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## WOOL TEXTILES FROM THE ROMAN PERIOD AT THE SITE OF GRUDNA, POLAND

### ABSTRACT

In October 2012, the Conservation Laboratory of the Institute of Archaeology at the NCU in Toruń received soil samples excavated from a kurgan in Grudna, Żłotów commune, dated to the Roman period. No human remains were reported inside the grave chamber apart from some elements of grave goods: a glass bead, a clay spindle whorl, three iron nails, fragments of a bone pin, bronze and iron chest fittings, and a bronze vessel with a stamp of Pubius Cypius Polybius, who was active around the first half of the 1<sup>st</sup> century AD. In result of a cleaning treatment removing all soil impurities, tiny textile fragments were obtained, which were, interest-

ingly, made of woollen fibres in sprang technique, while some of them imitated gauze (known in later periods) but were manufactured in a plain 1/1 weave. Technological analysis of the fibres revealed their high quality with average fibre thickness ranging from 8 to 18 µm. Insufficient material base for these textiles in Poland does not give a convincing answer to a basic question of whether it was an import or local production. Studies on the subject performed by European researchers, most notably J. Maik, indicate local or North European production. Hopefully, more light will be shed on this problem by further comparative studies.

### STRESZCZENIE

#### TEKSTYLIA WEŁNIANE Z OKRESU WPŁYWÓW RZYMSKICH NA STANOWISKU GRUDNA, POLSKA

W październiku 2012 roku do Pracowni Konserwacji Zabytków Instytutu Archeologii UMK w Toruniu trafiły próbki gleby wydobyte z kurhanu w Grudnej, pow. Żłotów, który datowany jest na okres wpływów rzymskich. We wnętrzu komory grobowej nie odnotowano szczątków ludzkich, ale odnaleziono paciorek szklany, gliniany przęślik, trzy żelazne gwoździe, brązowe i żelazne okucia od skrzynki, fragmenty szpili kościanej, a także brązowe naczynie sygnowane stemplem Publiusza Cypiusza Polibiusza, który działał mniej więcej w połowie I wieku n.e. Po wypreparowaniu z próbek zanieczyszczeń i ziaren gleby uzyskano niewielkich rozmiarów fragmenty tkanin. Były one niezwykle interesujące, ponieważ okazało

się, że są wykonane z włókien wełnianych w technice sprang, a druga ich część imitowała znaną w późniejszych wiekach tzw. gazę, tylko wykonaną w splocie płóciennym 1/1. Analiza technologiczna włókien wykazała bardzo dobrą ich jakość, średnia grubość włókien wynosiła od 8 do 18 µm. Jednak zbyt mała baza tego typu tkanin w Polsce nie daje możliwości odpowiedzenia na podstawowe pytanie: czy jest to import czy miejscowa wytwórczość? Badania wełnoznawcze europejskich badaczy, a przede wszystkim J. Maika, wskazują na produkt miejscowy lub z północnej Europy, co mamy nadzieję wyjaśni się w dalszych badaniach porównawczych.

**Keywords:** Poland, Roman period, kurgan, wool, sprang

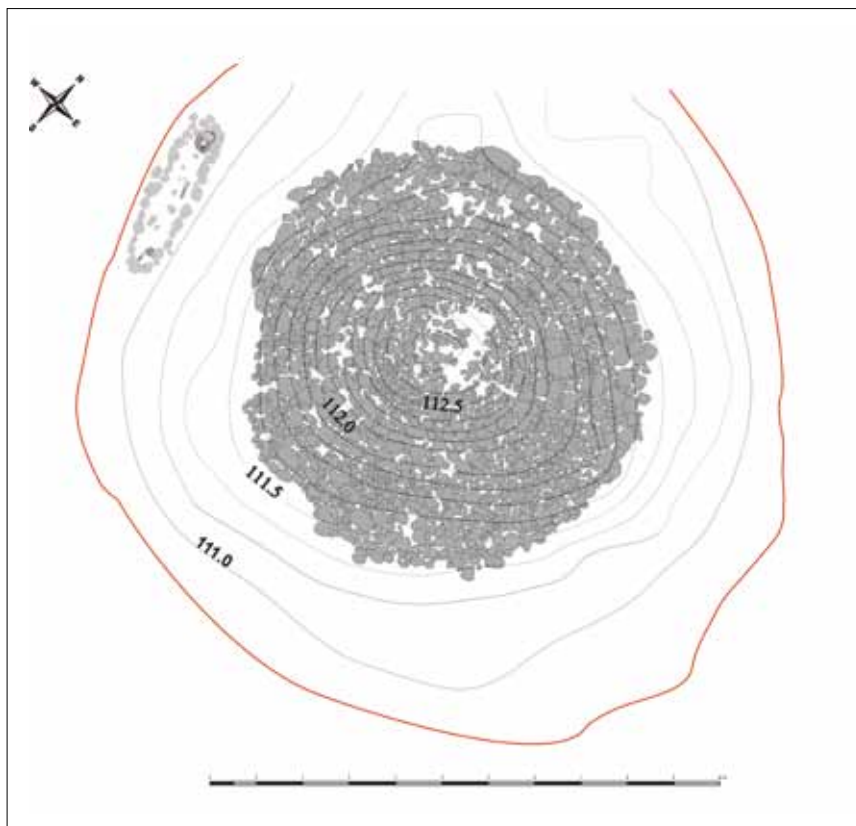


Fig. 1. Grudna, site 2, Złotów district. A layout of level II of kurgan 10 with marked location of the grave 1 and the range of the edge of the kurgan (after Kołoszuk 2015: Fig. 1).

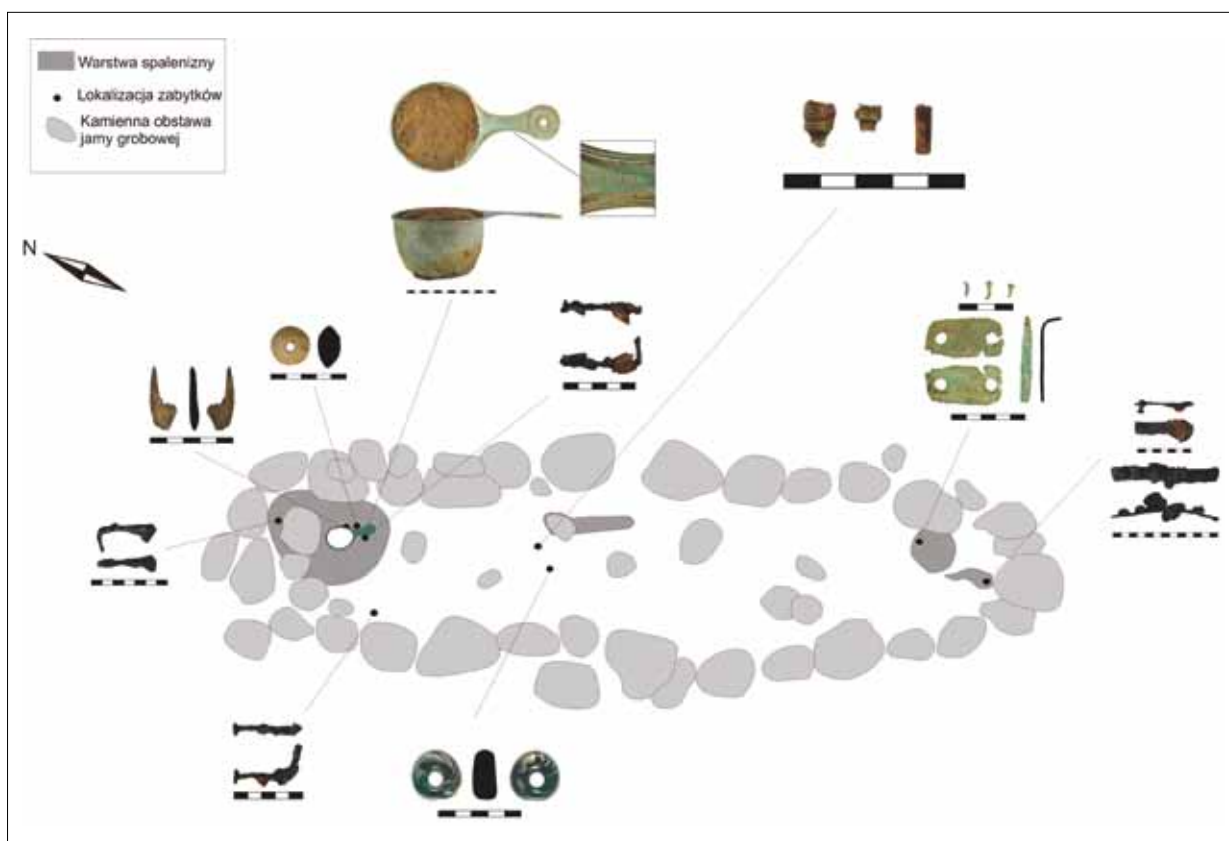


Fig. 2. Grudna, site 2, Złotów district. A layout of the grave 1 with marked location of the artefacts (after Kołoszuk 2015: Fig. 2).



Fig. 3. Textile relics with soil particles (photo by D. Grupa).

A grave exhumed in Grudna (Greater Poland voivodship, Pomerania province) delivered surprising finds. Exploration revealed relics of grave goods from almost 2000 years ago. Under a levelled earthen embankment, a stone structure of a kurgan centre on a burnt layer about 25 cm thick was registered (Kołoszuk 2015: 220). One and a half metre westwards from it, a rectangular object measuring 106 × 390 cm was excavated. In the course of exploration, it was interpreted as a burial pit (Fig. 1). Further work enabled reading clear signs of intentional dismantling of this compact stone construction, which was probably the original framework and a cover of the grave. No human remains were registered inside as they may have been removed for some reason. Apart from signs of this human interference, exhumation of human remains could also be confirmed by the fact that some of the grave goods were left in the 2 metres deep burial pit and included a glass bead, a clay spindle whorl, three iron nails, bronze and iron chest fittings, a fragment of a bone pin, and a bronze vessel (Fig. 2) (Kołoszuk 2015: 221–222). The finds also consisted of soil clods<sup>1</sup> which may have included textile relics.<sup>2</sup>

Separating the textile relics from the clods was a major challenge and although a tangled, twisted mass of fibres was visible, it was difficult to recognise the type of

the textile (Fig. 3). Therefore, the soil was removed carefully by rinsing it out delicately and cleaning its excess with a needle. Due to this treatment, several small fragments belonging to different types of woollen textiles were found. One of the types was represented by fragments (four pieces) of what was presumably a part of a bonnet made in the sprang technique with a Z-twist thread (Fig. 4). All the said fragments were made in the sprang technique,<sup>3</sup> with braiding classified as interlinking according to the Collingwood's typology (Collingwood 1974: 31, Fig. 1a). These were followed by fragments classified as plaited strings (three pieces) and 1/1 weaves (two pieces).

One fragment with a preserved selvedge made of 3-ply threads had a twisted string of three threads with composition: S2z+S2z+S2z=Z (Fig. 5).

Another type seems to be a woven piece in open plain 1/1 weave with large distances between the threads (loose structure). During the analysis, traces of an additional thread(s) were sought, since they might have been woven into this textile. However, while being made of another fibre, *e.g.* flax, which could indicate a half-woollen textile made of various types of fibres, the additional threads did not survive. Unfortunately, no such traces were reported. Therefore, it should be stated that the textile was intentionally woven as an open structure, imitating

<sup>1</sup> Unfortunately, the location of the obtained soil samples remains unspecified, so it is difficult to establish whether they were found in one or three different places. This information would not be useful, however, because of earlier grave exhumation.

<sup>2</sup> In October 2012, the Conservation Laboratory of the Institute of Archaeology, the Nicolaus Copernicus University in Toruń, received soil samples excavated from an empty grave at Grudna. The cleaning treatment and separating soil clods and fiber fragments lasted 3 months.

<sup>3</sup> Sprang is a term describing textiles, as well as a textile technique, of making fabric by manipulating parallel threads of a warp that is fixed at both ends. The manipulation takes the form of interlinking, interlacing, or intertwining of adjacent threads or groups of threads (Collingwood 1974: 31). History of textiles made in the sprang technique spans over 3000 years (Collingwood 1974: 37–44). They are known, for instance, from a Bronze Age oak coffin burial in Denmark.



Fig. 4. Textile fragment in the sprang technique after cleaning from soil particles (photo by D. Grupa).

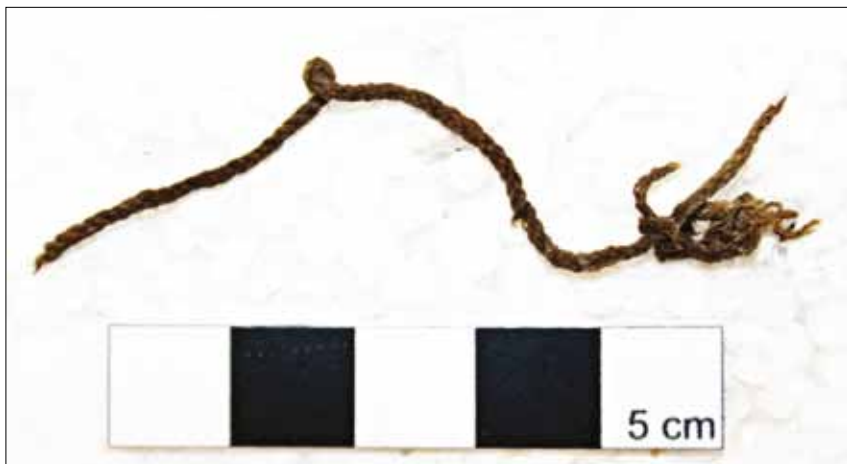


Fig. 5. Fragment of a woollen string (photo by D. Grupa).

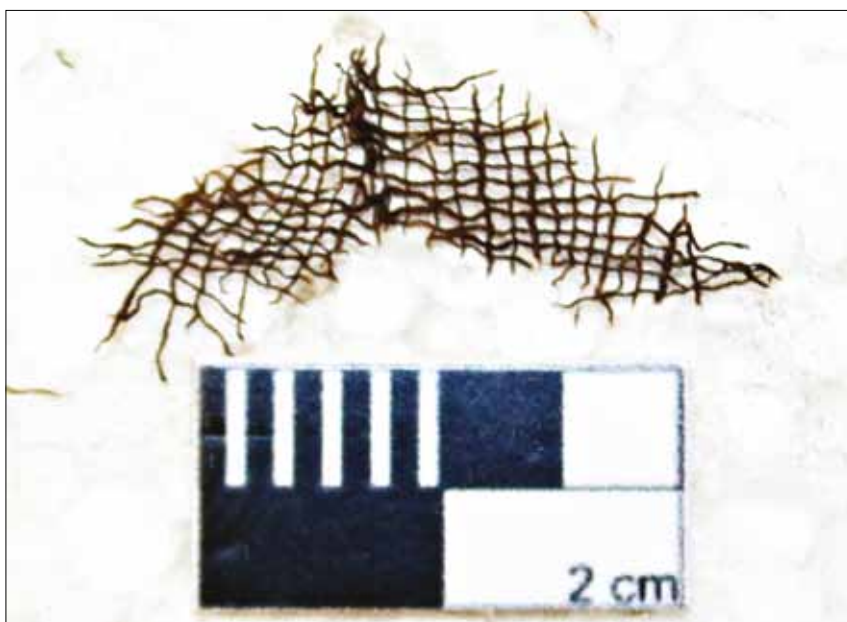


Fig. 6. Woollen net in 1/1 weave (photo by D. Grupa).

netting techniques with tiny loops (Fig. 6). This textile was made of z-spun from 0.10 mm to 0.20 mm thick, with a density of 11 threads per 14 threads per 1 cm.

An analysis of particular threads from the fragment of sprang identified animal fibres with small scales on their surfaces (Fig. 7). The size and shape of the scales could vary, depending on particular sheep breeds. It should also be noted that fleece of different breeds is characterised by different fibre diameter and absence of medulla fibres and barbs (Maik 2012: 66). Among 198 examined fibres, only six had a clearly-shaped, but not fully developed, medulla (Fig. 8). According to Antoinette Rast-Eicher's typology, they can be classified as interrupted structures (Rast-Eicher 2016: 11–12, Fig. 1). Average fibre diameter ranged from 8 to 18  $\mu\text{m}$  (Fig. 9), which amounted to nearly 70% of the examined fibres. Such a large quantity of thin fibres indicates high quality of the yarn (the thickest fibre had 44  $\mu\text{m}$ ). Studying wool quality in the Wielbark culture, J. Maik pointed out that textiles of the period contained mainly wool deprived of medullae, and only single samples exhibited small percentage share of them (Maik 2012a: 71). That information is compatible with the results of the analyses of the wool from Grudna, where these fibres amounted to only 3.03% (Fig. 9).

Following the studies of A. Nahlik (1964: 64–78), M.L. Ryder (1982), P. Walton (1990; 1993), and J. Maik (2001), we can state that domestic sheep derives from a wild mouflon living in Europe and Western Asia. It is characterised by two general types of wool: fine and short fluffy hair (6–18  $\mu\text{m}$ ), and long, thick and stiff hair (100–200  $\mu\text{m}$ ). In case of the wool used in sprang, the wool was fluffy and of perfect quality (whether it is a result of fine fleece used in this case, high processing skills, or both is yet to be determined).

It is still unknown, whether the sheep were sheared once or twice a year<sup>4</sup> and the role of combing escapes precise evaluation, since clean yarn is free from impurities (grass, straw, burdock achenes and other plants, excrements, sand, and small stones collected in the fleece during sheep's life) (Grupa 2012: 72). Long thick hair could have been removed during cleaning, with the use of flexible tree branches (soft willow, hazel, birch, or yew) or iron combs which have been excavated at various European archaeological sites (Werner 1990: 608–611; Ilkjær 1998: 43–54; Gładysz, Kokowski 2002: 92). The discussed cloth element manufactured in the sprang technique must have been made of high quality wool<sup>5</sup> rarely found in archaeological material.<sup>6</sup>

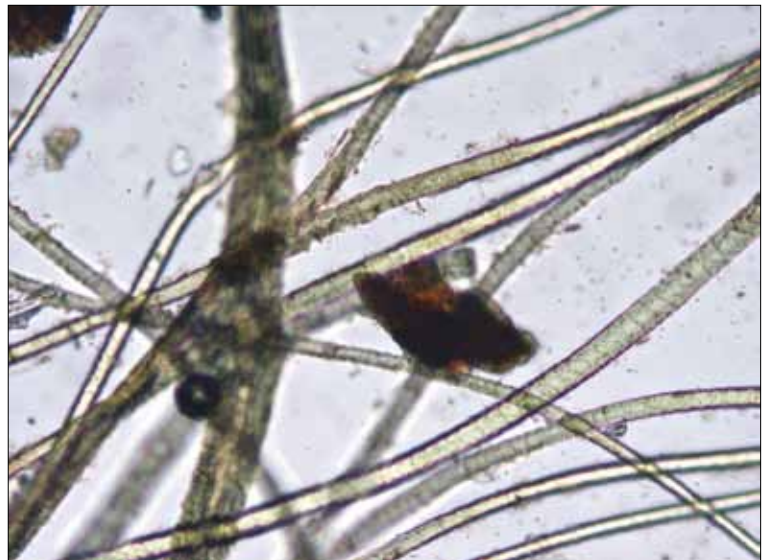


Fig. 7. Single fibres with visible flakes (photo by D. Grupa).

<sup>4</sup> During the Middle Ages, to obtain wool of higher quality, sheep were sheared only once a year (Maik 2012: 71).

<sup>5</sup> Sheep domestication took place in the Neolithic, which in the beginning of the Bronze Age produced sheep with thick coarse wool. Further breeding experiments resulted in breeding similar animals but with more delicate fleece. According to the researchers of the subject, similar evolution was observed in the sheep bred in Northern Europe, Middle East, and the Mediterranean. An analysis of the available material indicates

that the wool quality was mainly a result of intentional breeding and, to a smaller extent, of the region and the quality of pastures (Maik 2001: 313).

<sup>6</sup> While studying materials coming from Pomerania of the Roman period, J. Maik examined 117 samples and assessed the average fiber thickness to be 18–25  $\mu\text{m}$ , which was a base for interpreting the fleece as a product of local sheep bred in Europe during the Roman period (Maik 2001: 313).





Fig. 8. Formation of the rod in fibres (photo by D. Grupa).

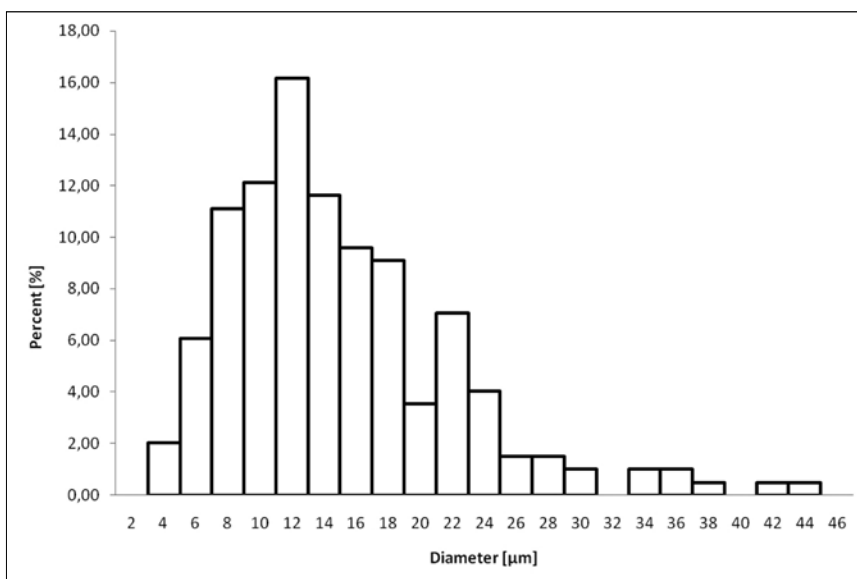


Fig. 9. Histogram of wool fibre thickness.

Over 15 years ago, Jerzy Maik presented a hypothesis regarding wool quality from the Roman period, suggesting that it was obtained as a result of crossbreeding between sheep imported from the Empire and local animals (Maik 2001: 314–315). As a result of the crossbreeding, two sheep groups were distinguished: the thin-fleeced and the thick-fleeced. The thick-fleeced sheep were of the Mediterranean origin, while the thin-fleeced variety came from the Middle East. First they came to Greece and next to Italy, where they were given various names: Taranto, Greek, or Attica sheep. In the next step, breeders tried to combine these crossbreeds with local animals to obtain the highest fleece quality. P. Walton and J. Maik's research results imply that the crossbreeds between the local and the Roman sheep were of a good quality (Walton 1993: 61–68; Maik 2001: 315–316). Following these conclusions, it can be assumed that the wool used in Grudna textiles was of local production or came from Northern Europe and thus belonged to the so-called *woolly Soay*, also known as the Roman sheep (Ryder 1982: 224–238; Maik 1986: 67–69; 2012: 68; Walton 1990: 144–158; 1993: 61–68). Of course, any new textile fragment to be

excavated may confirm or contradict this hypothesis. To solve this problem, new comparative tests of the quality of wool are required as well as, even more so, new textile finds from Northern Europe and Poland.<sup>7</sup> Until the final verdict, this hypothesis should be treated very cautiously. The textile products from Grudna could have come from trade exchange and been brought there together with the bronze vessel presented above.

The next step was spinning the combed wool with a wooden spindle fitted with a clay or stone spindle whorl. In the case of Grudna, a clay one was supposedly used, since such a spindle whorl was found among the grave goods. Did the person buried in the grave know the spinning technique? It was possible according to the analyses of the Pomeranian wool performed by Maik (Maik 2001: 320; 2012: 71).

Was it a grave of a woman whose occupation involved spinning? The absence of a skeleton makes answering this question impossible. If it had been a woman, she must have belonged to the tribal elite, since the grave also contained a bronze dish with a stamp of Publius Cippius Polybius (Fig. 10), who was a Roman copper-smith

<sup>7</sup> Excavations in the nearby Lędyczek yielded textile fragments in the 2/2 weave along with imported goods dated to the phase B1/B2 of the Roman period (Biborski, Kaczanowski 2001:

70–88). Was the wool quality identical with the studied samples? It is uncertain – further comparative analyses would probably answer this question.

Fig. 10. A stamp of Publius Scipio Polybius from the bronze vessel (photo by D. Grupa).



manufacturing various vessels near Capua around the 1<sup>st</sup> century AD (Kołoszuk 2015: 222). At this stage of research, it is difficult to recognise whether female graves were often equipped with bronze vessels, but their presence proves that an intense network of trade and cultural exchange existed along the northern sea route and affected also the southern coast of the Baltic. Such exchange must have also influenced innovations in textile production (as evidenced by an excavated textile sprang fragment in loose plain weave).

Fragments of sprang textiles were also excavated in a grave from Lubowidz near Łęborg (the Wielbark culture) (Maik 2007: 105–112), dated similarly to the Grudna burial. Analogous objects were also reported in Northern Africa and were made of flax threads, *e.g.* a mesh bonnet from the collection of the Museum of History of Art in Brussels (*Égyptiennes* 1997: 138). Another four examples of mesh head covers are held by the museum collection of Georges-Labit, two of which were made of coloured threads (Lorquin 1999: 80–83).

This brief outline of textiles made in sprang confirms popularity of the technique all over Europe, North Africa, and the New World in different periods. Variety of loop compositions and patterns required great manual skills and spatial imagination. This technique is very decorative, since even the basic manipulation would create an attractive ornamental form.

The fragments from Grudna were made the same way, *i.e.* interlinking, as in the case of bonnet pieces from Arden (Arden Mose) dated to the Early Iron Age (Hald 1980: 251, 258, Fig. 260). Are the finds from the kurgan ele-

ments of a headwear? It is possible. A woollen string running along one of the edges suggests that the very element was forming an oval shape of a face. However, due to the lack of a skeleton it is impossible to solve the riddle.

In Poland, the oldest fragment of sprang was excavated at the burial ground of the Lusatian culture in Świbie, Gliwice commune, dated to the Early Iron Age (650–400 BC). An analysis of the iconographical material shows that the mesh is combined with a metal ring which served as a belt clasp<sup>8</sup> (Łaszczewska 1966: 33–34; Maik 2012: 296) (a fragment of a woollen belt?). Three fragments made in the sprang technique are known to have been excavated in Pomerania before WWII. The textile from Grave 21 was made in the intertwining technique according to Collingwood (Collingwood 1974: 31, Fig. 1c). The yarn was classified as delicate (Maik 2012: 29). Unfortunately, the textiles were lost during WWII, hence comparative analyses are impossible.<sup>9</sup> Another example – a duke's grave located in Leśno, Chojnice commune, near Łędydzek, contained small fragments (size of up to 2 cm) of woollen textile made in the mesh technique (Maik 2012a: 40). The fragments were linked very tightly until their surface became completely compact.

The material discussed above provokes many questions which cannot be answered at this stage of research. The gender of the individual buried in the grave is unknown, just as whether the spindle whorl and sprang textile fragments are sufficient evidence to identify it as a female burial. It seems unlikely, since the sprang technique was used for male clothing as well,<sup>10</sup> and the spindle whorl is hardly a convincing proof. The majority of spindle

<sup>8</sup> Similar mesh was excavated in a tomb in Alicante, Spain, and it is dated to the 4<sup>th</sup> century BC (Alfaro Giner 2012: 340–342).

<sup>9</sup> The textiles from Grudna can also be defined as delicate wool fabrics.

<sup>10</sup> Permanent occurrence of that technique in history is evidenced by mesh belts worn by Polish nobles with zhupans and kontushes in the 17<sup>th</sup> and 18<sup>th</sup> centuries. During archaeological works in the Lublin cathedral, four mesh belts (probably crimson in colour) with edges plaited with silver or gold (Grupa 2005: 93) were excavated. All the textiles lost their colours while

deposited in the graves. In the case of the Lublin belts, we can infer the colour to be close to crimson, because the artefacts were folded carefully at least 27 times into small overlapping plaits, thanks to which their central internal parts kept colour, which could thus be identified during conservation process and microscope analyses performed by the author. Another example of a mesh belt, produced with the same technique (Grupa *et al.* 2015: 62), was excavated in Gniew (the southern crypt of a local church).

whorls were found in different periods in female graves, but medieval and later iconographical images evidence that also men were engaged in spinning. A 16<sup>th</sup>-century woodcut from Sebastian Münster's "Cosmographia" titled "Peasants spinning flax and wool" presents a woman, a man, and a child against a background of a mountainous landscape. The woman is probably twisting yarn in S twist, because she is keeping a spindle in her left hand, a man – in Z twist (a spindle in his right hand), while the boy (probably the couple's son) is winding the yarn onto a reel<sup>11</sup> (Kühn 2001: 556, Fig. 179; Grupa 2012: 84, 86,

Fig. 17).<sup>12</sup> Another problem – the head cover. Is it a hair net or a part of an upper bonnet? It is also unknown whether textile products manufactured in this technique and made of flax thread were reported from the territory of today's Poland. The wool quality is the most intriguing aspect of this find. Where did the sheep for such a fine product come from? Was textile manufacturing so highly-developed at the time in what is today's Poland? All these questions seem to remain unanswered at this stage of research. Hopefully, new finds will advance our knowledge on the subject.

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<sup>11</sup> It is difficult to define sex of individuals buried in different cemeteries and assume *a priori* that they were female burials.

<sup>12</sup> Some researchers think (unfortunately, these statements refer only to the Middle Ages and the modern times) that whole families were busy with spinning wool and flax (Semrau 1922: 63; Maik 1997: 44).



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