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PLATES FROM RADZYŃ CHEŁMIŃSKI

Preliminary issues

Radzyń Chełmiński is situated in the north-eastern part of Chełmno Land, about 17 km south-east from Grudziądz[1] (Fig. 1). The object is located about 250 m north from the town marketplace, close to an important historic route leading towards Grudziądz[2]. In the 1st half of the 13th c. it was one of the most significant administration centres of Duke Konrad (†1247). First information concerning Radzyń komtur comes from 1251[3]. The exact date of the convent castle erecting is not known today, but it presumably took place between 1270 and 1330[4]. The castle is situated on the top of a natural moraine hill and it consists of the main castle, southern and eastern outer castle baileys. The main castle was erected on a square plan with sizes of 49.4 x 49.6 m[5]. The convent building was flanked by four square towers placed in corners, sized 5.20 x 5.30 m, moved forward towards the wall facing. North-western corner roomed an octagonal massive tower with the diameter of about 12 m. Southern main castle wing was equipped with the only gate leading to the yard (Fig. 2).

Fig. 1. Location of Radzyń Chełmiński.

Archaeological-architectonic research in the castle started in 2007[6]. At that time, 6 trenches in the southern approaches were explored. The purpose of those systematic archaeological explorations was, first and foremost, to make a preliminary recognition of cultural layers' character, obtain stratigraphical sequence of layers deposited in that site and to define the object's chronology[7]. In 2008, the Institute of Archaeology, Department of Archaeology of Architecture of NCU in Toruń began an archaeological exploration in the area of the main castle[8]. The studies concentrated within the western castle wing, in which the komtur's dwelling buildings had been situated. In 2009, the exploration of the yard at western castle curtain and in the 'parcham' – the space between western curtain and another wall line, near the 'dansker' – were continued. Two trenches were situated there (Nos. 14 and 15 on Figs. 3–4).

A trial trench No. 15 adjoining to another castle wall line was dug to verify information from the documentation of architectonic research carried out in the 1980s, when an unrecognized construction was excavated near the 'dansker'. Under the humus layer, another strongly distracted

[1] The fundamental literature concerning historical, archaeological and architectonic studies of the castle in Radzyń Chełmiński – among the others: C. Steinbrecht, *Die Baukunst des Ritterordens in Preussen*, Berlin 1888; M. Arszyński, *Z badań nad zamkiem pokrzyżackim w Radzynie*, „Rocznik Grudziądzki", Vol. II, 1961, p. 39-77; A. Pabian, W. Rozynkowski, *Zamki Krzyżackie na Ziemi Chełmińskiej*, Toruń 1997; T. Torbus, *Die Konventsburgen ins Deutschordensland Preussen*, München 1998; M. Haftka, *Zamki Krzyżackie w Polsce,* Malbork-Płock 1999; R. Gazda, *Raport wstępny z badań zamku krzyżackiego w Radzyniu Chełmińskim, woj. kujawsko-pomorskie*, Toruń 2007, manuscript in Institute of Archaeology (IA) of Nicolaus Copernicus University (NCU) in Toruń; M. Wiewióra, *Badania archeologiczno-architektoniczne zamku głównego w Radzyniu Chełmińskim w latach 2008–2009,* [in:] XVII Sesja Pomorzoznawcza, in print.

[2] M. Arszyński, *op.cit.*, p. 43

[3] T. Torbus, *op.cit.*, p. 595.

[4] *Ibidem*, pp. 601–602; M. Arszyński, *op.cit.*, pp. 59–69; M. Wiewióra, *op.cit.*

[5] T. Torbus, *op.cit.*, p. 597.

[6] The works under supervision of Daniel Gazda from the Anthropological and Archaeological Institute of the Aleksander Gieysztor Humanistic Academy in Pułtusk.

[7] D. Gazda, *op.cit.*, p. 1.

[8] The exploration was supervised by Marcin Wiewióra from IA of NCU in Toruń.

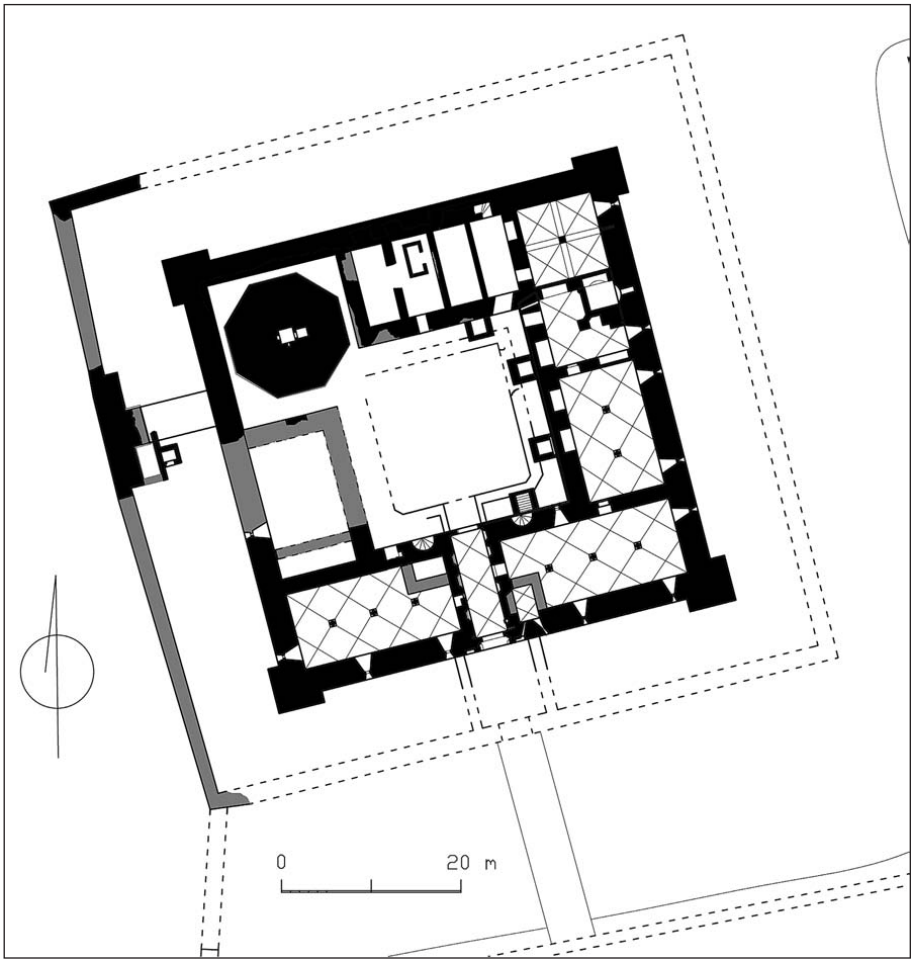

Fig. 2. Reconstruction of the upper castle in Radzyń Chełmiński (by B. Wasik).

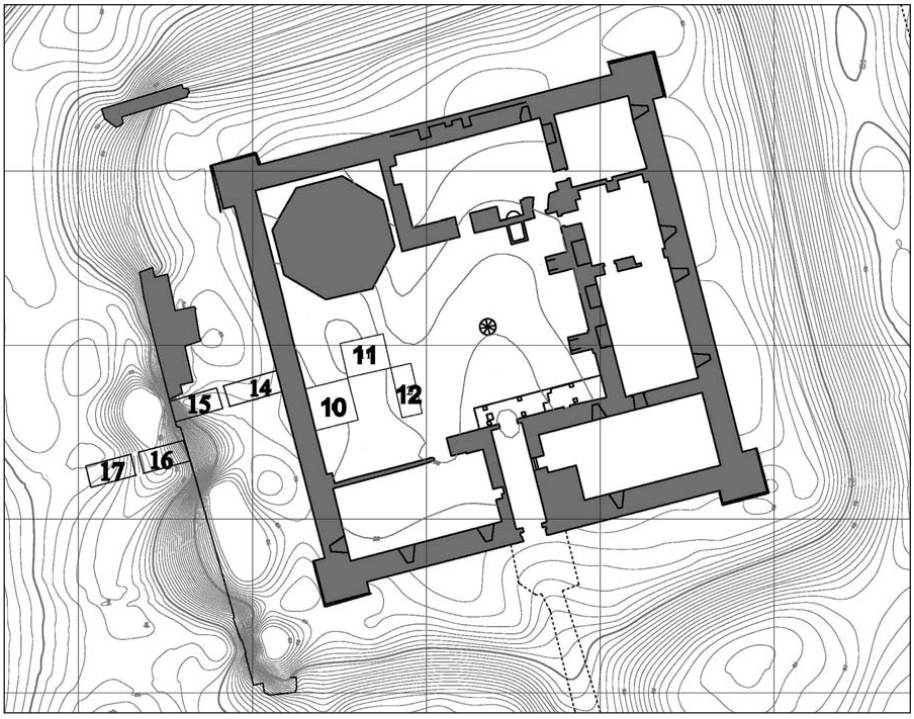

Fig. 3. Location of research trenches explored in 2009 (by R. Łopaciuk, M. Wiewióra).

composition of layers with the thickness of about 1 m and signs of a stone fireplace framing were registered (?). In the northern trench profile, about 0.5 m below the ground level, a fragment of a brick wall crown running from the east to the west was revealed. Near the wall crown and in the central and northern trench part, about 1.2 m from the ground surface, several dozens of fragments or complete elements of armour, crossbow bolts, iron nails and other metal objects were reported (Figs. 3–4). The military accessories collection excavated there was deposited in a relatively small area,

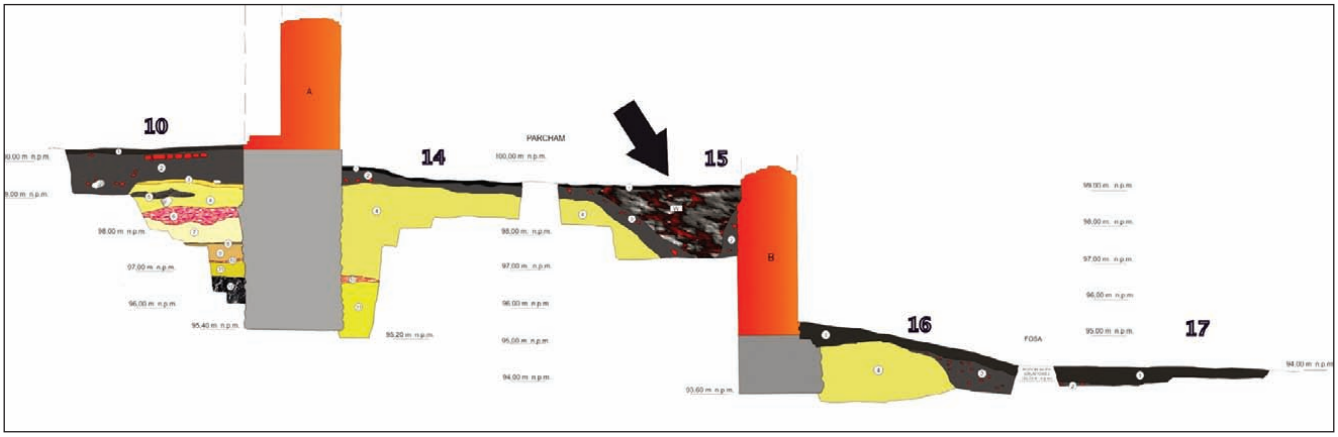

Fig. 4. The cross-section (EW) of research trenches Nos. 10, 14 and 15–17 (by W. Miłek).

Fig. 5. Research trench No. 15 – general view (photo D. Gazda).

scattered around without any intentional composition, registerable by the means of archaeological methods[9] (Fig. 5).

During trench 15 exploration, a significant number of iron plates, highly corroded, fragmentary and substantially misshapen, were obtained. The material distraction was about 2 m². A total of 134 elements were obtained with predomination of rectangular forms (Fig. 6) and trapezoid ones, but irregular shapes also occurred, as well as many tiny undefined pieces.

The state of preservation

The state of preservation of the metal elements of the armour was influenced by soil conditions in which they had reposed until their excavation. No traces of mechanical

[9] Archaeological explorations were not continued in the 'parcham' in the following years.

damage to elements connected with the exploitation of the armour have been found. The surface of all the fragments was covered with mineral particles of grey soil. Mineral accretion interpenetrated certain whitish products, most probably limestone formations and products of corrosion. While corroding, iron increases its volume, hence,

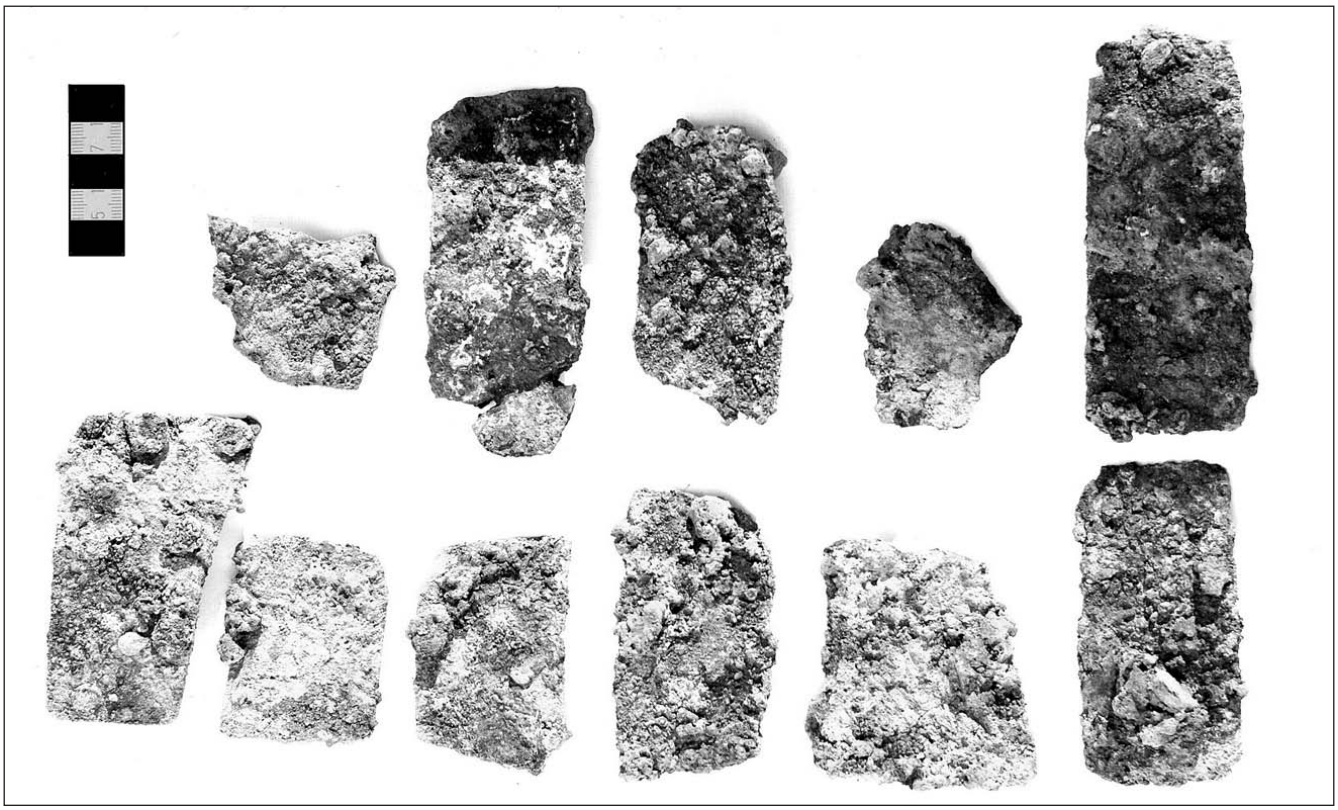

Fig. 6. Fragments of the armor before conservation work (photo M. Wiewióra).

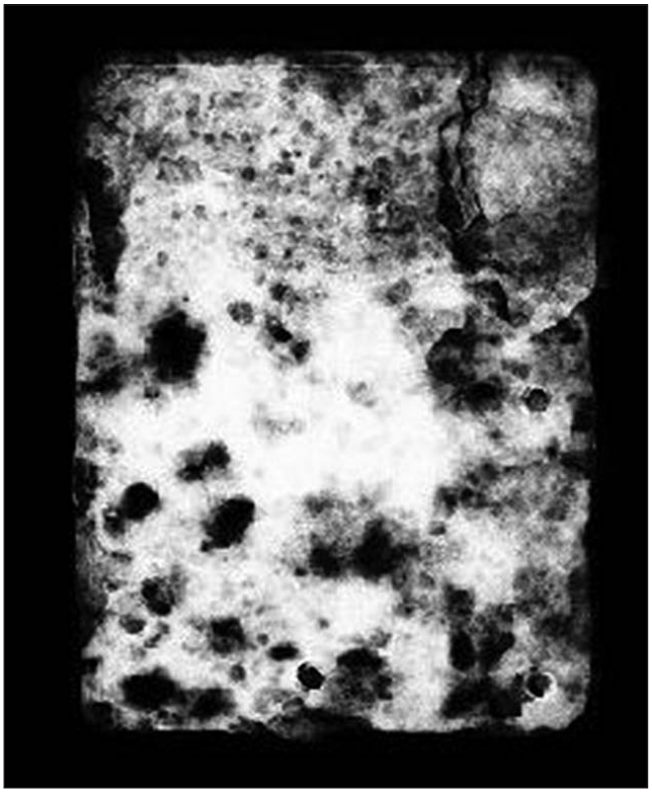

Fig. 7. X-ray examination – indentations repeating the outline of the plate (photo K. Cackowski).

Fig. 8. X-ray examination – rivet holes (photo K. Cackowski).

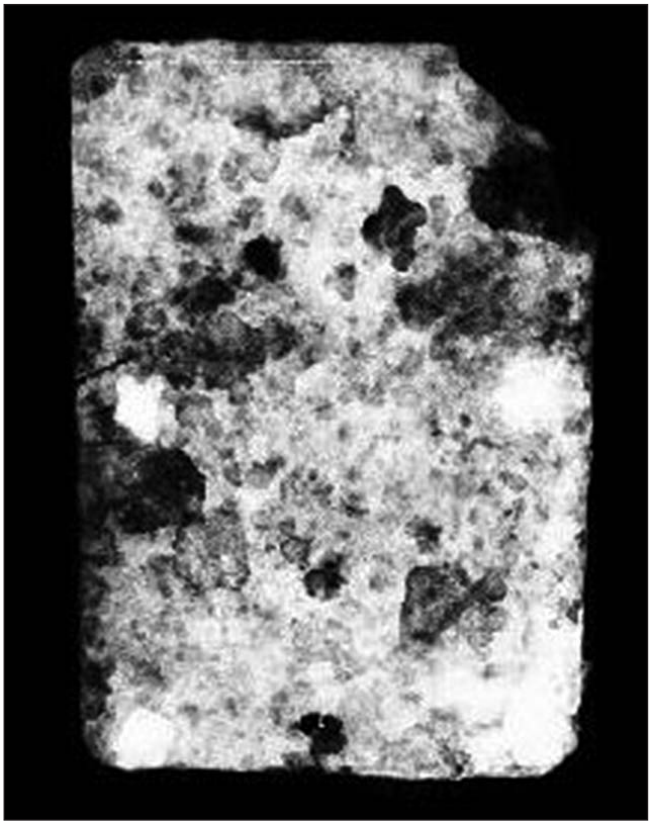

Fig. 9. X-ray examination – rivets in the shape of rosettes (photo K. Cackowski).

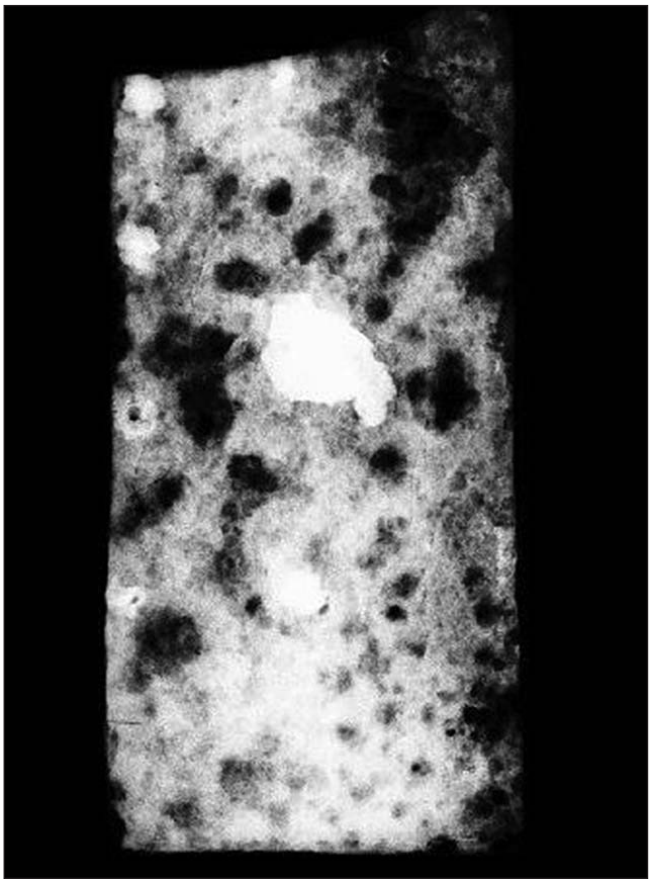

Fig. 10. X-ray examination – rivets in the shape of rosettes (photo K. Cackowski).

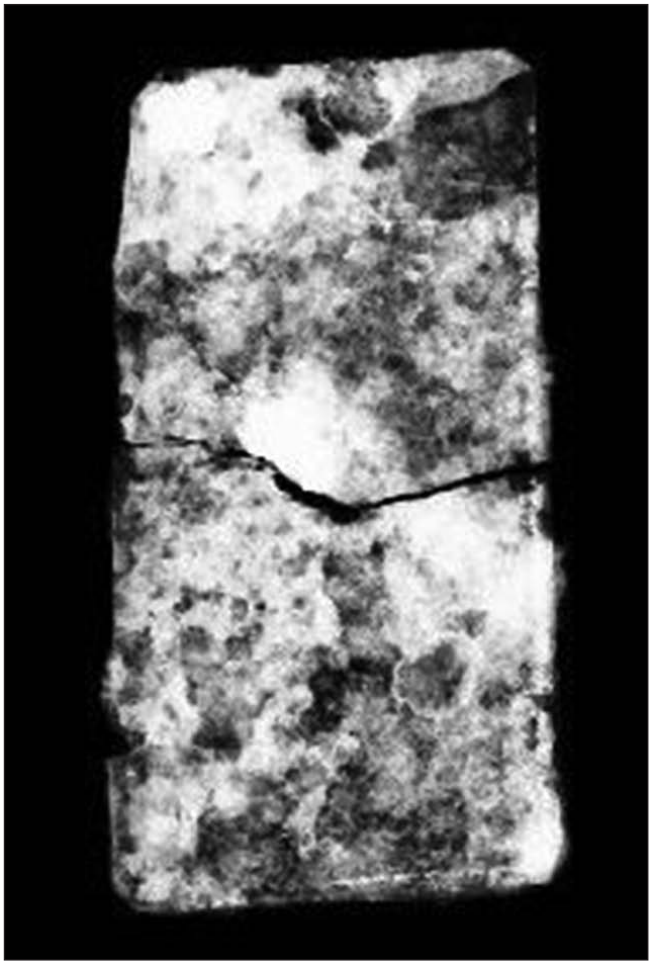

Fig. 11. X-ray examination – rivets in the shape of rosettes (photo K. Cackowski).

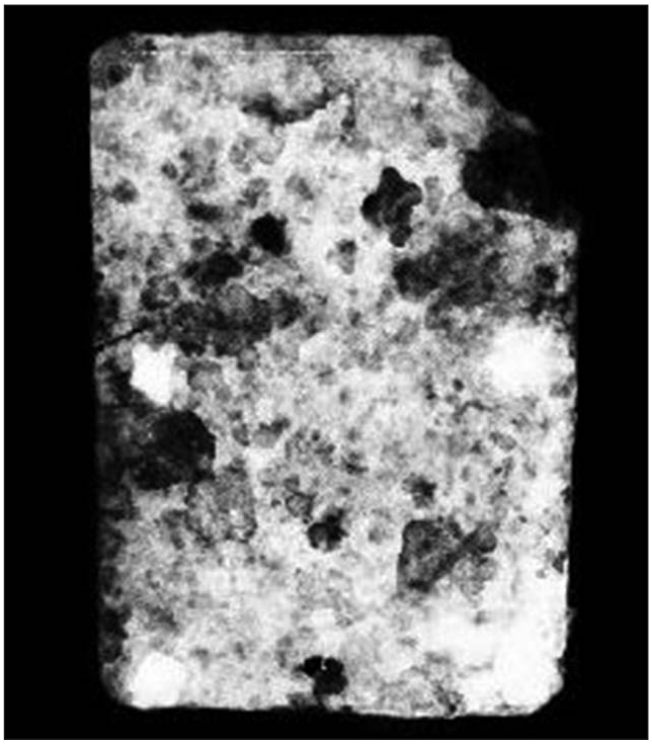

Fig. 12. X-ray examination – rivets in the shape of rosettes (photo K. Cackowski).

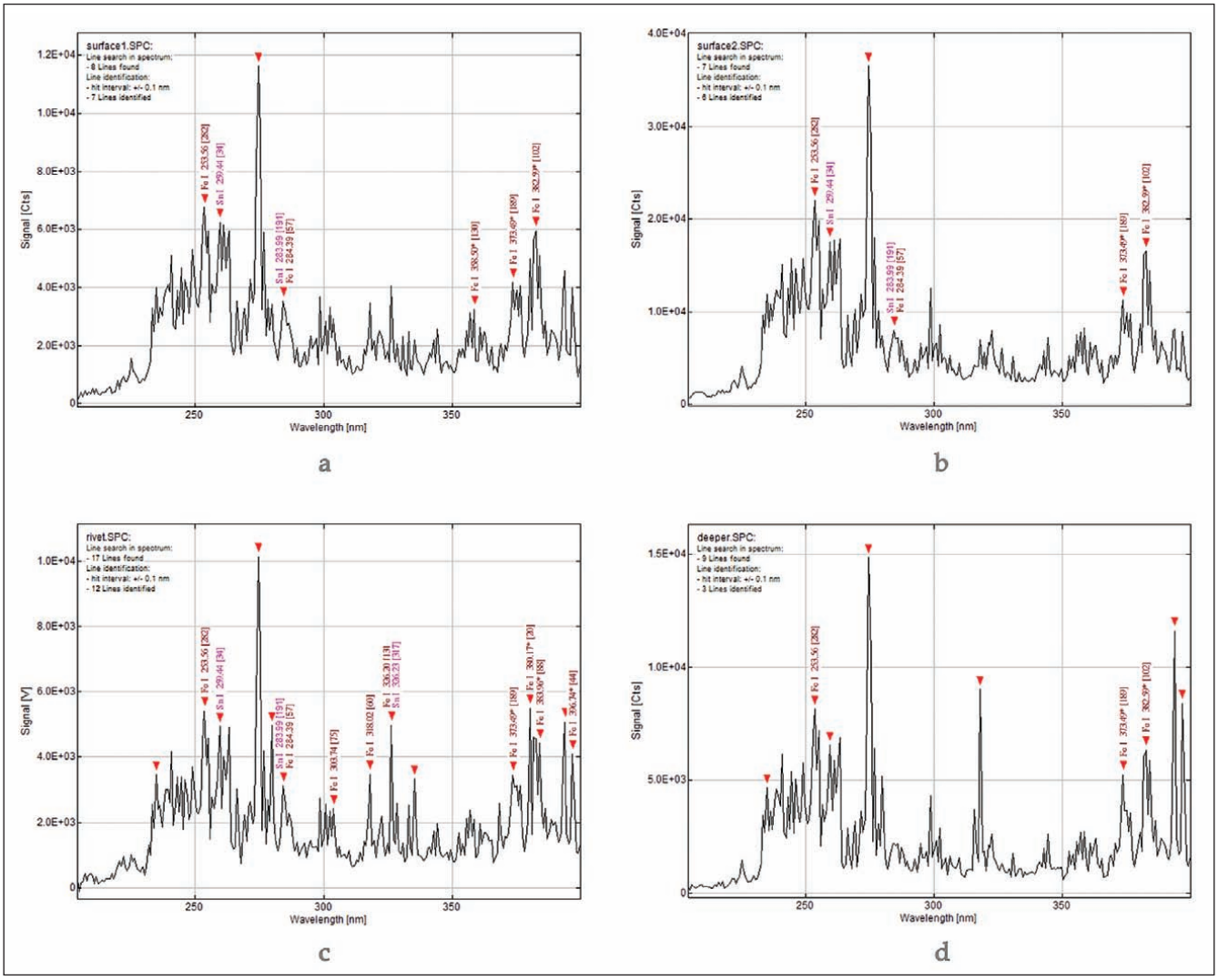

Fig. 13. Comparison of surface and subsurface layers' spectra (P. Kucypera).

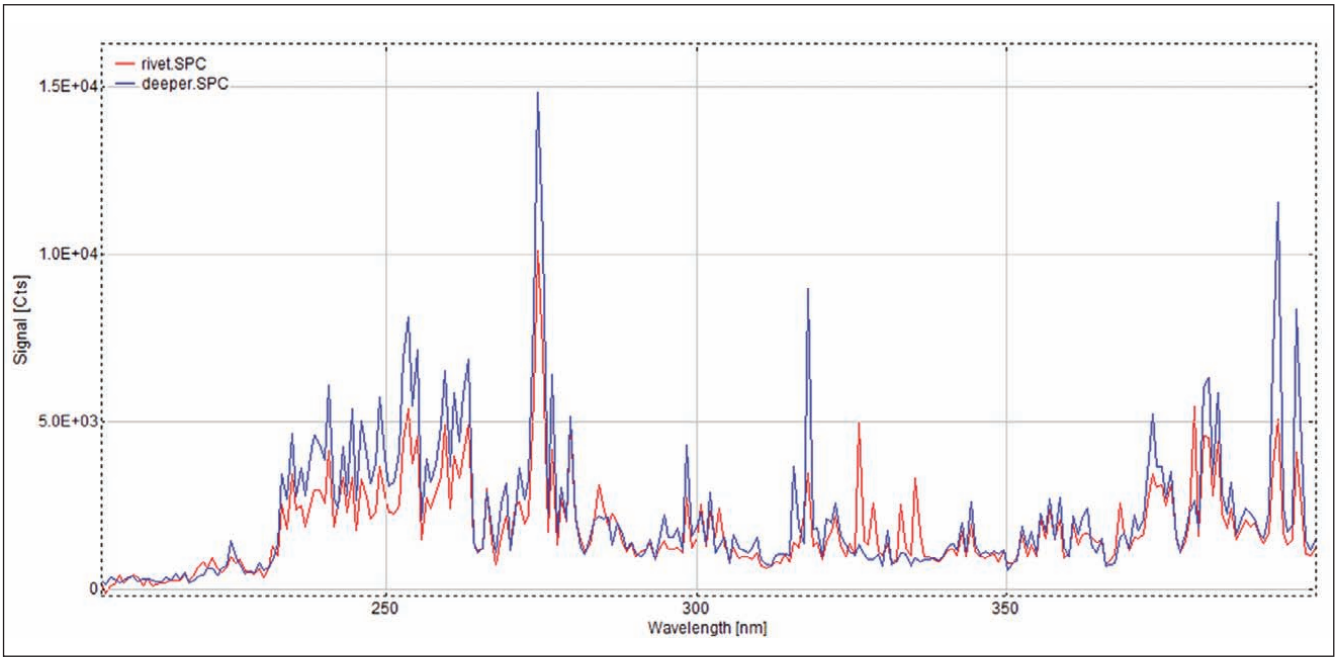

Fig. 14. Results of qualitative analysis of chemical composition using LIBS method: a – outer surface; b – inner (opposite) surface; c – rivet's head; d – subsurface layer (outer surface) (P. Kucypera).

the distortions of the conserved fragments of the armour. The products of corrosion covering the surface of the overlapping iron plates have a form of dark-brown lumpy accretions of diverse sizes and thick orange and brick-coloured corrosive accretions. A considerable part of the surface of the armour fragments is well-preserved in the corrosion products without traces of metallic core. The thorough examination has established that the average of 16.15% of the metallic core has been preserved. The density of the preserved raw material, from which the overlapping iron plates were forged, amounts to 1.26 g/cm³, while the density of pure iron was 7.8 g/cm³. The results of X-ray examination confirm the vestigial remains of the preserved metallic core.

X-ray examination

Prior to the commencement of conservation work, fourteen X-ray photos had been taken: two items of overlapping iron plates, ref. No. 15/09, two items of overlapping iron plates, ref. No. 54/09, three items of overlapping iron plates, ref. No. 39/09, three items of overlapping iron plates, ref. No. 55/09, two items of overlapping iron plates, ref. No. 13/09, and two items of overlapping iron plates, ref. No. 6/09. The examination has revealed that the area of the metallic core preservation is gravely limited. The X-ray examination allowed to ascertain the occurrence of details invisible to the naked eye. They were totally covered by the corrosion accretions. The fragments under X-ray examination revealed indentations repeating the outline of the plate (Figs. 7–8). Furthermore, the traces enabling the reconstruction of the system of fixing the overlapping iron plates to flexible surface have been identified (Figs. 9–12). Within a single plate, the system was based on the application of iron rivets and sewing on through densely located holes revealed in the X-ray pictures. Moreover, metallographic examination has been carried out in order to ascertain the composition of the ferrous alloy applied as well as to confirm the coating of the elements of the armour with a layer of tin. Scant amounts of grey-coloured coating have been found on the surface of several plates. They bore optical resemblance to layers of oxidized tin. Metallographic examination has confirmed that the plates were coated with tin on both sides.

Spectral analysis

One iron plate (inv. No. 6/09) was submitted to spectroscopic study in order to confirm the alleged presence of tin plating on the specimen's surface. Qualitative analysis of the chemical composition was performed using the LIBS (Laser-Induced Breakdown Spectroscopy) method. The object was excited at three points (both sides of the plate and a rivet's head).

Due to the purpose of this study, only iron and tin (if present) were marked on the obtained spectras (Fig. 13). In all cases of outer surface composition analysis, residues of tin plating were confirmed (e.g. 259.44 nm; 283.99 nm; 326.23 nm; Fig. 13:a–c). Owing to the ablation of material,

Fig. 15. Fragments of the armor before conservation work (photo M. Kołyszko).

which characterizes the utilized method, it was possible to define the structural composition of subsurface layers of the plate (Fig. 13:d). The acquired spectra comprised no peaks that would clearly indicate the presence of tin (this could be the case if it was at least a trace element present in the iron alloy) (Fig. 14). Therefore, with high probability, the assumption of presence of a tin plating on the specimen's surface is justified.

The course of conservation work

The first stage of conservation work concerned the elimination of all the accretions and impurities not connected with corrosion products or metallic surface (Figs. 15–16). The operation was carried out in distilled water using an ultrasonic cleaner. Having removed the moisture, we proceeded with the next stage of conservation work involving the anastylosis, the process which is concerned with matching the dispersed plate fragments and reassembling them. The anastylosis was carried out by means of epoxy resin thickened with zinc dust. After the operation and reassembling process, the number of fragments of the armour was reduced to one hundred and seventeen items. After the hardening of the adhesive bonded joint, the porous corrosion products were removed. The operation was conducted using endodontic microengine and dental milling cutters. Porous structures always have a detrimental effect on the state of metallic artifacts. They particularly affect ferrous alloys due to easy accumulation of moisture in the porous areas. It is commonly known that moisture initiates corrosion processes. The structure of the artifact with a considerably reduced metallic core was stabilized in 10% solution of gallotannic in alcohol and distilled water. After the hue of the surface changed, the metallic fragments were coated with a transparent protective layer of 10% solution of Paraloid B-72 resin in dimethylbenzene.

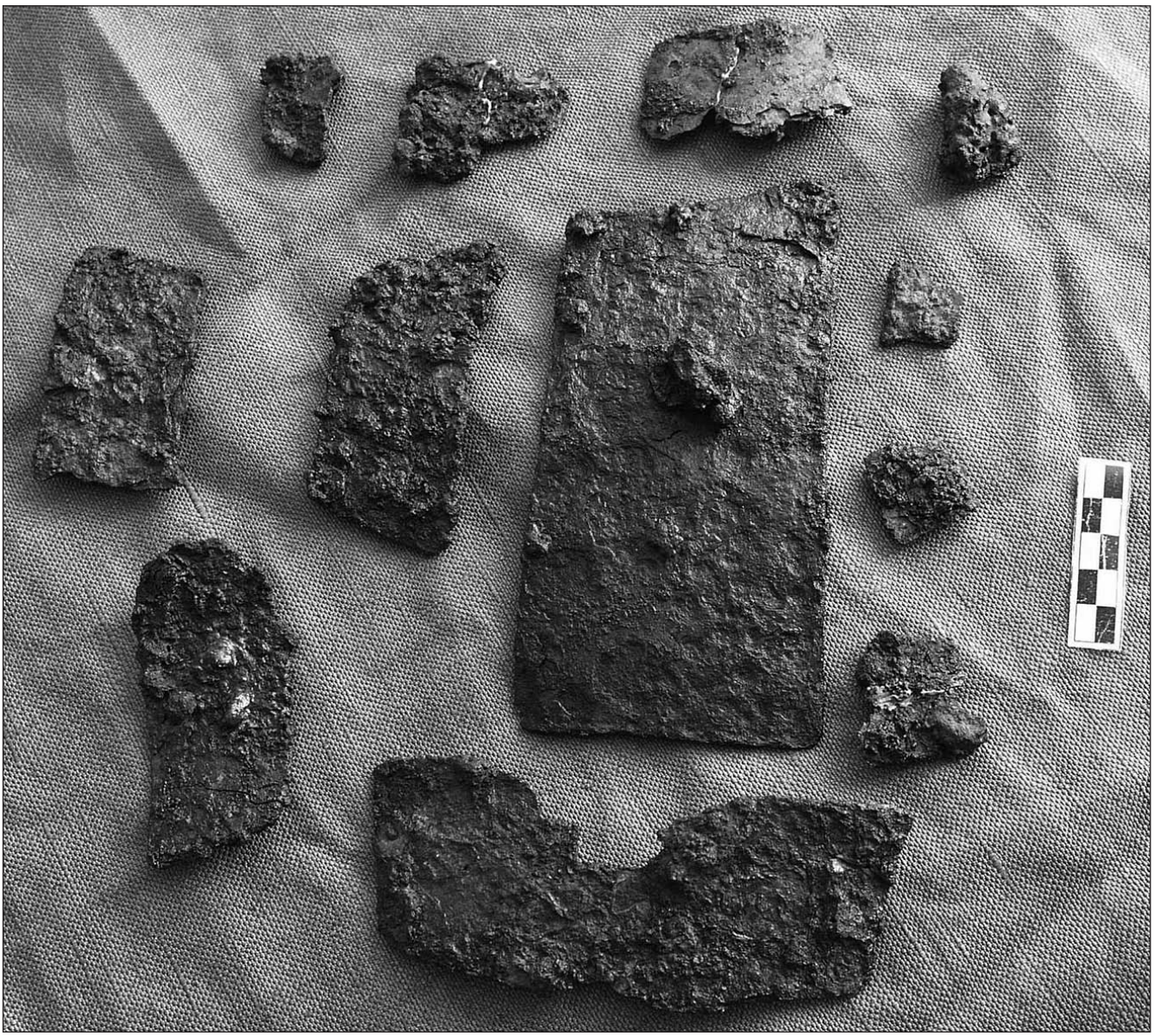

Fig. 16. Fragments of the armour after conservation work (photo M. Kołyszko).

The results of metallographic and spectral examinations clearly show that the alloy of lead, antimony, tin and copper was used[10]. Traces of antimony indicate the application of the so-called electrotype metal. The process of coating the iron elements of horse tacks or spurs with tin in the Middle Ages is commonly known, and it was even mentioned by Theophilus Presbyter, who wrote about the process of coating nail heads with tin[11]. The function of lead-tin alloy coating on the fragments of the armour is particularly interesting. The trade literature, which mentions the phenomenon of coating the iron surfaces with tin in the Middle Ages, explicitly emphasizes the anticorrosive character of the process[12]. However, when we take into consideration the phenomenon of galvanic corrosion as well as the direct interaction of iron and tin, and particularly lead, the anticorrosion protection of iron is out of the question. Iron and tin form a galvanic cell, yet the greater the electromotive force is, the further both half-cells are in the standard electrode potential. The electromotive force equals the difference in the potential of both metals. The metal with a lower potential will corrode and will become the anode, or the oxidised electrode, in the corrosive cell[13]. Analysing the potential in the metal pairs under discussion: iron–tin or iron–lead, we can conclude that iron will corrode faster as its potential is lower. The intensity of the corrosion depends on temperature, corrosion product types and the environment. This phenomenon is commonly termed galvanic corrosion. Such a kind of preservation involves also the direct interaction of two metals of different potentials. Tin is not the sacrificial anode preserving iron elements of the armour from corrosion. This fact stems from the position of tin in the galvanic series of metals. The mutual corrosion and anticorrosion dependency of both metals in electrolyte is easily explained by means of galvanic corrosion theory. This process involves the destruction of metals in electrolytic solution. Electric cells are created on the surface of metals, which leads to electrolysis, which in turn causes oxidation and destruction of those parts of the metal, which constituted the anodes. The destruction of metals has its root in their heterogeneity in electrolytes, which are acid or salt solutions in water affected by electric current. We should bear in mind

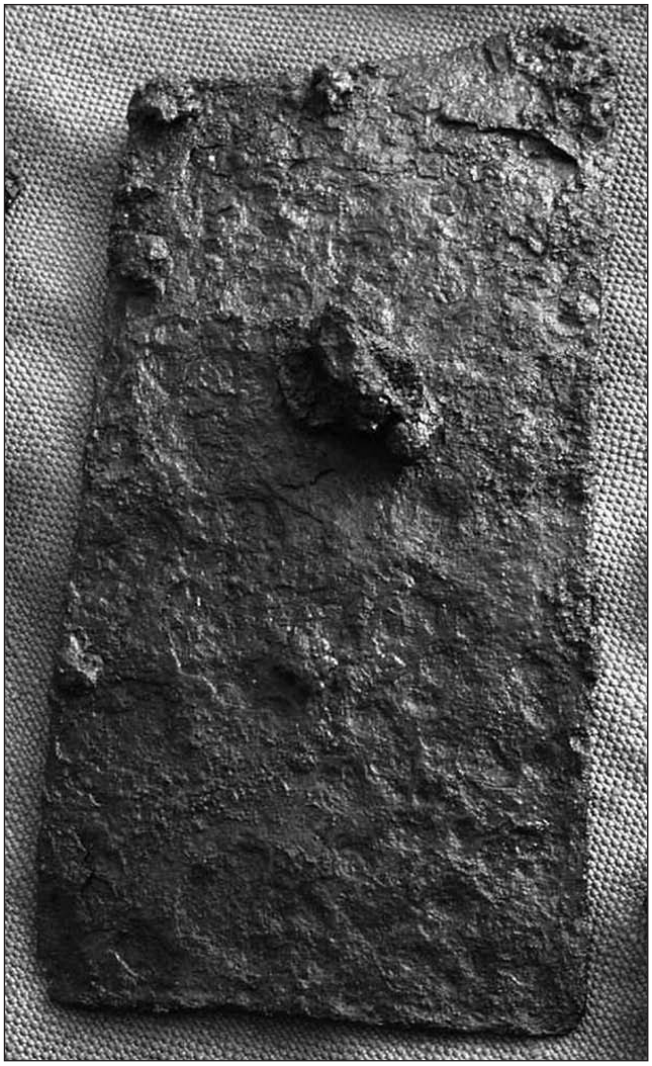

Fig. 17. Plate No. 15 – part of the chest protection (?) (photo M. Kołyszko).

that water in its natural state always contains some chemical compounds and constitutes an electrolyte, whereas distilled water is deprived of this property. The corrosion of metal fragments of the armour destroyed only the iron parts since in the metal pair iron–tin, the former is the anode and the latter, or alternatively lead, is the cathode. The destruction of the tin layer facilitates access to iron and formation of the cell, in which iron will corrode. In the case of the armour, it was easy for the tin layer to have been damaged. Without the tin or lead coating, the pace of the iron corrosion would have been slower. The direct interaction of tin and uncovered iron created ideal conditions for corrosion, as iron coated with tin rusts rapidly in regular weather conditions[14]. What was then the purpose of coating iron elements of the armour with tin alloys by a medieval craftsmen? It seems hard to believe that they were not familiar with the results of iron–tin interaction. Therefore, it appears that the lead–tin

[10] M. Biborski, *Chemiczne analizy konserwatorskie dwóch metalowych próbek*, Kraków 2007, pp. 1–2 (manuscript).

[11] Teofil Prezbiter, *Diversarum Artium Schedula, średniowieczny zbiór przepisów o sztukach rozmaitych*, ed. S. Kobielus, Kraków 1998, p. 131.

[12] W. Świętosławski, *Zamkowe siodlarnie krzyżackie w Prusach*, „Kwartalnik Historii Kultury Materialnej", vol. 34, 1986, p. 657; K. Darecka, *Gotycka stolarka drzwiowa w Gdańsku. Budowa, dekoracja, kolorystyka i konserwacja*, „Ochrona Zabytków", No. 2, 2005, p. 39.

[13] The potentials of several popular metals: aluminum – 1.32, zinc – 0.76, chrome – 0.51, iron – 0.44, and nickel-0.25, tin – 0.14, lead – 0.13; copper – 0.34, silver – 0.81; mercury – 0.86; gold – 1.50; after A.W. Frołow, *Artystyczna obróbka metali*, Warszawa 1989, p. 29.

[14] H. Stankiewicz, *Zabezpieczenie budowli przed wilgocią, wodą gruntową i korozją*, Warszawa 1984, pp. 165–166.

	Length (cm)	Width (cm)	Thickness (cm)	Additional remarks
1	11.4	4.5 (4.1)	0.2	narrows + 5 rivets
2	8.8	4.3	0.2	strongly profiled + 2 rivets
3	8.9	4.4	0.3	slightly profiled + 2 (3?) rivets
4	8.9	5.1 (3.7)	0.3	slightly profiled, broadens + 4 rivets
5	6.8	4.4	0.2	slightly profiled + 1 rivet
6	8.1	4.6	0.2	slightly profiled + 3 rivets
7	7.1	5.6	0.3	strongly corroded + 2 (4?) rivets
8	8.1	4.3	0.2	1 rivet
9	5.6	4.6	0.2	broken + 2 rivets
10	5.7	4.1	0.3	broken + 1 rivet
11	6.3	3.5	0.2	strongly corroded
12	7.2	4.2	0.2	slightly profiled + 1 rivet
13	8.1	7.4	0.2	slightly profiled, of rectangular shape (?)
14	7.0	5.8	0.3	slightly profiled
15	18.5 (17.0)	8.5	0.3	slightly profiled + 2 rivets (circle in the middle)
16	7.8	4.6	0.2	slightly profiled
17	9.2	7.3	0.2	slightly profiled (rectangular shape, possibly the torso protection) + 3 rivets
18	8.2	7.6	0.2	slightly profiled (rectangular shape, possibly the torso protection) + 1 rivet
19	10.0	6.7	0.3	slightly profiled (rectangular shape, possibly the torso protection) + 4 rivets
20	9.9	7.9	0.3	slightly profiled (rectangular shape, possibly the torso protection) + 1 rivet
21	9.4	4.3	0.2	slightly profiled + 3 rivets
22	7.5 (4.6)	4.6	0.2	slightly profiled (rectangular shape, possibly the torso protection – side [?]) + 3 rivets
23	12.6	9.2	0.2	clearly profiled (big rectangular fragment)
24	8.0	6.4	0.3	slightly profiled (strongly corroded)
25	7.2	4.1	0.2	slightly profiled
26	7.6	4.2	0.2	clearly profiled + 3 rivets
27	8.2	4.1	0.2	slightly profiled + 2 rivets
28	13.0	6.0	0.2	slightly profiled (strongly corroded)
29	6.5	4.4	0.2	slightly profiled
30	10.0	6.7	0.3	slightly profiled (rectangular shape, probably the torso protection)
31	19.0	4.7	0.2	lack of profiling
32	8.4	4.2	0.3	clearly profiled
33	9.6	7.8	0.3	slightly profiled (rectangular shape, probably the torso protection)
34	7.4	4.2	0.2	clearly profiled + 4 rivets
35	8.0	4.3	0.4	slightly profiled
36	9.7	7.6	0.2	slightly profiled (rectangular shape, probably the torso protection)
37	6.3	5.3	0.2	strongly deformed
38	6.2	3.7	0.2	deformed + 4 rivets
39	13.6	4.2	0.2	clearly profiled + 5 rivets
40	9.2 (6.6)	7.3	0.3	slightly profiled (rectangular shape, probably the torso protection) + 3 rivets
41	9.5	7.6	0.3	slightly profiled (rectangular shape, probably the torso protection)
42	7.9	6.6	0.3	slightly profiled (rectangular shape, probably the torso protection) + 4 rivets
43	9.8	6.4	0.3	slightly profiled (rectangular shape, probably the torso protection)
44	9.6	7.4	0.2	slightly profiled (rectangular shape, probably the torso protection)
45	9.3	7.4	0.3	slightly profiled (rectangular shape, probably the torso protection)

Tab. 1. Metrical catalogue of armour elements from Radzyń Chełmiński. Elaborated by K. Cackowski.

alloy coating must be treated not so much as a layer preserving the armour from corrosion as a layer performing a decorative function. The medieval craftsmen, well aware of the damage resulting from iron corrosion, must have taken anticorrosion measures. The methods of preserving iron were commonly known. They involved the blackening of iron by means of boiling the armour off in oil or coating iron artifacts with red lead paint.

In Theophilus Presbyter's treatise, particularly in the chapter discussing the method of working out the iron elements of horse tacks and the rider's gear, there is an interesting account of the process of coating them with tin or blackening them for the poor folk. The process of blackening involved rubbing ox's horn or goose feathers into the heated surface[15]. Apart from a clean, dark and homogenous coat, the obtained surface had also anticorrosive properties. This layer is termed the passivation coat as it was airtight

[15] Teofil Prezbiter, *op.cit.*, p. 162.

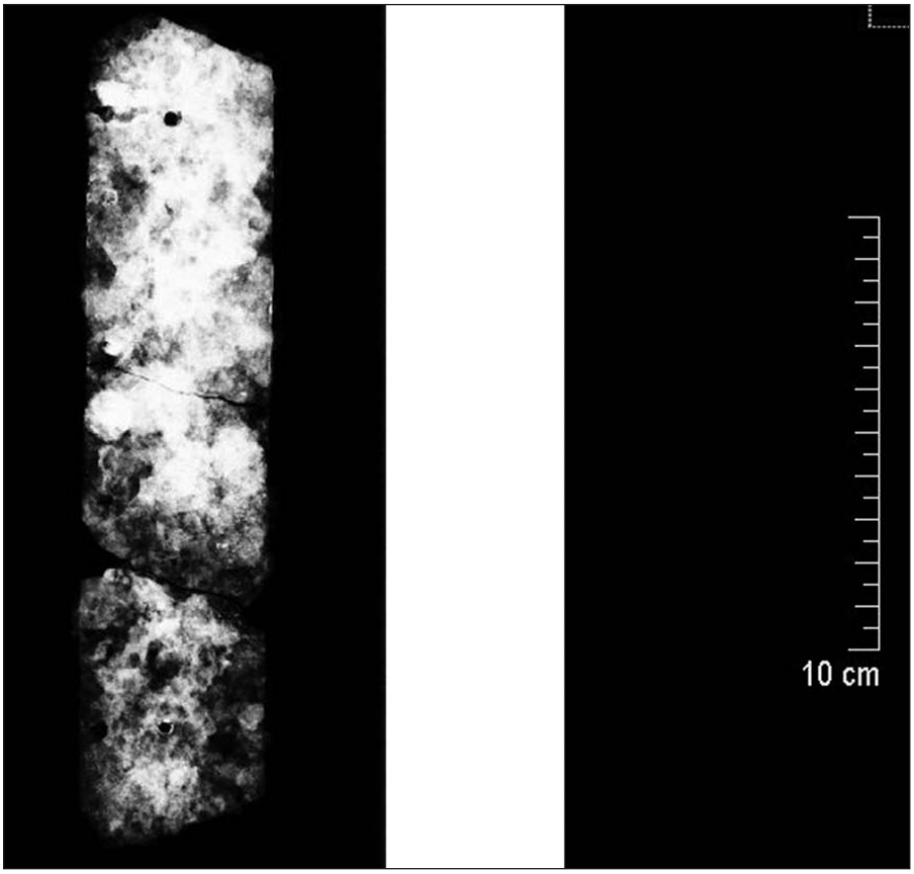

Fig. 18. Armour elements – leg or hand protection (?) (photo K. Cackowski).

and constituted a barrier against further oxidation of iron. Another method involved coating the surface of a metal artifact with red lead paint based on oil binder.

Attempt of the armour, cuirass type, from Radzyń reconstruction[16]

Due to the obtaining conditions and the state of the elements' preservation, not all artifacts could be interpreted as distinct armour elements. All material obtained during Radzyń exploration came from demolition layers, therefore, the analysis of collected plates and their reconstruction is of a limited character. Making reconstruction, similar solutions for armoury implemented in Poland and Europe were taken into account[17].

The plates' thickness ranges at present from 0.2 to 0.3 cm. More significant diversity is observed in case of plates' length and width. The biggest surface, having the most interesting features as far as its construction is concerned, characterizes the plate No. 15 (Fig. 17). That element could have been the chest protection. This can be confirmed by both its shape, with probable cuts for armpits and an additional circular part, which could have played the same role as round plates from the armour excavated in Nowe Miasto on the Warta River[18], i.e., serving for weapon fixing. Plate No. 31, practically unprofiled, is equally interesting. The X-ray analysis of plates indicated the presence of rivet holes unseen with the naked eye. It was not used in the reconstruction, as its shape suggested other armoury elements, e.g., leg or hand protections. It could have also been a part of a different armour altogether (Fig. 18).

The suggested reconstruction assumes vertical faulds composition in five horizontal rows. Faulds serving for side and partly back protection of the torso were placed in two rows[19]. Probably, the biggest and strongest fragments were used to protect the breast area, while smaller ones enabled twisting and turning, a trait often seen in this type of armour. The last faulds' band served as a kind of a skirt, covering lower body parts.

For the reconstruction purposes, 43 plates composed in vertical rows of varying number of components were used (Fig. 19). First supposed row consists of five plates building the protection of upper torso and shoulder sections. Reconstruction of the second row consists of four rectangular plates, where two border ones were provided with cuts enabling arm movement. Reconstruction of the

[16] The armour reconstruction was made by Krzysztof Cackowski from IA of NCU in Toruń – see: *Problematyka zbroi typu płaty z obszaru Polski w świetle badań archeologicznych*, Toruń 2012, manuscript in Institute of Archaeology, Department of Archaeology of Architecture of NCU in Toruń.

[17] The catalogue and more information: B. Thordeman, *Armour from the Battle of Wisby, 1361*, Vol. I–II, Stockholm 2001.

[18] R. Grygiel, T. Jurek, *Doliwowie z Nowego Miasta nad Wartą, Dębna i Biechowa. Dzieje rezydencji i ich właścicieli*, Łódź 1996.

[19] K. Cackowski, *op.cit.*

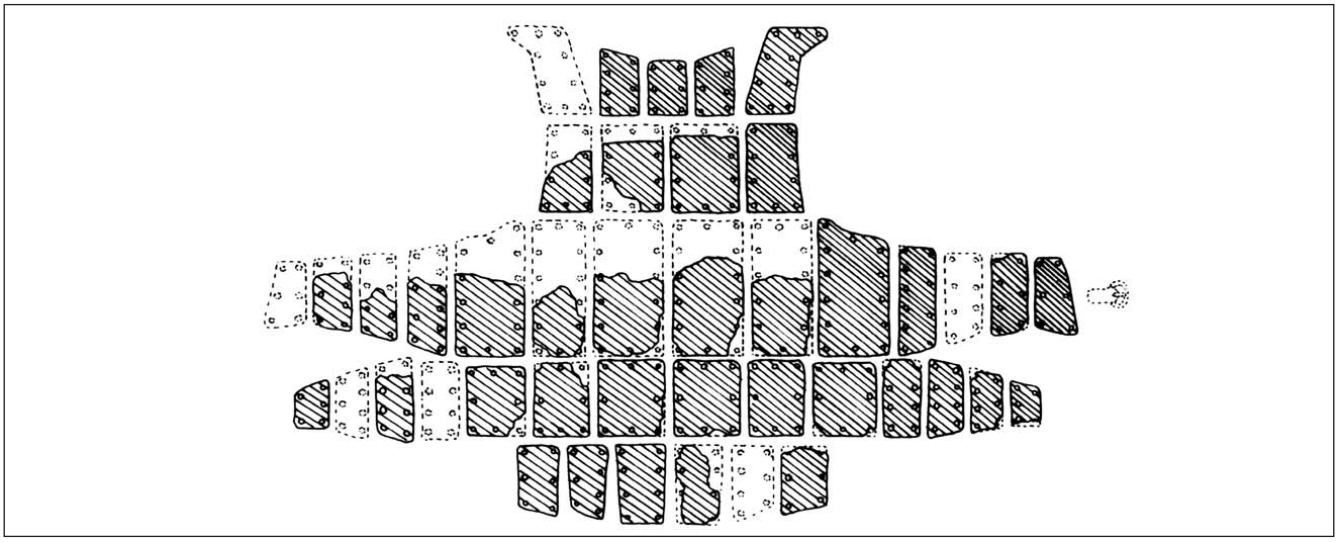

Fig. 19. Proposed reconstruction of the coat of plates from Radzyń Chełmiński.
Design and elaboration by K. Cackowski. Drawing by M. Gajewska.

following row assumes that it consisted of 14 plates forming the main torso protection as well as its sides. Here a clasp allowing the fixing of the armour to the back was originally placed (Radzyń collection did not report this item). This row comprises the biggest and strongest plates, which are additionally equipped with a circular strip for weapon fixing. In the sugested reconstruction, the fourth row could have also been composed of 14 elements. The last one contained six plates and was the finishing element of the whole of the cuirass.

In accordance with X-ray imaging, the 'frontal' elements were equipped with rivet heads shaped in rosettes, while the other plates had standardized round rivet heads.

The coat of plates from Radzyń Chełmiński is a form without any direct analogies. It resembles armours of type IV after B. Thordeman, with simultaneous occurrence of elements confirming gradual transformation into type V, in accordance with the same typology. Similarities to type IV concern mainly the frontal section, particularly the vertical plates of its upper portion (edge plates are of a similar shape). When type V is concerned, the similarities are evident not only in the significant increase of the amount of plates used, but also in the clear decline of their size[20]. The presence of decorative rosette rivet heads in some of these plates as well as tin-coating can suggest that the armour also served representative purposes.

Streszczenie

Zbroja typu płaty z Radzynia Chełmińskiego

Radzyń Chełmiński położony jest w północno-wschodniej części ziemi chełmińskiej, około 17 km na południowy-wschód od Grudziądza. Pierwsza informacja dotycząca komtura zamku pochodzi z 1251. Zamek wybudowano pomiędzy latami 1270 i 1330. Znajduje się on na szczycie morenowego wzgórza i składa się z zamku głównego oraz południowego i wschodniego przedzamcza. Prace archeologiczno-architektoniczne rozpoczęto w 2007 roku na przedzamczu. W 2008 roku Instytut Archeologii, Zakład Archeologii Architektury UMK w Toruniu zainicjował również badania archeologiczne na terenie zamku głównego. W 2009 roku prace objęły zachodnią część obiektu oraz tzw. parcham – przestrzeń pomiędzy zachodnią kurtyną i linią muru w pobliżu danskeru.

Podczas obserwacji wykopu 15 odkryto znaczną liczbę bardzo skorodowanych, fragmentarycznie zachowanych i zniekształconych żelaznych płytek. Zarejestrowano w sumie 134 elementy, wśród których dominowały formy prostokątne i trapezowate. Wykonano czternaście zdjęć rentgenowskich. Badania metalograficzne potwierdziły, że płytki były pokryte cienką warstwą cyny na obu powierzchniach. Poddano je również badaniom spektroskopowym w celu potwierdzenia domniemanej obecności cynowania.

Znalezisko określono jako pancerz typu płaty. Może ona być lokalną formą bez bliższych analogii. Jego forma przypomina zbroje typu IV z Visby wg B. Thordemana, chociaż jednocześnie występują w niej elementy wskazujące na stopniowe przekształcenie w V typ wg tej samej typologii. Obecność ozdobnych nitów w kształcie rozetki na części odkrytych płytek może sugerować, że ochrona ta miała także pewne walory reprezentacyjne.

[20] B. Thordeman, *op.cit.*, Vol. 2, p. 5.