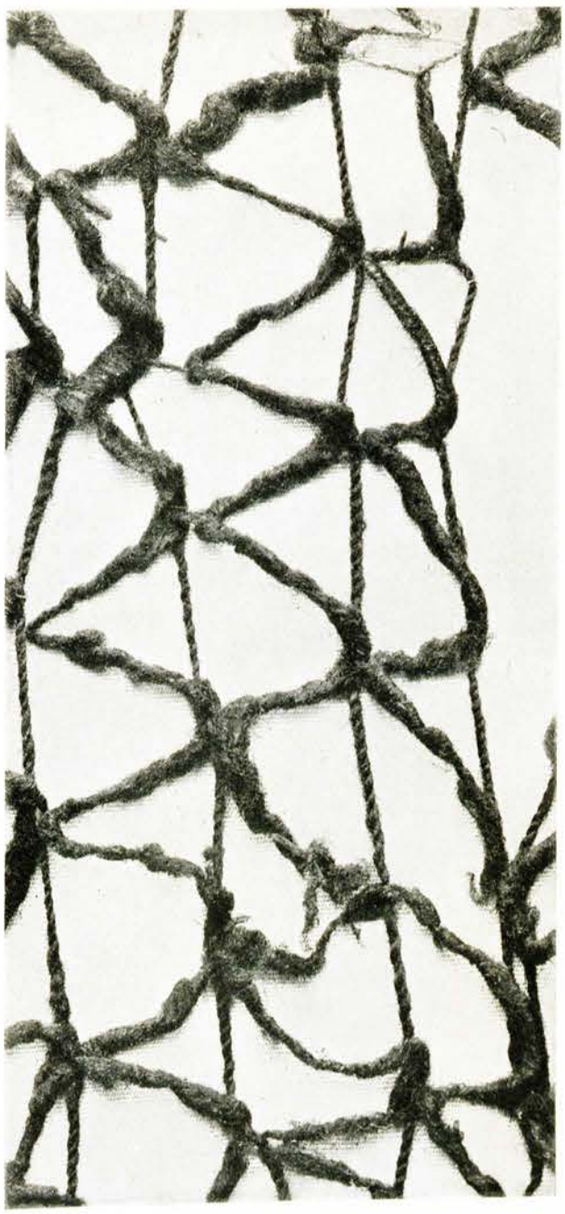


Fig. 92. Borum Æshøj, grave C. Detail of the network fig. 91. 1/1.

TWO BELTS. To the garment further belong two belts.

A. *One* of them (fig. 95) gives the analysis of plain weaving of the rep type; it measures 246 cm in length and 3 cm in breadth. The colour is now two shades of brown. The belt is woven in 3 stripes; the middle one is somewhat darker than the two others. The longitudinal effect called forth by the division in colours is further supported by another means, to wit that the threads of the light stripe are twisted in the opposite direction to those of the dark stripes. This causes the oblique lines running across the band to change their direction at the points where the colours meet; thus the band gets a peculiar herring-bone pattern. The changing of the oblique position of the threads is not due to any change of weaving, but simply to the different spinning of the wool. The light threads are twisted to the right, the dark ones to the left; the wool is very tightly spun and coarse, which gives a strong and peculiar effect to the fabric. The weft is very heavy and quite hidden by the warp.

This belt represents the only case in the Early Bronze Age in which we can speak of a deliberate aiming at an effect of pattern, and it is peculiar that the forming of the pattern is due to the way of spinning and not to variations in the weaving.

The belt is closed at either end by a tassel 7 cm long; one contains 88 fringes, the other 103 (some are lost). As the belt has only 38 warp threads it is a matter of course that not all the fringes can have been made of the ends of the warp threads; but the tassel consists partly of fringes artificially added in and partly of original fringes. The original fringes in the middle of the tassels consist of only two simply spun threads and are easy to distinguish

from those added in, as the former correspond in colour to the warp threads of the texture, the light fringes being in the centre and the dark ones in the edge-stripes. Further the

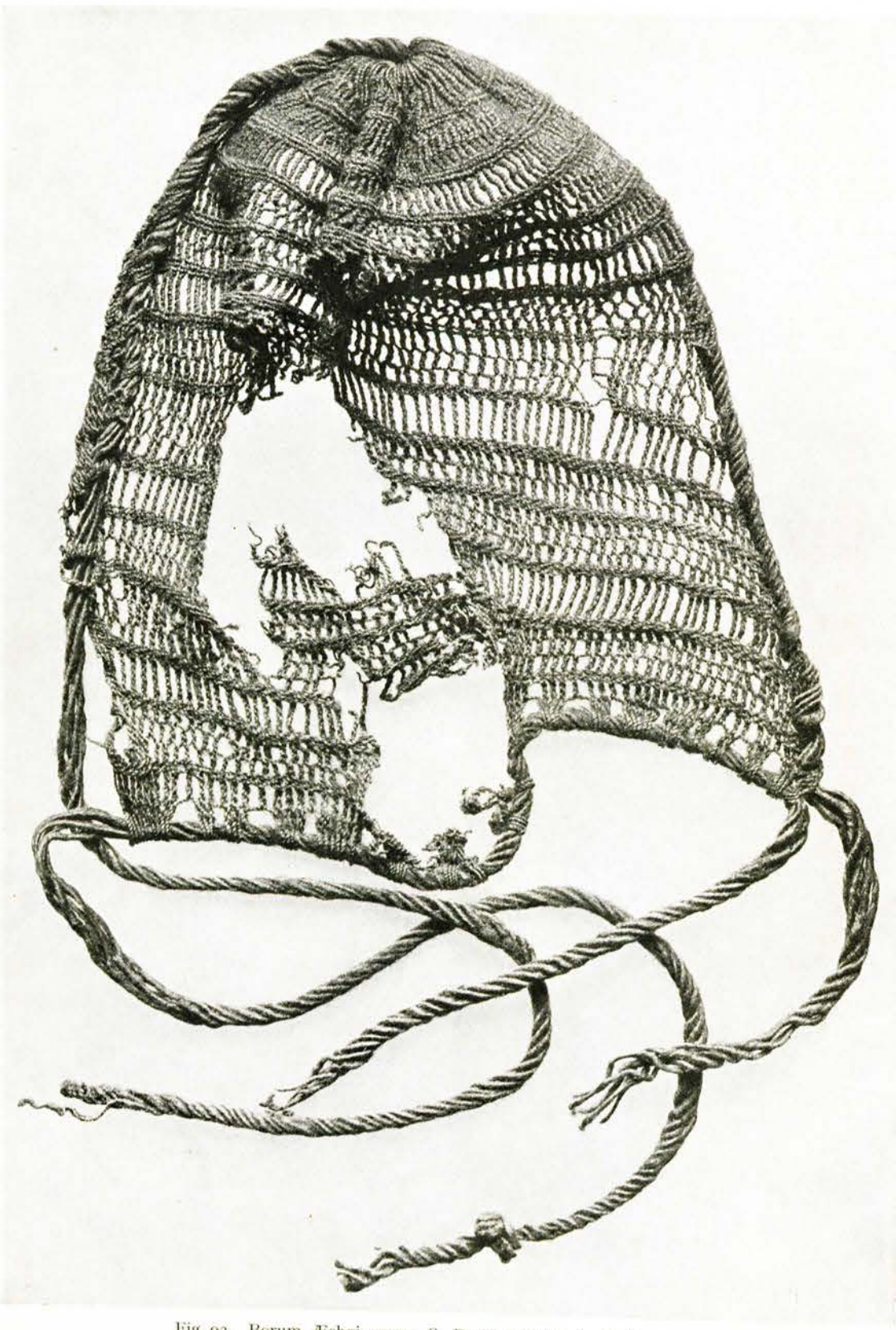


Fig. 93. Borum Æshøj, grave C. Braided hair-net. Ca. $^3/_4$. p. 137.

direction of twisting is opposite to that of the spinning in the texture, which is in full accordance with the rules for spinning and twisting. In one tassel all the original fringes

seem to be preserved; in the other some fringes are lost, and some of those left have knots.

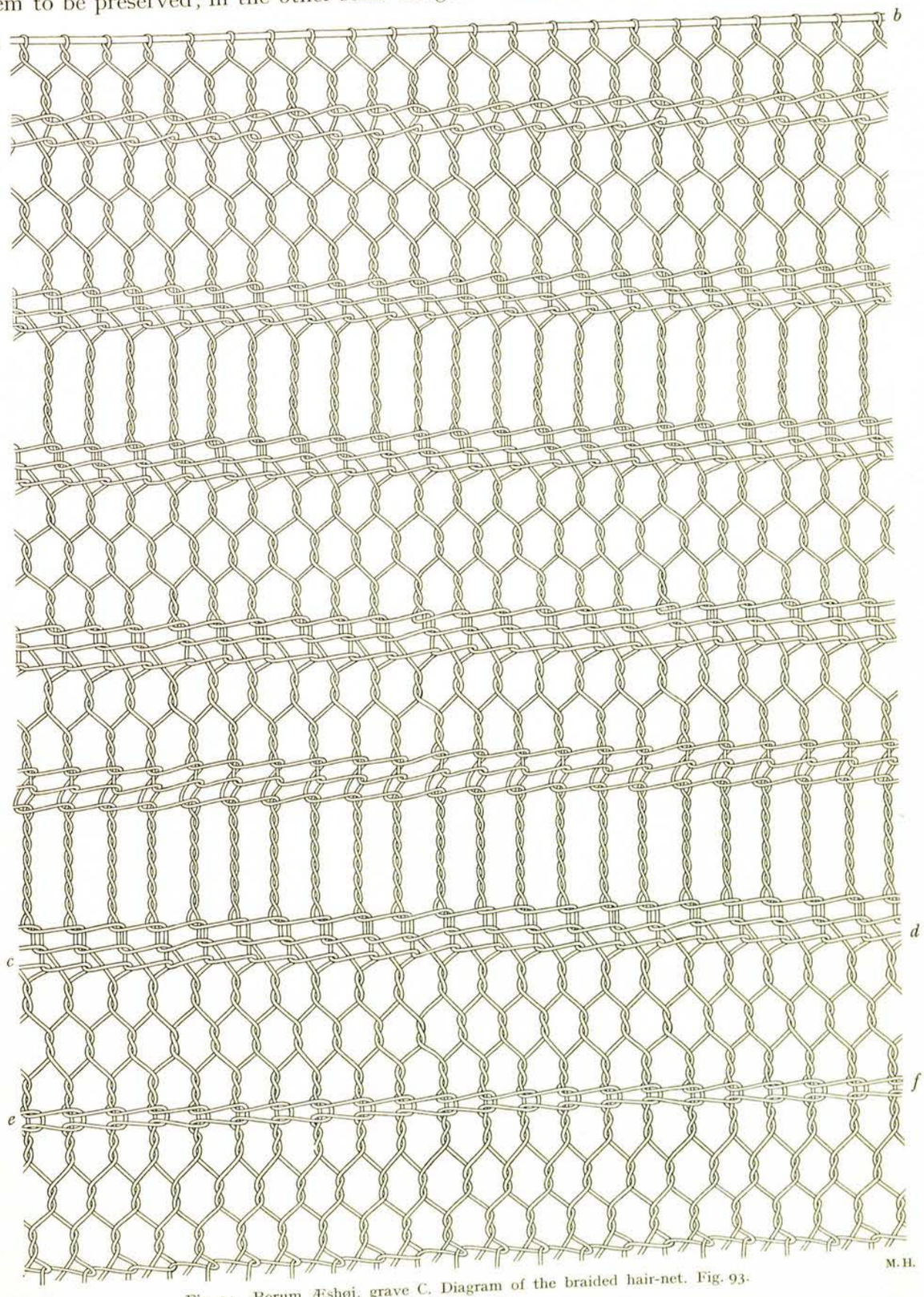


Fig. 94. Borum Æshøj, grave C. Diagram of the braided hair-net. Fig. 93.

The fringes added in consist of four threads and are made in the following manner: A two-ply thread is drawn under one or more of the warp threads of the texture and held

fast by them almost in the middle; then two free thread ends are twined together to form one fringe, they are twisted to the left, as fig. 95 shows. The fringes end in rings oversewn with wool.

Fig. 95. Borum Æshøj, grave C. The belt. p. 142. 1/1.

Fig. 96. Borum Æshøj, grave C. Detail of the belt fig. 95. 2/1.

Presumably the threads at the inside of these rings are placed in a similar manner, as is shown in fig. 116, only it must be noticed that at least one thread end has been cut off. The thread ends are made to meet (see fig. 117) and wound about with loose wool on the same principle as those of the Egtved skirt. The circumference of the rings is not circular, but rather egg-shaped with the broadest end turned downwards. Finally two threads have been drawn through all the rings to string them together like threaded beads.

As mentioned before the artificial fringes are fastened to the band a few shoots above the border of the fabric. The joining is covered by an oversewing consisting of four rows of transversing stitches. The stitches lie as double, opposite rows slanting slightly towards eachother; they seem to be made simultaneously with two threads coming out of the edge at the same place. Actually their course makes a kind of spiral (Fig. 96).

Apparently each stitch passes over four threads and back again under two. In the second row the threads of the stitches are more tightly twined than in the first, because the twining of the threads during the sewing goes in the same direction as the original twisting. The same thing may be observed by sewing ordinary backstitches. It cannot be determined, whether the stitches are sewn with a needle in the finished texture, or they have been made in the warp threads by hand, while the work was still on the loom and the warp threads separated in two halves by shed sticks.

The stitches are very compact and close together, so that it is impossible to see, whether the normal weft is present in the texture under the sewing. By cutting open some of the rings we found that at one end the warp threads had preserved closed loops while at the other end they were cut. This observation is of importance for the discussion on the loom on which the belt has been made (see p. 142). The peculiar plastic shaping of the tassel and the rings does not seem natural for a woollen material, rather it seems inspired by the art of metals, an impression which is confirmed by the fact that metal ornaments are not seldom combined with cordwork. Thus we know of remnants of skirts made of cords, the fringes of which were drawn through metal pipes (p. 149).

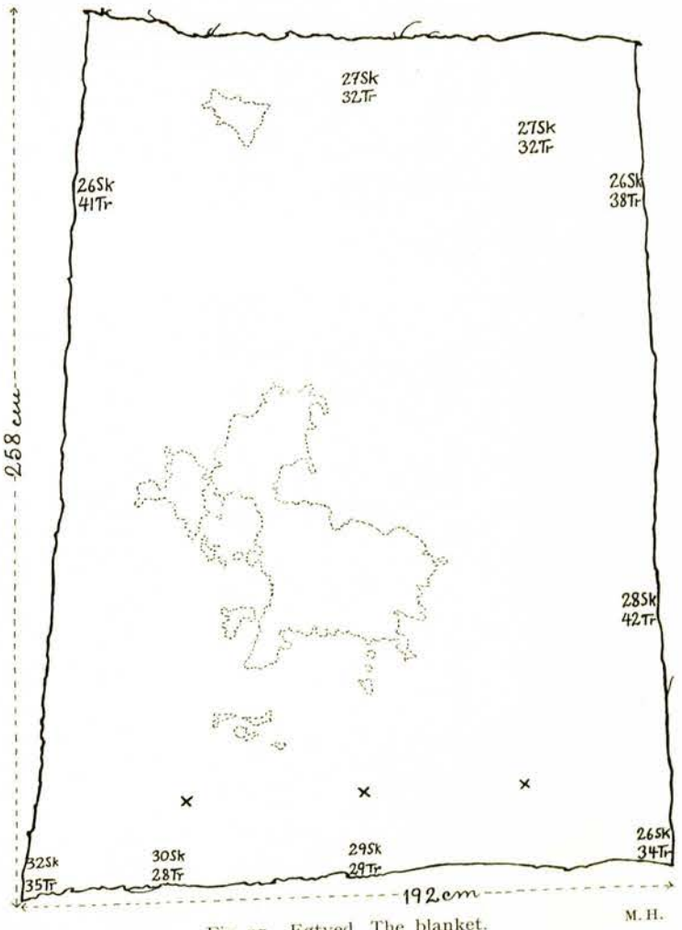


Fig. 97. Egtved. The blanket.
Sk. = Skud = weft. Tr. = Trend = warp. 1/20. p. 128.

B. *The other belt* which is 204 cm long and 1,5 cm broad is much matted and difficult to analyse. Possibly it is a strip of an edge cut off a texture. Along one side of the belt there is a compact group of threads consisting of 15 threads, round which the threads in the opposite direction, probably the weft of a piece of cloth, are wound. Next to the thick, round edge there is a piece about $^3/_4$ cm broad, which gives the impression of being ordinary bottom fabric, and in the edge itself we may now and then find the cut end of a thread; hence the belt is hardly an independent piece of fabric. As the things in the Borum Æshøj woman's grave were excavated by non-experts and as accordingly there is no reliable information as to their places in the coffin, it seems reasonable to postpone the discussion on the use of each piece of garment to the closing chapter on the Bronze Age type of costumes.

M. H.

Fig. 98. Egtved. Fault in the weaving of the blanket. The same thread appears as both warp and weft. p. 128.

Both the woman's grave and the young man's grave must be dated to the *first period* of the Early Bronze Age, and doubtlessly the old man's grave belongs to the same period. Being the primary grave of the mound, it can at any rate not be younger; but there is every indication that there has been but a short time between the putting in of the Borum Æshøj coffins. The skeletons of the two men present so much likeness that we feel tempted to suppose that two near relations have been buried here, most likely father and son. Then it does not seem absurd to presume that the old woman, who has been buried the last in the big mound, is the old man's wife, who, after having buried her husband and her son, has herself found a resting place by her nearest of kin.

10. THE WOMAN'S GRAVE FROM STORHØJ IN EGTVED, VEJLE AMT

In February 1921 Mr. Peder Platz, a farmer from Egtved, North-west of Kolding, came upon an oak trunk by carting away the last remains of the barrow called "*Storhøj*". As he supposed the trunk to be a coffin, he informed the National Museum of Copenhagen of the find. By the examination immediately undertaken by Mr. Th. Thomsen, Keeper at the

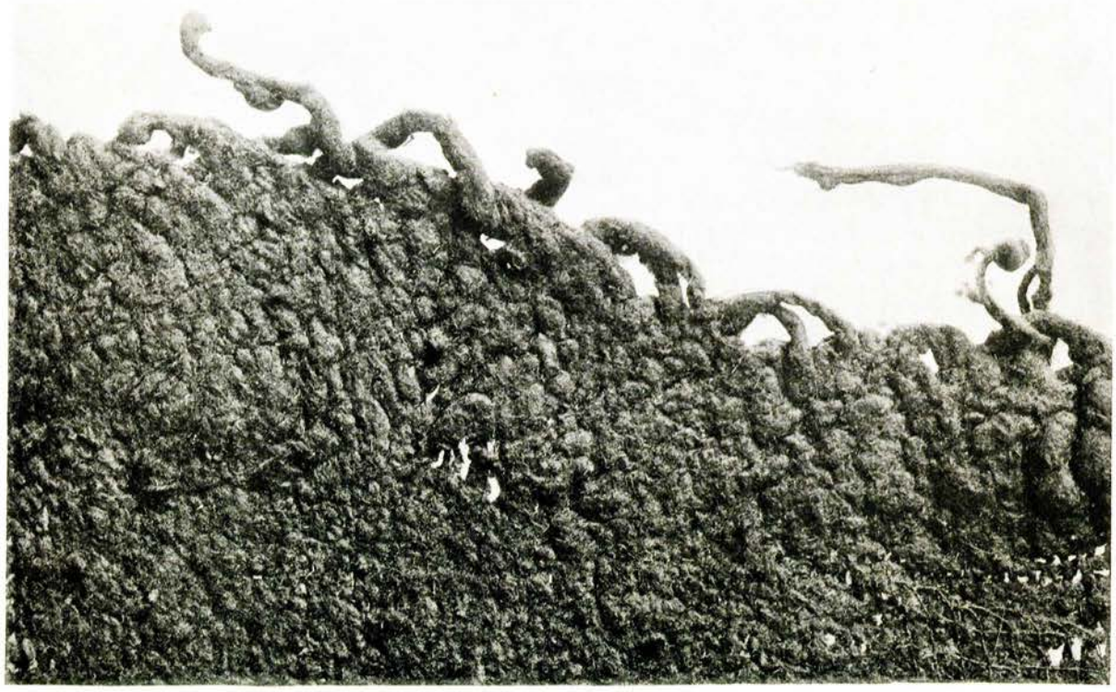


Fig. 99. Egtved. Detail of the plaited edge of the blanket. Ca. $^3/_4$. p. 128.

National Museum, the farmer's supposition was confirmed. The object found proved to be a bole coffin made of an oak trunk 208—218 cm long, 63 and 68 cm broad; it was split and hollowed out. The coffin (fig. 3) stood in the direction East—West on a pavement of small cobblestones placed in a single layer on the old surface of the field. The layer was 3 m long and up to 1,20 m broad. Some larger stones lay pushed in under the sides of the coffin to prevent it from turning over. The coffin was full of water.

On having opened the coffin and ascertained that it contained an uncremated dead body wrapped up in a woollen cloth, the excavator closed it again and had it sent over for further examination in the laboratory[1]) of the National Museum of Copenhagen.

The lid had fitted so tightly that not the slightest particle of earth had squeezed its way into the inside of the coffin; everything lay exactly as it had been laid down during the Bronze Age (fig. 100).

Uppermost there was a layer of detached hairs under which some coarse woollen material was barely seen; at the west end of the coffin the hairs of the dead person, apparently a woman, were visible, and at the north-eastern corner, that is at the feet of the dead woman there was a well-preserved pail of birch-bark.

The covering hairs proved to come from a *cow skin*, which had lain spread out at the bottom of the coffin with its hairs turned upwards; the body has been placed on the skin, then it has been covered by a square piece of cloth, and lastly the edges of the skin have been folded round the dead woman. When the edges were again bent back and the cloth that covered the body taken out, the dead woman was seen lying on her back with arms and legs ex-

Fig. 100. Egtved. Detail of the coffin, opened in the National Museum of Copenhagen. p. 9.

Fig. 101. $^{2}/_{3}$.

Fig. 103. $^{1}/_{1}$.

Fig. 102. $^{2}/_{3}$.

Fig. 104. $^{3}/_{4}$.

Fig. 107. $^{1}/_{1}$.

Fig. 105. $^{3}/_{4}$.

Fig. 106. $^{2}/_{3}$.

Fig. 101—107. Egtved. 101—102. Belt-disc. 103. Awl with wooden handle. 104. Comb. 105—106. Armrings. 107. Ear-ring.

tended. Her face, on which the loose hair had fallen down, was turned towards her right shoulder. From the ornaments as well as from the garment it was at once evident that the coffin contained the body of a woman. She was dressed in a short jacket with elbow-sleeves, and a circular, spiral ornamented belt-disc (fig. 101—102) together with a horn comb (fig. 104) were fastened to a belt with a large tassel. Below the belt commenced a skirt of cords, which reached almost to the knees and was wound round the body. Her legs were naked;

Fig. 108. 1/2.

Fig. 109. 1/2.

Fig. 108—109. Egtved. Pail and box of bark.

but her feet were wrapped in some rags, which cannot, however, be regarded as real footwear. Behind the back of her neck there lay a cord, which must no doubt have served as a fillet (fig. 116); it is 1,30 m long and twisted of 3 threads. Of ornaments she had two bronze armrings (fig. 105—106), and at her left ear there was found a slender ring of thin bronze wire (fig. 107).

On a level with her face there stood a small *bark box* (fig. 109), which contained a *bronze awl* (fig. 103) with a wooden handle, a *woollen cord* 2,45 m long and twisted of 4 threads[2]), and some bits of burnt bones. Further there was at the left tibia a *piece of cloth* folded together, which contained a heap of cremated bones.

The liquid in the inside of the coffin must have been acid, because it has preserved the dead *woman's hair* and the *nails of her hands and feet*, but it has decomposed the bones completely; still it was possible to follow the outlines of her body, because when the coffin was opened, the cuticle lay pressed together to a thin, brown layer, which in spite of its advanced decomposition showed quite clearly the outlines of the body. Preserved are also parts of the brain, on which lay the fair rather short cut hair, and *29 crowns of teeth*, according to which the woman's age is estimated at 18—20 years.

Measurings of the body in the coffin show that she must have been *159—160 cm high* and measured *60 cm round the waist*.

An examination of the crusts found in the *bark pail* (fig. 108) has shown that it has contained a drink made of red whortleberries or cranberries, corn and gales with an addition of honey[3]).

It is strange that the cremated bones wrapped up in the cloth belong to a *child 8—9 years of age*, presumably sacrificed to the dead woman[4]).

In the coffin there were found (perhaps come in accidentally) a leaf of a bracken (*Pteris*

aquilinium) and a flower of a milfoil (*Achillea millefolium*) without leaves, and in one of its heads there were found chitin shells of *two insects*, bugs *(hemiptera)*.

BLANKET. The blanket which was spread over the dead woman, and the shape of which appears from fig. 97, is one of the most interesting pieces of cloth preserved from the Bronze Age; it deserves attention simply by its size. It has preserved three original selvedges and

Fig. 110. Egtved. The jacket. 1/4. p. 84.

at the plaited starting edge which is somewhat winding, it measures 170 cm. The width is at the lower cut edge 192 cm, this shows an increase of width which is rather unusual. The side-edges are respectively 258 and 250 cm long. Like the bottom fabric they are plainly woven, only the warp threads are somewhat closer together. The warp is S-spun, the weft Z-spun.

In this piece of cloth the usual over-crossings of the weft threads can be seen. At a distance of 20—35 cm from the cut border line an attempt has been made to follow the course of the weft threads across the whole cloth. The material is here rather well fitted for investigation, even though there are matted and decomposed parts. About 35 cm from the border line it is possible to point out two crossings of weft threads in each shed, which means that three different threads have been used in each shed. Then follows a belt 3—4 cm broad, where no over-crossings can be seen. Either some rows must have been woven with one thread, of the crossings happen to be in the indistinct and matted parts. But further on in the examined area we find three over-crossings in each shed, which indicates that four different weft threads have been applied at a time. The illustration, fig. 97 shows the distance between three crossings in one shed. Otherwise the method is in principle the same as was explained in the description of the Trindhøj blanket, and illustrated in fig. 42, where only three threads are observed (compare fig. 65). While the Trindhøj blanket is 133 cm broad, this piece measures

up to 192 cm, and it is not unlikely that on account of the breadth of the cloth it has been advantageous to work with several threads at a time.

A curious fault in the weaving occurs in the blanket; it consists in one and the same thread appearing as both warp and weft, and as the warp is S-spun and the weft Z-spun, it is possible to prove that it is not—as I thought first—a weft thread inserted in the warp, but on the contrary a warp thread, led through the shed as weft, probably because it has burst while

Fig. 111. Egtved. The back of the jacket. $^1/_7$. p. 148.

the work was going on. The thread, which in the drawing, fig. 98, is hatched, runs from the fault to the side-edge, bends and comes back into the material, where further on it is joined to a thread that has the same direction of spinning as the other weft threads. This observ-

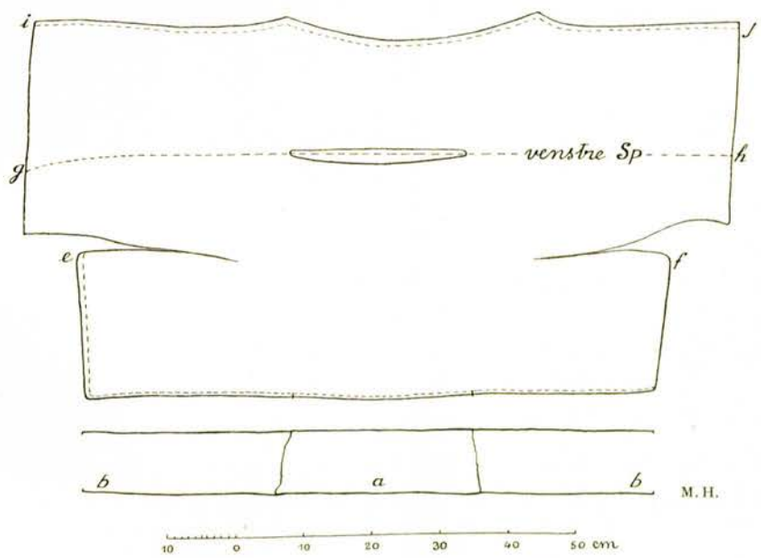


Fig. 112. Egtved. The pattern of the jacket. $^1/_{10}$. p. 158.

ation supports a theory advanced by Miss Agnes Geijer (see p. 127) that the plaited borders should be at the closing edge of a cloth, but I still think it possible also to find plaited borders at the opening edges.

The plaited edge of the blanket (the upper edge of fig. 99) is made in a manner similar to that of the cloth sewn together of the Æshøj grave fig. 87, 1. The edge of the Egtved blanket is, however, very irregular, being scalloped, and its width varying from two to six cm.

This is strange, as the stuff is otherwise rather accurately woven and with rather straight side-edges. In the description of the Muldbjerg gown a selvedge of piece IX was mentioned, in which occurred holes and small drawings out. Similar peculiarities are found in this blanket. With comparatively regular intervals we find holes or openings in the edge, and as

Fig. 113. Egtved. The corded skirt. 1/4. p. 86 & 149.

remnants of a thick thread or cord irrelevant to the weaving are still to be seen here and there in the edge, fig. 99, passing through such holes, it is possible that these peculiarities are traces of the setting up of the material on a beam or a bar, which has fastened it on the loom.

One corner is somewhat damaged; the other is very indistinct, the threads lying in a tangled bundle; there are remnants of threads tied in loops which apparently do not belong to the texture. The part of the material next to the plaited border is much matted, but further down there is less nap. It cannot, however, be made out, if the loss of part of it is due to decomposition. As it appears from the drawing the width at the top of the cloth deviates very much from that of the lower edge. Whether this striking irregularity comes from the weaving or from the fulling, is a question that cannot be answered.

THE JACKET. The fabric of the jacket (figs. 110—111) is so open that it can hardly have been subjected to fulling. The vertical threads are Z-spun, the horizontal S-spun; as the over-crossings which characterize the weft occur among the S-spun threads, these must be regarded as the weft threads; this is quite likely, since they lie at greater intervals than the vertical threads. Still it is an extraordinary case, because nearly always it is the warp that is S-spun, if both directions of spinning are present. Another deviation is found in this piece, the longitudinal threads (the vertical threads at the drawing) being also S-spun across a space of 15 cm measured from the edge of the right sleeve. Across the same part the weaving is particularly uneven. The material is drawn awry rather much, and the

line g—h (fig. 112) shows how the weft threads end in curves towards the edge of the right sleeve. The edge of the sleeves and of the neck-opening are oversewn with stitches of a kind known from the Borum Æshøj jacket (fig. 87, 3), and these also seem to have been made from the right to the left. S-spun thread twisted to the right has been applied for the sewing. The Egtved jacket has no small gussets under the corners of the neck-opening (as has the Borum Æshøj jacket). But an important point of resemblance is the lengthening at the waist by patches sewn on (fig. 112). Two pieces a and b have been applied, the seams of which are on the front side of the jacket.

One (a) is almost in the middle of the front side, whereas the other (b) passes round the back. The lower edge of b is a selvedge, probably a side-edge of a piece of cloth; it is, however, much damaged, and only in a few places it is so well-preserved that closed loops can be seen round the outmost edge thread. It is uncertain whether the different parts of the jacket come from the same piece of material, but it is not improbable that they do. The weaving is so unequal and uneven in the different parts of the jacket that deviations in the different samples are to be expected. When moreover threads of different direction of spinning lie parallel in the stuff, determinations on the basis of the spinning are very uncertain. Only the characteristic over-crossing of two weft threads is certain, and it shows here an exception, to wit that the Z-spun threads are the warp threads. At the lower edge of the jacket there was found a bronze belt-disc (figs. 101—102); 3,5 cm of its upper part were covered by the jacket. Under the bronze disc lay a beautiful horn comb (fig. 104). Like the belt-disc, it was fastened to a belt, which at the right side of the dead body was tied in so loose a half-bow that the woman can hardly have worn it in that way while alive; but from its position it appears that she has measured 60 cm round her waist.

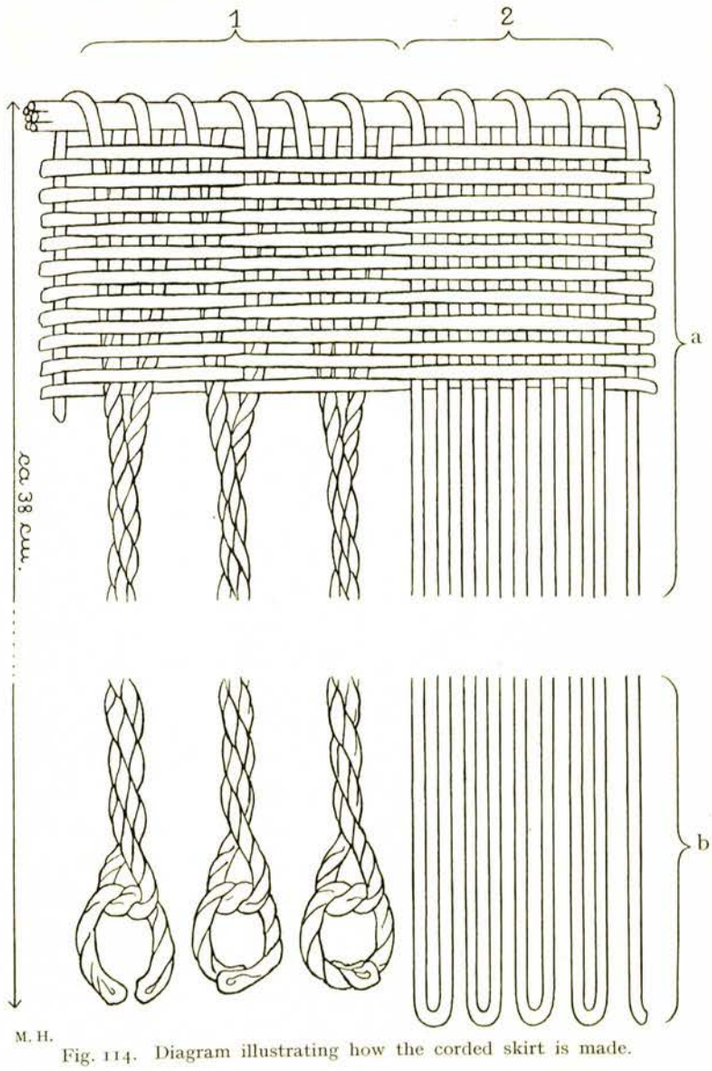


Fig. 114. Diagram illustrating how the corded skirt is made.

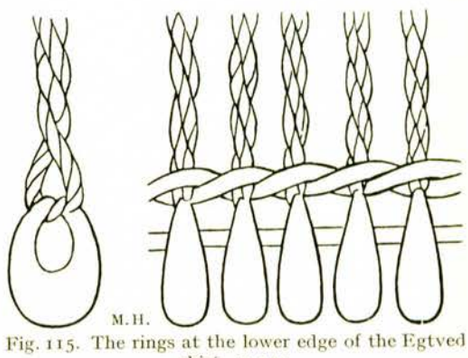


Fig. 115. The rings at the lower edge of the Egtved skirt. p. 143.

THE CORDED SKIRT. The corded skirt, fig. 113 consists of a band or belt, from which a row of cords or fringes hang down. The row of fringes covers 1,54 cm of the length of the band, and the skirt was wrapped twice round the body, being wound from the left side. Its width was 77 cm, 17 cm more than that of the belt, so it cannot have had its place round the waist, but must have rested on the hips. In order to bind the skirt the band had been lengthened on both sides. The strip which has probably been the outmost measures 26—27 cm and is continued in a three-plaited cord 17 cm long and ending in a knot from which some two-ply threads hang free. In one of the threads there is a ring of the same kind as those at the lower edge of the skirt. The other strip of the belt measures about 10 cm, and here we have found 2—3 double threads; probably the upper edge of the skirt has also been provided with some fringes with rings. Along the upper edge of the belt there is a very thick cord, on which the fringe-making strings are hung up (see figs. 114 and 115). From the diagram it appears further that the strings are made of one continuous thread, the vertical threads of the upper part a continuing in the vertical threads of part b, so that the full distance, indicating the length of the skirt, is 38 cm. The part marked 2 shows how the threads must have been inserted, before being twisted together into fringes. Part 1 shows the twistings, first two threads twisted to the right; then these have been twisted in pairs to the left. The belt, which carries the fringes, has the analysis of plain weaving and is made of S-spun wool. The lacing over the rings is made with two-ply, S-spun wool twisted to the right.

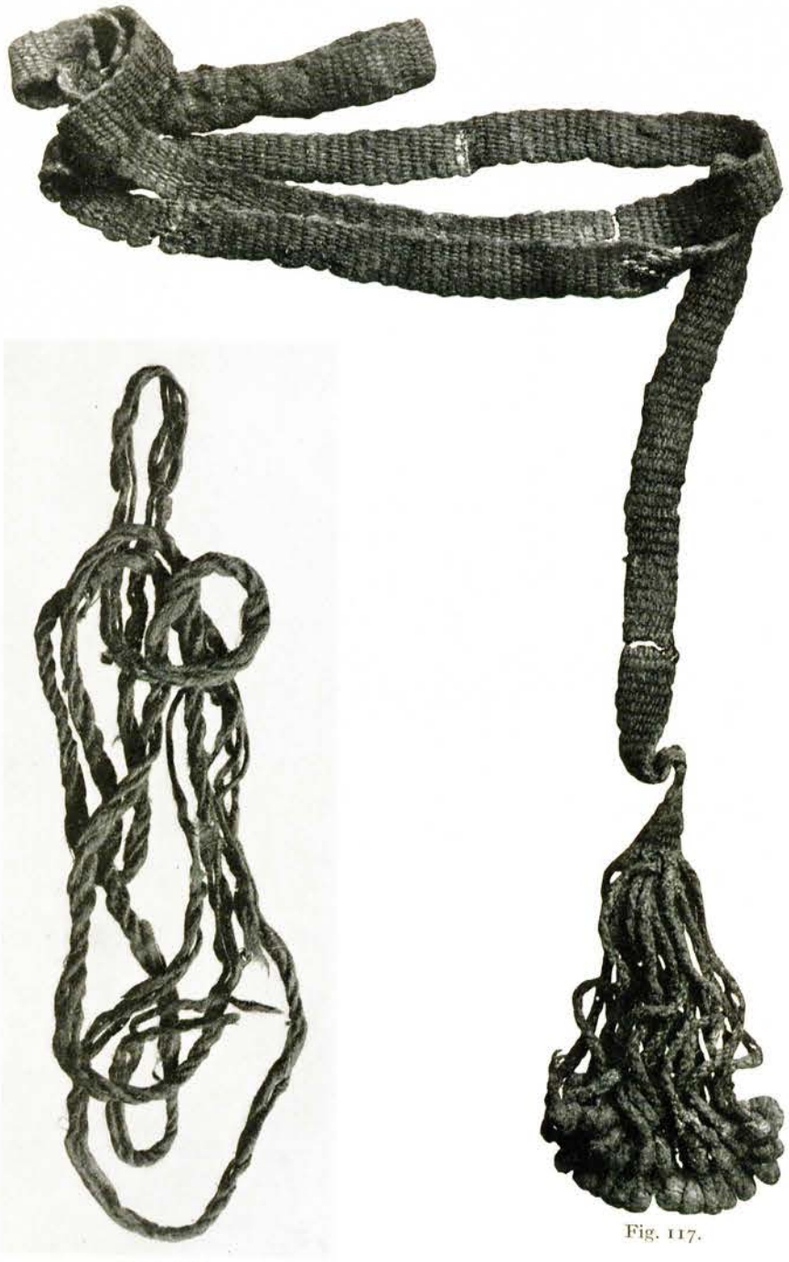


Fig. 116.

Fig. 117.

Fig. 116—117. Egtved. Cord, hair-ribbon. 3/4. The belt. 2/5. p. 142.

Here and there a fringe has its root in two neighbouring sheds; this peculiarity, which looks as if it were accidental, seems on a closer examination to serve the practical end of

keeping the bottom edge of the warp thread in its place, because there is nothing else to hold it close to the other warp threads, the weft never turning in the lower edge. The fringes end in rings strung together exactly like those of the tassel at the Borum Æshøj belt (fig. 95). The fringes are further joined together by two threads twisted together lying just above the rings (fig. 115). (See more about the making p. 142.)

THE BELT. The belt (fig. 117), which is 175 cm long and 2—2,50 cm broad, is plainly woven in the same way as the Borum Æshøj belt. At one end there is a tassel, at the other end a loop made as follows: 10 cm of this end have been doubled up and the two layers whipped together at the end and at the sides leaving an opening 4—4,5 cm long. Like the Trindhøj belt it has 20 S-spun warp threads, but the weft is laid double in the shed, which makes the band thicker and gives it a more solid impression. The tassel is made in a manner which reminds of the Borum Æshøj belt, the most elaborate of all the belts known from the Bronze Age. The tassel has 28 fringes arising from the belt in three divisions; 5 of the fringes are made of the continuation of the warp and each consists of two-ply threads, which accords with the fact that there are 20 simply spun warp threads in the belt. About $^1/_2$ cm above the original fringes there is a garland of artificial fringes, made of two-ply threads measured out in double length. In the centre the fringe is fastened under one or two of the longitudinal threads of the texture; probably the weaving has been finished first, and then the thread has been pulled through the "stitch" (the warp thread) by means of a needle. Finally the two hanging thread-ends have been twisted together to a fringe, the girth of which corresponds exactly to that of the original fringes. The third part of the tassel comes once more $^1/_2$ cm above the preceding one and is fastened in the same way. All the fringes end in rings like those of the other belts.

FOOT-CLOTHS. Round the dead woman's feet were wrapped some strips of cloth to make up for the foot-wear, as we know it from other oak coffin graves.

Round the left foot were found: a. A triangular piece of cloth, the longest side of which, a selvedge, is 45 cm, while the two short sides, which are concave, measure respectively 35 and 39 cm. The wool is S-spun in both directions. The selvedge seems to be made on the same principle as fig. 59, 1, but is besides very indistinct and matted; the edge is drawn and pierced, probably traces of lacing up. b. A triangular piece of cloth, which must be a corner of a larger piece, as it has two meeting selvedges, which are very indistinct; the longer one, which is 57 cm, is probably of the same type as fig. 41, 6, the shorter one, 25 cm long, probably like that of fig. 59, 1; it shows plainly curve-shaped drawings out, and in the middle of the curves holes are seen, probably cut by the cord used for lacing up the cloth. The third edge is concave, as if the piece was a bit that was left after the cutting out of a cloak. The material is much matted, so that counting of threads is impossible. The wool seems S-spun in both directions.

The following pieces were wrapped round the right foot: c. An irregular, square piece, the shortest side of which, a selvedge, is 9 cm long. The edge is compact and much matted; on the whole the piece is matted and indistinct. The threads are S-spun in both directions. d. A triangular piece, one border of which, a selvedge like fig. 41,6, is 26 cm long; the other edges are 15 and 32 cm in length. The threads are S-spun in both directions. e. A triangular piece of cloth with three cut borders, 10, 30, and 33 cm long. The wool is S-spun in both directions. f. 2 narrow strips of cloth.

Under the blanket close to the dead woman's left tibia there lay a bundle of cloth containing the cremated bones of a child 8—9 years old.

For wrapping up the bones a square *piece of cloth* had been used, a corner of a larger piece with two meeting selvedges, respectively 110 cm and 20 cm long; the two other edges are 27 and 97 cm long. The threads parallel to the longer selvedge are S-spun, those in the opposite direction Z-spun. The long selvedge seems to be like fig. 41,6.

The bronze ornaments—especially the belt-disc—date the find with certainty to the first period of the Early Bronze Age.

11. THE WOMAN'S GRAVE FROM SKRYDSTRUP, HADERSLEV AMT

In the summer of 1935 Mr. C. M. Lund, the keeper of the Haderslev Museum, excavated on the Skrydstrup field west of Haderslev a barrow (fig. 118), in which two mouldered oak coffins had earlier been found. Each of them contained a sword, so they must have been men's graves; at the investigation a third oak coffin was excavated, the primary central grave of the mound[1]). On a bed of stones laid on the old surface of the field a split hollowed-out oak bole had been placed in the Bronze Age and covered by a heap of stones, 3 m long in the direction of East—West, and 1 m broad (figs. 4—5). On top of the stone heap an earth mound had been raised, which was originally 1,75 m high and 13 m in diameter, but later on it was enlarged to a height of about 4 m and a diameter of 24 m. As it appeared from well-preserved remnants of plants in the deep layers of the mound, the filling consisted of green turf, apparently peeled off near the place of the mound.

The dead body, which was covered by two woollen cloths (pl. I), lay with its head towards the west end of the coffin, and although the coffin was very much decomposed, its contents proved to be well-preserved. The cause why in spite of the advanced decomposition of the coffin the find was still preserved must be the fact that under the grave there lay a thick layer of pan and in the line between the primary and the secondary mounds several thin layers of compounds of iron had been deposited and had luted together the grains of sand, so that the grave got locked up in a kind of airtight, semicircular box, which at the excavation proved to be full of water. Under these circumstances the oxygen of the air and the putrefactive bacteria have been excluded from any contact with the contents of the coffin.

The grave was plastered up and sent to the National Museum in Copenhagen, where the dressing and the preservation was undertaken by Conservator G. Rosenberg.

The burial of the dead woman had taken place after the rite known from other oak coffin graves. The dead body had been laid on a cow skin and covered by two pieces of cloth, on top of which the corners of the skin had then been bent towards each other (pl. I). When the blankets were removed the dead person, a woman, was seen lying on her back with her arms stretched down along her sides (pl. II). Hair, eyebrows, eyelids with lashes, parts of

Fig. 118. Skrydstrup. The barrow before the excavation. (C. M. Lund).

cheeks and chin were preserved; but the nose and the lips were decomposed and the beautiful teeth laid bare (pl. III). Her hair was covered by a net of horse hair, her brow surrounded by woollen cords, and under her head lay a piece of textile work pressed together, a cap, from which a great many cords projected. Of ornaments two spiral rings of gold thread were found, one at each ear; they seem to have been placed on the outer ear. The upper part of the body was covered by a jacket with elbow-sleeves, the lower part by a wide piece of cloth sewn together, the upper edge of which adjoined the lower edge of the jacket and was held together 20—25 cm below the waist by a belt, to which was tied a horn comb (pl. II and fig. 143). 20—25 cm of the lower edge of the cloth were folded round her feet, which had worn a pair of leather shoes and a kind of stockings consisting of oblong square pieces of cloth. It is important to emphasize that there has occurred no displacement whatever of the pieces of garment, apart from the sinking due to the decomposition of the body. Since the lid of the coffin was decomposed so that the stone cover had partly been in direct touch with the fabrics, these were much squeezed together, the threads had burst, and the bones of the skeleton were in part pressed through the cloths. At the bottom of the coffin there lay pressed together a layer of *plants*, which *Dr. phil. J. Iversen* declared to be different kinds of grass and leaves of an umbelliferous flower (*Antriscus silvestris*), which must have been newly picked when they were laid in the coffin. This fact gives an information of importance for the interpretation of the costume, viz. that the dead person must have been buried in the summer half-year. The hairs of the dead woman have been examined by *Dr. phil. C. M. Steenberg*, Professor at the University of Copenhagen, who has made out that they were originally cendré, and that a frisette of combed off, short hairs has been placed as filling in the artificially set up coiffure, which was covered by a net of horse-tail hairs.

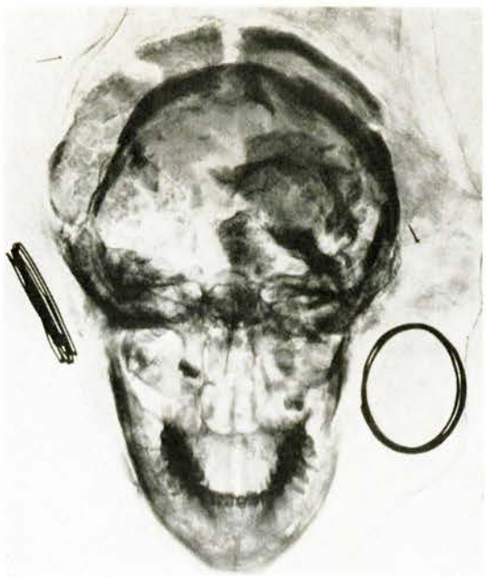


Fig. 119. Skrydstrup. X-rays photo of the woman's head. $^1/_3$.

Fig. 120. Skrydstrup. X-rays photo of the woman's teeth. $^1/_1$.

The skeletal parts have been studied by *Dr. K. Fisher-Møller*, anthropologist, and by two X-rays experts, *Dr. Chr. J. Baastrup*, chief physician, and Mr. *E. Kristiansen*, dentist; from their investigations I quote the following results about the exterior and the age of the dead woman:

The Skrydstrup woman is *dolichocephalic* with a long narrow face and a rather narrow nose. The bones of her limbs are long and slender, and according to a computation of the bones and to measures taken of the skeleton in the grave, her stature is estimated at 170—171 cm; her waistline was 105 cm above the sole of the foot.

"The X-ray photographs of the bones of the limbs shows closed epiphyses with very distinct epiphysis lines; the photograph of the cranium (figs. 119—120) shows the presence of all teeth exept the wisdom-teeth, which in the lower jaw are not even out, and in the upper jaw not fully developed. Accordingly the dead woman's age must be 20 years at most. The teeth are well-preserved without traces of caries or any other diseases".

On account of the bad state of preservation of the oak coffin and especially the lid the textiles of the Skrydstrup find were on the whole very much damaged, torn, and decayed, a fact which is so much more regrettable as a great many cloths were found there, and as no other single find has yielded so rich a representation of the different textile techniques as this one.

Fig. 123. Skrydstrup. The jacket. 1/7. p. 148.

TWO SQUARE PIECES OF CLOTH, BLANKETS. As mentioned above the dead woman was covered by two square pieces of cloth, spread lengthways over the body and almost hiding it. Uppermost there lay a large blanket, reaching from the feet of the dead body to its brow; under this lay a smaller one only visible at the brow, pl. I.

Blanket A. This piece is rather badly preserved, and large parts are totally missing. One side is 161 cm long, the other 160 cm. At the upper edge, the selvedge, it measures 125 cm, at the lower cut edge its width is 123 cm. The weaving is plain, and the thread is S-spun both in warp and weft*).

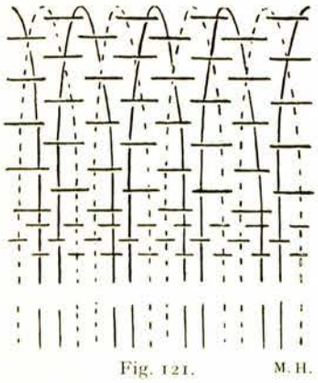


Fig. 121. M.H.

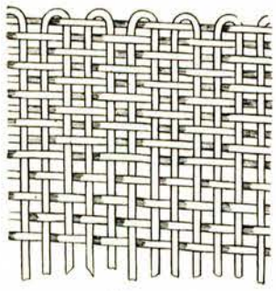


Fig. 122. M.H.

Fig. 121. Skrydstrup. Woven border at blanket A. The same type is found on the lower border of the jacket. Fig. 122. Skrydstrup. Woven border of the foot-wear, fig. 141.

The three borders have natural selvedges, whereas the fourth border is cut off; the 10 longitudinal threads that make the edge are somewhat closer together than the rest of the warp, but apart from this the analysis does not differ from that of the fabric in general.

The closed edge parallel to the direction of the weft is a starting border, i. e. an independently woven border set up as a work preliminary to the proper weaving, with the object of making a regular arrangement of the warp threads as a basis for the weaving of the material (see further p. 127). This border (fig. 121) has 10 threads, and in principle the analysis corresponds exactly to the selvedge at the waist of the jacket.

Blanket B. The other blanket measures at one side-edge 193 cm, at the other 179 cm. The upper and the lower edges both measure 106 cm, all measures are, however, based on an estimate, the piece being much damaged by decomposition.

*) Analysis of the textiles see p. 163.

The weaving is plain. The longitudinal threads of the cloth, the warp, are S-spun, the weft is Z-spun. In spite of the bad state of preservation crossings of the weft threads may be seen here and there. The number of crossings is doubtful, but one thing is certain: that at least two, probably more weft threads have been in use simultaneously in the weaving.

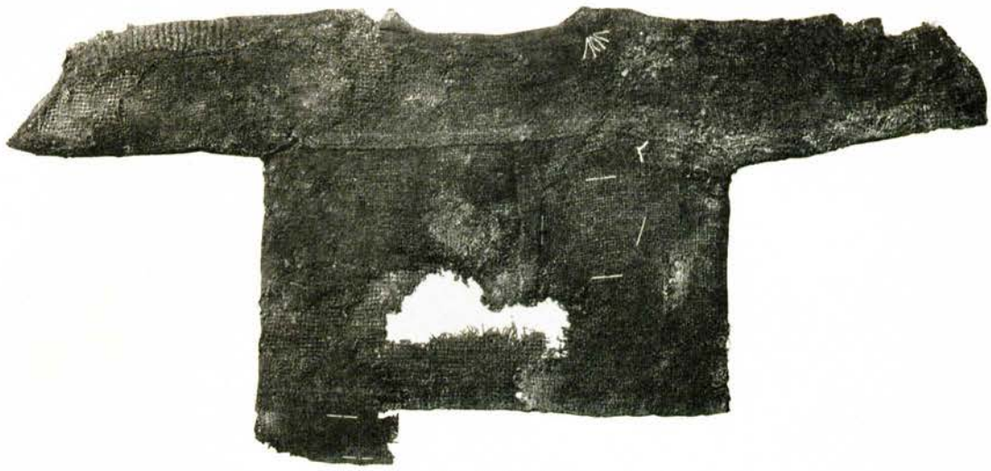


Fig. 124. Skrydstrup. The back of the jacket. $^1/_7$. p. 148.

Three of the borders have natural, closed selvedges, whereas the fourth shows cut thread ends; the plaited border belongs to a type illustrated in the drawings of fig. 59, 3, fig. 69, and fig. 87, 1. The principle of the method of working is the same in all cases, and it shows that a decided plaiting technique and weaving may be found in one piece. The edges of both longitudinal sides are preserved; each consists of 12 S-spun threads. The analysis of the edge does not deviate from that of the rest of the fabric except that the edge threads are closer together than the rest of the warp.

IRREGULAR, SQUARE PIECE OF CLOTH. At the left side of the dead person, almost on a level with her chin and close to the cap, there was found a folded, irregular, square piece of cloth about 39×31 cm. In one direction the threads are Z-spun, in the other S-spun.

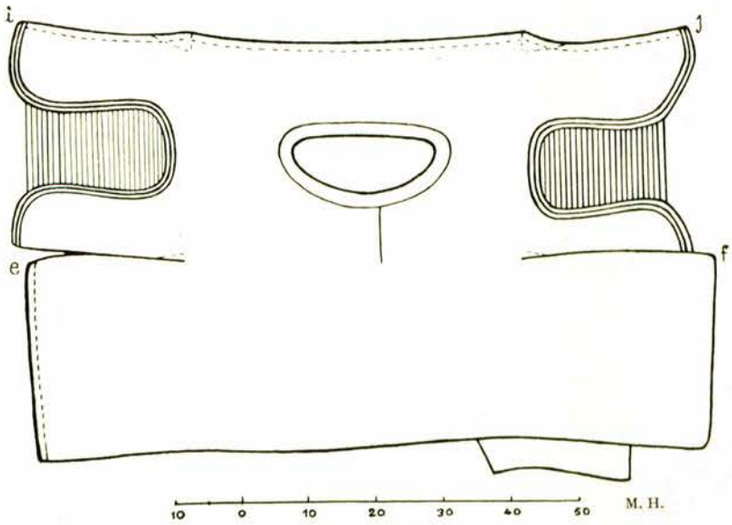


Fig. 125. The pattern of the Skrydstrup jacket. $^1/_{10}$. p. 158.

JACKET. The dead woman was dressed in a short-sleeved jacket, and the photograph, pl. II, shows its position in the coffin before its taking up; the photographs figs. 123—124 were taken after the cleaning of the jacket in the laboratory and show its front-side and its back-side. Unfortunately the state of preservation is not good, certain parts being lost; but the most valuable parts, that is the embroideries, are comparatively well-preserved.

The weaving is plain, the warp threads are S-spun, the weft is Z-spun. The material shows

Fig. 126. Skrydstrup. Detail of the right sleeve. $^1/_1$.

Fig. 127. Skrydstrup. Diagram of the embroidery of the sleeve.

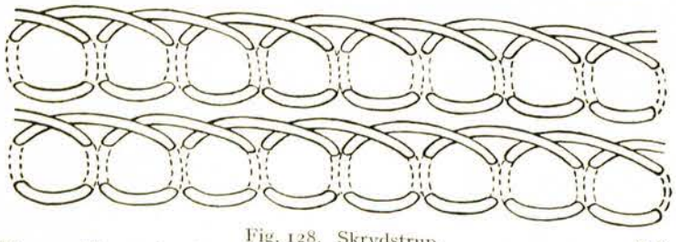


Fig. 128. Skrydstrup. M. H.
Diagram illustrating the sewing by which the ribs are made on the sleeve.

no signs of having been fulled. The cut of the jacket corresponds exactly to that of jackets from earlier finds. The pattern fig. 125 shows, how—by a careful calculation—it has been possible to create out of one cloth a piece of garment in shape. It seems quite simple, but still it is very ingenuously made. The two flaps below the letters e and f are bent towards eachother and meet in a vertical seam along the middle of the back, and the horizontal line between i and j is bent down, making a seam across the back and under the arms.

At the armpits gores are inserted, strips of cloth tapering off, which strengthen the seams and give a little more freedom of movement to the jacket. Also the short downward line is of importance for the shaping; for it marks a small sewing-in, which gives a better rounding to the neck-opening, removing some of the width necessary across the breast.

Copies of the original garments have been tried on living persons of the same stature as the buried women, and they show that the jackets have been unusually well-fitting; this is increased by the horizontal seam across the back drawing together the two meeting borders so that they overlap each other; in this way the material is shortened at the back, the front piece seems longer in proportion, and gives the necessary room for the bust.

At the lower edge there is a bit of cloth about 21 cm long and 5,5 cm broad, which as it sits now seems to be rather uncalled for. As, however, the jackets from Borum Æshøj and Egtved have lengthenings all the way round the waist, most likely a corresponding addition has been present here, but was lost already before the jacket was used for clothing the dead body.

In the remaining bit the number of threads across 5 × 5 cm is 25 S-spun and 17 Z-spun threads; the direction of spinning is opposite to that of the rest of the jacket, where the S-spun threads are vertical. Apart from this addition the lower border of the jacket ends in a closed selvedge, and the threads at right angles to the selvedge are, as already mentioned, S-spun, which is usually the case with the warp, whereas those in the opposite direction are Z-spun, as is generally the weft. So evidently the jacket is cut lengthways in the material, a supposition that is also supported by other features; thus the lower selvedge, shown at fig. 121, is of a construction determinable as a starting edge. Further the threads parallel to the border have the over-crossings characteristic of the weft.

As to the sewing and embroidery the Skrydstrup garment is superior to those known from other finds; varied applications of the stitches have to a far greater extent been used for decorative effects.

Thus some peculiar stitches forming something like a cord are found at the neck-opening and as a framing to decorated squares on the sleeves. These stitches are performed with three threads fastened in the ground under ordinary whipping stitches, figs. 126—127.

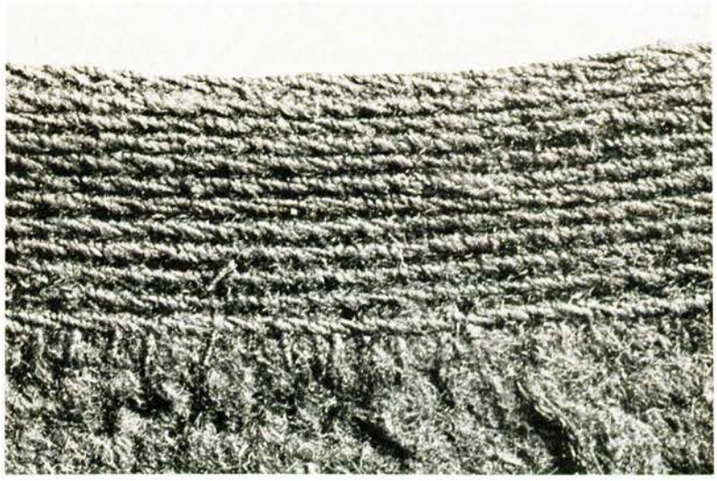


Fig. 129. Skrydstrup. The embroidery at the neck-opening. $^2/_1$.

The bounded squares at the sleeves are striped off with a kind of relief-like ribs, produced by a contraction of the material by means of a coarse two-ply thread twisted to the right, fig. 128. The stitch is related to the buttonhole stitch at the edge of the neck-opening, which will be discussed below; but whereas the thread at the neck-opening passes down into the preceding row of stitches, that at the sleeve lies in the material itself, and the raising of the surface, which gives the effect of relief, is the result of passing the thread to the backside of the cloth and tightening it. This kind of sewing may also be found in both earlier and later embroideries, where it goes under the name of Indian ground.

Even more interesting is the border about 2 cm broad at the neck-opening; the schematic diagram fig. 130 and the photograph fig. 129 seek to illustrate how it is performed. As a matter of fact we have here a two-storied sewing, the border being first sewn with a sort of buttonhole stitches or scallop stitches, the first row of which is fastened in the cloth edge, while the second row passes into the loop of the first, the third one into the second, and so on. The result is a kind of network. By their position the stitches seem to have been made from the right to the left. On top of the network there is a cord-like sewing, made of three threads, which pass into the turnings of the buttonhole stitches one by one. This technique has a parallel in a man's cap from Trindhøj (fig. 28, 2), the crown and sidepiece of that cap being joined together with similar stitches. The technique has one quality in common with crochet work, that is the sewing is made with one continuous thread; it is possible to decrease or increase, which means to shape the object by contracting or extending the work. Hence this technique is appropriate and proper, where the sewing must follow a rounding as here at the neck-opening of the Skrydstrup jacket.

Apparently buttonhole stitches have played a prominent part in our early textile art both for sewing on cloths and for making a network built up solely of a continuous thread. In the Bronze Age the buttonhole stitch was common, and in the earliest Danish textile work, a network of bast found in Ordrup Mose, a bog near Copenhagen, we have the same stitch only with one more turning of the thread, fig. 131.

From pile-dwellings in Switzerland we know a fragment of a network in the same technique, probably belonging to the Stone Age[2]). Fig. 132 shows a similar piece, belonging to Biologisch-archäologisch Institut de Rijks-Universiteit te Groningen; the director Dr. A. E. van Giffen has been obliging enough to lend it to us for an examination at the National Museum of Copenhagen. As to the circumstances of the finding Professor van Giffen informs us that it was found "in Valthe, an der Grenze zwischen Geest und Moor, unter Moor, auf dem

diluvialen Untergrund. Gemeinde Odoorn, Provinz Drente." Together with the net there was found a ball of yarn, a comb, and an "Absatzaxt", objects that date the find to the Early Bronze Age, to which period also mounds with surrounding palisades belong. The

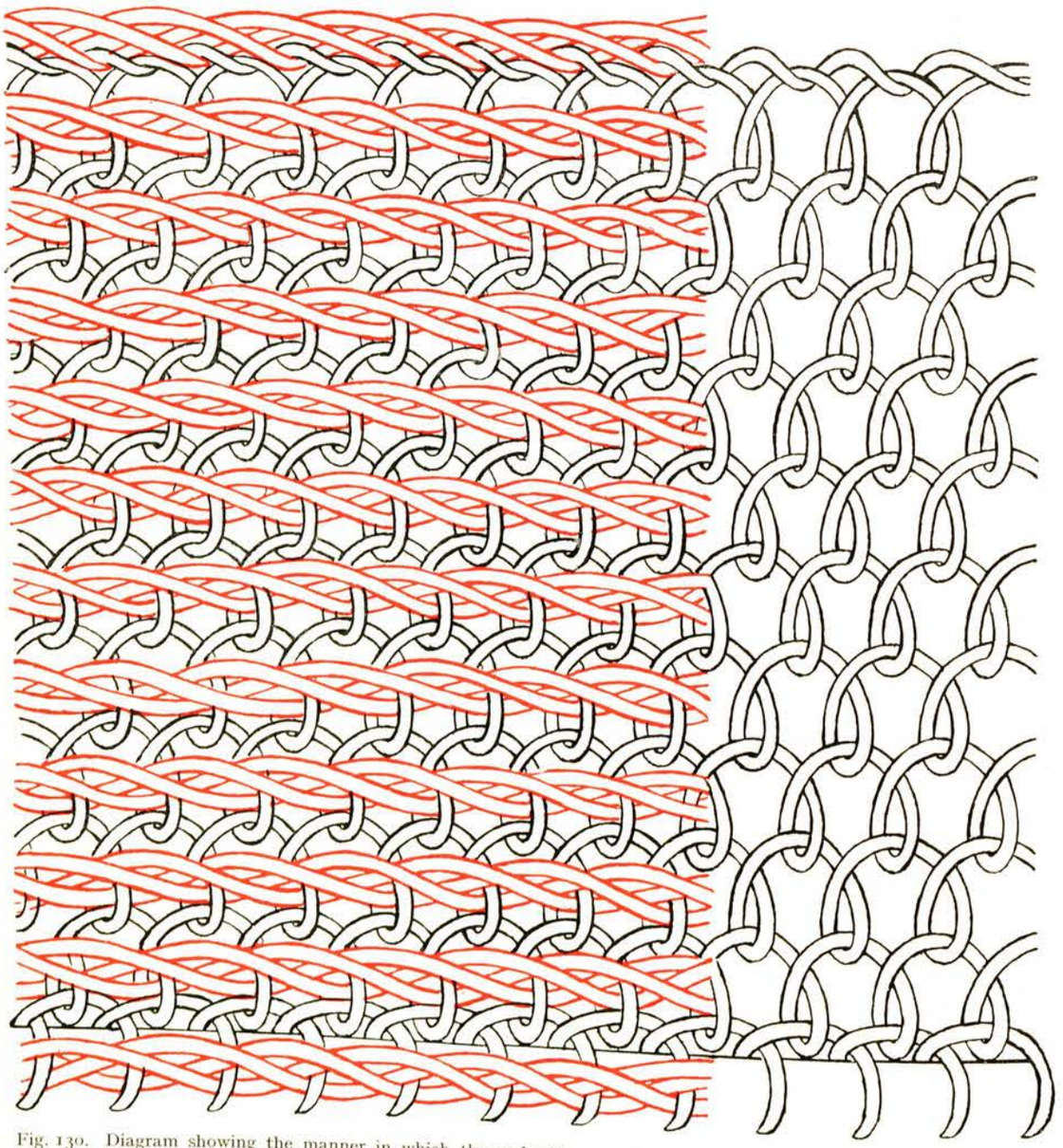


Fig. 130. Diagram showing the manner in which the embroidery at the neck-opening of the jacket is sewn. M. H.

piece is much damaged and its original shape cannot be determined. In the Antiquity networks of this technique have probably been made of different materials and meant for different use. For instance vines and climbers or rowels twisted of grass may have been used for baskets. At any rate the idea is not far to seek and easy to perform even for people that have but few technical aids at their command, and as a matter of fact those kind of nets are well-known among primitive peoples, who often use them for bags and hand-nets[3]); thus the Ethnographic Collection of the National Museum of Copenhagen is in possession of a net from the Congo made in this technique.

In North America the same kind of sewing is still in use for the making of cloaks (fig. 133) cut of long strips of hare skin; and the technique is still alive in the domestic industry of

Sweden. Through modern industry it has now come into use according to modern requirements; thus baskets are plaited from long shavings of coniferous trees, cut up in strips and softened by various processes. Fishermen, shop-boys, and gardeners avail themselves largely of such baskets[4]).

Fig. 131. Ordrup bog. Fragment of a network of bast.

PIECE OF CLOTH SEWN TOGETHER. From the waist to the feet the dead woman's body was, as it appears from the photograph pl. I, wrapped up in a piece of cloth sewn together, arranged in large folds, and held together by a belt. The upper edge of this piece reached the lower edge of the jacket (pl. II) and began 30 cm from the chin, 62 cm from the upper limit of the hair; the lower edge was folded round her feet.

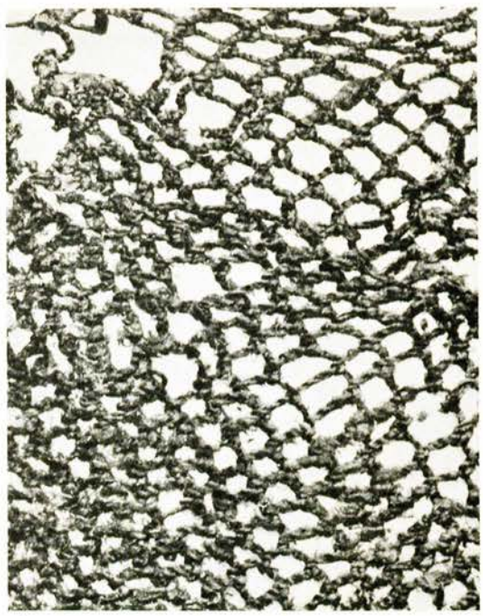


Fig. 132. Detail of a network from the Bronze Age found in Odoorn, Holland.

The cloth was exceedingly damaged by decomposition and by the pressure from the overlying stones. In many places the bones had been pressed through the stuff, which was transformed into a hard, crisp mass, for which reason it is now very poorly preserved. The edges as well as the bottom fabric have numerous rents and holes, and here and there even rather large parts are missing. The photograph of fig. 134 shows its shape and state of preservation; its size appears from the drawing of fig. 135. The cloth is now dark brown and measures 2 × 195 cm in length; its largest width is 145 cm. On account of the damagings the length of the upper edge cannot be measured quite accurately.

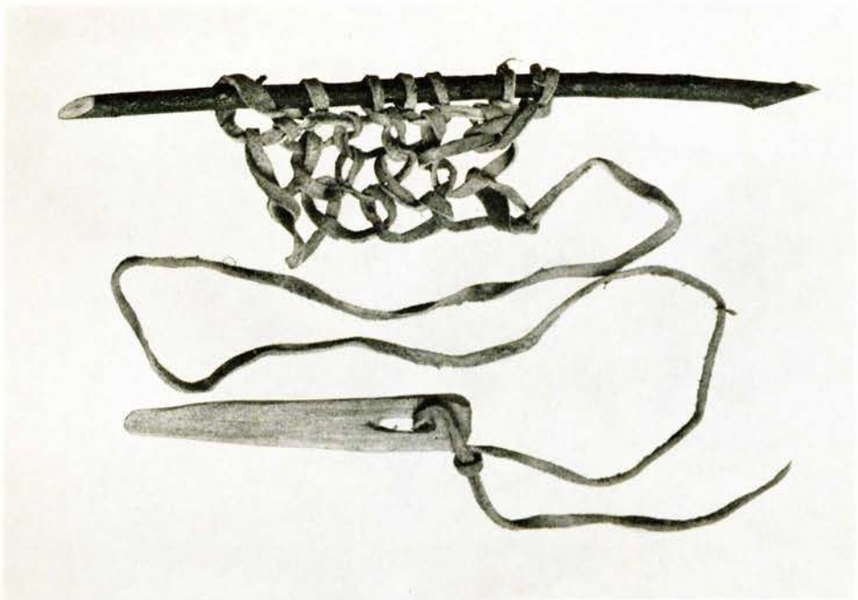


Fig. 133. Sewing of skin, from North America. (Ethnographical collection of the National Museum, Copenhagen.)

The cloth is plainly woven. The warp is S-spun, the weft is Z-spun. The closeness of the threads has been examined at four squares of 5 × 5 cm and 10 × 10 cm, and the figures are indicated at fig. 135 and p. 163. The material is much matted and difficult to analyse, and nowhere it is possible to follow the course of a weft thread from edge to edge; but numerous crossings of the weft threads have been ascertained; a

few weft threads are found to return before reaching the opposite edge, and traces of two gores may be seen. The two longitudinal selvedges are ordinary edges of plain weaving,

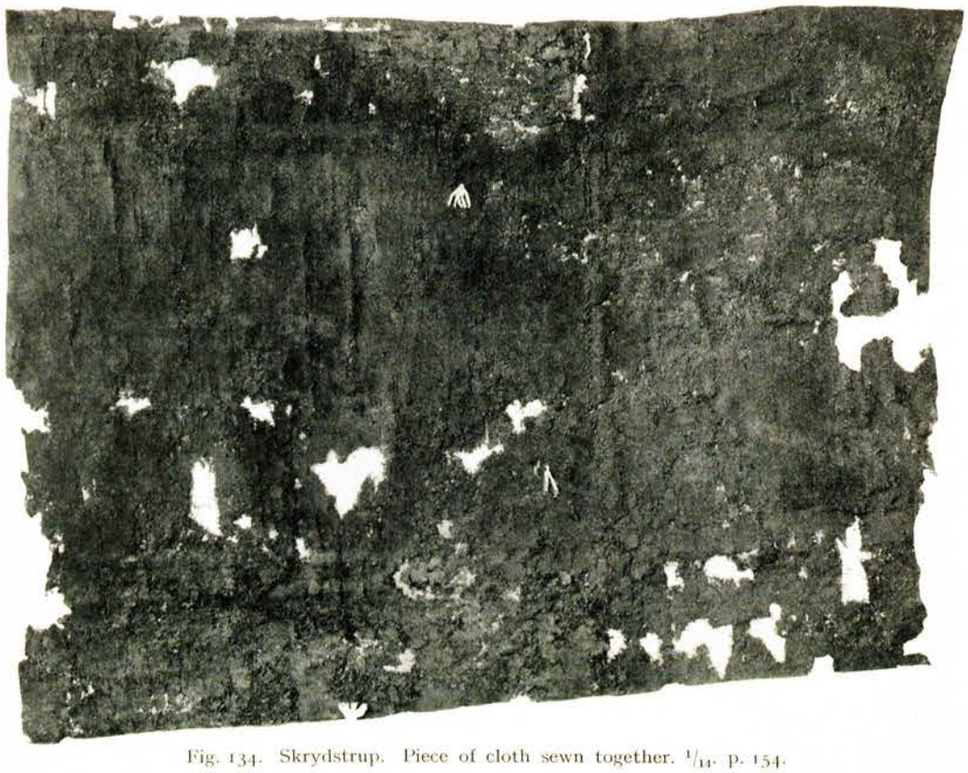


Fig. 134. Skrydstrup. Piece of cloth sewn together. $^1/_{14}$. p. 154.

performed in the same manner as fig. 41, 6. The edge parallel to the weft threads is plaited on the same principle as fig. 87, 1. Unfortunately it is so matted and the thread is so fragile

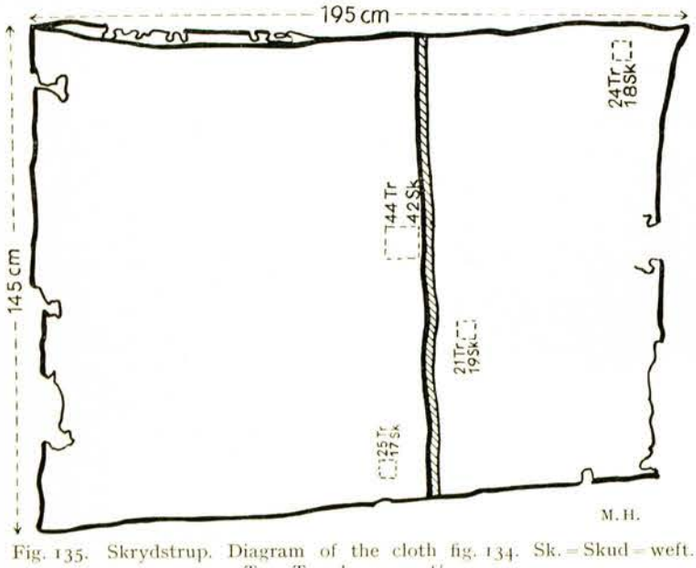


Fig. 135. Skrydstrup. Diagram of the cloth fig. 134. Sk. = Skud = weft. Tr. = Trend = warp. $^1/_{20}$.

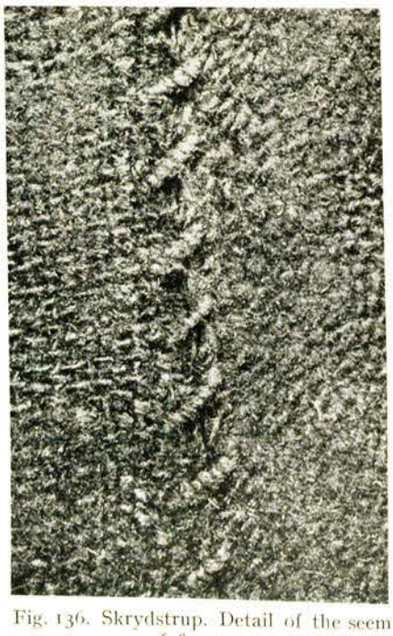


Fig. 136. Skrydstrup. Detail of the seem of fig. 134.

that it cannot be analysed more closely. The fourth border of the cloth is simply cut. The seams by which the two edges are joined together, fig. 136, is made with rather

coarse stitches; on an average 8—10 stitches cover 10 cm, or each stitch is 1—1,5 cm long. The thread is two-ply and twisted to the right. The seam was found to be at the front-side, and its oblique course across a part 25—30 cm long from the middle of the left

Fig. 137. Skrydstrup. Detail of belt. 1/1. p. 99 & 148.

thigh towards the comb is plainly visible at the photograph pl. I; above and below that part it disappears in the large folds of the cloth. As far as can be seen from the state of preservation of the whole piece, the almost 4 m long, and up to 145 cm broad cloth, in

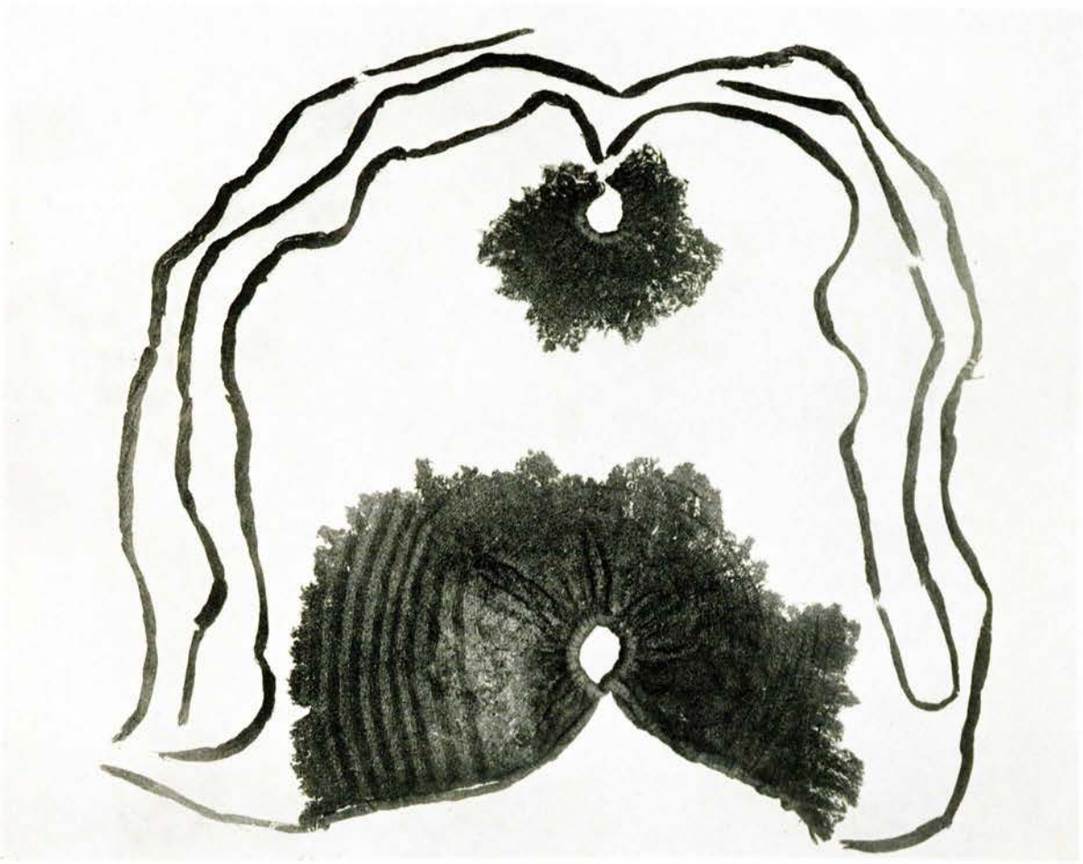


Fig. 138. Skrydstrup. The braided cap. p. 137.

which the dead woman was wrapped up, is not cut out or shaped in any other way. It has a close parallel in the piece of cloth sewn together which was found in the Borum Æshøj woman's grave (fig. 83 & 85); but it is somewhat larger, the former being only 330 cm long and not more than 122 cm broad. Both pieces have been joined together at the front-

side by a coarse seam. The seam of the Skrydstrup cloth is made with two-ply wool, whereas that of the Æshøj cloth is made with 4 or 5-thread wool, the threads being not twisted but simply doubled up. These clumsy sewings differ very much from the careful seams found on the jackets.

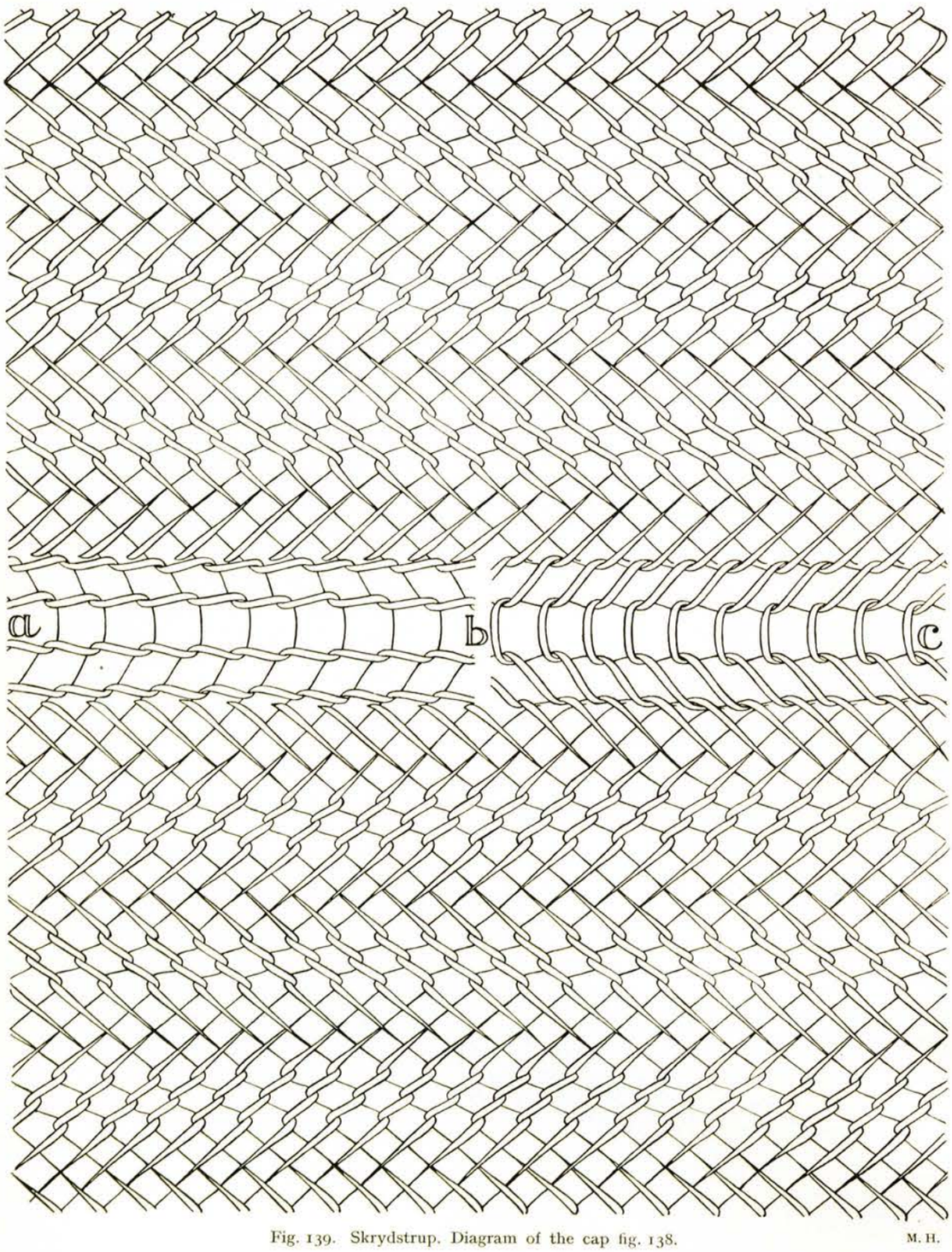


Fig. 139. Skrydstrup. Diagram of the cap fig. 138. M. H.

THE BELT. The piece of cloth sewn together is held in place round the dead body by a belt woven of a fine rather light wool. Its length is 215 cm and its breadth varies from 3 to 4 cm. The warp consists of 46 simply spun threads, the direction of spinning is to

the left both in warp and weft, the latter being likewise simply spun.

At one end the belt closes in a knot, which shuts in some torn threads. Hence the belt must originally have been longer, but part of it is lost. At the other end there are some fringes, fig. 137, which in a quite simple manner are plaited together of small tufts consisting of several threads. The tassel is damaged, but originally there were 5–6 fringes.

The analysis of the belt shows plain weaving of the type called rep. The threads lying lengthways are so close together that the weft is quite hidden. On the band weavings see the section p. 142 seq.

Fig. 140. The Skrydstrup cap, reconstructed by Margrethe Hald.

HAIR-NET OF HORSE HAIRS. As it appears from the photographs pl. III–IV the hair of the dead woman's head was covered by a net, which according to Professor C. M. Steenberg's determination is made of the mane or the tail of a horse. On account of the extraordinarily advanced decomposition of these hairs, most of the net crumbled away shortly after the removing of the find from the grave. According to Mr. G. Rosenberg's analysis the net is made in such a manner that the horse hairs, which are twined together two by two, cross at a right angle another system, twined together on the same principle. At the intersecting points the meeting strands are twisted round each-other. When the net was made the hairs formed quadrangular squares of about $^1/_2$ cm. In use they have been drawn awry and formed into rhombs, as it appears from the photographs. The free ends of the horse hairs were tied down into a cord of woollen threads.

CAP OR HOOD. Under her left cheek there lay rolled together a textile work, from which a great many cords projected, pl. II. It proved to be so much pressed together that it constituted a flat, very hard and brittle cake, pl. IV, much damaged by decomposition. Also the cords were partly squeezed together to flat tapes broken in many places, so that it was impossible to disentangle the various windings and separate the cords without taking them to pieces. When the cake had been soaked and cleaned, it was seen that the textile work, the present state of which appears from the photograph fig. 138, had fallen apart into two halves of unequal size, which could be spread out; and although a rather large part of it is missing, it seems by its position in the grave to have been a kind of cap or hood, ample

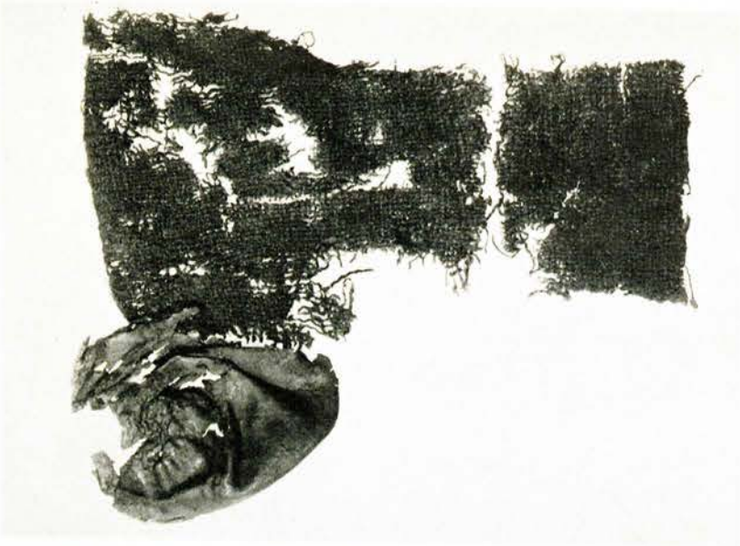


Fig. 141. Skrydstrup. The right shoe and a strip of cloth. Ca. 1/3.

Fig. 142. Skrydstrup. The left shoe. Ca. 1/3.

enough to protect the large, artificial coiffure. The cap is made of two-ply, S-spun wool twisted to the right, and has a dark almost black colour, and it is braided in the same manner as the hair-net from Borum Æshøj (fig. 93–94).

The preserved cords have been pulled through passages in the two borders, and a pull on the cords has given to the piece the shape of a semicircular bag (fig. 140). As it appears from fig. 138 the cords at one side have been crossed and drawn together to a ring, and then after that they have been led through the meshes of the side-edges; it cannot be made out whether the other side has been arranged in the same manner, as it is almost quite lost.

On account of the many ruptures it is impossible to state with absolute accuracy the length of the cords, but it may roughly be estimated at 5,50 m. The plaited work itself must when complete have been about 30 cm in the longitudinal direction of the threads; in the opposite direction the measure is less certain, the elastic stuff being able to stretch rather much; but the width must have been somewhere about 75 cm.

Whereas the Borum Æshøj net, figs. 93–94, had but one row of meshes in the closing, the Skrydstrup cap has two, see fig. 139 a–b and b–c. Further the closing is double, as the two layers of thread with which there has been worked all through the plaiting are closed separately. We must thus imagine the part which in the drawing is shown between a and b continued across b and c; this double row forms a tube or passage wide enough for a coarse knitting needle to pass through.

FOOT-CLOTHS. Two rectangular pieces of cloth were found at the feet of the dead body; the one at the right foot is 33 cm long and its width varies from 12 to 19 cm. As the photograph (figs. 141–142) shows, it is rather damaged by decomposition. The weaving is plain, the wool is now of a dark brown colour. The longitudinal threads are S-spun, the others are Z-spun and seem to be the warp. On a square of 3×3 cm there are 9 weft threads and 11 warp threads. On the longer narrow side there is a simple starting edge,

fig. 122. The edge threads making the border are Z-spun; the three other edges are cut out with a sharp instrument and not hemmed. The upper longitudinal side is cut out in a curved line, and in four places of this edge we have found, with intervals of 3 to 6 cm, remnants of threads of a fine, black, two-ply wool, twisted to the right.

The cloth found at the left foot corresponds in size to the former one; it measures 30 × 12 cm, is rather decayed and torn. The weaving is plain, the longitudinal threads are S-spun, those in the opposite direction Z-spun. All edges are cut and not hemmed, but on one longitudinal side there is near the edge remnants of a dark thread twisted to the right.

Fig. 143. Skrydstrup. Comb of horn. $^2/_3$.

LEATHER SHOES OR SANDALS. At both feet of the dead body were found remnants of leather shoes, which in spite of their damaged state are plainly seen to have been real foot-wear, worn by the living woman, and not shoes made solely for the grave.

Of the right shoe (fig. 141) a 12—14 cm long and 10—12 cm broad piece of the lower part of the toe is left, whereas the heel and the vamp are decayed, only at the outside of the shoe 3—4 cm of the edge are preserved; the edge has been oversewn with a thin leather strap 2 mm broad, and the sewing is very tight. The piece of leather has had the grain side turned outward, and the grain is partly worn off, especially along the outside of the foot.

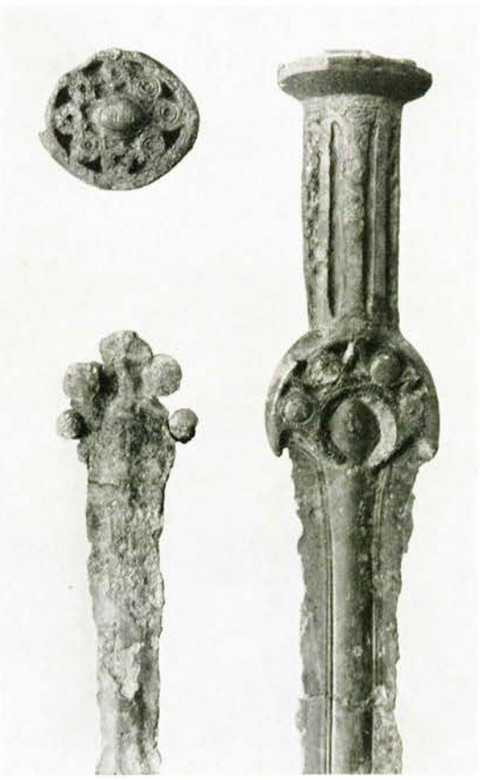


Fig. 144. Skrydstrup. The swords from the secondary graves.

Of the left shoe (fig. 142) almost the whole part of the sole is present; it is 25 cm long and 15 cm broad, and at the inside there was a distinct impression of the big toe. Two bits of leather, one 13×5 cm, the other 3×2 cm, found in the shoe, must be regarded as parts of an extra loose sole. In the shoe there were further found some hairs and remnants of plants; the latter were examined by Dr. Iversen and proved to be different sorts of grass, which, however, were too decomposed for a closer analysis.

This shoe likewise showed marks of wear in the grain, especially at the outside of the foot; along 5 cm of the inner side a remnant of an oversewing was preserved, similar to that of the other shoe, performed with a thin leather thong, 2 mm broad. Just below the edge there are two holes. The vamp is quite decayed. 3 strips of leather 10—12 cm long and 6—8 mm broad lie close together under the hollow of the sole.

The shoes must have belonged to a type reminding very much of the shoes known from the later bog finds, see fig. 187. The strips of cloth have been wrapped round the foot

as a kind of stocking in order to protect the foot from being chafed by the leather. There were no ornaments in the grave to date the find within the Northern Bronze Age. But the whole shape of the grave, and the vestment and the comb seem to indicate that the find belongs to the first section of the Early Bronze Age, a fact which is confirmed by the

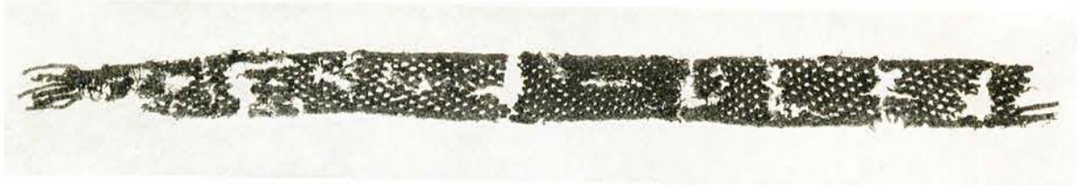


Fig. 145. Bredhøj. Belt. 1/5.

swords found in the secondary graves, fig. 144, which both belong to that period. It cannot be later than the first section of the Early Bronze Age, and the likelihood is that only a short space of time has elapsed between the laying-out of the 3 different graves, the central grave and the two secondary graves.

12. WOMAN'S GRAVE FROM BREDHØJ, RINGKJØBING AMT

In the year 1885 Dr. Henry Petersen excavated the large mound of Bredhøj in Maabjerg Sogn, north of Holstebro. It held four tombs from the Bronze Age, one of which, grave A, was made of a split and hollowed oak trunk, 2,90 m long, 0,95 m broad; it was now

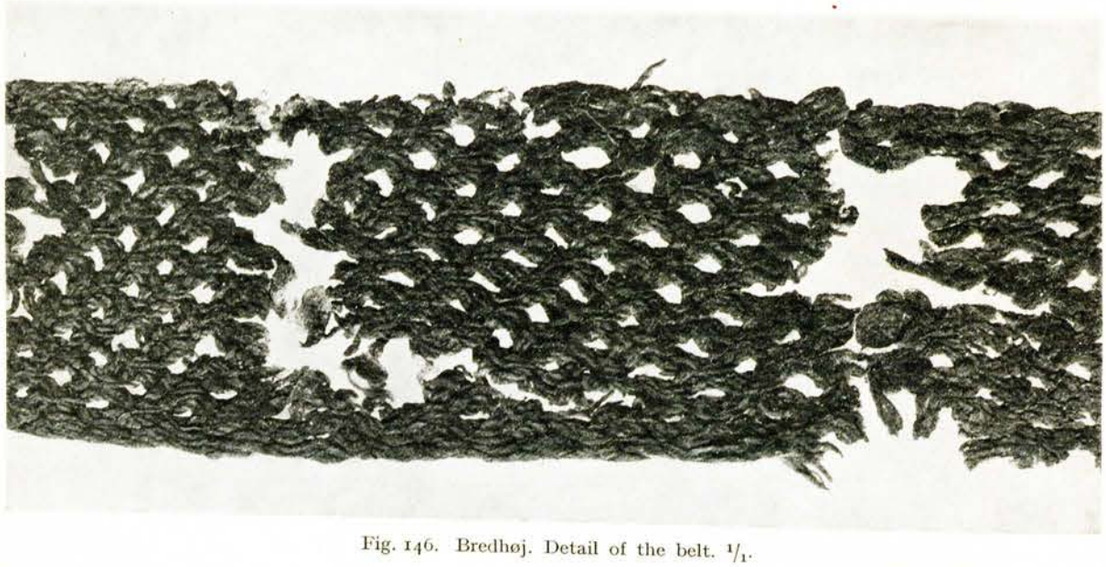


Fig. 146. Bredhøj. Detail of the belt. 1/1.

much compressed, but the coffin is supposed to have been a woman's resting place[1]). The west end of the coffin contained a small bronze dagger, which is supposed to date from the first section of the Early Bronze Age. A band of woollen threads lay in the middle of the coffin towards the northern side. The band is now in several pieces, as fig. 145 shows, so that it is impossible to decide whether we have got the original measures; now it is 85 cm long and 5—6 cm broad. The material is a fine S-spun wool. The band is worked up in a sort of plaited fashion, which unfortunately it is impossible to make out properly, the material being too fragile for a close examination, and so far we know of no fragment among the

Danish textiles from the Bronze Age to compare with this one. In a few places, where the band is broken, we can see that the threads meet the edge-line diagonally. The band, which fig. 146 shows in full size, has an open-worked pattern regularly carried out across the whole band apart from a piece of 5 cm at one end, where the threads cross each other squarely as in ordinary weaving. The analysis is plain weaving and the weft is double. There are about

Fig. 147. Vester Doense. Fragment of a network.

15 slips through the shed. On account of the decayed state of the band, it is impossible to find indications of the beginning and the end of the plaiting; but as a great many methods of plaiting require that the threads lie loose, it seems unnatural to finish up the plait by some woven rows. If anything it would be convenient to make a small piece of texture the starting point of the plaiting; for then the threads would be fixed and arranged in such a way as to form a foundation for the work. Both ends of the band are fringed.

13. TEXTILES FROM THE LATE BRONZE AGE

The change in the funeral ceremony caused by the introduction of cremation has had the effect that not a single complete piece of garment exists from the end of the Early Bronze Age and from the Late Bronze Age.

The largest remnants of cloth from the Late Bronze Age are in a grave find from Voldtofte, Baag Herred, Odense Amt[1]). It belongs to the 2nd section of the Late Bronze Age. Two fragments of woollen fabric respectively 45×35 cm and 38×25 cm large are preserved. In one of these there are counted 20 and 11 threads across 4×4 cm, in the other 45 and 27 threads across 10×10 cm. In the first case the direction of spinning is indeterminable on account of the decomposition of the material, in the other case it is seen that only S-spun wool has been used. To the same find belong some small fragments of plainly woven material, according to Mr. Bille Gram's determination made of pure flax[2]. The thread is simply spun and twisted to the left in both directions, and in one direction there were 17 threads, in the other 13 across 1×1 cm.

Exceedingly interesting is also another textile work of fringes or net (fig. 147), which together with a hanging vessel (fig. 149) from the end of the 2nd section of the Late Bronze Age was found in a bog at Matr. No. 2 of Vester Doense, Vebbestrup Sogn, Hindsted Herred, $2^1/_2$ Alen from firm ground[3]). The network lay round the vessel and was bent down over its edge. It is much torn and squeezed, and has been damaged by drying. It is made of a kind of plant, which is so decomposed that a closer analysis of it is impossible.

M.H.
Fig. 148. Vester Doense. Diagram of the network.

The net, part of which is shown fig. 147, is made of a row of parallel threads, here and there twined to the left. The threads are woven into a row of threads twined in the opposite direction. The twinings occur at distances of 3—4 cm, sometimes in ones, sometimes in twos, as the figure shows between e and f. In fig. 147 a—b shows a preserved border of the piece, of which fig. 148 gives a diagram; possibly it is a kind of starting border. The method is very much like that applied at the hanging up of the fringes of the Egtved skirt, where in a similar manner a thick cord is inserted in the edge. From c to d on fig. 147 there is another border, regarded as such because here the lacings end in closed turns. Hence the twining together of the two threads must have started at this side of the piece. (See further p. 143.) In spite of the decomposition and the difference of the material the network shows an obvious resemblance to the Egtved skirt. The twinings found in the present piece are performed exactly like the lacing that holds together the fringes of the Egtved skirt above the rings. Thus the odds are that the preserved fragment originates from a work of a kind similar to the skirt excavated from the Egtved barrow.

H. C. Broholm & Margrethe Hald.

Fig. 149. Vester Doense. Hanging Vessel from the Late Bronze Age found together with fig. 147.

CHAPTER III

THE TEXTILE TECHNIQUE OF THE BRONZE AGE

ILLUSTRATED THROUGH ARCHEOLOGY AND ETHNOLOGY

The Bronze Age vestments of the National Museum of Copenhagen take up an exceptional position among ancient finds excavated in Europe. No other European museum is in possession of a collection of textile works so interesting from a culture-historical point of view; in a curious manner they make us feel the kinship between the ancient people and modern man, and they give life to the dull study of dumb things. Being further the earliest complete fabrics preserved from our part of the world, they are unique sources of information on the history of the textile art, and they raise technical problems, which the following pages should contribute to solving*).

From the preceding accounts of the garments it is evident that they do not belong to the stage of absolute beginners. On the contrary they represent the result of systematical toil through generations in trying to produce textile fabrics[1]). Originally the textile art must have used the materials at hand and available without much preparation, such as rushes, grasses, strips of bast and bark or of animals' skins, etc. That this is more than a theory appears from the fact that the earliest textile work dug out in Denmark, fig. 131, a bit of a *net found in Christiansholm's Mose*, a bog near Copenhagen, and dated to the Late Stone Age, is made of *wooden bast* according to Mr. E. Rostrup's determination. And even from the Bronze Age we have side by side with the cloths made of wool two textile works for which a special material has been used; those are the network determined as remnants of a cord skirt in the woman's grave from *Borum Æshoj*, and the peculiar network, fig. 147, made of a kind of plant, which was excavated together with a hanging vessel from the 2nd period of the Late Bronze Age from a bog in *Vester Doense*, Vebbestrup Sogn, and which must likewise be regarded as a fragment of a cord skirt. Further it is interesting to remark that the sewings by which the bark boxes found in the oak coffins have been joined together are performed with bast—lime-bast—[2]).

*) The archæological material as well as the references to the ancient literature are due to Dr. H. C. Broholm.

Fig. 150. Women spinning and preparing the wool for spinning. (Drawing by L. J. Longley after the vase fig. 166).

The finds in the earth have shown that in the course of the Late Stone Age the population of Denmark received through cultural importations from the South the knowledge of the growing of corn[3]) and other profitable plants and of the breeding of *domestic animals*. The *sheep* of the Antiquity[4]) belonged to a small goat-horned breed[5]) closely related to the old Faroe sheep breed, which died out about the middle of last century. Three specimens of them—one shown in fig. 151—are found in the Zoological Museum of Copenhagen[6]). The finds suggest that already the Stone Age people must have learnt to work the wool.

As to the use of *flax* we know all but nothing. We have only one single evidence of its use in Bronze Age textile work, and that is the find mentioned p. 103 from *Voldtofte*, originating from the 2nd period of the Late Bronze Age, so we cannot reject the idea that this work may be an imported product, as there is no support for the supposition that flax should have been grown as a culture plant in Denmark as early as that[7]).

The fact that the knowledge of *spinning* and *weaving* was common during the *Stone Age* appears from the finds, although no pieces of cloth are preserved from that time. Numerous impressions in the earthen vessels show two-ply and twined thread[8]), and impressions of a fine plainly woven fabric occur in an earthen daubed wall from *Slotshøj* near Stege[9]). Another impression of a textile work (a mat) is known from a Stone Age dwelling in the island of *Langeland*[10]). Bearing in mind these evidences of the age of the textile art in our country, we do not think it strange that the Bronze Age garments are not beginners' works, but on the contrary in certain respects show extraordinary skill and no small experience.

1. THE WOOL AND ITS PREPARATION

Apart from the exceptions already mentioned, *all the preserved textiles are of sheep wool.* Among the hairs of the under fur coarse hairs of the outer fur often occur, which were formerly thought to be deer hairs put in as a sort of filling. The preparation of the wool for cloths and finished garments requires skill at more than weaving. The final result depends upon the interaction of a series of different processes, and a careful preparing of the material is often just as important as care in the weaving and the sewing. The wool must go through the following processes: gathering, cleaning, grading, carding, spinning, weaving, and fulling, and at last cutting and sewing (fig. 150).

Of some of these stages in the preparation of the wool the finds of the Antiquity fail to give any explanation whatever, or they give it only imperfectly. Hence it will be necessary to add to the information that the archeological material gives, by including in the investigation an *ethnological material* for comparison from a much later period. Not only is it necessary, but as Dr. Chr. Blinkenberg has maintained[1]), it is also quite allowable, at least if the material for comparison is taken from the same circle of culture as the finds which it tries to explain. It is also allowable to add to the picture by archeological and ethnological materials from related peoples and especially from such centres of civilisation as are supposed to have influenced directly or indirectly the cultural elements that this investigation involves.

We know of no shears from the Bronze Age, and it is supposed that they have not come into use for shearing sheep until the 12th century A. C.; so probably in the Bronze Age the wool was gathered in the manner still used in *Iceland* and the *Faroes*, where during the moulting season in spring or early summer (May—June) the wool is simply pulled off the sheep[2]).

This wool gathered in spring, the winter wool, is the best, as it contains the hairs in their

full length. It consists of the long outer fur, which is shiny and bristling, and of fine under fur. These two ingredients are graded from each other, and a fine very strong thread may be spun of the *outer fur* and applied as warp in the loom; but sometimes the soft wool is mingled up with the warp. The fine *under fur* is mainly used for soft threads, f. i. for wefts and elaborate

Fig. 151. Ram belonging to the extinct Faroe sheep breed. Notice the rough outer fur on neck, breast, and back. (The stuffed specimen is in the Zoological Museum of the University of Copenhagen.) $^1/_6$.

knitting works. In autumn, when the killing of the sheep takes place, the wool (summer wool and autumn wool) remains in the skin; the fleece is rolled up and suspended for some time, until the hairs are loosened so much that they can be pulled out of the skin. But before the plucking out of the hairs begins, the fleece is washed and nearly dried again. First the coarse hairs are picked off with the hands, and then the under fur is pulled out. Sometimes small bits of the animal's skin hang on the wool when the autumn wool or skin wool is pulled out. Unfortunately such particles are difficult to remove in washing[3]). Mr. E. Rostrup has pointed out[4]) that certain Bronze Age materials show a *grading of the wool;* f. i. in the tassels of the Borum Æshøj belt there is found wool of a quality so fine that it can only come from certain parts of young lambs. The method of the Faroe Islanders shows further that through a thorough and careful grading of the material it is possible to obtain varieties both of usefulness and effect.

It has not been possible to make out by chemical and microscopic examination whether the wool has been dyed by means of dye stuffs. Still now and then wool in different shades of brown occurs in one piece of garment. Thus the belt from Borum Æshøj is lined off with a light stripe between two darker ones, and the pile of the caps is sometimes of a darker wool than the fabric in which it is fastened. Finally the side-edges of the cloths often show

a darker colour than the rest, and the sewing thread is generally of a very dark colour. The fact is, however, that the wool of the different sheep varies rather much, not only in softness but also in colour. Also the wool from one animal varies considerably in quantity and colour. Thus through grading it is possible to get *different shades of colour* from light brown to almost black.

Fig. 152.

Fig. 153.

Fig. 154.

Fig. 152. Spinning whorl. 1/1. Fig. 153. Distaff from the Faroes. 1/2. Fig. 154. Distaff from Hjortspring. 1/2.

We do not know, how the wool was *prepared for spinning;* the modern form of carding has hardly been applied, but presumably some preparation or other to the same end has taken place[5]). It had hardly been possible to spin such fine threads as those found in the pile of the caps, if the material had not beforehand been prepared with great thoroughness. Possibly it has been submitted to a process similar to the combing known f. i. from Sleswick, where two combs were used at a time; one was made fast, and the wool was combed through it by means of the other comb[6]).

2. SPINNING AND TWISTING OF WOOL

Under primitive cultural conditions spinning is done by means of a *distaff*, a stick varying in size, and often provided with a whorl. The whorl may have the form of either a ball or half a ball, or a cone or a disc. The material is different in different tracts, and it can be placed either at the top or at the bottom. It serves to give the spindle the necessary speed in the turning[1]).

Whorls of different shapes and materials are known in Southern and Central Europe from the Stone Age. Here in Denmark the specimen shown fig. 152 is the oldest one known; it is 4,8 cm in diameter and 1,9 cm thick; it originates from the last period of the Bronze Age and was found in a grave in *Høje Taastrup Sogn*. This type of distaff occurs rather often in later periods of the Antiquity, and even within the Northern territory of civilisation it has been in use in remote tracts, f. i. the Faroes, right up to our modern times. The Faroe Islander Mr. J. C. Svabo, who in 1781—82 travelled through his native country collecting ethnological material, tells that originally the wool was spun with the fingers, but later on a distaff was used, to which a circular disc was fastened in order to give speed to the spindle in the turning. They were also used for twisting threads. Fig. 153 shows such a distaff belonging to the museum of Thorshavn.

The distaff (fig. 153), was, according to Mrs. Petra Djurhuus' information[2]), used for spinning warp threads, while the weft is supposed to have been spun with a spindle of a medium size. A larger distaff *(Bandasnælda)* was used for the making of twisted woollen bands. When spinning the men used to tie a strip of leather round their thighs in order to spare their trousers; for the spindle is started by rolling it down the thigh with the right hand; once started it is left to turn freely hanging in the thread that goes round the hook. Women

also spun on distaffs and often while walking about, so that f. i. they had them in their hands, when going into the "Hauge" to milk.

As distaffs do not occur in ancient Danish finds until the end of the Bronze Age, most likely the spinning tool before that was of wood all through and so primitive that it was not buried with the dead person. At any rate quite simple spindles have been in use in Denmark still after the end of the Bronze Age. Fig. 154 shows a distaff or a spinning stick found in the bog of *Hjortspringkobbel* on Als together with the boat and thus dated to the Pre-Roman Iron Age[3]). It is made of a hazel twig with part of the bark still preserved. At the top a piece is broken off and missing, but there is no mark of a hook; it is broken almost in the middle, but nothing seems to be lost. Its length is 31,6 cm, in diameter it measures 6 mm at top and 2,2 cm in the middle of the 8 cm long, double-conical part at the bottom.

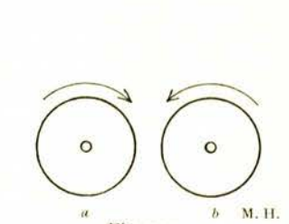


Fig. 155.

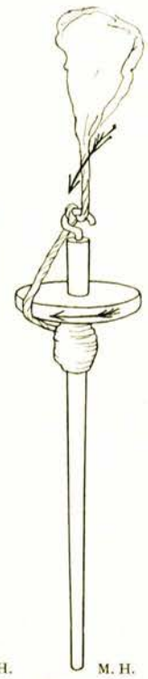


Fig. 156.

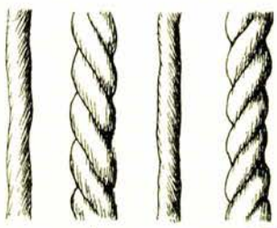


Fig. 157.

Fig. 155. a. Distaff seen from above turning to the right, b. Distaff turning to the left. Fig. 156. Distaff with a right-spun, or z-spun thread. Fig. 157. a. right-spun, b. left-twisted, c. left-spun, d. right-twisted.

The distaff, which is often illustrated in use in Greek vase-paintings from the 5th century, is still in the whole of Southern Europe, Sardinia, Sicily, Rumania, and the Balkan peninsula the tool on which the wool is spun by women, whenever they have a moment to spare. Here too, different sizes are applied according as a fine or a coarse thread is wanted[4]).

A quite simple spinning tool is the *spinning hook*, which has been in use in Bornholm right up to our days; it consists of a hook made of a cleft stick. As experiments have shown, it is possible with this spindle to spin a very fine thread; a thicker thread can be spun with a coarser hook[5]).

In the fabrics of the garments from the Bronze Age only *simply spun wool* occurs, but a *two-ply wool* has been used for sewing threads and for the hair-net of the Borum Æshøj grave. Further a two-ply wool has been used for the underlying cords in the coarse network, fig. 92 of that same find; and as edge threads in the hair-net, fig. 93 a great number of threads twisted together have been applied. Both *right-spun* (Z-spun) and *left-spun* (S-spun) *wool* is found (fig. 157). By righthand spinning we understand the twining which occurs, when the spindle swings to the right, i. e. when it is turned in the same direction as a normal screw or a cork-screw (fig. 155 a and 156). Lefthand spinning occurs when the spindle is turned in the opposite direction, like a left-handed screw (fig. 155 b).

Neither in archeological nor in technical literature the terms for yarns and directions of spinning are standardized, and if the author does not in each treatise explain in detail what he means by the expressions he has chosen, misconstructions may arise. If we look at the thread alone without thinking of the manner in which it has been brought forth, the thing is not evident. We must realize that a turning of a thread (i. e. a screwing movement) is characterized by the fact that it has both a direction of rotation round its own axis and a movement in the direction of the axis of the spindle. If we sight along the thread from above, and follow the movement of the spindle, a rotation with the sun (clock-wise) will naturally be called righthand spinning, and when the thread by means of the spindle is given a right-hand twist the thread must be right-spun; by keeping this rule before our eyes we can

determine right-spinning in any thread without regard to the construction of the spinning apparatus[6]). The twining or twisting of two or more threads is done in the opposite direction of the spinning, thus a left-spun thread is twisted to the right and vice versa (fig. 157).

The wool used for *the weaving* is always coarse; indeed there are variations, f. i. the Trindhøj blanket belongs decidedly to the finest of the cloths; but all in all the Bronze Age cloths must be classed among the coarse fabrics. It appears from the pile of the caps, the wool of which is two-ply and so fine that on an immediate view it gives the impression of corresponding almost to a sewing thread no. 50—60, that it could not be due to a deficient skill at spinning that the fabrics were woven of a coarse wool; other circumstances must have prevented the use of fine wool for weaving. In many cases of course the heavy materials are preferable, because they are both stronger and warmer than the light cloths; but among the textiles from the Iron Age there are found cloths that show a development in the direction of using fine threads[7]). The wool of the Bronze Age fabrics is generally spun so tightly that still in spite of wear and decay the threads of the cloths are apt to tangle, and they have a curious "rising" in the stitch originating in the twisting. It is a well-known fact that a simply spun woollen thread has less resisting power against pressure and wear in the weaving than two-ply wool, hence of late it has been customary to remove the difficulties of the weaving with untwisted woollen threads by "*glueing*" the warp. This "glueing" may have been known in the Bronze Age, but that cannot be proved since no traces are left of it. However, it is worth while remarking that yarn, spun of wool with some of its *natural grease* in it, may, if it is well dried, be used for warp without being glued. Only about 30 or 40 years ago the countrywomen in *Denmark* used to *warm the yarn*. Generally the balls were put in linen bags and laid into the large brick oven, when it had cooled down after the baking. Thus the thread became more firm and resistent to wear[8]). It is impossible to say whether people already in the Bronze Age noticed that the natural grease of the wool provides a means of making the thread firm and strong through drying; but it is not unlikely that this observation was made at an early period. And it is a fact that people of the Iron Age had such a knowledge of weaving and preparing of materials, that it became possible to produce regular textures of a fine untwisted wool. The Bronze Age fabrics are rather loose of weaving, a fact which may be connected with the fulling, mentioned below, but which may also be due to regard to a the durability of the warp, the warp threads being less worn if they lie spread, than if they lie close together. And as the warp threads must pass each other every time the shed is changed (provided of course that there is a shedding of the warp) there is every reason for taking their position into account. Weaving with two heddle-rods wears the warp more than weaving with several heddle-rods, and by the use of only one heddle-rod and a warp stick the warp obviously has to stand a lot.

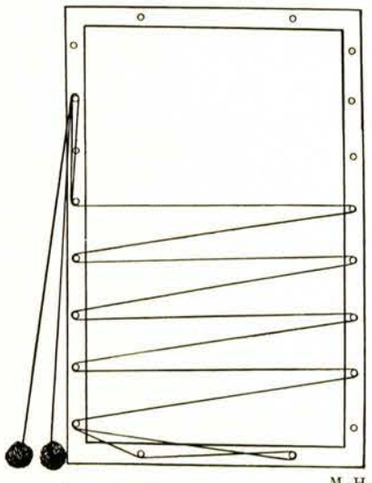

M. H.

Fig. 158. Warping frame from the Faroes.

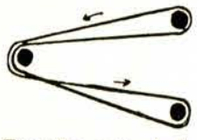

M. H.

Fig. 159. Egyptian method of warping.

We might expect that the weft threads were less tightly spun than the warp, which must stand the straining, and the fabric would gain in softness if that were the case. However, an examination of this problem has not taken place, as it would be rather circumstantial and require untwisting of the material. The superintendent of the Technological Institute of Copenhagen Mr. A. F. Geismar answered[9]) when questioned that now-a-days the warp is

generally more tightly spun than the weft, when simply spun yarn is applied.

According to Plato[10]) this was the case in *Greece* in the 5th century B. C. and probably that is also the case with the Bronze Age fabrics.

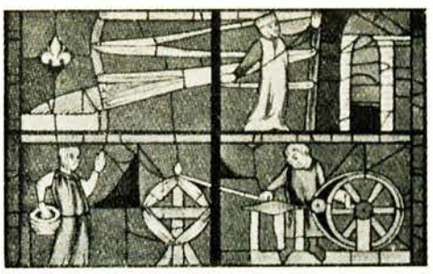


Fig. 160. Warping on a frame, glass-painting from the 13th century (Salzmann: English industries of the Middle Ages, 2nd ed. 1923).

In the Bronze Age cloths both Z-spun and S-spun wool occurs, the warp being most often S-spun and the weft Z-spun; but, as mentioned in the description of the finds, certain deviations from this rule are recorded. According to Miss Maria Collin it is still customary in *Scania* to spin warp and weft in different directions[11]). The same thing is known from *Jutland*, but there it cannot be said to have been a rule. According to Mr. A. F. Geismar the use of different directions of spinning is due to a desire of getting a smooth material. This is particularly important if the wool is simply spun and if the material is not fulled[12]). This explanation seems to accord very well with what we know of the Bronze Age materials.

3. WEAVING AND PLAITING

We have a very comprehensive theoretical literature on weaving. But it will fall beyond the scope of this treatise to enter more closely upon this side of the matter. Only one single question will be mentioned here, the question of the difference between plaiting and weaving and where to draw the limit between those two techniques, as it is of direct interest to our understanding of the Bronze Age cloths.

It must be said at once that it is very difficult to give a satisfactory definition of the difference between plaiting and weaving. The limits are undefined, and in many cases it is a matter of opinion which term is preferable. Some authors think that weaving was first created by the invention of the mechanical shedding, i. e. a mechanical dividing of the warp threads in two layers, between which the weft threads were easily led. Dr. Hugo Ephraim words this opinion quite distinctly, "The mechanical shedding is that which characterizes weaving as distinct from plaiting."[1])

Fig. 161. Warping on a frame. (Salzmann: English industries).

Objections have been raised to this definition, among others by Dr. Max Schmidt[2]), Dr. C. M. Joel[3]), and Dr. C. Danneil[4]), to whom the difference between weaving and plaiting lies in the marked distinction between warp and weft. No doubt this view is right, because several different textile techniques, f. i. certain plaitings of bands and cords, and further lacing, netting, and "Sprang" (Braiding) show an essential difference from weaving in consisting of a series of threads lying all in one direction, and worked together each according to its rules without applying any system of transverse threads. Dr. C. H. Johl has expressed his definition of weaving, pertinent also of the Bronze Age cloths, in the following few and plain words, *"Surely we are entitled to call it weaving, when a series of parallel threads, which are by certain arrangements kept in the same position, are crossed at a right angle by another system of threads."**) In practice it makes a great difference whether the weft is slipped through a shed at once

*) Some mat-plaitings and basket-plaitings, it is true, have two independent systems of threads crossing each-other. But if, like Dr. Johl we claim for weaving a special arrangement to keep the threads in position and a square crossing of the two systems, such works must rather be regarded as plaiting.

or laboriously pulled through with a needle; according to some people the former technique should then be termed weaving, the latter plaiting, but probably opinions are divided; at any rate we will term the Bronze Age cloths woven fabrics, although not all the threads pass through the whole shed, as it appears from the use of several threads in one shed, and although it cannot be said for certain whether the loom was provided with heddles and heddle-rod.

4. NORTHERN UPRIGHT LOOMS AND WARP APPARATUSES

From the Bronze Age finds we have no object that can be said with absolute certainty to have belonged to a *loom*, so if we will try to form an idea of the ancient loom, it will be necessary to include in our investigation archeological and ethnological material, the former mainly taken from *Hellas*, the latter from the remotest tracts of the *ancient Northern* territory of civilization, where the ancient modes of life and ancient handicrafts were still alive almost down to modern times. After that we shall return to the cloths preserved from the Antiquity. For practical reasons the ethnological material will be treated first.

THE WARPING-APPARATUS

The setting up of the warp is a necessary preliminary work to the weaving and may be done in different ways under the different conditions. Mrs. Petra Djurhuus has told that on the Faroes at the time of the vertical loom, the *Faroe Islanders* used three wooden pegs (Vørpur), which they knocked into the frame of a door, and round which they passed the threads. Later on and up to our days a square frame was used, which simply means that the door-frame was made portable and the number of pegs increased (fig. 158). Such *warp-frames* were known already in the 13th century, and have probably been common all over Europe. Fig. 160 illustrates a glass-painting, which shows the warp coming out of a box, no doubt of the same kind as those known from the work-shops of old village weavers. The box was divided in rooms, one for each ball, to keep the threads from getting entangled. Another glass-painting from the 16th century shows (fig. 161) the same method of warping; here we may observe that the work is rationalized further by the application of a spindle-stand with many regular, finely turned spindles[1]). A quite simple method was applied by the *Egyptians*[2]), who knocked three plugs into the wall (fig. 159); the warp was as one continuous thread wound round the plugs, yet with crossings of the threads for the sake of the shed.

THE FAROE LOOM AND THE NORWEGIAN LOOM

Several upright looms are known mainly from Western Norway[3]), while from the Faroes only two are preserved. One of them is the well-known "Worsaae's loom", which will be mentioned later on; the other one belongs to the museum of Thorshavn and is shown here in fig. 162[4]). Only the big timber is ancient, but the missing parts have now been supplemented by the direction of an old weaveress at Fugloy, who herself wove on an upright loom as late as 1903.

The Faroe loom (*Kliggjavevurin*) consists of two upright posts ending in crotches, on which there lies a movable cloth beam[5]). Outside the posts the beam is pierced by a bar acting as a stopper and serving to keep the beam in position. The beam is provided with a list or a projecting edge, in which there are at regular intervals holes, intended for the warp to be pulled through, or for a horizontal thick cord, which again carries the warp threads. At the top the warp threads make closed loops, generally quite short, only just long enough to

go round the cord; but in a single case (a fabric sitting on the loom in the Thorshavn museum) the loops have a length of about 3 cm, before the beginning of the actual weaving.

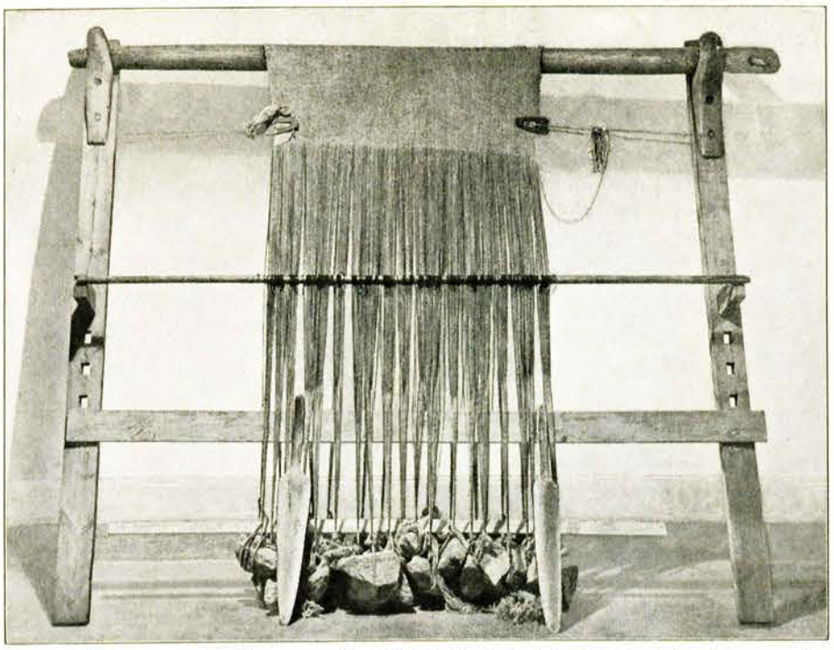


Fig. 162. The museum in Thorshavn, the Faroes. Upright loom arranged for plain weaving.

At the bottom near the ground the warp is hung with stones or loom-weights, also called warp-strainers, which serve to keep the warp taut. It is not necessary to hang a loom-weight on to each warp thread; by a loop or a warp knot they may be tied to packs of the warp threads. The length of the warp is not limited to the distance between the beam and the ground. If wanted it may be longer than the height of the loom. In that case the lower part of the warp threads, which is in excess at the beginning of the weaving, is wound into balls or bundles. When the finished piece of cloth is rolled up round the beam, the threads of these balls are pulled upwards towards the top of the loom and brought into use as a new warp. At the lower end of the loom there is a horizontal bar or board acting as warp stick or shed stick; this stick divides the warp in two parts, lifting alternate threads and going over the others. When the warp is divided in this manner, we have a so-called natural shed, fig. 163 a. The other horizontal bar is called the heddle-rod. Round it there is a row of heddles, which pass down into the threads of the warp lying behind the shed stick[6]).

By means of a pair of brackets, inserted in the side-posts of the loom, the heddle-rod can be placed in two positions; it can rest either on the top of the brackets, which are bifurcated, or in the angles between the brackets and the side-posts. The latter is the natural position of the warp, the natural shed is present, fig. 163 a; but when the heddle-rod is lifted up in the crotch, the lower layer of threads comes uppermost, and we get the artificial shed, fig. 163 b. There are in the side-posts two rows of holes, in which the brackets of the heddle-rod can be shifted in order to regulate the distance between the shed and the heddle-rod according to the convenience of the weaver. The picture shows that the weaving proceeds from the top of the loom towards the bottom, and that in the finished texture there is a spreader, which means an instrument that serves to keep the cloth strained and to work against a gradual tightening of the weft. It is hardly probable that this instrument was known in former days. But on some ancient Norwegian looms we find another device, which is likely to have served the same end[7]). Here the warp stick is provided with a row of small plugs or pegs sitting along it at a distance of 2,5—3 cm, so that the warp threads hanging down in front of the stick may be disposed evenly in the intervals, and thus be kept in position.

A Norwegian loom (*Uppstadgogn*) in the 3rd department of the National Museum of Copenhagen is set up with a very coarse thread, almost a cord, and with only 16 threads at every 10 cm. On the other hand a warp of a very fine two-ply wool is applied on a loom in the 2nd

department of the National Museum, the so-called Worsaae's loom, which was in 1848 given as a present to the Museum by Mr. Poul Jonsson, Eysturoy[8]).

The threads of the warp are of double length, and at the top they are supported by two cords, round which they go. As far as the arrangement of the warp is concerned this loom shows an improvement, the threads at the bottom of the loom being disposed in two layers of transversing cords, which are at one side tied to the post. On the other side the cord is now slackened, but presumably it has been taut. To the left the cord of one layer is now torn off. When Worsaae's loom was given to the Museum it was described as being ancient. However, it can hardly be supposed to be more than about 200 years old, probably originating from the first quarter of the 18th century, and the loom in the Thorshavn museum seems to be of the same age.

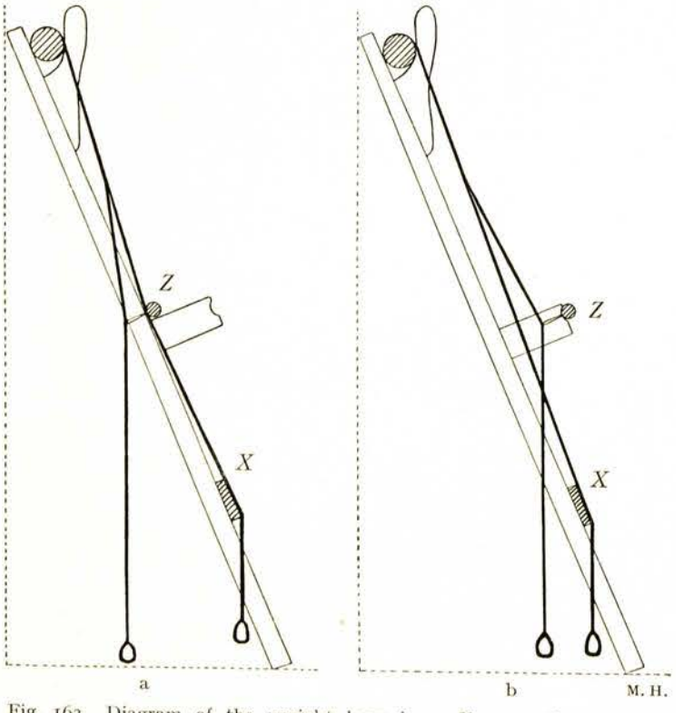


Fig. 163. Diagram of the upright loom in profile; a. the natural shed, b. the artificial shed.

At Bergþórsvoll and Bolstaður in Iceland loom-weights of rough stones have been excavated. The oldest stones found at the former place, and all specimens from the latter originate from the 10th century[9]). The *Iceland loom* has probably been of the same construction as the Faroe loom, because it was brought along from Western Norway, the common home of Iceland and Faroe colonists. As to the literature handed down on the Iceland loom it is sufficient to refer to the detailed description given by Mr. Hjalmar Falk[10]). Only a few points of special importance will be mentioned here. The oldest authoritative passage that gives a detailed piece of information on the upright loom is the so-called *Darraðarljoð* in the Njal Saga (chapt. 157), which was probably composed shortly after the battle of Clontarf 1014. It describes Darrað walking one Good Friday morning at Katanæs to a cottage, where he observes some women about to set up a loom Men's heads were used as loom-weights and men's entrails were the weft and warp, swords were used as battens and arrows as reels. The women chanted,

See! warp is stretched
For warriors' fall,
Lo! weft in loom
'Tis wet with blood;
Now fight foreboding,
'Neath friends' swift fingers,
Our gray woof waxeth
With war's alarms,
Our warp bloodred,
Our weft corseblue.
This woof is y-woven
With entrails of men,
This warp is hardweighted
With heads of the slain,
Spears blood-besprinkled
For spindles we use,
Our loom ironbound,
And arrows our reels;
With swords for our shuttles
This war-woof we work;
So weave we, weird sisters,
Our warwinning woof.

(The Story of Burnt Njal, by G. W. Dasent)

At any rate by the end of the 18th century an upright loom of the same type was in use in Iceland. It is described in detail by Mr. O. Olavius[11]), whose copper-plate figure cut by Mr. Sæmundur Magnusson is shown here as fig. 164. It is the oldest existing drawing of an Iceland loom. According to Mr. M. Þorðarson, director of the National Museum, Reykjavik, this loom did not go out of use in Iceland until about 150 years ago.

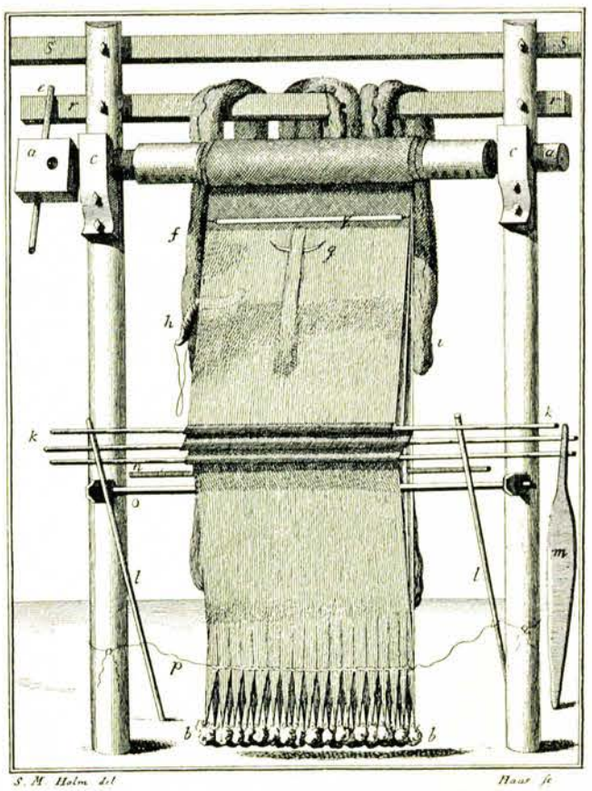


Fig. 164. Iceland loom after Olavius: Oeconomisk Reise igiennem Island (1780) Pl. XII. Arranged for weaving of fourshaft.

Dr. Johl[12]) expresses a doubt about the correctness of the Olavius loom, but surely unjustly; Mr. Olavius's account is not in the least improbable. The loom shown in the drawing is provided with three heddle-rods and one shed stick, and is thus set up for weaving a fabric with three heddle-rods, i. e. a fabric of the kind generally called four-shaft. Four-shaft weaving is very likely possible on a loom of the Olavius type, and according to Mr. I.C. Svabo[13]) one-shaft cloths and three-shaft cloths were woven on upright looms. In order to get reliable information on this point we have applied to Mrs. Petra Djurhuus, who again communicated with the old weaveress already mentioned from Fugloy[14]), surely one of the few perfect authorities on this domain, because she has learned weaving through tradition. She said that both one-shaft and three-shaft fabrics were woven on the upright loom. And the proverbial phrase that says, "Nu er ikki beint a midskaftid" (now the middle rod is out of order), when people disagree, shows that it was common, but not easy, to weave with three heddle-rods. Also the horizontal looms had in the beginning but three heddle-rods and one shed rod; a woman from Eysturoy was the first to weave with four rods. Thus there can hardly be any doubt that it would be correct to replace the expressions of *two-shaft* and *four-shaft* with the terms of *one-shaft* and *three-shaft*, which are the original expressions, and probably the notion of four-shaft did not exist till the introduction of the horizontal loom. However, it would be unpractical and likely to create confusion to change the weaving terminology on this point; for while it is easy to find out what is meant by one-shaft, the terms of two-shaft and three-shaft will involve an uncertainty which is only done away with by indicating in each case on which type of loom the cloth in question is woven, and whether a shed rod has been applied besides the heddle-rod; and that is in many cases impossible and at any rate troublesome[15]). A collection of samples of various cloths, sent to us by Mrs. Petra Djurhuus, and now to be found in the National Museum of Copenhagen, are of great interest by showing what the upright loom could do. Among these samples there is a piece of two-shaft or plainly woven material of a fine, untwisted yarn, and a piece of four-shaft cloth for a bed-tick. Some of the pieces are declared to be more than 200 years old.

THE LAPPLAND LOOM

An *upright loom* of a similar type is found in *Lappland;* as in all essentials it accords with the Faroe loom, it will not be necessary to notice it further here; Emilie von Walterstorff[16])

Fig. 165 a. Warping apparatus, used by the Lapplanders in Northern Scandinavia.

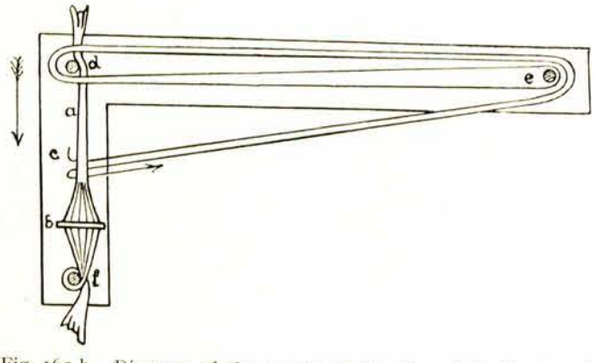


Fig. 165 b. Diagram of the course of the threads in the warping apparatus of the Lapplanders. a. Warp of the braid. f, d, e. Pegs. c. Weft thread. b. "Vævespjæld".

has given an excellent description of it. According to E. von Walterstorff the finished product is a cloth with three closed edges like our Bronze Age fabrics; nothing is said about the fourth edge, the one woven the last. But we are informed that the warp threads lie in pairs both in the border and in the middle, in which it differs from the Bronze Age textures, since they have only single warp threads in the middle fabric.

The upper edge of the Lappland cloths and the type of woven starting edges, found among others at the foot-cloths (fig. 122) belonging to the Skrydstrup find, correspond exactly to each other. Here the warping is made with only one thread; as far as I know the Lapplanders use only one single thread for the warping, and apparently they do not know a border like the one shown in fig. 121. Of great interest is further the *warping apparatus* (fig. 165 a) that the Lapplanders use in connection with the loom.

It consists only of two boards, one about 50 cm, the other a little over 100 cm long, joined at right angles and provided with three pegs 25—30 cm high, placed one in the joint and one at the end of each board. Between the two pegs on the short side a pack of threads is stretched out making the warp of a band weave, which is here made with a so-called "Vævespjæld", i. e. a square wooden tablet acting as a kind of heddle-rod (fig. 165 a). The weft threads (see fig. 165 b) of this band are pulled close in the usual manner at the outward side of the band, whereas on the inward side they are continued in long threads, wound round peg e, peg d, and again round e, from where they return the same way; the threads pass in and out in the same shed until the position of the "Vævespjæld" is changed. Thus the weft lies double in the woven border, and outside it it forms a long loop. It is necessary rather often to unfasten and move the band, because otherwise the long threads, meant for a warp of a piece of cloth, will be of unequal length. When the band has got the length required for the breadth of the ensuing weaving of a cloth, the whole warp arrangement is removed from the apparatus and carried over to the loom, where it is placed in such a manner that the woven border lies along the upper beam, and the long threads hang down from there.

Emilie von Walterstorff is of opinion that such a warp apparatus must have belonged to the upright weight-loom in the North of pre-historic times, and she refers to certain common features in the product of the Lappland loom and various textures preserved from the Antiquity of the North (see further p. 129).

Margrethe Hald.

5. THE UPRIGHT LOOM OF THE GREEK

An upright loom existed also in ancient Greece. We know this partly from illustrations and partly from literature, specially the Homeric poems; and this material being of importance for the determination of how long this loom has been in use in Indo-European countries, we cannot omit to mention it here[1]).

It is a matter of course that the artistic representations of the vase-paintings (they originate mainly from the 5th century B. C.), which only serve to indicate the locality where the action takes place, do not go in for an illustrative correctness in the rendering of the different parts of the loom, so already in 1872 Alexander Conze took the Northern looms into account to give an explanation of the vase-paintings. Professor Chr. Blinkenberg has vigorously emphasized[2]) that this method is justifiable and ought to be practiced in many more cases of common traits. In this connection it is therefore superfluous to go further into this topic.

The vase-paintings show that the upright loom prevailed or at any rate was so common in Greece during the 6th and 5th centuries B. C. that the vase-painters took it for granted that their women understood the pictures*). See fig. 166 and fig. 174, p. 120.

Fig. 166. Blackfigured attic lekythos, about 560 B. C. (Bull. of the Metrop. Museum of Art, 1931). See below p. 134.

The Homeric poems show that the upright loom has ancient ancestors within the Indo-European world of civilization, because everywhere in the Iliad and the Odyssey we find that this type of loom has been used; it is a loom at which the weaveress stands when she works, and it appears from the name ἱστός that the loom was upright[3]).

Odysseus meets Kalypso at the loom (Od. 5,62)

ἡ δ' ἔνδον ἀοιδιάουσ' ὀπὶ καλῇ
ἱστὸν ἐποιχομένη χρυσείῃ κερκίδ' ὕφαινεν,

and Polites hears Kirke's song, while she works at her loom (Od. X, 226)

*) I know the following vase-paintings with reproductions of looms: Skyphos with *Penelope and Telemachos*, published by A. Conze: Monumenti dell' Instituto IX, pl. 42 (text p. 192). Later the vase has often been reproduced, the best reproduction being Furtwängler und Reichhold: Griechische Vasenmalerei pl. 142. Buschor (text Bd. III, p. 129–130) quotes all earlier treatments. Vase-painting with *Eriphyle* at the loom, Notizie degli Scavi 1904, p. 199. Two Boetian vases representing *Odysseus in Kirke*'s palace. Journ. of Hellen. Stud. 1892–93, p. 81 and pl. IV. An excellent *Athenian jug* with black figures (Fig. 166), from about 560 shows a representation of women preparing wool and working at an upright loom. Bulletin of the Metropolitan Museum of Arts 1931, p. 293. The loom is higher than the women, and two women are at work with it (fig. 174). Apparently it has three shuttles. One woman is beating up the weft, the other is lifting the heddle-rod. A special description of the loom is given in the review mentioned 1932, p. 71. A fragment of *a black-figured vase*, on which is seen part of a loom of the same type, is reproduced Graeff und Langlotz: Die antiken Vasen von der Akropolis zu Athen, pl. 104, Nr. 2531 a and c (seems to belong to a Tyrrhenian vase). Finally there is a *picture on an Onos* in the National Museum of Athens, Carl Robert, Εφεμεριϛ ἀρχηολογίκη 1892, p. 254, and a *relief from Gomphoi* (5th century A. D.) published by Carl Robert, Athen, Mitt. 25, 1900, p. 325 seq., pl. XLV. According to Roberts the relief represents Eurykleia in the act of washing Odysseus' feet, and in the background Penelope stands with her loom. In a footnote p. 331 Robert writes about the passage in the Iliad XXIII, 759, but on account of lack of knowledge of the upright loom he has misunderstood the names of the different parts of the loom; unfortunately this is also the case in several generally used dictionaries.

ὦ φίλοι, ἔνδον γάρ τις ἐποιχομένη μέγαν ἱστὸν
καλὸν ἀοιδιάει, δάπεδον δ' ἅπαν ἀμφιμέμυκεν,
ἢ θεὸς ἠὲ γυνή.

A parable giving more detailed information on the loom is found in the Iliad (XXIII, 759 seq.). In the competitions, arranged by Achilleus at Patroklos' funeral Odysseus and Aias run a match, and the Iliad says about that as follows,

ἔκφερ' Ὀϊλιάδης· ἐπὶ δ' ὦρνυτο δῖος Ὀδυσσεὺς
ἄγκι μάλ', ὡς ὅτε τίς τε γυναικὸς ἐϋξώνοιο
στήθεός ἐστι κανών, ὅν τ' εὖ μάλα χερσὶ τανύσσῃ
πηνίον ἐξέλκουσα παρὲκ μίτον, ἀγχόθι δ' ἴσχει
στήθεος· ὣς Ὀδυσεὺς θέεν ἐγγύθεν. . . .

Here we have an *upright loom with a heddle-rod* (κανών) by which the weaveress lifts up the back threads of the warp and draws them up towards her breast, while she slips the reel or the shuttle (κερκίς)[4]) with the weft thread (πηνίον) through the shed of the warp (μίτος). The Northern loom and the Greek loom have so much in common that it cannot be a coincidence; there must be a connection. A further point of resemblance between the Greek and the Northern looms is the fact that on both the weft is beaten *upwards* by a weaving sword, or by a stick as illustrated at the vase mentioned. It is said expressly by Herodotus[5]) that on the Greek looms the weft is beaten upwards, whereas it is beaten downwards on the Egyptian looms, which must then at the time of Herodotus have belonged to another type.

Archeological investigations have made out that the Iliad in its present from was known in Korinth already in the 7th century B. C.[6]) and consequently the upright loom with a heddle-rod mentioned in this poem must have been used by the Greek living at the coast of Asia Minor at least from the 8th century, and most likely still earlier[7]). See further p. 134—135.

The quotations from the Homeric poems have already shown that the work on the loom was an occupation for the high-born woman, as by the way it has always been in Europe, and we shall here add only a few quotations in illustration of this fact.

Iris meets Helena at the loom (Il. III, 125),

τὴν (Ἑλένην) δ' εὗρ' ἐν μεγάρῳ· ἡ δὲ μέγαν ἱστὸν ὕφαινε,
δίπλακα πορφυρέην, πολέας δ' ἐνέπασσεν ἀέθλους
Τρώων θ' ἱπποδάμων καὶ Ἀχαιῶν χαλκοχιτώνων

and in the Odyssey (VI, 305) the poet gives us the splendid picture of the queen of the Faiaks at her work,

ἡ δ' ἧσται ἐπ' ἐσχάρῃ ἐν πυρὸς αὐγῇ,
ἠλάκατα στρωφῶσ' ἁλιπόρφυρα, θαῦμα ἰδέσθαι
κίονι κεκλιμένη· δμῳαὶ δέ οἱ ἅμ' ἕπονται.
ἔνθα δὲ πατρὸς ἐμοῖο θρόνος ποτικέκλιται αὐτῇ
τῷ ὅ γε οἰνοποτάζει ἐφήμενος ἀθάνατος ὥς.

Arete is of course assisted by her handmaids; but the work at the loom is so important that divine aid is necessary. (Od. VII, 108 seq.)

ὅσσον Φαίηκες περὶ πάντων ἴδριες ἀνδρῶν
νῆα θοὴν ἐνὶ πόντῳ ἐλαυνέμεν, ὣς δὲ γυναῖκες
ἱστῶν τεχνῆσσαι· πέρι γάρ σφισι δῶκεν Ἀθήνη
ἔργα τ' ἐπίστασθαι περικαλλέα καὶ φρένας ἐσθλάς.

These blessings of culture, the spindle and the loom, are here as everywhere in the Homeric poems a source of delight (no less a person than Pallas Athena herself invented the loom); probably the Bronze Age people also knew this delight.

In the ancient Northern literature from the Viking Age we have in the poem of *Rigsthula* in The Poetic Edda a kind of parallel to the scene in Alkinoos' hall.

"We know a tale from ancient times, which says that one of the Æser, he whose name was Heimdal, was wandering about. He walked along a shore at the sea, came to a farm, and called himself Rig. This song is composed as follows, according to what is told:"

1. Men say there went | by ways so green
Of old the god, | the aged and wise
Mighty and strong | did Rig go striding
....

Now follows a description of Rig's visit to the thrall and his offspring, and the song is continued,

14. Forward went Rig, | his road was straight,
To a hall he came, | and a door there hung;
In did he fare, | on the floor was a fire:
Afi and Amma | owned the house.

15. There sat the twain, | and worked at their tasks:
The man hewed wood | for the weaver's beam;
His beard was trimmed, | o'er his brow a curl,
His clothes fitted close; | in the corner a chest.

16. The woman sat | and the distaff wielded,
At the weaving with arms | outstretched she worked;
On her head was a band, | on her breast a smock;
On her shoulders a kerchief | with clasps there was.

(The Poetic Edda, translated by H. A. Bellows.)

H. C. Broholm.

CHAPTER IV

A TECHNICAL EXAMINATION OF THE WEAVING OF THE BRONZE AGE FABRICS

1. THE SIZE AND MAKING OF THE CLOTHS

The dimensions of the cloths show that the loom applied has been of a rather considerable size. The *longest pieces* found are the Muldbjerg cloak, the Egtved blanket, the piece of cloth sewn together from the woman's grave in Borum Æshøj, and the corresponding piece in the Skrydstrup grave, which are respectively 231, 258, 341, and 390 cm long. These measures need not, however, indicate the greatest possible length of a woven piece. At the fourth border the warp threads of these fabrics are cut off; accordingly it cannot be decided whether these are the original measures, or the cloths have been cut out of longer pieces. Further shrinkage caused by the fulling must in some cases be taken into account. Several of the cloths are in the sizes in which they now appear so long that they can hardly have been woven on a loom without a movable beam, round which the finished texture might be rolled up and the part to be woven thus constantly moved to a position convenient for the working woman. On the other hand a loom with only one beam must be regarded as sufficient, because, as already mentioned, it must have been possible to set up a sufficiently long warp in a loom of the Faroe type, fig. 162.

The *original breadths* of the fabrics are somewhat easier to determine, the natural selvedges being in numerous cases wholly or partly preserved. However, it must also here be taken into account that *fulling* (p. 135) involves a shrinking of the cloth. The large pieces, which are of interest in this connection, are somewhat unequal with regard to fulling. Thus it is not quite evident whether the Trindhøj blanket is fulled at all; the Egtved blanket shows rather much fulling in the upper part in the drawing, fig. 39, but in the lower part of the fabric the fulling is less conspicuous. But the cloaks from Muldbjerg and Trindhøj and the piece of cloth sewn together from Borum Æshøj (figs. 83 & 85) all have marks of much fulling, and here we must absolutely take into account the shrinkage due to this process, if we will decide the size of the loom by the measures of the cloths. The Egtved blanket is between 170 and 192 cm broad, and the Muldbjerg blanket, the broadest of all

Fig. 174. Upright loom (drawning by L. J. Longley after the vase, fig. 166). See the description p. 134—135.

examined pieces, measures 211 cm, but this piece is likewise much fulled and is one of the heaviest cloths known from the Bronze Age. If we may trust Caroline Halvorson's calculation[1]) and use it as a foundation for an estimate of the shrinkage by fulling of fabrics, the breadth of the cloth must have been lessened by a fourth part, and accordingly the original breadth must be set down at about 280 cm. Although the effect of the shrinkage can only be estimated discretionally, it is evident that as regards the cloths mentioned the *breadth is inconvenient for one single person* to work with, both on a vertical and on a horizontal loom. In his essay on the pre-historic textile art[2]) Mr. G. J:son Karlin maintains that a breadth of 130 cm is difficult to handle for one person, who sits at her work in front of the loom, and he comes to the conclusion that the loom must have been upright, and the beam placed high up. But Mr. Karlin hesitates to suppose that two persons have woven simultaneously, because evidently the advantage thereof is small if there is only one weft thread to work with; for one person must wait till she receives the weft from the other.

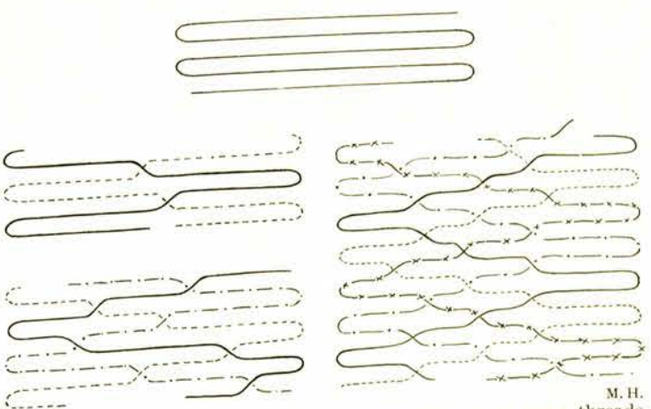


Fig. 167. Diagram illustrating the weaving with two or more threads in each shed.

An examination made by translumination of the cloths showed that *usually they were woven with two or more threads in each shed*, in such a manner that each traverses part of the shed. By marking the threads with different colours it was possible to determine exactly their courses across the cloth. It appears that over-crossings indicating the use of two or more threads are present in so to speak all the fabrics. The only exceptions are some small bits coming from the side-edges of the cloths; and much matted or oversewn pieces not fit for examination. We have counted up to 4 threads in one shed, and if an examination of the Muldbjerg blanket (fig. 18) had been possible across the whole breadth, it would probably have shown the use of 5–6 threads. The diagrams shown in fig. 42, fig. 65 and fig. 167 have already illustrated the course of the threads.

This method of working with two or more threads makes probable at any rate the supposition that *two or more persons were employed simultaneously at the loom*, so that one would not have to wait for the other to pass the weft thread over to her.

If we imagine that the work was made without a real shuttle, by means of a weaving needle, a stick, or only a spool of yarn, and that the shed was made by the hand, then it is evident that this method was exceedingly slow and that it was desirable to distribute the work among several persons. But even if we are disposed to think that the loom was provided with a heddle-rod, the advantage of the method mentioned is almost still more obvious, at least when it comes to cloths of the breadth in question. In the weaving of the Muldbjerg blanket the number of warp threads must have been about 1300, and accordingly the heddle-rod must have been capable of carrying half of them, i. e. about 650 + the strain caused by the loom-weights tied on to them, provided of course it was woven on a weight-loom. So the stick must in itself be rather strong, and it must have been very difficult, not to say impossible, for a single person to shift it to make the artificial shed. To the difficulties mentioned we may further add the friction that will necessarily arise, when so many threads of hairy wool must pass each other.

The weaving was, however, *not carried out consistently with a certain number of wefts* in each shed. The Egtved blanket showed in the part examined the use of 3 or 4 different weft threads in one shed; and in the Trindhøj blanket there were found now 2, now 3 wefts. Thus it seems as if the number of people working varied, according to time and opportunity. Also the distances between the over-crossings, indicating the meeting points of the weft threads and showing the length of the different slips of the weft through the shed, vary considerably, which means in practice that the partners have not shared equally between them the field of working. In the drawing of the Muldbjerg blanket (fig. 18) two special cases are shown, in which the crossings of threads lie so close together that this unequal distribution of the distances seems almost to be preposterous. Besides the reasons already advanced, the difficulty of avoiding too much tightening of the weft may have been a contributory cause of the use of several weft threads at a time. Possibly it has further influenced the strength of the material by adding to its elasticity; but on this point we have not been able to make any investigations. Both Mr. Karlin and Dr. Johl have entertained the idea that two persons have been at work simultaneously on the loom[3]). Dr. Johl has also realized that the work must have been done very slowly, and in proof of it he quotes several passages from ancient literature. The same thing is proved by Mr. Svabo[4]), and Mr. Niels Horrebow[5]). At any rate it is beyond all doubt that weaving on an upright loom required a considerable amount of work, and surely the cloths were already in the Bronze Age regarded as real articles of value. This supposition is favoured by the marked economy displayed with the smallest and apparently most insignificant bits of cloth.

2. THE FABRIC AND ITS BORDERS

The closing of the fabric is often indeterminable, but then the beginning is in many cases discernible by constructive peculiarities. In the Antiquity it was customary to prepare the actual weaving by linking together and arranging the threads of the *warp in a border*, which was next fastened to a horizontal bar or beam. In several of these starting edges we still find drawings out, or small holes, or remnants of foreign threads, which do not belong to the weave, but are probably traces of the fastening of the cloth on the loom.

This fact shows that when the question of the Bronze Age loom is raised, *certain types of looms* now applied among primitive people *can at once be left out of account*, thus f. i. the looms where the warp threads make two layers, because one and the same thread is continued passing round two beams. There are among Danish fabrics preserved so many pieces with three closed borders that we may surely take it for granted that the form of warping here mentioned has not been in use for wearing cloths; for a piece of cloth woven on such a loom must have two open edges, because it is necessary to cut the warp threads to give the cloth its size. The horizontal looms where the weaving persons have the textures fastened to them by girths, may likewise be left out of account, because this method is inapplicable for fabrics of the sizes of the Bronze Age cloths.

We know *two types of starting edges, both woven* and having the analysis of plain weaving or two-shaft, but *one* is warped with one thread, *the other* with two threads. The border is set up as an independent weave, quite narrow, f. i. with 16 warp threads; the threads that are intended for the warp of the cloth itself are put in as weft in the narrow warp; see on the warping above p. 112 and p. 116 and the diagrams fig. 59, 1 and fig. 122, which shows that the border has two threads in each shed, and they lie in such a way that a thread going upwards in one shed always passes back in the following shed. As the threads are bent round the crossing points

of the warp, they are tied firmly and cannot slip down through the border, when the latter is later on fastened on the loom. Thus the *breadth of the cloth is determined by the length of the woven border*, which in the texture lies parallel with the weft threads, a circumstance that is of interest in case we will try to determine the direction of weaving in fragments of cloths.

In several of the cloths we have found a *plaited* border, the construction of which is illustrated in the diagrams of figs. 59, 3 and 87, 1. It has been a subject of discussion whether this kind of border lies at the starting edge or at the closing edge, and the question is of importance for deciding the build of the loom, but it will be more natural to leave this point to the closing part.

3. IRREGULARITIES IN THE WEAVING OF THE CLOTHS

Many of the materials show irregularities in the making, which betray that the work was difficult, thus they are often out of shape and drawn. This unevenness is caused by different circumstances, f. i. *unequal straining* of the warp. For it is easier to beat up the weft if the warp is taut than if it is slack, and if for some reason or other the warp threads are unequally strained (f. i. the weights of the weight-loom may not be equally heavy), the weft will be uneven.

Another cause may be too much *tightening of the weft in the shed*, which causes a decrease of the breadth. Usually the weft will exert a certain pull towards the centre and thus the threads of the edges are pressed somewhat together. If this tendency prevails, it becomes a most annoying hindrance to the work, and it is surely difficult to resist this influence, if the loom is not fitted out with provisions against it; for actually a certain handiness and a great deal of practice is required to give the weft threads exactly the right length. When the shed is open and the weft slipped through, it looks as if it should only pass in a straight line from one selvedge to the other; but when the shed is changed, and the longitudinal threads close round the weft, the latter must to a certain degree accomodate itself to the warp threads, which being kept taut in the loom will now exert a pressure. The weft must pass in slight curves over and under the warp threads, and the distance to be traversed is now longer than the straight line. Accordingly it will pull the warp threads towards the middle, especially at the side from where it proceeds, and consequently the breadth of the texture will decrease gradually, if this is not deliberately resisted. The kind of wool used likewise plays a great part[1]). Possibly the weavers tried to *resist the tightening of the weft* and the drawing in of the texture, but it appears from the numbers of threads that they seldom succeeded; the figures indicate in most cases that the warp threads lie most closely in the vertical borders of the cloth. Therefore in this connection it is quite possible to imagine that also in relation to this fact it may be *advantageous to divide the shed* in several parts, each with its own weft thread, as mentioned before; for when a weft thread is beaten up in an open shed, it pulls back into the shed a small bit of the free end coming out of one side-edge. This is of little consequence, it is true, if one thread traverses the whole distance from one selvedge to the other; but if the breadth is divided among several threads and the effect is doubled f. i. up to 4—5 times, it must presumably have a certain influence.

The dividing must at least have a direct advantage in the fact that it is easier to give the weft an adequate length across a short distance than across a longer distance. But it appears from the cloths that the effect was still small in comparison with the existing difficulties; the cloths show that it must have been very difficult to maintain an even closeness of the warp across the whole breadth; and the resulting inconveniences, which often inter-

fered with the work, have brought about that the working person had to use various small tricks to carry through the weaving.

It is a well-known phenomenon from weaving in general that it is easy to beat up the weft in an open warp, but more difficult in a close warp. If the tightening increases to such a degree that the warp threads are pressed together at the edges and prevent the weft from being beaten up properly there, the consequence is a gradual changing of the line of the shed; for in the middle of the fabric, where the position of the warp is normal, the closeness of the weft is unchanged, whereas the distance between the weft threads is increased at the side-edges. Thus we get a *curved shed*, the middle of which curves in towards the starting edge. The blanket from the Trindhøj grave (fig. 38) shows a case where such a weaving line was straigtened out by the weft for some time passing only the part of the shed in which the displacement was found; when the curve was straigtened out the weft was again carried across the full breadth. As this part, thus woven by itself, lies as a belt tapering off towards both ends, I have used about it the term of *double gore*, whereas similar gores that taper off towards one side only have been called *single gores*. The latter occur in many cases, as was pointed out in the description of the pieces of garment. Here we shall only mention the piece of cloth sewn together from Borum Æshøj, where the warp is very much pulled inward at one edge, as figs. 83 and 85 show. The plaited border meets one edge at b at a right angle, but the other edge at a at an acute angle, which means that on account of tightening of the weft, the closing edge is narrower than the starting edge. The effect of that is counteracted by a single gore proceeding from the regular side and tapering off towards the drawn edge. The Guldhøj cloak showed how a piece of cloth has been straightened up partly by a single gore, partly by several, scattered weft threads, which cover only part of the whole breadth. Unfortunately the piece has been cut out so much that its original shape cannot be made out. The same is the case with the cloak of the old man's grave in Borum Æshøj, fig. 64, where both double and single gores are found so abundantly that it would have been exceedingly interresting to know, what this piece looked like before the cutting out took place.

It should still be borne in mind that also *uneven straining of the warp* may involve an unequal closeness of the weft threads, and that there is nothing to prevent this cause from occurring in connection with tightening of the weft, so that the effect of the two factors either supplement or check each other, according as the interaction is favourable or not.

On modern hand-looms too much tightening of the weft is usually avoided by means of a spreader, which with fine prongs or teeth takes hold of the texture at the side-borders and is strained so that the edges are pressed outward to resist the inward pull of the weft. The distance between every two warp threads is further fixed by the reed or the comb. But in spite of these excellent aids the weft may still now and then be tightened too much; and usually the consequence of this is that the warp threads at the edges of the texture get worn or cut by the comb, when the batten beats up the weft in the shed. In none of the Bronze Age fabrics we have remarked that in spite of much pulling inward, the threads of the edge have been particularly exposed to wear or to damages involving an eking out of the threads, and on the whole an eking out of the threads is seldom. Accordingly the weft must have been beaten up by gentler means than is the case on modern looms, and the prevailing idea is that a *weaving sword* like the one shown in fig. 164, m, or a similar instrument was used to this end. Probably the use of a reed or a spreader is absolutely out of the question, and the tricks of weaving gores mentioned before must be regarded as an attempt to do away with the effect of inconveniences already come about, and not as a means to prevent their occurring. But, as mentioned before, certain Norwegian weight-looms have some plugs or

pegs, which are thought to have had the aim of giving an equal breadth to the whole fabric. As half of the warp is shared out between the plugs placed on the warp stick, the latter will act as both warp stick and spreader; its function as spreader is, however, not so effective on account of the rather long distance between the warp stick and the weaving line, a fact which must no doubt weaken its effect considerably. The method applied on the Worsaae loom is mentioned above.

When weaving on an upright weight-loom it would seem natural to try an *extra weight on the warp threads* in the edge, which would result in the weft threads being more easily beaten sufficiently up there, and the weaving line thus kept straight, and besides, the heavier weight must increase the resistance of the warp threads to the pulling inward of the weft. We have *not*, however, *found such an arrangement* on the upright looms in Danish museums, nor does a weighing of the loom-weights from the Antiquity seem to give any positive result.

Thus it does not seem likely that the ancient loom should have had a really effective means against too much tigtening of the weft. We find, however, among the fabrics pieces showing *peculiarities of a quite different kind* from those mentioned. Thus f. i. the piece of cloth sewn together from Borum Æshøj *varies in breadth*, the piece being at the plaited border 130 cm broad, at another place only 110 cm, and at the cut border it measures 118 cm; here the weaving has caused *both a decrease and an increase* of the breadth. This observation does not, however, solve the question of tightening and slackening of the weft, nor does it allow any conclusion as to the position of the plaited border; for the Æshøj piece is broadest at the plaited border, whereas the reverse is the case with the Egtved blanket.

When working on the upright loom it must be natural to have the weaving line almost on a level with the breast. Only the starting part must necessarily be woven close to the cloth beam, and the last part of the cloth must be made as near as possible to the warp stick, to make the most of the warp; for the loom-weights cannot be lifted higher than to the warp stick. If the warp stick is framed in such a manner that it is capable of keeping the warp spread out, (f. i. by the plugs mentioned), this fact may explain an increase of the breadth in the part of the cloth woven the last. There is further the possibility that the varying breadth is due to uneven fulling. A piece of *garment showing a deviation* of a somewhat different kind is the loin cloth (fig. 68) in the old man's grave from Borum Æshøj. Here we meet with the rare exception that the number of threads in the warp is greater in the middle than at the edges; consequently the weft threads are closest together at the edges of the cloth, and the curves of the weaving line have been straightened out by two single gores, proceeding one from each side, the exact reverse of what we have found in the Trindhøj blanket.

Although on the whole the Bronze Age fabrics show features in keeping with the observations made by weaving in general, we find also peculiarities differing from them. This is well worth remarking, even if it is more difficult to explain.

It is hardly possible to decide with absolute certainty whether the loom of the Bronze Age had heddle-rod and heddles, although it is a rather overwhelming thought that so large pieces of cloth should have been made without this aid so advantageous to the work.

One thing is *certain: that the warp was subject to a regular dividing* so as to make a natural shed. It is a *fault not seldom occurring* that at the beginning of the weaving two warp threads have been taken up together instead of one, and at a few places of the Trindhøj blanket f. i. we may see double warp threads occurring along the whole length of the texture. If there had been no regular dividing of the warp, and the weft were pulled through f. i. by a needle, it would have been so easy to correct these faults that they had probably been corrected. Likewise such faults would have been likely to arise later on in the weave, but we have in no case observed anything of the kind.

4. THE SIDE-EDGES OF THE CLOTHS

The making of the side-edges varies somewhat. *The most simple form* is shown fig. 13, 1, where the edge is made only of two packs of threads, each consisting of some threads kept together. These strands should only be regarded as ordinary threads of an extra thickness, lying in the edges of the texture, but otherwise following the other warp threads, and the course of the weft is normal.

The other type, fig. 41, 6 is likewise quite simple. The threads follow the principle of the bottom fabric, but the longitudinal threads forming the edge are somewhat closer than the others, and possibly a special arrangement is required to keep up the closeness which distinguishes them from the bottom.

Fig. 59, 2 shows a *more peculiar side-edge*. When the weft thread has come out of the bottom and through the warp of the border, it goes directly into the bottom again without passing on its way back the warp of the border. When the weft threads are tightened the edge of the border is bent towards the edge of the bottom, thus forming a tube. Thus each time when the bottom has two weft threads the border has only one; accordingly it cannot follow the changing in the rest of the texture.

From the Bronze Age only this specimen of such a border is known, whereas *in the Iron Age it occurs rather often*. When in 1931 I wrote on the fabrics excavated in a bog at *Corselitze* in the island of Falster, I believed them to have been woven on a tablet loom; but later on I have become acquainted with a piece of cloth found in a bog, which is provided with such a border woven round, so well-preserved both at the beginning and at the end that we can make out that the warp loops are extant here. So now I regard the use of the tablet loom as being out of the question, because it would be necessary to break the tablets in order to remove them from the finished texture, a method which does not seem natural.

Finally in one case there occurs *a side-edge corresponding exactly to the starting edge of fig. 59, 1*. That in this case the type mentioned is determined as a side-edge is due to the fact that it lies at a right angle to the threads which we have decided to be the weft on account of the over-crossings of the threads. And this border can very well be woven as a side-edge of a piece of cloth; but like the preceding type it has only one changing of shed to every two changings in the bottom fabric.

Sometimes it is of interest to be able to *determine* which threads are *the warp* and which are *the weft* of a piece of cloth. That is not very difficult with a piece of cloth preserved in its entirety; but with cut out pieces or small and torn fragments we must rely on the observations made in the cases that are certain. If a bit of a *selvedge* is preserved it gives a certain hint, but as the same type may occur both as starting edge and side-edge, this distinguishing mark is not always to be trusted, so other criteria must be sought. Among them we may mention the *over-crossings* of the threads, described above, which are infallible characteristics of the weft. In all decided cases they occur on the weft threads, and it is quite unthinkable that they should ever occur on the warp threads. Further it is common, and almost a rule that the *warp is S-spun and the weft Z-spun*, and often the warp threads lie more closely together than the weft threads. However, it appears from the analysis p. 161—163 that *deviations may occur*. But usually it is possible even in quite small pieces to distinguish between warp and weft by the aid of these features, especially if several of them are present.

On the whole the Bronze Age fabrics must be characterized as coarse cloths. The greatest numbers of threads occurring at a space of 10 cm are in the case of the warp 56, 58, 62, 65, but more common is a number of about 40, and in the Egtved jacket we have found the smallest number of warp threads, as one of the samples had only 25 threads in 10 cm. The

Swedish cloak from Gerumsberg is of a somewhat finer quality than the Danish fabrics, its number of threads lying between 50 and 70.

It cannot be taken for granted that the smallest number of threads corresponds to the coarsest spinning. Thus the Egtved jacket is made of a somewhat finer wool than f. i. the Guldhøj cloak, which has 40 warp threads in 10 cm. We have already mentioned that the fineness of the fabrics is not limited by lack of skill at spinning. The small fragments of *flaxen textures* in the *Voldtofte find* from the Late Bronze Age show the surprising number of threads of 170 and 130 in 10 × 10 cm. But the woollen textures of that same find correspond in number of threads rather to those of the Early Bronze Age, one having 45 and 27 threads in a square of 10 × 10 cm. So the supposition suggests itself that the closeness of the threads is influenced by the difference of the material. Flax makes a strong thread even if it is fine, whereas the hairy woollen thread, which exerts much friction, will probably, if it is spun finely and simply, be too weak in the case of uneven straining of the warp and similar difficulties. It is worth while remarking that even the fine woollen cloth from Corselitze, mentioned p. 128, falls short in fineness of the flaxen textures from the Late Bronze Age, although it is several hundred years younger.

5. THE FABRIC AND THE LOOM

Several scholars both in Scandinavia and in Germany have entertained the supposition that the loom of the Bronze Age must have been an *upright weight-loom*, and it cannot be denied that the idea seems plausible, as finds of loom-weights in sites of houses prove that a weight-loom was known in Denmark already during the Early Iron Age[1]). And further certain features in the construction of the cloths, especially the selvedges mentioned, point towards a loom with a hanging warp.

The question is, however, not quite simple, and I shall here point out some of the difficulties.

In our work: "Danske Bronzealders Dragter", I determined (p. 310) the *plaited borders* to be *starting borders*, but I emphasized that they were often rather unequal in the making and somewhat drawn awry so that they must have given a rather weak foundation to the weaving, and they could not compare with the woven borders in strength. The supposition that the plaited borders act as starting borders is favoured first of all by the fact that the closed warp loops occurring here are like those of the woven starting edges of the Bronze Age cloths, further it is favoured by their resemblance to the starting edge of the fabrics sitting on the Faroe looms of the National Museum of Copenhagen. And also it seems to me unnatural and unnecessarily difficult to weave a fabric to the end with an uncut warp on a weight-loom, and on the weight-looms which I have seen myself the warp threads have cut ends at the lower edge.

Contrary to this supposition Dr. Agnes Geijer[2]) is of opinion that the *plaited cross-borders* must be at the *fourth and last border* of the texture, because the construction of the plaiting is inferior to the woven starting border and accordingly has less carrying power, and because it is easier to make a plaiting in a row of threads coming out from the edge of a finished cloth than in a row of long threads about to be arranged into a warp for weaving. Apparently Agnes Geijer, who adheres to the opinion that the fabrics were woven on weight-looms, does not realize that her theory about the closed loops being found at the end of the weaving will in that case cause practical difficulties; and she is also of opinion that on setting up their looms the Lapplanders preserve the warp loops at the bottom. Furthermore she refers to

a copy of a Lappland loom set up with an uncut warp. It belongs to Ingenieur Kurt Hentschel, Berlin. We shall now examine the material in hand.

The sizes of the Bronze Age cloths are rather impressive. The piece of cloth sewn together from the Skrydstrup find is even almost 4 m long. The blanket of the Egtved grave is 258 cm long. In this piece there occurs, as mentioned above p. 83 *a weaving fault*, fig. 98, which shows *a warp thread carried on as a weft*. This fault suggests that the weaving has taken place towards the plaited border, a fact which supports Miss Geijer's opinion that plaited borders can occur at the closing edge; but that does not mean that plaited borders cannot occur at starting edges as well.

None of the pieces of cloth in hand are provided with selvedges in all the four borders, and only one, the *Trindhøj blanket*, can be supposed to have preserved *its original measures*, as it ends in a fringe. To be sure fringes may just as well be made of a cut warp, but still there is a possibility of finding the warp loops both at the first border and at the last. The glueing of the fringes is very strong. So I tried with a needle to part the fringe threads from each other in order to find the continuity in the bend of the warp, and at the closing edge, which is here the most interesting, there was found a *warp loop*, fig. 37, which really seems to consist of the natural continuity of the thread. This is an important fact, so it will be necessary to follow it up and try to find out the consequences of it. At the starting edge of the blanket the examination showed that the fringe consists of two parts, the warp loops coming out of the woven border making only the inner part, and the loops are here preserved. The circumstance that the loops come out about 3 cm long from the upper edge of the fabric, like those of a piece of fabric on a loom in the museum of Thorshavn, gives occasion to another reflection. Such *loops* are seen also *in a fabric* sitting *on a loom in the Thorshavn Museum*. The Trindhøj blanket is not likely to have been suspended by the weaving border itself; for if that had been the case the warp loops coming out of the texture would have been pulled back to the edge of the starting border by the pressure from the straining on the loom or perhaps by the pull of the loom-weights. A suspending on a cord or a lacing up similar to that known from the Faroe loom seems to be a more likely arrangement, and the plaiting together into a border of the loops hanging out may have been done at last, when the piece of fabric had been removed from the loom. It is common for primitive looms to have the warp loops lying round a stick or a bar, which is again tied to a beam, and by such a method the loops would have a length fairly suitable for a bending down into a plaited border, which is then made after the weaving is done. This explanation cannot be said to contradict the theory that loops may occur at the lower edge of the warp; because there is nothing to prevent a cloth from having loops and consequently plaited borders at both cross-edges, if the loom permits it.

From the *time of the Migration* we have a piece of cloth in the *Corselitze find*[3]); it is provided with a tablet-woven *closing* border, where the warp threads are first led down through the border as weft and then up again, and in the line between the bottom fabric and the woven border the *cut* thread ends are found. As far as I can see, this corresponds exactly to a specimen found at *Snartemo* in Norway[4]); but these fabrics bring us no positive information on the loops.

In the case of Denmark I am, however, now able to add some new material. In some *bog finds* so far unheeded there are found some pieces of twill cloth which still have both original cross-edges, and the loops of the warp of these cloths are preserved. But there is *no starting border*, a circumstance which must be taken into account, as it may signify that we cannot at once place these pieces in the group of fabrics with which we work here, i. e. those which start with a band weave. At any rate these cloths are extremely interesting,

as they prove that during Antiquity it was possible to weave a piece of cloth to the end with an uncut warp—even rather close to the bend of the warp. Now we shall proceed to find out how this will tally with the instruments the use of which was presupposed in the preceding part.

The *warping apparatus* mentioned (p. 116) causes no difficulties; simple as it is, it manages in a very clever way its double function of band weaving and warping at the same time,

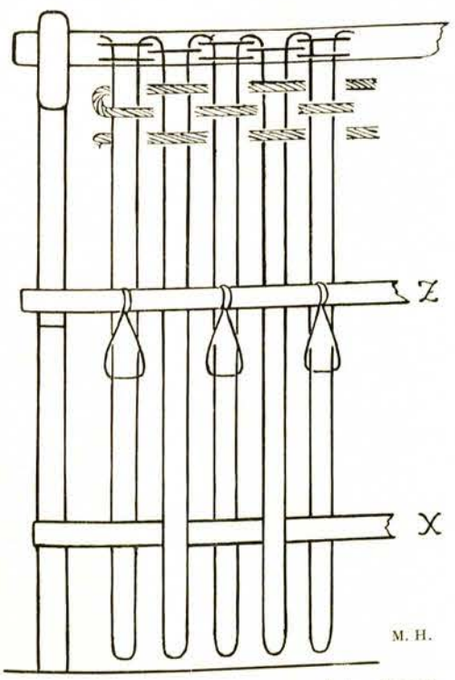


Fig. 168. Diagram of the course of the thread in a copy of the Lappland loom belonging to Ingenieur Kurt Hentschel, Berlin.

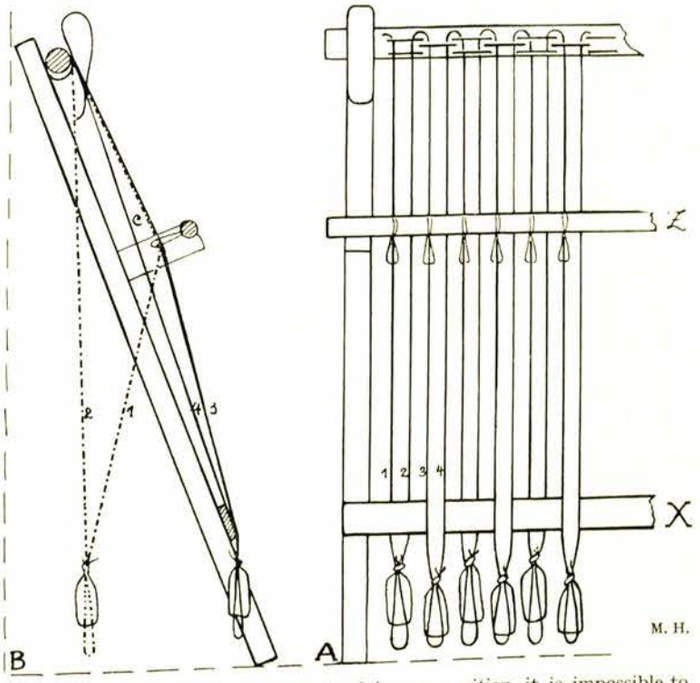


Fig. 169. As a shed is only obtained in one position, it is impossible to carry through the weaving.

and in case no band weaving were wanted, that would be of no moment, as warping methods similar to those of the Faroe Islanders and the Egyptians would then be considered. But on the other hand neither these specimens nor the warping arrangement belonging to a find from *Tegle* in Norway give any final answer to the problem raised here; because it is not unnatural to cut the warp *after* the warping, just as is done after the warping on a modern warping board, where the threads are also wound round pegs continuously and with closed bends of the warp. That which we want to make out is, how the weaving will get on with an uncut warp on the loom, for: *the value of preserving the closed loops is not directly obvious, if their preservation does not harmonise with the arrangement of the loom and the progress of the work.*

I shall begin with the model mentioned above of the *Lappland loom*, and I thank Ingenieur Kurt Hentschel for his information and for the permission to mention it here. The loom (Fig. 168) is set up in such a manner[5]) that the threads lie two by two in the upper edge; and at the lower edge the closed loops are present; but—the threads go also in pairs through the heddles and in pairs over the warp stick at the lower end of the loom[6]), a parting which can only give plain weaving with a longitudinal double thread; this does not accord with the analysis of the Bronze Age fabrics. In *principle* the loom brings *nothing new;* because that which happens in the present case is only that a double warp thread acts as one single thread; of course this fact has influence on the thickness and strength of the fabric, but that is of no interest in this connection; the central point of the case is that actually the function of the

two threads corresponds to that of one thread with the same position in the loom[7]) and then the closed loops can easily be preserved. Only this proves nothing about the problem which we are trying to solve, and as far as I can see, the same thing is the case with the original Lappland looms published up to now.

When the product has a double warp[8]) the setting up of the loom must have a double course of the warp, but whether the loops are preserved or cut at the lower end of the warp is really of no consequence to the carrying out of the weaving. It seems to me that the method of the Lapplanders is on this point behind and with the Bronze Age technique, as it rests content with the division and connection of threads given by the starting border, whereas the Bronze Age people aimed at a finer division of the texture. It looks as if the Lapplanders have purposely avoided a trouble.

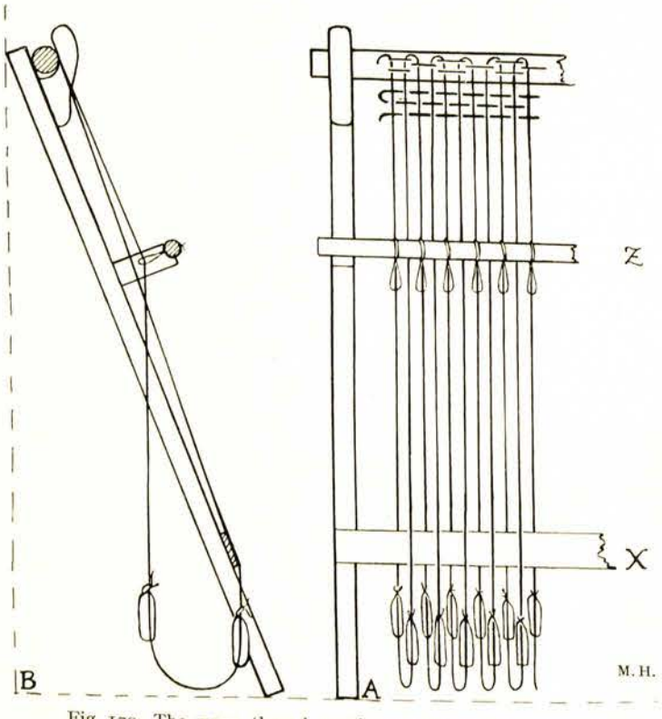


Fig. 170. The warp thread continuous below the warp stick.

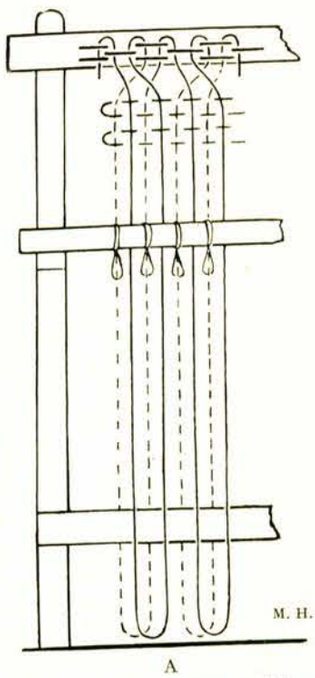
6. WEAVING EXPERIMENTS

In order to find the right solution it is necessary to arrange the threads in such a manner that the shed is made by raising each alternate thread and lowering the others. An upright loom has been used for these experiments, a copy of an original loom in the National Museum of Copenhagen, with warp strainers of the same pyramidal shape and the same weight (about 500—650 g) as the loom-weights, known from the Fredsø house[1]).

The heddles are easily arranged; they are made of one continuous string tied across the whole breadth of the warp, and the loops can be fastened to alternate threads. It is far more difficult to obtain a corresponding division at the warp stick, because it is impossible to get hold of each thread separately on account of the closed loops. And if now it is an indispensable claim that the loops must be retained, and if we try to place them just below the warp stick great confusion will arise. Fig. 169 shows the result: to wit that a shed *can* be made in the warp (at c) when the heddle-rod is lifted up in the crotch; but if the rod rests down in the angle, there is no parting of the warp whatever, and consequently it is impossible to carry out the weaving.

In order to obtain a balance and a sufficient freedom of movement to the warp layer which must constantly change its position, it is necessary to procure an even division of threads by heddle-rod and warp stick; and if we still want the bends of the warp preserved, the division of the threads can be done by taking out the warp stick, which must be loose, and putting it through the loops (fig. 170). If further an extra supply of warp is wanted, which is necessary for the weaving of long pieces of cloth, this extra yarn must hang down or lie on the earth in packs or balls between the two rows of weights. This arrangement makes possible a solution which is theoretically the right one, as we get a fabric with the

right analysis, i. e. two-shaft with single threads, and finish up with preserved warp loops. However—we can hardly call this a convincing method; it seems peculiarly illogical to insist so much on the idea of a connection between the two layers of warp, the functions of which are so different, one having to stay in its place and the other constantly changing its position. Moreover the loom must have a certain inclination in order that the pull of the weights may be so directed as to make the shed stand out easily and clearly. This again involves a separation of two rows of weights, a necessary arrangement to avoid the inconvenience of the weights touching each other when changed. There seems to be little sense in preserving a continuation of the thread under these circumstances.

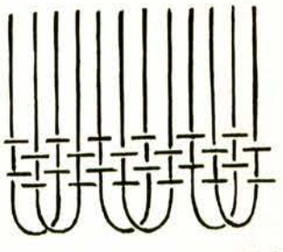


A

Fig. 171 A. Experiment with a shifting of the warp thread.

Dr. Emil Vogt[2]) pictures some fabrics with starting edges much related to those which we know from the Danish Bronze Age material; but there is a difference in the curious overcrossings of the warp threads occurring between the border and the middle of these Swiss fabrics. These peculiarities are probably there for some special reason, and I have set up some samples in which the warp was arranged in the same manner to see if possibly I could here find a solution as to the question of the position of the warp loops; the diagrams figs. 171 and 172 show my experiments.

By introducing this shifting of the warp threads below the starting border it is possible to get the right division of the warp and preserve the loops at the bottom of the loom. Unfortunately the Swiss fabrics are not so well preserved that the edges woven the last are present, consequently they cannot give satisfactory information. However, the closing border has the analysis shown in fig. 171 B, and this at least does not accord with the weaving edges of the Bronze Age fabrics on which the plaited borders are found; because here the threads connected in the bends come out of the texture side by side (as at the lower edge of the Trindhøj blanket).



B M. H.

Fig. 171 B. The position of the loops by the end of the weaving after the experiment shown in fig. A.

Fig. 173 shows an experiment of a purely theoretical interest. Here the warping is made with two threads simultaneously so that their course is parallel. Thus we get a warp in two layers, one of which may be placed at the upper side of the warp stick, and the other at the lower side. The result is that the weave and the closing edge are the same as shown in fig. 171 B and accordingly not quite satisfactory to our claims.

The experiments made now have probably shown in full that *it does not seem natural and simple to preserve the closed loops at the lower end of the warp in weaving a piece of ordinary two-shaft on a weight-loom*, on the contrary it seems far more natural to cut the loops. Conversely it follows from this that *if really the closed loops in the plaited borders were found at the fourth edge, the one woven the last, it would be natural to turn our attention to a type of loom which not only allowed of their preservation but possibly also utilized their presence constructively*. Dr. C. H. Johl is of opinion that the Egyptians put beams or cross-bars through the warp loops on setting up their looms[3]). Examples of this are not seldom with primitive peoples; f. i. the ethnographical section of the National Museum of Copenhagen is in possession of various looms where *at both ends* the warp loops lie round cross-bars, which are fastened in such a manner that the warp gets the necessary straining; thus the loops are utilized

directly by the setting up of the loom, and they may not only be preserved but even be useful.

Apparently Dr. Emil Vogt, who by the way believes that several types of looms have been known at the same time, entertains the same idea; in two of his figures he shows settings up with the warp loops lying round cross-bars or beams.

Thinking of the large and on the whole well performed fabrics I have been disinclined to set the claims to the Bronze Age loom too low, and I have thought it necessary to insist on the idea of an instrument which made the work comparatively easy. But on the other hand it is astonishing to see with how few aids certain peoples can manage even apparently great tasks.

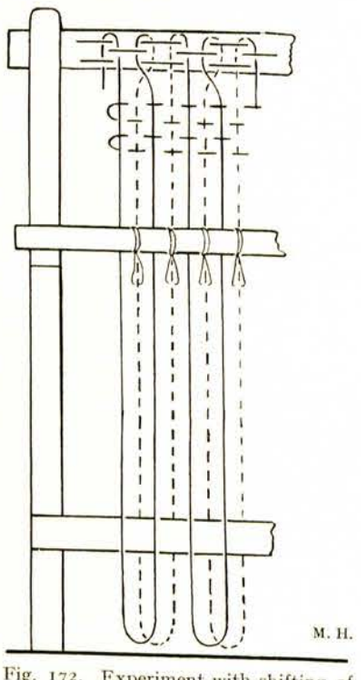


Fig. 172. Experiment with shifting of the warp thread.

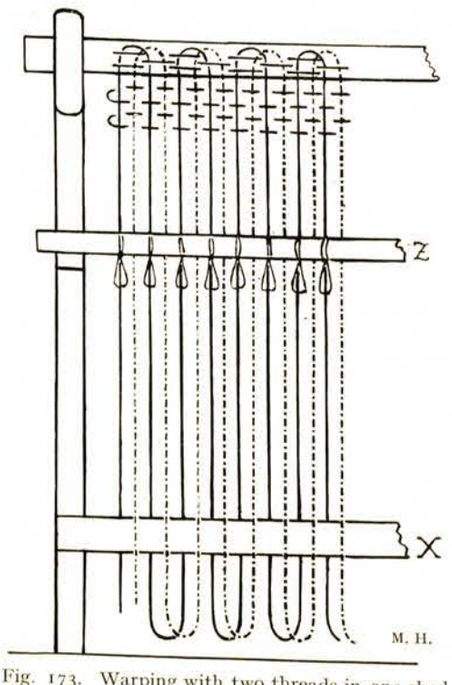


Fig. 173. Warping with two threads in one shed in a starting border.

Thus in a treatise Dr. K. Birket-Smith describes a very *simple loom*, used *by the Tlingit, Tsimshian, and Haida tribes*, "It consists only of two vertical posts, connected at the top with a cross-bar. Along its lower edge there is a cord round which the warp is hung, and the weft is led in from the top downwards by the fingers alone, generally in such a manner that the weft threads are wound two by two round pairs of warp threads with a constant shifting of the binding point by which we get a kind of twill binding; but each type of cloak has its special technique, of which we shall not here give an account. It should be remarked that neither shed sticks, rod, sword, nor shuttle are used"[4]).

So here we have textures which with regard to pattern and binding seem far more difficult than our Bronze Age fabrics; but with regard to dimensions, especially length, they are inferior, and if an equally simple loom was used for our rather greatly designed fabrics, it must have been necessary in some way or other to give a certain straining to the warp, which straining may be done in different ways in the different looms. The conclusion that the Bronze Age loom has had a regular division of the warp, f. i. by means of a warp stick or a cord, seems to me justifiable, when we regard the weaving faults occurring in the cloths (see p. 83 and fig. 98). If for the straining of the warp we will use loom-weights and at the same time preserve the closed loops, the weights must hang in one collected row of threads, and we must then forego the advantage of a separation of the warp into two layers at the lower edge. The experiments have shown that this separation is necessary, if one layer shall move and work independently of the other. If the warp has been arranged without any separation, we can hardly imagine that the loom should have had a heddle-rod; but each alternate shed may have been made by the hand or a stick. This means that *such a loom is far more simple than the shape of a weight-loom which we know from the Faroes*, from Norway

and Lappland, and from the Greek vase-paintings. *Very likely a prototype of this loom has existed;* for the more we study the upright weight-loom, the more we feel that really *it is not so primitive* as to be regarded as a first stage of a loom. Actually the idea of a fixed and a working warp layer conveys *a mechanical principle* signifying no small degree of inventiveness, and the fact that this loom has been in use right up to our days points in the same direction.

When we look at the fabrics with *woven starting borders*, we invariably get the impression that it seems most natural to imagine them woven on a *loom with a hanging warp*. For although through finds of loom-weights in sites in Jutland we have irrefutable proofs that the weight-loom was in use in Denmark during the *Iron Age* and accordingly has had a very long life in the North, it does *not follow* that *the ancient looms were quite like those preserved in Norway* and on the Faroes; they *may* have belonged to a *more primitive stage;* the finds give no information on the device of the loom. Unfortunately the excavations of sites inform us of the existence of a loom only in the cases where warp strainers of burnt clay are found. Consequently we cannot reject the idea that both during the Bronze Age and the Iron Age looms may have been used which were of wood all through; and certain features in the fabrics give rise to another reflection, which I think I ought to suggest, although it does not directly accord with the theory advanced above.

At the *preliminary stage* mentioned of the weight-loom it is very well possible to preserve the loops at the lower end of the warp, just as is the case with the Lappland loom, and as it seems of no importance to the work whether they are preserved or not, it may have been more convenient not to cut them. On the other hand I do feel tempted to assume that every feature in the material has its meaning, and accordingly it would be more satisfactory to our examination, if we might take for granted the use of a loom on which the warp loops could not only be preserved, but also be useful. But if now we imagine, founding our idea on several examples of primitive looms which have the *warp loops of both ends of the cloth lying round cross-bars*, that the same thing should have been the case with the *Bronze Age loom*, then we immediately meet with the demand of a warp beam. For it is evident that in the certainly few cases, where the length of the warp is 4 m or more, the warp cannot be placed in its full length on a vertical loom, and even a loom on which the warp can be set up in double length will hardly suffice for such long pieces of cloth. I have p. 51 and p. 128 called attention to a peculiarity of the Bronze Age fabrics, consisting in the normal course of the weft being suddenly interrupted by *goreshaped parts* woven apart, which occur either in the bottom fabric or tapering off from both edges towards the centre, and I have emphasized that very likely the weight-loom gets an unequal straining of the warp, and especially the Bronze Age loom, as we suppose its weights to have been rough stones, which are seldom exactly alike in weight; and further it seems reasonable to assume that on the weight-loom a shed drawn awry as a result of unequal straining of the warp is straightened up by means of gores; but it must be added here that on a loom where the fourth edge is so to speak open, until the fabric is finished, there is a possibility of regulating and possibly pulling out at the bottom the surplus length of the warp. This is, however, *impossible* in *a case where the warp is fastened at both borders;* here the bulk of the weft must of course be made to fit in with the existing measure of the warp, and if then f. i. on account of unequal warping certain parts of the threads are slackened, it is often absolutely necessary to find a means against it in the midst of the weaving, and an addition of the bulk of the weft in

the shape of *gores is an expedient which seems even more appropriate on a loom with two beams than on the weight-loom.*

Thus it is a question if we should not take into account the possibility that *a loom with beams may have been known during the Bronze Age,* and if such a loom is not really to be regarded as *more primitive than the weight-loom.* For if the principle on which the latter is built should be regarded as obvious, we might expect it to be widely diffused, which, however, it is not. So far it is only known within a comparatively small territory and in the various places where it occurs it can hardly have come to exist spontaneously; but its occurrence must be due to cultural impartations.

On the other hand a loom on which the warp is fastened at both ends by means of loops round wooden sticks or beams is widely diffused. And although Dr. C. H. Johl[5]) has not been willing to assume the existence of a loom with two revolving beams at this early stage of culture, the possibility that it did exist cannot be rejected.

Starting from the *Swiss textiles* of the Stone Age Dr. Emil Vogt[6]) has put forth reflections on the Stone Age loom, tending in the same direction as mine on the Bronze Age looms.

APPENDIX

After having written the preceding I became acquainted with a Greek vase-painting, which in a peculiar manner supports the ideas that I have advanced. It is a black-figured Athenian Lekythos (fig. 166) found together with a stem signed by the masters of the François vase Kleitias and Ergotimos. The vase, which is now kept in the Metropolitan Museum of Art, New York, and which was mentioned by Gisela M. A. Richter (The Bulletin of the Metropolitan Museum of Art 1931, p. 291 seq.), is, however, not made by these vase-painters, but must originate from almost the same period, about 560 B. C. The vase has a representation of women working with the preparing of wool (Fig. 157). Two of them are standing at an upright loom (see p. 120, fig. 174), and the vase gives us the earliest picture known of a Greek loom. Harriet Faxon has written a special essay on that loom (Bul. of Metr. Mus. of Art 1932, p. 70—71), and I rely on her information about the original. As mentioned it is an *upright weight-loom,* the breadth of which must be about 5 feet (160—170 cm) and the height a little more, calculated by the height of the persons pictured. At the top there is a cloth beam, round which the finished fabric is rolled up; a little above the middle the warp is divided by a shed stick, and kept taut by means of a row of pyramidal loom-weights, fastened to the warp divided in groups. *Two women work together on the loom,* where *3 reels* are seen, and the *warp is beaten up by means of some sticks.* Above the *shed stick* there is a *thinner rod inserted* between the threads of the warp. At the drawing this rod is broken in the middle. Harriet Faxon says as follows about it:

"This can be interpreted either as a failure of the glaze at that point, or as indicating two shed rods. That the latter were intended is suggested by actual experiments, for these showed that two short rods could be inserted in the warp in such a way as to form a shed on each side. In the model the rods were started over the first warp thread on each edge, covering alternate threads until the centre was reached. When two women were at work on a large loom it was therefore possible for one to open the shed on her side and, after passing the shuttle through, to weave with it from the centre to the edge of the warp; the other woman would then open the shed on her side and proceed in the same way. To divide a large warp in halves in this manner was to effect a great saving in time and labor".

This is exceedingly interesting, as it *corresponds exactly to the features that I have pointed*

out as typical of the Danish Bronze Age fabrics, i. e. the *application of several weft threads in one shed*, and the *division of the whole breadth in sections*, which I take as a proof that two or more weaveresses have been at work on the loom simultaneously. Thus we have here from Greece from the 6th century B. C. an example of an *upright loom which has not had a fixed heddle binding*.

The work on the Bronze Age loom may have been done in a similar way, and as to this loom I have already emphasized that we cannot make out with certainty whether it was provided with a heddle-rod, D. B. D., p. 313—14. Further it is of the greatest importance to remark that apparently the warp strainers hang in one row, and that accordingly the warp is not divided in two layers at the lower end, an observation which plays a part in connection with the attempts of weaving shown here p. 130 seq. Thus there is *nothing to prevent the warp loops* from having been *preserved in a loom of the type represented in the vase-painting*, as this loom may be said to be a *little more primitive than the weight-loom used by the Faroe Islanders*, the Icelanders, and the Lapplanders right up to our days. I have before put forth a supposition of the existence of such a primitive upright loom (Skrydstrupfundet p. 83, and here p. 133). I can fully accept Harriet Faxon's words: "This vase painting has taught us more about the methods and resourcefulness of the Greek weavers than any other extant representation".

7. FULLING

In the descriptions of each find separately it has been mentioned that the matting of the cloths indicates that they have been subject to the process generally called fulling, a finishing process with the object of adding to the softness and thickness of the fabric. Both in Greece, Italy, and in the North the woollen fabrics were fulled. *It is impossible to say how this was done in the Bronze Age.* On the basis of communications from Mrs. Petra Djurhuus we shall in the following give information on the method used by the Faroe Islanders[1]).

The oldest and most primitive way of fulling was to put down the cloth into the sea and let the water wash to and fro against it. This method seems to have been common within the Norse circle of culture, since it is known also from the Shetland Isles and from Iceland, and especially on the Faroes it has left traces in several names of places with the initial syllable of "Vad"[2]). But already in 1781, when Mr. Svabo wrote his account of the islands this method had gone out of use[3]). In Iceland the fabric was washed in the river after the fulling, after which it was spread out on a flat stone and beaten with a stick.

The general method, both in the 18th century and now, is that the cloth is treated in a large cistern, where it is laid in layers. Formerly urine or "fiskaso", i. e. "the soup in which fish has been boiled", was poured out upon it; a strong hot soap-lye is often used.

Also in Denmark fulling in fish soup (Fiskesø) was known, and the process took place under particularly primitive conditions on a wooden bench, round which a rope was wound, or on a basket made of twigs and placed at the end of the bench[4]). When the lye is suitably cooled down, the woman who is to do the fulling enters the vessel, and with naked feet she steps on the russet in a certain rythm, a proceeding that brings about a friction, which in connection with the hot liquid or lye makes the fabric shrink. The application of urine and stale kneaded mutton fat has not yet gone out of use. Cloths that are fulled with mutton fat are softer, thicker, more waterproof, and more pliable, and are regarded as far more durable than those fulled with soap and soda. Also storing of the russet for about a year is said to strengthen it. After the fulling the fabric is often scorched in order to remove the long hairs.

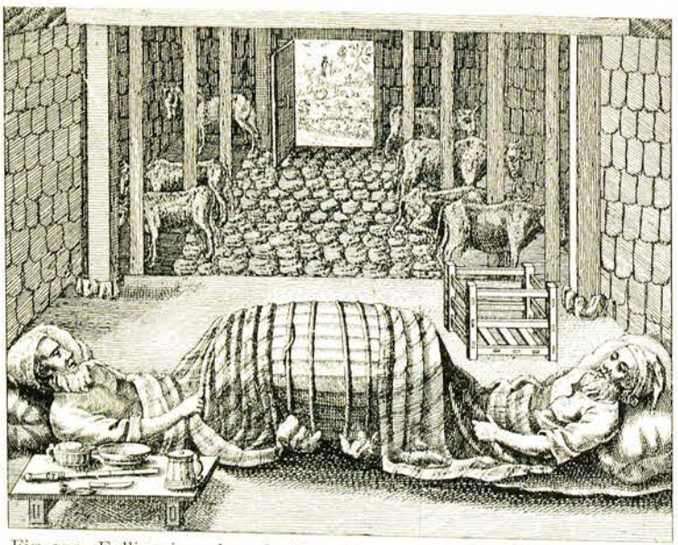


Fig. 175. Fulling in a barrel. After Olavius: Oeconomisk Reise igiennem Island (1780) pl. XIII.

Mr. O. Olavius mentions a peculiar method of fulling still used during the 18th century in Iceland. The cloth was placed in a barrel, and two grown-up men lying on their backs trampled the fabric one from each side until they reached the result wanted (fig. 175). Often the barrel stood in a barn or a cow-stable, and the work could last a whole day. Mr. Olavius supposes this method to have been brought along by the emigrants from Norway during the 9th century, but in our days it is not to be traced anywhere in Norway. Mr. J. Erichsen informs us, however, that this method is said to have been known and used also in Jutland about 1788. The shrinking of the fabrics caused by fulling varies rather much and depends on how much fulling is wanted (half fulling or quarter fulling). Further it is important that the wool is of an even quality, as also the spinning of the yarn plays a great part. The yarn shrinks more if it is loosely spun than if it is tightly spun, and an open fabric shrinks more and is more quickly fulled than if the threads are close together[5]). On the calculations made of the *shrinkage* of the woollen fabrics by fulling[6]), it must on an average be put at 20—35 %, and according to this the shrinkage of the Muldbjerg blanket is put at $^1/_4$ which accordingly does not seem to be at all exaggerated. It has already been mentioned that the fulling can be the cause of conspicuous irregularities in the fabrics, and on p. 121 it has been suggested that the unequal breadth of the blanket from Egtved may be connected with this process of fulling. The drawings out arising from the fulling are often due to faults that are already present in the fabric, f. i. badly mixed wool and uneven spinning. But the irregularities mentioned in the descriptions of each single find, such as weaving gores etc., are independent of the fulling; because they are corrections made in the texture itself, before the fulling took place. Nor is it likely that fulling is the cause of the warp threads lying more closely in the edges than in the middle of the cloth, since it is seen also in pieces which probably have not been fulled. Further it is easy to understand that the warp is pressed together in the borders of the fabric, and according to Mr. H. C. Nielsen the fulling causes the greatest shrinkage where there is the greatest distance between the threads; accordingly the fulling should have the greatest effect in the middle of the cloth, and the warp threads should then come comparatively more closely together in that part. Later on the fulling was performed in fulling mills, run by water-power.

8. CUTTING OUT AND SEWING

There is but very little to remark on the cutting out of the fabrics; as *scissors* were *not known* in the Bronze Age, it must have been done with a sharp knife; the cut edge is often clear and not much ragged in the much matted fabrics, which shows that the *shaping* must have taken place *after the fulling*. The pieces of garments consisting of several bits of cloth show that the Bronze Age people did not mind sewing different pieces together, and

the joining seems rather casual, because obliquely cut edges are made to meet edges that are straight of thread; but if the cloth is fulled in advance, the fabrics are less apt to get ragged edges. The sewing was often made with *two-ply thread* varying in coarseness. There are ordinary whipping stitches and scallop stitches, fig. 130, a kind of buttonhole stitches lying in such a manner that most likely they have been *sewn* from the *right to the left*. For if they were made in the opposite direction the needle had to pass through the cloth from below, a method which does not seem convenient[1]). Also in the caps we find these scallop stitches, and sometimes a cordlike oversewing in the stitches fig. 28. The application of scallop stitches for the making of elaborate borders is mentioned above, where also their age and diffusion is discussed. The decorative cord sewing and contraction sewing is mentioned in the same passage. The pile of the caps and the Trindhøj cloak is probably sewn on, because, as shown in fig. 25 and fig. 26 the stitches do not all lie in the same direction, a fact which is natural to sewing but not to weaving. It is, however, impossible to give an exact account of how the stitches are fastened in the bottom fabric, as a thorough examination cannot be made without damaging the things.

As far as we know no *needles* for sewing have turned up in the grave finds from the Early Bronze Age, whereas such needles, both of bone and bronze, have been found rather often in women's graves from the Late Bronze Age. There is no doubt that for the sewing of f. i. such fine embroideries as the neck-border of the Skrydstrup jacket a very *fine needle* must have been used; for the copy had to be made with a very fine canvas needle. Generally the eye of the needle from the Late Bronze Age was placed a little above the middle, seldom at the end[2]), and as bone needles of this shape occur in the Stone Age[3]), it can surely be taken for granted that the needles of the Early Bronze Age belonged to the same type.

9. SPECIAL TEXTILE WORKS

A. BRAIDED WORKS

Besides the textile works whose form shows that utility was the first consideration, there are also many of a special kind, which show an inclination to vary the material and use it in different ways. The men's caps and the Trindhøj cloak have already been mentioned; but also the hair-net from Borum Æshøj and the woman's cap from Skrydstrup show very valuable renewals in the prevailing techniques.

When the Borum Æshøj net was found, we knew no other works made in this technique. Fortunately it was so well-preserved that it could stand an examination, and it was Miss Petra Godskesen who solved the question of its construction, and she determined that it was made in a *braiding technique*[1]). A few faults in the stitches led to this discovery. The pattern was divided in two halves corresponding so exactly to each other that even the faults recurred symmetrically. Miss Godskesen made a copy of it and sent it to the Danish archeological stand at the world's fair in Paris 1889.

By the end of the 19th century some peculiar textiles were excavated from the Coptic graves in Egypt; in the nineties their technique was described by an Austrian lady, Mrs. Luise Schinnerer[2]), who found out that they were made in a braiding technique, which was still alive in South-eastern Europe[3]). Later on numerous specimens of them have been found in Scandinavia, dating from modern times.

In Danish archeological literature this braiding technique is generally called by the name of "*Sprang*"; but it should rather be called "*Bregding*", "*Slyng*", or "*Linkning*"*).

*) braid = oldisl. = breða, olddanish = bre(i)de, anglosaxon = bregdan.

Braiding requires very few aids, and for small works, as f. i. bands, a special instrument is not necessary, if only the threads can be fastened to two fixed points; but for the making of large pieces a *frame* is required (Fig. 176), which must stand upright in front of the person working; smaller frames can be placed upon the lap and rested against f. i. a table or a chair. First a series of vertical threads are passed round a pair of thin cross-bars or two tightly strained horizontal cords in the frame, (fig. 177, 1) the distance between the threads must be a little larger than the measure of the finished braided work. One of the horizontal bars or cords must be capable of being moved a little in the direction towards the other; for the advancing work will gradually bring about a straining of the threads, which is inconvenient, and the two cross-bars must then be capable of approaching each other in order to slacken the threads. A shed is made in the warp (fig. 177, 2) by means of a pair of sticks. The sticks (I—II) inserted at the upper and the lower edges of the frame divide the warp in two layers so that alternate threads pass over the sticks and the others under. Then the threads are interlaced according to certain rules, and a kind of interlacings or stitches are made, from which gradually a netlike fabric arises. The stitches are taken up with the hands, and the braiding is started at the side of the warp which is to the right of the working person. First the left hand grasps a group of the threads in such a manner that the 1st, the 3rd, and the 4th fingers are passed into the shed, while the thumb holds the upper threads from the front side and the second finger is laid round the lower threads. It is a rule that all the threads that lie over the stick must go down, and all the lower threads come up, when a round is braided; but the shifting takes place in such a way that one upper thread will lie aslant on two lower threads before it passes down to the lower shed. The grasps of the right hand are as follows:

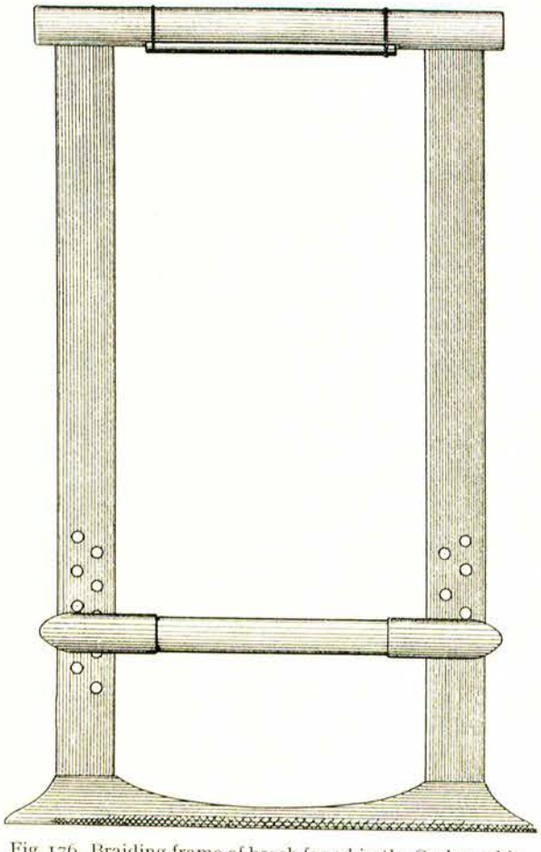


Fig. 176. Braiding frame of beech found in the Oseberg ship.

A. The thumb and the 2nd finger take up the outmost upper thread and let it slip into the hand between the 1st and the 2nd fingers.

B. The thumb and the 2nd finger take up the upper thread no. 2, which is also placed between the 1st and the 2nd fingers.

C. The outmost lower thread is taken up by the thumb and the 1st finger and is left on the end of the 1st finger.

D. The thumb and the 2nd finger take up the upper thread no. 3 and let it slip in between the 1st and the 2nd fingers.

E. The thumb and the 1st finger take up the lower thread no. 2, which is also placed on the end of the 1st finger, and so on taking upper and lower threads alternately until the row of stitches is completed. It should be remarked that the laying of the last thread is not normal, but fig. 177, 3 shows its position. At last all the threads are in the right hand and the forefinger of the latter in the shed; but it is replaced by a bar or knitting needle (III), which is pressed towards the upper edge of the braiding. However, it is evident that when

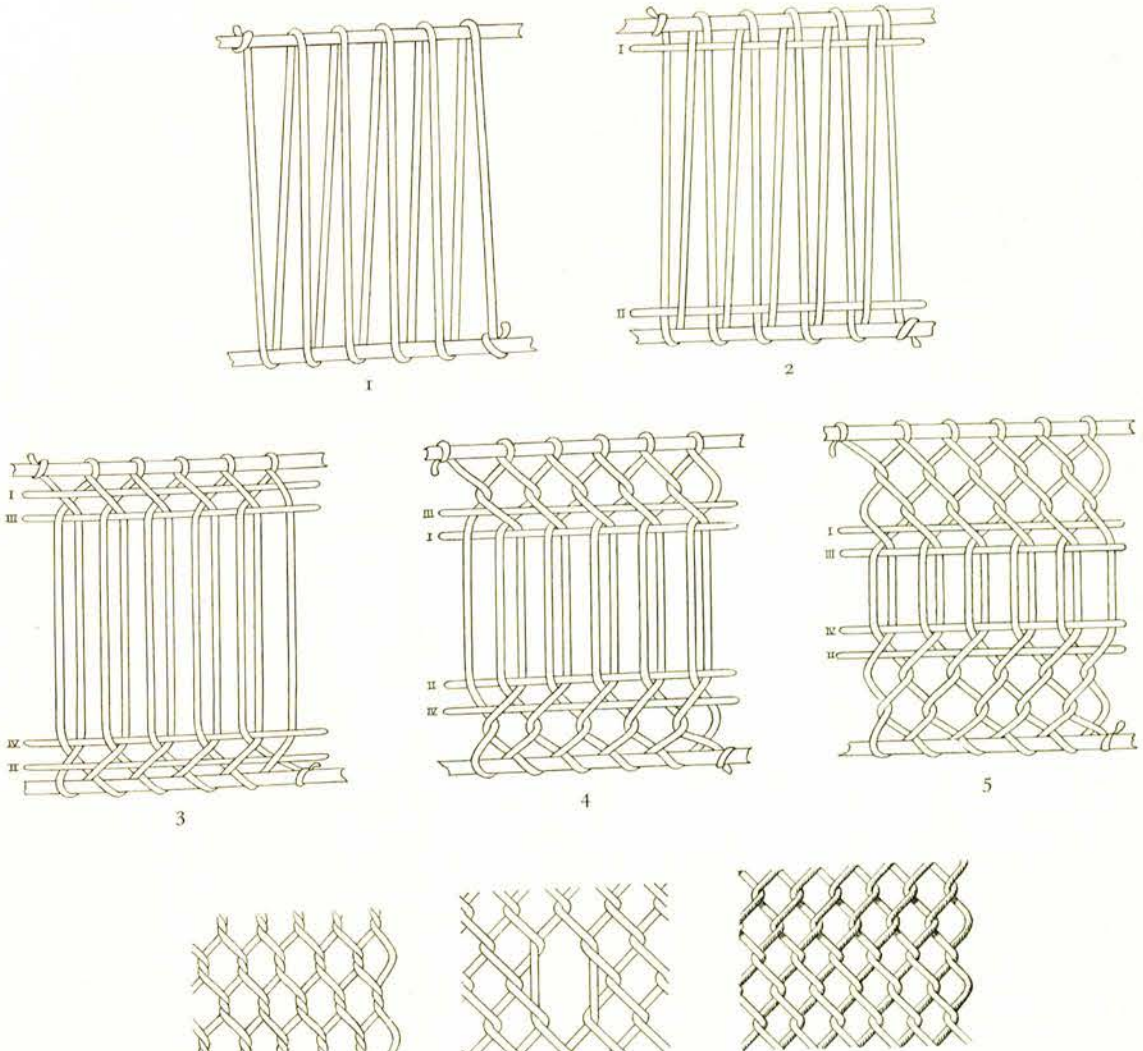


Fig. 177. The preliminary stages of the braiding technique.

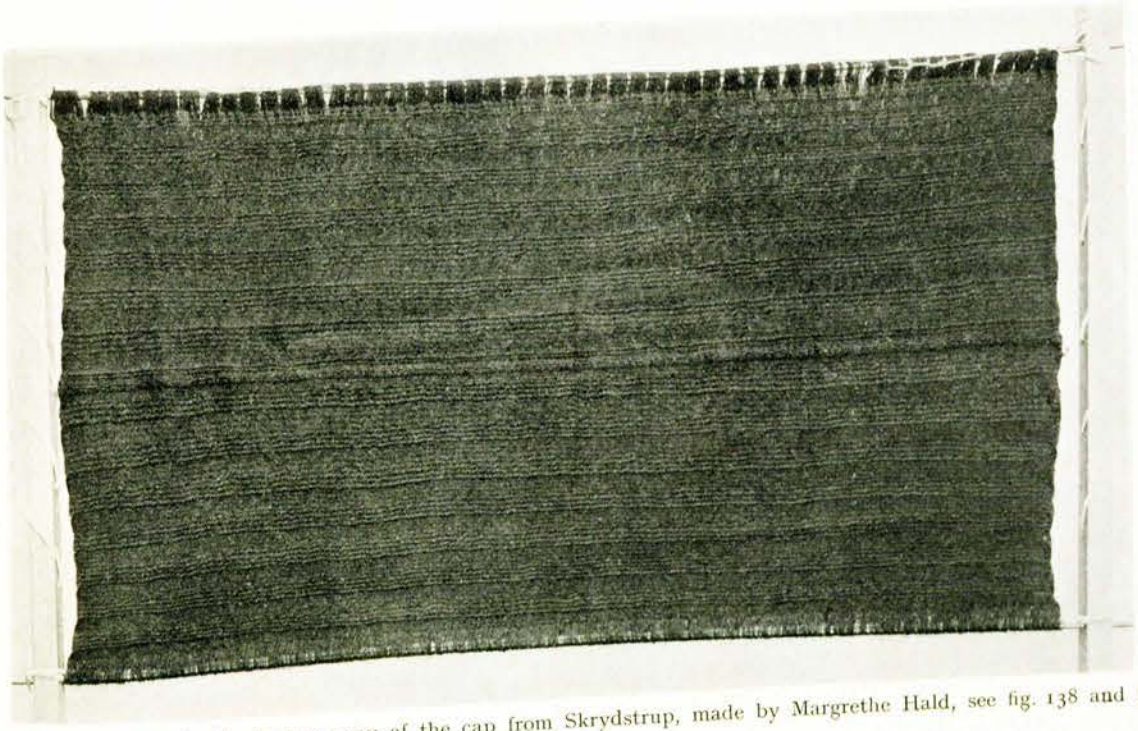


Fig. 178. Braided work in the frame; copy of the cap from Skrydstrup, made by Margrethe Hald, see fig. 138 and fig. 139.

the threads are fastened at both ends the interlacing will also *work below* the hands of the working person. It is one of the advantages of the method that it is double-acting, and therefore a fourth stick (IV) is inserted and pressed down towards the lower edge in order to keep the stitches in place there, and then the interlacings will appear as a row of stitches corresponding exactly to those of the upper part but in the reverse position. The next round starts again at the right edge. The threads are taken up by the left hand as described above. Fig. 177, 4 shows that there are now two lower threads in the further end of the right edge. The grasps of the right hand are as follows.

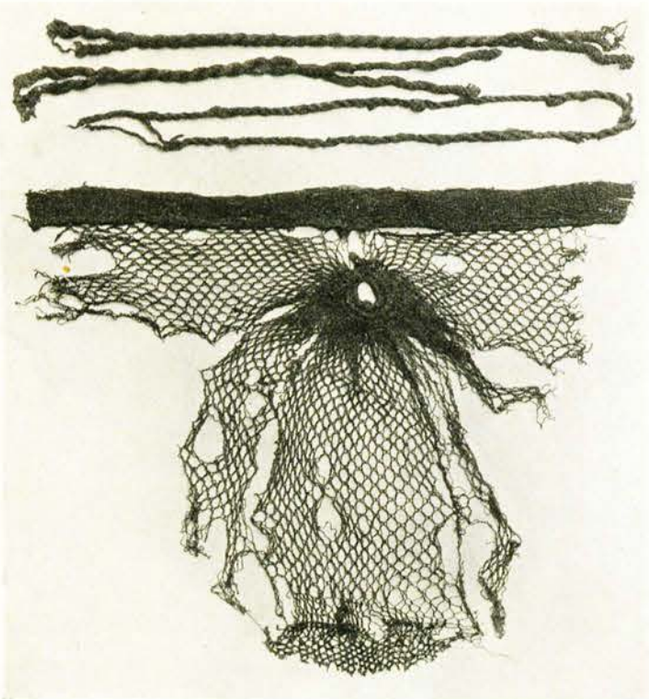


Fig. 179. Hair-net from Haraldskjær bog(?).

A. With the thumb and the 2nd finger the outmost upper thread is taken up and placed between the 1st and the 2nd fingers.

B. The thumb and the 1st finger take up the outmost lower thread and places it on the end of the 1st finger.

C. The next upper thread is by the thumb and the 2nd finger placed between the 1st and the 2nd fingers.

D. The following lower thread is taken up by the thumb and the 1st finger and laid on the end of the 1st finger.

Thus it is continued to the end of the round.

Now the sticks I and II can be taken out and placed as is shown in fig. 177, 5, and alternate rounds will start as the first one, the others as the second one. By continuous working the braiding will arise from both cross-borders and make two symmetrical halves (fig. 178).

After the last round the piece is closed in the shed, as the stitches will otherwise come loose. The closing can be made in different ways, f. i. by pulling a thread through the shed or by making a row of loops and pull the first loop through the second, the second through the third and so on; this method reminds a little of crotching. The diagrams fig. 177, 1—5 show only the preliminary of the technique, the most simple form of making stitches, which, if we want a point of resemblance from another technique, may be compared with an open stitch in knitting. But by varying the interlacings themselves different types of stitches can be made, which gives a possibility of changing the patterns.

A double turn occurs when the first turn of one pair of threads is followed by another, fig. 177, 6.

Openworked braiding. The braiding is here performed in such a way that slits or "holes" are made in the network, arising from the use of a special grasp, which loosens a stitch in the preceding round. The grouping of large and small holes makes the pattern (fig. 177, 7 and fig. 180).

The plain and purl, or right and wrong patterns are made by laying the interlacings to the right and left alternately. The effect is not unlike the plain and purl knitting, fig. 177,8

The *two Danish braided works from the Bronze Age are the oldest representatives known* of this interesting textile technique, and they show two different forms. In the Æshøj net (fig. 94) we

have both single and double turns, and the Skrydstrup cap (fig. 139) is performed in plain and purl patterns, which make stripes in the fabric. A bog find from *Tegle* in Norway[4]), which according to the editor of its publication belongs to the Migration, contained besides some other textiles part of the *leg of a stocking*, made in the same manner as the Skrydstrup cap, only the stitching of the former is performed in such a way that the pattern makes triangles (fig. 181). From Danish finds of antiquities we know two more braided works. One, which is made with single turns, was found in a grave from the Roman Iron Age near *Brændelydinge* (Blidegn) on Fuen; but it is only a very small fragment[5]). The other textile is the hair-net shown in fig. 179, the analysis of which is shown in fig. 180. Probably it dates from the Iron Age, but it cannot be said for certain; we suppose it to have been found in *Haraldskjær bog* at Vejle[6]), and it belongs to the type called "open-worked braiding". It is built of four rows of stitches in such a way that the first and the third rows, and the second and the fourth rows are alike. The first row consists of single turns only, and in the next row each alternate grasp makes a single-turned stitch, whereas the others take up a stitch from the preceding row so that a hole is made in the braiding. The third row is like the first, the fourth like the second, only with the difference that the making of the holes must begin in the stitch preceding the one which in the second row was taken up from the first.

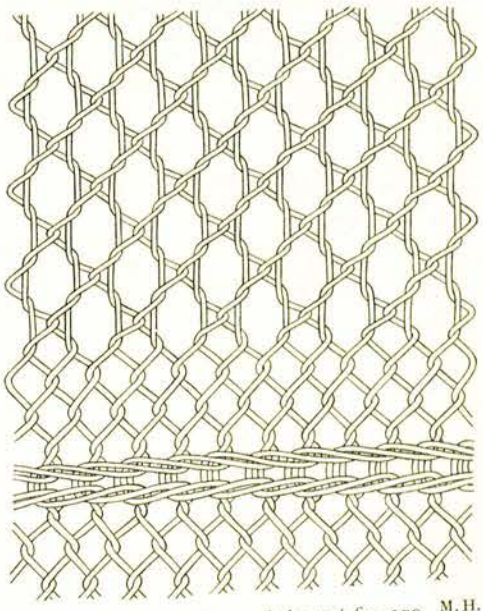


Fig. 180. The pattern of the net fig. 179. M.H.

In the *Oseberg ship* there was found a *small frame* fig. 176 probably a braiding frame. It is 119 cm high, 66–67 cm broad at the top, 75 cm at the bottom and made of beech-wood[7]). So it shows that "braiding" techniques were cultivated at the court of the Norwegian queen, and from Swedish graves of the Viking time we have fragments of braided works[8]).

Fig. 181. Braided leg of a stocking from Tegle, Western Norway. The pattern related to that of fig. 139.

Through literary reports and by means of some preserved specimens of braided textile works, it is possible to make out that in Denmark the *braiding technique* must have been *alive from the Bronze Age up to our days;* in recent time it seems to have been used chiefly by common people for the making of garters, jug bands, and similar small articles; the same was the case in Norway and Sweden.

Also in *Eastern Europe* the braiding technique has lived as a popular art up to our days, probably, as in the North, handed down from the Antiquity[9]); for from Greek vase-paintings (fig. 182) it is known that women in *Greece* could braid[10]).

No other country has yielded so rich and varied a material of braiding works as *Egypt*, and although it is neither the oldest nor that which was known first, the English have called the technique after it and given it the name of "Egyptian braiding". The main part of these

Fig. 182. Braiding woman. Lekythos from the end of the blackfigured period.

works are caps, small bags, and similar things, often made in beautiful patterns and nice colours; but as I am preparing a more comprehensive treatise on this question, I shall not enter further on it in this connection.

While the braiding technique is extremely logical and regular, the making of the network fig. 91 from Borum Æshøj shows a striking liberality with the material. It seems as if at the time of its making the idea had not yet become fixed that wool had to be spun before it could be used; unprepared wool in connection with small twigs was also a possibility.

A peculiar piece is also the band from *Bredhøj*, figs. 145—146. But both its technique and its use on the garment are obscure.

B. TABLET-WOVEN BRAIDS.

From the Early Bronze Age we have *four woven bands*, which are in the main preserved, viz. one from the man's grave in *Trindhøj*, and one from each of the 3 women's graves of *Borum Æshøj*, *Egtved*, and *Skrydstrup;* and further small remnants of woven belts have been excavated from several graves from the Early Bronze Age. The analysis of these belts have in all cases shown plain weaving of the type generally called rep, and it is possible to make such fabrics by means of several different, simple contrivances, even by means of the fingers alone. Therefore it is difficult to determine the manner of their making with certainty, and unfortunately the bands in hand do not give sufficiently satisfactory information, as both the Egtved belt and the Skrydstrup belt have torn ends, damages which make it impossible to decide whether the warp threads have consisted of one continuous thread or have had cut ends, while the belt was being woven. Further the *Trindhøj belt* must pass out of our examination of this point, because at one end it is provided with a tassel of an odd form, to which we have no parallel; as this tassel is unique we do not want to subject it to dissection. In those three cases it is impossible to find out whether the warp threads of the belts have had free thread ends or closed loops, a feature which would at least have given a suggestion of the apparatus used or perhaps rather the apparatuses not used.

Both in 1931 and 1935 I have examined *the Borum Æshøj belt* without entering on this point, because I dared not damage the tassel. By a reexamination the National Museum allowed me to cut some of the fringes; this examination showed that in one end of the tassel the warp threads ended in naturally closed loops, whereas in the other end the loops had been cut and knotted together again. Accordingly most likely this belt was *woven on a loom that required cutting of the thread ends*. Although several such looms can be taken into account, I find it unjustifiable and methodically wrong to put up all kinds of methods or apparatuses as being possible, just because they are capable of making plain weaving[11]). If we will inquire about the apparatus, it must be *our duty to look at the archeological* and *ethnological material from the same circle of culture* and see what it can yield for the solution of the problem.

Fig. 183. Bone plate, two-holed tablet from the Late Stone Age dwelling place, Bundsø, Als.

Starting from such considerations I found out, already in 1931, that the *tablet-loom* must have been the braid-loom of the Bronze Age people. *The tablet-loom* consists of a collection of thin square slabs (tablets), which are usually of wood, but sometimes of horn or bone.

Generally a tablet is 6 cm square and has rounded corners. They are 1—2 mm thick. In each corner there is a hole, through which a warp thread is drawn. The number of tablets determines the breadth of the texture, and as it is only possible to work with a rather limited number, the tablet-loom is best fit for the weaving of narrow braids or borders. There are also tablets with more holes, and some with fewer holes, f. i. 6, 3, or 2, and at the first stage of the technique probably tablets with only two holes were used similar to the piece shown in fig. 183 coming from a Stone Age dwelling in Als. The limit of simplification lies with tablet weaving as with all other weaving at a system of two threads. The tablets can be used for the so-called *cord weaving*, which means that the threads are twined round each other by constantly turning the tablets in the same direction. But it is also possible by turning the tablets alternately *forwards and backwards* to make a texture with the analysis of *plain weaving*. In principle both methods seem equally natural. There is no doubt that it is possible to weave on a tablet-loom the bands excavated from the Bronze Age graves, and if this was used, it must have been a *tablet with two holes*. The question is now, whether the ethnological and archeological material permits the supposition that the tablet-loom was known at that time, and an examination showed that possibly it was.

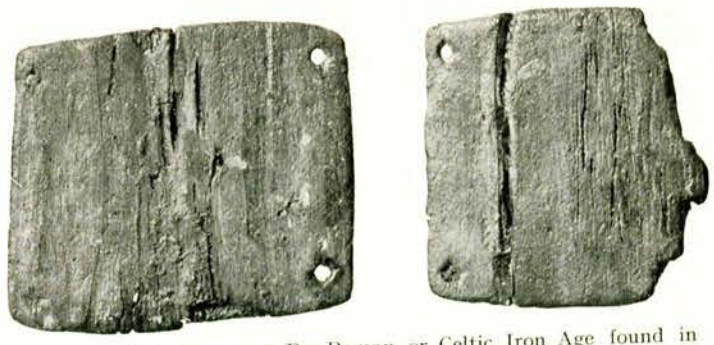


Fig. 184. Tablets from the Pre-Roman or Celtic Iron Age found in Deibjerg Bog, Western Jutland.

Like braiding *tablet weaving is rather widely spread*, and in Scandinavia it has existed as a popular art up to our days. We have a rather comprehensive literature on later tablet-woven braids, and also the tablet braids from the Iron Age have often been discussed in archeological literature[12]). I know only *three tablet-looms from the Antiquity*. In the Oseberg ship there were found 55 tablets, from a Viking grave near Birka 1 tablet was excavated, and two wooden tablets, fig. 184, belong to the cart find from *Deibjerg bog*. These finds prove the use of the *tablet loom in Denmark during the Celtic Iron Age*, the period of Antiquity succeeding the Late Bronze Age.

Among the Bronze Age textiles belonging to the tablet-woven braids we must mention *the Egtved skirt*. It has at the upper edge a border of braid resembling the belts and having like them the analysis of plain weaving, only with more than one weft in each shed. Crossing the rings at the lower edge of the skirt there lies a twisted cord consisting of two threads, which have the peculiar twining characteristic of tablet weaving with cord-making.

Particularly interesting both as to material and technique is the fragment from Vester Doense fig. 147. We find here the same intertwining of two threads as in the Egtved skirt.

Although the corded skirt from Egtved and the skirt *fragment from Vester Doense* do not belong to the earliest textiles known, there is no doubt that they may be regarded as types of ancient origin. By the making of a piece like the bast net fig. 147, it has not been endeavoured to work the material into a close fabric, but only to put together and arrange the filaments and keep them in position. The method applied, seen at fig. 148 and corresponding to the drawing of the lower edge of the Egtved skirt, is natural and though simple of a remarkable constructive effect. The crossing threads are twisted two by two round each other, binding at the same time a weft thread at every half turn, i. e. a cord-making principle. If the two threads were arranged on the two-shaft principle the result would be a less solid fabric; because then the twining together of the two warp threads would be missing, and they would more easily slide apart when the piece was brought into wear.

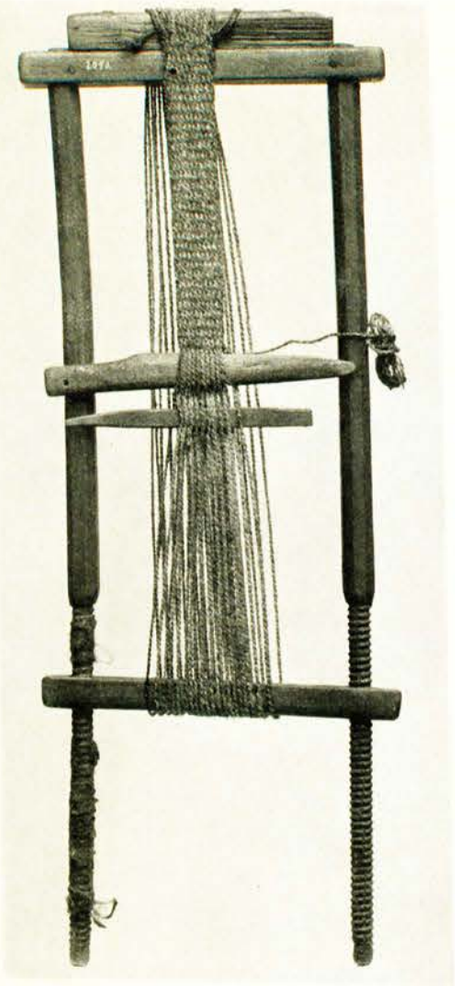


Fig. 185. Braid loom from Bodilsker Sogn, Bornholm. 1/7.

If now in spite of the archeological and ethnological material pointed out here, we prefer to suppose that a *loom with heddles* has been used for the making of the Bronze Age belts, then the *simplest form is a warp stick to give the natural shed and a heddle-rod with simple straps to make the other shed.* This method may, however, be simplified still further; primitive people sometimes make only one shed in the warp and keep it open by means of a stick, the other shed is taken up with the hand. It cannot be denied that it is possible to meet such modest demands under any mode of living; on the other hand it is astonishing how such primitive and old forms of working have kept alive even after the invention of better looms. Thus in 1935 during a visit to the museum of *Bornholm* my attention was called to a peculiar braid-loom coming from a farm in *Bodilsker Sogn;* but unfortunately no information about its age was available.

On this loom (Fig. 185) the first *shed is made only by a flat stick;* the other shed is taken up with the fingers or a weaving sword. How the warp is arranged matters little to the shedding, there are different ways of placing it. This loom has a *spiral course of the warp,* i. e. the warp consists of one continuous thread wound up round the two cross-bars in a closed ring.

This manner of warping involves that the finished texture has to be cut through in order to be disengaged from the loom. At p. 122 I have called attention to the fact that *this method of weaving cannot be considered in the case of the Danish Bronze Age cloths;* for we have so many cloths with three closed edges that we should be entitled to conclude that a loom of another type has been used.

The Bornholm loom cannot in its now existing form have been known in the Bronze Age, because it has a screw by which to vary the length of the warp and regulate the straining of the threads, and the screw is a far later invention.

Among the Danish looms I have found only this single specimen of that kind of loom, and apparently Dr. Emil Vogt does not know this one either, since he says[13]) that weaving with a continuous thread is not done in Europe. But a great many similar looms have been found in other parts of the world[14]). Several specimens are found in the ethnographical collection of the National Museum of Copenhagen, and there is no doubt that the loom, regarded as a type, belongs to a very early cultural stage.

As tablet-woven braids may further be regarded some of the woven borders mentioned above, which enter into the fabric as part of its construction, thus f. i. the starting borders rendered in the diagrams figs. 41, 1 and 59, 1. They have no doubt been arranged as independent weavings of a very small breadth, and the threads meant for the warp of the fabric have been inserted as weft in the warp of the braid-loom.

Margrethe Hald.

CHAPTER V

THE COSTUME OF THE BRONZE AGE

The examination of the preserved material shows so much accordance among the finds, that we may suppose them to give a reliable picture of the vestments of the Danish population during the Early Bronze Age. It is true that all the finds described come from barrows in Jutland; but large and small pieces of cloth excavated from graves on the Danish Islands show that the dress of the Islanders was of the same kind as that of the Jutlanders.

Of particular importance are the pieces of cloth, unfortunately rather decomposed, which in 1845 were taken out of a cist in a barrow at *Hvidegaard* near Copenhagen. The grave contained remnants of a cremated body on which were spread rather large pieces of woollen cloth, by the excavator regarded as a cloak[1]). But there seem to be several different pieces of garment; for a triangular corner of a cloth provided with oversewing must no doubt belong to a gown of the same shape as those from Muldbjerg and Trindhøj. Thus it shows that this piece of garment was known and used on the Danish Islands by the end of the Early Bronze Age, since the find of Hvidegaard is dated to the 2nd period of the Early Bronze Age. Also the round cap was used on the Islands; for in a grave excavated at *Smørum-ovre*, north-west of Copenhagen, and by its bronze objects dated to the first period of the Early Bronze Age, there was found a bit of a cap, which on the outside has a remnant of the pile. On the inside there are parallel sewings made with thread twined of several strands, and the edge ends in a compact oversewing. It can further be taken for granted that the women's garment was on the Danish Islands of the same kind as in Jutland; at any rate finds on Seeland give evidences of the use of the fringed skirt[2]). The examination of each find separately has also shown common traits, which make it possible to give an illustration of the types of the costumes, and not only a description of the single pieces of garment.

A trait which is common to all the vestments is that only *dark wool* has been used for them, while the use of *white wool* is limited to the Trindhøj blanket, which cannot be regarded as belonging to the dress. This trait distinguishes the dress of the North, in which it has never been possible to ascertain the use of dye[3]), from that of the South, which is made of white wool.

Fig. 186. Barrows from the Bronze Age at Bakkebjerg, North Seeland.

Strabon's words (III, 5, 11, p. 175) about the inhabitants of the Cassiterides that they wear black overclothing, apply well to the Bronze Age population of Denmark, and show that Strabon—or his source Poseidonios—has on this point found an important difference between the garments of the barbarians and those of the civilized peoples.

1. THE MAN'S DRESS

As to the *man's dress* we are in possession of a rather comprehensive material, since we have 4 well-described finds, which together with the remnants from the less well-described finds give a reliable picture of the man's attire, about which there is hardly any doubt. Both in Northern and Southern Jutland we find rather uniform dresses, although with certain variations of details. Besides weapons, ornaments, and similar small things for personal use, which we shall not mention here, the following garments belong to a complete man's dress: cap, cloak, under-garment, and foot-wear.

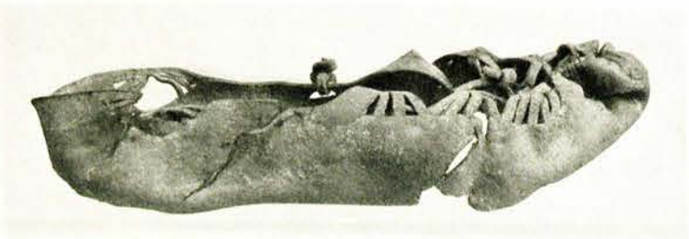


Fig. 187. Shoe from the Pre-Roman or Celtic Iron Age, found in a bog at Arnitlund, North Sleswick. 1/3.

We know *two types of caps*; one, which is made of a single layer of two-shaft woollen cloth without any oversewing, is represented by 3 specimens. To the round crown of the cap is sewn a sidepiece, high or low, which is made either of a cut strip of cloth or of gores sewn together, (fig. 29, fig. 44 and fig. 53). The other type is hemispherical and made of several layers of cloth, oversewn with a close layer of short or long pile. We have 3 complete specimens (fig. 11, fig. 27 and fig. 67); of 4 only fragments are preserved, and one (from Store Kongshøj near Kolding) is lost; by the way it presented the peculiarity that it was sewn round a ring made of a thin, square ash stick. As no doubt the thick, elastic fabric was able to ward off even a heavy blow of a palstaff, we suppose the cap to have been worn in fights.

The most important parts of the man's dress are the cloak and the under-garment. In the description of each find we have set down what could be said about the manner of wearing these garments; of course a piece of garment so variable as the cloak without sleeves could be changed at pleasure and according to need, just as we may see it with other peoples, with whom similar cloaks are still in use.

Of the four men's dresses preserved in their entirety the two from *Borum Æshøj* are quite alike and rather simple.

The *under-garment* consists of an oblong square *loin-cloth* or loin-skirt, kept in place by a cord or a leather belt. The two pieces (fig. 68 and fig. 79) show no traces of shaping, but as they are not fully preserved, as it appears from the torn edge at the top, it cannot be made out with certainty whether we should regard them as a kind of primitive skirts, used by living men, or simply as shrouds only meant for palling of dead persons.

The *cloak* is of a special type, but rather inconspicuous; both cloaks are of an oval shape, and the corners are uniformly rounded on both sides (figs. 66 and 76). If these cloaks are folded together lengthwise the two halves prove to be symmetrical, and that is also the case if they are folded broadwise. On this point they resemble the cloak found at Gerumsberg in Vestergötland, Sweden, but the latter is both larger and of a more roundish shape.

The *cloaks* of the finds in *Muldbjerg* and *Trindhøj* (figs. 9 and 25) are quite different from the Borum Æshøj cloaks not only in size but also in shape and cutting. One side-edge is straight almost to the corners and consists of one of the selvedges of the cloth, while the other is cut and much rounded; the cloaks have the shape of a kidney or a bean, and accordingly they are not symmetrical when folded lengthwise, only when folded broadwise.

It is not quite clear how the *Guldhøj cloak* was shaped, as only a fragment of it is preserved, and it is not even possible to determine with certainty its original size; the longitudinal halves do not seem to have been symmetrical, and accordingly it has most likely belonged to the same type as the Muldbjerg cloak.

As to the *under-garments* in the graves of *Muldbjerg* and *Trindhøj* they must be characterized as real articles of attire with an aim at a definite shape, a *gown*, which may be regarded as the origin of the shirt (fig. 15 and fig. 32). The straps with which the upper corners are provided show that the gowns were worn in a more complicated manner than the loincloths, as they are held in place on the shoulders by means of leather straps and tutuli, i. e. a kind of braces, and further they are gathered round the waist by means of a woven belt or a leather belt; this leather belt is closed either by a double button of horn, wood, or bronze, or by a special kind of belt hook[4]). The *belt* served not only to hold the gown together but also to carry the dagger; the sword was not carried in the waist-belt but in a broad leather strap across the shoulder.

Fig. 188. Copy of the Muldbjerg garment on a living person.

When a gown of the Muldbjerg type is put on in the right manner, it constitutes together with the large cloak a beautiful and impressive dress (figs. 19 and 35), in comparison to which the Borum Æshøj dress (fig. 70) seems rather poor and primitive. How such a dress looks when worn by a living man appears from fig. 188, where the young man is dressed in a copy of the Muldbjerg dress.

To the dress belonged *foot-wear*, which seems to have been quite alike both for men and women (fig. 187). As described p. 44 the *shoe* consisted of *an oblong square piece of leather*, at the toe cut in narrow flaps or strips through which the lace was pulled; from there the lace went down round the foot and was at last tied on the instep. At the back of the heel the shoe was held together by a vertical seam. In order to protect the ankle from being chafed it was wound about with an oblong strip of cloth. In the Guldhøj grave there was found a bit of a *cloth shoe* with a *sole* sewn on, suggesting that leather shoes with soles of the same type as those found from the Iron Age were known already in the Bronze Age.

Both Mr. Vilh. Boye and Mr. Th. Thomsen regard *the large pieces of cloth* in the graves of Muldbjerg and Egtved as a kind of blankets, in some way or other belonging to the dress; but that can hardly be right. From the Bronze Age we know only one piece that can be characterized as a blanket, i. e. the Trindhøj blanket. It is closed on all four sides, the longitudinal sides having selvedges, and the others fringes; and yet there is nothing to indicate that it was part of the dress. As mentioned, it was found cut in two halves; one lay under

the head of the dead body, while the other was wrapped round its feet, a fact which goes definitely against regarding it as belonging to the dress. This is in an even higher degree the case with the other large pieces of cloth from Muldbjerg, Egtved, and from Skrydstrup; those four pieces are not closed at the fourth edge, where the warp threads are simply cut. These blankets are only intended for shrouds, and must be regarded also as a gift for the dead person.

2. THE WOMAN'S DRESS

Although we know three fully preserved women's dresses from the Early Bronze Age, and although we have excavated from several graves, both in Jutland and on the Danish Islands, remnants of women's attire, which remnants on essential points add to our knowledge, we cannot fail to see that our sources of information are very imperfect and one-sided. Considering the fur garments preserved from bog finds from later periods of Antiquity, we may well suppose that also the women of the Bronze Age made extensive use of fur, especially in winter. So we must be prepared for surprises from new finds.

If now from the material in hand we try to form an idea of the type of dress worn by the Bronze Age woman, the *Egtved find* will be the natural starting point for our examination; because having been prepared in the laboratory of the National Museum of Copenhagen, it is in all respects a reliable source.

Of proper pieces of garment the Egtved grave contained a jacket, a belt, and a skirt, exactly the three pieces which can be characterized as the main parts of the woman's dress. How is now the relation to the two other contemporary graves?

THE JACKET. As regards the shape of the jacket the three finds accord exactly with each other; for as the drawings and the photographs have shown, the patterns of the jackets are almost identical, as also the position of the seams is alike in all three pieces. Also the measures are remarkably alike. Between the upper points (e—f) of the two lines that are met by the vertical seam at the back, the Borum Æshøj jacket (Fig. 90) measures 99 cm; the corresponding measure of the Egtved jacket (Fig. 112) is 87 cm and of the Skrydstrup jacket (Fig. 125) 102,5 cm; in determining the widths of the finished jackets we must subtract from these measures well over 1 cm for the seams, when the jackets are sewn together. The measure across the breast from one armhole to the other is on the Borum Æshøj jacket 52 cm, on the Egtved jacket 43 cm, and on the Skrydstrup jacket 49,5 cm. The largest breadth measured from the border of one sleeve to that of the other is 120 cm on the Æshøj jacket, 104 cm on the Egtved jacket, and 101,5 cm on the Skrydstrup jacket. It is of great importance to notice that all three jackets have been lengthened at the lower edge by bits of cloth sewn on, even if on the Skrydstrup jacket not all the bits are preserved. It cannot be a coincidence, but must have a cause, and no doubt we may be entitled to speak of a definite, fixed type of jackets for women in the Early Bronze Age. The Skrydstrup jacket is more elaborately embroidered than the other two, but that means nothing to the question of the type, nor does the slit in the Borum Æshøj jacket, as according to its shape and lack of oversewing of the edge it must be regarded as secondary.

THE BELT. Despite the fact that the belt in the Egtved grave had sunk a little on account of the decomposition of the body, we feel sure that it has had its place round the waist, and its importance to the dress is here quite evident. As the corded skirt was held in place by the woven braid or band at the top, the belt cannot have belonged to the skirt,

but must be regarded as an independent piece of garment with its own function. Its main functions were to carry the belt-disc and the comb, and perhaps to hold together the jacket, which is rather wide at the lower edge, just as the man's waist-belt held the gown together. In the graves that contained dagger, belt-disc, and tutuli their position showed that they had been fastened on the belt, and that the belt had sat round the waist. Also the tasseled belt in the Borum Æshøj grave had carried the ornamental disc and the small tutuli, as it appears from marks of wear and spots of oxide. So the belts in the graves of Borum Æshøj and Egtved have had the same purpose and may be regarded as a kind of ornaments to brighten up the garment[5]).

The Skrydstrup belt cannot be parallelized with those just mentioned, at least it serves another aim, i. e. that of holding together round the dead body the piece of cloth sewn together (Pl. II), and in accordance with this it does not sit round the waist but 15—25 cm below it, placed in such a manner that if we imagined the dead woman raised to her feet a large part of her abdomen would be bared, and the belt-disc, if such a one had been fastened to the belt, would be covered. Accordingly it cannot be regarded as a belt of the same kind as those found in the other graves but as a band, which had to hold together the piece of cloth; and probably the strip of cloth 204 cm long, p. 77, found in the Borum Æshøj grave has had the same purpose. Consequently I distinguish between ornamental belts and simple bands.

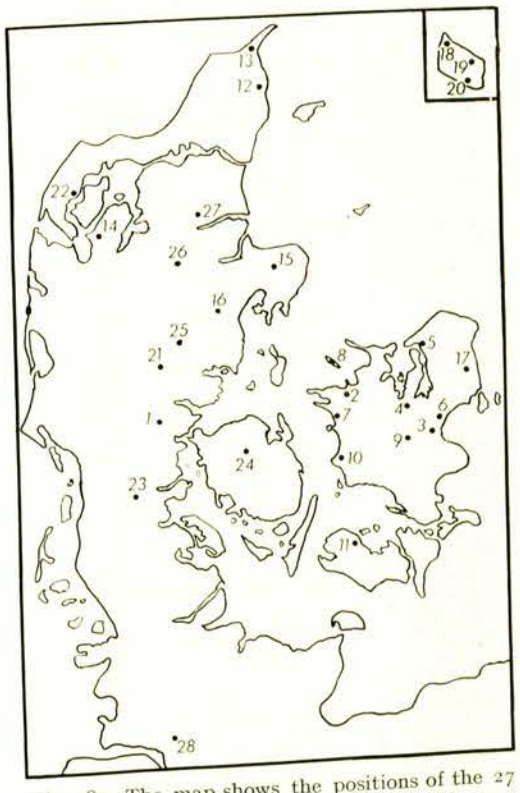


Fig. 189. The map shows the positions of the 27 finds known until January 1939, in which were evidences of the use of corded skirts.

THE SKIRT (1)*). According both to its position in the coffin and its measures, it can be taken for granted that the Egtved skirt has had its place a little lower down than the belt and has rested on the hips; it has been wound twice round the body and tied on the front side by means of the long loose ends of the band, found at both sides, and it has reached almost to the knee. On its appearance in 1921 this skirt naturally caused a great sensation, and various explanations of it were advanced; but although both Mr. Th. Thomsen[6]) and I have previously maintained that the corded skirt was a Northern piece of garment, we still find wrong opinions advanced as to its origin, for which reason I think it proper to find out what can be said about the history of the corded skirt in Denmark[7]).

Seeing how the textile work of the Bronze Age bears the stamp of personal taste, we dare not presume that the Egtved skirt would represent the only type worn by the women; rather we should on such a point expect to find great variation and changing of fashions. If we examine the textile fragments and ornamental objects excavated from the woman's graves, we find fragments which with rather great certainty can be determined as parts of corded skirts.

In a barrow at *Hagendrup*, Bregninge Sogn, Skippinge Herred (2) there was found, besides fragments of a collar and a piece of fur and some bits of woollen cloth, the fragment of a

*) The figures in parentheses refer to the present map (fig. 189) showing finds of women's graves with corded skirts. 29—30 are not marked on the map.

belt with fringes shown in fig. 190; probably it was made in the same manner as the sustaining band of the Egtved skirt, and had the fringes hanging down in the same way. But just below the belt there were placed tubes of thin bronze-leaf folded together, some of which are still present in their original places[8]).

Tubes of bronze-leaf folded together have been found in several woman's graves and in 5 deposit finds, often under such conditions that no doubt they have had their place on corded skirts, and accordingly we do not say too much when we take the finding of such tubes as an evidence of the presence of a corded skirt.

A barrow at *Ølby*[9]), Højelse Sogn, Ramsø Herred (3), examined by Mr. Sophus Müller, contained an oak coffin, in which was buried a woman lying on her back. Besides traces of fur and woven fabric there were found a fragment of a belt, a collar, a belt-disc, 4 tutuli, a dagger, a blue glass bead, 2 amber beads, and about 125 bronze tubes lying as fig. 191 shows in two rows with an interval at the middle of the body. In each tube were seen remnants of "two parallel threads of wool, wound about with thinner woollen threads". It seems quite natural to suppose that they belonged to a corded skirt, and that the skirt had been worn on the hips.

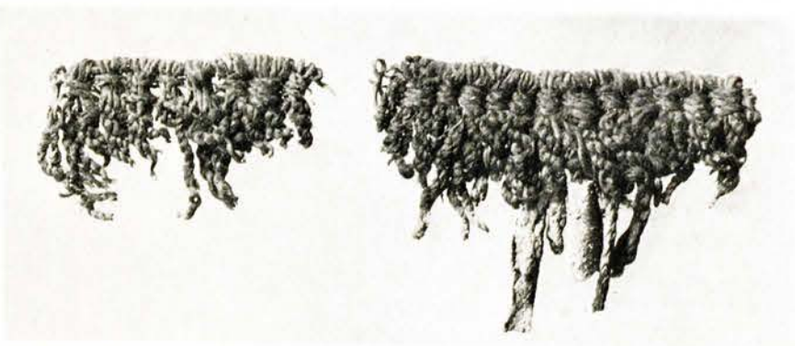


Fig. 190. Fragments of a corded skirt ornamented with bronze tubes, from a barrow at Hagendrup, Seeland.

We have a similar find in a barrow, *Nellikehøj* in Saaby Sogn, Voldborg Herred (4). Besides a one-edged bronze knife and two spiral rings of gold thread about 70 bronze tubes up to 8 cm long were excavated in which were found fragments of cords.

A fragment of a belt-disc, a tutulus and about 70 bronze tubes 3 cm long have been found in *Tjørnehøj*, Sonnerup, Kregme Sogn, Strø Herred (5).

The rest of the finds are from the following localities, *Karlslunde Sogn*, Tune Herred (6), collar, gold fingerring, fragments of "metal plates folded together".

Maglehøj, Svallerup Sogn, Arts Herred (7), collar, fragments of 1—2 bronze rings, two-piece fibula, 4 tutuli, 5 bronze tubes[10]).

Mastrup, Sejrø Sogn, Skippinge Herred (8), dagger, collar, tutulus, many small bronze tubes, all open on one side, awl, fragments of armrings.

Klokkerhøj, Kværkeby Sogn, Ringsted Herred (9), collar, fragment of a fabric, fragments of several bronze tubes.

Taarnborg Sogn, Slagelse Herred[11]) (10), belt-disc, 2 tutuli, collar, 2 armrings, dagger, fragment of a spiral finger ring, bronze tubes.

Ravnsby, Birket Sogn, Laalands Nørre Herred (11), belt-disc, awl, dagger, fragments of 2 bronze rings, a collection of bronze tubes with remnants of cords.

Gjerum Sogn, Horns Herred (12), dagger, 1 bronze tube.

Raabjerg Sogn, Horns Herred (13), collar, tutuli, belt-disc, bronze tubes, which when the find was excavated were gathered on strings (deposit find).

Bustrup, Ramsing Sogn, Rødding Herred (14), neck ring, dagger with sheath, belt-disc, beads of animals' teeth, earthen jug, bronze tubes with cords.

Nimtofte Sogn, Randers Nørre Herred (15), clay vessel, fragments of armrings, bronze tubes.

Among these finds of corded skirts, all from the first period of the Early Bronze Age, we may probably class the elaborate network (fig. 91) from the *Borum Æshøj grave* (16); at least it is hardly possible to give a more likely interpretation of it[12]).

The following 6 finds are known to me from the second period of the Early Bronze Age,

Holte, Søllerød Sogn, Sokkelund Herred (17). In a barrow there was found a large tutulus with a star on its end, a few other bronze objects, and a great many bronze tubes.

Vornedgaard, Olsker Sogn, Bornholm (18), 2 arm rings of bronze band, a knife with an open-worked handle, 2 double buttons, a two-piece fibula with a rhombic plate, a great many bronze tubes.

Gyldengaard, Øster Marie Sogn, Bornholm (19), a collection of bronze tubes found together with cremated bones.

Loftegaard, Pedersker Sogn, Bornholm (20), bronze hooks, finger ring, glass-beads, a two-piece fibula with a plate, 1 tube of bronze-leaf.

Hammer Sogn, Vrads Herred (21), a dagger with tang, a double button with star pattern. 2 bronze tubes.

Ginderup, Heltborg Sogn, Refs Herred (22). In the stone slab cist, which had contained the dead body of a woman, it was possible by the examination to trace quite a great part of the dead woman's dress; unfortunately it was so decomposed that it could not be preserved, and a single important point could not be made clear. A cloth lay spread on the body, and under it, at the left wrist, which had worn a bronze ring, there were found remnants of 10 cm long fringes. The excavator Dr. J. Brøndsted writes, "It looks as if the dead woman has worn a fringe-skirt, or perhaps rather a fringe-apron". However, it seems to me most likely that it is a skirt of the same type as the Egtved skirt[13]).

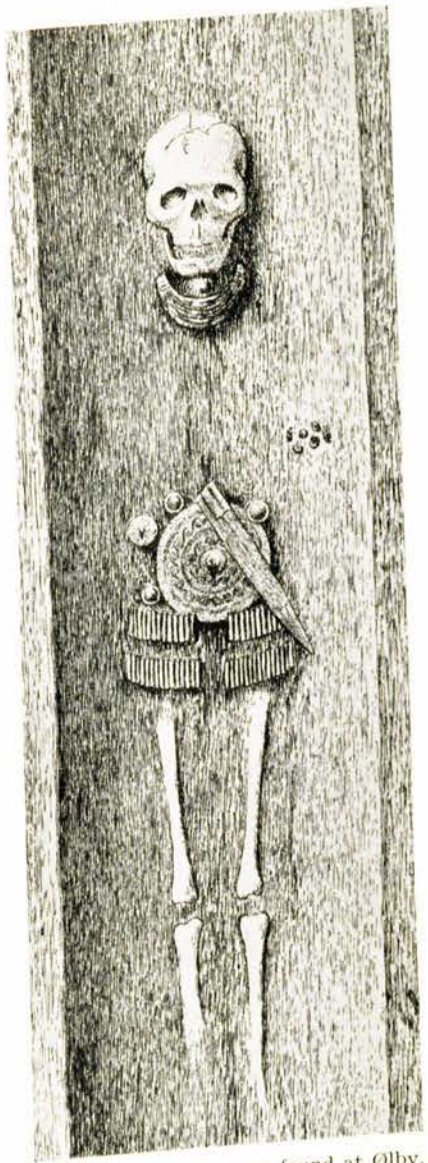


Fig. 191. Woman's grave found at Ølby, after Boye.

Among later finds of tubes for corded skirts we shall further mention:

A grave find from *Gjedsted Sogn*, Rinds Herred (1st period of the Early Bronze Age) brought to the light in August 1939. Together with a belt-disc, 14 tutuli, a collar, 4 arm rings, a dagger, and a bronze comb, there were found 60 bronze tubes; in one of these were two fragments of cords from the skirt. Each cord consists of four single strands, first spun to the left, then in pairs twisted to the right, and at last the double threads are twisted together to the left (29). In a badly described grave find from *St. Fuglede Sogn*, Arts Herred were found fragments of several bronze tubes together with a spiral ring and parts of a belt-disc (17319—27; 18137—43) (30).

So by now we have 24 Danish finds from the Early Bronze Age, in which it is possible to prove the existence of corded skirts, and apparently the custom of decorating them with bronze tubes was most common on the Islands, because of the 20 preserved finds of this kind 15 are from the Islands, and 10 of these—even the richest—are found on Seeland.

From the Late Bronze Age we know three finds of bronze tubes, one in a deposit find from *Bevtoft Sogn*, Nørre Rangstrup Herred (23), the second, likewise in a deposit find,

from *Kirkendrup*, Næsbyhoved-Broby Sogn, Odense Herred (24)[14]), and the third, found together with cremated bones in an urn, from *Sdr. Vissing Sogn*, Tyrsting Herred (25)[15]).

We know for certain from three small bronze figures that the corded skirt was used during the Late Bronze Age, and they are important also because they show how the skirt was

Fig. 192.

Fig. 193 b.

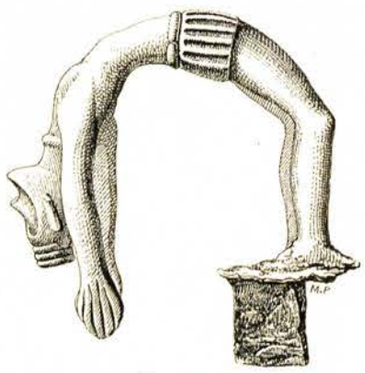


Fig. 193 a.

Fig. 194.

Fig. 192—194. Representations of women, from the Late Bronze Age; Fig. 192. Knife from Itzehoe. 1/1. Fig. 193 a—b. Woman with corded skirt. Unknown locality. 1/1. Fig. 194. Knife from Javngyde, Jutland. 1/1.

worn. We do not know where the backwards bent figure (fig. 193) was found[16]). The standing figure, forming the handle of a knife (fig. 192), whose Northern image of a ship dates it to the 2nd period of the Late Bronze Age, was found at *Kaisersberg* near Itzehoe, Holsten (28)[17]), while the little kneeling figure, assuredly a goddess (fig. 195), is from *Faardal*, Viskum Sogn, Sønderlyng Herred (26) near Hobro and belongs to a votive find dating from the transition between the two last periods of the Bronze Age[18]).

Also the fragment of a *bast net* described p. 104 may probably be regarded as a remnant of a corded skirt; it was found at *Vester Doense*, Vebbestrup Sogn, Hindsted Herred (27) together with a "hanging vessel", the bronze vessel replacing the belt-disc as an ornament.

In my "Studier over den yngre Bronzealder i Danmark"[19]) I have tried to show that the bone tubes made of polished birds bones 3—6 cm long, which have been found three or four times in urn graves from the Late Bronze Age, should be regarded as a compensation in a domestic plain material for the more expensive bronze tubes.

If this opinion is right, it would be natural to find out whether finds from an earlier period contained objects that could be parallelized with the bronze tubes mentioned

and taken for ornaments of corded skirts. As far as I can see the earlier finds do contain such objects.

Such bone tubes have been found in several graves from the *Stone Age*, and Mr. Hans Kjær is right when he compares them to the oblong, tube-shaped amber beads[20]); but as none of these have been found in their original places, the conditions of the finds do not

Fig. 195. Woman figure (goddess) from Faardal. $^1/_1$.

contribute to the determination of their use on the garment. Fortunately we have one find which seems to give information on the manner in which the tube-shaped amber beads were worn.

In a single grave from the Stone Age, examined at *Ettrup* north of Viborg, and which had apparently contained the body of woman, there were found a large number of tube-shaped amber beads spread round the grave; but, according to the excavator, 12 of them lay close together in the longitudinal direction of the grave, as if they had sat on a belt[21]). But I think that we should rather imagine them as having belonged to a corded skirt after the analogy of the bronze tubes.

Even if there were people who would not acknowledge these interpretations of the beads of bone and amber, nobody can deny that *the corded skirt is an ancient, Northern piece of garment, used in Denmark at any rate during the whole Bronze Age*. By the end of the Bronze Age every trace of the corded skirt disappears; probably the change of climate setting in with cold and downfall at the beginning of the Iron Age has put a stop to the use of this piece of garment[22]).

A dress of the Egtved type is seen fig. 196, which show a copy of the Egtved dress made 1934—35 for the National Museum of Copenhagen by Miss Margrethe Hald; it is imitated as closely as possible, also its measures. Also the stature of the wearer corresponds rather closely to that of the Egtved girl, according to our calculation of her size[23]). But how are the *long "skirts" sewn together* in the graves of *Borum Æshøj* and *Skrydstrup* to be interpreted? From 1871 until the excavation of the Egtved grave—for about 50 years—nobody doubted that the piece of cloth sewn together in the grave of the Borum Æshøj woman was a skirt. Although its size seemed to Mr. Sophus Müller rather striking, he rested satisfied with the thought that she might have worn it, if her height was 69 inches or 180 cm[24]), which is a quite wrong calculation of the height of the woman.

When the Egtved skirt was found Mr. Th. Thomsen remarked[25]) that the two different garments might reflect the difference between the *young girl's dress* and that of the *elderly*

Fig. 196. Copy of the Egtved garment, made by Margrethe Hald.

matron, and perhaps also the difference between the *garments of summer and winter*. This interpretation seems very plausible; but it can hardly be right. Indeed, the Borum Æshøj woman was an elderly woman, but the Skrydstrup girl, who was dressed in a "skirt" of the same type, was 20 years at most, and it appeared with certainty from the herbs in her coffin that she had died during summer. So it will be necessary to put the problem differently, and *ask whether the pieces of cloth sewn together really are skirts worn by living people.*

Mr. Germ states four reasons in favour of this: the pieces were wrapped round the dead woman's body in the same manner as a skirt; they bear a certain resemblance to the wide russet skirts formerly used by Danish country women; like the latter they are sewn together; and they are surrounded with a belt. But none of these arguments have any weight; for although most of the cloths found in the Bronze Age graves must be regarded as garments, it does not follow that they are all so, and if we look at the pieces themselves, we must admit that their likeness to the russet skirt is not more striking than their difference from it. The russet skirt is distinctly shaped, and the upper edge is folded and fastened to a band, by which it is tied round the waist, but the Bronze Age cloths have no shaping, they are only square pieces of cloth without a band to hold the folds and tie the skirt round the waist.

The seam, which is so carelessly performed that, if the cloth was worn, it would no doubt pull threads out of the loose woollen cloth, differs very much in character from the carefully made buttonhole stitches by which the other pieces of garments are sewn together; and all in all its appearance is so far from being adducible as a proof of the use of the pieces as skirts that we feel inclined to say on the contrary that it is a proof against it; for the only skirt known from the Bronze Age, the *Egtved skirt*, is *open*. It was wound twice round the body and was tied by means of a cord forming the ends of the braid in which the "fringes" are woven. *This accords well with the gowns from Trindhøj and Muldbjerg*, which are also open.

I have already accounted for the importance of the belt to the Bronze Age garment.

But *the size of the pieces* (see p. 66 and 96) *goes directly against their use as skirts;* this is even more conspicuous when it is compared to the women that should have worn the skirts. The piece in the *Skrydstrup* grave is 2×195 cm long, 145 cm broad and reached from the lower edge of the jacket to the feet, round which the last 20 cm were wrapped. It can be said for certain that there has been no shifting of this cloth nor of the "belt", but apart from the compression of the fabric caused by the decomposition of the body, it lay exactly as it had been placed on the dead woman when she was buried. The corresponding piece of cloth in the *Borum Æshøj* grave is also made of a square piece of cloth with three selvedges and one cut edge, and is joined together by a clumsy seam with 8—10 stitches per 10 cm. It is 2×165 cm long and when sewn together its greatest breadth is 122 cm. But when the tape-line follows the edges, one edge is 341 cm, the other 306 cm, and if the sewing is undone the greatest breadth is 130 cm, the smallest 110 cm. As to the position of the piece in the

grave we know only that the woman was wrapped in it; but from an oxide mark from the belt-disc it appears that the clumsy seam was on the front side, and the widest edge turned upwards towards the breast of the dead body. Also it appears from the old folds that in the coffin it must have been arranged round the body in the same manner as the piece in the Skrydstrup grave.

As the renewed examination of the skeleton shows, the *Borum Æshøj woman* was 156—157 cm high and her waistline was 90 cm above the sole, accordingly she would either have a train of 32 cm's length or 32 cm of the upper end of the cloth, 2 × 165 cm wide, would hang down and cover belt, belt-disc, comb, and dagger. The relation would be the same in the case of the *Skrydstrup woman*; as she was 170—171 cm high and her waistline was 105 cm above the ground, she would have had a train 40 cm long or 40 cm of the cloth 2 × 195 cm wide would hang down and cover the belt. But the *strip of cloth* sewn on to the lower edge of the jacket is indicative of the use of a short skirt, which was not long enough to cover the body, and this strip seems quite superfluous if the skirt had been so enormously long and wide.

Fig. 197. Copy of the Skrydstrup garment, made by Margrethe Hald.

There is, however, still one thing that we must not over look, the evidence which the Skrydstrup grave gives. The Skrydstrup grave is the only grave excavated by experts, and as there does not seem to have been any displacement of the cloth, we should expect to find here a perfectly reliable piece of information of how the skirt was worn. But it does not seem to give any information on this point. As mentioned in the description of the belt, the upper edge of the piece of cloth sewn together lay close to the lower edge of the jacket, whereas the belt was placed 20—25 cm below the waistline.

On account of this strange arrangement of the belt it would of course be very difficult to make the skirt sit, if on the whole it were possible, and at any rate 20—25 cm of the woman's abdomen would be bared, when the cloth above the belt fell down; both by this and by the long train the freedom of movement of the wearer would be much checked, even within doors. So everybody must admit that the Skrydstrup grave gives no information of how a skirt of this shape was worn.

Consequently it is necessary to try through *experiments* with a dress of the same character and size as the original to clear up the problems—as was tried in the National Museum of Copenhagen with the copy made by Miss Margrethe Hald, and it appeared that with the lower edge of the skirt resting on the wearer's feet, the belt in the waistline, and the spare 40 cm of cloth arranged above the belt, it is possible to wear the garment in the manner shown in fig. 197. But while the experiment with the Egtved copy gave a positive result as to the question of how the corded skirt was worn, *the value of the experiment* made with the Skrydstrup copy seems to be *negative*. To my eyes it is not likely that the women of the Bronze Age should have been dressed in that manner. Accordingly I have a conviction that the two pieces of cloth sewn together were not used as skirts.

As two quite similar specimens are preserved, such pieces must have had a certain function; the problem is then to make out, from that which the finds teach us about the culture of the Bronze Age, the significance of the pieces in hand. In order to solve this problem we must regard how *a funeral* was performed *during the Bronze Age*. The excavations show that there were fixed rites. When the place for the barrow was chosen, a bed of stones for the coffin was piled up on the surface of the field; the coffin, which was very heavy, was shaped on the spot, as it appears from chips in several cases found at the bottom of the barrow; when the coffin was finished it was placed in the direction of East—West or North—South, and then its bottom was covered with a cow skin with the fur turned upwards. Presumably the dead body was carried on a bier to the coffin, in which it was laid with its head turned eastward or southward.

From the oak coffin finds it appears that great care was shown at the burial of the dead body. The woman's hair was dressed, she was decorated with ornaments, and some of her possessions came with her into the grave. As no traces of beards were ever found in the oak coffins, and as especially the well-preserved skulls of the men in the Borum Æshøj grave do not show any hairs of beards on the partly preserved chins, we may conclude that the men probably were shaved before they were laid in the coffin. Weapons, ornaments as gold arm rings, and razor, tweezers and awl, in some cases also a tinder-box or wooden boxes were laid in the grave together with the man.

The attention paid to the looks of the dead body in the grave goes to show that those taking part in the funeral stood face to face with the dead person, an arrangement which is reasonable both from a human and from a judicial point of view. The finds themselves show[26]) that the coffin was not closed until certain offerings—sometimes even of human beings[27])—had taken place, or the ritual parting drink or a jug of honey had been put into the coffin as a gift to the dead person. These ceremonies at an end and the lid fastened on the coffin it was covered with the pile of stones as a protection against robbers and animals, and the mound was covered with tufts of grass thus making a memorial of the deceased person.

If we may suppose that those taking part in the funeral should see the dead man or woman, there is nothing peculiar in burying a woman in a richly folded cloth sewn together.

The lower part of the body and the legs of the man could be covered with his cloak, and the woman's body could be wrapped up in a cloth of a convenient size, as was the case in the Egtved grave; but it seemed equally natural to lay the dead woman on the cloth, sew it together, and arrange it as a richly folded robe, which was wrapped round the feet.

As now in two barrows, lying so far from each other as Skrydstrup and Borum Æshøj, we have found uniform garments used as coverings for the dead women, we must be entitled to take them for a kind of *grave clothes, shrouds*, which were regarded as particularly suitable for the burying of high born women.

I do not intend to deny that long *skirts made of cloths* may have existed in the Bronze Age; for since in the Bronze Age the climate had a rather continental character, very likely it was necessary to wear warmer clothes during winter than those known from the grave finds; but so far no such skirt has been found.

If it did exist it was probably, like the Egtved skirt, wrapped several times round the body and tied by a band. The reason why it has not yet been found in the graves may be that it was not long enough to cover a body lying in its coffin.

3. THE ORIGIN OF THE COSTUME OF THE BRONZE AGE

It is quite natural that the garments from the Bronze Age, which have no parallels in other countries, have always interested the archeologists; and descriptions of the finds have indeed appeared only few years after the excavation of each of them.

But the utilization of a material of this kind requires collaboration with other sciences. The most important contribution given from non-archeological side in illustration of the oak coffin finds, is no doubt Mr. Bille Gram's essay from 1891, which for the first time determined the colour of the dead person's hair and also the different kinds of wool used for the garment. In 1896 Mr. Vilh. Boye published the whole of the material then excavated, and a year later there came out in "Vor Oldtid" p. 214 (=Nordische Altertumskunde p. 268) Sophus Müller's description of the Bronze Age dress, which he characterizes as a national costume, a result at which he arrived already in 1891[28]).

The finds of garments from Egtved, Jels, and Skrydstrup, excavated since 1897, have all been published in monographs; and also *foreign scholars* have contributed to the study of the finds of garments.

In 1915 Dr. Georg Girke finished his thesis: Die Tracht der Germanen in der vor- und frühgeschichtlichen Zeit, which after the author's death was published by Professor Gustav Kossinna[29]). Dr. Girke's description of the Germanic dress in the Iron Age may be of interest. But the passage in his book (p. 26 seq.), in which he gives a description of the Bronze Age dress, represents no step forward to our investigations. It is an unoriginal compiler's work, built on the works of Mr. Vilh. Boye and Mr. Sophus Müller, and the author's own contributions are of no value whatever, as they show plainly that he has never had an opportunity of examining the originals. Also his attempts (p. 36 seq.) to reconstruct the names of the different pieces of garments must be met with scepsis.

Another contribution is due to Mr. Bror Schnittger, who in a treatise: Våra kulturförbindelser med östra medelhavet under den äldre bronsåldern[30]), points out various cultural elements of the Northern Bronze Age (the spiral ornaments, the folding stools, and the rock-sculptures of the Kivik grave), which are supposed to originate from the Eastern Mediterranean countries. Mr. Schnittger regards also the dress as one of these elements and is of opinion that the cut of the Northern Bronze Age dress is a coarse imitation of that of the Cretan-Mycenean dress. Mr. Schnittger refers expressly to the warriors' vase from Mycene and to a Mycenean grave stela. It is true, he says, that in the North there are no fringes on the under-garments; but on the other hand they are found on the blanket from Trindhøj. Mr. Schnittger finds also marked points of contact between the Northern woman's dress (i. e. the Borum Æshøj dress) and the Mycenean.

We shall not here go into the question of the place of origin of the spiral ornaments and the folding stools, nor on the question of the connection between the rock-sculptures of the Hagia Triada sarcophagus and the Kivik grave. Mr. Schnittger's opinion on these points may be right. But his hypothesis as to the connection between the Northern Bronze Age dress and the Cretan-Mycenean dress is not convincing. On the contrary it is obvious to everybody who compares the women's garments of the two circles of culture that on this point there is no connection. And also the men's garments show only such casual similarities as may occur between garments from widely different circles of culture, which otherwise have no connection[31]).

In his description of the cloak from *Gerumsberget*[32]) Mr. Sune Lindqvist mentions the numerous evidences of the connection between the North and the South, especially Hungary and North Italy. This is probably quite right, and when Mr. Lindqvist suggests that there

may be a connection between the small cloaks and togas used in Italy and the Danish Bronze Age cloaks, we must admit that this possibility really does exist.

It is, however, hardly possible in the Bronze Age dress to find traces of influences from the cultural centres of the South. The type of dress known from the oak coffin finds is really unique, a dress proper to the Northern circle of culture, and consequently we feel tempted to seek *its model* not in foreign vestments but *in the Northern dress from a still earlier period.*

The cloak without sleeves is an ancient garment, which occurs so commonly all over the earth that we cannot even fix the limits of its occurrence. Likewise it is hardly possible to prove whether it has arisen independently in the places where it occurs, or whether its occurrence is due to an influence from other parts[33]).

In primitive times the sleeve-less cloak was probably made from the hide of one animal, but also cloaks sewn of several hides are found[34]). So the idea is near at hand to seek the origin of the Bronze Age cloak in such a garment made of an animal's pelt; and it appears with absolute certainty from the Trindhøj cloak, figs. 25—26, that this is not unjustifiable. Already in 1891 Mr. Sophus Müller said that the decoration of the outside of the cloak with a long pile was surely due to a desire of making it resemble a cloak made of fur[35]). Probably the close pile on the round caps had the same object.

In those two cases the fabric shows that they have their origins in the fur garment, while in the case of the gowns from Muldbjerg (fig. 14—15) and Trindhøj (fig. 31—32) it is the cut which indicates that their model must have been the primitive fur garment. This idea is further strengthened by the presence of the long straps which pass over the shoulders; these are probably a reminiscense of the forelegs and hindlegs of the animal's pelt, which in fur garments were used in different ways.

Further it is of importance to notice that those two gowns correspond in size rather closely to what can be made of a large deer's hide. According to Dr. phil. M. Degerbøl the hide of a stag measures 107 cm from the shoulder to the tail-root, 140 cm from the neck to the tail-root, and its measure round the breast is 132 cm; the corresponding measures of the skin of a roe are 63, 85, and 73 cm.

Not only the man's dress but also the woman's dress shows peculiar, primitive features. Especially we should pay attention to the three jackets fig. 88, fig. 110, and fig. 123.

They may all justly be called by the Spanish name of Poncho, imported from South-America. In its primitive form the Poncho is a garment made of a piece of fur or cloth with a hole in the middle through which the head is put so that the Poncho rests on both shoulders and covers the breast and the back[36]). This type of garment was widely spread and was found among the Germans during the Iron Age, as is seen from Roman reliefs. On the whole it played a great part and was the primitive form from which several garments, such as shirts and fur coats, have developed. A fur Poncho is known from ancient times within the Arctic territory; and so it is possible that the Danish Bronze Age jackets have preserved reminiscenses from a time when an animal's pelt was used for the jacket. One of these reminiscences is probably the patches sewn on to the lower edge of the jacket; for as they occur on all three specimens, we can hardly suppose them to be due to accidental causes, f. i. to the cause that the jacket had become too short because its wearer had grown out of it. There must be a definite reason for their application, but the question is which reason? We are sure that they are not there on account of the sewing, nor because of a lack of skill in weaving; for it was possible to weave a piece of cloth large enough for cutting a jacket in its full length. The cause of the application of such patches is rather to be sought in a time when the woman's Poncho was sewn of one single animal's pelt. Even a large hide (f. i. that of a stag) would

hardly be large enough to give the necessary length to a jacket, so it had to be lengthened by strips of hide sewn on.

Taking into account the conservatism which on the whole characterizes the Bronze Age dress it seems quite likely to suppose that even this detail was transferred to the garment made of woollen fabric. It is here to be regarded as a rudiment, a reminiscence, which even the Bronze Age people hardly understood[37]).

This opinion as to the relation of the Bronze Age dress to the fur dress seems to be confirmed by the character of the seams by which the proper pieces of garment, f. i. the jackets are joined; the sewings are made without any regard to the fact that woollen cloth is apt to ravel out. The edges are not turned under, but are simply laid one on top of the other, and then joined by means of the stitches. According to Dr. K. Birket-Smith this method corresponds exactly to that of the Eskimo women, when they make their fur garments; their sewings are, like those of the Bronze Age garments, performed from the right to the left[38]).

In the discussion on the origin of the Bronze Age dress we must take into account the possibility of such ancient traditions as well as the possibility of influences from foreign centres of culture; and although on certain points the Danish Bronze Age culture borrowed from the South and was dependent on foreign impulse, there is no indication that such influences prevailed in the dress; on the contrary there is every indication that the ancient forms were preserved, only transferred from fur to woven fabrics.

H. C. Broholm.

a b

Fig. 198 a. Razor from Thinghøj, Seeland. $^1/_1$. b. The head on the knife fig. 198 a. $^2/_1$.

NOTES AND REFERENCES

ABBREVIATIONS

Aarbøger = Aarbøger for Nordisk Oldkyndighed og Historie (Résumés en Français).

Boye = Vilhelm Boye: Fund af Egekister fra Bronzealderen i Danmark, 1896.

D. B. D. = H. C. Broholm og Margrethe Hald: Danske Bronzealders Dragter, Nordiske Fortidsminder II (1935), p. 215.

Bille Gram = Bille Gram: Analyses de matériaux archéologiques, Mémoires 1890—95, p. 75.

Margrethe Hald: Le tissage = Margrethe Hald: Le tissage aux plaques dans les trouvailles préhistoriques du Danemark, Mémoires 1926—34, p. 389.

Madsen: Bronzealderen = A. P. Madsen: Afbildninger af danske Oldsager og Mindesmærker, II, Bronzealderen.

Mémoires = Mémoires de la Société Royale des Antiquaires du Nord.

Nordiske Fortidsminder = Antiquités Scandinaves (Résumés en Français).

Thomsen = Th. Thomsen: Egekistefundet fra Egtved fra den ældre Bronzealder, Nordiske Fortidsminder, II (1929), p. 165.

Skrydstrupfundet = H. C. Broholm og Margrethe Hald: Skrydstrupfundet, Nordiske Fortidsminder, III (1939), 2.

CHAPTER I

The funeral Ceremony in Denmark in the first Period of the Early Bronze Age.

[1]) J. Brøndsted: Danmarks Oldtid I, p. 216, fig. 163 and p. 226, fig. 178. Aarbøger 1898, p. 205, fig. 23. (Sophus Müller).

[2]) Aarbøger 1898, p. 189, fig. 14 (Sophus Müller), Aarbøger 1936, p. 219 (C. J. Becker).

[3]) See the map, Aarbøger 1938, p. 83 (Broholm).

[4]) A map showing the distribution of all grave finds from this period is found H. C. Broholm: Studier over Danmarks Bebyggelse i den ældre Bronzealder, Fortid og Nutid, XII (1937), p. 110.

[5]) Boye p. 27 f.

[6]) Nøragerhøj, Boye p. 119.

[7]) H. C. Broholm: Studier over den yngre Bronzealder, Aarbøger 1933, p. 47 and 49.

[8]) It is the case with the man's coffin in *Guldhøj* west of Kolding (Boye Pl. 13 A), two coffins in *Store Kongshøj* of the same group of mounds (Boye Pl. 16 A—B) and the coffin in *Flødhøj* (Boye S. 21).

[9]) Boye Pl. 3.

[10]) Boye p. 156.

[11]) Thomsen p. 169.

[12]) Boye Pl. 18 B-C and 13 C.

[13]) Boye Pl. 13, Pl. 16, Pl. 18.

[14]) Thomsen p. 172 and 174.

[15]) Aarbøger 1938, p. 4 (Broholm); Skrydstrupfundet p. 15 (Werner Christensen).

CHAPTER II

A Description of finds of preserved garments.

1. Muldbjerg.

[1]) Mus. Nr. B. 3319—3332 a. Boye, p. 30—37.

[2]) According to measurings made during the excavation the length of the shin-bone is stated as 40 cm. If that is true the stature of the man may be set at 175—176 cm. But of course a stature calculated on one bone only is very uncertain. The hair is now dark but originally it was fair. Bille Gram, Mémoires 1890—95 p. 75 seq. Where nothing else is stated, all indications of the hairs of men and animals are due to Mr. Bille Gram.

[3]) It has proved a very difficult task to give absolute certain measures for textiles; for the cloths are easily drawn out of shape. The materials have not been measured until they had lain a day and a night spread on smooth paper for the threads to find their natural measures. Neither has it been possible to lay out the cloths exactly alike twice; accordingly there may be small differences between the drawing and the photo. The longitudinal threads of the stuff are called warp, the transverse threads weft.

[4]) For the fine piled cover at the outside they have used fine clean sheep's wool without the outer fur.

[5]) Boye Pl. 5, 3.

[6]) In a few cases the gown seems to have been held up not by tutuli but by two-piece fibulæ. Because, sometimes we find on the right shoulder of the body 1—2 fibulæ, which are not likely to come from the cloak, the latter being spread over the body in the cases we know of. In 1932 an oak coffin grave in Haverslev Sogn, Aars Herred was examined. The coffin stood East—West, and at its west end close to the north-side lay a sword, which has lain either on the breast of the dead body or on its left arm. On the spot where the right shoulder of the dead person must have rested two-piece fibulæ were found. That was the case, too, in a grave at Følhøj, Odby Sogn, Refs Herred. Here the two pins (Mus. Nr. B. 10830) lay close together and had left marks on the skeleton's bones of the right shoulder and upper part of the arm. The same arrangement was found in a grave at Erslev in Mors, examined in 1929. But in a grave near Rosilde, Vinding Herred, the fibula was found at the left collar-bone. (Mus. Nr. B. 10239—43).

Analysis of the Textiles of the Muldbjerg-find.

Muldbjerg		Cloak	Gown	Foot-wear	Blanket
Sample 1 ...	wa.	37l	43l	40l	42l
	we.	28r	30r	26r	34r
Sample 2 ...	wa.	32l	43l	..	..
	we.	27r	28r	..	..
Sample 3 ...	wa.	..	42l	..	..
	we.	..	34r	..	..
Sample 4 ...	wa.	..	16l	..	..
	we.	..	13r[1])	..	..
Sample 5 ...	wa.	..	18l	..	..
	we.	..	15r[2])	..	..
Sample 6 ...	wa.	..	18l	..	..
	we.	..	14r[2])	..	..
Sample 7 ...	wa.	..	13l	..	..
	we.	..	17l[2])	..	..

[1]) 4×4 cm. [2]) 5×5 cm.
The other figures indicate the closeness of the threads measured in squares of 10×10 cm.

2. Trindhøj.

[1]) Boye p. 65 seq. [2]) Mus. Nr. 19908—22.
[3]) A. P. Madsen: Afbildninger af danske Oldsager og Mindesmærker, Bronzealderen II Pl. 6 (text by Henry Petersen p. 11—14). J. J. A. Worsaae: Dragter fra den ældre Bronzealder, Illustreret Tidende XIII (28. Jan. 1872), p. 177—180. Boye p. 6 and p. 88 seq., Pl. XVIII—XX. [4]) Mémoires p. 75 seq.
[5]) The same result is reached by Mr. G. J. Karlin: Några undersökningar om den förhistoriska textilkonsten i Norden, Studier tillägnade Oscar Montelius 1903, p. 197. Vivi Sylvan: Svenska ryor (1934), p. 15 utters on account of some analyses, made by Miss. Elna Mygdal, that the pile is probably woven, an interpretation with which we, according to the above mentioned, cannot agree. [6]) Aarbøger 1891, p. 110.
[7]) Aarbøger 1891, p. 108, fig. 7, and Sophus Müller: Ordning II, 2. [8]) Boye Pl. XIX, 2. Madsen: Bronzealderen II, Pl. IV, 4.
[9]) Madsen: Bronzealderen II, Pl. 5.
[10]) Madsen: Bronzealderen II, Pl. 5. Boye: Pl. XIX, 8.

Analysis of the Textiles of the Trindhøj find.

Trindhøj		Cloak	Cap	Gown	Foot-wear	Blanket
Sample 1 ...	wa.	20l	37l	37l	28l	48l
	we.	15r[1])	26r	31r	21r[3])	36r
Sample 2 ...	wa.	20l	..	38l	29l	43l
	we.	15r[2])	..	31r	19r[3])	42r
Sample 3 ...	wa.	..	..	41l	..	43l
	we.	..	..	32r	..	38r
Sample 4 ...	wa.	..	..	40l	..	50l
	we.	..	..	31r	..	32r
Sample 5 ...	wa.	..	..	..	..	47l
	we.	..	..	..	..	32r
Sample 6 ...	wa.	..	..	..	..	54l
	we.	..	..	..	..	29r

[1]) Of 5×5 cm in the piece sewn on. [2]) Of 5×5 cm in the large piece.
[3]) Of 5×5 cm.
The rest of the tests are made in squares of 10×10 cm.

3. Guldhøj.

[1]) Boye, p. 70—80, Pl. XIII—XV. [2]) Mémoires 1891, p. 84.
[3]) These threads are of pure wool. Determinations by Professor Dr. Knud Jessen, communicated to Dr. H. C. Broholm $^{6}/_{12}$ 1933.

Analyses of the Textiles of the Guldhøj find.

Guldhøj		Cap	Foot-wear	Cloak I	Cloak II	Gown
Sample 1 ...	wa.	62l	28l	40l	38l	46l
	we.	44r[1])	28l[2])	25l	28l	34r
Sample 2 ...	wa.	56l	18l	39l	..	42l
	we.	34r[3])	18l[2])	27l	..	30r
Sample 3 ...	wa.	..	..	40l	..	..
	we.	..	..	28l	..	..

[1]) At the edge of the cap. [2]) Of 5×5 cm. [3]) In the crown.
The rest of the tests are made in squares of 10×10 cm.

4. Barrow in Jels.

[1]) H. C. Broholm: Jelsfundet, Aarbøger 1938, p. 1.

5. Dragshøj.

[1]) Mus. Nr. 19463—70. [2]) J. J. A. Worsaae: Dragshøjfundet, Illustreret Tidende II (28. April 1861), S. 244. Boye p. 114. Mémoires 1891, p. 77, and Aarbøger 1914, p. 251.
[3]) Further a little fragment was found; it is regularly torn at all edges and measures 35 × 20 cm. Warp and weft are both S-spun.

6. Toppehøj.

[1]) Mus. Nr. MDCCLXXX—VI. Nordisk Tidsskrift for Oldkyndighed III, p. 283 seq. Boye p. 109 seq. Mémoires 1891, p. 77. Aarbøger 1914, p. 251.
[2]) Further there was found *a small bit of plainly woven woollen fabric*, 11 × 7 cm large, and an *irregular piece of cloth*, likewise of plainly woven woollen material, 19 × 17 cm large. 4 cm of the original edge of the fabric are preserved, a selvedge being seen here as in fig. 41,5 in which the longitudinal threads lie closer than in the bottom fabric. These warp threads are S-spun and are parallel to the S-spun threads of the fabric. The edge is probably a side-edge.

Analysis of the Textiles from Jels, Dragshøj and Toppehøj.

		Jels	Dragshøj				Toppehøj	
		Cap	Piece of cloth	Fragment I	Fragment II	Cap	Fragment I	Fragment II
		I						
Sample 1 ...	wa.	21	46l	38l	50l	22l	20l	22l
	we.	23[1])	36r	38l	39l	17r[1])	14r[1])	20r[1])
		II						
Sample 2 ...	wa.	oo	48l	..	..	..	..	..
	we.	oo	37r	..	..	..	..	..
		III						
Sample 3 ...	wa.	25	..	..	..	..	..	..
	we.	17[1])	..	..	..	..	..	..
		IV						
Sample 4 ...	wa.	13	..	..	..	..	..	..
	we.	9[2])	..	..	..	..	..	..
		V						
Sample 5 ...	wa.	11	..	..	..	..	..	..
	we.	9[2])	..	..	..	..	..	..
		VI						
Sample 6 ...	wa.	8l	..	..	..	..	..	..
	we.	7r[2])	..	..	..	..	..	..

[1]) Of 5×5 cm. [2]) Of 2×2 cm.
The rest of the tests are made in squares of 10×10 cm.

7. Borum Æshøj; Grave A.

[1]) C. Engelhardt: Egekister fra Borum Æshøj, Illustreret Tidende XVIII, (25. Okt. 1876), p. 25—27. Boye p. 49—64. A. P. Madsen: Bronzealderen II, p. 17—19, Pl. 9—10.

[2]) Mus. Nr. B. 1396—1403.

[3]) Mémoires 1891, p. 77 f.

[4]) Ejnar Kristiansen: Den marginale Paradentitis' Patogenese, Odontologisk Tidskrift 1939, S. 6 f.

Analysis of the Textiles of Borum Æshøj, Grave A.

Sample	Cloak	wa.	we.
1	At the rounding near f.....	30	35
2	Where the rounding ends at e	43	26
3	Where the rounding ends at h	43	25
4	Where the rounding begins at a....	42	26
5	Almost in the centre off a.....	32	23
6	A little off the rounding at l	41	21
7	Near the holes of the pins.....	45	23
8	In II, the piece sewn on	33	33
Sample	Gown	wa.	we.
1	In the middle of the lower part....	43	40
2	At the lower right hand corner	39	41
3	At the lower left hand corner.....	38	37
4	In the middle of the upper part....	46	38
5	At the upper right hand corner	41	39
6	At the upper left hand corner	39	39
Sample	Foot-wear	wa.	we.
7	I	18	16
8	II	19	16

As regards the foot-wear the threads are counted in squares of 5×5 cm, the other pieces are counted in squares of 10×10 cm.

8. Borum Æshøj, Grave B.

[1]) Mus. Nr. B 1404—16.

[2]) Ejnar Kristiansen: Op. Cit. p. 6.

Analyses of the Textiles of Borum Æshøj, Grave B.

Sample	Cloak	wa.	we.
1	At the rounding at the left side....	38	22
2	At the rounding at the right side ..	46	27
3	2 cm within the plaited border	36	26
4	In the selvedge	44	26
5	In the centre	36	32
6	In the right hand edge at j	39	31
Sample	Gown	wa.	we.
1	Lower right hand corner.....	49	34
2	At the centre 16 cm from the edge	35	38
3	Torn edge at the upper right hand corner	50	34
4	At the middle near the cut edge ...	35	37
5	Smaller piece, lower left hand corner	39	31

All samples are of 10×10 cm.

9. Borum Æshøj, Grave C.

[1]) Mr. Boye announces p. 58 after information by Professor F. Schmidt that the skeleton must be that of a woman of middle age "whose stature was rather under than over the average, but well-proportioned. For a woman the bones have unusually conspicuous protuberantia, especially the humeri, which suggests that she has done hard work".

[2]) Aarbøger 1915, p. 361. [3]) Kristiania Videnskapsselskaps Forh. 1914, Nr. 6. [4]) Mus. Nr. B. 679—700.

[5]) Besides the piece mentioned there are some pieces of cloth supposed to be remnants of a big cloth, which is said to have been spread over the dead body. One of those pieces has two border lines of almost equal length, 45 cm, which meet at right angles. At one side there is a selvedge in which two threads lie in one shed, as is shown at the diagram of fig. 59, 1. The adjoining edge is cut off straight, the other edges are irregularly torn off. The threads parallel to the selvedge are S-spun, those in the opposite direction are Z-spun, and as the latter have the crossings characteristic of the weft, they must be regarded as the weft threads, which again means that the selvedge is a side-edge; that is something quite out of the common, selvedges of this type usually being starting edges. There are 46 S-spun and 31 Z-spun threads to a square of 10 × 10 cm, which also suggests that the S-spun threads are warp threads.

To the same item in the museum catalogue belongs an irregular piece of cloth with torn edges. It measures about 90 × 24 cm. The long threads are S-spun, the short Z-spun, and the Z-spun threads have crossings. There are 42 S-spun and 32 Z-spun threads at a square of 10 × 10 cm. The colour of the material is blackish and somewhat uneven.

10. Egtved.

[1]) Th. Thomsen: Egekistefundet fra Egtved, Nordiske Fortidsminder II, p. 165 seq. Mus. Nr. B. 11831—50.

[2]) As a great many cow's tail hairs have been inserted in it, it is most probably an amulet. [3]) Th. Thomsen p. 184, the examination made by Mr. Bille Gram. [4]) Th. Thomsen p. 197, the examination made by Professor Ellermann.

Analyses of the Textiles from Egtved.

Egtved		Blanket	Jacket	Foot-wear	Cloth with burnt bones
Sample 1 ...	wa.	41 l	27 r	a 31 l	42 l
	we.	26 r	25 l	a 29 l	31 l
Sample 2 ...	wa.	32 l	28 r	b 00	..
	we.	27 r	28 l	b 00	..
Sample 3 ...	wa.	32 l	32 r	c 12 l	..
	we.	27 r	25 l	c 7 l[2])	..
Sample 4 ...	wa.	38 l	a 19 r	d 37 l	..
	we.	26 r	a 12 l[1])	d 28 l	..
Sample 5 ...	wa.	42 l	b 20	e 19 l	..
	we.	28 r	b 13 l[1])	e 15 l[1])	..
Sample 6 ...	wa.	34 l	..	..	..
	we.	26 r	..	..	..
Sample 7 ...	wa.	29 l	..	..	..
	we.	29 r	..	..	..
Sample 8 ...	wa.	28 l	..	..	..
	we.	30 r	..	..	..
Sample 9 ...	wa.	35 l	..	..	..
	we.	32 r	..	..	..

[1]) Of 5×5 cm. [2]) Of 3×3 cm.
The other tests are made in squares of 10×10 cm.

11. Skrydstrup.

[1]) H. C. Broholm and Margrethe Hald: Skrydstrupfundet, en sønderjysk Kvindegrav fra den ældre Bronzealder. Med Bidrag af Chr. J. Baastrup, Werner Christensen, K. Fisher-Møller, Johs. Iversen, Ejnar Kristiansen, G. Rosenberg, C. M. Steenberg. Nordiske Fortidsminder III, 2 (1939). Ejnar Kristiansen: Den marginale Paradentitis' Patogenese, Odontologisk Tidskrift 1939, p. 2. Mus. Nr. B. 12960—970.

[2]) Emil Vogt: Geflechte und Gewebe der Steinzeit, Monographien zur Ur- und Frühgeschichte der Schweiz I, 1937 p. 34, fig. 55. The piece comes from Schötz, Kt Luzern.

[3]) Emil Vogt: p. 33 of the tract mentioned.

[4]) Similar stitches occur in basket-work nearly all over the world, compare Nils Lihtberg: Svensk korgslöjd, Rig IV, 1921, p. 126. See an Egyptian specimen fig. 17. G. Semper: Der Stil in den technischen und tektonischen Künsten I (1878), p. 174 seq. Maria Collin: Sydda vantar, Fataburen, 1917, p. 17 seq.

Analysis of the Textiles from Skrydstrup.

Skrydstrup		Blanket A	Blanket B	Jacket	Piece of Cloth
Sample 1 . . .	wa.	44l	45l	35l	44l
	we.	32r	40r	35r	42r
Sample 2 . . .	wa.	47l	41l	37l	25l
	we.	30r	40r	36r	17r[1])
Sample 3 . . .	wa.	..	..	35l	21l
	we.	..	..	38r	19r[1])
Sample 4 . . .	wa.	..	..	..	24l
	we.	..	..	..	18r[1])

[1]) Of 5×5 cm.
The other tests are made in squares of 10×10 cm.

12. Bredhøj.

[1]) Boye p. 24—29, pl. 2, 1—2. Mus. Nr. B. 3610—11. The grave B mentioned above is probably a man's grave. The two other oak coffins, which have presumably contained children's bodies, were empty.

13. Textiles from the Late Bronze Age.

[1]) Mus. Nr. 20080—84, 26430—36. Aarbøger 1868, p. 114.

[2]) Letter of $^2/_5$, 1896.

[3]) Acta archaeologica V, p. 198.

CHAPTER III

The Textile Technique of the Bronze Age.

[1]) The word "textile fabrics" is here taken in its widest sense. From indicating the art of plaiting and weaving (*opus textile*, from texere = plait, weave) it has gradually passed into comprising fabric made by joining threads together (sewing, weaving, plaiting, crocheting, etc.), and even the making of the thread (spinning) and the preparing of the material on the whole.

[2]) Thomsen, p. 184. The determination is due to Mr. Bille Gram.

[3]) Gudmund Hatt: Landbrug i Danmarks Oldtid (Kbhvn. 1937) p. 20 seq.

[4]) No doubt the sheep of the Bronze Age resembled the old Danish heath sheep, and perhaps the latter were their direct descendants (Hugo Matthiessen: Den sorte Jyde, p. 64).

[5]) Affaldsdynger fra Stenalderen p. 189 (H. Winge), Aarbøger 1919, p. 94 (H. Winge), Meddelelser om Grønland, Bd. 88, Nr. 3, p. 14 seq. (M. Degerbøl), Aarbøger 1939, S. 143—166 (M. Degerbøl).

[6]) Skrydstrupfundet, Nordiske Fortidsminder III, 2, p. 38 (C. M. Steenberg).

[7]) Aarbøger 1938, p. 224 (Hans Helbæk).

[8]) Sophus Müller: Stenalderens Kunst i Danmark p. 26.

[9]) A flint dagger found at Wiepenkathen near Stade gives an evidence of the textile work excavated close to the southern frontier of Denmark, for at the handle of the dagger there was found a winding with a woven material. See A. Cassau: Ein Feuersteinsdolch mit Holzgriff und Lederscheide aus Wiepenkathen, Mannus XXVII, p. 199. G. Schwantes: Schleswig-Holstein I, p. 301, fig. 367. An excellent account of the Swiss textile material is given by Emil Vogt: Geflechte und Gewebe der Steinzeit, Monographien zur Ur- und Frühgeschichte der Schweiz I (Basel 1937).

[10]) J. Winther: Troldebjerg (Tillæg) p. 14, fig. 20.

1. The wool and its preparation.

[1]) Chr. Blinkenberg: Epinetron und Webestuhl, Mitt. d. arch. Instituts, Athenische Abt. Bd. 36, 1911, p. 145 and 149.

[2]) Niels Horrebow: Tilforladelige Efterretninger om Island (1752) p. 117. Eggert Olafssen og Biarni Povelsen: Reise igiennem Island 1752—57 (Sorø 1772), p. 199. Olaus Olavius: Oeconomisk Reise igiennem de nordvestlige, nordlige og nordøstlige Kanter af Island (Kbhbn. 1780), p. XC. J. Landt: Forsøg til en Beskrivelse over Færøerne (Kbhvn. 1800), p. 404. Hj. Falk: Altwestnordische Kleiderkunde, p. 1 and 13. H. F. Feilberg: Dansk Bondeliv, 3. Udg., p. 109.

[3]) This information is due to Mrs. M. Andersen, Barrit, who was born at Nólsoy.

[4]) Aarbøger 1891, p. 121.

[5]) In Gretter's Saga (Chapt. 11) Gretter sits in the women's room, and is ordered to scratch his father's back, which he does with the carding comb.

[6]) C. H. Friis: Om Uldkæmning, Sønderjydsk Maanedsskrift IX, 1932—33, p. 198. A similar process is known from the Faroes.

2. Spinning and twisting of wool.

[1]) N. M. Mandelgren: Om äldre spinnredskaper og spinnsätt. Sv. Fornminnesfor. Tidskr. I, 1871—72, p. 154. Gerda Cederblom: Några av våra älsta spånadsredskap och deras ätlingar, Fataburen 1909, p. 1—14. Maria Collin: Om primitiva spinnmetoder, Rig 1921, p. 75. W. la Baume: Das Spinnen mit der Handspindel in vorgesch. Zeit, Blätter für deutsche Vorgesch. Heft 6 (1929), p. 1. Falk: Kleiderkunde, p. 6.

[2]) Letters to Miss Margrethe Hald $^{22}/_6$ and $^{15}/_9$, 1933.

[3]) G. Rosenberg: Hjortspringfundet. Nordiske Fortidsminder III, 1. An attempt has been made to spin with a copy of this distaff, and it appears that it lends itself well to spinning a fine thread. Some Scotch distaffs have small grooves or heads, in which the threads are fastened (Proceedings of the Society of Antiquaries of Scotland XX, p. 259). Also from the Oseberg find we have two spindles all of wood, Osebergfundet II, p. 181 (Sigurd Grieg).

[4]) See S. A. Xanthoudides: Epinetron, Athen. Mitt. 35 (1910), p. 323. Chr. Blinkenberg: Lindos I (Text), p. 130 seq., p. 643. Carsten Høeg: Les Saracatsans I, p. 6 and p. 20.

[5]) The spinning hook is known also from Halland. G. J: son Karlin: Den förhistoriska textilkonsten i Norden, Studier tillägnade Oscar Montelius af lärjungar 1903, p. 200 ff.

[6]) Margrethe Hald: Bidrag til Betegnelsen for Spinding af Oldtidsgarn, Aarbøger 1937, p. 278. H. J. Hannover: Textilindustri II, p. 181. Poul Sterm: Textil, p. 35. Melliant: Textilberichte 1934, p. 285. E. Vogt: Geflechte und Gewebe der Steinzeit, p. 49. Bronsåldersmanteln från Gerumsberget, p. 27. The terminology adopted by the International Cotton Committee (Paris 1937) applies the term of Z = openband =

right spinning, and S = crossband = left spinning, the oblique lines of the letters illustrating the direction of the twining.

[7]) Thus two pieces of cloth, found in a bog at Corselitze in the island of Falster, had respectively 108 and 122 warp threads per 10 cm. The cloths were found together with the body of a woman, and by a two-piece fibula they are dated to the Migration. The wool is very fine and Z-spun in both directions. A fragment of a piece of cloth from a field near the rectory of Hjørring showed 230 and 240 threads at a square of 10 × 10 cm.

[8]) H. C. Nielsen: Haandbog for Vævere (Horsens 1881), p. 63 and 66.

[9]) Letter of $^{19}/_{12}$ 1934.

[10]) Plato: Polit. 282 e.

[11]) Rig. 1921, p. 80.

[12]) Caroline Halvorsen: Haandbog i Vævning, Kristiania 1920. H. J. Hannover: Textilindustri III, Vævning (Kbhvn. 1938).

3. Weaving and plaiting.

[1]) Hugo Ephraim: Über die Entwicklung der Webetechnik und ihre Verbreitung ausserhalb Europas. Mitt. aus dem Städtischen Museum für Völkerkunde zu Leipzig I (1905), p. 8.

[2]) Zeitschr. für Ethnol. 1906, p. 811.

[3]) Carl Herman Johl: Die Webestühle der Griechen und Römer (1917), p. 4—5.

[4]) Der Übergang vom Flechten zum Weben, Intern. Archiv für Ethnographie, 1901, p. 229.

4. Northern upright looms and warp-aparatuses.

[1]) L. F. Salzman: English Industry of the Middle Ages (1923) p. 216—217.

[2]) C. H. Johl: Altägyptische Webestühle, p. 15.

The Faroe loom and the Norwegian loom.

[3]) Eilert Sundt: Bygningsskik paa Bygderne i Norge (1900) p. 373 seq.

[4]) I must thank the management of the museum of Thorshavn for the photograph and the drawing of this loom and for the permission to give a figure of it. Also I must thank Mrs. Petra Djurhuus for valuable information on the Faroe looms (letters to Margrethe Hald $^{6}/_{10}$ and $^{30}/_{11}$ 1934). The horizontal loom did not come into use on the Faroes until about 1800 (Svabo: p. 106 of the essay quoted. Jørgen Landt: p. 404 of the essay quoted); when in most places it superseded the old loom it is because it is far more handy. The heavy timber of the upright loom was then often used for building purposes. A good description of the upright loom is given by Dr. C. H. Johl: Die Webestühle der Griechen und Römer p. 19 ff. See further Chr. Blinkenberg: Epinetron und Webestuhl, Athen. Mitt. 36, p. 145, where the objections are rejected that Mrs. M. v. Kimakowicz-Winicki (Mannus-Bibl. Bd. II, p. 36 f.) have raised to the correctness of these looms, and Hj. Falk: Kleiderkunde p. 9 seq.

[5]) The terms for the single parts of the loom are found in: Antiquariske Tidsskrift 1846—48, p. 212.

[6]) As the loom had but one rod, the heddle-rod, the cloth woven on this loom has been called "Einskaft".

[7]) F. i. on a loom originating from Western Norway, in the National Museum of Copenhagen. Others are pictured: Johl, p. 21 fig. 14 of the essay mentioned. Meddel. från Nordiska Mus. 1906, p. 23, fig. 6, Anders Sandvig: De Sandvigske Samlinger I, p. 142, fig. 264.

[8]) Pictured J. J. A. Worsaae: Afbildninger fra det Kongelige Museum for nordiske Oldsager 1854, 422 (2. Udg. 1859, 558).

[9]) Communicated by Mr. M. Þorðarson in a letter to Dr. H. C. Broholm from $^{13}/_{12}$ 1934.

[10]) Kleiderkunde, p. 9.

[11]) Oeconomisk Reise igiennem Island, p. 630, p. XII.

[12]) Die Webestühle der Griechen und Römer, p. 23.

[13]) I. C. Svabo: Føroyaferðin, p. 106.

[14]) Letters of $^{13}/_{12}$, 34 to Dr. H. C. Broholm.

[15]) In Jutland (Bjerge Herred) old people still use the term of Tosel (to Søl = two heddle-rods) about tabby weaving or plain weaving or two-shaft.

[16]) En vävstol och en varpa, Fataburen 1928, p. 143. Agnes Geijer: Birka, p. 29—34.

5. The upright loom of the Greek.

[1]) C. H. Johl: Die Webestühle der Griechen und Römer. H. Ling Roth: Ancient Egyptian and Greek looms. Bankfield Museum notes 1913, p. 30 seq. Blümner: Technologie der Griechen und Römer I p. 156 seq. Guhl und Kohner: Das Leben der Griechen und Römer, p. 320. Neugebauer: Technik des Altertums, p. 175.

[2]) Athen. Mitt. 36, p. 145.

[3]) ἱστός = mast, post in the loom, from the verb ἵστημι Compare O. Schrader: Sprachvergleichung und Urgeschichte (1907), II, p. 262. Vilh. Thomsen: Oldarisk Kultur, Samlede Afhandlinger, I p. 223.

In the department of Greek and Roman antiquities in the National Museum there are a few loom weights of different form and size. Some are made of terracotta, others of lead. The biggest piece of terracotta is 10,5 cm high, 8 × 6 cm at base and weights 634 g. A conical piece of lead, which is very much like the weaving weights on fig. 174, is 5 cm high, and weighs 202 g. A third one, made of lead too, only weighs 68 g. See: Chr. Blinkenberg: Lindos, Text p. 143.

[4]) Originally a radius (of a sheep) is supposed to have been used for a shuttle, but already Homer mentions reels of metal (Od. V, 62). A piece of bronze is reproduced Chr. Blinkenberg: Lindos I, pl. 15, 406; text col. 146—147 ff.

[5]) Herodot II, 35. . . . οἱ δὲ ἄνδρες κατ' οἴκους ἐόντες ὑφαίνουσι· ὑφαίνουσι δὲ οἱ μὲν ἄλλοι ἄνω τὴν κρόκην ὠθέοντες, Αἰγύπτιοι δὲ κάτω.

[6]) K. Friis Johansen: Iliaden i tidlig græsk Kunst, Studier fra Sprog- og Oldtidsforskning Nr. 165, p. 45.

[7]) Probably the upright loom has also in the Mycenian time been in use in Greece. Mr. I. A. B. Wace regards some round disciform earthen objects found in Mycene as loom-weights (Annual of the Brit. School of Athens XXV, 215); similar objects have been excavated in Tiryns and Orchomenos. (Schliemann: Tiryns, p. 165 f.) The well-known vase from Ödenburg in Hungaria has a representation of an upright loom with two heddle-rods; the four groups of warp threads are strained by roundish loom-weights. L. Bella und O. Müller: Prähistorische Funde in der Umgegend von Ödenburg, Mitt. der anthrop. Gesellschaft XXI, p. 166. From Italy we have also evidences of the ancient, upright loom, H. L. Ahrens: Die Webestühle der Alten, Philogus Bd. 35, 1876, p. 385 seq.; but the tradition is so comparatively recent that in this case it is of no great interest.

CHAPTER IV

A Technical Examination of the Weaving of the Bronze Age Fabrics.

1. The Size and Making of the Cloths.

[1]) Caroline Halvorson: Norsk Husflidsforenings Haandbok i Vævning p. 48.

[2]) Studier tillägnade Oscar Montelius (1903) p. 195.

[3]) Die Webestühle der Griechen und Römer, p. 54 and p. 50.

[4]) Svabo p. 106.

[5]) Tilforladelige Efterretninger p. 332. Likewise Jørgen Landt in his essay p. 405 fixes 1—1½ Alen of russet as a day's work, whereas E. Olafson p. 35 says that a girl should be able to weave 5 Alen a day.

3. Irregularities in the Weaving of the Cloths.

[1]) As already mentioned p. 42 and p. 110 the wool of the Bronze Age materials is sometimes twisted so tightly that the thread tangles at the thin places, i. e. runs up in spirals. By an attempt to weave with new wool with similar qualities, the consequence of the tight twisting proved to be that the texture had a strong tendency to shrink together. The attempt was made on an ordinary hand-loom with a spreader, and several weft threads were passed through one shed. The weft was slipped through by the hand, and the weaving person was careful to avoid straining the thread. When the piece of cloth, which was about 100 cm broad, was taken off it showed a strong tendency to shrink together, and after some time its width decreased to 96—98 cm. We may infer from this that a similar wool on a primitive loom without a spreader must exert a strong pull towards the centre, and the tightening of the weft, observed so often, is the natural consequence.

5. The fabric and the loom.

[1]) In a site excavated during the investigations of the National Museum of Copenhagen at the Iron Age settlement in Ginderup, Thy, and by the ceramics dated to the Migration, a large collection of pyramidal loom-weights of burnt clay were found. They lay in the east end of the house near the southern outer wall. Close to the wall 3 stake holes were seen, 13—18 cm deep. Between the first and the second hole, where the loom-weights were found, the distance was 1,80 cm, a measure which probably indicates the breadth of the loom. Between the second and the third hole the distance was 0,70 m, and no loom-weights were found there. Probably the loom leaned against the wall. Gudmund Hatt: Oldtidsbopladsen i Ginderup, "Tilskueren", Oktober 1934, p. 105, fig. 5. Fra Nationalmuseets Arbejdsmark 1934, p. 41 and p. 50. To the same period belongs a collection of loom-weights (about 50) found in the ruins of a burnt down Iron Age house in Mors. They are almost of equal size and must have weighed about 600 g. Together with them were found fragments of a flat, narrow stick of ash, probably a weaving sword. Gudmund Hatt: Emplacement d'incendie d'une maison de l'âge du fer dans l'île de Mors. Mémoires 1926—34, p. 309 seq.

The Vimose find also has a wooden weaving sword, C. Engelhardt: Vimosefundet p. 15, pl. 6, 7, pl. 17,5. Another one of bone—most likely from the Late Bronze Age—was picked up from Randers Fjord, Aarbøger 1907, p. 114, fig. 28. Pyramidal loom weights were found in the Bronze Age village of Buch near Berlin. A. Kiekebusch: Die Ausgrabung des bronze-zeitlichen Dorfes Buch bei Berlin, p. 61.

On pre-historic looms see further Karl Brandt: Neuerkenntnisse zu vor- und frühgeschichtlichen Webestühlen. Prähist. Zeitschr. XXVI, 1935, p. 87—101.

[2]) Fornvännen 1937, p. 245.

[3]) Th. Thomsen: Vævede Stoffer fra Jernalderen, Aarbøger 1900, p. 257.

[4]) Bjørn Hougen: Snartemofunnene, p. 69.

[5]) See a description: Rundschau technischer Arbeit $^{6}/_{6}$ 1937 (Berlin).

[6]) It must be remarked that the drawings of the looms are much simplified for the sake of clearness. The heddles are shown as separate loops, while actually they are made of a continuous thread. The loom-weights are not in practice fastened one to each thread, but they are tied to groups or bundles. Many weight-looms have a warp regulator, i. e. a lacing or plaiting across both layers of threads, the object of which is to keep the warp threads in place in the right order; this regulator is left out here.

[7]) The same of course is the case with twill weaving; if two threads are drawn through one heddle, we get a product with two threads in one stitch, an analysis which so far I do not know from the fabrics of the Bronze Age. There cannot, as Agnes Geijer suggests (Birka p. 34) be different ways of heddling in a vertical loom and a horizontal loom, if the same analysis is to be the result, and as for the warp loops their preservation will no doubt cause still more trouble by the setting up of a twill weaving than by a two-shaft or plain weaving on a weight-loom.

[8]) Fataburen 1928, p. 155.

6. Weaving-Experiments.

[1]) Aarbøger 1930, p. 104.

[2]) Geflechte und Gewebe der Steinzeit, p. 53, figs. 82 and 86.

[3]) Alt ägyptische Webestühle p. 11 and 25.

[4]) Vævede Kapper fra Nordvest-Indianerne. Fra Nationalmuseets Arbejdsmark 1937, p. 52. George T. Emmons: The Chitkat Blanket (Memoirs of the American Mus. of Natural History. Vol. III, no. 4 N. York 1907) p. 329. Charles C. Willonghby: A New Type of Ceremonial Blanket from the Northwest Coast (American Anthropologist. New series, vol. XII Lancaster 1910) p. 1 seq. Mary Lois Kissel: The Early Geometric Patterned Chilkat (Ibid. vol. XXX, p. 116, Menasha 1928). The same: Organized Salish Blanket Pattern (Ibid. XXXI menasha 1929) p. 85. Ronald L. Olson: The possible Middle American Origin of Northwest Coast Weaving (Ibid.) p. 114.

[5]) Johl: Altägyptische Webestühle, p. 2.

[6]) Vogt: Geflechte und Gewebe der Steinzeit.

7. Fulling.

[1]) Letter to M. Hald, $^{6}/_{10}$ 1934.

[2]) Chr. Matras: Stednavne paa de færøske Norðuroyar, Aarbøger 1932, p. 9 and 303.

[3]) Svabo: p. 110. The curved drawings out in the weaving edges, mentioned p. 21, are thought to be traces of the lacing up of the cloth on the cloth beam. But it is strange that in several cases the holes in the curves are quite distinct, which were not to be expected after the process of fulling. It is not impossible that the cloth was hung up during the fulling in a similar manner to the Faroe method described here. Another possibility is that the drawings out come from hanging up the wet cloth after the fulling.

[4]) Karen Thuborg: Fra det gamle Harboøre p. 101. H. F. Feilberg: Dansk Bondeliv p. 331.

[5]) It is also of importance for the fulling that the wool is well mixed, as different kinds of wool react differently to the process. Therefore it was formerly common to lay the wool in a heap and whip it thoroughly, after which it was more easily carded.

[6]) J. la Cour og Siegumfeldt: Vævebog for Hjemmene p. 37 estimates the shrinkage of russet to be $^{1}/_{4}$. C. Halvorson: Haandbog i Vævning p. 48 reckons the shrinkage to be $^{1}/_{5}$ in length and $^{1}/_{4}$ in breadth. H. C. Nielsen: Haandbog for Vævere, p. 59 informs us that russet of plain weaving, the warp of which is always rather open, must lie 2 Alen broad on the loom to give a breadth of $1^{1}/_{4}$ Alen after the fulling, which means a shrinkage of about 37 %. A four-shaft piece of cloth, the warp of which can be more close, shrinks about 25 %.

8. Cutting and Sewing.

[1]) Such stitches are found also elsewhere, Gottfried Semper: Die textile Kunst, p. 186, fig. 1—2 shows them in the reverse position, fig. 6 a further development of the same stithc, which

seems to be made from the right to the left. Stitches on the Danish net from the Stone Age show much resemblance to these (Sophus Müller: Ordning, Stenalderen 189); but those on the net lie in a manner that seems natural if they were made from the left to the right. The Eskimos also sew from the right to the left; K. Birket-Smith: The Caribou Eskimos II, p. 117 and 200. On the sewing of fur garments see also Gudmund Hatt: Arktiske Skinddragter p. 39 seq.

[2]) Sophus Müller: Ordning, Bronzealderen 202 and 204. The flat needle with the rounded end was probably used as a bodkin.

[3]) A. P. Madsen: Afbildninger af danske Oldsager, pl. 17, fig. 15.

9. Special Textile Works.

[1]) Aarbøger 1891, p. 101. Sophus Müller: Nordische Altertumskunde, p. 271.

[2]) Luise Schinnerer: Antike Handarbeiten (Wien about 1890).

[3]) Agnes Branting: Knytning, knipling och språngning, Fataburen 1907, p. 105 seq. Elna Mygdal: Sprang, en Haandarbejdsteknik, som er gaaet i Forglemmelse. "Vore Damer" 10th May, 1917. E. van Reseema: Contributions to Early History of Textile Technique, Verhandlungen der kon. Akademie van Wetenschappen, Amsterdam, 1926. Elna Mygdal: Danske Folketekstiler, Nordens Husflidsforbund VI (1931) p. 13. H. C. Broholm and Margrethe Hald: To sprangede Textilarbejder i danske Oldfund, Aarbøger 1935, p. 29 seq. Margrethe Hald: Sprang, Berlingske Tidende, Sunday $^{24}/_{5}$, $^{7}/_{6}$, $^{12}/_{7}$ 1936. Erna Lorenzen: Gamle danske Haandarbejder (1932), p. 1 seq. Hans Dedekam: Hvitsøm fra Nordmør (1914), p. 33 seq. Helga Brekke-Vasbotn: Bregding (Oslo 1929). Astrid Sandvold—Halfdan Arneberg: Sprang (Oslo 1927). Anna Grostøl: Sprang (Oslo 1932). Maria Collin: Gammalskånska band, Fataburen 1915, p. 14 seq. and p. 214 seq. The same author: Den äldsta kändte flätningen, Fataburen 1932, p. 11 seq.

[4]) Hans Dedekam: Et Tekstilfund i myr fra romersk Jernalder, Stavanger Museums Årshæfte 1921—24, p. 3 seq.

[5]) Mogens B. Mackeprang: Om et Træskrin med Amuletter etc., fra Nationalmuseets Arbejdsmark 1936, p. 47. The textiles described by Margrethe Hald, see P. Helweg Mikkelsen: Blidegngraven (1938, p. 34 seq.).

[6]) Aarbøger 1935, p. 42 seq.

[7]) Osebergfundet II, pl. 14, p. 176. Karin Mellby: Billedvevningen i Norge under renæssansen, p. 9 and Emil Vogt: Geflechte und Gewebe, p. 111 regard the frame as a tapestry loom, an interpretation which can hardly be right.

[8]) Agnes Geijer: Birka III (1938), p. 128. Aarbøger 1935, p. 132 seq.

[9]) Zeitschrift für Ethnologie 1914, p. 825.

[10]) J. Six: Altgriechische durchbrochene Arbeiten, Jahresheft des Österreich. Arch. Instituts 19—20 (1919), p. 162 seq. Possibly a "Sprang" cap and hair-net are mentioned II, 22, 468.

[11]) Karl Schlabow: Germanische Tuchmacher der Bronzezeit, p. 44.

[12]) Margrethe Lehmann-Filhés: Über Brettchenweberei, (1901). A. Götze: Brettchenweberei im Alterthum, Zeitschrift für Ethn. 1908. R. Stettiner: Brettchenwebereien in den Moorfunden von Damenforf, Daetgen und Torsberg, Mitt. des Anthrop. Vereins in Schleswig-Holstein, Heft 19 (Kiel 1911). C. H. Johl: Brettchenweberei, Ebert: Reallexicon II, p. 134. H. Hahne: Moorleichenfunde aus Niedersachsen, Vorzeitfunde aus Nieders. VI. Margrethe Hald: Brikvævning i danske Oldtidsfund, Aarbøger 1930, p. 277 seq. Le tissage aux plaque dans les trouvailles préhistoriques du Danemark, Mémoires 1930, p. 389. Margrethe Hald: Brikvævning (Kbhvn. 1932). Hans Dedekam: To textilfund fra Folkevandringstiden. Evebø og Snartemo, Bergens Museums Aarbok, 1924—25. Hist. Ant. Række 6. Bjørn Hougen: Helgelandfundet. Et myrfund af tekstiler fra eldre Jernalder, Stavanger Mus. Aarshefte 1930—32. Hougen: Snartemo-funnene, Norske oldfunn VII, 1935. Maria Collin: Skånsk konstväfnad (Lund 1914). Vivi Sylvan: Brickbandet som kulturobjekt, Fornvännen 1926. Agnes Geijer: Birka III, p. 76. Grace M. Crowfoot: The Tablet-woven Braids from the Vestments of St. Cuthbert at Durham. The Antiquaries Journal XIX, 1939, p. 57.

[13]) Geflechte und Gewebe der Steinzeit, p. 98.

[14]) H. Ling Roth: Studies in Primitive Looms, Journ. of R. Anthrop. Instit. 48, p. 104, fig. 173 a.

CHAPTER V

The Costume of the Bronze Age.

[1]) Mus. Nr. 9220a—x. Antiquarisk Tidsskr. 1843—45, p. 236—37. C. F. Herbst: Hvidegaardsfundet, Annaler 1848, p. 336, pl. III. From the same period is a find from Gundsømagle (Mus. Nr. B. 1265—67), found in a stone cist at the bottom of a barrow together with cremated bones, and further the well-known find with the Etrurian kettle car (Chr. Blinkenberg: Etrurisk Kedelvogn funden ved Skallerup, Aarbøger 1895, p. 366). The fabrics of these two finds are also much decomposed so that it is impossible to give a proper description of the garments. The same is the case with the pieces of cloth already described from the Voldtofte grave from the beginning of the Late Bronze Age. (Compare: Boye, p. 121 seq.).

[2]) Thomsen, p. 194.

[3]) Bronsåldersmantelen från Gerumsberget, p. 27.

[4]) Aarbøger 1907, p. 116 (Sophus Müller) and Aarbøger 1938, p. 79 (Broholm).

[5]) They have had the same object in several other graves, where we have found a bit of a belt in connection with a bronze disc and a dagger. See f. i. fig. 191, and N. F. B. Sehested: Archæologiske Undersøgelser, pl. IV, a woman's grave, which with regard to equipment resembles very much that of the Æshøj woman.

[6]) Thomsen, p. 195. D. B. D., p. 285 seq.

[7]) A piece from Holsten closely related to the Egtved skirt is found in the: Museum vorgeschichtlicher Altertümer in Kiel, Schlabow: Germ. Tuchmacher, p. 59, fig. 87. A figure from the Late Bronze Age in a corded skirt found at Itzehoe, is shown in fig. 192.

[8]) Thomsen, p. 190.

[9]) Boye, p. 137 seq.

[10]) Aarbøger 1871, p. 22.

[11]) Boye, p. 149.

[12]) D. B. D., p. 288.

[13]) D. B. D., p. 286.

[14]) Aarbøger 1933, p. 112.

[15]) Sehested: Archæologiske Undersøgelser, p. 130.

[16]) Aarbøger 1871, p. 453, fig. 2.

[17]) Aarbøger 1871, p. 451, fig. 1.

[18]) Aarbøger 1927, p. 259, figs. 21—23.

[19]) Aarbøger 1933, p. 108 seq. Aarbøger 1920, p. 94.

[20]) Aarbøger 1910, p. 199.

[21]) Acta archaeologica V, p. 156, figs. 15 and 17.

[22]) Also the man's garment seems by this time to have undergone a change. The old open gown disappears, and probably trousers come into use; they are first seen on the Gundestrup vessel, Nordiske Fortidsminder I, pl. VI; but most likely this is an imported show piece. From the time of the Migration we know a pair of long trousers, C. Engelhardt, Thorsbjergfundet, pl. II.

[23]) Already in 1915—indeed before the excavation of the Egtved skirt—Mr. Georg Girke (Die Tracht der Germanen, p. 35. Mannus Bibliothek, Bd. 22—23, 1922) declared that

the corded skirt could not be regarded as a "Germanic" piece of garment, and in a treatise edited in the autumn of 1936 (Der germanische Mantel und das illyrische Röcken. Sitzungsber. der Akademie der Wissenschaften, Berlin 1936, p. 137 seq.) Dr. Carl Schuchardt has developed further this unfortunate idea, and tried to refer the corded skirt to the Illyrian circle of culture. Dr. Schuchardt's treatise, which is full of misunderstandings, and shows a lack of knowledge of the Danish material, deserves no elaborate refutation. The material described has already proved that the corded skirt does not represent a transient fashion, but has had a life in Denmark of about 1000 years, and every expert is able to see that the small bronze figures are Northern works. Further it is evident that the tube-ornamented skirt (fig. 191) of the Ølby grave cannot be parallelized with the belt and skirt decorated with bronze knobs and bronze buttons, found in the well-known woman's grave at Mühltahl, excavated by Mr. J. Naue, J. Naue: Die Bronzezeit in Oberbayern, p. 266, pl. VI. Georg Karo: Die Schachtgräber von Mykenai, pl. 27,6, text p. 49.

[24]) Aarbøger 1891, p. 106.

[25]) Thomsen, p. 195.

[26]) On the drink see Thomsen, p. 184.

[27]) Thomsen, p. 197. Burnt bones, originating from offerings of human beings, have also been found in other Bronze Age graves.

[28]) Aarbøger 1891, p. 122.

[29]) Mannus-Bibliothek, Bd. 23—24 (1922).

[30]) Ord och bild 1919, p. 65—71.

[31]) H. Schliemann: Mykene, p. 153. On later finds of representations of figures, Tiryns II, G. Rodenwald: Der Fries des Megarons von Mykene.

[32]) Bronsåldermantelen från Gerumsberget, p. 43. Compare Helbig: Toga und Trabea, Hermes Bd. 39, p. 170.

[33]) Already in 1886 Dr. Franz Studniczka (Beiträge zur Geschichte der Griechischen Tracht, p. VI) advanced the following opinion, "Die elementaren Formen der classischen Tracht, die auch späterhin unter dem Namen der dorischen ihren vorgeschichtlichen Charakter bewahrte, hatte der edle Arierstamm als Erbgut seiner Völkerfamilie mit nach Hellas gebracht, die Chlaina der Männer und den Peplos der Frauen... Unter der Chlaina trugen die Männer nur einen Hüftenschurz."

Apparently it is the thought of the North as the homestead of the high-bred Arians in connection with an exhibition in Berlin of Karl Schlabow's reconstructions of the Danish Bronze Age garments which have caused Professor Carl Schuchhardt to conceive the idea that he advances in the treatise already mentioned: Der germanische Mantel etc., that there must be a connection between the Greek and the "Germanic" cloak. As the Chlaina is said to have occurred first in Homer, and as a note in Philostrate says that the Greek had got their Chlamys from Thessaly, Professor Schuchhardt also finds that, "Es wäre schon ein Hinweis auf den Norden", and without explaining his reasons he advances the theory that the cloak is of ancient Germanic origin and together with many other things brought to the South with the Doric Migration. Schuchhardt is so sure of the truth of his idea that he says, "Heute braucht man die Abstammung der 'dorischen Tracht' von der altgermanischen wohl nur auszusprechen um sie allgemein anerkannt zu sehen". This seems a rather daring assertion. Not many scholars would venture to draw such extreme conclusions from a garment as wide-spread and as simple as the cloak.

[34]) Gudmund Hatt: Arktiske Skinddragter i Eurasien og Amerika, p. 6 and 118.

[35]) Aarbøger 1891, p. 110.

[36]) Gudmund Hatt: Arktiske Skinddragter, p. 49, 52, and 216 seq. Also the bronze figure shown in Aarbøger 1871, p. 453, fig. 3, wears a jacket of the Poncho shape with hanging corners at the front and at the back.

[37]) Compare the Tschuktischan Poncho, Hatt: Arktiske Skinddragter, Bl. II, 4, text p. 60 and an Eskimo man's fur coat, Hatt, Bl. VIII, 2.

[38]) Kai Birket-Smith: The Caribon Eskimos II, p. 117. Report of the fifth Thule Expedition 1921—24, Vol. V (1929).

EXPLANATIONS OF THE PLATES

The drawing at the cover is due to the artist Mr. Sikker Hansen.

Title-plate. The Skrydstrup woman's head, drawn by the artist Mr. Johannes Glob (November 1935).

Pl. I (left). The coffin opened. The outlines of the dead body are seen through the covering woollen blankets.

Pl. I (right). The dead body in the coffin after the removal of the woollen blankets.

Pl. II. The Skrydstrup woman's head and the upper part of her body. On both sides of her head we may see parts of the cow skin. The sleeves and the neck-opening of the jacket are embroidered. The lower edge of the jacket meets the upper edge of the skirt. About 25 cm below the waistline is the belt, to which the comb is fastened. The lower arms are decomposed.

Pl. III. The face. Great parts of the flesh of the cheeks and the chin, as well as the eyelids and the eyelashes are preserved. The fair hair is covered with a horse-hair net. The gold rings were placed in the outer ear. The forehead is wound about with woollen cords.

Pl. IV. The back of the head. The back of the neck has been pressed inward by a stone. To the left the "Sprang" cap pressed together, the cords of which are seen in pl. II. Below the cap a piece of plainly woven woollen fabric.

LIST OF LITERATURE

Affaldsdynger fra Stenalderen udgivet af A. P. Madsen, Sophus Müller m. fl. (1900).

H. L. Ahrens: Die Webestühle der alten, Philologus, 35, 1876.

Chr. J. Baastrup, se Skrydstrupfundet.

W. la Baume: Das Spinnen mit der Handspindel in vorgeschichtlicher Zeit, Blätter für deutsche Vorgesch., VI.

C. J. Becker: Enkeltgravskulturen paa de danske Øer, Aarbøger 1936.

L. Bella und O. Müller: Prähistorische Funde in der Umgegend von Ödenburg, Mitt. der anthrop. Gesellsch., Wien 21.

Kaj Birket-Smith: The Caribou Eskimos. I—II (1929), Report of the fifth Thule Expedition V.

— Vævede Kapper fra Nordvest-Indianerne, Fra Nationalmuseets Arbejdsmark 1937.

Chr. Blinkenberg: Etrurisk Kedelvogn funden ved Skallerup, Aarbøger 1895.

— Epinetron und Webstuhl. Mitt. des arch. Instituts, Athenische Abteilung Bd. 36, 1911.

— Lindos. I (1931).

Hugo Blümner: Technologie der Griechen und Römer I (1912).

Vilhelm Boye: Fund af Egekister fra Bronzealderen i Danmark, med 27 kobberstukne Plancher af A. P. Madsen.

Karl Brandt: Neuerkenntnisse zu vor- und frühgeschichtlichen Webestühlen, Prähist. Zeitschr. 26, (1935).

Agnes Branting: Knytning, knypling och språngning, Fataburen 1907.

Helga Brekke-Vasbotn: Bregding (Oslo 1929).

H. C. Broholm: Studier over den yngre Bronzealder i Danmark med særligt Henblik paa Gravfundene, Aarbøger 1933.

— Studier over Danmarks Bebyggelse i den ældre Bronzealder, Fortid og Nutid XII (1937).

— Nye Fund fra den ældste Bronzealder, Aarbøger 1938.

— Jelsfundet, en sønderjydsk Mandsgrav fra den ældre Bronzealder, Aarbøger 1938.

— Die Tracht der Bronzezeit in Dänemark, Tracht und Schmuch I (1939).

H. C. Broholm og Margrethe Hald: To sprangede Textilarbejder i danske Oldfund, Aarbøger 1935.

— Danske Bronzealders Dragter, Nord. Fortidsm II (1935).

— Skrydstrupfundet, en sønderjydsk Kvindegrav fra den ældre Bronzealder. Med Bidrag af Chr. J. Baastrup, Werner Christensen, J. Iversen, K. Fischer-Møller, Ejnar Kristiansen, G. Rosenberg, C. M. Steenberg.

Bronsåldersmanteln från Gerumsberget. Stockholm 1925.

Johannes Brøndsted: Danmarks Oldtid I (1938), II (1939).

Bulletin of the Metropolitan Museum of Arts 1931 & 1932.

A. Cassau: Ein Feuersteinsdolch mit Holzgriff und Lederscheide. Mannus Bd. 27.

Gerda Cederblom: Några av våra äldsta spånadsredskap och deras ätlingar, Fataburen 1909.

Werner Christensen. See Skrydstrupfundet.

Maria Collin: Gammalskånska band, Fataburen 1915.

Maria Collin: Om primitiva spinnmetoder, Rig 1921.

— Gamla vävnader och deras mönster (1928).

— Skånsk konstväfnad (Lund 1914).

— Den äldsta kändte flätningen, Fataburen 1922.

J. la Cour og Siegumfeldt: Vævebog for Hjemmene.

Grace M. Crowfoot: The Tablet-woven Braids from the Vestments of St. Cutbert at Durham, The Antiquaries Journal, 19 (1939).

Hans Dedekam: Hvitsøm fra Nordmør (1914).

— Et tekstilfund i Myr fra romersk Jernalder, Stavanger Museums Årshefte 1921—24.

— To tekstilfund fra Folkevandringstiden. Evebø og Snartemo. Bergens Museums Årbok 1924—26, Hist.-antikvar. Rk. Nr. 6.

Edda, The poetic, translated by H. A. Bellows (New York 1923).

C. Engelhardt: Thorsbjerg Mosefund.

— Vimosefundet.

— Egekister fra Borum Æshøj, Illustreret Tidende XVIII, 1876.

Hugo Ephraim: Über die Entwicklung der Webetechnik und ihre Verbreitung ausserhalb Europas, Mitt. aus dem Städt. Mus. für Völkerkunde zu Leipzig I (1905).

C. Danneil: Der Übergang von Flechten zum Weben, Intern. Archiv für Ethnographie 1901.

Hj. Falk: Altwestnordische Kleiderkunde (1919).

H. F. Feilberg: Dansk Bondeliv. 3. Udg.

K. Fischer-Møller. See Skrydstrupfundet.

J. E. Forssander: Sveriges förhistoriska bebyggelse. (1938).

C. H. Friis: Om Uldkæmning, Sønderjydsk Maanedsskrift IX, 1932—33.

Agnes Geijer: Litteratur och Kritik, Fornvännen 1937.

— Birka III. Die Textilfunde aus den Gräbern. (1938).

Georg Girke: Die Tracht der Germanen in der vor- und frühgeschichtlichen Zeit, Mannus-Bibliothek Bd. 22—24, 1922.

Bille Gram: Analyses de matériaux archéologiques avec remarque de Sophus Müller, Mémoires 1890—95.

Anna Grostøl: Sprang (Oslo 1932).

Guhl und Kohner: Das Leben der Griechen und Römer (1893).

A. Götze: Brettchenweberei im Altertum, Zeitschr. für Ethnologie 1908.

Hans Hahne: Moorleichenfunde aus Niedersachsen, Vorzeitfunde aus Niedersachsen herausgegeben vom Provinzialmuseum zu Hannover, Teil B (Bd. VI).

Margrethe Hald, see H. C. Broholm.

— Brikvævning i danske Oldtidsfund, Aarbøger 1930.

— Le tissage aux plaques dans les trouvailles préhistoriques du Danemark, Mémoires 1931.

— Brikvævning (1932).

— Sprang, Berlingske Tidende, Søndag $^{25}/_{5}$, $^{7}/_{6}$, $^{12}/_{7}$, 1936.

— Bidrag til Betegnelsen for Spinding af Oldtidsgarn, Aarbøger 1937.

— Textiler i Blidegnfundet fra den romerske Jernalder in P. Helweg-Mikkelsen: Blidegnfundet. (1938).

Margrethe Hald, see H. C. Broholm.
— Leonora Christinas "Jammersminde" som etnologisk Kildeskrift, Fra Nationalmuseets Arbejdsmark 1939.
Caroline Halvorsen: Haandbog i Vævning (1920).
H. I. Hannover: Textilindustri. II—III.
Gudmund Hatt: Arktiske Skinddragter i Eurasien og Amerika (1914).
— Emplacement d'incendie d'une maison de l'âge du fer dans l'île de Mors, Mémoires 1926—34.
— Landbrug i Danmarks Oldtid (Kbhvn. 1937).
W. v. Helbig: Toga und Trabea, Hermes 39.
C. F. Herbst: Hvidegaardsfundet, Annaler for Nordisk Oldkyndighed 1848.
Niels Horrebow: Tilforladelige Efterretninger om Island (1752).
Bjørn Hougen: Helgelandsfundet, Et Myrfund av tekstiler fra eldre Jernalder, Stavanger Museums Årshefte 1930—32.
— Snartemofunnene, Norske Oldfunn VII, 1935.
Carsten Høeg: Les Saracatsans (1925).
J. Iversen, see Skrydstrupfundet.
K. Friis Johansen: Iliaden i tidlig græsk Kunst, Studier fra Sprog- og Oldforskning Nr. 165 (1934).
C. H. Johl: Die Webestühle der Griechen und Römer (1917).
— Altägyptische Webestühle.
— Brettchenweberei, Ebert: Reallexikon der Vorgeschichte II.
G. J. Karlin: Några undersökningar om den förhistoriska textilkonsten i Norden, Studier tillägnade Oscar Montelius (1903).
Georg Karo: Die Schachtgräber von Mykenai.
M. v. Kimakowicz-Winicki: Spinn- und Webewerkzeuge. Mannus-Bibliothek Nr. 2, 1910.
Hans Kjær: Deux trouvailles votives du récent âge du bronze, Mémoires 1929—30.
Fr. Knorr: Klappstühle aus Gräbern der Bronzezeit, Mitth. des Anthrop. Vereins in Schleswig-Holstein, Heft 14, 1901.
Ejnar Kristiansen: Den marginale Paradentitis' Patogenese, Odontologisk Tidskrift, Göteborg 1939, p. 5.
— See Skrydstrupfundet.
J. Landt: Forsøg til en Beskrivelse over Færøerne (Kbhvn. 1800).
Margrethe Lehmann-Filhés: Über Brettchenweberei (1901).
H. Ling Roth: Ancient egyptian and greek looms. Bankfiel Mus. notes 1913.
— Studies in primitive looms. Journ. of R. Anthrop. Inst. 48.
Erna Lorenzen: Gamle danske Haandarbejder (1932).
Mogens B. Mackeprang: Om et Træskrin med Amuletter, Fra Nationalmuseets Arbejdsmark 1937.
A. P. Madsen: Afbildninger af danske Oldsager og Mindesmærker, Bronzealderen; Text af Henry Petersen.
N. M. Mandelgren: Om äldre spinnredskaper och spinnsätt. Svenska Fornminnesfören. Tidskr. I, 1871—72.
Chr. Matras: Stednavne paa de færøske Norðuroyar, Aarbøger 1932.
Karin Mellby: Billedvevningen i Norge under renæssansen, 1932.
Elna Mygdal: Sprang, en Haandarbejdsteknik som er gaaet i Forglemmelse, "Vore Damer" 10. Maj 1917.
— Folketekstiler i Danmark, Nordisk Husflidsforbund VI, 1931.
Sophus Müller: Ordning af Danmarks Oldsager, II, Bronzealderen (1891).
— Vor Oldtid. (Kbhvn. 1896).
— De jydske Enkeltgrave fra Stenalderen, Aarbøger 1898.
— Débuts et première évolution de la civilisation du bronze en Danemark, d'après les découvertes les plus récentes, Mémoires 1908—1913.
— Bronzealderens Begyndelse og ældre Udvikling i Danmark, Aarbøger 1909.
— Det store Sølvkar fra Gundestrup, Nord. Fortidsminder I.
J. Naue: Die Bronzezeit in Oberbayern.
A. Neugebauer: Technik des Altertums. (1919).
H. C. Nielsen: Haandbog for Vævere (Horsens 1881).
Njal, The story of Burnt, by G. W. Dasent (London 1900).
Eggert Olafssen og Biarni Povelsen: Reise igiennem Island 1752—57 (Sorø 1772).
Olaus Olavius: Oeconomisk Reise igiennem Island (Kbhvn. 1780).
Henry Petersen, see A. P. Madsen.
E. van Reesema: Contributions to early history of textile-techniques, Verhandelingen der K. Akad. van Wetenschappen, Amsterdam 1926.
C. Robert: Die Fusswaschung des Odysseus, Athen. Mitt. 25 (1900).
G. Rodenwald: Der Fries des Megarons von Mykenai.
G. Rosenberg: See Skrydstrupfundet.
L. F. Salzman: English industries of the middle ages (1923).
Astrid Sandvold—Halfdan Arneberg: Sprang (Oslo 1927).
Luise Schinnerer: Antike Handarbeiten. (Wien ca. 1890).
Karl Schlabow: Germanische Tuchmacher der Bronzezeit (1937).
H. Schliemann: Mykene. (1878).
— Tiryns. (1886).
Bror Schnittger: Våra kulturförbindelser med östra medelhavet under den äldre bronsåldern, Ord och bild 1919.
O. Schrader: Sprachvergleichung und Urgeschichte. 3. Ed. 1907.
Carl Schuchhardt: Der germanische Mantel und das illyrische Röcken, Sitzungsber. der Akad. der Wissens., Berlin 1030.
G. Schwantes: Geschichte Schleswig-Holsteins I.
F. Sehested: Fortidsminder og Oldsager fra Egnen omkring Broholm. (1878).
— Archæologiske Undersøgelser. (1884).
Gottfried Semper: Die textile Kunst.
Shetelig, Haakon—Falk, Hjalmar: Scandinavian Archæology (Oxford 1937).
J. Six: Altgriechische durchbrochene Arbeiten, Jahresheft des oesterreich. arch. Instituts 19—20, 1919.
Skrydstrupfundet, see Broholm.
C. M. Steenberg, see Skrydstrupfundet.
Poul Sterm: Textil.
Richardt Stettiner: Brettchenwebereien in den Moorfunden von Damendorf, Daetgen und Torsberg, Mitt. des Anthropol. Vereins in Schleswig Holstein, Heft 19, Kiel 1911.
W. von Stokar: Spinnen und Weben bei den Germanen. Mannus Bücherei 59.
Franz Studniczka: Beiträge zur Geschichte der altgriechischen Tracht. (1886).
Eilert Sundt: Bygningsskik paa Bygderne i Norge (1900).
J. C. Svabo: Føroyaferðin 1781—82 (Thorshavn 1924).
Vivi Sylvan: Brickbandet som kulturobjekt, Fornvännen 1925.
— Svenska ryor (1934).
Th. Thomsen: Vævede Stoffer fra Jernalderen, Aarbøger 1900.
— Egekistefundet fra Egtved fra den ældre Bronzealder, Nordiske Fortidsminder II, (1929).
Vilh. Thomsen: Oldarisk Kultur, Samlede Afhandlinger I.
Karen Thuborg: Det gamle Harboore, Danmarks Folkeminder Nr. 36 (1928).
Tracht und Schmuck im nordischen Raum I—II (1938—1939).
Emilie von Walterstorff: En vävstol och en varpa, Fataburen 1928.
Ole Wanscher: Klapstolen fra Guldhøj, Arkitekten 1935.
Emil Vogt: Geflechte und Gewebe der Steinzeit, Monographien zur Ur- und Frühgeschichte der Schweiz I (Basel 1937).
J. J. A. Worsaae: Afbildninger fra det Kongelige Museum for nordiske Oldsager, 1854 & 1859.
— Dragshøjfundet, Illustreret Tidende 1861, 28 Apr.
— Dragter fra den ældre Bronzealder, Illustreret Tidende XIII, 1872.
S. A. Xanthudides: Epinetron, Athen. Mitt. 35 (1910).

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Pl. IV

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