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A SWORD FRAGMENT FROM NOWOSIÓŁKI KARDYNALSKIE, TOMASZÓW LUBELSKI DISTRICT. MATERIALS AND CONSERVATION REMARKS

The sword is part of the archaeological collection of the Janusz Peter Regional Museum in Tomaszów Lubelski, Poland (Muzeum Regionalne imienia Janusza Petera w Tomaszowie Lubelskim), inventory number MT/1163/A. The artefact was found in Nowosiółki Kardynalskie, Lubycza Królewska Commune, Tomaszów Lubelski District, Lubelskie Voivodeship, Poland. It was an accidental find, as the sword was discovered during ground works conducted at a private property. The context of the find was defined thoroughly as "excavated 40–60 cm below the ground level."

The analysed specimen is actually a fragment consisting of a small portion of the blade broken c. 5 cm below the lower guard, and the tang broken right below the upper guard. A greater part of the blade and the pommel are missing[1] (Fig. 1). The lower guard remains solidly attached to the blade and bears traces of silver wire plating decorated with Viking Age Scandinavian animal style motifs, identified as the Jellinge style. Basic formal features of the cross-guard as well as its ornamentation suggest that the sword should be classified as Petersen's Type R or S[2] (1919) and treated as an import (Michalak, Pudło 2008, pp. 362–363). There are some differences between "classic" examples of these types and the sword from Nowosiółki Kardynalskie. From the side view the sword's guard is rather narrow and slightly concave on both sides. Viewed from the top it appears wide and oval, with both ends being rounded. Narrow and slender guards are more typical for Type R swords (Petersen 1919, fig. 113; Peirce 2002, p. 97), but sometimes, although rarely, they are combined with Type S pommels (Peirce 2002, pp.100–101, 106–107). Both types of lower guards are usually of lenticular shape when viewed from the top (Petersen 1919, figs. 113–116). More seldom they have rounded ends, as in specimens from Boye, Busdorf or Lutowo (cf. Müller-Wille 1973, figs. 9–10; Peirce 2002, p. 106; Siwiak, Zajączkowska 2008, fig. 1). Therefore, while relying on the shape and decoration of the guard only, it is impossible to assign it to one of the mentioned types.

The distribution of finds of both types might be helpful in this case. Swords of Type R are almost exclusively known from Scandinavia (Petersen 1919, p. 140–142; Jakobsson 1992, p. 40–41, 212, 225, Plate 2; Sørheim 1997, p. 31–40, fig. 12–14; Martens 2004, p. 134; Thålin-Bergman 2005, Plate 7–8; Stalsberg 2008a, Plate I). A few specimens were found in Western Europe (cf. Petersen 1919, p. 142; Walsh 1998, Plate 8; Żabiński 2007, Plate 2). There are almost no finds of Type R swords in Central,[3] Eastern and Southern Europe (cf. Ruttkay 1976; Kirpičnikov 1986, Plate I; Mandel 1991; Jakobsson 1992, p. 225; Шитов 1994; Kovács 1994; Кирпичников, Измайлов 2000; Yotov 2003; Marek 2005; Strzyż

[1] Dimensions of the sword: preserved length – 15.6 cm; preserved length of the tang – 6.9 cm; thickness of the tang – 0.6 cm; length of the lower guard – 11.3 cm; height of the guard – 1.3–1.5 cm; thickness of the guard – 2.3 cm; preserved length of the blade – 7.4 cm; width of the blade – 5.3 cm; thickness of the blade – 0.35–0.5 cm.

[2] A. Geibig found the differences between these types so small that he decided to combine them into one type, namely his Kombinationstyp 10 (Geibig 1991, p. 52–54, fig. 1, 11). I. Martens (2004, p. 134) disagrees with this opinion.

[3] A fragment of a Type R sword from Hamburg, Germany is an exception (Müller-Wille 1970).

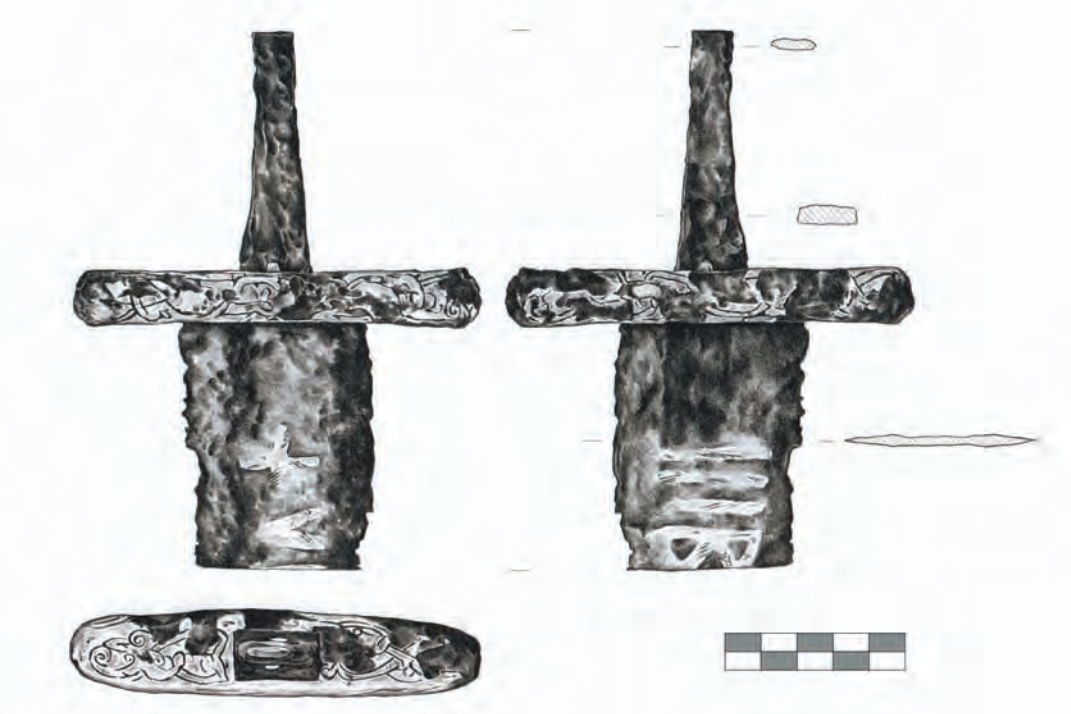

Fig. 1. Nowosiółki Kardynalskie. Sword fragment. Drawing P. Ignaczak

2006; Кирпичников, Сакса, Томантери 2006). The same applies to the areas adjacent to the find place of the discussed sword (cf. Зоценко 2004; Strzyż 2006; Терський 2007). Only one sword from the territory of Poland is believed to be of Type R[4] – the specimen from Karsznice in Central Poland[5] (Nadolski 1954, p. 25, Cat. № A:24, Plate III:1; Wrzesiński 1998, Plate I:20; Marek 2005, Cat. № 174). On the other hand, swords of Type S are one of more popular types, distributed throughout Europe. Their number is estimated at about 90 specimens (Michalak 2007, p. 201). They are common in Northern, Central and Eastern Europe (Martens 2004, p. 134). Single finds are known even from places as exotic as Volga Bulgaria (Кирпичников, Измайлов 2000, p. 208, fig. 2, 4–5) or Bulgaria (Yotov 2003, p. 7). Some Type S swords are known from present-day Poland (Sarnowska 1955; Dunin-Karwowski 1978, p. 165–167, figs. 1–2; Świątkiewicz 2002, p. 20–21. Cat. № 9, 13, fig. I:5, 8; Michalak 2007, p. 200–201; Siwiak, Zajączkowska 2008; Rybka 2009). One specimen was found in the territory of the Lubelskie Voivodeship in Dołhobyczów (cf. Strzyż 2006, p. 21, Plate I:6, fig. 2:1 – there as Hrubieszów). Another sword is known from a burial ground in Plisnensk, Western Ukraine (Liwoch 2005, Phot. 10–12, figs. 12–13).

Given the above considerations, it is not possible to determine the typological assignment of the analysed sword fragment, although the distribution of both types suggests that the find from Nowosiółki Kardynalskie is more likely Type S. Still, this is no more than a conjecture. Both types are dated to the 10th century (Jones 2002, p. 18–19; Martens 2004, p. 127; Stalsberg 2008, fig. 4), albeit on the periphery of its range of occurrence Type S could remain in use at the beginning of the 11th century (cf. Plisnensk – Liwoch 2005, p. 50, 52). This corresponds to dating of the lower guard's ornamentation style, which was popular throughout the 10th century (Wilson, Klindt-Jensen 1966, p. 95–118). The chronology of the analysed artefact should therefore be set in the early 10th or 11th century.

The sword was covered with thick, heavily mineralized corrosion products, its surface being rich in deep-seated rust marks. Unexpectedly no remains of sheath or grip lining or any other traces of organic materials were observed, neither macro- nor microscopically. The corrosion products also covered the partially damaged silver plating (Fig. 2).

[4] A bone pommel head found in Gniezno, Greater Poland was connected with Type R (Sawicki 1990, pp. 225–226, figs. 1–2). Due to the lack of "animal heads," which are typical for Type R, this interpretation seems to be incorrect (Petersen 1919, pp. 140–142).

[5] Re-examination of the Karsznice sword conducted by our colleague Piotr Pudło from the Institute of Archaeology, University of Łódź resulted in its recognition as a representative of Type S. This was based on the specimen's construction details as well as general massiveness of its hilt elements. We extend our thanks to Dr. Pudło for sharing this information.

Fig. 2. Nowosiółki Kardynalskie. Sword's condition before conservation. Photo. K. Rybka, P. Lucypera

During the initial conservation treatment aimed at removal of corrosion products from the preserved part of the blade, it was observed that some of its segments bore differently shaped rust marks, compared to those visible on the remaining portions of the blade's surface (Fig. 3). Further analysis with a stereoscopic microscope conducted on the cleansed sword's flats allowed to identify some distinguishable

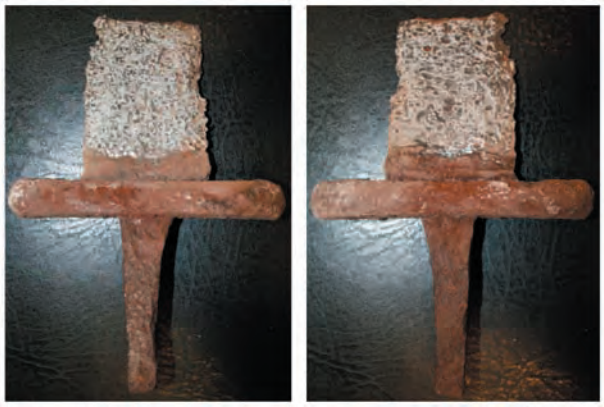

Fig. 3. Nowosiółki Kardynalskie. Condition after removal of corrosion products from the blade. Photo. K. Rybka

darkened traces-lines as remains of inlay, enclosed within the outer borders of the fuller (Fig. 4).

The blade was etched with a 4% solution of Nital (Fig. 5). This process revealed the presumptive signs welded on both flats of the blade. One was read as an inscription consisting of V and L letters (the other preserved partially) preceded with a cross mark, identified as part of the Ulfberht signature[6] (Fig. 6). The inlay discovered on the other side confirmed the

[6] Taking the results of recent metallographic study of Ulfberht blades carried out by A. Williams into consideration, this sword's full signature should have the second cross placed after the letter T (cf. Williams 2009). We thank Dr. Williams for pointing out this possibility.

Fig. 4. Nowosiółki Kardynalskie. Traces of pattern-welded inlay on the blade. Before etching. Photo. K. Rybka

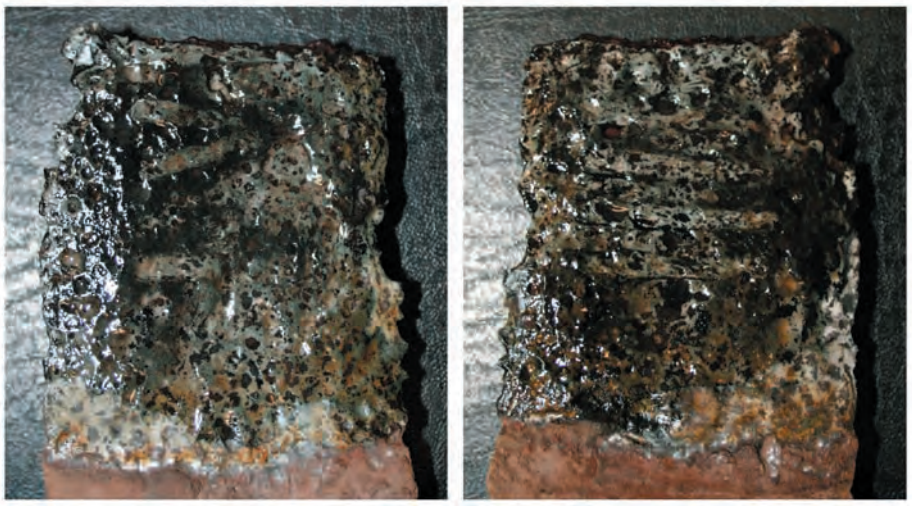

Fig. 5. Nowosiółki Kardynalskie. Blade during etching. The signature (left) and reverse marks (right) becoming visible. Photo. K. Rybka

former opinion, as it proved to be a set of geometrical signs composed of three vertical bars and diagonally crossed lines (Fig. 7). This geometrical composition is intrinsic to Ulfberht sword blades (Stalsberg 2008a, p. 95–97, fig. 1). The signature as well as the reverse marks were presumed to be pattern-welded due to some characteristic traces visible within the borders of the letters/signs.

Because of the sword's condition it was possible to make a metallographic analysis of the blade without it suffering too much damage. Transverse samples were cut out from the end of the remaining blade and the tang. The blade was cut along the inlaid inscriptions, so the cross-section picture was obviously expected to contain traces of outer layers corresponding both to the signature and the geometrical pattern. While the tang cross-section clearly depicted a three-layer composition (Fig. 9), the profile of the blade was somewhat disturbing (Fig. 10). Apart from obvious slag inclusions (Fig. 8), the inlaid letters/signs were distinguishable, but there were some concerns about the location of their outer parts and the transitions between individual layers of the blade itself. Another question was whether the visible slag lines were traces of packeting of the blade's innermost layer, or they should be interpreted as separate bands over- and

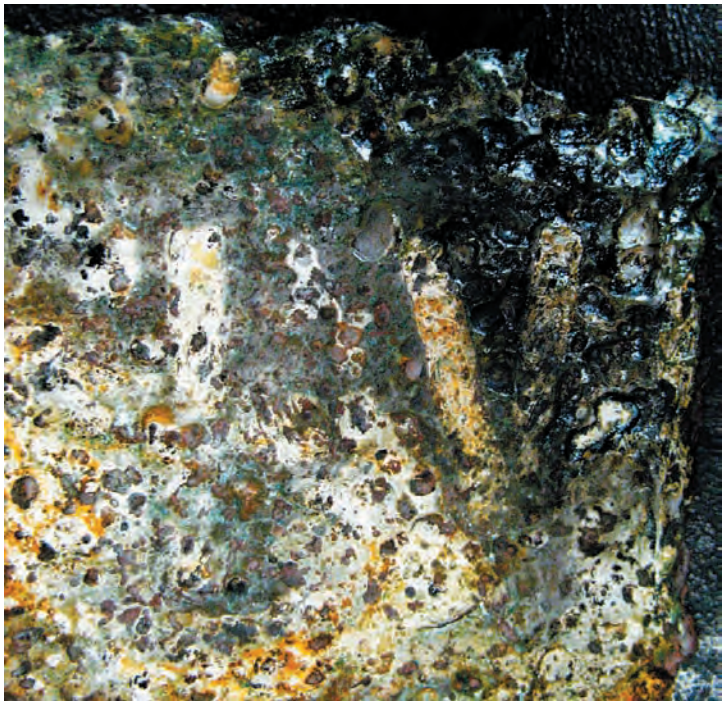

Fig. 6. Nowosiółki Kardynalskie. Blade after etching. Signature. Photo. K. Rybka

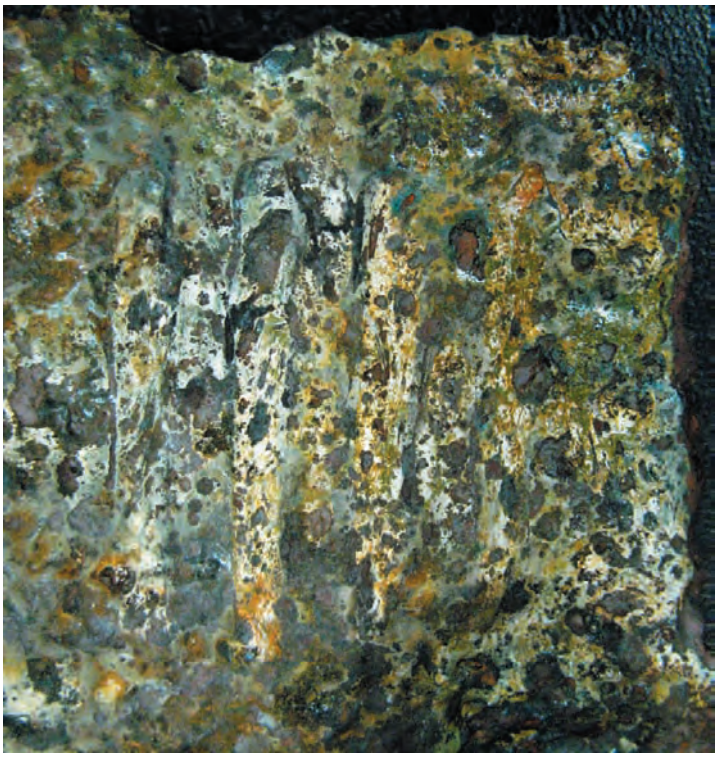

Fig. 7. Nowosiółkli Kardynalskie. Blade after etching. Reverse marks.
Photo. K. Rybka

underlying the core. If the dark layers were parts of the inlays, it would mean that the grooves for inlaying the signature and reverse marks were cut quite deep. This interpretation would correspond to the three-banded profile of the tang – if one assumes that it was drawn out from the blade and not welded onto it – there are clearly no as highly carburised layers visible on its cross-section. These deep cavities along with the observed large slag inclusions could be the reason for the blade to break in this particular place. The obtained samples and micrographs were sent for verification and further, more detailed research, to Jiří Hošek from Archeologicky Ústav Akademie Ved Česke Republiky in Prague (to whom we extend our warm thanks for conducting all this disinterested work).

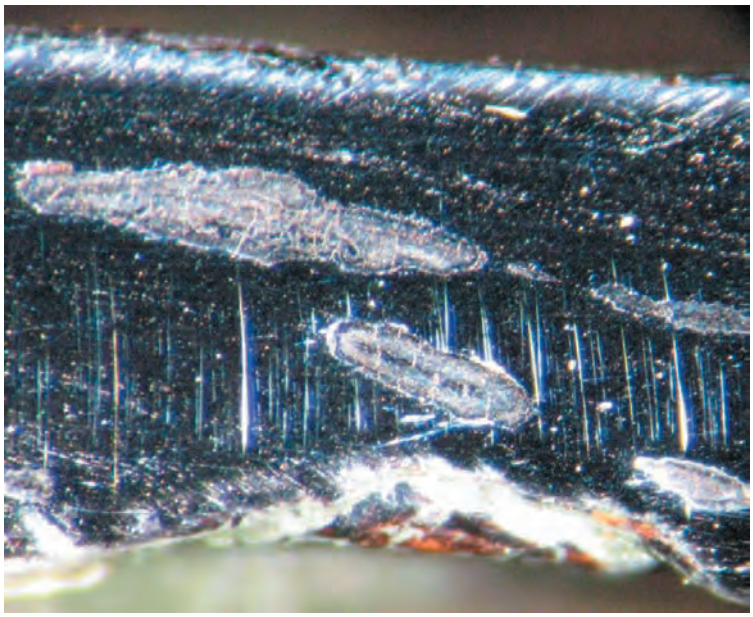

Fig. 8. Nowosiółki Kardynalskie. Cross-section of the blade.
Slag inclusions. Unetched. Photo. P. Kucypera, K. Rybka

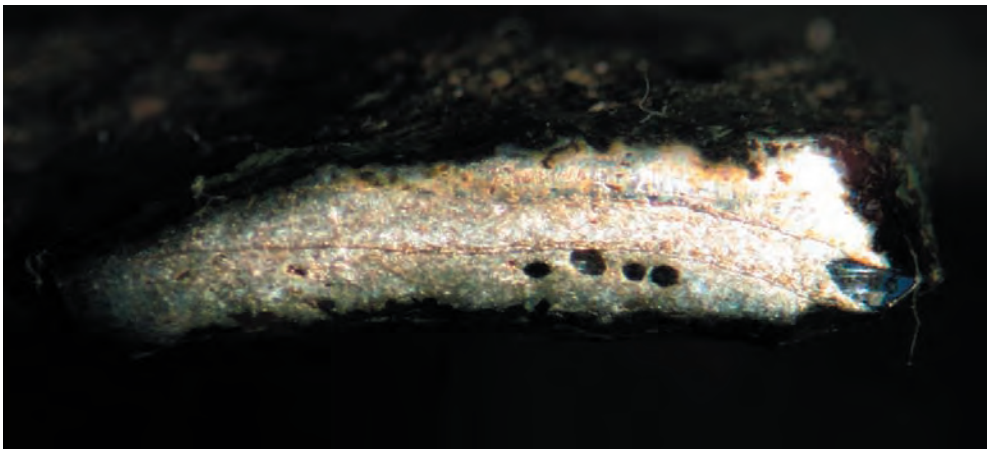

Fig. 9. Nowosiółki Kardynalskie. Cross-section of the tang. Etched. Photo. K. Rybka

Sample's micrographs (Fig. 11) depict a heterogeneous core of varying ferrite–pearlite/ferrite structure (iron/phosphoric iron and low carbon steel [carburised iron]) or a banded structure of alternating phosphoric iron and steel layers welded together to form the main substance of the blade. Although no weld lines were clearly visible during the microscopic analysis, the latter explanation would correspond to the three-layered tang construction. The pattern-welded signature letter as well as the geometrical reverse mark were made of a twisted phosphoric iron and steel laminate. The dark bands visible in the cross-sectional view of the blade can therefore be associated with pattern-welding.

Original cutting edges are largely missing. They should have rather belonged to the middle part, but they may have also been made of some other steel rods welded to the core or hammered in between its layers. Anyway the analysed sample has an area of tempered martensite with the hardness of 382±27 HV0.2 (martensitic structure is characteristic for heat treated steel, or – to be more specific – quenched steel). It is visible near the preserved edge – we can suppose that the original cutting-edges were hardened.

The silver plating of the lower guard (Fig. 12) was made of silver wire (conducted spectrometric analysis showed that the silver was actually an alloy of silver with small amount of copper). The surface was covered with numerous thin, shallow cuts and the wire was delicately hammered in (heat had to be applied for this process to work), flattened out and smoothened to achieve a uniform surface. The ornament placed on the cross-guard was made using niello technique. Decoration was cut in the plating and filled with a sulphur, copper and silver powder mixture, heated (the mixture melted and consolidated as a black metallic alloy) and finally polished to achieve the ultimate effect.

The conservation required the removal of all corrosion products from the surface of the preserved sword fragment. This was achieved by using

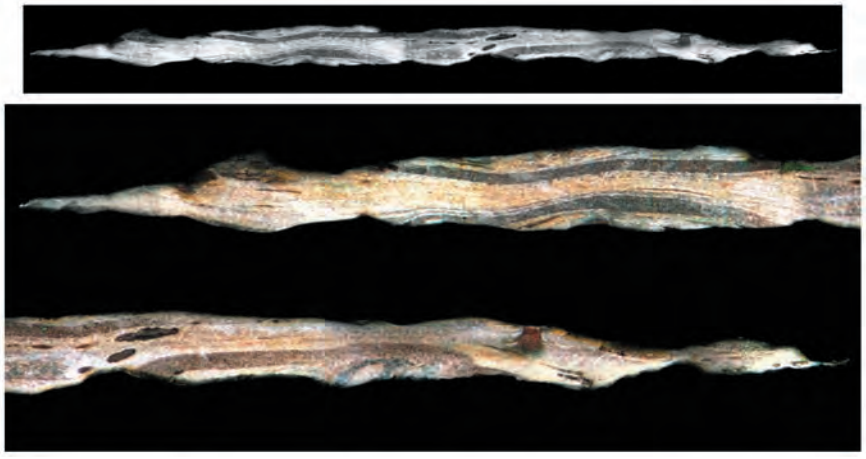

Fig. 10. Nowosiółki Kardynalskie. Cross-section of the blade. Etched. Photo. P. Kucypera

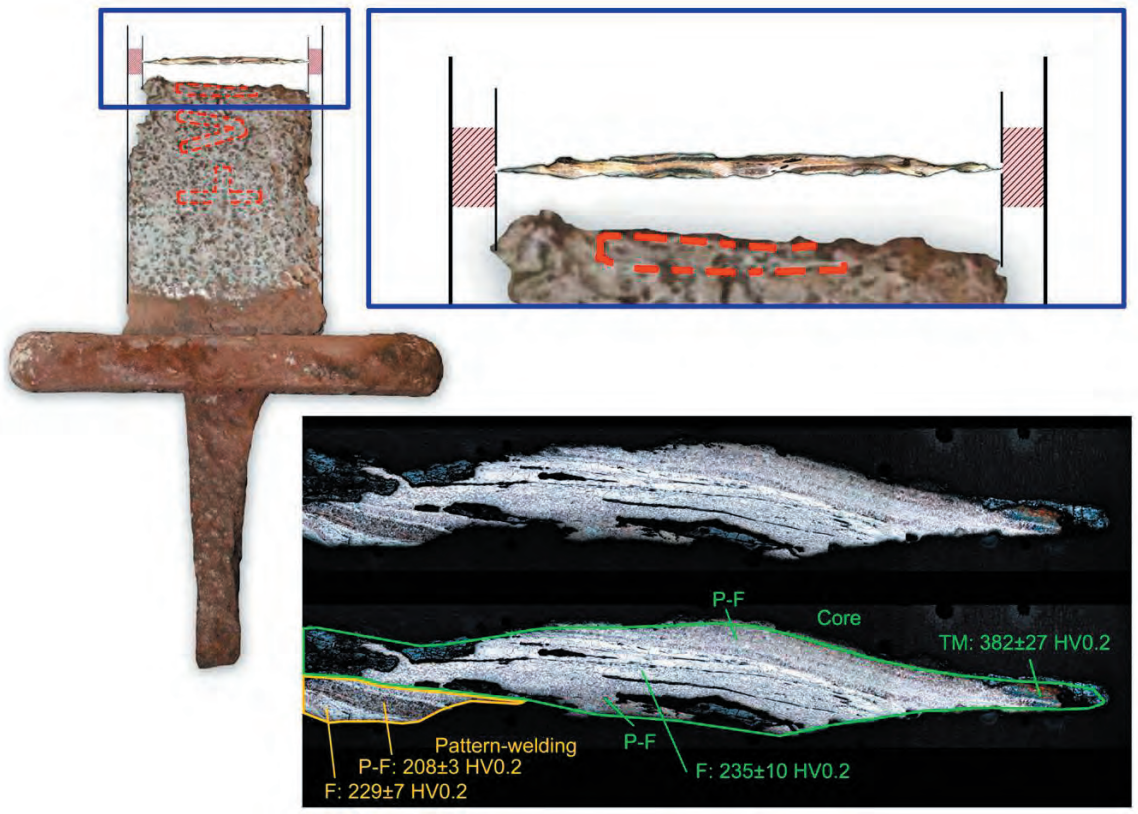

Fig. 11. Nowosiółki Kardynalskie. Metallographic analysis of blade. Drawing J. Hošek

interchangeable ultrasound treatment of the object bathed in 99.9% ethanol and mechanical removal of loosened rust (including microdrills). The plated surfaces were cleaned separately. When the removal of all corrosion products was completed, the sword was bathed in a solution of tannin in ethanol. The silver plating was cleansed again and all its parts which were loosened or removed during the course of conservation were glued back to their place and secured. It was sometimes necessary due to the need of removal of corrosion products from the substance of the cross-guard situated under the plating. The sword was then bathed in a 10% solution of B72 Paraloid in toluene and placed in a vacuum chamber to extract all the moisture and stop any further corrosion processes (water is imminent for them to progress). Finally the sword was covered with a 5% solution of Paraloid B72 in acetone. The finishing treatment involved covering of the object with a solution of H80 Cosmoloid microwax in turpentine. The silver surfaces were covered with a pure microwax paste, while its mixture with graphite dust was used to cover the iron/steel parts. The excess of the paste was removed and the object was polished with a cotton cloth (Figs. 13–15).

In short, we once again need to emphasize the role of comprehensive studies of individual military finds, taking into account the significance of such specimens as the one described here in detail. Despite its fragmentary state, the object required an in-depth analysis far exceeding a standard description of a typical late example of weaponry. This detailed expertise is not conducted solely for the benefit of the specimen itself. Such a study allows to produce a valuable base, even if tedious, of knowledge on high quality craft products, which results in the expansion of factual groundwork for a deeper scientific discussion in the scope of military oriented manufacture confined within the social history of the given time.

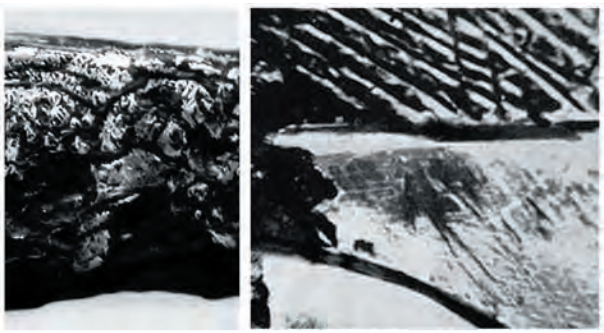

Fig. 12. Nowosiółki Kardynalskie. Detail of guard plating. Photo. P. Kucypera

Fig. 13. Nowosiółkli Kardynalskie. Sword after conservation. Photo. J. Bagińska

Fig. 14. Nowosiółki Kardynalskie. Sword after conservation (second side). Photo. J. Bagińska

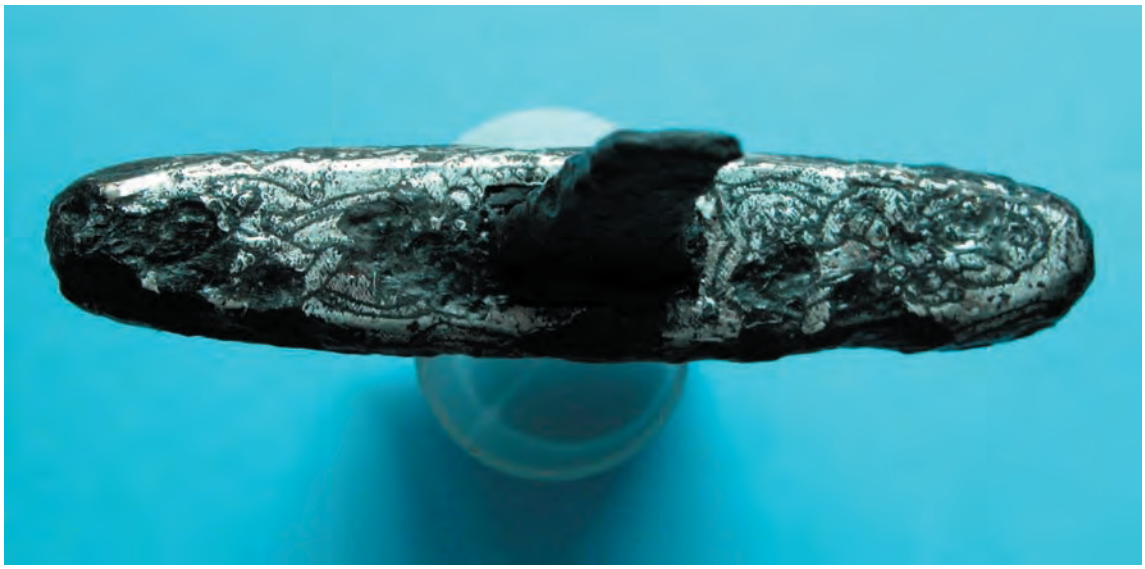

Fig. 15. Nowosiółki Kardynalskie. Sword after conservation. Top view. Photo. J. Bagińska

BIBLIOGRAPHY

Dunin-Karwicki J.
1978 *Analiza bronioznawczo-metalograficzna trzech mieczy wczesnośredniowiecznych ze zbiorów Państwowego Muzeum Archeologicznego w Warszawie*, Wiadomości Archeologiczne, Vol. 43, No 2, pp. 165–172.

Geibig A.
1991 *Beiträge zur morphologischen Entwicklung des Schwertes im Mittelalter. Eine Analyse des Fundmaterials vom ausgehenden 8. bis zum 12. Jahrhundert aus Sammlungen der Bundesrepublik Deutschland*, Offa-Bücher, Vol. 71, Neumünster.

Jakobsson M.
1992 *Krigarideologi och vikingatida svärdtypologi*, Stockholms Studies in Archaeology, Vol. 11, Stockholm.
Jones L. A.
2002 *Overview of Hilt & Blade Classifications,* (in:) I. G. Peirce (ed.), *Swords of the Viking Age*, Woodbridge, pp. 15–24.
Kirpičnikov A.N.
1986 *Russische Waffen des 9.–15. Jahrhunderts*, Waffen- und Kostümkunde. Zeitschrift für Waffen- und Kleidungsgeschichte, Vol. 28/1, pp. 1–22.
Kovacs S. T.
1994 *A Kopaszi-Zatonyi Fegyverek*, Folia Archaeologica (Budapest), Vol. 43, pp. 251–276.
Liwoch R.
2005 *Militaria z dziewiętnastowiecznych badań w Podhorcach*, Acta Militaria Mediaevalia, Vol. 1, pp. 37–59.
Mandel M.
1991 *Eesti 8.–13. sajandi mõõkade. Tüpoloogiast ja dateerimisest*, (in:) Muinasaja Teadus I. Arheoloogiline kogumik, Tallin, pp. 101–133 + Pl. VII–XIII.
Marek L.
2005 *Early Medieval Swords from Central and Eastern Europe. Dilemmas of an Archeologist and a Student of Arms*, Acta Universitatis Wratislaviensis, No 2713, Wrocław.
Martens I.
2004 *Indigenous and imported Viking Age weapons in Norway – a problem with European implications*, Journal of Nordic Archaeological Science, Vol. 14, pp. 125–137.
Michalak A.
2007 *„A grodzianie [...] wyszli naprzeciw z dobytymi mieczami...". Więcej o występowaniu mieczy na Środkowym Nadodrzu w średniowieczu*, Archeologia Środkowego Nadodrza, Vol. 5, pp. 199–224.
Michalak A., Pudło P.
2008 *Poszukując miecza Wikingów. Uwagi o aspektach i kryteriach pozwalających ustalić pochodzenie,* (in:) M. Bogacki, M. Franz, Z. Pilarczyk (eds.), Kultura ludów Morza Bałtyckiego. Starożytność i średniowiecze, Mare Integrans. Studia nad dziejami wybrzeży Morza Bałtyckiego, Toruń, pp. 359–384.
Müller-Wille M.
1970 *Ein neues ULFBERHT-Schwert aus Hamburg*, Offa, Vol. 27, pp. 65–88.
1973 *Zwei wikingerzeitliche Prachtschwerter aus der Umgebung von Haithabu*, Berichte über die Ausgrabungen in Haithabu, Vol. 6, pp. 47–89.
Nadolski A.
1954 *Studia nad uzbrojeniem polskim w X, XI i XII wieku*, Łódź.
Peirce I.G.
2002 *Swords of the Viking Age*, Woodbridge.
Petersen J.
1919 *De norske Vikingesverd. En typologisk studie over vikingetidens vaaben*, Kristiania.
Ruttkay A.
1976 *Waffen und Reiterausrüstung des 9. bis zur ersten Hälfte des 14. Jahrhunderts in der Slowakei (II)*, Slovenská Archeologia, Vol. 24/2, pp. 245–395.
Rybka K.
2009 *Wyniki prac konserwatorskich miecza z Lutowa*, (in:) P. Kucypera, P. Pudło, G. Żabiński (eds.), Arma et Medium Aevum. Studia nad uzbrojeniem średniowiecznym, Toruń, pp. 169–181.
Sarnowska W.
1955 *Miecze wczesnośredniowieczne w Polsce*, Światowit, Vol. 21, pp. 276–320.
Sawicki T.
1990 *Wczesnośredniowieczna nakładka głowicy miecza z Gniezna*, Gniezno. Studia i Materiały Historyczne, Vol. 3, Warszawa-Poznań, pp. 223–236.
Siwiak A., Zajączkowska T.
2008 *Znalezisko wczesnośredniowiecznego miecza z Lutowa, gm. Sępólno Krajeńskie, komunikat,* (in:) M. Bogacki, M. Franz, Z. Pilarczyk (eds.), Kultura ludów Morza Bałtyckiego. Starożytność i średniowiecze, Mare Integrans. Studia nad dziejami wybrzeży Morza Bałtyckiego, Toruń, pp. 403–407.
Sørheim H.
1997 *En Høvdings Gård – En Høvdings Grav. En vikingtids båtgrav på Egge i Steinkjer, Nord-Trøndelag*, Gunneria, Vol. 72, Trondheim.
Stalsberg A.
2008 *The Vlfberht Sword Blades: Production and Trade,* (in:) M. Bogacki, M. Franz, Z. Pilarczyk (eds.), Kultura ludów Morza Bałtyckiego. Starożytność i średniowiecze, Mare Integrans. Studia nad dziejami wybrzeży Morza Bałtyckiego, Toruń, pp. 321–358.
2008a *Herstellung und Verbreitung der Vlfberht-Schertklingen. Eine Neubewertung*, Zeitschrift für Archäologie der Mittelalters, Vol. 36, pp. 89–118.
Strzyż P.
2006 *Uzbrojenie we wczesnośredniowiecznej Małopolsce*, Acta Archaeologica Lodziensia, Vol. 52, Łódź.
Świątkiewicz P.
2002 *Uzbrojenie wczesnośredniowieczne z Pomorza Zachodniego*, Łódź.
Thålin-Bergman L.
2005 *Irradiation of swords*, (in:) L. Thålin Bergman, B. Arrhenius (eds.), Excavation in Helgö. Weapon Investigations Helgö and Swedish Hinterland, Stockholm, pp. 35–51.
Williams A.
2009 *A Metallurgical Study of Some Viking Swords*, Gladius, Vol. 29, pp. 121–184.
Walsh A.
1998 *A Summary Classification of Viking Age Swords in Ireland,* (in:) H. Clarke, M.N. Mhaonaigh, R.Ó. Floinn (eds.), *Ireland and Scandinavia in the Early Viking Age*, Bodmin, pp. 222–238.
Wilson D. M., Klindt-Jensen O.
1966 *Viking Art*, London.
Wrzesiński J.
1998 *Groby z mieczami na terenie Polski wczesnopiastowskiej*, Prace i Materiały Muzeum Archeologicznego i Etnograficznego w Łodzi, Seria Archeologiczna, Vol. 40 (1997–1998), pp. 7–46.
Yotov V.
2003 *The vikings on the Balcans*, Varna.
Żabiński G.
2007 *Viking Age Swords from Scotland*, Acta Militaria Mediaevalia, Vol. 3, pp. 29–84.

Зоценко В.М.
2004 *Скандинавські артефакти південно-західної Русі,* (in:) О.П. Моця (ed.), Стародавній Іскоростень і слов'янські гради VIII–X ст., Київ, pp. 87–105.
Кирпичников А.Н., Измайлов И.
2000 *Каролингские мечи из Булгарии (из фондов Государственного объединенного музея Республики Татарстан*), (in:) Средневековая Казань: возникновение и развитие, Казань, pp. 207–218.
Кирпичников А.Н., Сакса А.И., Томантери Л.
2006 *Мечи средневековой Карелии,* (in:) А.Н. Кирпичников, Е.Н. Носов, А.И. Сакса (eds.), Славяне и финно-угры. Контактное зоны и взаимодействие культур, Санкт-Петербург, pp. 41–72.
Терський С.
2007 *Скандзнавські археологічні пам'ятки Волині (X–XII ст.),* (in:) Другі «ольжині читання», Львів, pp. 53–58.
Шитов В.Н.
1994 *Мечи X–XI вв. на территории Мордови*, (in:) Историко-археологическое изучение Поволжья, Йошкар-Ола, pp. 44–49 + Pl. XVII–XX.

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