

Woman's Costume in the Territories of Poland during the Roman Period. Reconstruction Based on Finds from Nowy Łowicz in Pomerania

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Abstract

During archaeological excavations in Nowy Łowicz, Pomerania (Poland), in 1991, burial mound 55 with a woman's grave was examined, in which numerous fragments of textiles, costume accessories and jewellery had been preserved. The work presents the results of structural and technological analysis of fragments preserved. Based on these, as well as on preserved iconography and analogous archaeological finds, an attempt was made to reconstruct the woman's clothing from the period to which the grave is dated, i.e. phase B2/C1 of the Roman period. The reconstruction was made by means of computer graphics and includes three elements of clothing: a shirt, dress and short coat, made by identified techniques and partly taking into account the original colours. The work done is particularly important due to the fact that this is the first attempt to reconstruct a woman's complete clothing worn on the territory of what is now Poland in the above-mentioned period.

Key words: textiles, archaeology, costume history, Roman period, textiles' reconstruction, computer graphics, raw material analysis, structure, dyes, vertical loom, board and tablet weaving.

metal objects, whose oxides protect textiles against biocorrosion.[5, 7].

During excavations in several mounds, numerous textiles were found dating to phase B2/C1 of the Roman period. They were initially analysed by Maik. As for the woven textiles from barrow 55, which are the subject of this study, analysis showed that they came from 3 different textile products made of different threads and using different weaves. This allowed him to hypothesise that “the woman buried in the grave was dressed in a shirt with sleeves and a dress, probably sleeveless, on straps. She would also have a decorative cloak that could be used as a shroud” [15].

The aim of the work was to reconstruct the entire outfit. The successive stages included:

- determination of the original properties of the threads: structure and colour,
- determination of the original structure of fabrics and edges,
- formulating assumptions about the clothing – the type, form, colour and manner of wearing,
- visualisation of individual fabrics and fabric edges by computer graphic methods,
- recreating individual elements of the clothing using computer graphics and presenting them on the silhouette of a woman.

■ Purpose of research

The first amateur excavations in Nowy Łowicz (Poland) were conducted by Anna Sylwia von Wangenheim in 1894. Professional research on the site began in 1988 under the direction of Krystyna Hańka, from the Museum in Koszalin, until her premature death in 2001, then they were continued, and are conducted today by Cieśliński (Institute of Archeology of the University of Warsaw) and Kasprzak (Museum in Koszalin). A number of textiles were found during these archaeological works. Many of them have been very well preserved in large fragments. They were usually in the immediate vicinity of

■ Material and methods

Research on barrow 55 was conducted in Nowy Łowicz in 1991 and has not been published yet. Numerous pieces of textiles were found in it, as well as ornaments and jewellery: a belt buckle, 3 bronze fibulas, a gold pendant and silver bracelets (*Figure 1*). So far, this is the only situation where a female grave with so many preserved clothing items has been found in Poland. The textiles, currently in the deposit of the Museum in Koszalin, include 19 objects, with catalogue numbers from 11 to 30, each of which consists of several pieces of woven cloth, fabric edges and in some cases also braided structures (fringes). Their location relative to the skeleton is illustrated in *Figure 2* [10, 15].

The textiles represent various weaving techniques (vertical loom, tablet loom), and they also differ in the structure of the threads and weaves used.

All fragments have been re-examined. Scans of textiles were made with a resolution of 2400 dpi. Structural parameters of threads and woven fabrics were determined by computer image analysis methods. Samples from the best preserved areas of individual fragments were selected for analysis so as to accurately determine their original parameters. The following parameters were determined: threads – diameter, twist direction and number of

turns per meter; woven textiles – warp and weft count, number of warp threads in the edges, and weave [6, 8].

Based on the results of the analysis, visualisations of the woven fabrics were prepared. It was also specified what type of clothing was made from individual fabrics. Then, on the basis of iconographic analysis and analysis of the burial itself, the type and form of clothing was determined and the complete costume on the female figure visualised. Adobe Photoshop and 3dsmax were used for this purpose [13].

■ Results of analysis

To determine the original properties of the threads, computer analysis of scanned images was used, based on which the diameter and twist of the threads from which the textiles were woven were characterised. The results were so different that they allowed to unambiguously qualify individual fragments as coming from one particular fabric. Comparison of the results confirmed earlier Maik analyses indicating that they represent three different woven fabrics, each of which is made of threads with different structural parameters. The analysis results are summarised in **Table 1**. Each number represents the average of 20 measurements.

In previous studies, dye analysis was performed for fabric 3 [9, 15].

Computer image analysis was used to determine the weaves and original structural parameters of the woven fabrics. The best-preserved fragments were selected for analysis to accurately determine their original parameters. Results of the analyses are summarised in **Table 2**.

Woven fabric 1 is medium thick, with all threads made of woollen fibres. Two types of threads were used – in S twist and in Z twist, the same for warp and weft. The use of threads with different twists in sequences of 4 threads in the same twist creates a characteristic texture on the surface of the cloth. This type of woven fabric is referred to as Odry (**Figure 1.e** and **Figure 3.a**) [4,15].

The edges were made of the same threads as those of the whole cloth. The preserved selvedge is the starting edge. Made before weaving the main fabric, it was the stage of warp preparation. It could have been woven by means of a weaving

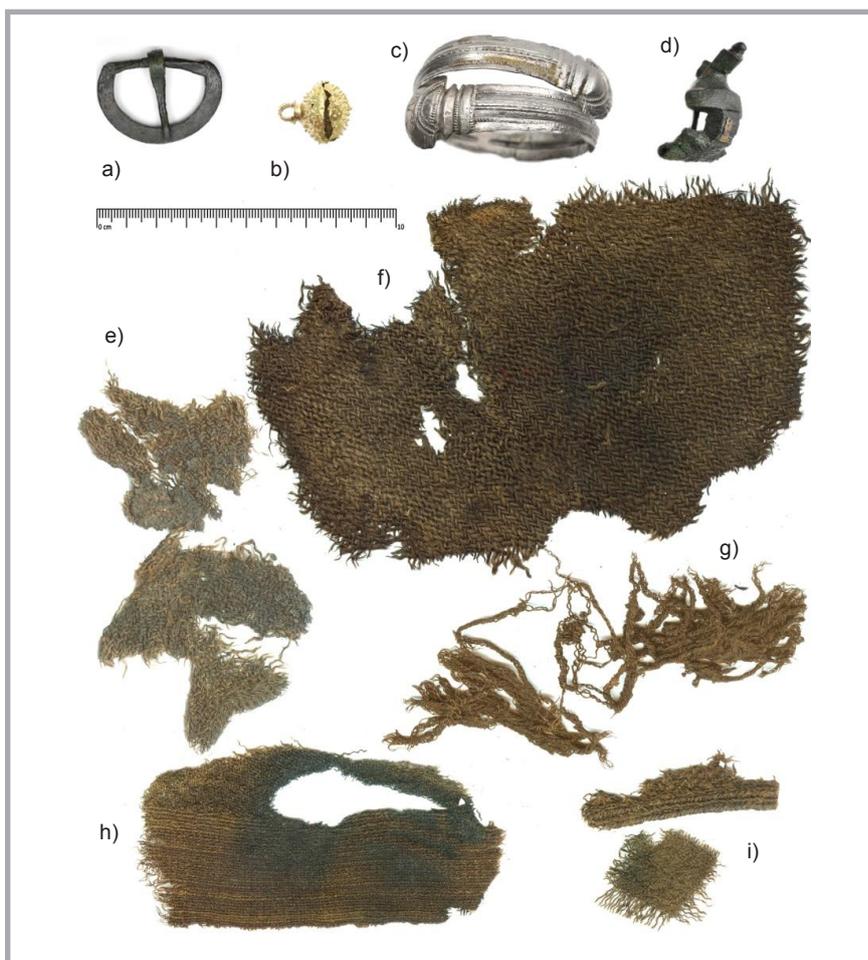


Figure 1. Exemplary finds from kurgan 55: a) buckle, b) pedant, c) bracelet, d) fibula, e) fragment of woven fabric 1 (shirt) with preserved starting edge, f) fragment of woven fabric 2 (dress), g) fringes (woven fabric 3), h) decorative side edge (woven fabric 3), i) starting edge and piece of woven fabric 3 (outer cloth). (Photos a-d) Ilona Łukjaniuk, courtesy of the Museum in Koszalin).

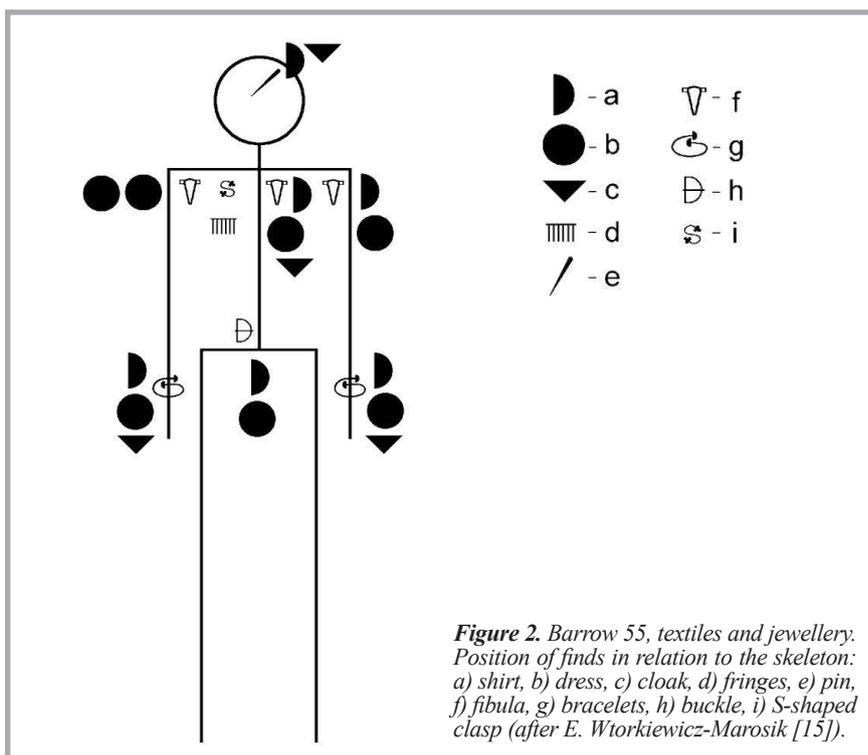


Figure 2. Barrow 55, textiles and jewellery. Position of finds in relation to the skeleton: a) shirt, b) dress, c) cloak, d) fringes, e) pin, f) fibula, g) bracelets, h) buckle, i) S-shaped clasp (after E. Wtorkiewicz-Marosik [15]).

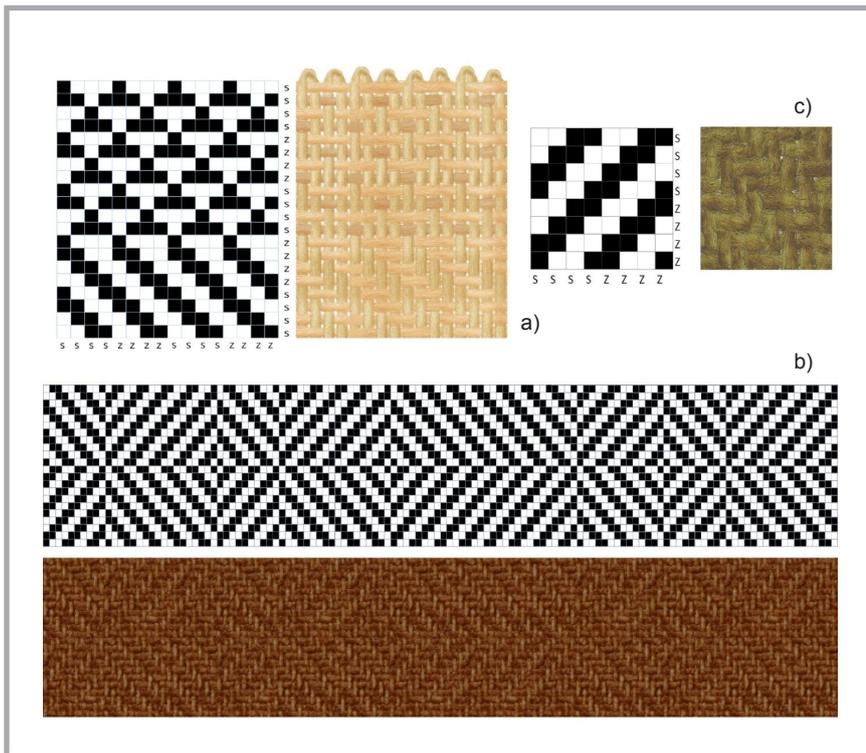


Figure 3. Weaves and visualisation of the structure of woven fabrics a-c.

Table 1. Parameters of threads.

Woven fabric	Warp/weft	Twist direction	Diameter, mm	Twist, no of twists per metre
1	warp	s	0.615	474
		z	0.552	618
	weft	s	0.615	459
		z	0.563	572
2	o	z	0.719	615
	w	s	0.797	320
	tablets – edge	S2Z	0.562	548
3	o	s	0.365	828
		z	0.365	827
	w	s	0.433	562
		z	0.432	613
	tablets – side edge	S2Z	0.396	570
	tablets – starting edge	S2z	0.458	400

Table 2. Parameters of woven textiles.

Woven fabric		Threads number/10 cm		Number of tablets	Weave		Weave repeat
		o	w		type	basis	
1	basic	169	164		twill	2/2 S	8x8 (taking into account the twist of threads)
	selvedge	169	164		double cloth	plain in both layers 1/1, 1/1	8x4
2	basic	127	117		diamond	2/2S, 2/2Z	128x22
	selvedge	8 tablets preserved, 4 threads in each tablet, one colour					
3	basic	237	245		twill	2/2 S	8x8 (taking into account the twist of threads)
	side edge	38 tablets, yellow and red threads, 4 in each tablet, in one or two colours					
	starting edge	4 tablets, 4 yellow threads in each tablet					

board and the sections of weft threads of large length on both sides of the fabric introduced separately, forming the warp of the main fabric. Thus, although the final edge structure is a double cloth, it was probably woven as a single plain fabric, folded in half after weaving. Then the long sections of weft threads became the warp of the main fabric with a doubled weft count.

Fabric 2 is the thickest one. Thinner, higher twisted threads were used for the warp than those used for the weft. This is a rule often used today. The warp is entirely in the Z twist, and the thread in the S twist. The edges are made of thinner plied threads. The fabric was made in an irregular diamond weave, which created an interesting fabric texture (Figure 1.f and Figure 3.b).

The last fabric is definitely the most delicate. It was made of the thinnest threads of the three fabrics tested: thinner warp with high twist, and the weft a little thicker. The edge of the cloth is made of threads only slightly thicker than those of the rest of the cloth, but in a much lower twist. They are in two colours, one of which is clearly red, while the other is currently in a yellow-brown shade (Figure 1.g-1.i, Figure 3.c).

Dye analysis using HPLC was performed on this cloth. The main fabric and starting edge are made of yellow wool yarn, while the side and end edges are woven into red stripes. The yellow was obtained from ramnetin, luteolin and camferol (Alchemilla, Reseda lutea, Polygonum aviculare), while the red was from alizarin and purple (Rubia tinctorum) [9].

In all cases, S2Z plied threads were used in the tablets. This gives an interesting effect in the form of stripes along the edges. The threads in the tablets rotated in the S direction are as if additionally tightened, and the fringes are narrower and more compact, while in the tablets rotated in the Z direction the threads untwist slightly and the stripes have a looser structure.

Comparative analysis of the woven textiles confirms Maik's suppositions as to their use in clothing. Woven fabric 1 represents an undergarment – a type of dress or shirt with sleeves, and woven fabric 2 – fleshy and patterned, constituting outer dress. However, it appears that fabric 3 is not a remnant of a shroud or coat but that of a kind of light outer garment.

Assumptions about the form of clothing

When formulating general assumptions about the form of the clothing and its individual parts, various factors were used. The most important concerned the distribution of individual fragments of textiles, including the edges of the fabrics and fringes, relative to the skeleton found in the barrow (*Figure 2*).

The form of clothing was also inspired by preserved indirect forms – works of art from a similar period. One of them is a bas-relief from Virunum depicting a Norse servant, from the Landesmuseum Kärnten in Klagenfurt, dated to the 2nd century. It depicts a young woman in a long shirt with sleeves, on which a gown in the form of a tube is applied, held on her arms with fibulas [17, 18].

Maik had previously attempted to assess the type of textiles against various garments of the Wielbark culture population. He relied on his own research of archaeological textiles and on Roman images of the Germans (including the column of Marcus Aurelius, and the Arch of Trajan) and descriptions of Germanic clothing by Tacitus in ‘Germania’. Comparison of the relief from Virunum with the images of Germans from Rome indicates a great similarity between the costumes. Because one had

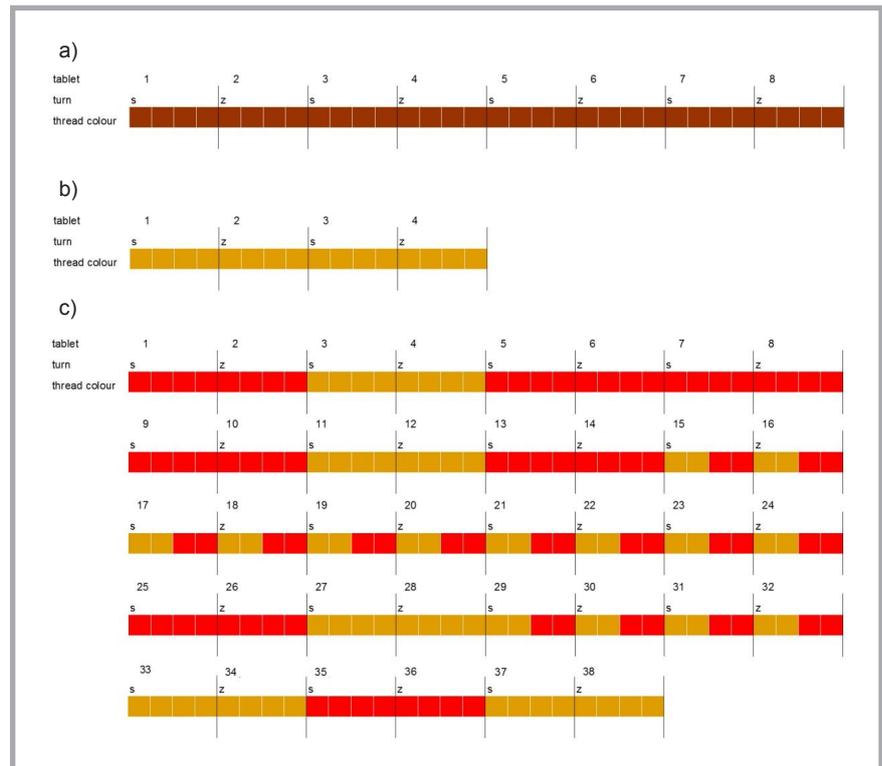


Figure 4. Schemes of weaving the selvages on a tablet loom: a) starting and side edges of woven fabric 2 (dress), b) starting edge and c) decorative end and side edges of woven fabric 3 (outer cloth).

to rely on one image for reconstruction, Virunum was chosen [2].

Account was also taken of the accompanying decorations and jewellery, mainly

fibulas, of which 3 were found. Two of them most likely, as on the relief mentioned above, fastened the dress on the shoulders, thus having the form of a tube fastened in two places on the shoulders.



Figure 5. Visualisation of starting and side edges of woven fabric 2 (dress).

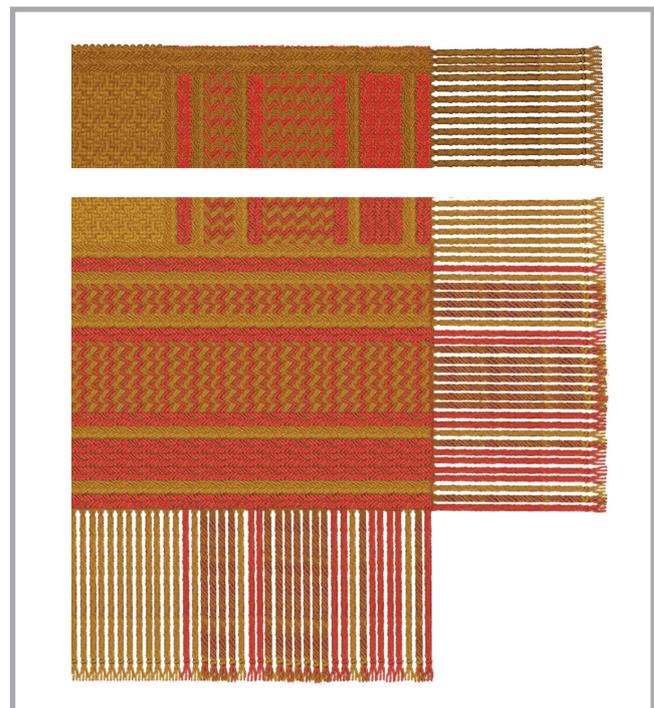


Figure 6. Visualisation of starting edge, decorative side and end edges of outer cloth.

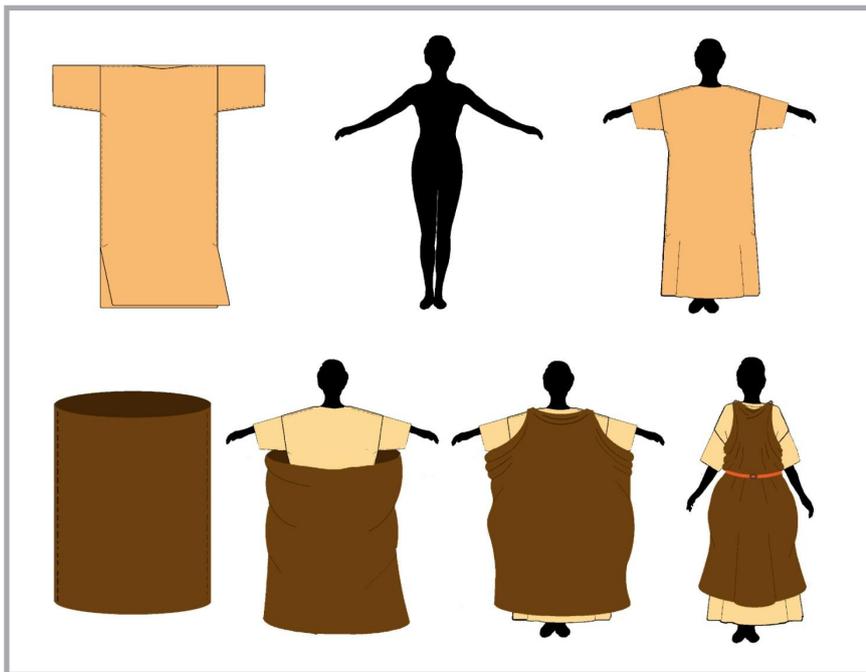


Figure 7. Construction drawings of the female costume: shirt at the top, dress at the bottom.



Figure 8. Reconstruction of female costume form phase B2/C1 of Roman period costume from Nowy Łowicz, (Pomerania, Poland).

A buckle was also found, which proves that the garment was tied at the waist by a belt with a buckle (Figure 2).

The third fibula bound the edges of the outer cloth on the chest. Therefore, the third fabric could not be a shroud but rather a coat or scarf. The hypothesis that the product from which the fragments of fabric 3 come from is a scarf rather than a coat is confirmed by the results of structural anal-

ysis. A long coat would require the use of thicker threads. Comparing the parameters of the woven fabric with those of similar fabric coming from coats from the same period, one can see that the fabric is much more delicate: the threads are about 20 to 40% thinner and, at the same time, their density in the fabric is higher [12, 14, 16].

At the beginning sketches and template drawings of individual clothes were

made, as well as drawings showing how to put on and wear the clothes (Figure 7).

The shirt has the form of two rectangles sewn on the shoulders (leaving a hole for the head) and on the sides, to which straight sleeves are sewn. The sides at the bottom of the garment are not sewn to the end.

The dress has the form of a tube, fastened on the shoulders with fibulas. The waist is tied with a belt with a buckle. The fabric is draped under the arms.

Visualisation of the woven textiles and reconstruction of the costume

Using computer graphics, three-dimensional models of threads were made, from which, based on the results of structural analysis of the fabrics, visualisations of the woven fabrics, edges and fringes were made (Figures 3, 5 and 6).

Figure 3.a shows a visualisation of the cloth from which the shirt was sewn, along with the starting edge in double weave.

The fabric for the dress was made in an irregular diamond weave (Figure 3.c). Irregularity is not an intended effect; rather it results from the fact that the warp threads on which the twill weave was broken were selected “more or less” or measured with a stick or other tool.

In the edges woven on tablet looms, threads of the weft and warp of the main fabric become weft for the edges woven on the tablets. As the warp in the tablets, thinner plied threads are used. The different direction of rotation of the tablets causes that they form more compact or loose stripes (Figure 4.a).

It was assumed that the dress was made of two rectangular fabrics sewn together, with all the edges woven on tablet looms. It was therefore necessary to visualise the corners, where the threads from the tablets forming one of the edges become threads for the tablets on which the perpendicular edge is woven. Figure 5 schematically shows the arrangement of a pair of corners.

The scarf is the most complex and, at the same time, the most decorative object. It consists of a main cloth, with a starting edge on 4 tablets, an end edge and side

edges woven on 38 tablets each, with threads in two colours: yellow, as in the main fabric, and red. Thus, in one tablet with 4 holes there could be threads in one or two colours (**Figures 4.b, 4.c** and **6**).

Each of these three edges ends with fringes. Their colour depends on the location: at the height of the main fabric, the fringes are yellow, while at the corners their colour depends on the threads in the tablets- they are yellow, red or yellow-red (**Figure 6**) Each fringe is twisted in the Z direction from four S-plied threads and can be described as Z4 (S2Z).

Since dye analysis was not performed for the shirt and dress fabrics, in the visualisations we can see them in their current colours – a lighter and darker shade of brown.

Using a 3D graphics program, a model of the woman's figure and models of individual clothes were created, which were then placed on the model. The materials previously developed corresponding to individual fabrics were applied to them. For visualisation of the restored garment, visualisations of selected ornaments were also made: the buckle, bracelets, pendant and fibulas.

As mentioned above, because dye analysis was not performed for the shirt and dress fabrics, we can see them in the visualisations in their current colours – a light and darker shade of brown.

The complete costume is shown in **Figure 8**. In the right one we can see a woman in a long straight shirt with sleeves and a short dress fastened on the shoulders with fibulas and with a belt at the waist. A pendant and bracelets on the wrists complete the whole. In the illustration on the right, the dress is covered with an outer garment – a scarf with a decorative, fringed edge, pinched on the breast with one fibula.

An animation was also prepared, presenting individual items of clothing, including decorations and jewellery. The figure of a woman is shown at subsequent stages of applying clothing: from a shirt to a complete outfit.

■ Summing-up

As for the Roman period, textiles are a fairly common find during archaeological excavations in today's Poland. How-

ever, it is rare to find objects preserved in such a quantity and condition that a complete costume can be reproduced on their basis [2, 3, 10]. This is probably because the clothing items were made of vegetable fibres and hence completely biodegradable. In the case of burial in barrow 55, all three pieces of clothing were made of wool. Metal ornaments and jewellery were also helpful in preserving textiles. As can be seen in **Figure 2**, near the lower parts of the skeleton, where there were no metal elements, no fragments of textiles have survived.

Costume reconstruction, if it is to have scientific value, must be based on multi-faceted research. Sources for its creation include structural analysis, knowledge of old technologies as well as, if possible, iconography of a given historical period and analogous objects that have survived and been examined.

Reconstruction of archaeological clothing can take place using original ancient technologies. This approach, pioneered by the outstanding German archaeologist Karl Schlabow, is now very popular in experimental archaeology as well as among historical reenactment groups [1]. A large number of publications in this field are devoted to the reconstruction of clothing from various regions of Europe. However the possibilities of computer graphics are so large that they allow to include in computer visualisations all aspects of the object being recreated: from details of the structure and nuances of the technique in the final external form of the clothing.

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