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### 3.2. Execution of the ornament

**Abstract:** The engraved ornament on the artefact from Rusinowo covers its two sides (A, B). On side A there is a single zigzag line and six groups of 2-11 densely engraved parallel zigzag lines. The ornament on side B consists of eight groups of zigzag lines and, accompanied by a short zigzag, an anthropomorphic figure likely to represent a woman with legs spread out, perhaps about to give birth. Input from microscopic examination and experiments was used to determine the biography of the ornament although not all the phases of its creation could be recognized. The engravings on side A were made with a steady hand, by 1-3 people, proficient technologically and artistically. Except for the anthropomorphic design, the execution of ornaments on side B displays a much lower proficiency and appears to be the effect of the work of 6-8 individuals. On both sides, the zigzag lines were engraved mostly west to east, and within their respective groups, lines were mostly engraved north to south. Next to the stroke by stroke technique, there is evidence also of serial engraving. The strokes building the zigzag lines were touched up, many of them more than once. The composition on both sides has a zonal arrangement and evidently refers to a shamanistic view of the world.

**Keywords:** ornament, engraving, zigzag lines, anthropomorphic representation

#### Introduction

Ornamentation on antler and bone objects made during the Palaeolithic and the Mesolithic age has long raised the interest of researchers with interest in the Stone Age (Lartet, Christy 1864; Sarauw 1903; Breuil 1952; Leroi-Gourhan 1965; Moro Abadía, González Morales 2004). Next to the formal recognition of patterns executed by engraving and drilling, and the determination of anthropo-, zoomorphic and geometric motifs, an obvious focus of discussion was the significance and the function of this artwork. This discussion goes back to the time of the discovery of the Palaeolithic art in the nineteenth century and subsequent discoveries of ornamented Mesolithic artefacts (Reinach 1903; Clark 1936, 1975; Breuil 1952; Leroi-Gourhan 1958, 1965, 1982; Marshack 1983, 1991; Bahn, Vertut 1988; Conkey 1987, 1997; Lorblanchet 1995, 1997; Lewis-Williams 2002; Płonka 2003, 2012; Guthrie 2005). However, only in the late 1960s and early 70s Palaeolithic and Mesolithic ornaments on artefacts came under the focus

of a more detailed formal analysis of elements of these patterns using the optical microscope. This line of research was pioneered by Alexander Marshack (1969, 1970, 1983, 1984, 1989, 1991) who, irrespective of the various shortcomings of his method (d'Errico 1989, 1996), drew attention to the fact that the technological details of the execution of an ornament afford a variety of information about the world of the Palaeolithic and Mesolithic hunters – their skills, way of thinking and symbolizing. The method of observation and analysis of ornaments on objects of portable art was developed by Francesco d'Errico who introduced the wide-scale use of the scanning electron microscope and resin casts (d'Errico 1988a, 1988b, 1992, 1994; d'Errico, Villa 1997). This method was used with great success in analysing objects made of bone, antler and stone (cf. Fritz 1999, Bosinski *et al.* 2001). Currently, it is frequently assisted by Reflectance Transformation Imaging (RTI) and mapping of ornaments in 3D (Bello, Soligo 2008,

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Joordens *et al.* 2015; Milner *et al.* 2016), nevertheless, the primary tool in the analysis of ornaments continues to be an examination under a scanning electron microscope.

The complex system of ornamentation on the Rusinowo object covers its side A and B (cf. fig. 1 in sub-chapter 3.1.). On side A the ornament is formed by zigzag lines motifs arranged transversely to the axis of the object. Apart from a single upper line, they form six groups of zigzag line, 2-11 to a group. Side B is covered by eight analogous groups of zigzag lines in a similar arrangement, their number within each group ranging from two to eight elements. Engraved between two of these groups is an anthropomorphic motif built by straight strokes, and an additional zigzag, understood to accompany the human figure.

Our analysis focused on the engraved lines of the ornament on sides A and B. In sub-chapter 3.1. we reported on macroscopic and microscopic methods of examination, resin casts and experimentation, and also on the way of orienting the object according to the points of the compass to ease its description. As the last step, the antler object was examined with a Hirox 3D Digital Microscope RH-2000 to measure the find and the width of the strokes of the ornament (see Tables in sub-chapter 3.2.) and to make a visualization of the depth of the anthropomorphic ornament. Individual groups of the ornament on sides A and B were assigned Roman numerals, moving from the north (AI-AVII, BI-BVIII), so that the anthropomorphic representation (PA) and the short zigzag line next to it (Z) are found between groups BV and BVI. Individual zigzag lines within each group were assigned lowercase letters of the alphabet (once again moving from the north), and each stroke building the motif has its own number (Arabic numeral), with the numeration running west-to-east. Thus, for example, AIIIb7 refers to stroke no. 7 (counting from the west) within zigzag line b in group III on side A of the object.

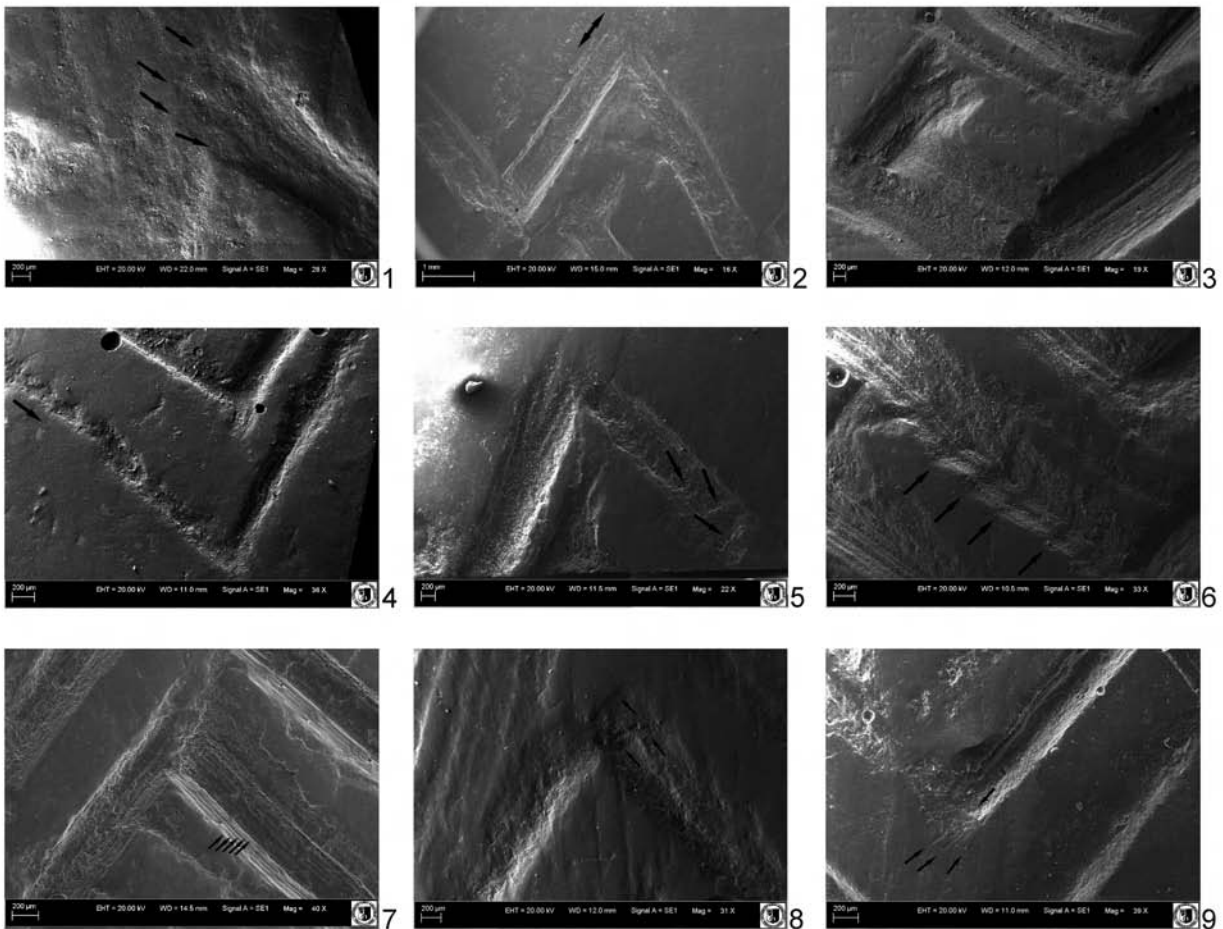
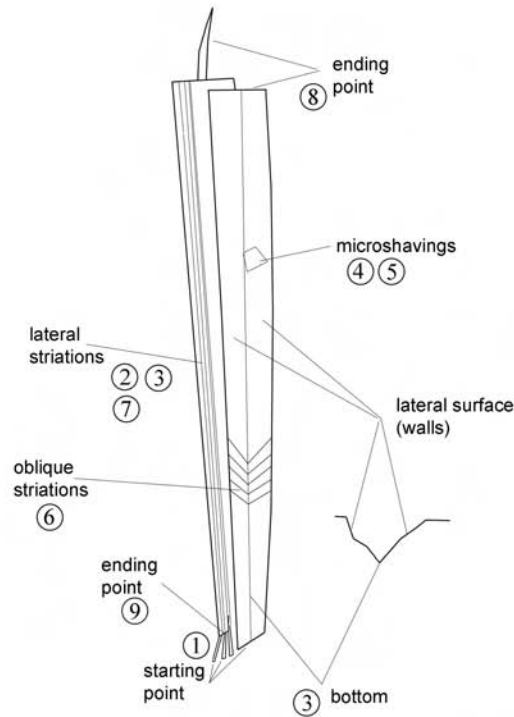
During the analytical work, the smallest observation module was an individual stroke within a zigzag line or within the anthropomorphic representation. Usually, this is a single stroke – more rarely, if corrected by the engraver, it has the form of two or three parallel marks. For every module we set out to determine: i./ the cross-section of the stroke; ii./ interventions made to touch up the engraving, and the number of such interventions; iii./ the direction in which the stroke was engraved; iv./ the points of

In analysing the ornamentation system of the artefact our target was to determine the engraving techniques, the sequence of the execution of individual zigzag lines and their groups. Also addressed by us was the length of time needed to produce the ornament and the number of individuals involved in this process. A painstaking examination of patterns covering the surface of the object yielded evidence used subsequently to explore the meaning of the ornamentation of the artefact, its purpose and manner-of-use within the group. By bringing together the data obtained from our study with the information about the raw material of the artefact, and the traces of mechanical and chemical processes surviving on its surface we were well equipped to address in a comprehensive manner the history of the object and its possible uses.

## Methods

contact with adjacent strokes. Not every touching up intervention could be recovered because sometimes the last stroke in a touching up sequence obliterated older traces (Fritz 1999; Bosinski *et al.* 2001). The preservation of the ornament and the uncharacteristic nature of the traces sometimes prevented deciphering the direction of engraving the strokes. Overall, the direction of engraving was determined for 77 % of cases. On side A the direction of engraving was determined for 80.7 % of strokes, on side B for 73.6%. Moreover, not all the points of contact between adjacent strokes could be sequenced. For one thing, a point of contact does not always take the form of an intersection – two strokes may not intersect, only end a small distance from each other. Second, an intersection of strokes does not always represent an unambiguous sequence – in some cases the points of contact may be too worn or all but undecipherable. The sequence of strokes in an intersection was determined for 68 % of cases. These sequences have been determined in 77% of cases for all zigzag vertices on side A, and in 60.1 % of cases on side B. The disproportions in the determinations of the direction of engraving and intersections of strokes on the two sides would be explained on the one hand by the superior level and precision of execution of the engravings, and on the other, the better preservation of patterns on side A.

In the present text, to simplify the descriptions the symbol „/” has been used, corresponding to the verb “cuts into” or “crosses”. Thus, the notation AIIa21/a20 will mean that stroke a21 in group AII cuts into stroke AIIa20. The sequencing of individual strokes helped to recognize the general direction in



**Fig. 1.** Rusinowo. Technological traces in the ornament. 1: touching up in the same direction (a “comet” at a starting point); 2: touching up with the to-and-fro movement (cf. lateral striations); 3: bottom and lateral striations; 4: stopping points of an engraving tool when the pressure of the tool is uneven; 5: microshavings; 6: oblique striations; 7: lateral striations 8: ending points (touching up 3 ×); 9: touching up with a shift (an ending point cuts into a “comet”)

**Table 1.** Rusinowo. A complete list of zigzag ornaments (zigzag line next to human representation not included)

| Side | Group | Line | Number of strokes | Direction of odd strokes | Direction of even strokes | Linear method | Serial method | Direction of engraving zigzag line | Sequence of engraving lines in group | Comments   |
|------|-------|------|-------------------|--------------------------|---------------------------|---------------|---------------|------------------------------------|--------------------------------------|--|
| 1    | 2     | 3    | 4                 | 5                        | 6                         | 7             | 8             | 9                                  | 10                                   | 11   |
| A    | I     | -    | 31                | NE-SW                    | SE-NW<br>NW-SE            | +             | +             | W→E                                | -                                    | -  |
|      | II    | a    | 30                | SE-NW                    | SW-NE                     | +             | +             | W→E<br>E→W (3)                     | a→b                                  | -  |
|      |       | b    | 26                | SE-NW                    | SW-NE                     | +             | +             | W→E                                |                                      | -  |
|      | III   | a    | 30                | NE-SW                    | SE-NW                     | +             | +             | W→E<br>E→W (7) ?                   | a→d                                  | -  |
|      |       | b    | 30                | NE-SW<br>SW-NE           | SE-NW                     | +             | -             | W→E                                |                                      | -  |
|      |       | c    | 28                | SE-NW                    | SW-NE                     | +             | +             | W→E                                |                                      | -  |
|      |       | d    | 28                | SE-NW                    | NE-SW                     | +             | single        | W→E                                |                                      | -  |
|      | IV    | a    | 25                | NW-SE                    | SW-NE                     | +             | +             | E→W                                | c→a<br>c→d<br>f→e?                   | -  |
|      |       | b    | 25                | NW-SE                    | NE-SW                     | +             | -             | E→W                                |                                      | -  |
|      |       | c    | 26                | NE-SW                    | NW-SE                     | +             | -             | E→W                                |                                      | -  |
|      |       | d    | 25                | SE-NW                    | NE-SW                     | +             | +             | W→E                                |                                      | -  |
|      |       | e    | 25                | SE-NW                    | NE-SW                     | +             | +             | W→E                                |                                      | -  |
|      |       | f    | 25                | SE-NW                    | NE-SW                     | +             | +             | W→E                                |                                      | -  |
|      | V     | a    | 35                | SE-NW<br>NW-SE           | SW-NE<br>NE-SW            | +             | +             | W→E                                | a→k                                  | -  |
|      |       | b    | 34                | SE-NW<br>NW-SE           | SW-NE<br>NE-SW            | +             | +             |                                    |                                      | -  |
|      |       | c    | 34                | SE-NW                    | NE-SW                     | +             | -             |                                    |                                      | -  |
|      |       | d    | 34                | SE-NW                    | NE-SW                     | +             | -             |                                    |                                      | -  |
|      |       | e    | 32                | SE-NW                    | NE-SW                     | +             | single        |                                    |                                      | -  |
|      |       | f    | 30                | SE-NW                    | NE-SW                     | +             | single        |                                    |                                      | f1 i f2 under e1-e4 and f3 under e5                |
|      |       | g    | 32                | SE-NW                    | NE-SW                     | +             | single        |                                    |                                      | rhythm like in line Vf                             |
|      |       | h    | 30                | SE-NW                    | NE-SW                     | +             | single        |                                    |                                      |  |
|      |       | i    | 30                | SE-NW                    | NE-SW                     | +             | +             |                                    |                                      |  |
|      |       | j    | 30                | SE-NW                    | NE-SW                     | +             | +             |                                    |                                      |  |
|      |       | k    | 30                | SE-NW                    | NE-SW                     | +             | +             |                                    |                                      |  |
|      | VI    | a    | 31                | NE-SW                    | NW-SE                     | +             | single        | W→E                                | a→j                                  | -  |
|      |       | b    | 31                | NE-SW                    | SE-NW                     | +             | -             |                                    |                                      | -  |
|      |       | c    | 31                | NE-SW                    | SE-NW                     | +             | -             |                                    |                                      | -  |
|      |       | d    | 30                | SE-NW                    | NE-SW                     | +             | -             |                                    |                                      | -  |
|      |       | e    | 30                | SE-NW                    | NE-SW                     | +             | -             |                                    |                                      | -  |
|      |       | f    | 28                | SE-NW                    | NE-SW                     | +             | -             |                                    |                                      | f3 under e3-5, f4 under e6                         |
|      |       | g    | 28                | SE-NW                    | NE-SW                     | +             | -             |                                    |                                      | -  |
|      |       | h    | 28                | SE-NW                    | NE-SW                     | +             | single        |                                    |                                      | -  |
|      |       | i    | 28                | SE-NW                    | NE-SW                     | +             | single        |                                    |                                      | -  |
|      |       | j    | 24                | SE-NW                    | NE-SW                     | +             | single        |                                    |                                      | j17 under i17-i19, j18 under i20                   |
|      | VII   | a    | 27                | SW-NE                    | SE-NW                     | +             | +             | E-W,<br>W-E                        | a→e                                  | -  |
|      |       | b    | 27                | NE-SW                    | SE-NW                     | +             | -             | W-E                                |                                      | -  |
|      |       | c    | 27                | NE-SW                    | SE-NW                     | +             | -             |                                    |                                      | -  |
|      |       | d    | 27                | NE-SW                    | SE-NW                     | +             | +             |                                    |                                      | -  |
|      |       | e    | 24                | NE-SW                    | SE-NW                     | +             | -             |                                    |                                      | change of the ornamentation<br>rhythm: e2 under d4 |

| 1 | 2    | 3  | 4     | 5              | 6              | 7      | 8      | 9           | 10                      | 11   |
|---|------|----|-------|----------------|----------------|--------|--------|-------------|-------------------------|--|
| B | I    | a  | 40    | SE-NW<br>NW-SE | SW-NE<br>NE-SW | +      | +      | E-W,<br>W-E | ?                       | lines divided by vascular groove   |
|   |      | b  | 40    | NW-SE          | SW-NE<br>NE-SW | +      | +      | E-W,<br>W-E |                         |  |
|   | II   | a  | 26    | SE-NW          | SW-NE<br>NE-SW | +      | -      | W-E         | a→b                     | -  |
|   |      | b  | 26    | SE-NW          | SW-NE          | +      | -      |             |                         |  |
|   | III  | a  | 24    | NW-SE          | NE-SW          | +      | +      | W-E         | a→b<br>b→d<br>d→c<br>e? | strokes a20-24, b20-24, c20-24 and d5-9 were engraved with the same point after incising: a1-19, b1-19, c1-19 and d1-4 |
|   |      | b  | 24    | SE-NW          | SW-NE          | +      | +      |             |                         |  |
|   |      | c  | 24    | SE-NW<br>NW-SE | NE-SW          | +      | +      |             |                         |  |
|   |      | d  | 9     | SW-NE          | SE-NW          | +      | single |             |                         |  |
|   |      | e  | 7     | NE-SW          | SE-NW          | +      | -      |             |                         |  |
|   | IV   | a  | 28    | SE-NW<br>NW-SE | SW-NE          | +      | +      | W-E         | a→e                     | -  |
|   |      | b  | 31    | SE-NW          | SW-NE          | +      | +      |             |                         |  |
|   |      | c  | 31    | SE-NW          | NE-SW          | +      | +      |             |                         |  |
|   |      | d  | 11    | SE-NW          | SW-NE          | +      | +      |             |                         |  |
|   |      | e  | 31    | NW-SE          | SW-NE          | +      | +      |             |                         |  |
|   | V    | a  | 34    | NW-SE<br>SE-NW | NE-SW<br>SW-NE | +      | single | E-W         | a→d                     | -  |
|   |      | b  | 34    | SE-NW<br>NW-SE | SW-NE          | +      | single |             |                         |  |
|   |      | c  | 34    | SE-NW<br>NW-SE | SW-NE          | +      | +      |             |                         |  |
|   |      | d  | 34    | NW-SE          | SW-NE<br>NE-SW | +      | single |             |                         |  |
|   | VI   | a  | 24    | NE-SW          | NW-SE          | +      | ?      | E-W         | a→e                     | -  |
|   |      | b  | 26    | NW-SE          | NE-SW          | +      | single |             |                         |  |
|   |      | c  | 29    | NE-SW          | NW-SE          | ?      | +      |             |                         |  |
|   |      | d  | 25    | NE-SW<br>SW-NE | SE-NW          | +      | +      | W-E         |                         |  |
|   |      | e  | 22    | NW-SE          | NE-SW          | +      | +      |             |                         |  |
|   | VII  | a  | 28    | NE-SW<br>SW-NE | NW-SE          | +      | single | E-W,<br>W-E | c→a<br>e→d<br>e→g       | determination uncertain due to the poor preservation of the ornament   |
|   |      | b  | 28    | NE-SW          | NW-SE<br>SE-NW | +      | single | E-W,<br>W-E |                         |  |
|   |      | c  | 28    | SW-NE<br>NE-SE | NW-SE<br>SE-NW | +      | single | W-E, ?      |                         |  |
|   |      | d  | 28    | SW-NE          | NW-SE          | +      | single | E-W, ?      |                         |  |
|   |      | e  | 28    | SW-NE          | SE-NW          | +      | -      | W-E?        |                         |  |
|   |      | f  | 26    | SW-NE          | SE-NW          | +      | +      | E-W?        |                         |  |
|   |      | g  | 28    | SW-NE          | SE-NW          | +      | +      | W-E?        |                         |  |
|   | VIII | a  | 20    | NE-SW          | NW-SE          | +      | +      | W-E         | f→h (?)<br>f→a          | -  |
|   |      | b  | 22    | NE-SW          | NW-SE          | +      | +      |             |                         |  |
| c |      | 22 | NE-SW | NW-SE          | +              | +      |        |             |                         |  |
| d |      | 22 | NE-SW | NW-SW          | +              | +      |        |             |                         |  |
| e |      | 11 | NW-SE | NE-SW          | +              | +      |        |             |                         |  |
| f |      | 22 | NE-SW | NW-SE          | +              | -      |        |             |                         |  |
| g |      | 22 | NE-SW | NW-SE          | +              | single |        |             |                         |  |
| h |      | 22 | NE-SW | NW-SE          | +              | single |        |             |                         |  |

which individual zigzag lines were engraved, and additionally, more often as not, the order in which they were made within the group. This helped us to determine the main techniques used in making the zigzag lines, described in this text as a linear and a serial technique. In the linear technique, zigzag lines are engraved one after another, stroke by stroke (eg, a1, a2, a3, a4 and so on). In the serial technique, the first to be engraved are the strokes with the same orientation (eg, a1, a3, a5, a7), after which they are connected by adding strokes directed the other way (a2, a4, a6). However, what needs bearing in mind is that the identification of these techniques rests on the assumption that the execution of a given stroke and its touching up were not spread out in time, by which we mean that the stroke was engraved, touched up and not revisited again. This is because theoretically, it is feasible that the fragment was executed in a sequence, from a1 to a7, and next, strokes a2, a4, a6 were touched up. This question must remain open. However, we find it more likely that the serial method was the one used in making some zigzag line fragments.

The results of the macroscopic and microscopic examination were collected in database tables, using as additional assistance schematic drawings of zigzag lines and their fragments. Additional comments were entered in a special observations and comments notebook, where we also recorded assorted ad hoc interpretations and ideas which were later re-examined in more detail. In this chapter the intersections between the strokes of the zigzag and the direction in which they were engraved are shown on schematic drawings. For better legibility, most of the intersections of strokes belonging to neighbouring lines have been omitted. The figures with ornamentation are oriented to the north if not specified otherwise.

When describing the technology of the engravings we did our best to use the terminology

commonly accepted in literature, (Fig. 1: 1-9). We described the different techniques used in touching up the ornament using three terms: i./ in the same direction ii./ to-and-fro movement; iii./ with a shift. In the first case the engraver, after making a stroke, touches it up, applying the tool to the starting point or near to it. In the to-and-fro technique, the engraver corrects a stroke after it has been made using a reverse movement, from the ending point to the starting point, without disengaging the engraving tool from the surface. In the third technique, the artist, after engraving a stroke, shifts the object being ornamented and administers the touching up stroke, taking as the starting point the vertex (ending point) of the stroke now being corrected or an area near this vertex. Touching up the engraving is evidenced by the presence of lateral striations and by multiple starting and ending points (Fig. 1).

### Ornament on side A

#### Line A1

It runs transversely to the axis, its middle point is found about 15.2 cm to the south of the base (Figs. 2, 3). The total length of this zigzag line is ca. 6 cm, the height of the zigzag band – 0.35-0.55 cm. This line consists of 31 strokes of a different length (0.3-0.55 cm each), made with the same cutting tool, roughly V-shaped in cross-section. The outlying strokes in the zigzag line (nos. 1, 30 and 31) are visibly smoothed down and worn, evidently the effect of rubbing. The nature and circumstances of this action are hard to specify but its impact must have had a uniform and an extended duration, its effect on the surface of the object not overly strong – like touching or rubbing it with a hand, carrying it about wrapped in an organic material. Our replication experiments showed that the replica of the object, wrapped in a red deer skin, carried about and transported in a linen bag (a total of 48 hours) developed no visible traces on its surface; the same effect (or lack of it) was observed



Fig. 2. Rusinowo, line A1. General view of the ornament. (Photo T. Gąsior)

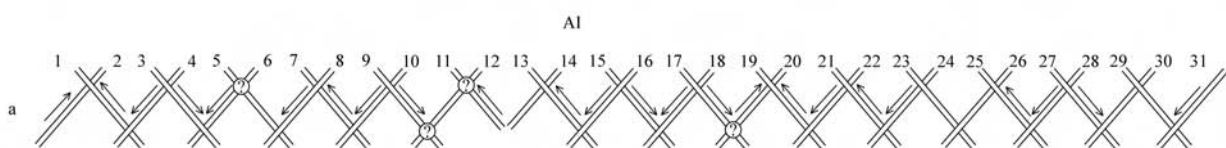


Fig. 3. Rusinowo, line A1. Diagram showing the process of engraving the ornament. (an arrow - direction of engraving; a question mark - indeterminate intersection; A1a12 and 13 - no intersection)

after repeatedly rubbing the zigzag lines with a finger (1270 times). The traces of polish and gloss were visible only under a microscope (cf. sub-chapter 3.1.), rather than with the naked eye, as in the case of the original ornament.

The zigzag line fills almost entirely the space between the sides of the object (sides D and E). It passes across two vascular grooves which certainly must have impeded the engraving process; the maker apparently was a true expert and succeeded in negotiating these obstacles very well – the ornament has not been disrupted in any way (Fig. 2). The skill and experience of the engraver are confirmed further by the regular, harmoniously rendered strokes of this zigzag line, and also by the well aligned, arrangement of the lines.

Intersections of the strokes confirm that the ornament took form west-to-east (Fig. 3, Table 1). Individual strokes in this zigzag line were incised NE-to-SW (odd strokes) and SE-to-NW (even strokes). However, with a few exceptions from this rule (Fig. 4), indicating that there was no strict rule of a technological or an ideological nature to dictate the direction of the engraving of strokes – it seems that the artist was guided by his convenience. At the start of the line, ie, in its western part, stroke no. 1 was engraved SW-to-NE, similarly as no. 19. In the first case, the decision about changing the direction may have been prompted by the curvature of the antler. The lack of consistency in engraving stroke no. 19 was dictated by the properties of the antler surface – the presence of the vascular groove; proceeding according to the scheme of the engraving of the other lines in this zigzag, when negotiating the depression of the vascular groove the engraver would have had to move the engraving tool upwards. To cope with this problem he chose an easier variant and to move the

tool from the top down towards the most depressed part of the vascular groove. This choice confirms the engraver's experience in this type of work.

There is evidence that the strokes of this ornament were touched up – in a small number of cases where this was confirmed the touching up followed the same direction as originally used in engraving the stroke. Some of the strokes (eg, nos. 5, 13, 18) were touched up more than once (Fig. 4).

Most of the strokes of the ornament were engraved one after another (linear or stroke by stroke technique), although there were some departures from this rule, as may be seen eg, in the case of strokes nos. 6-9 (Figs. 5, 6). In this case, consecutive elements of the zigzag line were created with the serial method. This admittedly results in accelerating the process of engraving itself but with this technique, there is less control over the direction of the arrangement of the zigzag line as a whole. The line grew west-to-east as indicated by the order of the engraving of consecutive strokes. Some of them have asymmetrical, V-shaped cross-sections (Fig. 7) so that their maximum depth is shifted towards their western wall. This shows that the hand engraving the ornament rested on the eastern side (cf. Bosinski

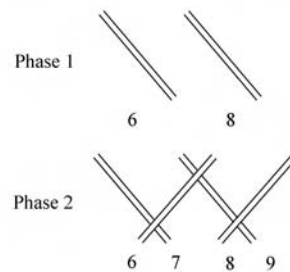


Fig. 5. Rusinowo, line AI. Diagrams showing the serial process of engraving of strokes nos. 6-9

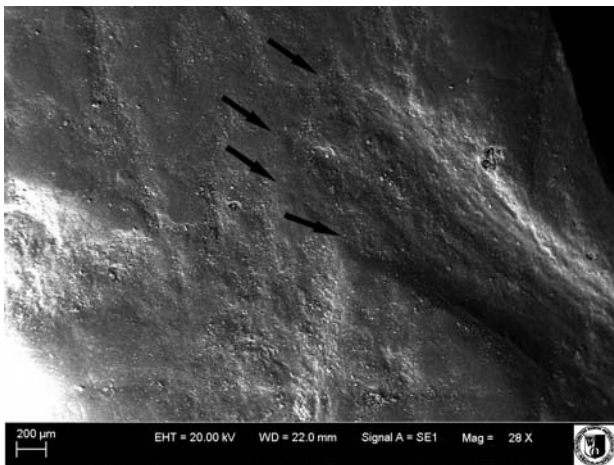


Fig. 4. Rusinowo, line AI. Starting section of stroke no. 18, evident traces of repeated touching up (arrows)

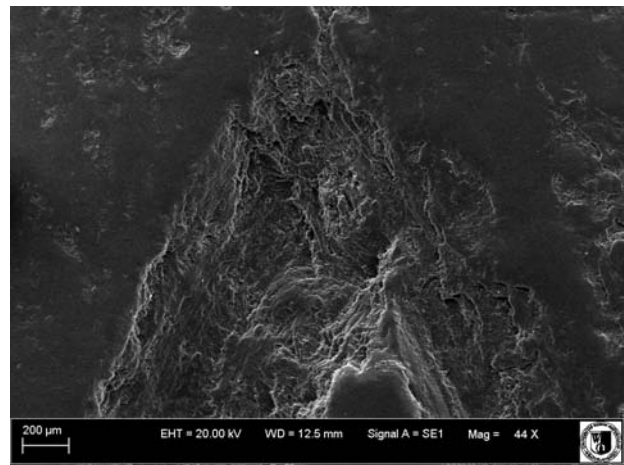
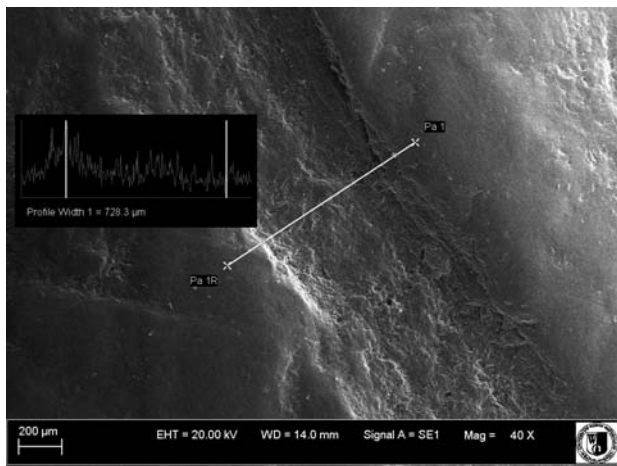


Fig. 6. Rusinowo, line AI. Stroke no. 7 cutting into no. 8.



**Fig. 7.** Rusinowo, line AI. Cross-section of stroke no. 18 – the variation in depth caused by the position of engraver’s hand

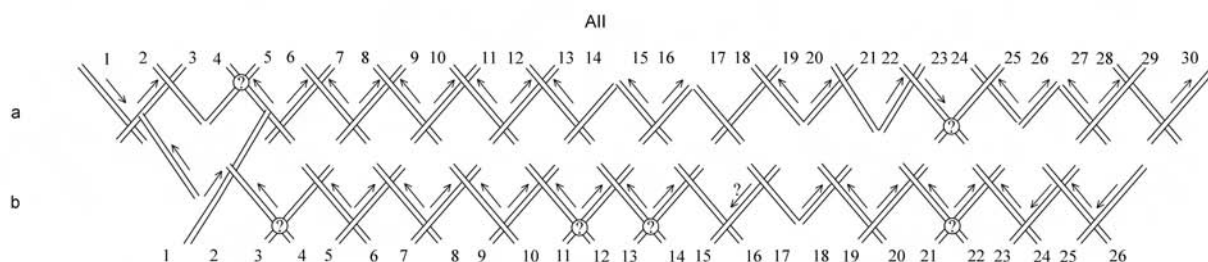
*et al.* 2001). In this way, the engraver could see the ornament made earlier. A right-handed individual would have held the object with the point toward himself, a left-handed one – with the base toward himself.

**Group AII**

This group consists of two zigzag lines (Figs. 8, 9, Table 2): the northern (IIa) and the southern (IIb). Their arrangement is slightly curved, with the highest lying fragment roughly midway, pointing south. The distance from AI to AII is about 9.5 cm. The distance between IIa and IIb ranges from 0.4 to 1.6 cm, and the two lines intersect at their ends (cf. remarks below). Strokes a1 and 2, 29, 30, and b1 and 26 are worn away, which illustrates the particularly intensive gloss of the object in this part. The cross-sections of strokes are V-shaped. They were made



**Fig. 8.** Rusinowo, group AII. General view of the ornament. (Photo T. Gąsior)



**Fig. 9.** Rusinowo, group AII. Diagram showing the process of engraving the ornament. (symbols – see Fig. 3)

with the same cutting tool as the zigzag line AI. A large number of intersecting strokes in these lines shows that each of them was engraved west-to-east (Fig. 9, Table 1), similarly as zigzag AI. Only a short fragment, IIa28-30 was engraved east-to-west: first, stroke a30 was made, followed by a29 and a28 – the latter cut into the already existing a27. The strokes were incised SW-to-NE, and SE-to-NW, only the outlying strokes: a1, a23, b24, b26, were engraved reverse to this trend, that is, NE-to-SW (even strokes) and NW-to-SE (odd strokes). This disruption in the direction of engraving the motif would have been dictated, at least in some cases, by the curvature of the surface being ornamented. The strokes of the ornament were touched up, in many cases more than once, as evidenced by distinct lateral striations which suggest even a three- or a fourfold transit of the engraving tool (Figs. 10, 11). The touching up was mostly in the same direction but there is some evidence for the use of the to-and-fro technique. Some of the individual modules within this zigzag are doubled (b25), ie, there are two strokes instead of one – most likely, not a deliberate effect, rather an unsuccessful attempt at touching up when the engraver missed hitting the original stroke.

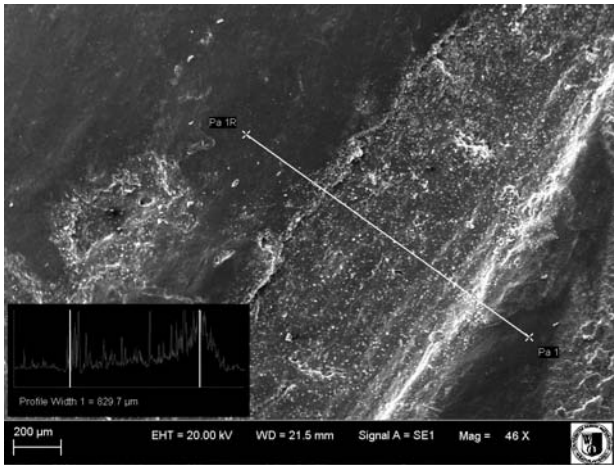
The strokes were engraved mostly one after another, although there are some rare places where they were made using the serial method (eg. a17-19). The sequence of intersections proves that this technique, with some modification, was used also on the western extremity of line AIIa. The first three strokes were engraved in sequence: a1, a2, a3. They were followed by a4 and a6, and next, by a5 (Fig. 12). After this last activity, stroke a4 was touched up.

Line IIb took form after line IIa; this is shown by a large number of intersections, whereby strokes

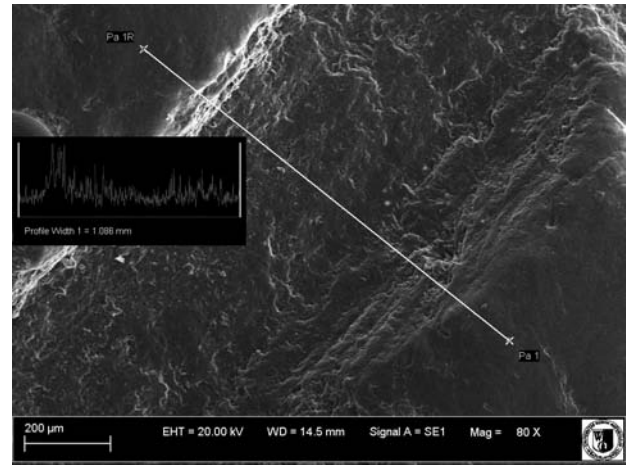
**Table 2.** Rusinowo, group AII. Parameters of zigzag lines IIa and IIb

| No. of line | Number of strokes | Height of zigzag line [cm] | Length of strokes [cm] |
|-------------|-------------------|----------------------------|------------------------|
| IIa         | 30                | 0.4–0.5                    | 0.45–0.6               |
| IIb         | 26                | 0.4–0.65                   | 0.4–0.8                |

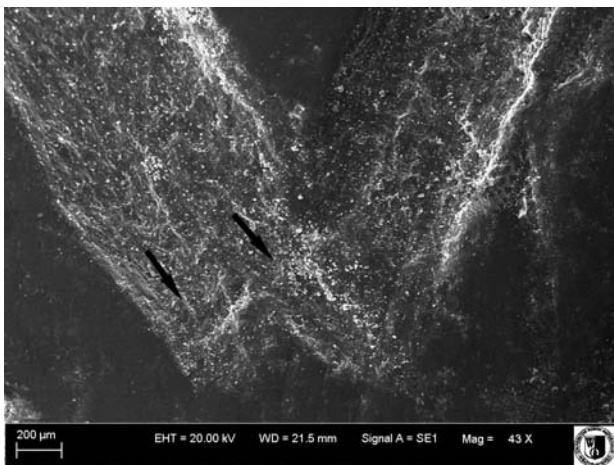




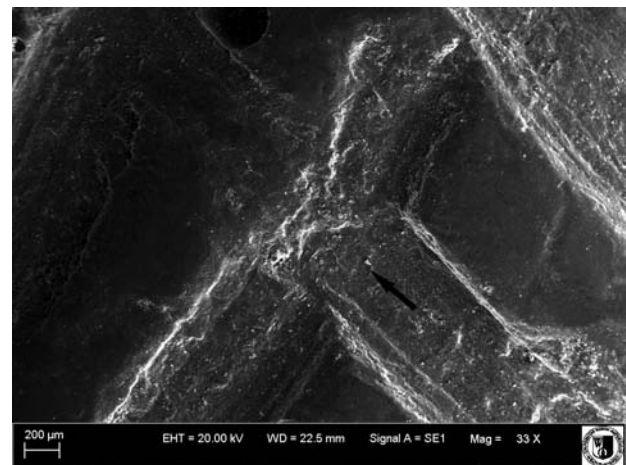
**Fig. 10.** Rusinowo, group AII. Traces of touching up the ornament at stroke b24. The cross-section shows that the stroke is deeper by its western wall



**Fig. 11.** Rusinowo, group AII. Traces of touching up of stroke b10. The cross-section shows that the stroke is deeper by its western wall



**Fig. 12.** Rusinowo, group AII. The intersection of strokes a5 and a6 (a5/a6; arrow)



**Fig. 13.** Rusinowo, group AII. Stroke b7 cuts into stroke a8 (arrow)

forming IIb cross elements belonging to IIa (b1/a2, b7/a8, b8/a9, b22/a23, and b26/a30). Stroke b7, engraved SE-to-NW, cuts into stroke a8 (Fig. 13). The intersections named earlier rule out a simultaneous execution of these two zigzag lines, something that we had assumed was theoretically possible. In this process, the two lines would have been engraved at once, for example, during phase I – a1 and b1, followed by a2 and b2, next, by a3 and b3, and so on. However, the sequence of stroke intersections demonstrates clearly that line IIa was already in existence when the strokes of line IIb were being engraved, although theoretically, it is feasible that first, a fragment of line IIa was executed, followed by a fragment of IIb, then another fragment of IIa.

#### Group AIII

Group AIII consists of 4 zigzag lines, running roughly W-E (Figs. 14, 15, Table 3). The distance between AII and AIII is 0.7 cm. The lines forming

group AIII are rather crowded, and come into contact or intersect; the distance range between them is 0.1-0.2 cm.

The thickness of the lines is not uniform. Three northern lines (IIIa-IIIc) were engraved using the same cutting tool as lines in groups AI and AII. Line IIId was carved using a different engraving point, probably made by snapping a flake or a blade (Fig. 16). Line IIId displays evident faults: some of the strokes in the zigzag are thick and irregular; this suggests that the tool change was made when the old cutting tool became damaged. Thus, it appears that line IIId was engraved right after IIId – to complete a full sequence of the engraving.

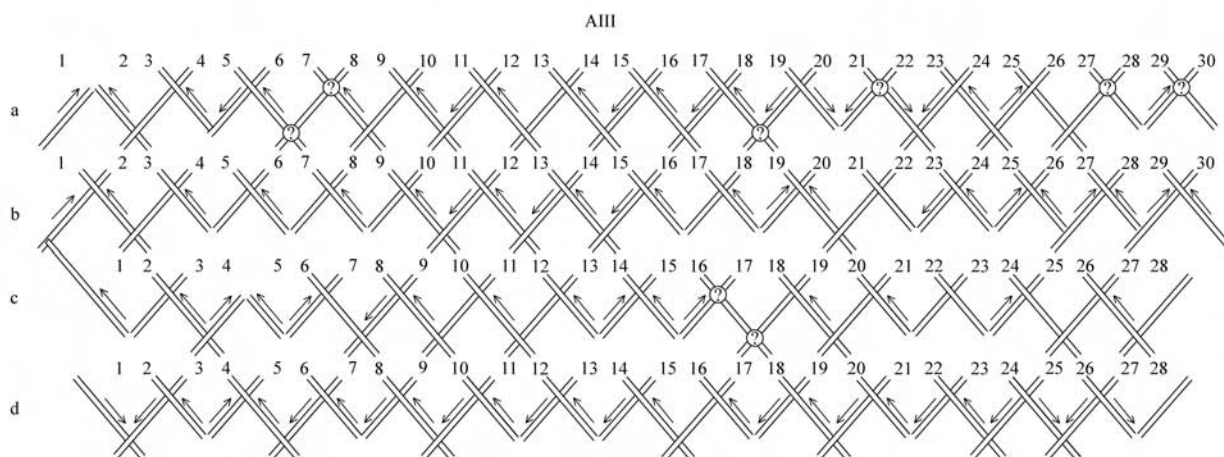
A large number of intersections indicates that similarly as with groups described earlier lines IIIa-IIIId were engraved mostly west-to-east (Table 1). An anomaly is observed at the end of line IIIa, ie, in the case of strokes a22-27. Unfortunately, not all the intersections here are decipherable, but those that

**Table 3.** Rusinowo, group AIII. Parameters of zigzag lines IIIa-III d

| No. of line | Number of strokes | Height of zigzag line [cm] | Length of strokes [cm] |
|-------------|-------------------|----------------------------|------------------------|
| IIIa        | 30                | 0.3–0.55                   | 0.25–0.7               |
| IIIb        | 30                | 0.3–0.6                    | 0.35–1.25              |
| IIIc        | 28                | 0.35–0.7                   | 0.25–0.65              |
| III d       | 28                | 0.3–0.65                   | 0.25–0.75              |



**Fig. 14.** Rusinowo, group AIII. General view of the ornament. (Photo T. Gaşior)



**Fig. 15.** Rusinowo, group AIII. Diagram showing the process of engraving the ornament. (symbols – see Fig. 3)

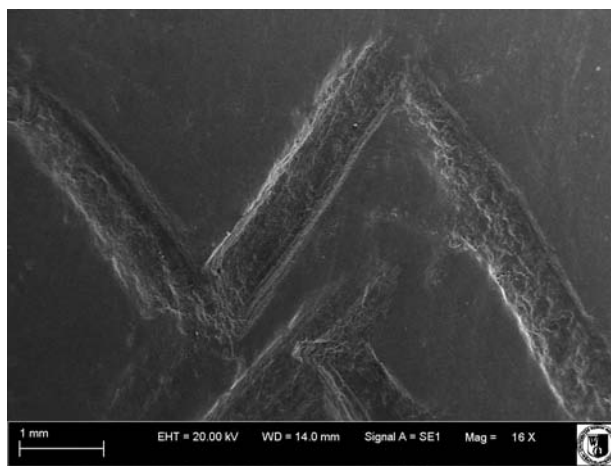
could be examined show that this part of the zigzag line may have been engraved in a reverse direction – east-to-west (Figs. 15, 17). In most cases, the traces of touching up the strokes are not visible but where they could be recovered, the strokes of the ornament were mostly engraved a second time, in the same direction, or using the to-and-fro technique. The direction in which the strokes themselves were engraved is a less easy to decipher. When it comes to lines IIIa and IIIb, the strokes were engraved mostly SE-to-NW, and NE-to-SW. In the outlying fragments of these lines, the direction of engraving

of the odd strokes was sometimes reversed (SW-NE). In the case of line IIIc there is an observable change of the rhythm of the engraving: here, odd strokes are engraved SE-to-NW, even strokes - SW-to-NE. This order of working resembles the case of lines IIa and IIb described earlier.

As a rule, the strokes in individual lines were carved one after another, but there were three major departures from this rule – one of them has been described above (cf. Fig. 17). In line IIIa, strokes a9-17 were executed using the serial method (cf. Fig. 5). Odd strokes are crossed by even strokes, showing



**Fig. 16.** Rusinowo, group AIII. Fragment of the ornament, line III d at the bottom, from SE (10x). (Photo M. Diakowski)



**Fig. 17.** Rusinowo, group AIII. Intersections of strokes a22-a24 (a23/24, a22/a23)

that the latter took form only once the odd strokes had been engraved. Perhaps, the same method was used in making strokes a18-21, but this cannot be established definitely because of the poorly recoverable unclear intersections. The other larger sequence made using the serial method is represented by strokes c6-13, only in this case, the even strokes were engraved first, after which the spaces in between them were filled in with odd strokes. The closing elements in this sequence reveal very clear traces of severe wear of the cutting tool.

Intersections of strokes belonging to different zigzag lines show that new lines were created moving from the north southward, thus: IIIa, b, c, d. In this context, the making of line III d with a new tool and the technological convergence of strokes forming part of lines AI, AIIa, AIIb, AIIa-c indicate that the engraving of groups AI and AII preceded that of

group AIII. Given the evidence of the gradual wear of the cutting tool, it may also be suggested that AI was made earlier than AII.

#### Group AIV

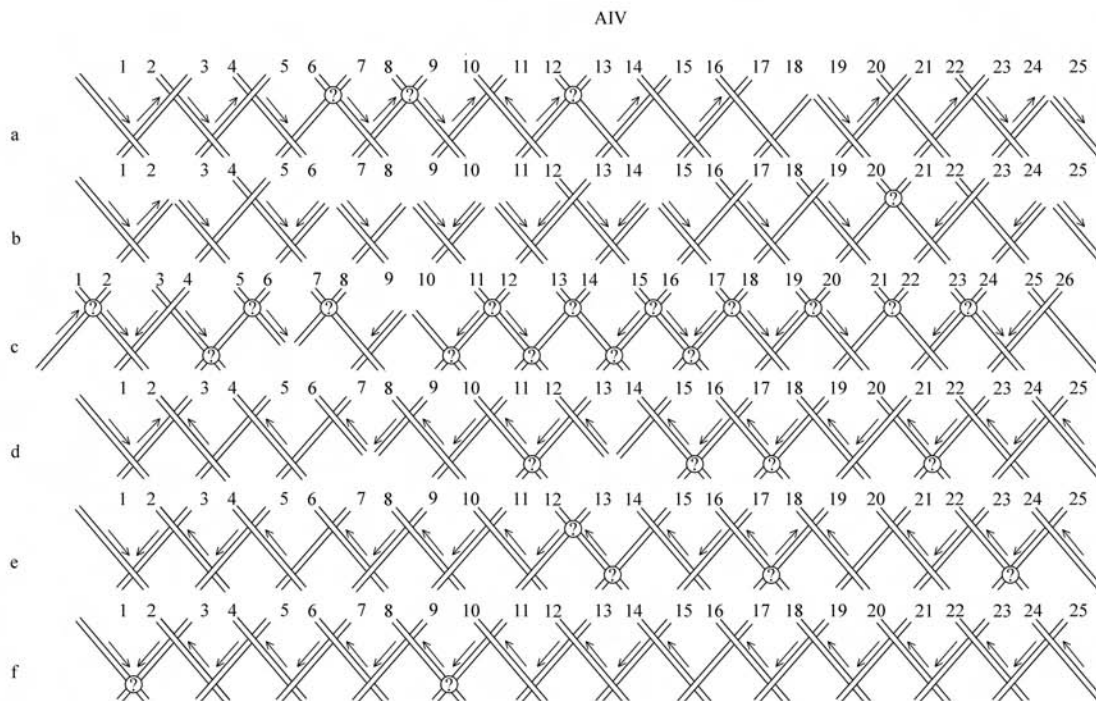
Group AIV consists of six zigzag lines (Figs. 18, 19, Table 4); they run roughly W-E, sloping lightly towards SE. Each line is built by 25 strokes, except for IVc, which is formed by 26 elements. Also belonging to this group, some strokes are found next to it, on both its sides: i./ a stroke to the west of it, right next to line IVc; ii./ three longer and two shorter strokes (the latter could be the result of a rapid engraving action) to the east of line IVd-IVf, roughly parallel to the stroke c26. The distance between groups AIII and AIV is about 1 cm. The lines are engraved much more densely than in the previously discussed groups, and the point of the engraving tool – finer,

**Table 4.** Rusinowo, group AIV. Parameters of zigzag lines IVa-IVf

| No. of line | Number of strokes | Height of zigzag line [cm] | Length of strokes [cm] |
|-------------|-------------------|----------------------------|------------------------|
| IVa         | 25                | 0.35–0.45                  | 0.4–0.6                |
| IVb         | 25                | 0.35–0.55                  | 0.4–0.65               |
| IVc         | 26                | 0.4–0.5                    | 0.4–0.65               |
| IVd         | 25                | 0.35–0.6                   | 0.45–0.7               |
| IVe         | 25                | 0.35–0.5                   | 0.35–0.8               |
| IVf         | 25                | 0.4–0.55                   | 0.45–1.0               |



**Fig. 18.** Rusinowo, group AIV. General view of the ornament. (Photo T. Gaşior)



**Fig. 19.** Rusinowo, group AIV. Diagram showing the process of engraving the ornament. (symbols – see Fig. 3)

resembling the tool used in engraving IIIId. Quite a few strokes forming this zigzag line are dragged out, they sometimes intrude on other strokes, and some are doubled. The distance between parallel strokes in adjacent lines tends to be less than 0.1 cm or a little more, only rarely as much as 0.2 cm.

The quality of execution of this group diverges visibly from the quality of execution of the lines described earlier, also, the manner of their execution is less uniform (Fig. 19). Two subgroups may be differentiated here: i./ IVa-IVc; ii./ IVd-IVf.

Lines IVa-IVc were incised east-to-west, therefore in a direction reversed to that of most of the zigzag lines described so far (Table 1). Strokes forming individual zigzag lines were engraved mostly one after another, only in line IVa we found evidence, in strokes a18-a9, for the use of the serial technique (cf. above). Here, odd strokes (a17, a15, a13, a11 (?) and a9) cut into even strokes, therefore the latter were made earlier (Fig. 19). Odd strokes in zigzag lines IVa and IVb were incised NW-to-SE, even strokes

– SW-to-NE and NE-to-SW, and in line IVc, even NW-to-SE, and odd strokes, NE-to-SW (Fig. 20). Touching up was in the same direction, or in the to-and-fro technique; touching up in the “with a shift” technique is rare. Intersections of lines IVa, b, c, suggest, that the first to be made was zigzag line IVc, followed by IVb, and next, IVa (Fig. 21). However, this conclusion is based on only a small number of observations (a3/b4, b3/c5 and b14/c14) as intersections of strokes belonging to adjacent zigzag lines were very rare.

The direction of engraving of lines IIIId-IIIIf was different – they were carved west-to-east (Fig. 19). Some of the strokes retained a characteristic asymmetry of a cross-section (Fig. 22), that is, in even strokes (NE-SW) the deepest part is by the eastern wall, in odd strokes (SE-NW) – by the western. Presumably, this phenomenon could have been caused by the difference in the positioning of the engraver’s hand; in the first case, it was positioned to the west of the stroke as it was being engraved, in the other cases – to the east of it. Strokes within individual lines were carved one after another, with some evidence however, for some use of the serial technique as well. This is how strokes d1-11, e18-23, f11-15 were created – each time, first the even strokes were engraved, which next were intersected by an odd stroke. The strokes within individual zigzag lines were engraved mostly NE-to-SW (even strokes) and SE-to-NW (odd strokes). The traces of touching up suggest that this process was mostly in the same direction, more rarely, using the to-and-fro and with a shift techniques. Intersections of strokes belonging to individual lines clearly show that line IVd took form after IVc, after which IVf and IVe were engraved in succession. At the same time, the order of engraving lines IVf and IVe is not fully certain

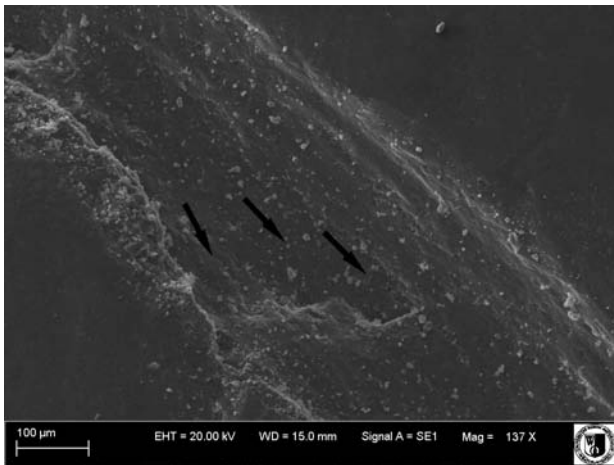


Fig. 20. Rusinowo, group AIV. Microrelief at the bottom of stroke c4 confirming the direction of its execution (NW-SE)

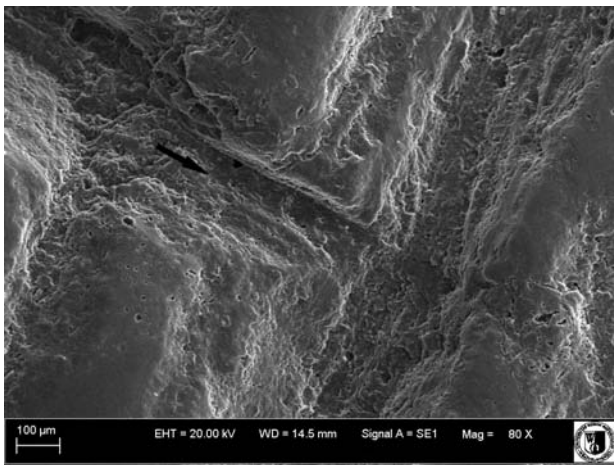


Fig. 21. Rusinowo, group AIV. Stroke a3 cutting into b4 (arrow)

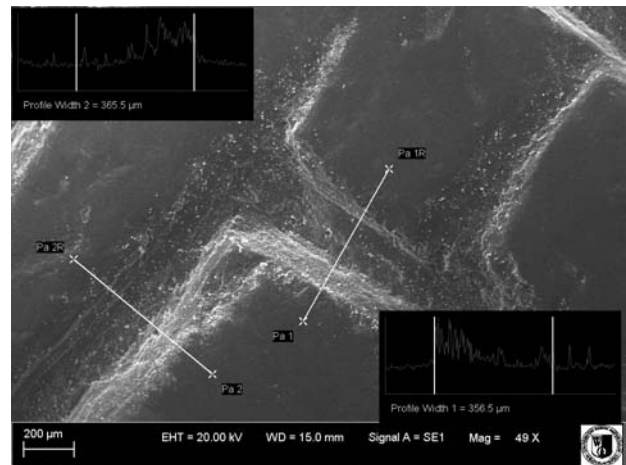


Fig. 22. Rusinowo, group AIV. Cross-sections of strokes f2 and f3 showing their irregular depth

because intersections of the two lines are not unambiguous. There is also the possibility that the lines were engraved one after another, ie, first IVe, and next IVf, after which some strokes within line IVe were touched up – which would explain the intersections mentioned earlier.

The strokes to the west and to the east of the group of zigzag lines are an integral part of this ornament. The stroke to the west of line IVc was intersected by f<sub>1</sub>, and the strokes on the east side are parallel to c<sub>26</sub>. Therefore it may be concluded that the stroke found to the west of AIV was engraved only after the lines IVc, b and a were completed.

### Group AV

Group AV consists of 11 zigzag lines (Va-k) running W-E (Figs. 23, 24, Table 5). The maximum distance between AIV and AV is about 1.5 cm, and between individual zigzag lines – on average 0.1 or 0.15 cm. The outlying strokes, found by the edges of the decorated surface, are worn away, which is evidence for a long-lived use of the object after the ornament was made. The lines in group AV are engraved deeply, at a first glance it is apparent that their execution was more fluid than in the lines within group AIV. The strokes are executed with greater precision, have a more uniform width, and the elements in individual zigzag lines do not intersect too often. The appearance of northern angles of the zigzag lines is often peculiar (Figs. 23, 25): strokes engraved SE-to-NW do not cut into strokes engraved NE-to-SW exactly at the apex but join them a little below the apex, leaving a variously well-defined “hook”. There is no doubt that this way of connecting the strokes has to do with the position of the engraver and his manner of wielding the engraving tool – in the case of lines AIVa-c described earlier, engraved in a reverse direction, ie, east-to-west, the “hook” was present in the S rather than the N angle of the zigzag lines.

The strokes of the zigzag were added west-to-east, as a rule, one after another (Table 1). Only in a handful of cases, there is an evidence of a serial technique of execution of the ornament: a<sub>1</sub>-8, a<sub>10</sub>-18 (?), b<sub>9</sub>-13, b<sub>21</sub>-24, g<sub>10</sub>-13, where the first strokes to be engraved were either even (a<sub>10</sub>-18, g<sub>10</sub>-13) or odd (a<sub>1</sub>-a<sub>8</sub>, b<sub>9</sub>-b<sub>13</sub> and b<sub>21</sub>-24). Within line Vf we observe a change of the rhythm: stroke f<sub>1</sub> occupied the whole distance below e<sub>1</sub> and e<sub>2</sub>, and stroke f<sub>2</sub> extends for the entire length of strokes e<sub>3</sub> and e<sub>4</sub> so that f<sub>3</sub> runs parallel to e<sub>5</sub> (Fig. 26). It is unclear why the rhythm changed, but this must have been rather abrupt because all of a sudden in line Vf there is an abandoned f<sub>2</sub>, a leftover from the earlier rhythm

(Fig. 26). The other lines, Vg-k, are executed in a pattern identified for Vf. Four pairs of strokes examined to identify the symmetry of their cross-section were found to have an asymmetrical profile, similarly as in group AIV. In even strokes (NE-SW) the deepest part is by the eastern wall, in odd strokes (SE-NW) – by the western. As was noted earlier, this was understood to reflect the position of the hand which wielded the engraving tool.

The possibility, suggested by the similarity shown by corresponding strokes belonging to different lines, as eg a<sub>11</sub>-k<sub>11</sub> (cf. the discussion under Group AII), that all zigzag lines could have been engraved at the same time was taken into consideration but ultimately discounted. We think this is unfeasible on the evidence of fragments of lines engraved using the serial method, and intersections of strokes in adjacent lines which are inconsistent with the use of the simultaneous method (b<sub>12</sub>/a<sub>13</sub>, b<sub>26</sub>/a<sub>25</sub>, f<sub>19</sub>/e<sub>22</sub>, g<sub>2</sub>/f<sub>3</sub>, k<sub>3</sub>/j<sub>4</sub>).

Strokes within zigzag lines were engraved mostly SE-to-NW (odd strokes) and NE-to-SW (even strokes). Other directions (NW-SE and SW-NE) were rare – in lines Va-c, often in the outlying fragments of the line (Fig. 23). At the start of line Va, a pair of even strokes was engraved SW-to-NE. Presumably, these changes were dictated by problems with executing the ornament in areas of the surface lying close to the edge of side A. This difficulty is suggested also by the presence of oblique and transversal striations (cf. Fritz 1999, 32, Fig. 15:1, 2), which were observed in some of the outlying strokes (Fig. 27), which take form when the position of the engraver's hand is wrong, or the inclination of the engraving point is incorrect. The strokes of the ornament were touched up, although quite a few of them do bear some traces of this process. Nevertheless, we are confident it happened, given the depth and width of the strokes; the absence of such traces is one more proof of the high competence of the engraver who made these patterns. Where traces of touching up are visible there is an evident tendency for the engraving to be in the same direction, with only rare evidence of the to-and-fro and the with a shift techniques, occasionally it is also possible to identify traces of repeated touching up in the form of lateral striations (Fig. 28). On the other hand, traces associated with the touching up of the ornament are pronounced in the case of strokes k<sub>23</sub>-28, obviously engraved with a damaged cutting tool (Fig. 23). The resulting strokes are engraved wide, and their appearance is irregular and visibly different from other zigzag lines in this group. We shall return to this question under the next heading.

Intersections of zigzag lines identify the direction of their engraving as north-to-south, that is, from Va to Vk. Apparently, the only exception would be the closing strokes in lines Vb-d (nos. 33 and 34), g (nos. 30-32) and h-k (no. 30). They differ from the main strokes in the zigzag lines, ie, were made with a different cutting tool, at a later time (Fig. 29). This is especially clear in the case of strokes b32, b33 vs. b34 (Fig. 29). Strokes h30-k30 were evidently

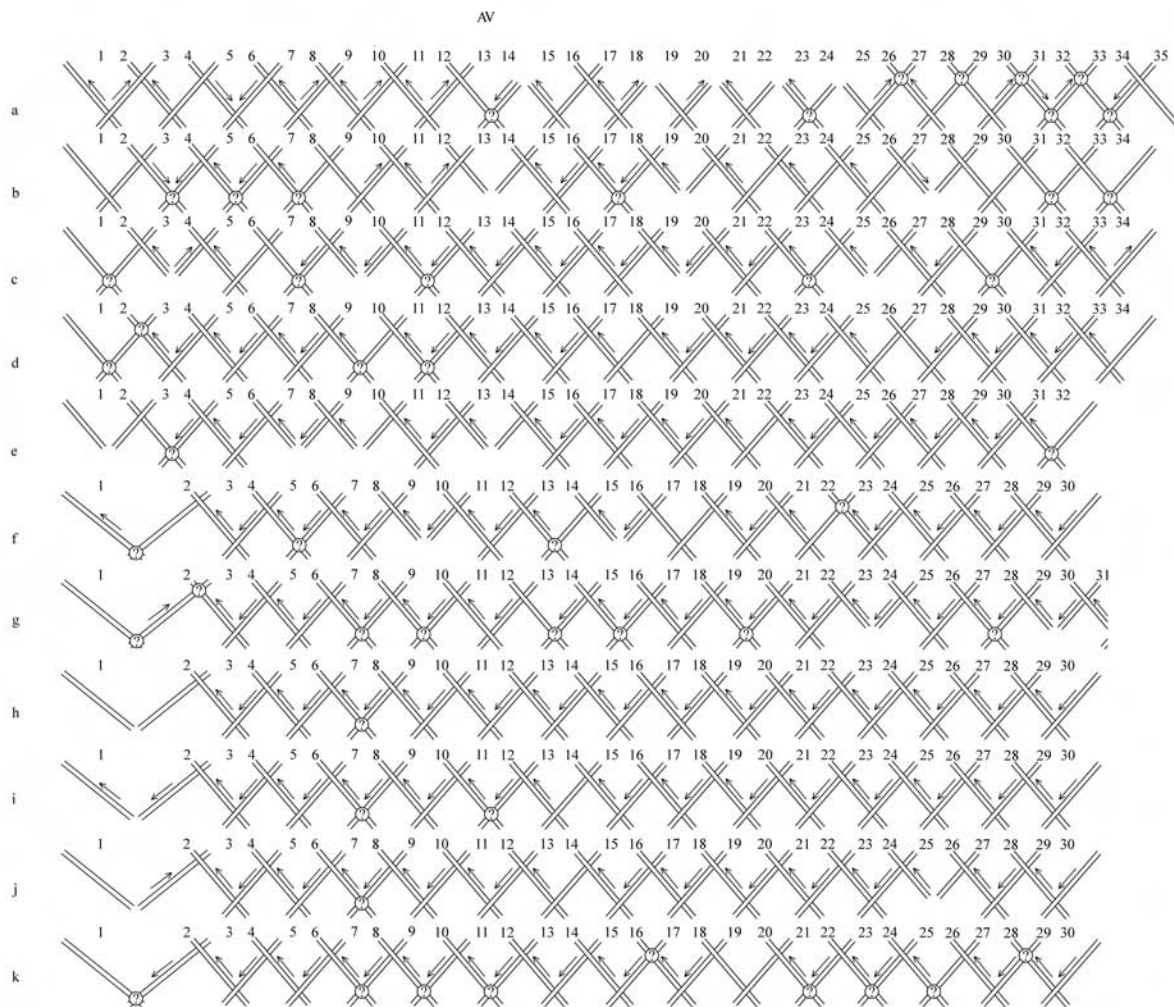
engraved during the same phase (Figs. 27, 29, 30), after all of the strokes in zigzag lines AVh-k had been completed. This observation is confirmed by an intersection in which stroke h30 cuts away the apex of i29. What is also known is that once group AV had been completed the surface of one side of

**Table 5.** Rusinowo, group AV. Parameters of zigzag lines Va-Vk

| No. of line | Number of strokes | Height of zigzag line [cm] | Length of strokes [cm] |
|-------------|-------------------|----------------------------|------------------------|
| Va          | 35                | 0.35-0.5                   | 0.35-0.7               |
| Vb          | 34                | 0.3-0.45                   | 0.35-0.6               |
| Vc          | 34                | 0.3-0.4                    | 0.4-0.6                |
| Vd          | 34                | 0.3-0.45                   | 0.3-0.65               |
| Ve          | 32                | 0.3-0.4                    | 0.4-0.55               |
| Vf          | 30                | 0.25-0.3                   | 0.4-0.6                |
| Vg          | 32                | 0.3-0.35                   | 0.4-0.6                |
| Vh          | 30                | 0.3-0.35                   | 0.3-0.55               |
| Vi          | 30                | 0.3-0.35                   | 0.3-0.6                |
| Vj          | 30                | 0.3-0.35                   | 0.35-0.8               |
| Vk          | 30                | 0.3-0.35                   | 0.35-0.85              |



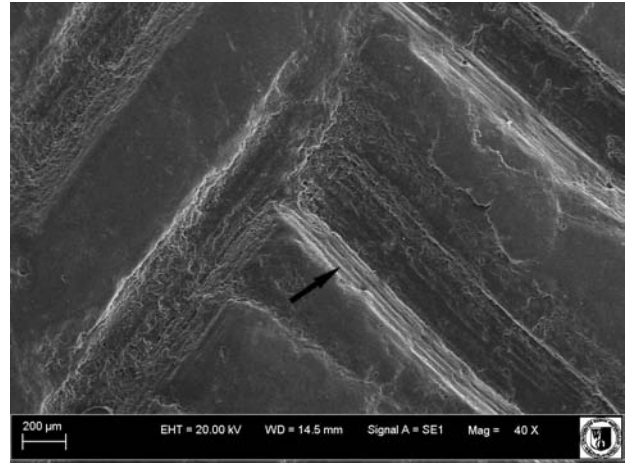
**Fig. 23.** Rusinowo, group AV. General view of the ornament. (Photo T. Gašior)



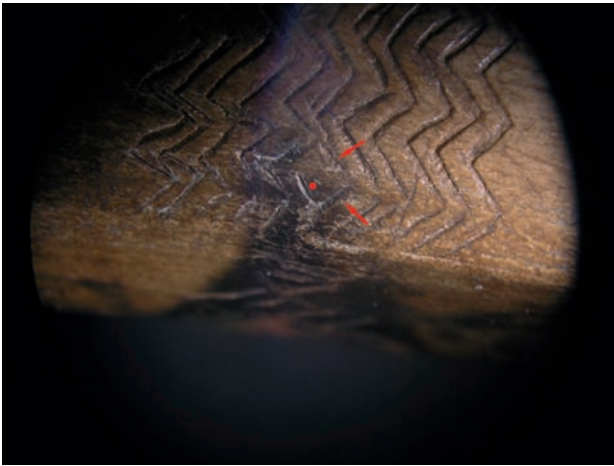
**Fig. 24.** Rusinowo, group AV. Diagram showing the process of engraving the ornament. (symbols – see Fig. 3)



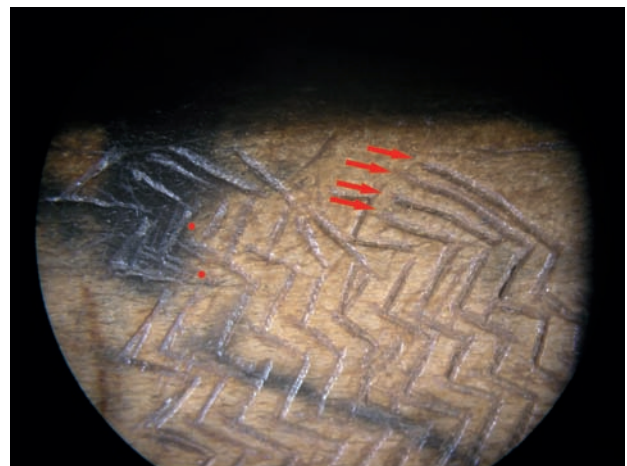
**Fig. 25.** Rusinowo, group AV. NE "hooks" of the strokes (arrows), not to scale. (Photo T. Gąsior)



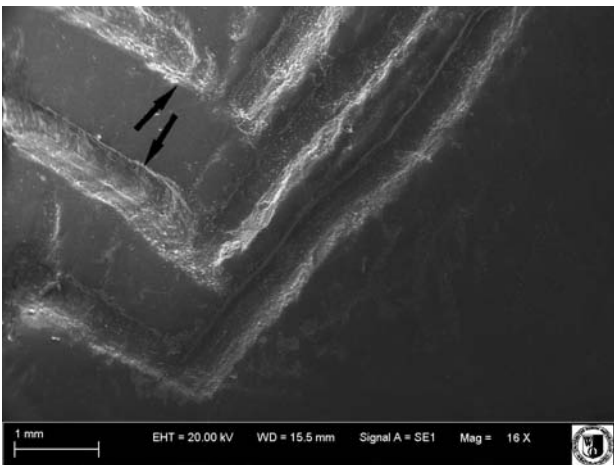
**Fig. 28.** Rusinowo, group AV. The intersection of strokes h19 and h18. Stroke h19 retains traces of repeated touching up (at least 5 times) in the form of lateral striations (arrow)



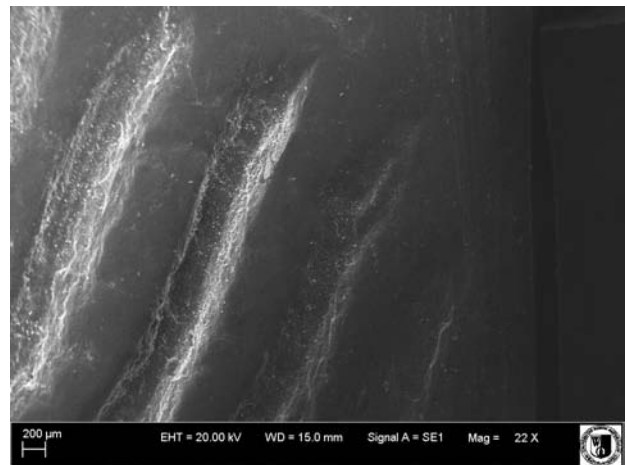
**Fig. 26.** Rusinowo, group AV. Change of rhythm of engraving the ornament at line Vf (photo from W); arrows indicate strokes f1 and 2, the dot mark the stroke which adheres to the hitherto direction of the zigzag (6,3x). (Photo M. Diakowski)



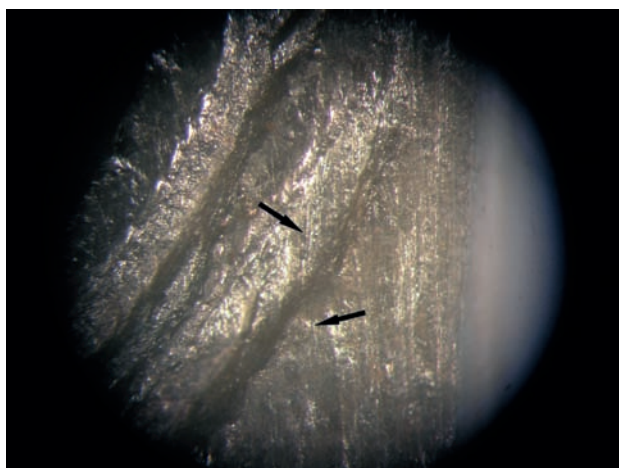
**Fig. 29.** Rusinowo, group AV. Group of strokes at the end of lines Vb, c, d, h, i, j, k (h30, i30, j30, k30 – arrows) and strokes b32 and b33 (dots) (8x); photo from W



**Fig. 27.** Rusinowo, group AV. Intersections of strokes i30/i29, j30/j29 and k30/k29 (moving downwards). In strokes i29 and j29, pronounced oblique striations (arrows)



**Fig. 30.** Rusinowo, group AV. Group of strokes at the end of lines Vh, i, j, k (h30, i30, j30, k30), engraved as a single episode (photo from W). At centre, most discernible i30 and j30



**Fig. 31.** Rusinowo, group AV. Lines of working the surface in the north-eastern section of stroke k<sub>30</sub> (arrows, 57×). (Photo M. Diakowski)

the object (side E) was subjected to working. This is evidenced by distinct lines from working (scraping with a blade) visible in the NE angle of stroke k<sub>30</sub> (Fig. 31).

#### Group AVI

Group AVI consists of 10 zigzag lines (AVIa-j) running W-E, with the distance between AV and AVI at 2.2-2.3 cm (Figs. 32, 33, Tables 1, 6). The lines of this group are engraved densely and in terms of the level of craftsmanship they resemble the lines in group AV. There is no mistaking that the strokes in this group were incised with the same cutting tool as zigzag lines in group AV, only the ten closing strokes of line VIj have a different appearance. The distance between individual zigzag lines is 0.1-0.15 cm or slightly less. There is a very characteristic dragging out of strokes of the zigzag on its N apexes (except for VIa), which has been described at more length under the preceding heading. Some strokes, found by the edges (a<sub>31</sub>) are worn away from an extended use of the object.

Individual zigzag lines took a form west-to-east, the strokes within the lines engraved one after another (Table 1). Differently than in the earlier described groups, no use was made here on a wider scale of the serial method – we identified individual strokes engraved in this manner in lines VIa, VIh-VIj. We ruled out the simultaneous engraving of more than one line on the evidence of intersections of adjacent strokes of the zigzag line (i<sub>5</sub>/h<sub>6</sub>, i<sub>11</sub>/h<sub>12</sub>). Moreover, group AVI is characterized by at least a triple change of the rhythm of execution of the ornament (Fig. 34). In the first three lines (VIa-c) the opening strokes (a<sub>1</sub>, b<sub>1</sub> and c<sub>1</sub>) are engraved NE-to-SW and SW-to-NE. In all the other lines, strokes

opening the ornament (d<sub>1</sub>-j<sub>1</sub>) were made SE-to-NW. The second change of the rhythm is observed in the arrangement of line VIi namely, below VIe<sub>3-5</sub> only a single element of line VIi (f<sub>3</sub>) was engraved so that stroke e<sub>6</sub> is parallel to f<sub>4</sub> (Fig. 34). The third change of the rhythm of the ornament is visible in the sequence of line VIj, in a section engraved by repeatedly touching up the line (Figs. 35-38). The sequence of engraving is reconstructed as follows: first, stroke j<sub>17</sub> was made, followed by j<sub>17a</sub>, j<sub>18a</sub>, and at the very end – j<sub>18</sub> (Figs. 36-38). However, it was not fully clear which pattern of the strokes was significant for the engraver – j<sub>17</sub>, j<sub>17a</sub> and j<sub>18a</sub>, or whether the engraving of stroke j<sub>18</sub> – which cuts into both j<sub>18a</sub>, and j<sub>17</sub> – may be understood to have cancelled out in some way the engraving of strokes j<sub>17a</sub> and j<sub>18a</sub>. Ultimately, a closer analysis has shown that this latter pattern was more important, because both stroke j<sub>17</sub> and j<sub>18</sub> were touched up repeatedly, so as to stress their importance in this way – stroke j<sub>18</sub>, at least six times, as evidenced by the characteristic “comet” (Fig. 36). Additionally, the direction of touching up j<sub>20</sub> (SW-NE) was inconsistent with the prevailing manner of execution of strokes in this group, ie, NE-to-SW. Furthermore, the touching up of stroke j<sub>17</sub> took place after j<sub>17a</sub> was engraved, as evidenced by the ending point which is visible in the SW apex of the latter stroke (Fig. 38).

Moreover, above the intersection of fragments of VIa<sub>5</sub> and 6 a solitary stroke was identified, engraved NE-to-SW (evident ending point), resembling by its length and shape the elements within the zigzag lines (Fig. 34). The presence of this stroke is definitely not random but its significance is unclear – perhaps it indicates a specific point (intersection a<sub>6</sub>/a<sub>5</sub>) within the sequence of the zigzag line.

Analysis of strokes forming individual zigzag lines helped distinguish two variants of the direction of engraving. The first variant includes line VIa, with odd strokes engraved NE-to-SW, and even strokes engraved NW-to-SE, moving from the west to the east (Figs. 33, 39). There are no characteristic “hooks” observed in northern angles of other lines forming group AVI. Elements of other lines were engraved NE-to-SW and SE-to-NW, therefore in a manner which predominates among the already described lines. Only the strokes opening the lines were engraved in a reverse direction – NW-to-SE (f<sub>1</sub>, h<sub>1</sub>, j<sub>1</sub>) and SW-to-NE (b<sub>1</sub>), among the remainder the state of preservation does not permit a conclusive assessment of the direction. This anomaly most likely had technical grounds and was associated with the inconvenience of engraving the first stroke towards the



edge of the object, ie, side D. Sometimes also stroke no. 1 was engraved after stroke no. 2 – this was the case of i1 and i2, as well as j1 and j2 (Fig. 40). The change of the direction in engraving the strokes was also associated with the change of the rhythm of the ornament, as in the case of group j17-20 where stroke j20 was engraved SW-to-NE (Fig. 36)

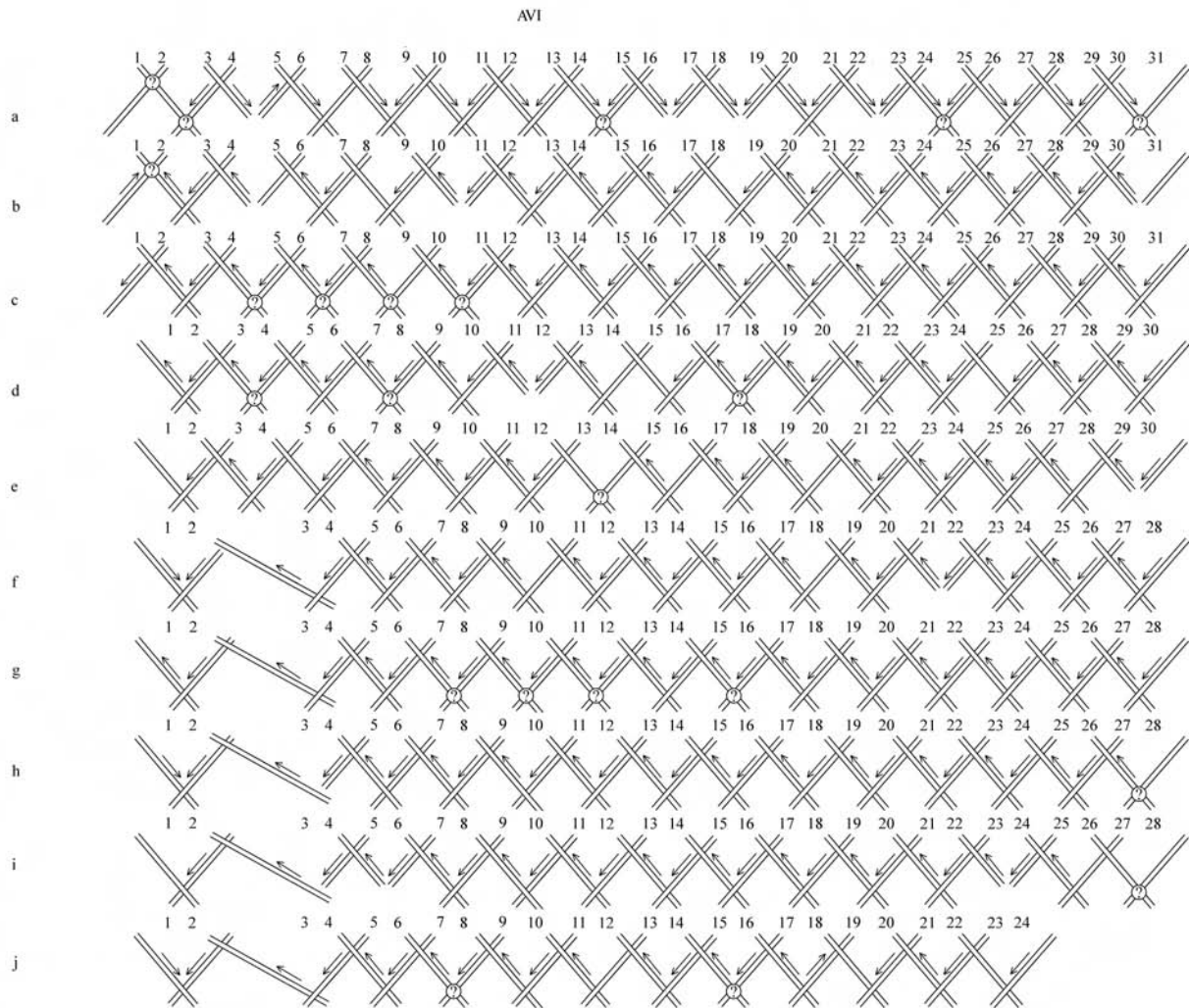
**Table 6.** Rusinowo, group AVI. Parameters of zigzag lines VIa-VIj

| No. of line | Number of strokes | Height of zigzag line [cm] | Length of strokes [cm] |
|-------------|-------------------|----------------------------|------------------------|
| VIa         | 31                | 0.4–0.6                    | 0.3–0.6                |
| VIb         | 31                | 0.4–0.7                    | 0.35–0.6               |
| VIc         | 31                | 0.35–0.75                  | 0.25–0.6               |
| VI d        | 30                | 0.3–0.7                    | 0.25–0.7               |
| VIe         | 30                | 0.35–0.8                   | 0.25–0.6               |
| VI f        | 28                | 0.3–0.8                    | 0.35–0.6               |
| VI g        | 28                | 0.45–0.85                  | 0.4–0.7                |
| VI h        | 28                | 0.4–0.85                   | 0.3–0.6                |
| VI i        | 28                | 0.5–0.8                    | 0.35–0.5               |
| VI j        | 24                | 0.45–0.95                  | 0.3–0.9                |

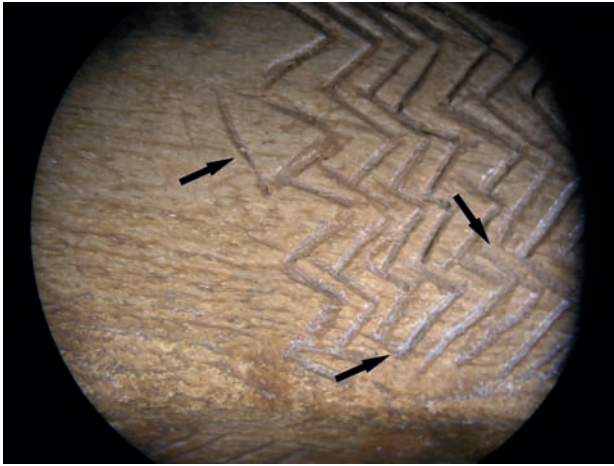
The strokes of the ornament were touched up at least twice, mostly in the same direction (Fig. 39). A pair of sections forming line VIj was engraved more than once, eg, j20 was touched up at least six times (Fig. 36). In this case also visible was a change in the direction of engraving combined with a change in pressure. In many cases traces of repeated touching up were observed.



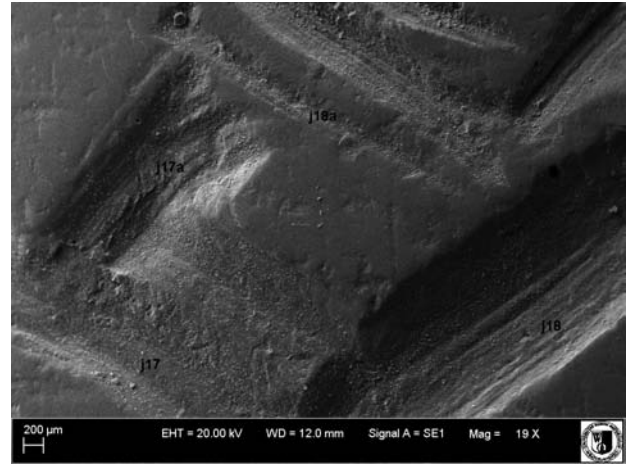
**Fig. 32.** Rusinowo, group AVI. General view of the ornament. (Photo T. Gaşior)



**Fig. 33.** Rusinowo, group AVI. Diagram showing the process of engraving the ornament. (symbols – see Fig. 3)



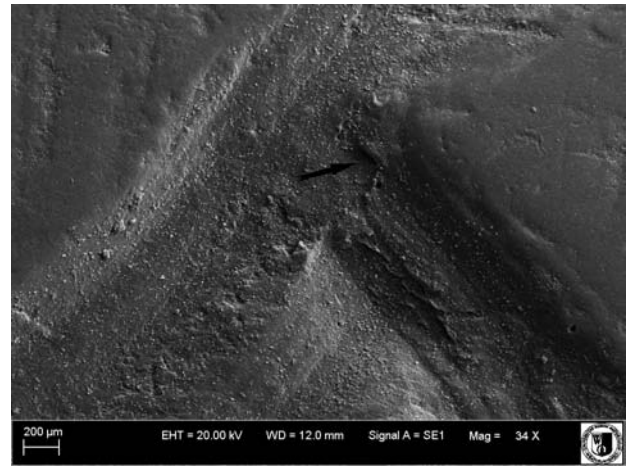
**Fig. 34.** Rusinowo, group AVI. Starting sections of lines VIa-h with two changes of the rhythm of engraving and with a stroke engraved above the intersection of strokes a5 and a6 (arrows), (8.0x); photo from W. (Photo M. Diakowski)



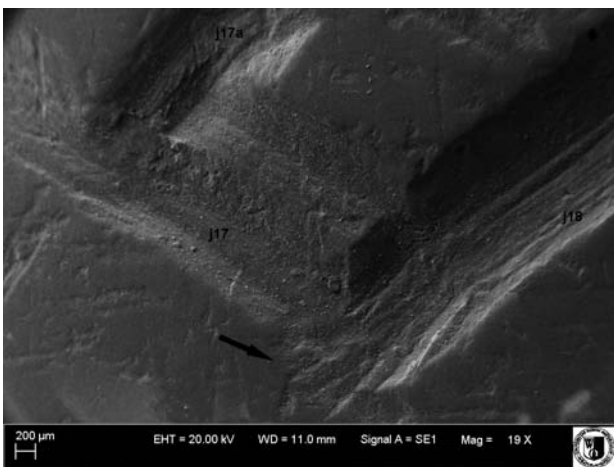
**Fig. 37.** Rusinowo, group AVI. Intersections of strokes j17, 17a, 18a and 18. Evident traces of repeated touching up



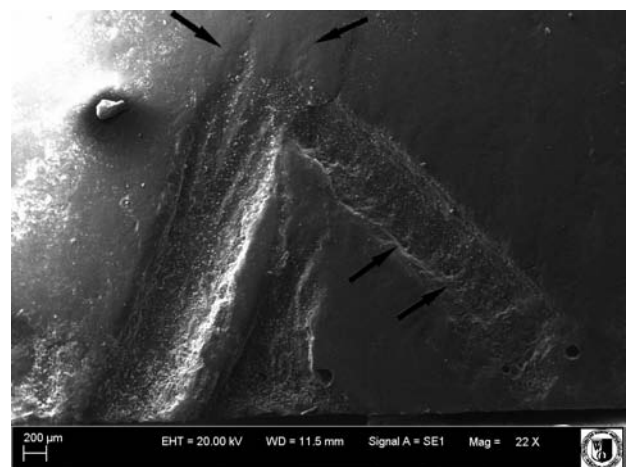
**Fig. 35.** Rusinowo, group AVI. Change of rhythm of engraving within line VIj, strokes j17-j20 (arrow), not to scale. (Photo T. Gaşior)



**Fig. 38.** Rusinowo, group AVI. The intersection of strokes j17a and 17 (photo from E); j17a cuts into j17 but the final touching up of stroke j17, evidenced by the ending point (arrow), is later than the intersection



**Fig. 36.** Rusinowo, group AVI. Intersections of strokes j17 and j17a, j17 and 18. The “comet” resulting from the multiple engraving of j20 (arrow)



**Fig. 39.** Rusinowo, group AVI. Stroke a4 cuts into a3. The “comet” at the NE top of stroke a3 confirms at least three touching up episodes (arrows); the microrelief of stroke a4 identified the direction of engraving was from NW to SE (arrows)

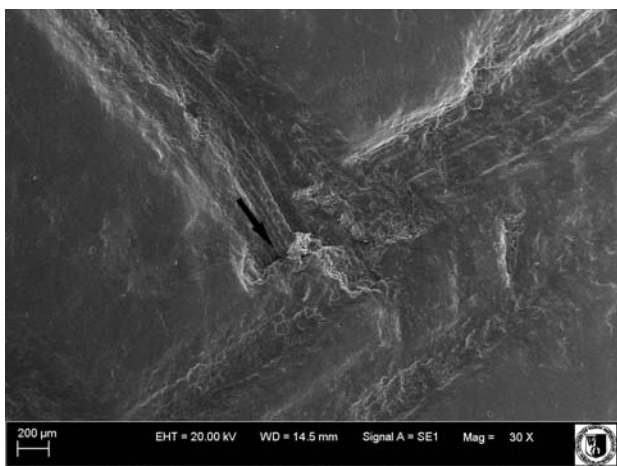


Fig. 40. Rusinowo, group AVI. Stroke i1 cuts into i2

The larger number of intersections (28) proves that consecutive zigzag lines were engraved north-to-south, thus, beginning with VIa and ending in VIj. The only inconsistency in this scheme was shown by two strokes belonging to lines VIg and h (Fig. 41). This type of anomaly could result from the touching up of strokes in upper lines already after engraving fragments of the lower line (touching up g6 already after engraving h5). Evidence of a process in which the engraver returns to older strokes now found to be insufficiently well-defined has been observed on many occasions in Magdalenian engravings on bone (Fritz 1999).

At the very end we need to mention similar irregularities in the arrangement of the closing lines in groups AV and AVI (Vk23-28 and VIj17-20). In both, the strokes within the zigzag differ in their appearance from the rest – they are visibly wider and were repeatedly touched up. They may have been made with a different cutting tool, or with the same cutting tool – and be the result of repeated touching up, perhaps made at a different angle. It is difficult to resolve this question, even if the rest of the zigzag lines in group AVI were engraved, it would seem, with the same cutting tool as the lines in group AV. To sum up, the emphasis placed on the strokes mentioned earlier did not have technological causes but must have been an element of ritual, similarly as the addition of the last strokes to lines Vb, d, h-k (cf. above).

#### Group AVII

Group AVII consists of 5 zigzag lines which run diagonally to the axis of the object, that is, NWW-to-SEE (Figs. 42, 43, Table 7). The distance between groups VI and VII is 1.3 cm, and the distance between group VII and the object's apex is 7.4 cm.

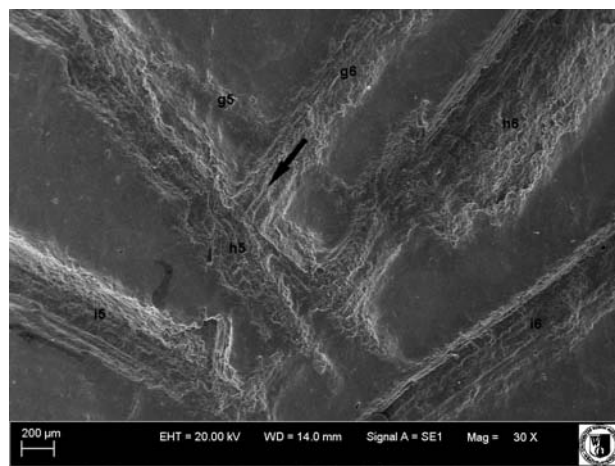


Fig. 41. Rusinowo, group AVI. Intersections of strokes h6 and h5, g6 and g5, and strokes i6 and i5 (no point of contact). Stroke g6 evidently cuts into g5 and h5 (arrow)

The lines have been engraved quite densely. In the style of their execution they resemble groups V-VI, although a fragment of line VIIa differs in its level of execution from other ornaments in this group. Every line in VIIa-d is built by 27 strokes, only zigzag AVIIe has been engraved according to a different rhythm. It is built by 24 strokes, with the change of the rhythm made right at the beginning – stroke e2 is found under d4, and moreover, there is no closing stroke engraved under the final strokes in the other lines (a27-d27).

The analysis of the execution of successive strokes forming the zigzag lines shows that we can make out two groups: i./ line VIIa; ii./ lines VIIb-e. The method of execution of VIIa was reconstructed using a limited number of intersections, first, because there were no strokes intersecting in their apex part, second, because of the damage to this line (Fig. 43). The technological level of execution of the lines is markedly different: strokes a1-20 were engraved with a level of skill similar to that of the rest of the lines in the group – sometimes they are crooked, their junctions at the angles are irregular, and striations observed at the bottom of the strokes and the considerable width of some of them are evidence that the maker had to struggle to keep the appropriate angle of the engraving point and had insufficient control over the pressure exerted by the tool (Figs. 44-46). Strokes a21-26 were made by applying limited pressure, with a broad engraving point; alternately this could be the effect of work in unsoftened antler.

The analysis of the strokes in the ornament has shown that in the fragment a1-16, a17 or a18, the direction was generally west-to-east (Table 1). With some irregularities, however (Fig. 43): stroke a2 took form before stroke a1 (a1 cuts into a2), and in

engraving strokes a9-14 the serial method had been used to some extent. Analysis of intersections of strokes a18-a20 and a25 with a26 shows that this part of the line was engraved east-to-west. If so, the two fragments of the line must have met at a16-18. None

of the other intersections of strokes within subgroup a16-27 can be deciphered, or these strokes do not join to form an angle. Given that the point used in carving the strokes a21-27 is broad and had been changed/repairs after engraving a21, and moreover that strokes a16-20 do not differ from a1-15, it may be surmised that the eastern fragment of the line was



Fig. 42. Rusinowo, group AVII. General view of the ornament. (Photo T. Gąsior)

Table 7. Rusinowo, group AVI. Parameters of zigzag lines VIIa-VIIe

| No. of line | Number of strokes | Height of zigzag line [cm] | Length of strokes [cm] |
|-------------|-------------------|----------------------------|------------------------|
| VIIa        | 27                | 0.4-0.8                    | 0.4-0.7                |
| VIIb        | 27                | 0.4-0.8                    | 0.35-0.6               |
| VIIc        | 27                | 0.35-0.8                   | 0.3-0.6                |
| VIIId       | 27                | 0.3-0.9                    | 0.3-0.7                |
| VIIe        | 24                | 0.55-0.9                   | 0.3-0.75               |

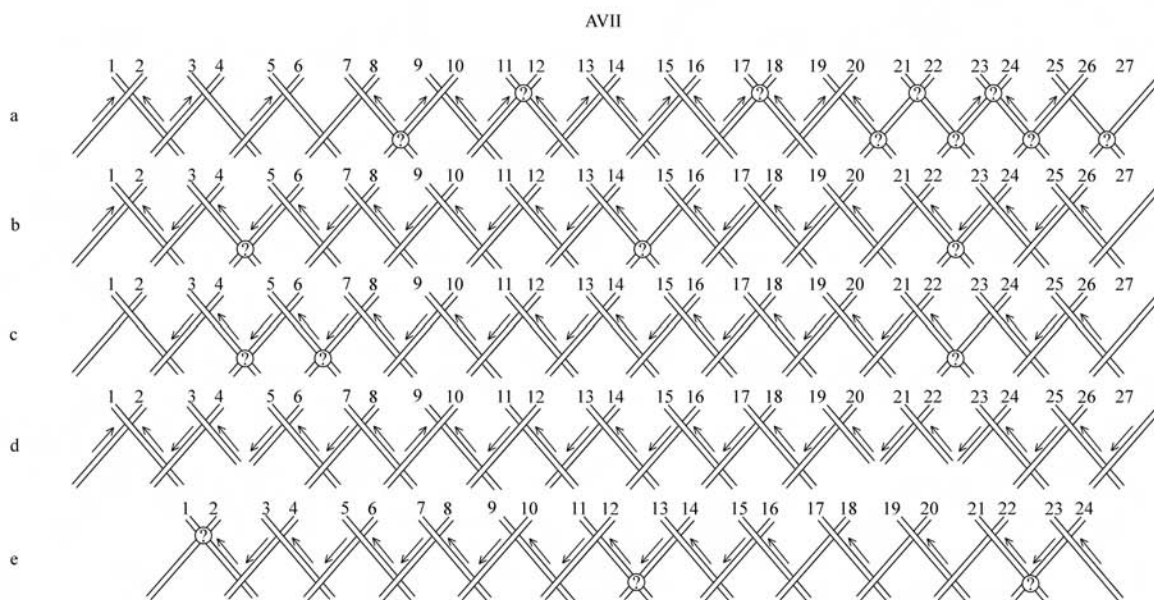


Fig. 43. Rusinowo, group AVII. Diagram showing the process of engraving the ornament. (symbols – see Fig. 3)

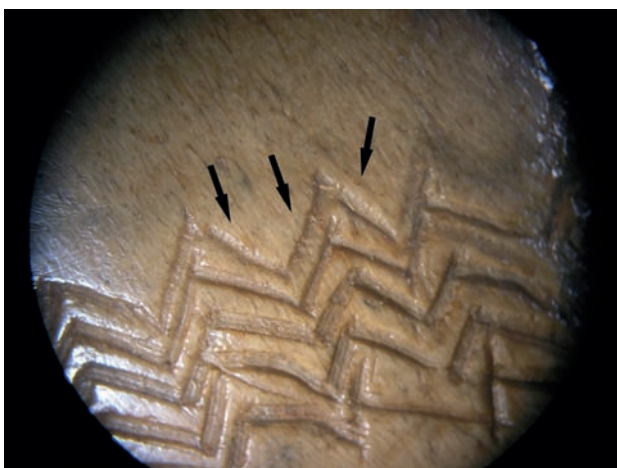


Fig. 44. Rusinowo, group AVII. Irregular strokes in line VIIa, a18-a20 (arrows), (10.0x) photo from SW. (Photo M. Diakowski)

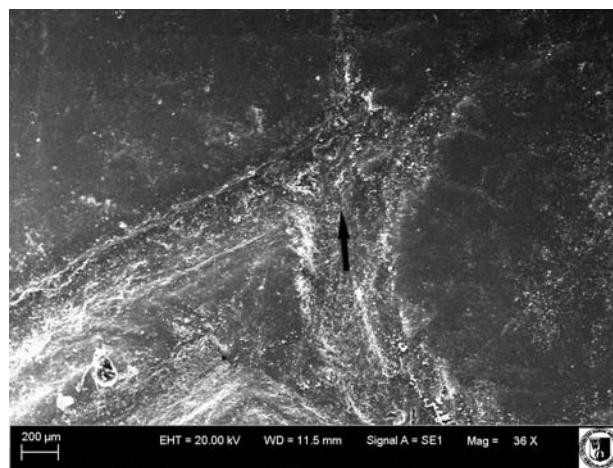


Fig. 45. Rusinowo, group AVII. Irregular intersection of strokes a14 and 13 (a14/a13) (arrow)

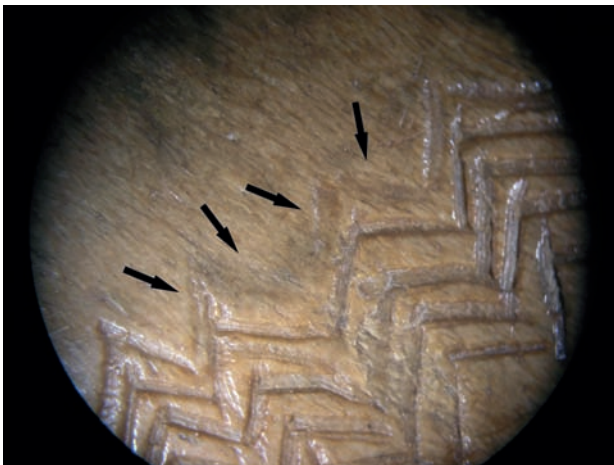
the first to take form. However, this hypothesis cannot be proven on the evidence of the intersections alone so that in theory it is possible that the western fragment was engraved first.

These observations suggest that the two fragments of the zigzag line AVIIa were made by two different individuals: a “master”, who had engraved also all the other lines, and an “amateur”, who carved strokes a21-27. However, it is not fully unfeasible either that a single individual had used two different engraving points or/and had worked in unsoftened antler.

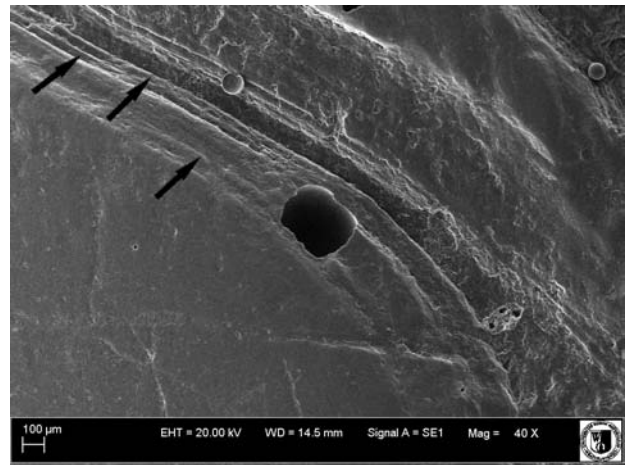
The remainder of the lines, VIIb-e, were engraved west-to-east with strokes forming individual zigzag lines executed one after another. Only some of the strokes building line VIId (d8-13) were carved using the serial method (Fig. 47) – starting with the even strokes (d8, d10, d12), and followed by odd strokes. One intersection is not consistent with this

scheme – stroke d12 cuts across d13. The cause of this inconsistency must have been the touching up of stroke d12 when the whole group d8-13 was already complete.

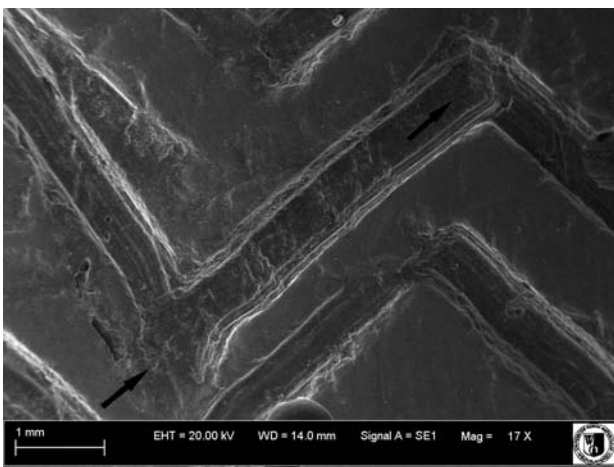
Strokes building individual zigzag lines were engraved largely according to the most frequently observed scheme, SE-to-NW and NE-to-SW. However, some departures from this rule were identified. In line VIIa, which diverges from other zigzag lines in its group, even strokes were engraved mostly SW-to-NE. Moreover, the opening strokes of lines VIIb and d (b1, d1) were executed SW-to-NE, to avoid the inconvenience of engraving them towards the edge of the object (side D). Strokes building the zigzag lines were touched up, often three or four times, as is evidenced by multiple starting points and lateral striations (Figs. 47, 48). The prevailing method of touching up the strokes was in the same direction. Except for the fragment of line VIIa, the



**Fig. 46.** Rusinowo, group AVII. Flat and broad, repeatedly touched up strokes a21-24 (arrows), ( $\times 10.0$ ). (Photo M. Diakowski)



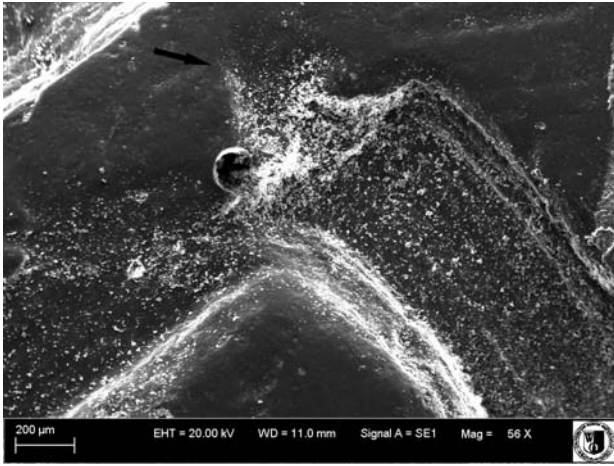
**Fig. 48.** Rusinowo, group AVII. Traces of touching up stroke e16 in the form of lateral striations (arrows)



**Fig. 47.** Rusinowo, group AVII. Intersection within line VIIId, d11/d10 and d11/d12 (arrows)



**Fig. 49.** Rusinowo, group AVII. Strokes e18-e23 (arrows) of a different width, with imprecise joins, not to scale. (Photo T. Gąsior)



**Fig. 50.** Rusinowo, group AVII. The ending point of the of stroke e10 with evident mark of lifting the engraving tool (arrow)



**Fig. 51.** Rusinowo, group AVII. Vicinity of strokes b23, c23 and d23 with traces of pecking (arrow), (10.0x); photo from SW (Photo M. Diakowski)

level of execution of the ornament indicates an expert engraver who only occasionally made mistakes. These are evidenced by the presence of striations, an irregular arrangement of individual strokes, and their imprecise joins (Fig. 49), and also, by traces developed when the engraving tool was lifted from a stroke (Fig. 50).

Intersections of strokes forming individual lines demonstrate that they were engraved north-to-south, ie, starting with VIIa, and ending in VIIe. When the ornament was complete some of its area was stippled, these short strokes more reminiscent of percussion marks produced with a blunt tool than regular engraving. These remains of pecking were observed in the region of strokes c23, c24, d23 and d24; their preservation proves that they took form long ago, most likely, soon after the ornament was made (Fig. 51). Since they lack any practical explanation they may be identified with some confidence as traces of ritual behaviour.

**Ornament on side B**

*Group BI*

This group consists of two zigzag lines running lightly diagonally to the vascular groove which divides the decorated surface of the object (Figs. 52, 53, Table 8). The orientation of this groove is parallel to the N-S axis of the artefact. Zigzag lines (Ia and Ib) are discontinuous, they stop short of the groove; each of these two lines are divided by the vascular groove into an eastern and a western fragment. The lines themselves are irregular, with evidence of weathering, preventing a closer examination of the sequence of execution of the ornament.

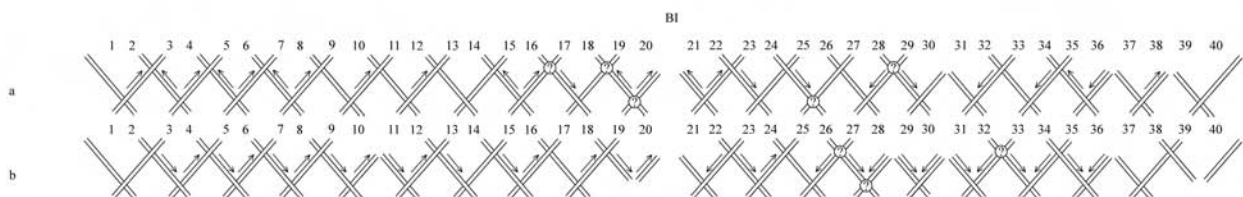
Each line consists of 40 strokes, evenly spaced, 20 within the western and 20 within the eastern fragments (Table 8). These strokes are quite small - the shortest and the narrowest of all the zigzag lines on the artefact, similarly, the width of Ia and Ib is the smallest of all the zigzag lines. The impression is that their small dimensions were dictated by



**Fig. 52.** Rusinowo, group BI. General view of the ornament. (Photo T. Gaşior)

**Table 8.** Rusinowo, group BI. Parameters of zigzag lines Ia-Ib

| No. of line | Number of strokes | Height of zigzag line [cm] | Length of strokes [cm] |
|-------------|-------------------|----------------------------|------------------------|
| Ia          | 40                | 0.2–0.4                    | 0.18–0.45              |
| Ib          | 40                | 0.2–0.4                    | 0.18–0.5               |



**Fig. 53.** Rusinowo, group BI. Diagram showing the process of engraving the ornament. (symbols – see Fig. 3)

the need to fit a specific number of strokes (20 each time) on both sides of the vascular groove. They were executed using a fine cutting tool, one which was not used while engraving the ornament on side A. These lines were carved by an individual with little experience in the art of engraving: the apexes are dragged out, the arrangement of the strokes is far from regular. Near to the edges of the object, strokes a1, a40, b1 are worn, due to the extended use of the object.

As was noted earlier, in the area of the vascular groove these two zigzag lines were interrupted – the maker did not continue engraving the ornament here. However, 1.75 cm above line Ia, within the vascular groove, there is an oblique 0.8 cm long stroke (see Fig. 1 in sub-chapter 3.1.). It was engraved deeper than the strokes of zigzag lines in group BI. If the gaps in the two zigzag lines are not there for a technological reason, they may represent a space left empty within the ornament for symbolical reasons. This stroke might mark the boundary of the space left between the eastern and western sections of the zigzag, but added over it. The significance of this pattern will be addressed in the later discussion. Other than the solitary stroke engraved inside the vascular groove, over a fragment of lines a2-a5 we observe another engraved stroke, with a length of 0.35 cm. The significance of this stroke is unclear. It was definitely engraved after working the surface of the object, most likely, at the same time as group BI. On the other hand, it is shallower and more delicate than the strokes forming the zigzag lines of this group.

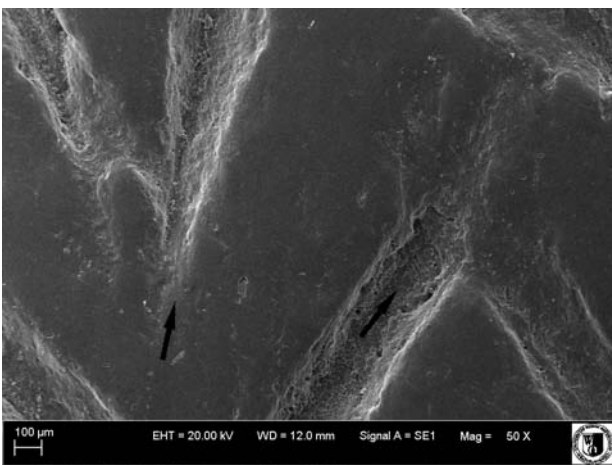
The sequence in which zigzag lines in group B were engraved appears more complex than in the case of side A. The western fragment of line Ia (a1-20) was engraved east-to-west, although the intersections

show some outsiders in this sequence: strokes a18-20: i./ stroke a18 was crossed by a17, next, stroke a15 was engraved; ii./ stroke a15 was crossed by strokes a14 and a16, and stroke a14 by a13; iii./ the serial method was used – odd strokes a13-1 were engraved, followed by even strokes a12-2 (Fig. 54).

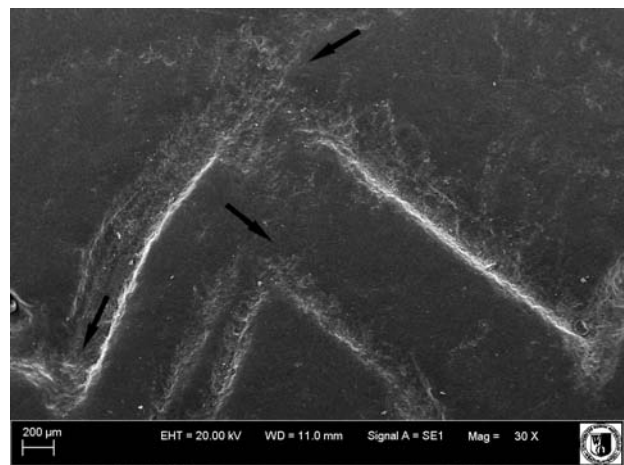
In the eastern fragment of Ia the sequence of engraving the ornament was reversed –away from the vascular groove, eastward. There is evidence (at least for a31-36) for the extensive use of the serial method: odd strokes (a31, a33, a35) were engraved first, followed by even strokes (Fig. 55). It is possible that the serial method was applied here on an even wider scale.

Strokes forming the western fragment of line Ib (b1-20) were engraved similarly as fragment a1-20, from the vascular groove towards the edge of the object (Fig. 54). In contrast to a1-20 in engraving this fragment the serial method played only a minor role – it was used only intermittently. The time of engraving stroke b20 is unclear, because it does not form an intersection with b19; presumably, it took form at the very beginning of the process of carving this fragment, but we have no direct evidence for this.

Not less problematic is reconstruction of the sequence of engraving the ornament in the eastern fragment of the zigzag line Ib (b21-40). Two methods were used here: the serial and the linear (stroke by stroke) method, only the participation of the two cannot be recognized conclusively owing to the damaged condition of the ornament and the absence of intersections. Strokes b21-26 were engraved using the serial method, with odd modules executed first, followed by even strokes. A little farther on, evidence was found for the use of the serial method (b34-36), but here even strokes were engraved first (Fig. 55).



**Fig. 54.** Rusinowo, group BI. Intersections in western sections of zigzag lines Ia (a8/a7) and Ib (b8/b9) (arrows)



**Fig. 55.** Rusinowo, group BI. Intersections in eastern sections of zigzag lines Ia (a34/a33 and a34/a35) and b (b35/b34) (arrows)

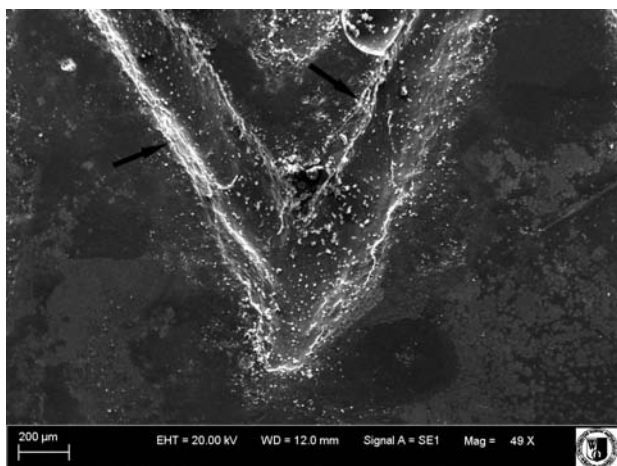


Fig. 56. Rusinowo, group BI. Traces of touching up in strokes b11 and 12 (arrows)

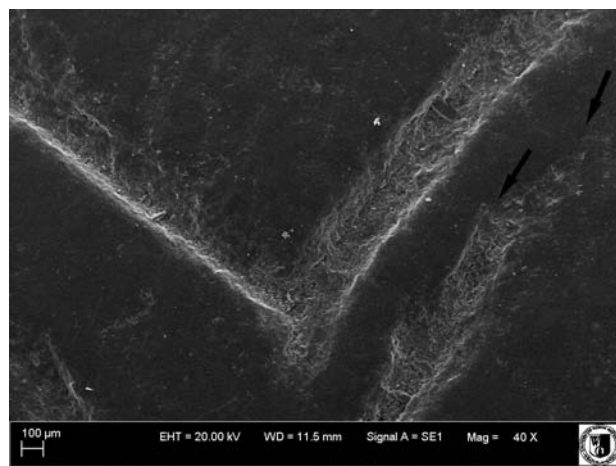


Fig. 57. Rusinowo, group BI, strokes. Change of direction of stroke b36 (arrows)

Some sequences in the fragment b21-40 where strokes were engraved one after another prove that it took form, similarly as a21-40, west-to-east – from the vascular groove towards the edge of the object.

Basing on the available observations it may be concluded that within individual fragments of the line the strokes were engraved in different directions. Within fragment a1-20 odd strokes were engraved mostly SE-to-NW, while even strokes were engraved SW-to-NE. Within a21-40 and b1-20 odd strokes were mostly engraved NW-to-SE, and even strokes – mostly SW-to-NE. Strokes forming part of fragment b21-40 as a rule were engraved NE-to-SW (even strokes) and NW-to-SE (odd strokes). The traces of the touching up of the strokes are quite often worn away. The touching up was performed mostly in the same direction, its remains have survived in the form of multiple lateral striations and multiple starting points (Figs. 56), sometimes it results in a small change of stroke direction (Fig. 57).

Evidence to identify the sequence of engraving lines Ia and Ib is limited; this is because strokes within these two zigzag lines rarely come into contact with each other. Worse still, the data at hand is apparently contradictory. In the case of the western fragments of both lines b15/a15 it suggests that the fragment b1-20 was probably engraved after a1-20, although it is feasible that these two fragments were engraved simultaneously. For eastern fragments, we have just one piece of solid evidence – a32 cuts into b32. A single intersection, given the data presented above, tells us little about the sequence of engraving these fragments (a21-40 and b21-40).

*Group BII*

Group BII is found 1.5 cm to the south of the previously described. It consists of two zigzag lines (IIa and IIb), running parallel to the east-west axis (Figs. 58, 59, Table 9). The lines cut into the vascular groove at right angles, but differently than group BI, the



Fig. 58. Rusinowo, group BII. General view of the ornament. (Photo T. Gaşior)

Table 9. Rusinowo, group BII. Parameters of zigzag lines IIa-IIb

| No. of line | Number of strokes | Height of zigzag line [cm] | Length of strokes [cm] |
|-------------|-------------------|----------------------------|------------------------|
| IIa         | 26                | 0.3–0.6                    | 0.3–0.5                |
| IIb         | 26                | 0.25–0.55                  | 0.25–0.55              |

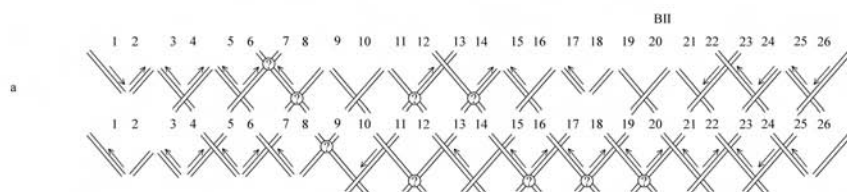
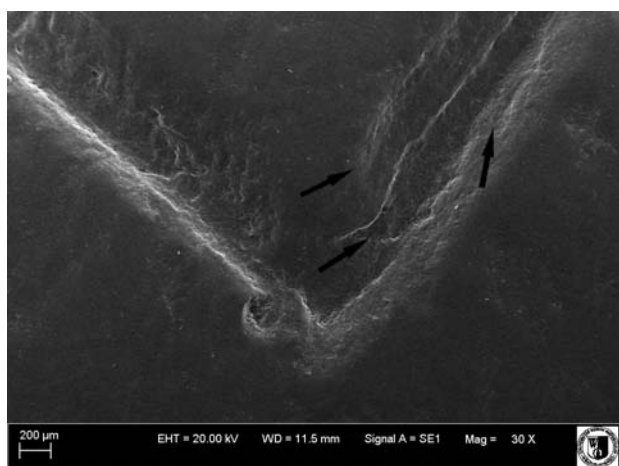


Fig. 59. Rusinowo, group BII. Diagram showing the process of engraving the ornament. (symbols – see Fig. 3)



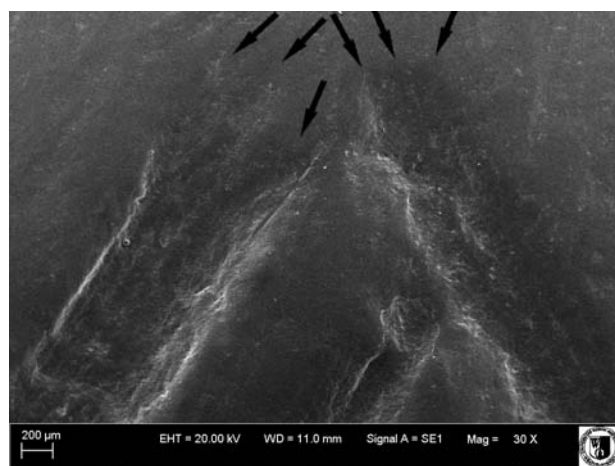


**Fig. 60.** Rusinowo, group BII. The intersection of strokes b23 and b24 (b24/b23), evident ending point b24; striations and microchips in both strokes (arrows)

ornament does not lose its continuity at this point, it is seen on the walls and the bottom of the vascular groove, shallow at this point and its depression – barely visible. The surface of the artefact in the area featuring group BII is damaged by erosion. The lines of the ornament have either been affected by this damage – their bottom and edges are smoothed down and have a characteristically cracked structure. This process is most apparent in the depression of the vascular groove. Each line is formed by 26 strokes which range in length from 0.25 to 0.6 cm (Table 9). Both of them were engraved with a broad cutting tool, evidently different from the one used in incising BI.

Both zigzag lines, IIa and IIb, were executed west-to-east (Table 1). The strokes were engraved one after another, none of the available intersections confirm the use of the serial method. However, this does not mean that it was not used at all, only that its remains were no longer recoverable due to the erosion of the ornament and the fact that a large number of strokes forming the zigzag lines do not intersect at the angles. On the other hand, many strokes opening and closing the zigzag lines display a peculiarity of direction and a sequence of execution because the maker had to cope with the curvature of the surface being decorated.

Strokes in both zigzag lines were engraved SE-to-NW (odd strokes) and SW-to-NE (even strokes) (Fig. 60). Only a handful of elements were executed in the reverse order (a1, a26, b24). After engraving, the strokes were touched up, mostly in the same direction, moreover, often this was done more than once. This is evidenced primarily by several starting points, observed in many strokes, and also



**Fig. 61.** Rusinowo, group BII. The intersection of strokes a22 and a23, evident multiple starting points in a22, and ending points in a23 (arrows)

by cases where the touching up stroke does not fully coincide with the original stroke (Figs. 60, 61). At the same time, quite a few of the strokes exhibit no such traces – the touching up is evidenced by the stroke width and depth, and the traces of touching up have been fully removed by the last engraving episode.

Intersections of strokes within lines IIa and IIb confirm the sequence in which they were engraved – first, line IIa, and only then, line IIb.

#### *Group BIII*

Group BIII is found 1.9 cm to the south of BII and runs parallel to the east-west axis (Figs. 62, 63, Table 10). It is much less regular than the groups of zigzag lines described so far, since next to three full lines (IIIa-c), each consisting of 24 strokes, there are two short zigzag lines built by nine (III d) and seven (III e) strokes (Table 10). Both short zigzags are found in the eastern part of the group, between III b and III c (III d1-9), and to the south of III c (III e1-7). Right below this group – under its SE angle – is a simple engraved mark which may be described as half of an arrow.

In the light of current studies line IIIa, at least in its fragment a1-19 was engraved west-to-east using the stroke by stroke technique (Fig. 64, Table 1). Unfortunately, in the fragment a19-24 there were no intersections, or they are poorly preserved so that we do not know for certain whether this fragment of the line was engraved following the system outlined earlier. Thus, presumably, a part of the strokes was executed using the serial method (a23 was probably engraved after a22 and a24).

Line III b presumably took a form west-to-east, and the use of the serial method prevails here (Figs.

63, 65, 66). However, the significance of this method cannot be determined more accurately due to the absence of intersecting strokes or where readable, their damaged condition. What is known however is that in the fragment b10-b15 the first to be engraved were strokes b10, b12, b14, and only after them, strokes b11, b13 and b15 (Fig. 63).

Line IIIc took form west-to-east with a varying involvement of the serial method (Fig. 67). In lines IIIId and IIIe, the order was west-to-east as well. The strokes were engraved one after another, except for d4-6, where their sequence is d4, d6, d5.

The rhythm of engraving the strokes of the ornament was not always the same. In line IIIIa odd strokes were engraved NW-to-SE, and even strokes, NE-to-SW. At the eastern end, the rhythm is disrupted since we observe here fragments engraved in the reverse direction (SE-NW, SW-NE). In line IIIIb, the strokes were engraved mostly SE-to-NW, and SW-to-NE, similarly as the modules in line IIIId. Within line IIIIc the directions were SE-to-NW and NE-to-SW, the same in line IIIIe – the movement

was NE-to-SW and SE-to-NW. After engraving, the strokes were touched up, very likely, mostly in the same direction. Sometimes this touching up lacked accuracy and did not fully coincide with the originally engraved stroke – in which case there were two strokes instead of one (eg, a16, c6, c12, c16). Strokes a20-24, in any case, similarly as b20-24 and c20-24, and d5-d9 as well, were executed with the same cutting tool, apparently not the same as the tool used in engraving all the other strokes in all the lines. Furthermore, the fragments named here were executed with greater skill (expert!) and the strokes display a regular direction of engraving (Table 11).

The sequence of the engraving of individual lines is documented by intersections of their constituent strokes. On the evidence of numerous intersections, it would appear that the first zigzag lines engraved were IIIa and IIIb (Fig. 66). The sequence of the engraving of IIIc-d is confirmed by a smaller number of intersections (eg, stroke c17/ d3, c21/d7, c23 cuts into d9, and c18 crosses e1). Based on that, it may be



Fig. 62. Rusinowo, group BIII. General view of the ornament. (Photo T. Gašior)

Table 10. Rusinowo, group BIII. Parameters of zigzag lines IIIa-IIIe

| No. of line | Number of strokes | Height of zigzag line [cm] | Length of strokes [cm] |
|-------------|-------------------|----------------------------|------------------------|
| IIIa        | 24                | 0.3-0.6                    | 0.25-0.5               |
| IIIb        | 24                | 0.35-0.55                  | 0.3-0.45               |
| IIIc        | 24                | 0.4-0.5                    | 0.3-0.55               |
| IIId        | 9                 | 0.35-0.5                   | 0.4-0.5                |
| IIIe        | 7                 | 0.35-0.55                  | 0.25-0.5               |

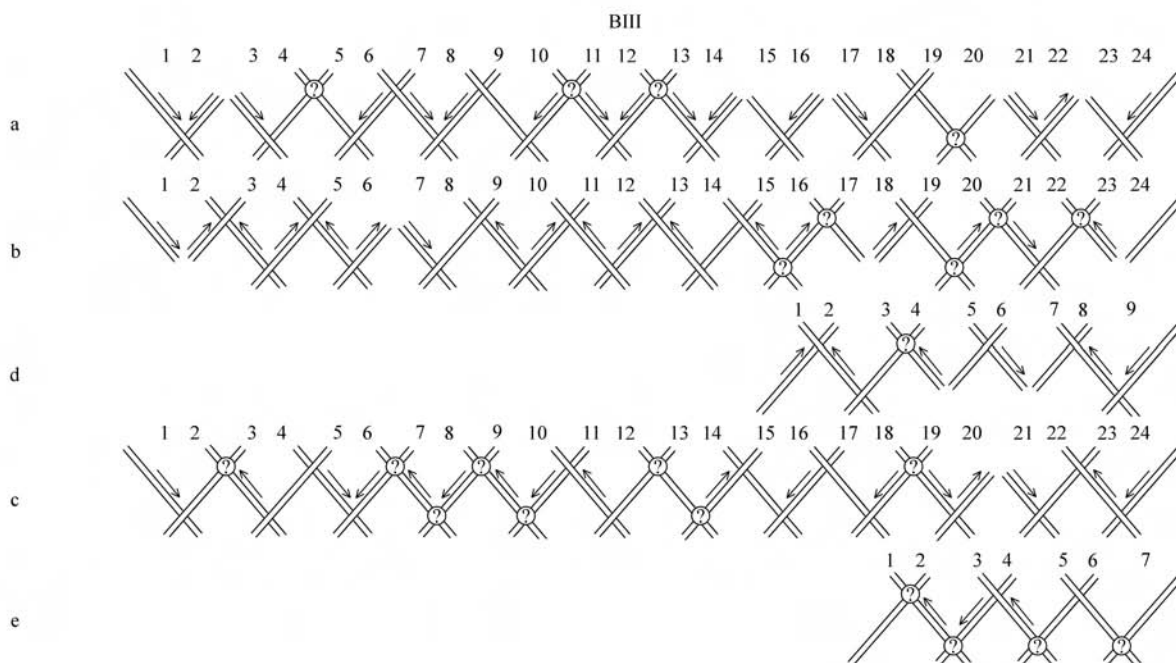
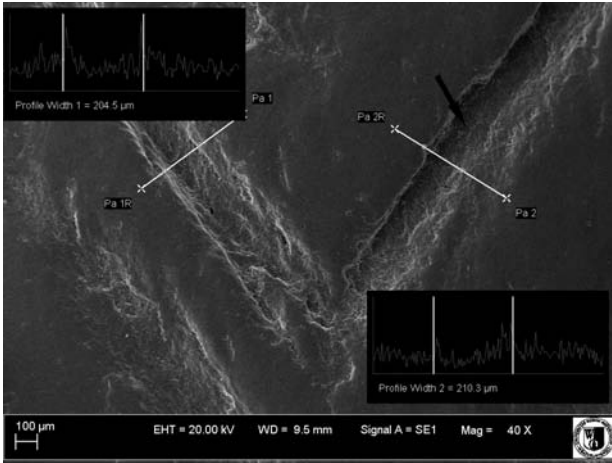
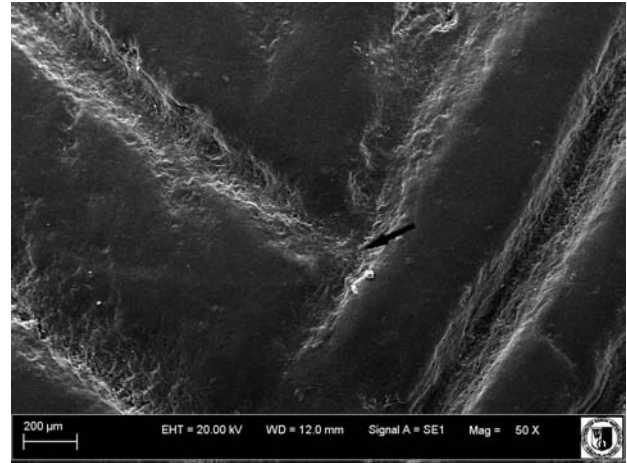


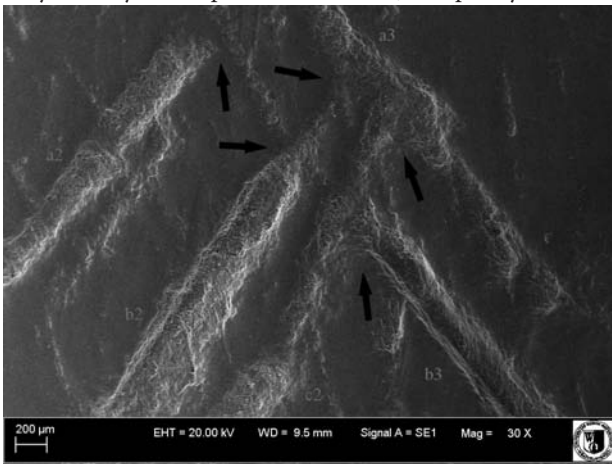
Fig. 63. Rusinowo, group BIII. Diagram showing the process of engraving the ornament. (symbols – see Fig. 3)



**Fig. 64.** Rusinowo, group BIII. The intersection of strokes a4 and a3 (a3/a4, arrow) and their cross-sections. Evident asymmetry of the profile of stroke a3, deeper by W wall



**Fig. 66.** Rusinowo, group BIII. The intersection of strokes b21 and b22 – b22/b21 (arrow)



**Fig. 65.** Rusinowo, group BIII. The intersection of strokes a2, a3, b2, b3, c2: b2/b3; b2/a3; b3/a2; c2/a3, c2/b3 (arrows)



**Fig. 67.** Rusinowo, group BIII. The intersection of strokes c12 and c11 (photo from SW); c12 is composed of two strokes: upper and lower (arrows); the upper stroke was cut by c11, the lower one cut into c11 (16×). (Photo M. Diakowski)

**Table 11.** Rusinowo, group BIII. Direction of engraving strokes a20-24, b20-24, c20-24, d5-d9

| Strokes<br>Lines | 20 (d5) | 21 (d6) | 22 (d7) | 23 (d8) | 24 (d9) |
|------------------|---------|---------|---------|---------|---------|
| IIIa             | ↗       | ↘       | ↗       | ?       | ↖       |
| IIIb             | ↗       | ↘       | ?       | ↖       | ↖       |
| IIIc             | ↗       | ↘       | ?       | ↖       | ↖       |
| IIId             | ?       | ↘       | ?       | ↖       | ↖       |

surmised that line IIId was engraved after IIIb but before zigzag line IIIc, which was executed at the very end. The chronological position of IIIe is not fully clear, it was completed before line IIIc. The final sections of lines IIIa-IIIId were engraved in a similar sequence, ie, IIIa20 to 24, moving downwards, presumably only when the rest of the ornament had been executed by a less skilled engraver (c23/d9).

Cross-sections of the strokes of the ornament revealed, in some lines, a characteristic asymmetry,

already mentioned by us earlier: the deepest part of the stroke groove is by its western wall, suggesting that the hand of the engraver rested on the eastern side of the engraved strokes (Fig. 64).

*Group BIV*

Group BIV consists of five zigzag lines running parallel to the east-west axis. It is found 2.1 cm to the south of group BIII. The lines forming group BIV consist of a different number of strokes (Figs. 68, 69, Table 12), with the engraving of line IVd abandoned at an early phase. Line IVa, consisting of 28 elements, ends in stroke (a28) after which there are three short strokes, partly intruding on each another. In zigzag line IVe on the other hand, stroke e11 was nowhere to be seen, but it is not fully clear whether deliberately or through oversight. In line IVd there are 11 strokes, with d10 followed by d12, thus, stroke no. 11 is missing here too.



Fig. 68. Rusinowo, group BIV. General view of the ornament. (Photo T. Gąsior)

Table 12. Rusinowo, group BIV. Parameters of zigzag lines IVa-IVe

| No. of line | Number of strokes | Height of zigzag line [cm] | Length of strokes [cm] |
|-------------|-------------------|----------------------------|------------------------|
| IVa         | 28                | 0.3–0.5                    | 0.2–0.45               |
| IVb         | 31                | 0.3–0.5                    | 0.25–0.4               |
| IVc         | 31                | 0.3–0.45                   | 0.2–0.4                |
| IVd         | 11                | 0.3–0.5                    | 0.25–0.4               |
| IVe         | 31                | 0.3–0.55                   | 0.3–0.65               |

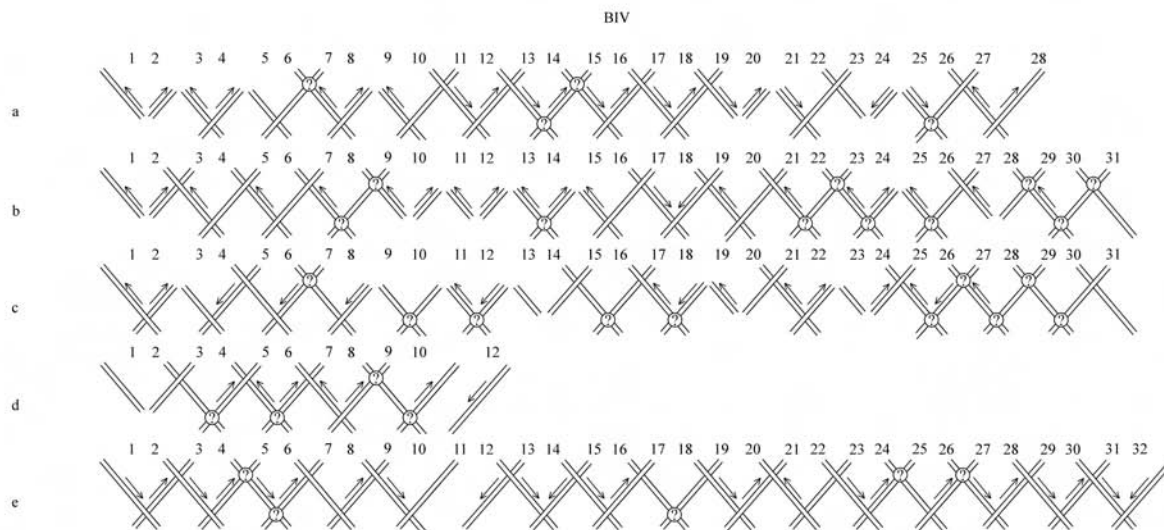


Fig. 69. Rusinowo, group BIV. Diagram showing the process of engraving the ornament. (symbols – see Fig. 3)

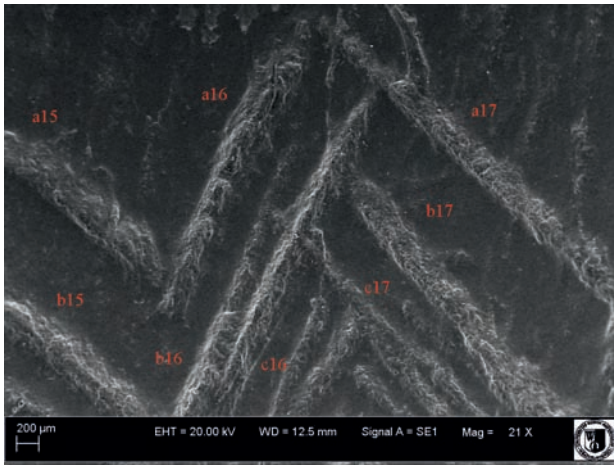
Elements building the zigzag lines in group BIV were incised with little skill; they are uneven, irregular, intrude on one another. It is possible they were made with the same tool as the one used in engraving most of the lines in group BIII (strokes incised by an “amateur”).

On its eastern side, the group extends to the plane with the exposed spongiosa; on its surface is visible a deep, 1.0 cm long cut, running obliquely towards strokes b31 and c31, forming something like an extension of the two lines named here IVb and IVc. This extension line was engraved from NE, and its SW apex evidently removes the apexes in strokes b31 and c31.

Other zigzag lines in the same group have also some other, additional strokes around them (Fig. 68), which have only a partly understood relationship with the rest of the composition. Most of them are associated with line IVe. At the extension of stroke e12 to the south-west, there is a shallow stroke, more eroded than other elements in this group, possibly a leftover from a group of zigzag lines predating the engraving of BIV, or an attempt at engraving such a group. At e14 and angles e27 and 28, line IVe crosses, at right angles to the group, a number of linear

traces – possibly associated with the working of the object; on the other hand, they could indicate some orientation points used while making the ornament. Finally, stroke e20 is intersected midway by a perpendicular stroke – possibly associated with a failed attempt at giving the zigzag a slightly different route.

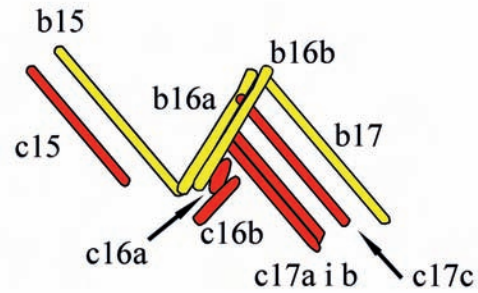
The zigzag lines tend to be engraved west-to-east, with strokes executed one after another, or using the serial technique (Table 1). The absence of intersections and the damage to the ornament sometimes prevent identifying the extent to which the latter technique was used, thus, for example, barring one exception we were unable to sequence the intersections in the long fragment of line IVb (b22-31). The serial technique was used in engraving strokes a21-a23, as well as a26-28: first, the even strokes were engraved, and after them, the odd strokes. The shape of strokes a24 and a25 shows that they could have been engraved in such a way that the entire fragment a21-28 was made in the serial fashion. This too was the method used in engraving strokes b3-7 (first, b3, b5, b7, and next, b4 and b6), b15-20 (b15, b17, b19, followed by b18 and b20), at least c1-6 (c2, c4, c6 followed by c1, c3, c5), d1-5 (d1, d3, d5, followed by d2, d4), e1-8 (e2, e4, e6, e8, followed by e1, e3, e5,



**Fig. 70.** Rusinowo, group BIV. Strokes a and b15, a-c 16 and 17: a16/a15, b16/b17, c17/c16, for more intersections see Fig. 71 (arrows). Repeated touching up of the strokes, evidently ragged stroke edges

e7). In the case of the closing fragment of line IVc (c21-31), we may also assume a wider scale use of the serial technique. Unfortunately, in this part of the ornament, the strokes often do not intersect at the angles and their state of preservation is not too good; however, it is understood that stroke c21 was crossed by c20, that c24/c25, and c30/31. Thus, presumably, in this part of line IVc the odd elements were made first, and only then, the even strokes. The strokes in the eastern part of line IVe (e20-32) were mostly engraved using the serial technique (Fig. 69).

Recognizing the direction of engraving the strokes is hindered by their repeated touching up and poor preservation. The strokes in the western fragment of line IVa were incised SE-to-NW (odd strokes) and SW-to-NE (even strokes); in a later fragment of IVa odd strokes were mostly engraved NW-to-SE. Lines IVb and d are definitely dominated by strokes made in a SE-to-NW rhythm (odd strokes) and SW-to-NE (even strokes) although there were some which were made the other way round. In line BIVe strokes were engraved NW-to-SE and SW-to-NE. They had been touched up more than once, as a rule in the same direction, and sometimes in the to-and-fro technique. The repeated touching up is confirmed by the profiles of the strokes which do not exhibit any more obvious asymmetry. On the other hand, there is ample evidence that while touching up, the individual who made the engraving missed hitting the original stroke, so that some of the strokes came out doubled or trebled (Fig. 70). This appears to be due to the limited experience of the person who executed this part of the ornament and would be confirmed by a large percentage of strokes with ragged edges (Fig. 70). They suggest problems with



**Fig. 71.** Rusinowo, group BIV. Schema of strokes b15-b17 and c15-c17. Strokes b15, b16a and b17 were engraved first, followed by c15, c16a and b and c17a-c (c17c cuts into b16a). The last to be engraved was b16b

sustaining the right angle of attack of the engraving tool (Fritz 1999). On occasion the process of touching up is very comprehensive, as with b16, c16 and c17 – ultimately stroke b16 was touched up after the engraving and touching up of c16 and c17 (Figs. 70, 71). Strokes d1-8 were engraved very tentatively – they merely outline the arrangement of the ornament.

The sequence of the engraving of individual lines is documented by intersections between them. On their evidence it is safe to say that lines IVa-c took form in succession, moving from the north, ie, first IVa, next b, and at last, c. After this, the work on line IVd started but its strokes tend to be very delicately engraved – and not touched up. Stroke d9 clearly intruded on c9 and uses its course, d10 has the form of an overly short stroke. In the closing fragment of this unfinished line is a solitary stroke – d12 – but it is unclear whether it is an example of the use of the serial technique or a deliberate skipping of stroke d11 (cf. e11). It seems that this unfortunate meeting point of the two lines may have persuaded the maker to abandon line IVd and engrave IVe, the last to be completed within this particular sequence.

#### *Group BV*

Group BV consists of four zigzag lines, running SW-to-NE (Figs. 72, 73). In the western part, the distance between groups BIV and BV is 2.1 cm. Each of the four lines consists of 34 strokes. The height of individual zigzag lines is in the range of 0.3-0.8 cm, and the length of strokes in lines of this group is 0.25-0.75 cm (Table 13). Line Va is not uniform in the quality of its execution: next to strokes engraved ineptly and touched up with little skill, there are fragments similar to lines Vb-d, showing a superior



Fig. 72. Rusinowo, group BV. General view of the ornament. (Photo T. Gąsior)

Table 13. Rusinowo, group BV. Parameters of zigzag lines Va-Vd

| No. of line | Number of strokes | Height of zigzag line [cm] | Length of strokes [cm] |
|-------------|-------------------|----------------------------|------------------------|
| Va          | 34                | 0.45–0.7                   | 0.25–0.7               |
| Vb          | 34                | 0.4–0.75                   | 0.3–0.7                |
| Vc          | 34                | 0.4–0.8                    | 0.3–0.7                |
| Vd          | 34                | 0.3–0.8                    | 0.3–0.75               |

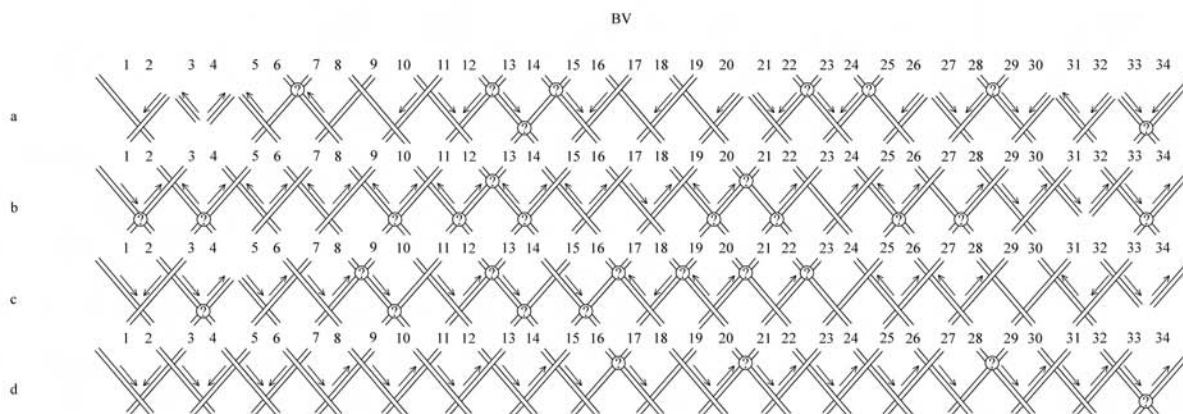


Fig. 73. Rusinowo, group BV. Diagram showing the process of engraving the ornament. (symbols – see Fig. 3)

craftsmanship (Fig. 74). To the north of the eastern part of the group we observed a single chevron, its strokes engraved in a direction opposite to other zigzags in the group (Fig. 75). It is hard to say whether this mark represents a separate “commentary”, or is associated with an older attempt at making a different ornament. The first interpretation appears to be the more likely because nowhere else on the artefact are there similar unfinished elements, therefore we may suppose that if they existed at all, they had been rubbed out with care.

Individual zigzag lines were engraved east-to-west, the strokes executed in different ways – one after another, or in the serial technique (Table 1). For the large fragments of a line, the sequence of engraving the strokes cannot be resolved because they do not form intersections, or the points at which they cut into one another are now eroded. Line Va has a documented stroke by stroke rhythm from a12 through to a10 (a10 cuts into a11 which cuts into a12) and from a20 to a17 (a19/20, a18/19 and a17/18). In the case of strokes a27-34 we may suspect the use of the serial technique: first, odd strokes were

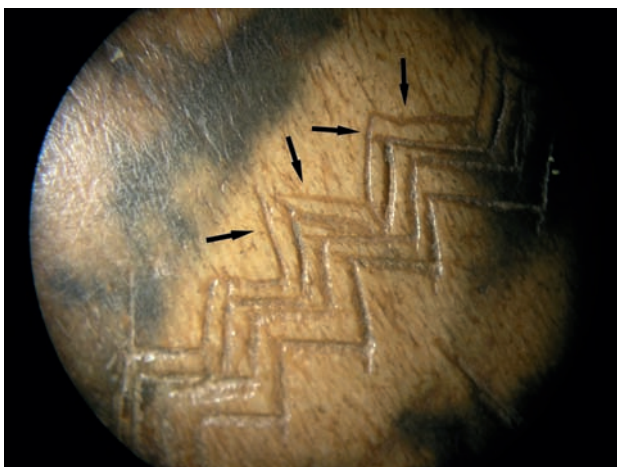
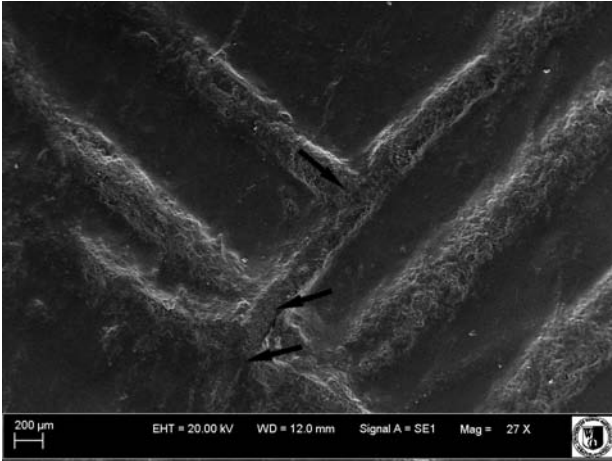


Fig. 74. Rusinowo, group BV. Differences in the level of execution of line BVa (arrows), (10×); photo from SW. (Photo M. Diakowski)



Fig. 75. Rusinowo, group BV. A chevron to the north of the eastern section of the group, (10×). (Photo M. Diakowski)

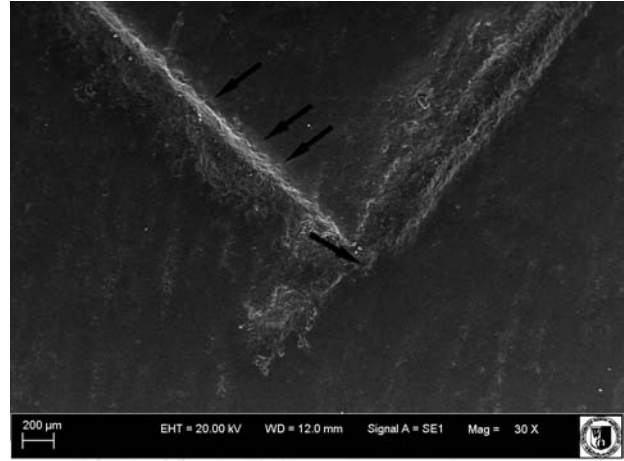


**Fig. 76.** Rusinowo, group BV. Stroke a23 cuts into a24, a24 intersects b24 (arrows)

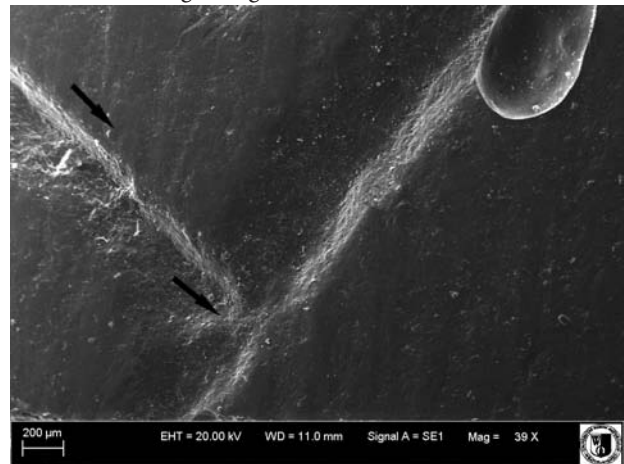
engraved, and only after them, even strokes; at the same time, it is hard to resolve whether a21-26 were engraved one after another, or in the serial technique (Fig. 76). The latter was used in making strokes a13-17. First, a16 and a14 were engraved, and only after them, the odd strokes. Moreover, there is some serious evidence that the serial technique was also used in engraving strokes a6-a9. On the other hand, it is hard to reconstruct more closely the sequence of engraving a1-5, we only know that a1 was crossed by a2.

Other lines, Vb-Vd, were produced in a similar manner. Within Vb, fragments b22-25 and b14-19 were engraved using the linear (stroke by stroke) technique whereas in b28-31 and b4-19 the serial technique was used – first odd strokes, and only then, even strokes. In line Vc one long fragment was engraved using the linear technique (c21-30) and some short fragments engraved in the serial technique (eg, c31-33). The western fragment of line Vd (d1-12) was engraved using the serial technique: at first, even strokes were engraved, and next, the gaps were filled in with odd elements. The only inconsistency (stroke d4 cuts across d3) is the effect of touching up the former after engraving d3. Other than that, there is evidence that in engraving line BVd the stroke by stroke technique was used as well (d33-21), (Figs. 77, 78).

Strokes forming lines Va-Vd were engraved in a number of different rhythms. In line Va they were executed NW-to-SE (odd strokes) and NE-to-SW (even strokes) (Fig. 76), except for the western fragment, at least the fragment a3-7, where odd strokes were engraved SE-to-NW, and stroke a4, SW-to-NE. Very likely, this change was caused by the difficulty in engraving the ornament in an area marked by a more pronounced curvature of the object. These



**Fig. 77.** Rusinowo, group BV. Stroke d23 cuts into d24. Evident striations inside stroke d23 and ending point (arrows) visible at the end of this stroke identify the direction of engraving was from NW to SE



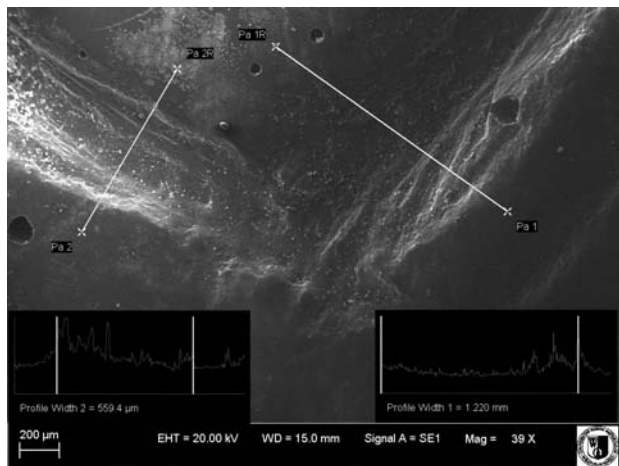
**Fig. 78.** Rusinowo, group BV. Stroke d31 cuts into d32. Ending point (arrow) at the end of stroke d31 identifies the direction of engraving was from NW to SE

difficulties could have been aggravated by the lack of experience of the maker engraving line Va. Within line Vb the evidently prevailing direction is SE-to-NW and SW-to-NE, whereas in its closing fragment (b29-34) odd strokes were executed NW-to-SE. Within line Vc the western fragment was engraved for the most part NW-to-SE (odd strokes) and SW-to-NE (even strokes), whereas farther on, the prevalent direction was SW-to-NE and SE-to-NW. Within line Vd the strokes of the opening fragment were engraved NW-to-SE and NE-to-SW (d1-7), whereas the later parts of the same zigzag line had a rhythm of NW-to-SE (odd strokes) and SW-to-NE (even strokes) (Fig. 78).

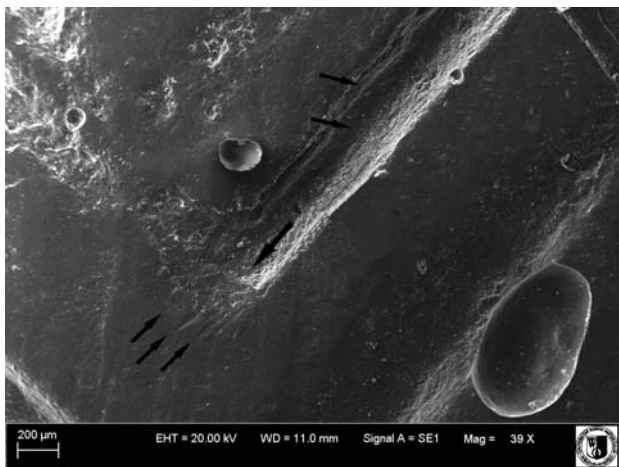
Strokes in the ornamentation group BV had been touched up. In one part of the line BVa this touching up had a very inept form, so that individual modules are doubled, and trebled even (Fig. 79). Other parts of the ornament were touched up with more skill so



**Fig. 79.** Rusinowo, group BV. Fragment of the ornament with inaccurate touching up of line BVa (arrows); photo from SE, (10×). (Photo M. Diakowski)



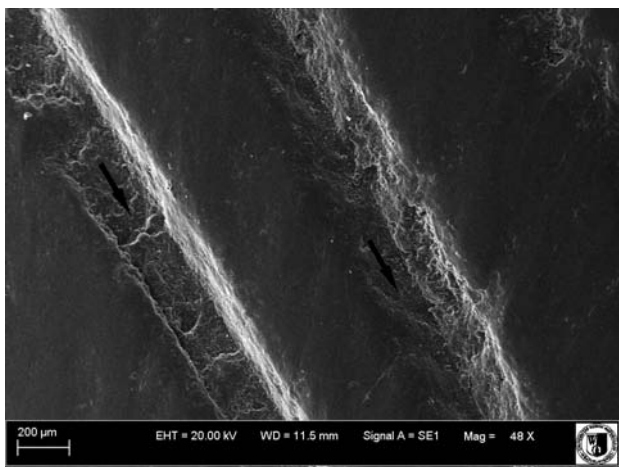
**Fig. 82.** Rusinowo, group BV. Cross-section of strokes b11 and b12. Asymmetry of depth is especially pronounced in stroke b11 (to the left)



**Fig. 80.** Rusinowo, group BV. The intersection of strokes c32 and c31 (c32/c31). At the end of stroke c32, starting points (arrows) and ending point (thick arrow), confirm the touching up of this stroke with a shift technique: the stroke was engraved from SW to NE and touched up finally from NE to SW. Lateral striations (arrows) document at least two touching up episodes



**Fig. 83.** Rusinowo, anthropomorphic representation and zigzag. General view



**Fig. 81.** Rusinowo, group BV. Strokes b33 and c33 with characteristic striations and microrelief inside the strokes, identifying the direction of engraving was from NW to SE

that often this process may only be guessed at, from the depth and the width of the stroke. The surviving technological traces suggest that the dominant touching up technique was in the same direction, although some evidence for the use of the to-and-fro movement and with a shift were found as well (Fig. 80). Some of the more successful strokes within line Va cut into the modules forming part of lines Vb and Vc, while elements of Va engraved with little skill are intersected by the latter. These observations allow us to suppose that some strokes within Va were touched up one more time, when the other lines had been completed by the maker of lines Vb-Vd (Fig. 76). Generally, the level of execution of lines in this group is mediocre – the engraver sometimes had trouble sustaining the right angle of attack, as is evidenced by irregular edges of some strokes, and much more often, by the characteristic striations (Fig. 81).

The strokes of the ornament exhibit a characteristic asymmetry – the deepest part of a stroke is either by the western (NW-SE) or by the eastern wall (NE-SW) (Fig. 82).



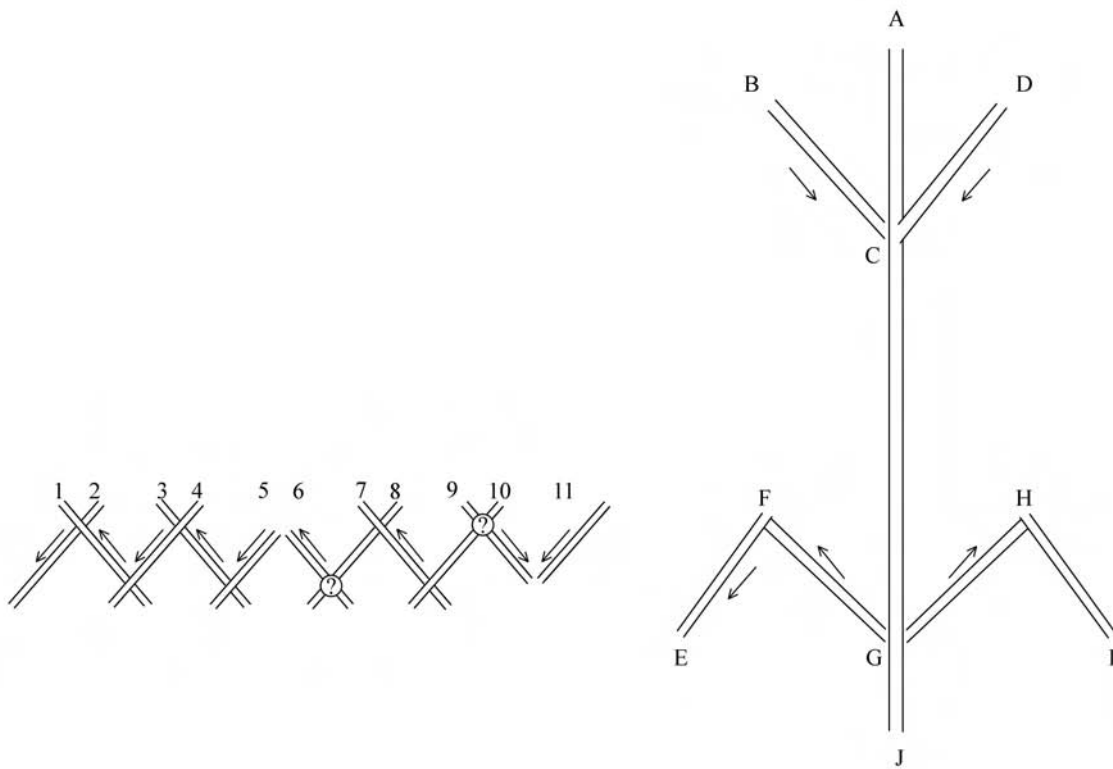


Fig. 84. Rusinowo. Diagram showing the process of engraving the zigzag and the anthropomorphic representation

The sequence of the engraving of individual lines is hard to establish because except within Va and Vb the number of intersections of individual zigzag lines is small. In the light of the data presented above, line Va was given a form at first, but some of its strokes were touched up later, only after the other lines had been completed. This is understandable because the strokes within line Va in some places were only outlined, the maker must have thought it necessary to touch up some of them once all four lines had been engraved (Fig. 76). On the evidence of the small number of intersections it may be suggested that Vc was engraved after Vb. The time of engraving of line Vd is hard to establish, especially given the intersections – c4/d4, and c10/d9 – which suggest that line BVc was engraved at the very end. This, however, seems unfeasible to us because of some major technological difficulties such a procedure would have posed, and the intersections are, in our view, evidence of touching up of some strokes within Vc at the time of engraving Vd or when it was complete. To summarize these observations it may be assumed as likely that the lines within this group were engraved north-to-south, thus in this order: Va-Vd.

*The anthropomorphic representation with a zigzag*  
It is found to the south of group BV and to the north of the group of zigzag lines BVI. It includes an engraved human figure and a short, single zigzag line found to the west of the anthropomorphic image (Figs. 83, 84). The zigzag line consists of eleven strokes (Z1-11). The anthropomorphic representation has been engraved in a geometric convention: the torso, limbs and other parts of the body are depicted using short lines and strokes. The style of this engraving is such that we cannot state clearly whether this is a man with arms upraised and a long penis, or an added on tail forming an integral part of the trunk (Fig. 85), or rather, a woman, in a supine position, legs spread out, arm used for support (Fig. 86). Assuming that the maker of the engraving reproduced the basic proportions of the limbs, the latter interpretation appears the more likely (Płonka *et al.* 2011, 726). The proportion reflecting the ratio (S) of the distance between the ends of arms/legs (a) to the distance between the elbows/knees (b) is 1.3-1.4, depending on small differences in the measurement points. Measurements of models showed that for a woman with spread out legs the ratio was ca. 1.2-1.4 (Fig. 86), while for



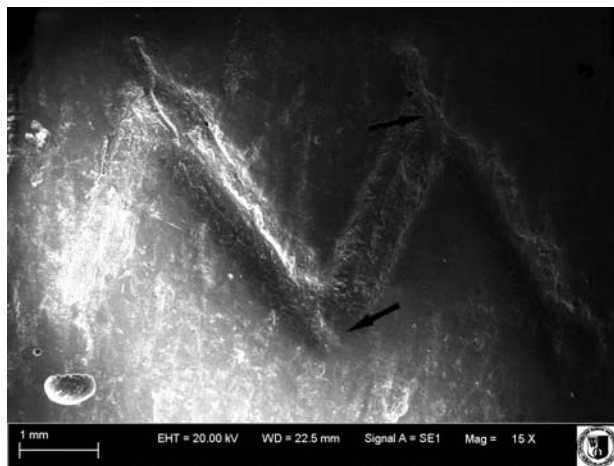
**Fig. 85.** Rusinowo, anthropomorphic representation. “Male” interpretation (a, b – sections used in calculating the S-ratio, see text)



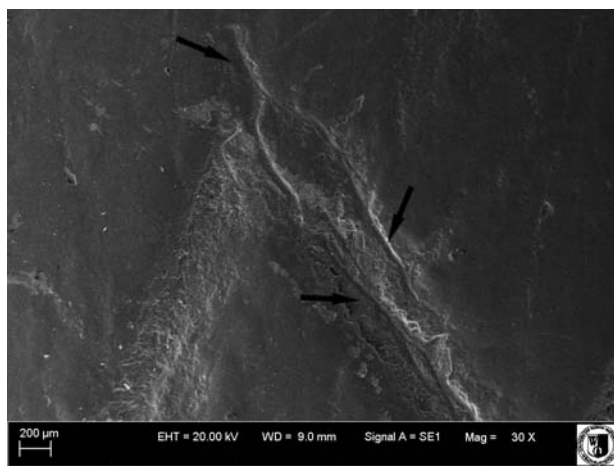
**Fig. 86.** Rusinowo, anthropomorphic representation. “Female” interpretation (a, b – sections used in calculating the S-ratio, see text)

a man with raised arms, bent at the elbows, it was more than 1.5-1.6 (Fig. 85). Also, the length of the strokes representing limbs (0.6 cm) corresponds to the proportions of the arms on which the woman supports herself in a half-reclining position, rather than to the proportions of the legs of a standing man. The picture was made with a creative perspective, which is characteristic of the Palaeolithic art: the torso and upper limbs are seen from above, the spread out legs – in front view. During more in-depth technological studies we found additional supporting evidence for the interpretation of this engraving proposed here.

The zigzag line consists of strokes with a length of 0.3-0.5 cm, the height of the zigzag band at 0.5 cm. Intersections clearly show that the zigzag was engraved west-to-east. The technique used was stroke by stroke, but for the fragment Z2-5, there is evidence for the serial method – first, Z2 and Z4, and only later, Z3 and Z5 (Fig. 87). Even strokes were engraved SE-to-NW, odd strokes – NE-to-SW. All strokes have traces of touching up, mostly in the same direction (Fig. 88) but also, using the method



**Fig. 87.** Rusinowo, the zigzag next to the anthropomorphic engraving. Intersections: Z3 cuts into Z2 and Z4 (arrows)



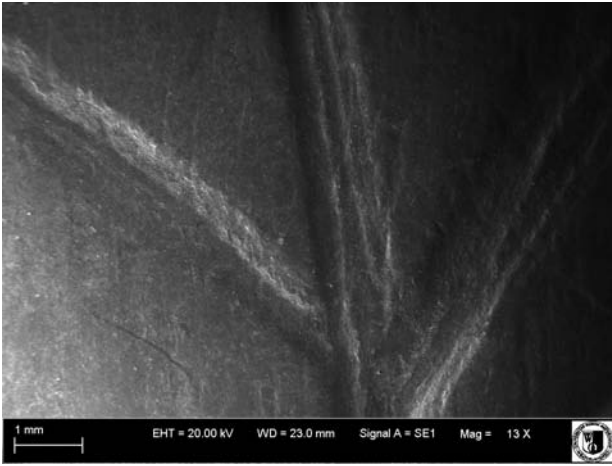
**Fig. 88.** Rusinowo, the zigzag next to the anthropomorphic engraving. Traces of touching up stroke Z2 (arrows)



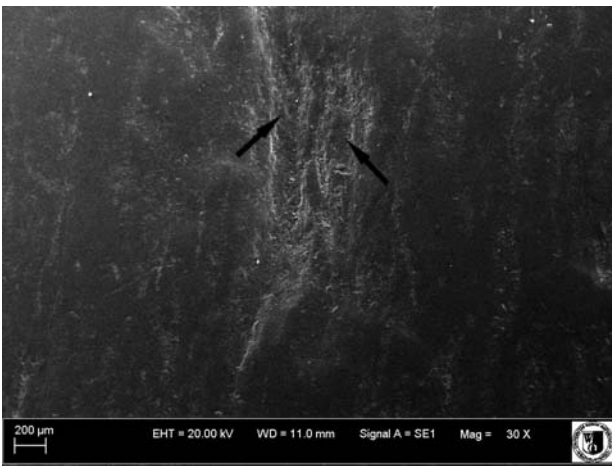
**Fig. 89.** Rusinowo, anthropomorphic representation. Section CG, southern fragment: evident striations on the bottom of the line (arrows)

with a shift. Some of them, for example Z5, were engraved more than once.

The human figure was rendered using lines and strokes were touched up repeatedly (Fig. 83). Strokes

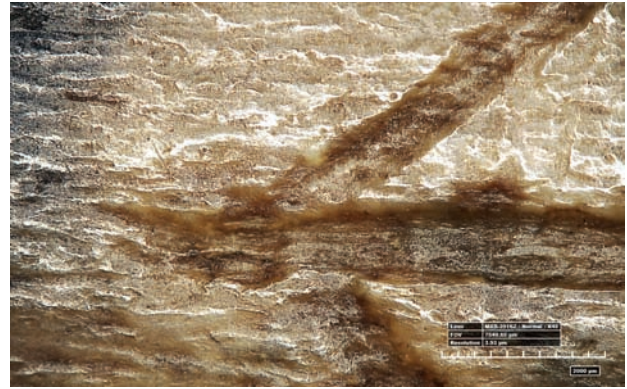


**Fig. 90.** Rusinowo, anthropomorphic representation. View of point C with fragments of sections AC, BC, CD and CG: evident traces of repeated touching up

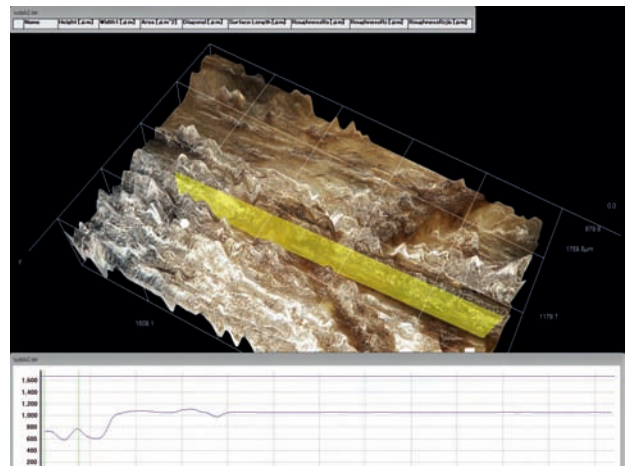


**Fig. 91.** Rusinowo, anthropomorphic representation. Multiple starting points at the end of section GJ, which is deeper than other sections of the engraving (arrows)

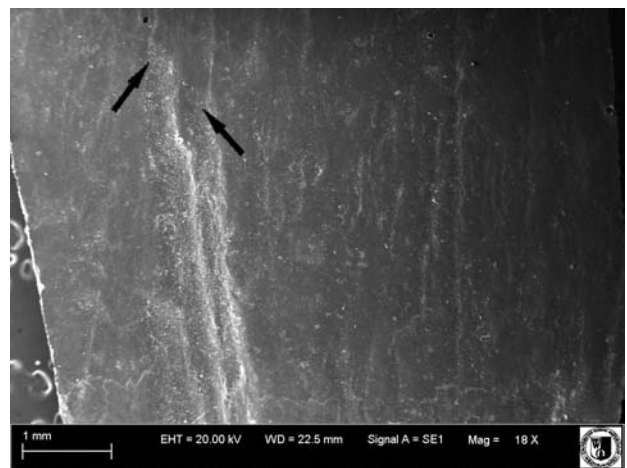
and lines building the figure have a width of 0.07-0.27 cm, not observed in the zigzag lines covering the artefact. This is evidenced amply also by the large number of striations inside the strokes (Figs. 89, 90), leftovers from the passage of engraving points, the multiple starting and ending points of the engraving tool (Figs. 91, 94), and multiple strokes formed when the engraver failed to make contact exactly with the line being touched up (Figs. 90, 92, 94, 95). Nevertheless, the level of execution of the engraving is superior – the representation comes across as harmonious, even if the touching up strokes at times occur -next to the touched up ones, and in some of the lines oblique striations are seen, evidence of problems in sustaining the appropriate angle of carving (Figs. 89, 96). Nevertheless, in most cases, the engraver succeeded in making the touching up so that they resulted in a relatively uniform stroke with a flat bottom. This is evidenced by the results



**Fig. 92.** Rusinowo, anthropomorphic representation. Deepened section GJ



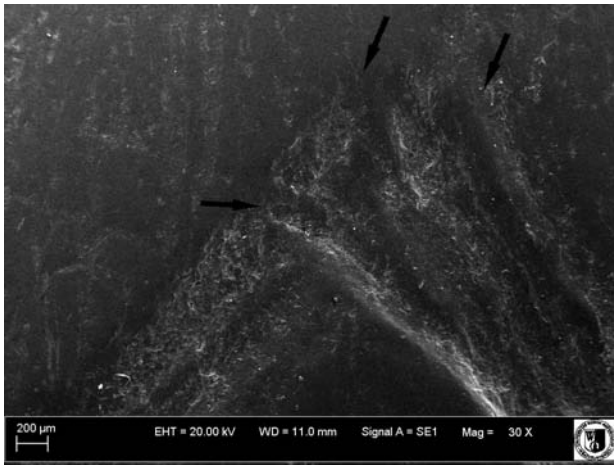
**Fig. 93.** Rusinowo, anthropomorphic representation. Cross-section of the lower part of the torso with the deepened section GJ



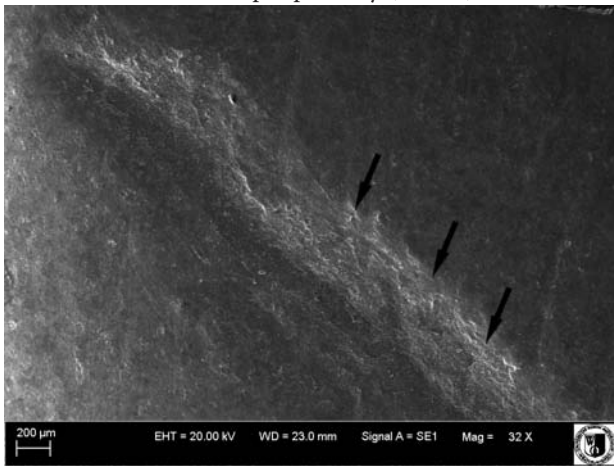
**Fig. 94.** Rusinowo, anthropomorphic representation. Apex A of section AC: evident multiple strokes and their ending points (arrows).

of SEM examination of cross-sections of these lines which revealed fluctuation in depth (Fig. 97). On side B there are no engravings to match the skill of execution of the anthropomorphic figure.

Intersections of strokes and lines building the anthropomorphic representation were used to recover

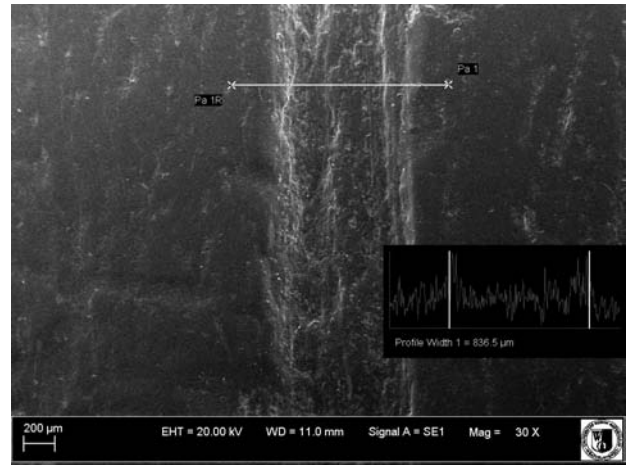


**Fig. 95.** Rusinowo, anthropomorphic representation. The intersection of strokes GH and HI (HI/GH). Stroke HI touched up repeatedly (arrows)



**Fig. 96.** Rusinowo, anthropomorphic representation. Section BC, evident striations (arrows)

the sequence of engraving successive elements of the representation, although it needs recalling that strokes building the figure were touched up so many times. The intersections show that the first to be created was the fragment AJ, forming the torso, it was engraved S-to-N, as evidenced by many technological traits (Figs. 89, 91, 94). The southern part of this fragment, in the region of point J, was additionally deepened (Fig. 91-93). In the light of the interpretation adopted by us here, this depression would be symbolic of the woman's vulva. The upper and lower limbs were engraved after the torso. The strokes meant to represent the arms (BC, CD) were engraved from the outside, towards the torso. The stroke which represents the left arm (CD) evidently intersects the torso (Fig. 90), whereas the right arm does not form an apparent intersection – perhaps it was erased when the torso was being touched up. The lower limbs were engraved in a reverse direction, ie, first the thighs, engraved moving outward, followed by calves, engraved from the knee downwards



**Fig. 97.** Rusinowo, anthropomorphic representation. Cross-section of stroke CG (torso) – several touching up episodes

(Fig. 95). On the evidence from intersections, it is also clear that within the lines of the torso the stroke of the left thigh (GH) intersects the stroke of the right thigh (FG).

#### *Group BVI*

Group BVI includes five zigzag lines running NWW – SEE (Figs. 98, 99, Table 14), consisting of 22 to 29 strokes. Its distance from group BV is not uniform, about 0.8 cm in the west and 2.9 cm in the east. Between these two groups is the anthropomorphic representation with the single zigzag. The surface of the artefact here is weathered, particularly in the most convex part, so that in places the strokes of zigzag lines are barely visible, but the course of the ornament is still decipherable. Zigzag lines of this group are rather irregular at both ends, the fragments of the zigzag run in directions different than in the main arrangement of the lines and consist of a different number of strokes (Figs. 100, 101); moreover, in the eastern part, beyond c29, is an additional stroke not attached to the other strokes of this zigzag line (Figs. 101, 102). The point with which all the lines were executed was broad and uneven and left a characteristic pattern of striations on the bottom of the strokes building the zigzag.

Analysis of the sequence of execution of strokes within individual zigzag lines is hindered by the damage to the ornament and the method of engraving – many strokes form no intersections with their neighbours (Table 1). Consequently, there is only a small number of longer sequences to use in tracing the stroke order, step by step (Fig. 99). This situation is illustrated well by line VIa, where intersections were observed in S angles whereas in their northern counterparts the strokes, as a rule, do not connect. A sequence at the eastern end of this line



Fig. 98. Rusinowo, group BVI. General view of the ornament. (Photo M. Diakowski)

Table 14. Rusinowo, group BVI. Parameters of zigzag lines VIa-VIe

| No. of line | Number of strokes | Height of zigzag line [cm] | Length of strokes [cm] |
|-------------|-------------------|----------------------------|------------------------|
| VIa         | 24                | 0.5-0.8                    | 0.35-0.8               |
| VIb         | 26                | 0.55-0.8                   | 0.3-0.7                |
| VIc         | 29                | 0.45-0.8                   | 0.35-0.9               |
| VI d        | 25                | 0.5-0.8                    | 0.35-0.95              |
| VIe         | 22                | 0.5-0.75                   | 0.5-1.15               |

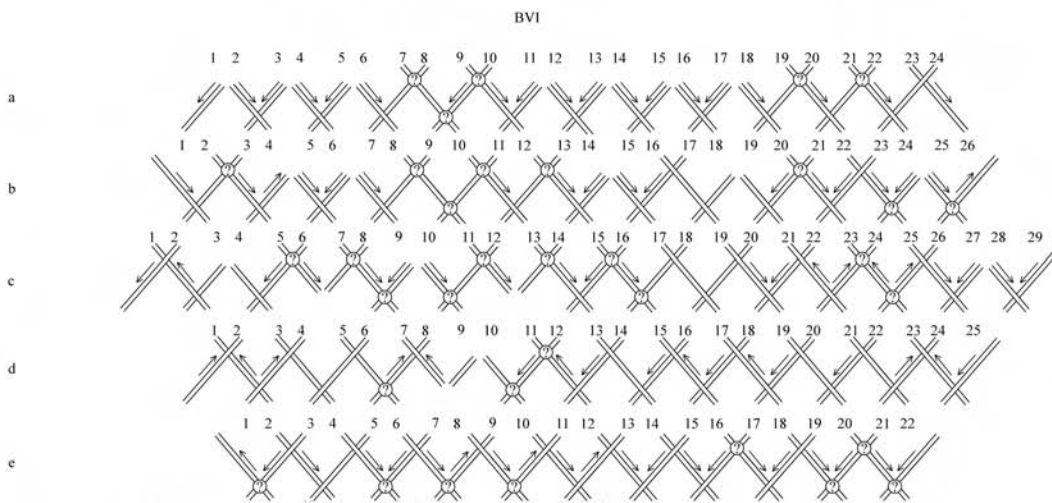


Fig. 99. Rusinowo, group BVI. Diagram showing the process of engraving the ornament. (symbols – see Fig. 3)

(a23/a24, a22/a23) suggests that the zigzag was engraved east-to-west. Less easily determined on the other hand is the role played in its execution by the serial method. Line VIb was produced in a similar manner, and here two intersections document the use of the serial method.

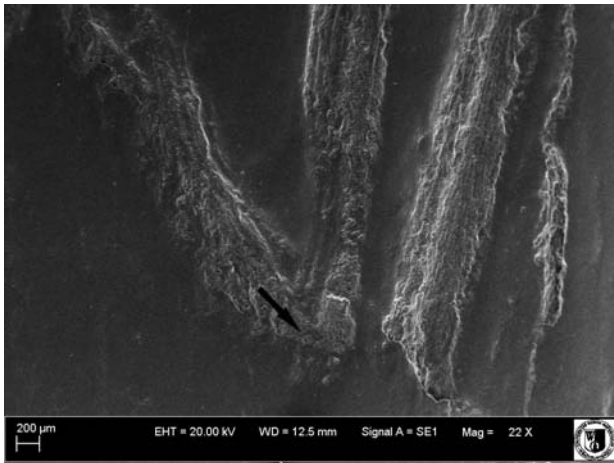
Line VIc was probably engraved east-to-west (Fig. 102), this is indicated by a similar manner of execution of the strokes and similar intersections (c1/c2, c2/c3, c4/c5). The significance of the serial technique is better documented here: in sequence c17-23 odd strokes c17, c19, c21, c23 were engraved first, and only then, even strokes c18, c20 and c22.



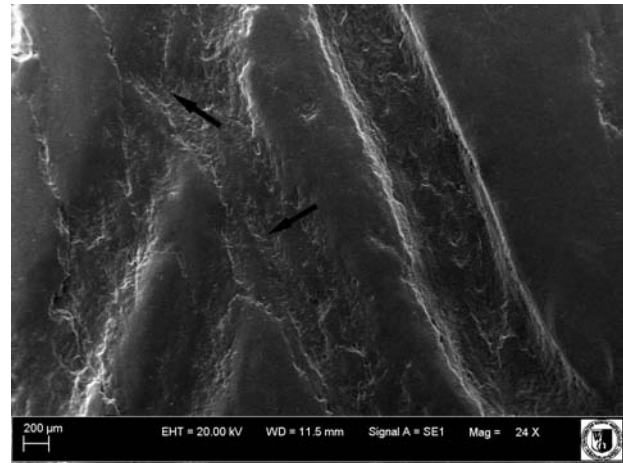
Fig. 100. Rusinowo, group BVI. The western part of the ornament; photo from SW (8x). (Photo M. Diakowski)



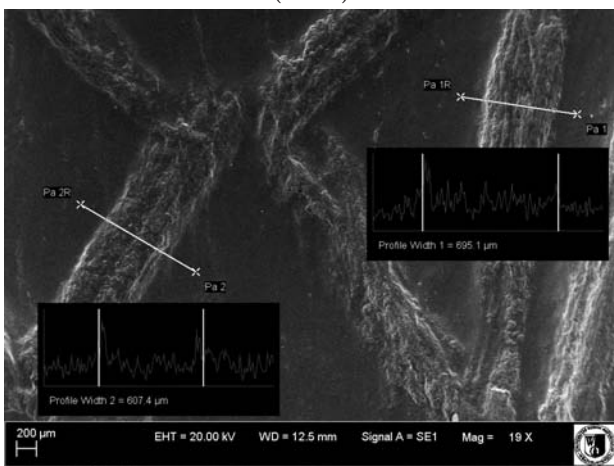
Fig. 101. Rusinowo, group BVI. Eastern part of the ornament; photo from SW (8x). (Photo M. Diakowski)



**Fig. 102.** Rusinowo, group BVI. Stroke c28 cuts into c29 (arrow)



**Fig. 104.** Rusinowo, group BVI. Stroke d18 cuts into d17 and c17 (arrows)



**Fig. 103.** Rusinowo, group BVI. Cross-section of strokes c27 and c29

The two other lines, BVI d and e, are similar in terms of their execution. Both were engraved west-to-east, using in tandem the stroke by stroke and the serial techniques, with the latter playing the leading role. In line BVI d one of the sequences identified as produced using the serial technique is the fragment d13-21. The first to be engraved were the odd strokes, followed by even elements.

In lines VIA-c and VIe the strokes of the ornament were engraved NE-to-SW and NW-to-SE. Individual elements retain traces of tool movement made in the opposite direction (SW-NE and SE-NW). Within line VIc this was observed eg, for a sequence of four strokes (c22-25), within line BVIe, for three consecutive odd strokes – e11, e13 and e15. Line VI d is more complicated in this regard. Here, even strokes were engraved SE-to-NW, and odd strokes NE-to-SW and SW-to-NE. At the same time, on the evidence of stroke width and characteristic traces it is clear that the strokes were touched up – some of them many times, although not on every occasion the technological traits characteristic of this

procedure were identified. Therefore it would seem that different directions of touching up the strokes have resulted in a rather mixed picture.

Cross-sections made through the strokes reveal their asymmetry – in almost all of the zigzag lines (VIA-e) their deepest part is by the western wall, or there are two troughs, one by each wall (Fig. 103). Thus, presumably, in the first case, the hand of the engraver had rested to the east of the strokes being engraved. The other profile would be the effect of a repeated touching up of the strokes.

A large number of intersections (Fig. 104) proves that within group BVI the lines were engraved starting from VIA and ending in VIe. In the case of eastern fragments of lines VIb and VIc we may surmise that they were engraved and/or touched up alternately, given that stroke b25 cuts across c26, and b26 intersects c27.

#### *Group BVII*

Group BVII consists of seven zigzag lines (Figs. 105, 106, Table 15) which run roughly parallel to group BVI, about 0.9 cm to the south of it. Each line is built by 28 strokes, except for the zigzag VIIIf, which is built by 26 elements. Everywhere in group BVII the surface of the artefact is weathered in places, especially in the central and western part (Fig. 107), hindering the analysis of the ornament. Dark traces on a part of the surface covered by the ornament could have developed within the deposition context. These dark traces are not present inside the strokes of the ornament where they are deep, but in the shallow ones they cover the walls and the bottom of the engraved marks (cf. sub-chapter 3.1.).

The execution of the lines belonging to this group is far from uniform (Table 1). In engraving the zigzag lines VIIa and VIIb the work proceeded from



Fig. 105. Rusinowo, group BVII. General view of the ornament . (Photo M. Diakowski)

Table 15. Rusinowo, group BVII. Parameters of zigzag lines VIIa-VIIg

| No. of line | Number of strokes | Height of zigzag line [cm] | Length of strokes [cm] |
|-------------|-------------------|----------------------------|------------------------|
| VIIa        | 28                | 0.4–0.9                    | 0.3–1.0                |
| VIIb        | 28                | 0.5–0.8                    | 0.35–0.85              |
| VIIc        | 28                | 0.4–0.65                   | 0.5–0.7                |
| VIIId       | 28                | 0.4–0.7                    | 0.4–0.7                |
| VIIe        | 28                | 0.4–0.7                    | 0.6–0.95               |
| VIIIf       | 26                | 0.45–0.65                  | 0.4–0.75               |
| VIIg        | 28                | 0.45–0.7                   | 0.4–0.65               |

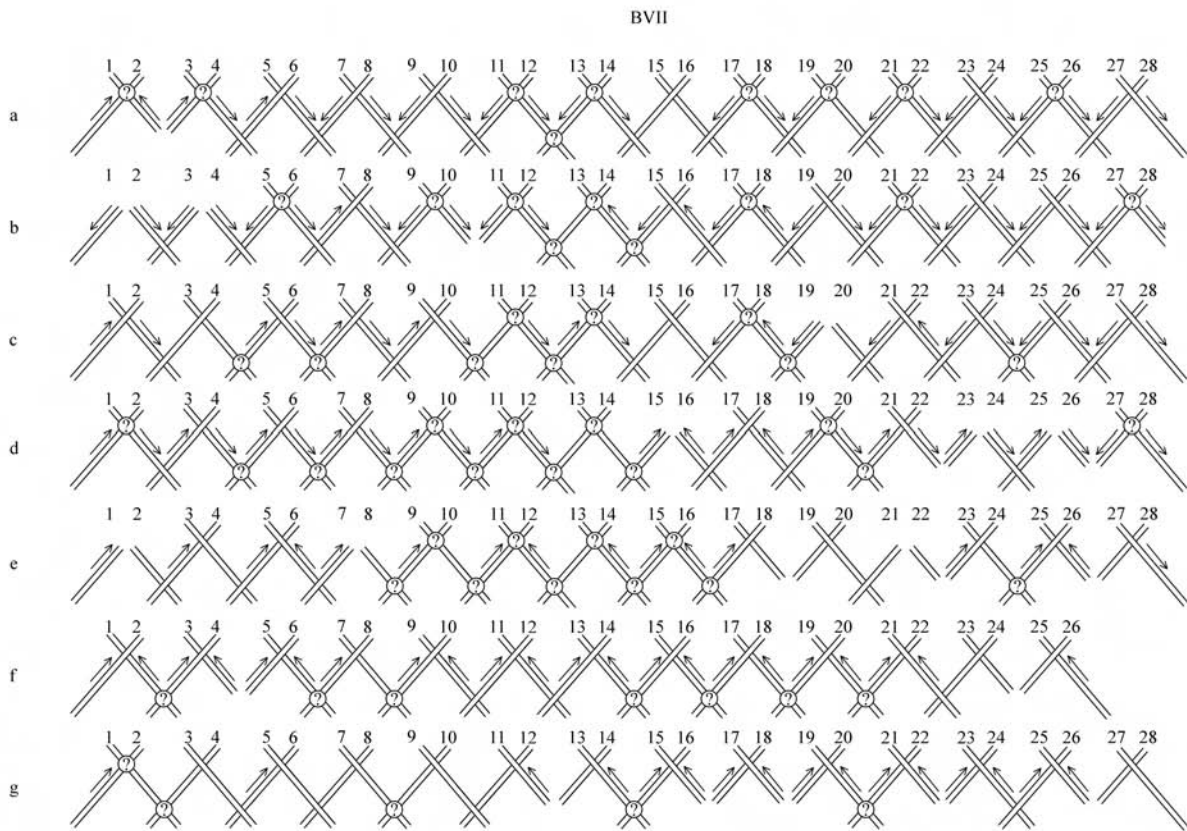


Fig. 106. Rusinowo, group BVII. Diagram showing the process of engraving the ornament. (symbols – see Fig. 3)

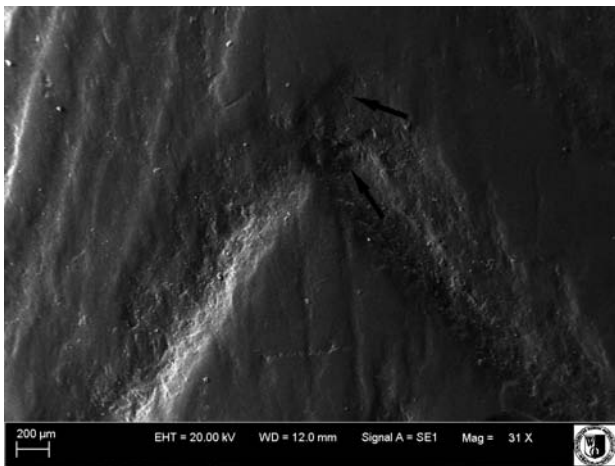
the centre of the surface being ornamented. Within line VIIa the first stroke to be engraved was a16. Afterwards the direction of the work progressed eastward (strokes a17-18) and westward (strokes a15-a1), however, it is unclear which fragment of the line was the first to be engraved once stroke 16 had been accomplished – the eastern or the western. The main technique used in this work was the stroke by stroke technique, and only in short fragments, to the west, we find evidence for the use of the serial technique (a9-11, a5-7). In the case of line VIIb, the first to be made were, presumably, strokes b15 and b17, given that they are intersected by stroke b16. As work

proceeded, the western and the eastern fragment of the ornament was engraved, using mostly the stroke by stroke technique, and only exceptionally, the serial technique.

Directions of the execution of the other lines in this group can be identified only to a limited extent (Figs. 108; 109): using the data obtained it may be concluded that the eastern fragment of line VIIc was made west-to-east, but the direction of the engraving of strokes c1-14 is much less certain. Within VIIId, the direction for the fragment d1-8 was presumably east-to-west. Here, the most affected by the damage to the ornament is line VIIe, so affected that details of



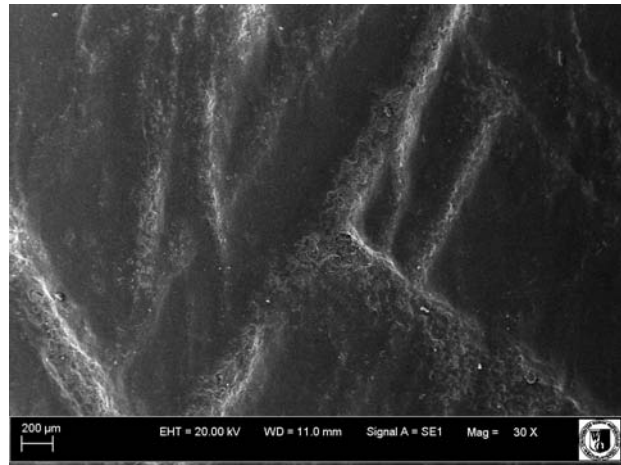
**Fig. 107.** Rusinowo, group BVII. Eroded surface of the object and the ornament in the central and western part of the group; photo from SW (6.3 $\times$ ). (Photo M. Diakowski)



**Fig. 108.** Rusinowo, group BVII. Stroke g26 cuts into g25 (arrow). Evident ending point and traces of touching up stroke g26, engraved from SE to NW (arrows)

execution of this zigzag are hard to recover, although we may assume that fragment e1-7 was engraved west-to-east. In the case of lines VIIIf and g, there is evidence for an extensive use of the serial method. Some fragments of these two lines, retaining a series of intersections suggest that zigzag line VIIIf was engraved east-to-west, and VIIIf in the reverse direction (Fig. 109).

The rhythm of stroke execution within individual lines differed. In lines VIIa and b strokes were engraved mostly NE-to-SW (odd strokes) and NW-to-SE (even strokes). Only in a limited number of cases reverse orientation (SW-NE and SE-NW) is encountered – perhaps the effect of the touching up of strokes of the ornament in a different direction. Strokes within lines VIIe, f and g, were incised in a rhythm opposite to the rhythm used in VIIa and b. The strokes were engraved here SE-to-NW and SW-to-NE (Figs. 108; 109), with some rare departures



**Fig. 109.** Rusinowo, group BVII. Intersections of lines VIIId-f: e25/e26, f25/f26, f26/e25 and d25. The evident ending point of stroke f 26 (in the centre) and damage caused by the intrusion of stroke f25 on f26



**Fig. 110.** Rusinowo, group BVII. Eastern part of the group with different processes of touching up the strokes; photo from SE (8 $\times$ ). (Photo M. Diakowski)

from this rule. Within lines VIIc and d, odd strokes were engraved also SW-to-NE, and even NW-SE, nevertheless, with some strokes engraved in the opposite direction: NE-to-SW (eg, c21, c23, c25 and c27) and SE-to-NW (c18, c22).

The width of some strokes of the ornament, their overlapping and the doubling and trebling of the same stroke, prove that the rule was to touch up individual fragments (Figs. 108; 110). Where touching up was confirmed, it was mostly in the same direction, with some solitary instances of the two other techniques namely, to-and-fro and with a shift. However, it would appear that the two latter actually played a greater role since the direction of engraving the strokes within lines VIIc-e is quite varied. The shape of the strokes indicates that groups BVI and BVII were engraved with the same tool. The level of execution of these two groups is similar – their maker/makers had only mediocre skills.



A large number of intersections of strokes forming part of different lines do not provide an explicit answer as to their sequence. Strokes belonging to line VIIb cut into strokes of VIIa and VIIc, hence the conclusion that VIIb postdates line VIIc and was the last to be touched up in its final form. Since lines VIIc and d do not form any intersections the order of their execution is unknown. On the other hand, it was found that VIId cut into VIIe more often than the other way round therefore, VIId assumed its final form after line VIIe. Finally, the large number of intersections demonstrates that the southern zigzag lines took form in the order: VIIe, f and g. To

summarize the above observations it needs noting that it is unlikely that line VIIb was engraved after line VIIa and before line VIIc. It is more likely that VIIb was touched up after VIIa was completed. The same may be true of lines VIId and e.

*Group BVIII*

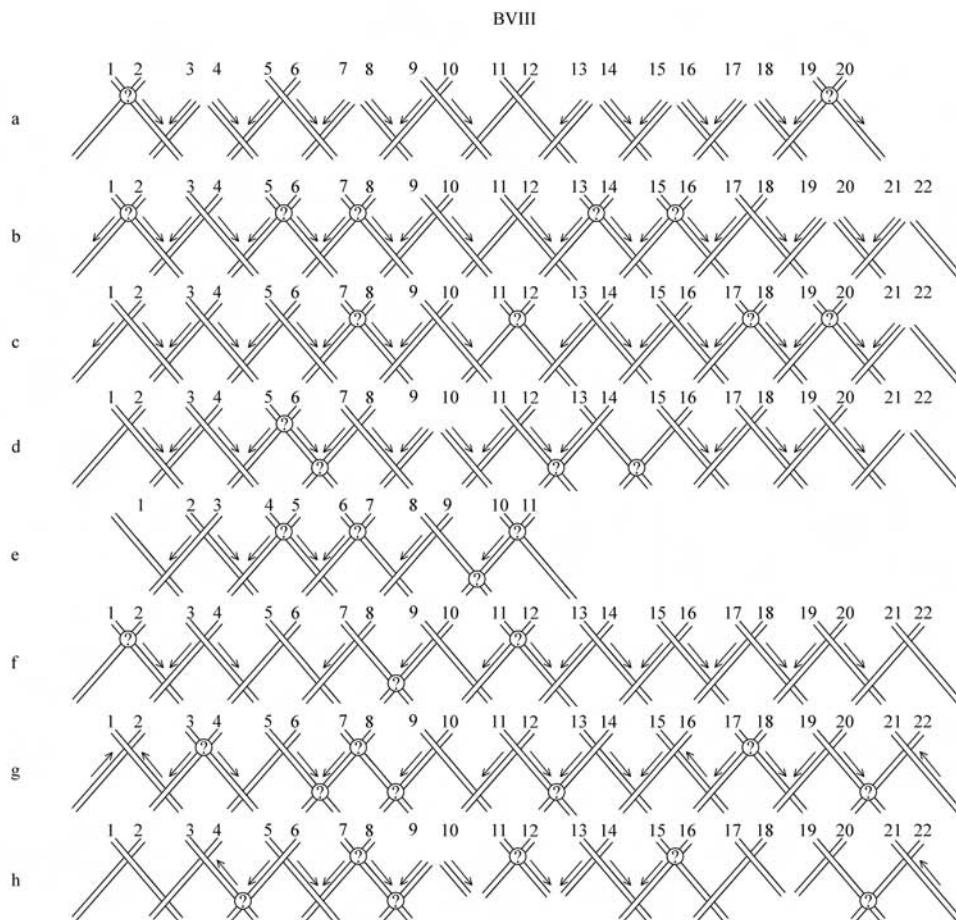
Group BVIII consists of seven zigzag lines (Figs. 111, 112, Table 16). Each of the lines VIIIb-d, and VIIIf-h is built by 22 strokes, while VIIIa has only 20. The

**Table 16.** Rusinowo, group BVIII. Parameters of zigzag lines VIIIa-VIIIh

| No. of line | Number of strokes | Height of zigzag line [cm] | Length of strokes [cm] |
|-------------|-------------------|----------------------------|------------------------|
| VIIIa       | 20                | 0.45–1.05                  | 0.3–1.05               |
| VIIIb       | 22                | 0.4–0.85                   | 0.3–0.7                |
| VIIIc       | 22                | 0.5–1.0                    | 0.3–0.8                |
| VIII d      | 22                | 0.6–0.75                   | 0.35–0.8               |
| VIIIe       | 11                | 0.55–0.8                   | 0.35–0.7               |
| VIII f      | 22                | 0.55–0.85                  | 0.45–0.75              |
| VIII g      | 22                | 0.55–0.75                  | 0.3–0.7                |
| VIII h      | 22                | 0.6–0.9                    | 0.35–0.75              |



**Fig. 111.** Rusinowo, group BVIII. General view of the ornament. (Photo M. Diakowski)



**Fig. 112.** Rusinowo, group BVIII. Diagram showing the process of engraving the ornament. (symbols – see Fig. 3)



**Fig. 113.** Rusinowo, group BVIII. The western section of the group (8×). (Photo M. Diakowski)

most original of them all, line VIIIe consists of only 11 strokes and lacks a stroke we could describe as e1. Group BVIII runs lightly diagonally in relation to BVII at a distance of about 1.8 away. Individual zigzag lines increase in width towards the north, this is the most apparent in the case of VIIIc-VIIIa (Fig. 113). The distance between BVIII and the blade of the artefact is 8.1 cm.

Lines BVIIIa-d show a marked similarity in the rhythm of execution of the ornament (Table 1). In all four of them strokes nos. 1-12 were engraved using the serial method: at first the odd elements, and next the even ones (Fig. 114). Successive strokes in individual lines were engraved west-to-east, definitely using the stroke by stroke technique, while the extent of the use of the serial method is not fully known.

Zigzag line VIIIe was engraved west-to-east using the stroke by stroke and the serial techniques.

Line VIII f has well-documented intersections (Fig. 112). They confirm that the ornament took form west-to-east, and that the strokes of the zigzag were engraved in linear technique. Most likely, lines VIII g and VIII h were engraved west-to-east. Within fragments where the intersections could be deciphered we found some limited evidence for the use of the serial method.

All the zigzag lines were engraved in a similar rhythm, ie, odd strokes were engraved NE-to-SW, even strokes – NW-to-SE (in line VIII e, even strokes – NE-to-SW, odd strokes – NW-to-SE). Strokes incised from the southern direction occur singly, most often at the western and the eastern end, owing to the need for a better control over the tool in places with



**Fig. 114.** Rusinowo, group BVIII. Intersections of strokes a11 and 12, b11 and 12: a12/a11, b12/b11 – arrows (16×). (Photo M. Diakowski)

a more prominent curvature. Many strokes within group BVIII have traces of touching up, mostly in the same direction, although quite a few were re-engraved in the with a shift technique.

The few dozen intersections of individual lines within group BVIII were mostly identified within lines VIII a-f. On the other hand, there are few intersections within lines VIII f-h. Based on that, it may be argued with some confidence that lines VIII a-f were engraved starting with VIII f an ending in VIII a. The few intersections which are not consistent with this reconstruction (b21, b22/a20; e3/d3) show that at the time when new lines were being engraved, some strokes belonging to earlier made lines were touched up. As the ornament was being engraved, the strokes within the line steadily grew wider northwards. This was the result of the gradual exhaustion of the engraving point which steadily grew thicker as the work on the ornament progressed.

A small number of intersections suggests that lines VIII g and h took form in succession after the completion of line VIII f. However, we have only a small number of observations to confirm this fact. Nevertheless, we may conclude that they are likely to have been engraved prior to the execution of VIII a-e, given that VIII g and h were engraved with a less exhausted cutting tool, and moreover, are intersected by some of the strokes forming part of lines found higher up (d13/g12).

A large number of intersections and the rather irregular arrangement of strokes testify to the lack of proficiency of the individual who engraved this fragment of the ornament.

## Ornament execution phases and dynamics

The detailed analysis of the rich ornament on the object of elk antler brought in sufficient evidence to justify a tentative reconstruction of the technological and social realities of the manufacture and use of this unique artefact. The identified traces permit resolution of at least some issues related to the execution of this object and its use. To organise our discourse we expressed the problems in need of resolution in the form of questions:

i./ was the ornament executed by one, or more than one individual?

ii./ did the ornament take form at a single sitting, or did it build up in stages over several ornamentation episodes?

iii./ can we claim that the execution of the ornament was an element of some ritual?

iv./ was the object used over a longer period?

v./ why was the object discarded?

In solving the first of the presented problems we may turn for assistance to the formal analysis of individual elements of the ornament. However, already at the outset we have to make the reservation that the question of the number of ornament makers involved does not fully coincide with the use of more than one engraving tool – the same individual could have used one or more of such tools, or a single tool could have been used by many people. Therefore, meaning to resolve this problem we need to examine all the elements of a personal style, dependent on technological and artistic proficiency and the pressure with which the designs were engraved. Moreover, not without impact on the style was the quality of the engraving tool, the method used in preparing the surface (softened or not) and other local conditions at the time of the execution of the engraving. Examination of the two decorated sides of the object showed clearly that side A as a whole was made by a person/persons high in technological and artistic ability. The technological attributes of the engravings on side A suggest that they were made with two different cutting tools. It is not clear from the style of the execution of the strokes whether they were made by one or two engravers; if the latter is true, then one of them engraved groups AI-AIIIa-c, the other – groups AIIIId, AIV-AVII. The only hesitation is caused by line VIIa the execution of which could have involved a third person. On the other hand, it is possible that the inept execution of some of the strokes may have been caused by the unsoftened surface, or other reasons. Two facts convince us that on side A, line AI and groups AII-AVII, were engraved

north-to-south: i./ traces, moving southward, of an evident progressing deterioration of the cutting tool during the execution of AI-AIII, brought to a head when it broke at the eastern end of line AIIIc; ii./ the use, in engraving AIV, of a cutting tool used in making AIIIId. These findings convince us that the ornamentation of side A was completed over a fairly brief period. It gives the impression of a planned whole so that its maker/makers had an awareness of the plan of the composition or followed guidelines of someone who controlled the process of ornamentation.

Within the groups, the lines were created in succession, north-to-south. The use of the simultaneous method is unlikely, only the use of the linear and the serial techniques, and consecutive elements of the zigzag lines took form mostly west-to-east. A definite exception from this rule was within group AIV. Here, the first to be engraved was IVc, and zigzag lines IVa-IVc were executed east-to-west (Table 1). In other groups, this direction (east-to-west) was confirmed only in lines AIIa and AIIIa – and only within a short fragment of these zigzag lines.

The direction of engraving individual strokes within the zigzag lines is far from uniform, but here also it is possible to formulate some rules of execution. The most frequent variant is the alternating one, NE-to-SW and SE-to-NW is the most prevalent pattern. What this means is that if one stroke was engraved NE-to-SW, its neighbours were executed SE-to-NW. Among the unidirectional patterns within groups AI-AIII the more frequent variant is SE-NW and SW-NE, whereas within AIV-AVII – it is NW-SE and NE-SW. It is worth noting also that within AIV-AVII, the line the first to be engraved within the group had a unidirectional pattern (Table 1), (IVc, Va, VIa and VIIa).

The ornamentation of side B departs from the fairly regular pattern presented above. Here, the highest technological and manual competence were those of the maker of the human figure and the accompanying zigzag. A special skill is exhibited by lines and strokes forming the anthropomorphic representation: the lines, repeatedly touched up, have been engraved with confidence and ease, the drawing has the marks of excellence within the adopted representational convention.

Groups of zigzag lines display a variety of stylistic traits, and evidence for the use of at least five cutting tools: i./ BI; ii./ BII; iii./BIII-BV; iv./ BVI, BVII; v./ BVIII. The process of engraving the groups of lines and individual zigzag lines appears as much

more complex than is the case of side A. The reason for this would be the larger number of individuals involved in this work (although, as noted earlier, not all the tool changes have to be associated with a new engraver) and possibly, questions associated with ritual, addressed at more length below. Within four groups (BII, BIV-BVI) the lines, starting with the northern, were evidently executed in a regular manner. On side B many more lines were engraved moving from the east-to-west (Table 1) – this is how the entire group BV was executed. Also noted on side B is a specific engraving method in which a fragment of a line is executed west-to-east, but its other fragment is engraved in the reverse direction. Within lines BIa and BIb fragments of zigzag engraved in this manner were separated by the vascular groove. Lines VIIa and VIIb also started at the centre and carried on to the west and east.

The direction of engraving the strokes within individual lines is much less uniform than on side A. What is striking at the same time is the high proportion of unidirectional variants, with an evident domination to the north of the anthropomorphic representation of directions SE-to-NW and SW-to-NE, and to the south of the human figure, of directions NW-SE and NE-SW. It is also worth noting that changes in the direction of engraving the strokes are observed more often on this side than on side A (Table 1).

It is hard to decide, based on an analysis of the available evidence, whether the engravings on side B were completed over a short period, or in the course of several ornamentation episodes. On the one hand, a larger number of cutting tools was used here, on the other hand, with a larger number of individuals involved in making the ornament there must have been someone who coordinated these activities because the complete ornament on this side is an orderly whole. This is evidenced by: i./ the ordering of the zigzag lines into groups; ii./ careful positioning of the human figure roughly at the centre of the ornamented field; iii./ sealing the decorated zone with an oblique stroke, which is found within the vascular groove, above group BI. On the other hand, there is no denying that zigzag lines on this side have been executed by persons less skilled in the art of engraving. At the same time, the whole process was overseen by someone well versed in symbolic principles of composition of the representation. In our opinion, all ornaments on side B were incised by 6-8 persons.

Can we say that the act of engraving the ornament was an element of a ritual? There is a number of reasons to answer this question in the affirmative,

other than the fact known from ethnological sources that this form of behaviour, ie, the making of a complicated decoration, tends to have at its source rich symbolic motivation inherent in religious and cosmological beliefs (Reinach 1903; Breuil 1952; Leroi-Gourhan 1965; 1982; Richard 1993; Lewis-Williams 2002; Palacio-Pérez 2013). First, the ornamentation of the object was an effect of the labour of many individuals, even if there was someone to oversee the overall composition of the whole. Individual groups of zigzag lines have been engraved differently, using slightly different techniques, rhythms and sequence of the lines, moreover, zigzag lines within a group are often built by a different number of strokes. These questions have been discussed above at some length, here we will address some of the changes in the rhythm. Within group AV, after the main ornament was completed, it was extended at its eastern end with a few more strokes (c33, 34; d33, 34; g30-32; h-k30), so as to “properly” close the surface covered by the ornament. Within group BIII we observe a similar treatment applied at the end of lines IIIa-d. Furthermore, in different groups on side B we observe the occurrence of extremely short zigzag lines. These practices have no technological justification, rather they seem to express an order of a different sort – a symbolic one, companion to every ritual. It seems that the number of strokes within a line was not significant – it is variable (Table 1). In our view, from the perspective of the object’s makers it was more important to properly arrange the zigzag lines : i./ their groups or an individual zigzag line (AI) had to fill the entire width of plane A and B; ii./ within the groups the zigzag lines had to be approximately parallel.

The symbolic meaning of the groups is confirmed by different types of engraved marks and actions observed within the groups of zigzag lines and next to them. Below is a list of their traces: i./ group AIV: additional strokes next to lines IVc-IVf; ii./ the vigorous touching up of the strokes within the fragments of the closing zigzag lines in groups AV and AVI (Vk23-28, VIj17-20); iii./ group AVI: diagonal stroke above a5 and a6; iv./ group AVII: traces of pecking on strokes c23, 24; d23 and d24; v./ group BI: a break in lines I and II, a diagonal stroke above the break; vi./ group BIII: an engraving resembling half of an arrow underneath SE angle of this group; vii./ group BIV: three short strokes at the extension of a28, unengraved strokes d11 and e11, the diagonal cut to the east of strokes IVb31 and c31, already in the spongiosa, a shallow stroke to SW of e12; viii./ group BV: a chevron engraved to the north of the

eastern fragment of this group; ix./ group BVI: an additional stroke to the east of c29. These engravings and actions do not appear to be random, neither do they represent the remnants of earlier decoration; rather, they are a form of a “commentary” to the main ornament and/or they are meant to emphasise the meaning of some of its part. What is striking is their large number on side B. Obviously, the literal meaning of these practices is unclear to us. Nevertheless, the composition on side B evidently refers to the multilevel structure of the world, such as is known in many traditional cosmologies inspired eg, by shamanism (Eliade 1951 [1994]; Winkelman 1990; Vitebsky 1995 [1996]; Price 2001): we have here a zone of zigzag lines at bottom, a figural representation, and upper zigzag lines, their last group interrupted, and the break covered by the diagonal stroke, representing a sort of a symbolic seal of a passageway to another world.

Even earlier, we drew attention to several pieces of evidence confirming long-term use of the object – the worn condition of the lines of the ornament, visible especially at the E and W boundary of individual decorated zones. This apparently extended use of the decorated antler is an indirect evidence moreover for its ritual and religious significance, given the absence on this object of traces of its use as a tool.

### On the meaning of the ornamentation motifs

The complex ornamentation of the Rusinowo object consists of two elementary motifs: a zigzag line and an anthropomorphic representation. In the light of observations presented so far the latter is an image of a woman, with her legs spread out, her vulva emphasized. Woman representations with spread legs are known not only in Palaeolithic art but also in many traditional cultures across the world (Guthrie 2005, 353, 360). Some of them, for example an engraving on one of the pillars from Göbekli Tepe (Pre-Pottery Neolithic B) (Schmidt 2006 [2010, Fig. 30]), are thought to represent a scene of childbirth.

Deciphering the literal meaning of the zigzag patterns was a more complicated matter. Worth invoking at this point is the observation in Barton *et al.* (1994, 186) that we would have to have recourse to H.G. Wells’ time machine to grasp the true content of a representation from such a distant age. We are not as sceptical, however, and propose to delineate the context of these patterns in order to decipher their possible significance. In our studies, we drew on resources available in the Human Relations Area Files (eHRAF) published online. Obviously, it does

All things considered, we think that the ornaments on the object are the effect of the work of more than one individual. The engravings on side A were made by between one and three individuals, who (barring minor exceptions) were masters of the art of engraving. On side B, a similarly high level of craftsmanship is demonstrated by the anthropomorphic representation. All the other zigzag lines are the effect of the work of at least five people – and the level of execution is mediocre or quite poor. This is demonstrated by the measurements of the width of the zigzag lines and of the length of strokes building them, listed in tables 2-10 and 12-16. The data obtained for zigzag lines on side A is much more uniform, attesting the high technical skill of their maker. The order of engraving the designs on side A has been described earlier, only their time relationship to ornaments on side B is unknown. The regular appearance of the decoration on side A and the engraving of the zigzag lines decorating with a rapid episode suggest their canonical character – they and the anthropomorphic representation represent a narrative of a myth or doctrine explaining the world, its structure and operation. This narrative was created by a master engraver. The other engravings which set the female figure within a structure of space are the work of amateurs, the uninitiated – engraved within a cycle of recurring rituals.

happen that simple geometric patterns are used as if automatically, without any special meaning. A good example is how calabashes are ornamented by the indigenous Miskito and Sumu in present day Nicaragua and Honduras (Conzemius 1932, 53), with geometric patterns, zigzag lines included. These are impromptu inventions, lacking in a deeper meaning, meant only to assist identification of one’s own calabash. On the other hand, in the case of the Rusinowo object, this type of a relationship is improbable since it has no utilitarian significance.

Additionally, it should also be taken into account that the zigzag patterns on the object are not uniform. There is the solitary, short zigzag line, apparently companion to the anthropomorphic representation. The patterns on sides A and B are arranged in groups of 2-11 zigzag lines – except for the idiosyncratic, solitary line AI. Furthermore, group BI differs from the rest because the lines forming it have a break midway. Over this break is a diagonal stroke, a form of a symbolic seal. A review of the abundant literature concerned with the symbolism of zigzag lines among forager peoples brings

in a rich and complicated meaning of this motif. In many societies, a single zigzag is a symbol of the thunderbolt or lightning. This meaning of the motif is encountered eg, among the Assiniboine, Black Feet, Comanche, Crow, Gros Ventre, Omaha, Apache and many other peoples. In the iconography of the Semang of Malaysia, a stick figure of a human being with a vertical zigzag is Kiei, the god of thunder with his attribute (Schebesta 2000, 157, Fig. 1). In some societies, the zigzag mark has a wider use. Among the Western Apache, a zigzag line symbolises lightning, but may also have a different meaning within different groups, and even within the same group (Roberts 1929, 200). Among the Black Feet a zigzag may also denote a snake, animal tracks, a power-giving symbol; on the shields of the Crow, a zigzag above the head of a bison represents its breath (Lowie 1922, 404). Among the Omaha, this symbol was used as a mark of tears. In some situations, the meaning of zigzags could be more complex. Among the Aranda of central Australia, zigzags on ceremonial shields associated with the witchetty grub totem represented trails left by this insect (Spencer, Gillen 1927, 566); among the Maori, a zigzag on a fighting staff representing the god Tangaroa signifies sea waves (Buck 1952, 467). In the context of the solitary zigzag represented next to the human figure on the antler find from Rusinowo of most interest are the meanings we found among the Yokuts of central California and the Northern Paiute. Among the former, the zigzag pattern on a cradle is a mark of a baby's gender, with some difference of opinion as to whether it was used for girls (Kroeber 1953, 536), or of boys (Gayton 1948, 188). Among the Northern Paiute, the shade of a cradle was given a pattern of zigzags or diamonds – to mark cradles for girls (Kelly 1934, 133; Fowler, Liljeblad 1986, 449, Fig. 14). Themes related to fertility and birthing have been recorded in the

culture of the Western Apache. Painted zigzag lines, symbols of lightning, were used by them to decorate the poles of tepees where the initiation ceremony for girls was held (Goodwin 1939, 17, note no. 1). On the other hand, among the Cuna, horticulturalists living on the border of Panama and Columbia, a zigzag signifying the umbilical cord appears in songs telling about the creation by God of the first woman, Olotililisop (Nordenskiöld, Kantule 1938, 374).

The above list illustrates the rich symbolic meaning of the zigzag ornament. In reference to the representation of a woman on the object from Rusinowo, possibly in a birthing scene, the most likely meanings would be those associated with that event, and with fertility. At the same time it must remain unclear whether the zigzag is a symbol of the umbilical cord, or perhaps, it marks the child's gender, not to mention that other interpretations of this motif are also admissible. The other zigzag lines, arranged in groups – except for line AI, most likely have a different significance – if we accept the argument that the ornamentation of the Rusinowo object is a reference to the concept of a zonal structure of the world, popular among the forager peoples. It is conceivable that the zigzags separate different levels of this world. We may assume that these boundaries have an “aquatic” character. This could correspond to the dramatic landscape changes at the end of the glacial period in Northern Europe, the time of the emergence of a dense network of water bodies formed as a result of melting blocks of ice. We return to this issue in the next chapter.

Studies on the psychological significance of zigzag patterns show that the zigzag is often seen in conjunction with the eye ornament, it has accompanied a range of sexual representations and was used to ward off danger (Uher 1991). All of which suggests that the significance of this motif on the Rusinowo object is complex and multilayer.