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Towards manufacturing technology: *Balteus* belt–fittings from the Wielbark culture cemetery in Linowo (Poland)

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ABSTRACT

This study characterizes extraordinary *Balteus* belt–fittings recovered from the Wielbark culture cemetery in Linowo (Chełmno land, Poland). The belt–fittings were cast in Cu–alloys and decorated with embossed applications made of noble metals. Among the belt–fittings, some other grave inventory was also placed with the deceased.

The metal inventory was described in terms of its composition and structure. The investigations were performed by means of the energy dispersive X–ray fluorescence spectroscopy (EDXRF). In order to fingerprint the *Balteus* belt–fittings manufacturing technology, the investigations involved the employment of the scanning electron microscopy (SEM) coupled with the energy dispersive X–ray analysis system (EDS) and optical microscopy (OM).

The elemental composition indicates the application of two main types of Cu–alloys, i.e. scrap bronze (Cu–Sn, Cu–Sn–Pb, Cu–Pb–Sn) and scrap leaded gunmetal (Cu–Sn–Pb–Zn). It has been established that the Barbarian metalworkers were familiar with embossing the Au–Ag foils and made themselves capable of attaching them to a metal background with Sn–Pb solder. Based on the metallographic data, the reconstruction of the *chaîne opératoire* used for manufacturing the belt–fittings was implemented in this study as well.

1. Introduction

During excavations conducted between 2006 and 2011 by Władysław Łęga Museum in Grudziądz at site 6 in Linowo (Grudziądz county, Cuyavian–Pomeranian Voivodship) an inhumation grave with three extraordinary *Balteus* belt–fittings was recovered. Among the belt–fittings, a number of other personal belongings (e.g. fibula, needle) was also buried together with the deceased. The grave was situated in a biritual cemetery of the Wielbark culture around 210/230–260 CE (C1b phase). According to the archaeological data, the Linowo cemetery had been established around 110/120 CE (B2b phase) and was in use for over 300 years (i.e. until D phase), although it upheld the biritual nature only until the end of the C2 phase (c.a. 310 CE) (Kurzyńska, 2015a, 2015b, 2015c).

The *Balteus* belt–fittings are not frequent findings in Poland (Fig. 1). Up till now, only three more of such have been discovered, i.e. two in Pomerania (Kamienica Szlachecka and Obliwice) and one in Dobrzyń land (Zębowo) (Kurzyńska, 2015a, 72).

The belt–fittings from Linowo are technologically coherent, and thus, indicative of a 3–step manufacturing process implementation. The process involved (1) casting the backgrounding Cu–alloyed plate, (2) embossing a decorative noble foil, and (3) soldering the foil to the plate. Here, the craft mastery of the Barbarian metalworkers, who were fully conscious of the technological limitations, and thus, applied deliberate treatment for manufacturing the *Balteus* belt–fittings is apparent.

2. Experimental

2.1. Materials

The artefacts investigated here were recovered from a skeletal inhumation grave (no. 114) dated from 210/230 CE to 260 CE (C1b phase). The rectangular grave pit was oriented in the N–S alignment (2.60 m long, 0.90 m wide and 0.55 m deep) and the body deposited within the grave had been protected with a wooden coffin (Fig. 1) (Kurzyńska, 2015b, 39).

The grave inventory was buried together with the body of an *Adultus* male (?), aged 25–30. The well–preserved skeleton was lying in the

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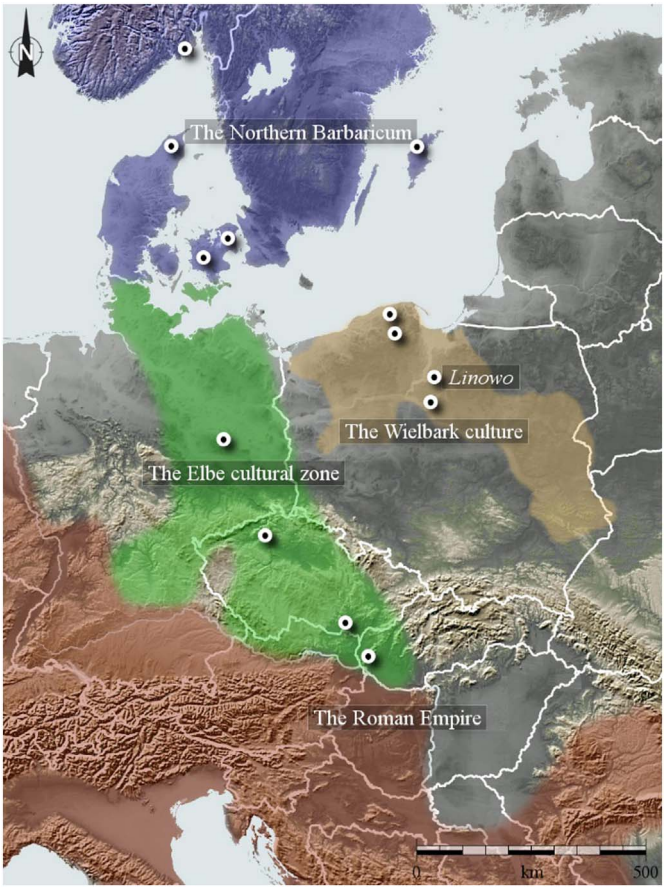

Fig. 1. The distribution of the *Balteus* belt–fittings from Poland with corresponding findings from the Barbaricum (Kaczanowski and Kozłowski, 1998, 232, Fig. 128; Kurzyńska, 2015a; Przybyła, 2010, 118, Abb. 21 as amended; map background: V. Junior/Shutterstock.com).

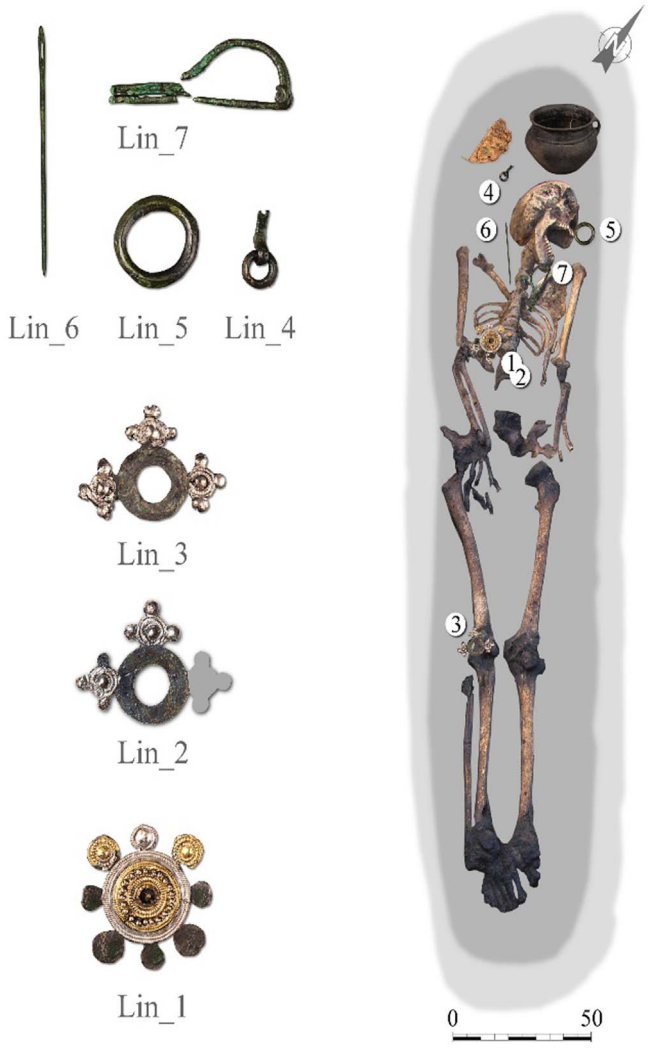

Fig. 2. The grave no. 114 with investigated metal inventory (Kurzyńska, 2015b, 234, Tabl. XXX as amended).

anatomical order, in the supine position, with the skull facing north and the face towards east (Fig. 2). Over the skull, on the left side, a ceramic vessel was deposited. Apart from the pottery offering, seven Cu–alloyed personal belongings of the deceased were also recovered. To the right, next to the vessel, a fragmented link–item (Lin_4) was found. A circle link (Lin_5) lay by the upper jaw. Below, on the chest a fibula (A.VI.161/162 type; Lin_7), and nearby, below the right clavicle, a needle (I–1B type; Lin_6) were placed. Among the bones of the right arm and ribs, at the height of the elbow joint, two adjacent *Balteus* belt–fittings (Lin_1 and Lin_2) were found. The third belt–fitting (Lin_3) laid next to the right femur (Kurzyńska, 2015b, 39).

The belt–fittings recovered from the grave no. 114 were original items of the *Balteus* belt. The belt was worn over the left shoulder, passing obliquely down, and was fastened at the right side where a sword was suspended (Fig. 3a). This can be confirmed by the discovery context of the fittings found along the right side of the skeleton. Since the Lin_3 was discovered next to the right leg, it might be then possibly treated as a scabbard–fitting (see Fig. 2) (Kurzyńska, 2015a, 73–75).

The *Balteus* belt was an indicative of military, and therefore, it was also the expression of a high social status of the deceased. The lack of the sword itself in the grave no. 114 was not a coincidence but had in fact been determined by the myths (cultural rules) concerning the military praxis. Hence, the weapon abandonment in the funerary tradition may be treated as one of the forms in which this myth could be existent among the Wielbark culture communities (Gralak, 2012, 391; Kurzyńska, 2015a, 73–75).

While the majority of the swords found in northern Europe is treated as the goods imported from the Roman Empire, the belts and the scabbards were commonly manufactured in the Elbe cultural zone, from which they spread to neighboring areas, including the Wielbark culture, or at least from which their stylistic patterns were emerging further. When analyzing the belt–fittings design and the fastening construction, it can be assumed that the *Balteus* belt from the cemetery in Linowo represents the Elbe type (Fig. 3b) (Kurzyńska, 2015a, 72–73; Przybyła, 2010, 97–102).

Two ring–shaped links made of a squared rod found in the grave no. 114 (see Fig. 2) should also be connected with the *Balteus* belt. Whereas the smaller one (Lin_4), recovered above the skull on the right side, was probably combined with a buckle attached to the case containing the antler comb, the Lin_5 link was used to connect two leather items of the belt (Fig. 3c–d) (Kurzyńska, 2015a, 73–74).

2.2. Methods

The elemental composition was established by means of the X–ray fluorescence spectrometry with the energy dispersive X–ray fluorescence (EDXRF) Spectro Midex spectrometer equipped with a molybdenum X–ray tube and a Si Drift Detector (SDD) with 150 eV resolution at 5.9 keV. The analysis conditions were 44.6 kV, 5.9 mA and 180 s of live time. The EDXRF quantification used the fundamental parameters program FP + for element analysis of alloys. For the belt–fittings, the elemental composition was also determined as a result of investigations with the use of a scanning electron microscope (SEM)