

MARCIN MAJEWSKI

Institute of History, Chair of Archaeology, University of Szczecin

marcin.majewski@usz.edu.pl

ORCID 0000-0001-8404-3347

GRAPEN LUTTICK UND GRODT. PRODUCTION AND USE OF BRONZE THREE-LEGGED CAULDRONS, OR GRAPENS, IN THE BALTIC SEA REGION IN THE LATE MIDDLE AGES AND EARLY MODERN TIMES – EXAMPLE OF WESTERN POMERANIA

ABSTRACT

This article discusses the latest archaeological research into the casting and marking of bronze three-legged cauldrons (*Grapens*) in the Baltic Sea Region. It offers a detailed analysis of production centres in Western Pomerania, which have not as of yet been the subject of interest of a wide circle of scholars, and presents the results of recent archaeological excavations in Stargard that revealed further workshops specializing in the produc-

tion of cauldrons. Their functioning was associated with two *Grapengiessers*, Jochim and Jacob Ingerman, who were active in the first half of the 16th century. Moreover, the article also deals with the activity of other founders in relation to other centres in the Baltic Sea Region on the basis of historical sources and bells which have survived down to our times.

Keywords: Baltic Sea Region, Hanseatic League, Western Pomerania, Late Middle Ages, Early Modern times, bell founding, bronze three-legged cauldrons (*Grapens*)

Introduction

A cauldron (three-legged pot) with two handles cast in bronze (*Grapen*) was one of the most popular cooking pots in Northern Europe in the Late Middle Ages and Early Modern times.¹ It was placed directly over an open fire or hung over it using an iron rod, which can be seen in numerous iconographic sources dating back to the Late Middle Ages.² Its form was similar to earthenware pipkins – cooking pots with spheroidal bottoms and three feet. The beginnings of bronze cauldron casting date back to ca. 1200 and the production process itself has been the subject of numerous studies.³ Archaeological excavations have revealed many remains which prove their production. The craftsmen engaged in it, called *Grapengiessers*, were mentioned in historical sources since the mid-13th century. The founding of bronze vessels of this type flourished in the Baltic Sea Region. Among the members of the Hanseatic League, it was primarily Lübeck which was associated with being the production place of cauldrons, as well as other objects made of bronze, including

baptismal fonts, incense burners and candle holders. Meanwhile parts of Pomerania, with such towns as Stralsund, Greifswald, Szczecin and Stargard, also played an important part in the production.

Archaeological excavations in cauldron production sites in the Baltic Sea Region

Archaeological remains of workshops where bronze pots were produced have so far been unearthed in Sweden, Denmark, Germany and Poland (Fig. 1). In Visby on Gotland over 5,000 fragments of cast forms used for the production of cauldrons were excavated, out of which 2,000 show traces of contact with cast objects. The workshop located there, unfortunately not the subject of thorough archaeological excavations, functioned from the second half of the 13th century. Cauldrons produced in that location measured from 12 cm to 33 cm in diameter; however, the biggest number of unearthed remains was of cauldrons measuring 23 cm in diameter, which could

¹ Hasse 1981, 66–67.

² Drescher [1982], 163–169.

³ Vellev 1988; 1998; Thomas, Bourgarit 2014; Drescher 2017, among other authors.



Fig. 1. Archaeological sites with remains of workshops where *Grapens* were produced (marked with a *Grapen* symbol) and places on the Baltic coast where the activity of *Grapengiessers* is confirmed only by historical sources (marked with a dot, with the place name underlined) (according to Vilsteren *et al.* 2019, 205, fig. 4 and the author's research, drawing by C. Rysz).

hold from 4 to 4.5 litres.⁴ The first written sources which provide information on cauldron casting in Visby date back to ca. 1350, and records which date back to the period from 1485 to 1487 mention two *Grapengiessers*: Stena and Geraudher.⁵ In Jönköping cauldron casts which came from different workshops were excavated in eastern and western parts of the town in layers dating back to the period from the 14th to the 17th century. Remains of bottom moulds and other refuse, the chronology of which was dated to the second quarter and the end of the 17th century, were excavated on one of the plots. In 1696 the owner of the property was a *Grapengiesser* by the name of Anders Jöransson.⁶ So far, almost ten sites indicating the locations of workshops have been unearthed in Västerås, two of which were active in the Late Middle Ages. A further workshop which dates back to the 17th century specialized not only in cauldrons but also small items. The surviving

historical sources allow for the conclusion that in the period from the 15th to the 17th century four or five workshops carried out their activity simultaneously.⁷ It was also in this town that the remains of a workshop in which tin jugs were produced were uncovered; it was active at the turn of the 14th century near the cathedral.⁸ A well preserved foundry was unearthed in Uppsala; excavations revealed buildings, archaeological features, tools and production waste (almost 3,000 fragments of moulds), and the activity of the foundry in the period from the 14th/15th to the 15th/16th century was linked to people known from historical sources.⁹ Further late mediaeval foundries in which cauldrons were cast were located in Lund, Vadstena, Valbo, Stockholm and Lödöse. Publications regarding some of these sites are still insufficient.¹⁰

The only workshop in which cauldrons were cast that has been the subject of thorough archaeological

⁴ Engeström 1974; Anund 1997, 22; Skyllberg, Anund 2003, 20; Zerbe 2006, 574–575.

⁵ Engeström 1974, 62–63.

⁶ Anund 1997, 23; Bramstäng Plura *et al.* 2013, 102–104.

⁷ Anund 1997, 23; Bergold, Bäck 2007.

⁸ Ros 2012.

⁹ Anund *et al.* 1992; Anund 1997, 22–23; Skyllberg, Anund 2003, 20.

¹⁰ Anund 1997, 23; Anund 2000; Keller 2015, 59–60.

excavations in contemporary Denmark was uncovered in the vicinity of a Dominican monastery in Odense. The excavation works, carried out over two seasons, revealed founding equipment and numerous fragments of moulds which were used mainly for the production of cauldrons. The workshop was active around the year 1300.¹¹

The biggest number of unearthened workshops which specialized in casting cauldrons was discovered in northern Germany. The remains of dozens of workshops were unearthened on the coast stretching from Hamburg to Anklam. A workshop active in the first half of the 13th century was excavated in Lübeck, with furnaces for drying moulds, a pit filled with clay for the production of moulds and half-finished products. According to rough estimates, as many as 300 cauldrons could have been produced there, along with candle holders, incense burners, elements of belts and garment decorations. Two other mediaeval workshops in which cauldrons were produced were also discovered in Lübeck.¹²

Further foundries were located in Rostock, where deposits of bronze scrap to be melted and numerous pieces of moulds used for the casting of cauldrons were uncovered. Just like in Lübeck, garment ornaments and decorations were also produced there.¹³ The remains of a pit used for bell founding and of moulds used for cauldron casting were uncovered in a plot located in the vicinity of defence walls in the neighbouring Güstrow. Some of them display a drawing of a municipal coat of arms used for the marking of bronze vessels which has been unknown until now. The workshop functioned in the second half of the 14th century.¹⁴ Additionally, a mediaeval pit filled with fragments of moulds used for casting bronze cauldrons was uncovered in Wismar.¹⁵

The largest number of cauldron production remains was uncovered in Stralsund and Greifswald, in a total of ten locations. Archaeological excavations allow for the dating of the beginning of this activity, which was quite intensive throughout the following century, to the end of the 13th century. Numerous pieces of forms bear municipal coats of arms of Stralsund and Greifswald, as well as the house mark of the founder (Fig. 7).¹⁶ A late mediaeval pit with remains of cast cauldrons, one of which dis-

played the house mark of a pewter smith, was unearthened in Anklam. A further trace of such production found in this town were casts and other production waste which date back to the turn of the 16th century, uncovered in the cellar of one of the houses located in the market square. The activity was also confirmed by written sources.¹⁷

The remains of a *Grapengiesser's* workshop dating back to the mid-14th century were uncovered in Pasewalk. Apart from remains of casts, an unspecified technical device used in the workshop was also found. One of the fragments displayed the house mark of the master *Grapengiesser*.¹⁸ Apart from late mediaeval fragments of casts, a well-preserved founding pit with the bottom part of a *Graben* mould dating back to the end of the 14th or the beginning of the 15th century was uncovered in Neubrandenburg.¹⁹

***Grapengiessers* in Fore Pomerania and Western Pomerania in light of historical sources**

Craftsmen who specialized in the casting of bronze cauldrons were mentioned in written sources in major Pomeranian towns relatively early on. A representative of the trade was known in Stralsund as early as in 1278. Shortly after 1300 a *Hermannus fusor ollarum*²⁰ appeared in Greifswald; *Henricus ollarum fusor* was mentioned in Szczecin in 1306.²¹ In light of the 1533 Guild Statutes of Szczecin, which were allegedly agreed in an oral form already in 1313, metal craftsmen were associated in one guild. It comprised blacksmiths, whitesmiths, sword makers, cutlers, nail makers, coppersmiths, armourers and *Grapengiessers*. Learning the trade took two years, whereupon a journeyman who could provide proof of his competence by producing the masterpiece: a cauldron, mortar or roasting pan, could rise to the status of a master. One of the streets of Szczecin was named after the *Grapengiessers*; in 1351 it was called *platea olifusorum* and later *gropengeterstrate*.²² Apart from producing three-legged pots, *Grapengiessers* would also cast other bronze objects, among them bells. Two bells which

¹¹ Vellev 1988; 1998.

¹² Gläser, Mührenberg 1998; Mührenberg 2000, 225–228; Drescher 2017; Wywrot-Wyszkowska 2019b, 60–61.

¹³ H. Schäfer, C. Schäfer 1994, 150–152; Mulsow 2000a, 209; 2000b, 256; H. Schäfer 2000b, 65; Rütz 2005, 296; Mulsow 2006, 294–296; Wywrot-Wyszkowska 2019b, 61–65.

¹⁴ Fries 2012; 2014, 108–109, 114.

¹⁵ H. Schäfer 2000b, 65.

¹⁶ Stralsund: Kaute, H. Schäfer 2000, 201; Samariter 2000, 243–244; H. Schäfer 2000a; 2000b; Ansorge 2005a, 127–128; 2005b; Samariter 2005, 717, fig. 104; Brüggemann 2016;

Greifswald: H. Schäfer 1995; 1996, 146; Ansorge 1998, 161; Ansorge, Rütz 1999, 308–310; H. Schäfer 2000b, 65; Rütz 2002, 94–96; 2005, 298–299; Ansorge 2006; Kaute, Manske 2017, 370; Wywrot-Wyszkowska 2019b, 65–69.

¹⁷ Hoche, Fries 2004; Popp 2010, 484.

¹⁸ Hoffmann 2006.

¹⁹ Kaute 2006; Ansorge 2010, 384.

²⁰ Rütz 2005, 295.

²¹ Mangelsdorf 1990, 270.

²² Blümcke 1884, 108–109.



Fig. 2. Engraved decorations with images of *Grapens* on bells in Western Pomerania: 1 – Bodzęcin, Goleniów District, 14th/15th centuries (drawing by C. Rysz); 2 – Mechowo, Kamień Pomorski District, 1423 (photo by B. Bubnowicz).

survived down to our times in the region of Goleniów and Kamień Pomorski might have been founded by *Grapengiessers* alone. A craftsman signed the waist of the bell in Bodzęcin, which dates back to the turn of the 14th century, with a house mark and put a picture of a cauldron decorated with triple lines running around and a lily growing out of it (Fig. 2: 1).²³ It would be difficult to contest the opinion of the authors of a catalogue of historical monuments who assumed it to be the canting arms of the German family von Grape (*Grapen*).²⁴ The seal belonging to Peter Grape, which was published in 1481, shows a visual representation of three cauldrons and it was the canting arms used by the family until the 18th century.²⁵ A vessel with a lily, in this case a characteristic cauldron, needs to be considered a symbol of St Mary. In another bell, which was founded for a village church in Mechowo in 1423, apart from the house mark of the founder and an inscription with two names: Haso Rugge (founder)²⁶ and Hermen Grape (funder), there is a picture of St Catherine standing in front of two cauldrons of different sizes holding one of her attributes in her hand: a sword (Fig. 2: 2). One of the cauldrons is decorated with triple and the other with double lines. In this case, again, there is the name of a member of House Grape, which might explain the depiction of a cauldron. However, the connection of the decoration with the craftsman, who possibly was simply a *Grapengiesser*, needs to be considered as well.

Both bell decorations – which were engraved in negative (German *Ritzzeichnung*) in the clay mould – became positive, intricate pictures after the founding process was completed.²⁷ Using the same technique, *Grapengiessers* would decorate the body of a pot with lines running around it, putting on a house mark and municipal coat of arms. The bell in Sokolniki near Maszewo is signed with the plaque of the craftsman, Martin Kukuch (Kukuck), who founded the bell in 1485 (Fig. 8: 12). Apart from the name and surname of the master founder, there is also a sign in the form of a double plaque. According to Marceli Tureczek, it represents a bell and a three-legged pot,²⁸ yet the picture was not cast sufficiently well and can raise some interpretive controversy.

Stargard is a centre of cauldron-casting in Western Pomerania that is most widely represented in historical sources. The oldest written records which mention *Grapengiessers* in Western Pomerania date back to the 15th and the beginning of the 16th century. Founders participated in fund-raising activities for the Kalands Brethren and St Mary's Church. They included *Hans Horne*, *Martinus Mathei* (Marten Matties), *Marten Scholchin*, *Mathias Bockholt* and *Jacob Iugerman* (Ingerman). Hans Horne is known to have founded only three bells which he signed with his name and surname. They were founded between 1487 and 1501 and were hung in village churches in the areas of Stargard and Goleniów. Marten Mathei (Matties) is known to have signed two bells,

²³ Bells cast by him survived down to our times in two churches: Łoźnica and Węgorza, Goleniów District.

²⁴ On the opposite side of the bell is an image of an ox head with a star on the forehead depicted on a coat of arms shield; authors of the catalogue associated it with the canting arms for the German family von Schwan. However, as the family name itself seems to be indicating, it is the swan that is used in their arms. The picture of the ox head on the bell may indicate that

the bellfounder came from Mecklenburg. Cf. Bronisch, Ohle 1939, 100–101.

²⁵ Bagmihl 1847, 155–158, tab. LIII.

²⁶ In literature the bellfounder is referred to as Hans Rugge, cf. Bronisch, Ohle 1939, 150, or Andreas (sic!) Rugge, cf. Poettgen 2010, 51.

²⁷ Cf. Schulze 2006.

²⁸ Tureczek 2015, 95.

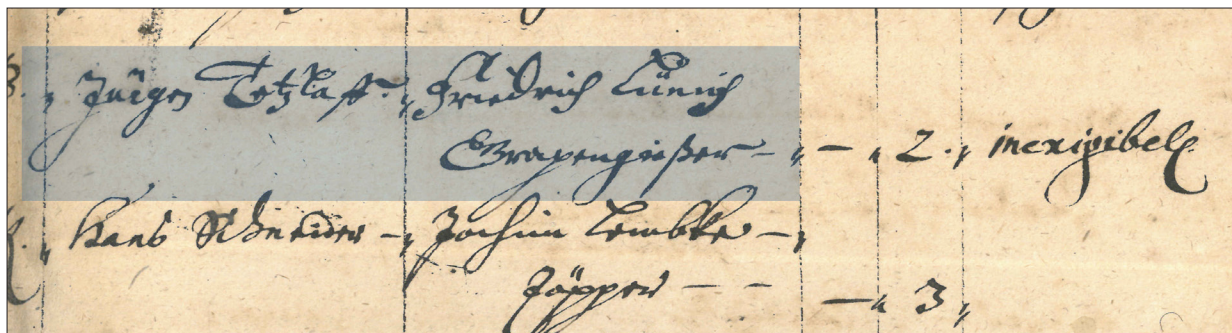


Fig. 3. *Grapengiesser* Friedrich Lünich mentioned in the list of property owners in Trzebiatów, 1665 (State Archive, Szczecin: Archives of the Dukes of Szczecin, Ref. No. I/4908).

which were founded for village churches in the areas of Świdwin and Kołobrzeg in 1505 and 1508, with his name, surname and house mark (Fig. 8: 20). Judging by the house mark, he might have also been a co-founder of the big bell in St John the Baptist Church in Stargard, which was cast in 1464 (Fig. 8: 8c). Information about two further *Grapengiessers*, Jochim and Jacob Ingerman, dates back to 1506–1542. We do not know anything about the relationship between the two master craftsmen. Perhaps Jochim was Jacob's father. The former founded bells for village churches in the areas of Choszczno, Goleniów, Łobez, Gryfice and possibly Wałcz between 1506 and 1525. The latter, Jacob, founded bells for village churches in the areas of Stargard, Goleniów and Drawsko Pomorskie between 1529 and 1542. Both signed their bells with their name and surname, their surname only or with the house mark (Fig. 8: 14–16). Further founders from Stargard would consistently use a crafts name other than *grapenger*, namely *klockenger*, i.e. bell founder.²⁹

Nevertheless, that did not mean that those master craftsmen would cease to produce cauldrons. In fact, since the mid-16th century the term *Grapengiesser* did not come up in West Pomeranian historical sources. The name of Henning Grape,³⁰ a founder who carried out activity in the area of Koszalin and in the borderland of Pomerania and Greater Poland at the turn of the 17th century, sounds interesting. It could indicate that either he or his predecessor also produced cauldrons.³¹

The departure from calling founders *Grapengiessers* is in line with the general tendency known from other regions.³² Therefore, the case which occurred in Trzebiatów in 1665 seems quite peculiar. Namely, following the

inspection of a property, the occupation of its owner, Friedrich Lünich (Lünig, Lunick), was noted down as *Grapengiesser* (Fig. 3).³³ The previous owner of the property occupied by F. Lünich was also a *Grapengiesser*, Jürgen Tetzlaff. Until recently their work was thought to be relevant to bell founding only: we know that J. Tetzlaff founded bells between 1609 and 1633, when he produced a few bells for village churches in the areas of Goleniów, Stargard, Świdwin, Szczecinek, Kamień Pomorski and Gryfice, while F. Lünich founded bells for village churches in the areas of Trzebiatów and Gryfice between 1645 and 1664.³⁴

Archaeological traces of the work of *Grapengiessers* in Stargard

So far, Stargard is the only centre in West Pomerania where traces of the work of *Grapengiessers* have been discovered during archaeological excavations. In the front part of a plot situated in the corner of one of the centrally located town quarters, a well-preserved workshop which specialized in the casting of cauldrons was uncovered several years ago. It functioned from the second half of the 13th until the third quarter of the 14th century. The dig revealed remains of a square brick furnace used for melting metal, a store of clay used for making moulds and over 1,700 pieces of moulds. Objects filled with moulds, the cross sections of which were either rectangles or circles, would indicate a production process which was carried out around the furnace. The outer and inner moulds were of cauldrons from 14 to 27 cm in diameter. The

²⁹ Majewski 2005, 49–55.

³⁰ The same craftsman also appears in inscriptions on bells at Hennick, Henninck Kgrape.

³¹ Bells which he founded are known from the period from 1589 to 1606; Poettgen 2010, 21 narrowed down his activity to 1590–1601; Tureczek 2011, 320–323, 350–351 also mentions his bells.

³² Wiechmann [1999], 168.

³³ State Archive, Szczecin: Archives of the Dukes of Szczecin, Ref. No. I/4908.

³⁴ Cf. Majewski 2011.



Fig. 4. Selected *Grapen* cast moulds from Stargard, first half of the 16th century (photo by M. Szeremeta).

finds also included several fragments of moulds used for casting candle holders and bells. Pieces of old cauldrons, which were probably scraps to be used for melting down, were excavated on the plot, as well. There were no house marks of craftsmen, decorations or inscriptions.³⁵

In the area located on the outskirts, to the northeast of the medieval town, where St James's Chapel was until the reformation, almost 4,500 heavily fragmented moulds which were used for the production of cauldrons were excavated. Unfortunately, the area was seriously distorted, since it was used as an auxiliary graveyard of St Mary's parish. Clusters of moulds, charcoal and minor remains of bronze alloy were best preserved in spaces between graves. Numerous pieces of moulds were found in necrosol. The remains of a small space paved with stone, pieces of brick and fascine were also uncovered; it was probably an area used for some temporary structure, such as a shed. The functioning of both the revealed building and the workshop from which the bronze alloy remains were found was dated to the first half of the 16th century; however, due to lack of any tangible structure that would indicate cauldron-casting *in situ*, it seems impossible to conclude whether there was a casting workshop next to the building or whether waste which was a by-product of founding activity carried out somewhere in town was brought there.³⁶ The remains of the engraved house mark of the craftsman were noted on two pieces of inner moulds.³⁷

Further traces of cauldron-casting activity were uncovered during archaeological excavations which

were carried out in one of the quarters located in the north-eastern part of the town. A total of 2,179 pieces of moulds were recovered; they were deposited in charcoal-rich layers in the back patch of one of the quarter's corner plots. Scattered remains of moulds were also located in the front part of the plot. The well preserved pieces included elements of shaped legs, pouring spouts and plugs which closed the pouring channels of cauldron moulds (Fig. 4). On the surface of the latter, three hollows were formed which enabled the putting on and raising of plugs with three fingers. The cross sections of the cauldron legs were either rectangles or polygons, and their surface was often decorated with grooves. The remains of an outer mould show the engraved house mark of the craftsman.³⁸ The fact that there are no characteristic 'nest' clusters of pieces of clay moulds that would indicate the place where cauldrons were cast allows for the conclusion that the production waste was brought in so as to harden the ground and that this happened in the first half of the 16th century.

All archaeological remains of the workshops where cauldrons and other bronze objects were cast indicate a quick adoption of the founding craft in Stargard, which took place simultaneously with the granting of the town charter in the 13th century. The remains of the uncovered workshop and moulds from that period correspond to many similar ones which are to be found in other towns on the Baltic coast, such as Lübeck, Rostock or Stralsund. It is worth noting that among waste from workshops which carried out activity in Stargard in the first half of the 16th century, more variety in the shapes of cauldron legs can be observed than in the case of earlier items (Fig. 5). Clay used for moulds was also better prepared, the moulds themselves were more precise and the craftsmen would give the full cauldron moulds individual workshop characteristics, such as kneading the edges of leg moulds or shaping high, cylinder spouts and profiled plugs.

Two shaft furnaces unearthed during excavations in the Old Town market square also indicate an intensive founding activity in mediaeval Stargard. The first furnace was built on an oval plan. Its preserved outer dimensions were 1.2 × 0.8 m. The walls and the bottom were made of clay, which was burnt on the inside of the furnace. Twelve holes – the remains of the poles surrounding it – were also recorded. The other furnace was of a similar structure; however, it was considerably smaller in size, measuring 0.6 × 0.4 m. There was a drain hole in the bottom of both furnaces. A pit with refuse deposits

³⁵ Majewski 2013; Wywrot-Wyszkowska 2019b, 69–70.

³⁶ Cf. notes on the subject by Wywrot-Wyszkowska 2019a, 108.

³⁷ Sil, Burdziej 2015.

³⁸ Stań 2016; Wojciechowska, Szeremeta 2020, 9–10.

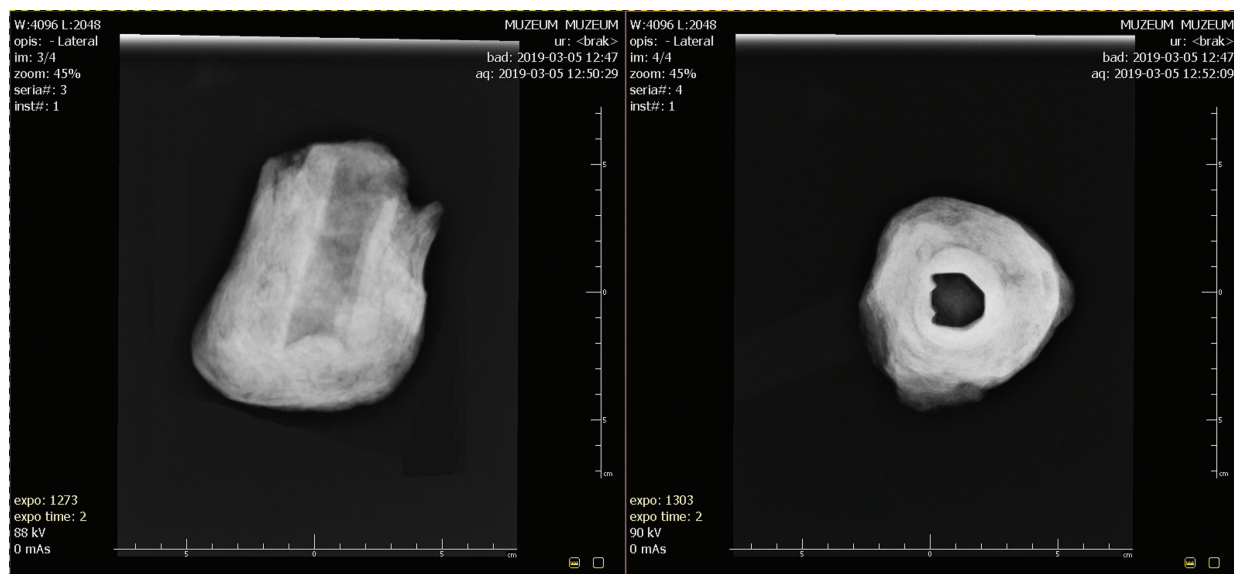


Fig. 5. X-ray image of a *Grapen* leg mould from Stargard, first half of the 16th century (image by A. Ławnikowski).

containing abundant remains of charcoal and bronze alloy was unearthed in its immediate vicinity (Fig. 6).³⁹ Both structures are the remains of the so-called shaft furnaces which were used for melting bronze. During the first stage of the construction process, an oval shape was staked out and then enclosed with a wall made of wattle (German *Korbofen*). The inner basis and sides of the furnace were made of clay. Two holes were made in the walls. Halfway up the wall of the structure there was a hole for pumping air, at the bottom there was a drain hole for channelling away the alloy. Such structures are characteristic of the oldest type of furnaces that were used for melting metal. The remains of furnaces which have been unearthed so far in Corvey, Konstanz, Kückhausen, Nienover, Ossendorf-Twiste, Schwerte and Trondheim are of a similar shape and size to those discovered in Stargard. They are dated to the period from the 8th/9th to the 13th century.⁴⁰ Younger remnants of structures of this type are located in Wismar, where the remains of as many as ten shaft furnaces dating back to the period from the 14th to the 17th century were unearthed in the yard of the dukes of Mecklenburg.⁴¹ In a context similar to the one in Stargard, the remains of three furnaces were uncovered in Ribnitz. They were unearthed during archaeological excavations which were also carried out in the market square. The furnaces' construction is dated to the period between the second half of the 13th and the turn of the

15th century.⁴² Another similar case is Neukalen, located near Demmin, where a furnace was unearthed between the town hall and a church.⁴³

In total, traces of founding activity which date back to the period between the second half of the 13th and the middle of the 16th century were unearthed in three sites



Fig. 6. Remains of alloys and bronze scrap registered next to shaft furnaces in the Old Market in Stargard, first half of the 14th century (photo by M. Tureczek).

³⁹ An analysis of the pieces of metal and lump of raw material from this deposit is presented in Tab. 1.

⁴⁰ Krabath 2002, 117, 133, 135–136.

⁴¹ Rütz 2005, 297.

⁴² Konze, Rütz 2008a, 353–354; 2008b, 155–161.

⁴³ Darjes 2012, 460–461.

in Stargard. Basically, the activity of the craftsmen concentrated mainly on the production of cauldrons; however, they would also produce candle holders and bells. It could be assumed that furnaces located in the market square in Stargard were used for founding bells primarily by *Grapengiessers*. This is indicated by the analysis of metal samples collected there, some of which show similarities to alloys used in the production of cauldrons. Considering that the construction of St Mary's parish church in Stargard was completed at that time, it is possible that its two bells, measuring a bit more than a metre in diameter at the lip, were founded here at the turn of the first and second quarters of the 14th century. Numerous archaeological excavations confirm that bells were often founded in the immediate vicinity of the church.⁴⁴

Sourcing bronze components and wood for the production of three-legged cauldrons

In the Middle Ages and Early Modern times copper ore was mined in Central Europe, primarily in the area of the Upper and the Lower Harz, Mansfeld, Upper Saxony, Vogtland, Thuringia, Fichtelgebirge, Tyrol, Carinthia, Bohemia and Moravia, Slovakia, and Transylvania. Tin, which is the necessary element of tin bronze alloys, was transported from Bohemia and Saxony, and sometimes from the British Isles.⁴⁵ At the turn of the 14th century the majority of copper mined in Hungary-controlled central Slovakia was exported north. There were two major routes: one via Orava, Kraków and Gdańsk or via Žilina, Cieszyn, Wrocław and further down River Oder to Szczecin. The other, land route ran through Greater Poland to Szczecin and further to Lübeck and Hamburg bypassing Sund.

Copper mined in Sweden and Hungary dominated Hanseatic markets, which in fact meant markets along the Baltic coast. The centre of raw material sourcing located near contemporary Falun kept flourishing from the beginning of the 1370s, which made Lübeck the central market for sharing and transporting Swedish copper until ca. 1620. Copper from Hungary also had a considerable, albeit smaller, share in Lübeck trade. The situation in Gdańsk was different at that time: the city was one of major trade partners of Sweden, but it bought copper from Sweden only in exceptional cases. Gdańsk primarily used copper from Hungary; we also know that

from 1474 to 1476 the tin for the city was purchased via Szczecin.⁴⁶

Due to a dispute over the staple right which started in the middle of the 14th century between Kraków and Wrocław, Louis I of Hungary considered a trade routed via Košice to Wrocław and further down River Oder via Frankfurt to Szczecin as an alternative one for transporting the copper mined in Spiš. A trade war between the Teutonic Order and Poland, in turn, caused the trade routes from Kraków to Prussia and Gdańsk via Toruń to close, and merchants had to travel via Poznań and the New March. These events made Duke Bogisław VI of Pomerania accord the market rights to merchants from Poland, Hungary, Lithuania and Russia and lower the customs duty in 1390. Soon, the Hanseatic towns of Stralsund, Anklam and Greifswald did the same. A few months later Polish King Władysław II Jagiełło accorded rights to merchants from the Duchy of Pomerania, from places such as Stralsund, Greifswald, Anklam, Szczecin and Gartz (Oder), as well as Lübeck, Hamburg, Rostock, Wismar, Frankfurt (Oder), Gorzów and other towns and cities which were members of the Hanseatic League. The rights set, among other provisions, a duty on copper, lead and tin, and prescribed a new trade route from Szczecin down River Warta or a land route via Poznań.⁴⁷ At the beginning of the 17th century, most raw materials from Frankfurt were transported along the newly constructed channel between Rivers Oder and Havel and further down the Elbe to Hamburg.⁴⁸

The sourcing of tin, which was used by pewters in Lübeck, Lüneburg, Stralsund and Gdańsk, was a slightly different matter. It was mined mostly in England, and since the 16th century, also in the Ore Mountains.⁴⁹ The fact that this raw material was transported to Western Pomerania from that region is mentioned in sources which date back to the beginning of the 17th century. Tin for the production of a new bell in Chojna was brought from Altenburg, while that for a bell in Stargard came from Leipzig.⁵⁰

In the second half of the 16th century lead, which appeared in alloys used for the production of cauldrons as an alternative to precious tin, was imported to Baltic ports from England. The process continued until the beginning of the 17th century, when all export of this raw material from the British Isles stopped.⁵¹

The oldest Szczecin customs tariffs, which date back to ca. 1255, mention copper brought from 'far away'. According to the city's customs book (*Pfundzollbuch*),⁵²

⁴⁴ Cf. König 2002.

⁴⁵ Dziekoński 1963, 59–114; Molenda 1989, 810.

⁴⁶ Lesiński 1975, 25.

⁴⁷ Irsigler 1979, 19–21.

⁴⁸ Molenda 1989, 813.

⁴⁹ Zins 1967, 205; Irsigler 1979, 27.

⁵⁰ Bütow 1937, 23–27; Redlin 1896, 28–32.

⁵¹ Zins 1967, 204–205.

⁵² Kehn 1968, 173, 225.

in the 14th century copper sourced in Hungary was transported from Szczecin to Lübeck. Documents from Early Modern times give scarce information on duty levied on raw materials or finished foundry products. In 1560 the duty levied on one hundredweight of copper and tin transported to Szczecin up River Oder was 10 pfennigs, while for lead it was 3 pfennigs.⁵³ In 1573 the duty on one hundredweight of tin was 8 shillings, similarly to a hundredweight of cauldrons made of bronze (*Grapenzeug*) or brass (*Messings grapen*). Seven years later the customs duty for one hundredweight of half-finished founded product for the casting of cauldrons or bells (*Grapen-oder Klockspeise*) in Stargard and Pyrzyce remained at the same level.⁵⁴ Between 1606 and 1613 in Szczecin the duty on one hundredweight of Swedish copper was 12 shillings, one hundredweight of Hungarian copper – 4 shillings, and one hundredweight of lead – 1 shilling. In 1615 the tax levied on the sale of one hundredweight of bronze cauldrons (*Grapenzeug*) was 4 shillings.⁵⁵

Imported raw material was processed in hammer mills, which we know were used in Greifswald, Szczecin, Stargard and Słupsk.⁵⁶ The so-called *Grapenspeise* was processed by the smiths themselves. However, the simplest and the most popular method was the recycling of metals, which is proven by numerous finds of bronze scrap unearthed in foundry sites. They include mostly broken cauldrons: their feet, fragments of walls and spouts. A similar procedure was followed during the production of bells, where bronze, copper or tin scrap was willingly collected by public donation.⁵⁷

Analyses of fragments of cauldrons unearthed during archaeological excavations in Stargard indicate that tin- and lead-based bronze alloys were used for their production (Tab. 1). Different samples taken from the same object show an uneven distribution of metals in the alloy. Particularly visible here is gravity segregation in the case of lead, which could be the result of a quick and uneven hardening process. Arsenic and antimony are important components of the alloy, which negatively affected the plastic properties of copper, but increased the resistance of the walls of the cauldron to high temperatures. Other, mainly alloy, metals correspond to the results of analy-

ses of bronze cauldrons from the area of northwestern Germany, where the share of tin was 0.45%, and lead ranged from 2.62% to 12.80%.⁵⁸ Interesting data is provided by analyses of the samples collected in the area of shaft furnaces unearthed in the Old Market, some of which display similarities to alloys used for the production of bells,⁵⁹ and some to those used for producing cauldrons. Quite different in this context are the results of the metal analysis of the mount of a lavabo handle (?) which was uncovered accidentally in the area of Stargard, and which needs to be classified as bronze due to the dominating element of zinc and copper, the share of the latter being more than 80%.⁶⁰ However, the object was imported, not produced locally. Its final interpretation, due to the lack of archaeological context at the time at which it was excavated and the lack of direct analogy, is insufficient. It only allows for a general dating to the 15th century (?).⁶¹

Charcoal and wood were used as fuel for drying moulds and the preparation of alloy. This is confirmed directly by the remains of workshops uncovered during archaeological excavations. The analysis of charcoal unearthed in the vicinity of shaft furnaces in the Old Market in Stargard revealed the species of wood of the highest energy content, namely: oak *Quercus sp.*, common hornbeam *Carpinus betulus* L. and common beech *Fagus sylvatica* L.⁶² It is possible that such good wood was no longer available in the vicinity of the town from the Late Middle Ages on, which is confirmed by historical information from 1614 about a Stargard founder, Jochim II Karstede, who transported beech wood to dry the bell mould and melt metal from a locality almost 40 kilometres away from the town.⁶³

The marking of cauldrons and the issue of their use

Some three-legged bronze cauldrons which date back to the Late Middle Ages and Early Modern times bear the house mark of the producer and the coat of arms of the town in which the founders carried out their work. This

⁵³ Tureczek 2015, 171.

⁵⁴ State Archive, Szczecin: Manuscripts and Legacies, Ref. No. 1335; for more on half-finished cast products in the Middle Ages and Early Modern times, cf. Werner 1977, 153.

⁵⁵ Blümcke 1908, 31, 100.

⁵⁶ State Archive, Szczecin: The collection of Martin Wehrmann, Ref. No. 96; Wachowiak 1981, 143; Molenda 1989, 802; Rütz 2005, 295.

⁵⁷ Wywrot-Wyszkowska 2019b, 75.

⁵⁸ Tureczek 2015, 178; Gan 2016, 357–358; Drescher 2017, 123–132.

⁵⁹ Cf. Gan 2017, 160.

⁶⁰ The analysis of chemical composition was carried out by Paweł Gan, M.A., from the Bio- and Archeometric Laboratory of the Institute of Archaeology and Ethnology of the Polish Academy of Sciences in Warsaw.

⁶¹ Cf. similar interpretation problem with regard to the discovery of a brass lavabo: Russow 2018.

⁶² Rennwanz 2017, 224.

⁶³ State Archive, Szczecin: The collection of Martin Wehrmann, Ref. No. 96.

Tab. 1. Results of metal analyses of *Grąpens*, production waste collected in foundries, and other objects made of copper alloy uncovered in Stargard.

No.	CL No.	Accession No.	Cu	Sn	Pb	Al	Si	Ti	Cr	Mn	Fe	Ni	Zn	As	Ag	Sb	Au	S	P	Bibliography
1	-	321/Gm/Kw/S	53,86	17,52	17,18	-	-	-	-	-	2,03	-	7,41	-	-	-	-	-	-	Tureczek 2015, 594
2	-	273/Gm/Kw/S	77,58	4,02	7,9	0,05	0,08	-	-	-	0,23	-	0,32	-	-	4,1	-	0,1	-	Tureczek 2015, 595
3	-	129/J/Kw/S	58,62	17,91	18,26	-	-	-	0,1	-	2,21	0,2	0,26	-	-	-	-	-	-	Tureczek 2015, 595
4	-	91/J/Kw/S	57,96	18,17	19,19	-	0,01	-	3,39	-	0,32	0,2	0,3	-	-	-	-	-	-	Tureczek 2015, 595
5	19354	174/IIb/A/S	73,67	5,98	13,46	0	0,06	0,01	0,08	0,1	0,27	1,1	0	2,4	0,08	2,85	0	0	-	Gan 2016, 362
6	19361	251/IIa/A/S	79,02	4,49	9,93	0,06	0	0,07	0	0	0,05	0,7	0,19	2,57	0,02	2,91	0,01	0	-	Gan 2016, 362
7	19356	224/IIb/A/S	80,04	3,98	6,56	0,04	0	0,09	0	0	0,72	1,1	0,56	3,22	0,11	3,56	0	0,01	-	Gan 2016, 362
8	19361	525/IIb/A/S	82,02	3,43	8,31	0,07	0	0	0	0,1	0,15	0,5	0	2,11	0,2	3,09	0	0	-	Gan 2016, 362
9	19653	10/R/P	48,88	47,28	1,25	-	-	-	-	-	0,06	0,1	0,65	0,43	0,18	1,17	-	-	1	Gan 2017, 164
10	19654	11/R/P	96,69	0,48	0,09	0,23	1,33	0,03	0	0	0,1	0,2	0	0,71	0,05	0	0	0,06	0	Gan 2017, 164
11	19654	11/R/P	19,02	65,64	0,44	1,14	5,29	1,08	0,1	0	0,66	0,2	0,52	0,88	0	4,67	0,21	0,07	0	Gan 2017, 164
12	19655	12/R/P	36,36	49,37	5,69	0,22	2,37	0,39	0,09	0,1	2,26	0,1	0,26	2,16	0	0	0,06	0	0,58	Gan 2017, 164
13	19655	12/R/P	71,42	22,73	1,35	0,11	0,16	0,24	0	0	0,21	0,3	0	0,81	0,02	2,68	0	0	0	Gan 2017, 164
14	19657	35/R/S	62,57	23,91	9,37	0,09	0	0,14	0,07	0	0,28	0	0,08	0,27	0,08	2,5	0,63	0	0	Gan 2017, 164
15	19675	48/R/S	69,91	24,41	1,19	0,18	0,04	0,28	0	0,1	0,02	0,3	0	1,02	0	2,77	0	0,03	0	Gan 2017, 164
16	19683	38/R/S	76,03	2,39	17,02	0,04	0	0	0	0	0,21	0,4	0,6	1,41	0	1,94	0	0	0	Gan 2017, 164
17	19685	40/R/S	72,01	21,94	1,39	0,16	0,02	0,21	0,11	0	0,04	0,4	0,07	0,65	0,25	2,77	0	0	0	Gan 2017, 164
18	19659	237/R/S	86,83	3,23	1,99	0,07	0,02	0	0,03	0	0,2	0,3	5,72	1,31	0	0,33	0	0	0	Gan 2017, 164
19	20125	D/A/31	80,31	1,29	1,26	-	0,02	-	-	0	0,51	0,2	16,1	0,05	0,01	0,07	-	0,05	0,18	-

(Note: X-ray microanalysis was applied in the analysis of items 1–4; samples were subject to earlier preparation by mechanical sanding and polishing of microsections and thereafter by etching with MnI_5Cu agent; item 18 was described by the author of the analysis as a fragment of a pot / *Grąpen*; however, the profile and thickness of the walls seem to indicate it is a part of a bell waist.)

is usually connected to the regulations which were passed during three conventions of Hanseatic League members in 1354, 1368 and 1375. They mainly concerned the production, marking and trading of cauldrons. The towns and cities of Wismar, Rostock, Stralsund, Greifswald, Szczecin and Hamburg, which participated in the conventions under the leadership of Lübeck, undertook, among other things, to observe the quality of the alloy, mark the products with the house mark of the producer and the coat of arms of the town, and, moreover, that no master would employ more than two journeymen and two apprentices.⁶⁴ Similar regulations applied in Flanders towns, as attested to by a mark with a shield divided into four quarters (*party per cross*) and the house mark of the craftsman which appeared on a pot from Mechelen.⁶⁵

Despite the Hanseatic regulations, however, a third of the total number of 200 known cauldrons from the period from the 14th to the 16th century bears neither the house mark of the craftsman nor the coat of arms of the town. The remaining pots bear markings indicating their origin: from Lübeck, Stralsund, Greifswald, Bremen and Lüneburg. A craftsman from Lübeck by the name of Gerhard Kranemann placed his house mark and an element from the coat of arms of Lübeck on a baptismal font and a bell which date back to 1357 and 1391, respectively. Thanks to this recognized mark, he has also been identified as the producer of three cauldrons and a frying pan.⁶⁶

The results of archaeological excavations carried out in foundries in Wismar, Stralsund (Fig. 7), Greifswald (Fig. 7), Anklam (Fig. 7) and Stargard (Fig. 9), which were active from the second half of the 14th to the mid-16th century, indicate a partial marking of products. Engraved markings could be found on outer and inner clay moulds. Most often they were placed on the inner or the outer side of the cast, where the inlet of alloy joined the body or on parts close to the bottom of the pot. Coats of arms of Lübeck and Stralsund were recognized relatively early and then confirmed by archaeological finds. In the case of Lübeck it is a shield partitioned by a horizontal line into two fields (*party per fess*), in Stralsund it is a perpendicular arrow (*Strela* in Polabian) pointing upwards, whereas in Greifswald the town sign is a shield partitioned by horizontal lines into three fields (*tierced per fess*). Hans Drescher associated with the latter town the sign of a shield partitioned by horizontal lines into three fields with crosshatching covering the upper and bottom fields.⁶⁷ However, none of the coats of arms of Greifswald which have been found until now show crosshatching.

The coat of arms of Güstrow (Fig. 7), which did not take part in the Hanseatic conventions mentioned above, but which adopted its own regulations setting forth the principles of cauldron-marking, was unknown until recently. It is a shield partitioned into three fields in a Y shape (*party per pall*) with a circle in the middle.⁶⁸ With regard to such Pomeranian towns as Anklam, Pasewalk (Fig. 7) and Stargard, only house marks are known; the towns were not parties to conventions which imposed regulations governing cauldron-marking. This in itself, however, does not mean that they did not also use their coats of arms, which is proven by the example of Güstrow.

The above review indicates that markings which were used by *Grapengiessers* were elements of the coat of arms of the town in which a craftsman produced his goods or another town mark used by other metal craftsmen, as well. A combination of the coat of arms of the town and the house mark of the craftsman is observed in the markings of pewter and gold goods, but heraldic elements of seals and coins struck by individual centres were also of importance as patterns. Therefore, it could be assumed that producers of cauldrons in Szczecin could use a shield partitioned by a horizontal line into two fields, each emblazoned with a square, just as on former town banner or, what is more complicated when working with a mould, a head of a griffin or a head of a griffin wearing a crown. In Pasewalk it could have been three griffin heads in a shield divided into three parts with the upper one *tierced per pale*; in Anklam – an arrow similar to the one in Stralsund; while in Stargard – a shield partitioned with horizontal lines into three parts (*tierced per fess*), or a six-pointed star.

Unfortunately, only a few *Grapengiessers* could be identified on the basis of the house marks they left behind. Thanks to that kind of marking, it was possible to date objects and point to a specific production centre more precisely. In Western Pomerania this concerned two workshops unearthed in Stargard. House marks recorded on moulds were ascribed to Jochim and Jacob Ingerman, who, as was mentioned above, were known as bell founders active in the years 1506–1542 (Fig. 9).⁶⁹ Both Ingerman craftsmen marked their products with their name or house mark or their house mark as well as name, as exemplified on village church bells in the areas of Choszczno, Łobez and Nowogard. Like on cauldron moulds, the house mark appears on the bells in two versions. It takes on the form of a cross with arms of equal length, where the horizontal arms are supplemented with lines of length identical to that of each of the arms but

⁶⁴ Wywrot-Wyszkowska 2019b, 72, and older literature therein.

⁶⁵ Drescher 1968b, 27.

⁶⁶ Drescher 2017, 11.

⁶⁷ Drescher 1969.

⁶⁸ Fries 2014, 109.

⁶⁹ Majewski 2005, 51–52, 114–121.

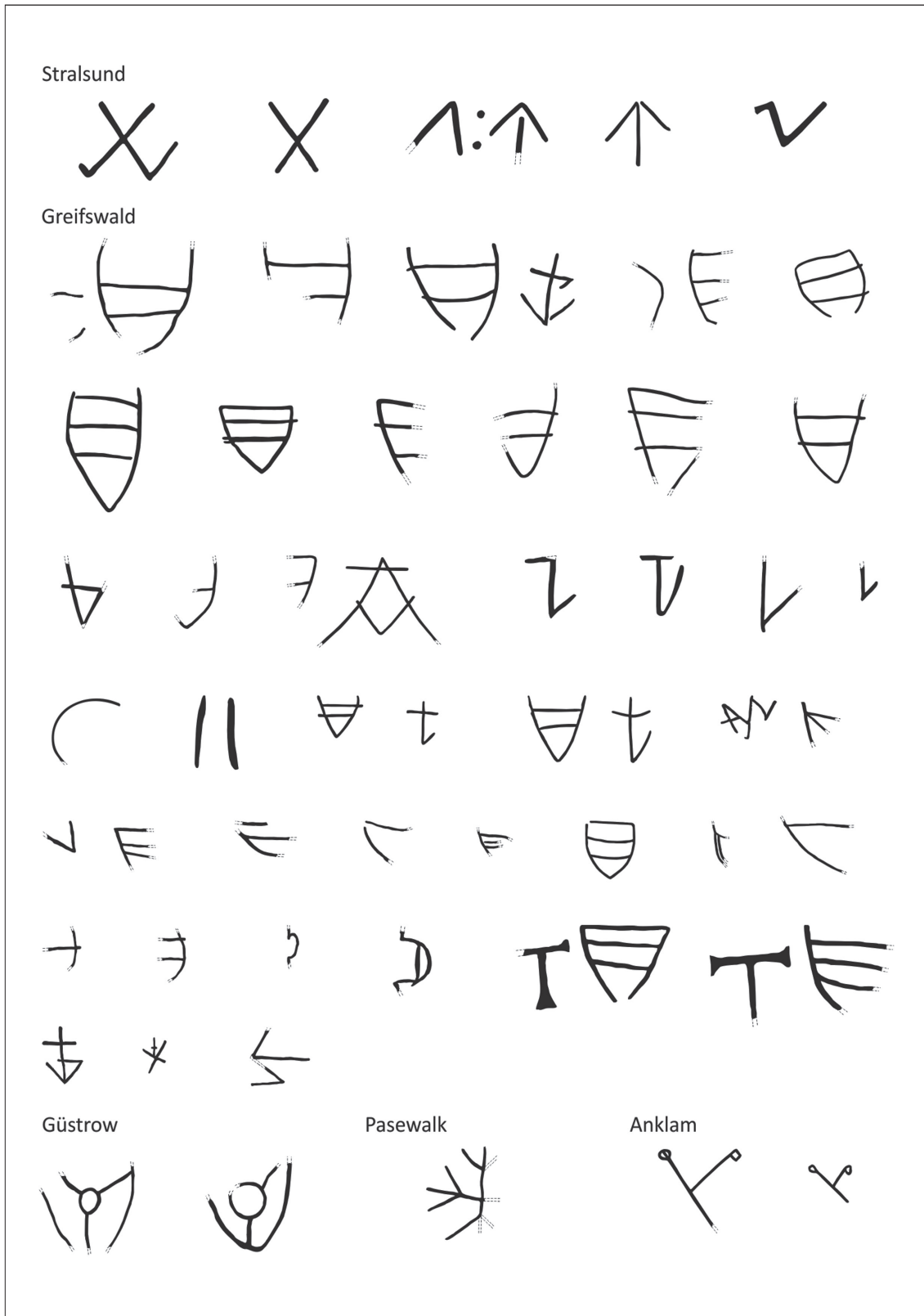


Fig. 7. Coats of arms and house marks of craftsmen from Stralsund, Greifswald, Güstrow, Pasewalk and Anklam registered on cast moulds of *Grapens* uncovered during archaeological excavations and on a *Grapen* piece. Stralsund according to: Ansorge 2005a, 128, fig. 11; 2005b; Rütz 2005, 299, fig. 11; Samariter 2005, 717, fig. 104; Brüggemann 2016, 459, fig. 348; Greifswald according to: H. Schäfer 1995, 163–165, figs 10–12; 1999, 655, fig. 145; Rütz 2002, 162, fig. 36; 2005, 299, fig. 11; Kaute, Manske 2017, 371, fig. 264; Güstrow according to: Fries 2014, 109, fig. 2; Anklam according to: Hoche, Fries 2004, 578, fig. 66; Pasewalk according to: Hoffmann 2006, 445, fig. 99 (drawing by C. Rysz).

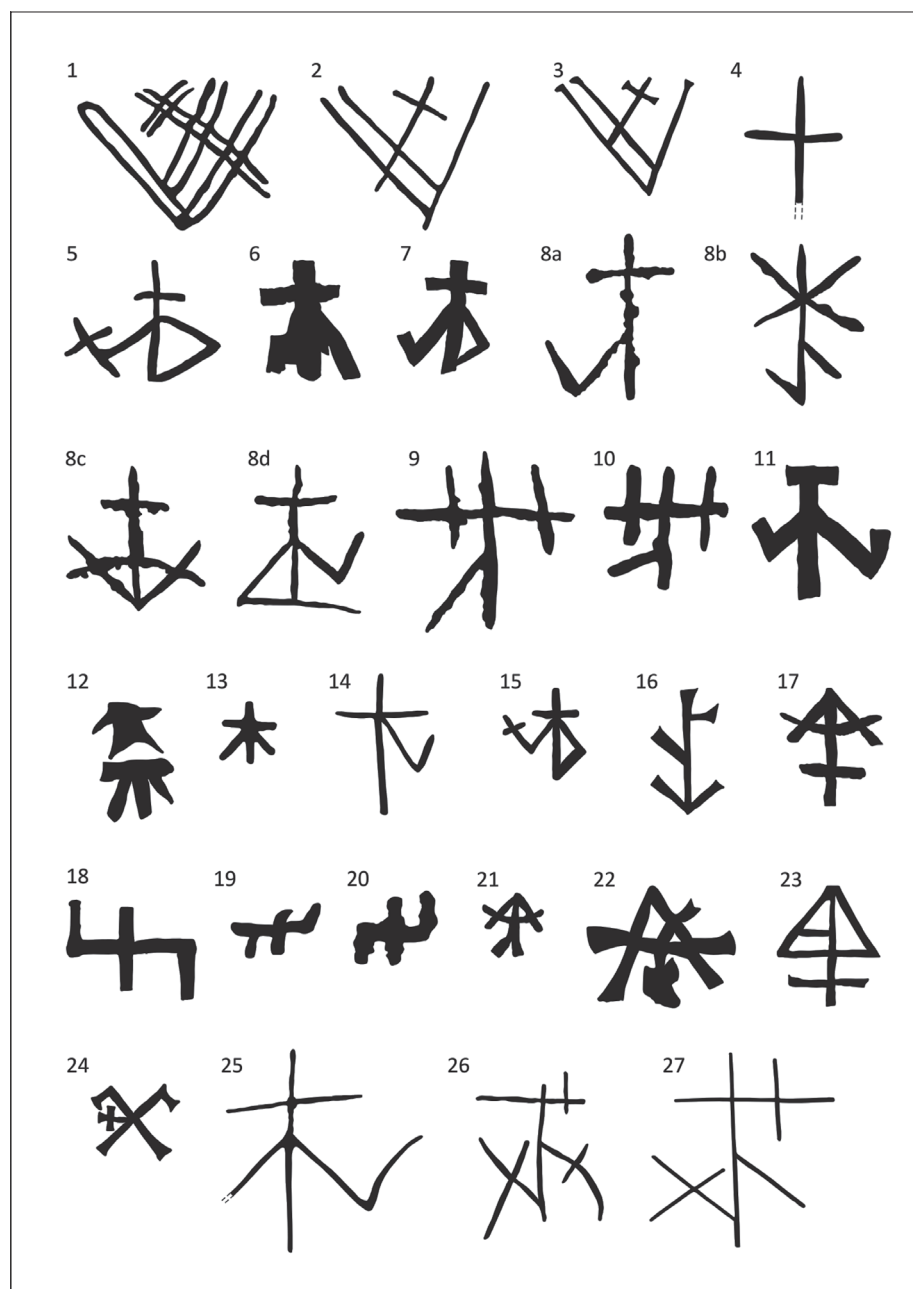


Fig. 8. House marks of *Grapengiessers* from West Pomerania, 14th–16th centuries: 1 – Łoźnica, Goleniów District, bell, 14th/15th centuries; 2 – Bodzęcin, Goleniów District, bell, 14th/15th centuries; 3 – Węgorza, Goleniów District, bell, 14th/15th centuries; 4 – Kamień Pomorski (surrounding area), Kamień Pomorski History Museum, Ref. No. MHZK/H/264, *Grapen*, 14th/15th centuries; 5 – Mechowo, Kamień Pomorski District, bell, Haso Rogge, 1423; 6 – Obromino, Pyrzyce District, bell, 1443; 7 – Słodkówko, Stargard District, bell, 1448; 8a–8b – Stargard, St John the Baptist Church, bell, 1464; 8c – Stargard, St John the Baptist Church, bell, Martinus Mathei, 1464; 8d – Stargard, St John the Baptist Church, bell, 1464; 9 – Kłodzino, Pyrzyce District, bell, 1479; 10 – Redostowo, Goleniów District, bell, ca. 1480; 11 – Mechowo, Pyrzyce District, bell, 1480; 12 – Sokolniki, Goleniów District, bell, Martin Kukuch, 1485; 13 – Rzystnowo, Goleniów District, bell, 15th century; 14 – Lublino, Stargard District, bell, 15th century; 15 – Suliborek, Choszczno District, bell, 1502; 16 – Rzecko, Choszczno District, bell, Merten Jacob, 1504; 17 – Niemierze, Kołobrzeg District, bell, Martinus Mathei, 1505; 18 – Stradzewo, Choszczno District, bell, Jochim Ingerman, 1525; 19 – Łosośnica, Łobez District, bell, Jacob Ingerman, second quarter of the 16th century; 20 – Karsk, Goleniów District, bell, Jacob Ingerman, 1532; 21 – Kościuszki, Goleniów District, bell, 1532; 22 – Porost, Koszalin District, bell, Diderick Beckmann, 1581; 23 – Place unknown, National Museum in Szczecin, Ref. No. MNS/Rz-460, mortar, Rolof Klassen, 1584; 24 – Kółki, Choszczno District, bell, Jacob Stelmaker, 1586; 25 – Place unknown, National Museum in Szczecin, Ref. No. MNS/A-12829, cauldron, 16th/17th centuries; 26 – Suchań, Stargard District, Museum of Archaeology and History in Stargard, Ref. No. MS/A/397/6, cauldron, Jochim II Karstede (?), 16th/17th centuries; 27 – Stargard, skillet, Jochim II Karstede (?), 16th/17th centuries, archival data, National Museum in Szczecin, Department of Archaeology, Ref. No. 1588 (drawing by C. Rysz).

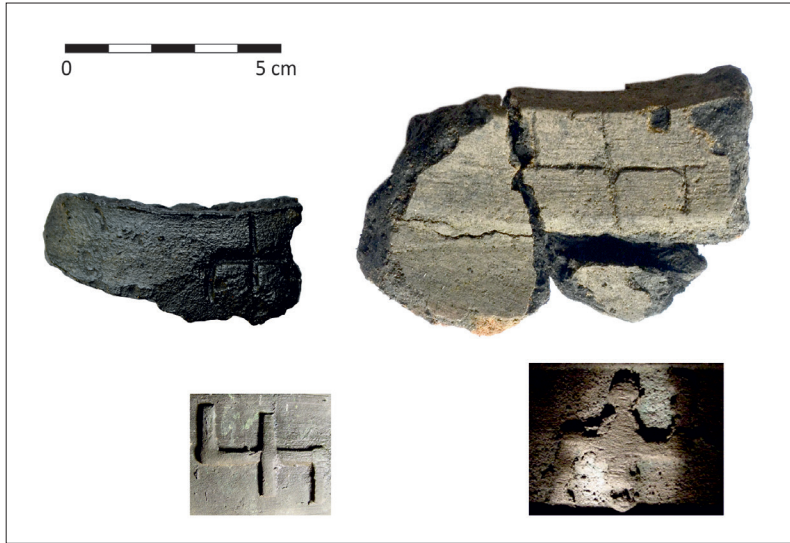


Fig. 9. Fragments of *Grapen* moulds with house marks from archaeological excavations in Stargard and house marks of Jochim Ingerman and Jacob Ingermann on bells from Stradzewo, Choszczno District, 1525, and from Karsk, Goleniów District, 1532 (photo by M. Majewski, M. Szeremeta).

extending at the right angle: up from the left arm and down from the right arm – or *vice versa* in the second variant. At the present stage of research we are unable to tell whether one house mark belonged to Jochim and the other to Jacob.

It is possible that the marking of goods was one of the conditions of their sale, a proof of payment of duty and a sign of their quality. Some of the cauldrons were sold on the local market, some were exported to other centres. A good example of such a practice are the numerous finds of bronze vessels preserved in museum collections with the coats of arms of Lübeck and Stralsund which were used in households located in neighbouring areas of those towns, but also further away, in Danish Jutland, Funen, Zealand and Skåne.⁷⁰

Many bells which date back to the period from the 14th to the 16th century were identified in areas where there were towns known for the production of cauldrons, which, just like bells, bear house marks.⁷¹ The founders were in most cases local *Grapengiessers*. This is exactly the case in Stargard, where four *Grapengiessers* from the turn of the 15th century were also bell founders.⁷² It can by no means be excluded that masters from other centres would cast bells for towns which were located at a considerable distance from their home town. This practice seems to be confirmed by a bell in the village church in Ołobok near Świebodzin, which was most probably founded in an unknown location in Western Pomerania by a craftsman from Lübeck at the turn of the 14th century.⁷³ The place of its origin is indicated by a house mark and a shield

partitioned by a horizontal line into two fields (*party per pale*) – the coat of arms of Lübeck (Fig. 10), which, as we saw, was also a marking used on cauldrons. It is not known how the bell came to that location: it was probably transported from Lübeck by sea; however, it is also possible that the itinerant craftsman founded the bell close to the church for which it was cast. It is not excluded that another *Grapengiesser* from Lübeck who was also occasionally active in Pomerania was among the founders of the great bell for St John the Baptist Church in Stargard, which dates back to 1464. One of the four house marks left on the waist was recognized almost two decades ago and ascribed to a *Grapengiesser* from Stargard, Martinus Mathei (Marten Matties).⁷⁴ Other two house marks have not yet been decoded, nor have any analogous marks been found. The final house mark on the bell is known from two cauldrons bearing the coat of arms of Lübeck and dated to the middle or second half of the 15th century, which are now in the collections of the Altonaer Museum in Hamburg and the Viborg Museum.⁷⁵ Therefore, one of the makers of the Stargard bell can be associated with Lübeck. Interestingly, the year in which such the spectacular instrument was founded, the weight of which is about 4.5 tons, coincided with the signing of a peace treaty between Stargard and Szczecin in Anklam, which ended a ten-year war over sea trade between the two cities. This was possible thanks to many years of mediation by other members of the Hanseatic League. Already in 1458 Lübeck made attempts to mitigate the dispute, showing its support for Stargard. A year later Stargard filed many

⁷⁰ Drescher 1969, 313; Ansorge 2005a, 127.

⁷¹ Cf. Buggenthin 1998.

⁷² Majewski 2005, 49–52.

⁷³ Tureczek 2015, 92.

⁷⁴ Majewski 2005, 49.

⁷⁵ Drescher 1967, 57–58; 1968a, 165; 1968b, 28; 1969, 305.

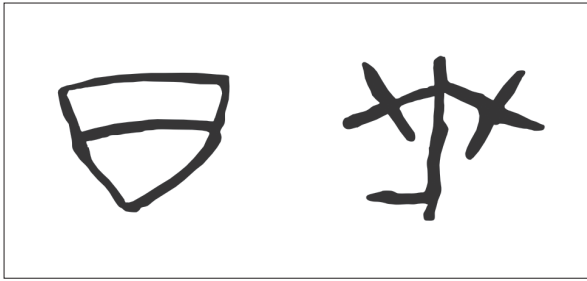


Fig. 10. Coat of arms of Lübeck and a house mark on a bell in Ołobok, Świebodzin District, 14th/15th centuries (drawing by C. Rysz).

complaints against Szczecin with Lübeck, and in 1460 Lübeck protected convoys of Stargard boats to its port.⁷⁶ Perhaps this alliance between the two cities also resulted in a master from Lübeck being one of the founders of such an exquisite masterpiece for Stargard.

Apart from house marks of recognized *Grapengiessers*, at least several bells, bronze mortars and cauldrons with house marks which could not be ascribed to any known producers have also survived to our times (Fig. 8). The unfinished inventory of bells in Western Pomerania prevents us from establishing the chronology of pots which have identical markings. Cauldrons often became parts of museum collections in the 19th and 20th centuries, when archaeologists were not interested in the archaeological context of the find but the artefact itself.⁷⁷ Therefore, the one and only chance to push forward studies on West Pomeranian *Grapengiessers* is to catalogue all known cauldrons and bells.

One of the aims of cauldron-marking which were set in the second half of the 14th century was to observe the quality of the alloy. However, all metal analyses which have been published so far show a considerable share of lead and arsenic in the alloy used for the production of pots. Obviously, such a composition of metals, considering the long time for which the vessels, those used for cooking anyway, were subjected to heating, could not have had a positive influence on the health of their users; just as in the case of glazed earthenware in which dishes including vinegar were served, one of the components was lead monoxide. Studies have shown that it must have had a strong toxic effect.⁷⁸

It is not likely that late mediaeval and early modern users of bronze cauldrons were aware of the harmful effect of food prepared in such pots. What they were aware of, however, was the financial value of bronze pots. Vessels of this type appeared in inventories, which also indicates the scale of their distribution in the society. The estate of Pomeranian Duchess Sophia (1434–1497) included, among other things, two mortars (*moser*) and one brass lavabo (*missinges hantvat*), 15 cauldrons and one vessel described as *schottelgrapen*.⁷⁹ The inventory of the Szadzko Castle made in 1505 included one *grote nige schottel-grapen*, three further *kleine koken-grapene* and one *moyser mit einer kule*.⁸⁰ An inventory of Szczecin townsman Severin Frederici, made in 1538, included seven small and big cauldrons (*Grapen luttick und grodt*).⁸¹ The inventory of Lukas Brinck, the Mayor of Stargard, made in 1586, included 31 bronze three-legged cauldrons and four cauldrons cast in bronze (*Grapenkeßel*) which were stored in a granary with many other copper-alloy objects. The house inventory also listed, among other things, a mortar without pestle (*Meuser ohne Keule*), two cauldrons and one baking tray (*Bradtpfanne*). The estate of Michell Egers, a Stargard townsman, made in 1603, included 30 cauldrons, small and large (*Grapen klein und groß*), and one cauldron with a handle (*Grapentiegel*),⁸² whereas the inventory of the castle of the Order of St John in Swobnica near Gryfino, made in 1560, included only one large cauldron (*großen Grapen*).⁸³ While stocktaking the effects of the Otto Jageteufel Collegium in Szczecin in 1597, three large cauldrons and one small were noted.⁸⁴

Bronze cauldrons were used to deposit valuables, which not only protected precious items, but also raised the value of the deposit. A cauldron provided more durable packaging than ceramics, wood or a piece of cloth, and ensured the contents could be retrieved safely. Coins or objects so safeguarded were uncovered in abundance in the east of Scotland, in Rhineland, east of the Ruhr, in northern Germany and (in biggest numbers) in Denmark; their chronology ranges from the end of the 13th to the first half of the 15th century. Nevertheless, as a rule cauldrons filled with valuables were deposited until the 17th century.⁸⁵ An ideal example of such a practice is a hoard in a cauldron uncovered in a plot at 3 Targ Rybny Street in Szczecin, which included 358 coins, 7 coin fragments, 304 costume accessories and pieces of

⁷⁶ Gaziński 1993.

⁷⁷ Cf. National Museum in Szczecin, Department of Archaeology, Ref. No. 1588; Kosegarten 1856–1857, 50–51; Zuwachs der Sammlungen 1894; Majewski 2003, 66–69.

⁷⁸ Cf. Rasmussen *et al.* 2015.

⁷⁹ Bülow 1879b, 463.

⁸⁰ Wehrmann 1901, 285.

⁸¹ Bülow 1880, 214.

⁸² State Archive, Szczecin: Imperial (Reich) Chamber Court, Ref. No. 558.

⁸³ Bülow 1879a, 28.

⁸⁴ Wehrmann 1899, 37.

⁸⁵ Keller 2015, 33–34.

jewellery, and a cauldron.⁸⁶ A hoard consisting of only coins in a cauldron was uncovered decades ago in the area of Drawsko Pomorskie. Unfortunately, the treasure was dispersed and only the cauldron was subject to publication.⁸⁷

Cauldrons were hidden for fear of spoliation. Naturally, the reason was the value of the vessel and the alloy it was made from. Some cauldrons, especially those recovered from wet contexts, i.e. rivers, ponds, lakes and marshes, are considered to have been ritual offerings made while performing acts of white magic.⁸⁸ A cauldron dating back to the turn of the 15th century which was recovered from the seabed off the coast near Kamień Pomorski might be evidence of such a practice.⁸⁹ Alternatively, single cauldrons hidden individually or together with copper cauldrons and tin crockery were hidden for fear of theft.⁹⁰ Such deposits, which date back to the period from the 14th to the 17th century, are quite common in areas in which war operations or acts of banditry occurred. This was the case of a hoard consisting of five bowls, two tin churns and a bronze cauldron without legs, which was uncovered in Suchań near Stargard. All tin vessels bear the house marks of pewter makers who were active at the turn of the 16th century; on the bottom of the cauldron there is a house mark which might be related in some way to Jochim II Karstede, a bell-founder from Stargard.⁹¹ The deposit might have been buried in 1627 or later, during the Thirty Years' War, which wrought havoc on West Pomerania.⁹² A set of five copper cauldrons and two three-legged cauldrons hidden in a former mill pond in Gützkow near Greifswald seems to be related to the same period.⁹³

Conclusions

The foundries uncovered in the course of archaeological excavations in towns located on the Baltic coast operated in the period from the 13th to the 17th century. Their activity was particularly intense in north German centres. Archaeological remains of their work can be seen primarily in the assemblage of fragments of clay moulds used for the production of cauldrons. Some of the uncovered workshops also dealt in casting garment decorations and ornaments, incense burners and candle holders.

Information about *Grapengiessers* in Pomerania coincides with the appearance and growth of new towns.

This points to the spread of craftsmanship and its increased importance for the economy. The oldest records of *Grapengiessers* in Western Pomerania come from Szczecin and date back to the beginning of the 14th century. Records of craftsmen specializing in this trade in Stargard appear no sooner than two centuries later. As a rule, the founders called *Grapengiessers* were consigned to oblivion in the middle of the 16th century. However, as an example from Trzebiatów in the second half of the 17th century shows, professionals thus called continued to carry out their activity and cast cauldrons in provincial localities beyond that point.

So far, remains of founding industry have been uncovered in three locations in Stargard. The operation of the workshops is dated to the period from the second half of the 13th to the middle of the 16th century. By and large, the activity of craftsmen concentrated on the production of cauldrons, but they also made candle holders and bells. It could be assumed that furnaces uncovered in the Old Market in Stargard are the remains of bell founding activity, which was usually performed by *Grapengiessers* at that time. This is indicated, among other things, by metal analysis of the samples collected in that locality, some of which show similarities to alloys used for the production of cauldrons. It is possible that two bells, measuring a bit more than a metre in diameter at the lip each, made for St Mary's parish church, which was completed at that time, were founded here at the turn of the first and second quarters of the 14th century. As the results of numerous archaeological excavations show, bells were often founded in the immediate vicinity of churches.⁹⁴

The raw material used for the production of cauldrons in Western Pomerania was sourced from Sweden and Hungary (copper) and England and the Ore Mountains (tin). Recycling of used bronze and tin vessels also played a major role. Metal analyses indicate that the percentage of major metals in alloys used in Western Pomerania corresponds to the results of analyses of cauldrons from north-western Germany. An analysis of the charcoal unearthed by the furnaces has shown that the species of wood used were those of the highest energy content, namely: oak, common hornbeam and common beech.

Thanks to archaeological sources, it was possible to extend the database of municipal coats of arms and house marks which were found on cauldrons. Especially prominent in this context are the examples from Stralsund and

⁸⁶ Frankowska-Makała 2004a; 2004b; 2006; Słowiński, Wilgocki 2004.

⁸⁷ Majewski 2006, 287.

⁸⁸ Cf. van Vilsteren 1998; 2000a; 2000b; van Vilsteren, Jöns 2013.

⁸⁹ The item can also come from a wreck. It was caught in a fisherman's nest and scrapped; eventually retrieved, it was included in the collection of Kamień Pomorski History Museum.

⁹⁰ Auler, Hupka 2012, 121.

⁹¹ Cf. Lemcke 1906, 42, 215; cf. a mark on a skillet uncovered in Stargard ca. 1889, National Museum in Szczecin, Department of Archeology, Ref. No. 1588.

⁹² Majewski *et al.* 2016.

⁹³ Metzzen, Schirren 2014.

⁹⁴ Cf. König 2002.

Greifswald. House marks on moulds were also excavated in other towns (Anklam, Pasewalk and Stargard), along with municipal coats of arms which had been unknown previously, such as that of Güstrow. The process of product-marking is related to the regulations passed by Hanseatic towns and cities in the second half of the 14th century. It should be noted, however, that not all products were marked.

One of the distinguishing features of cauldrons was the financial value of bronze alloy of which the pots were made. Therefore, they were meticulously noted in inventories and carried as a precious possessions over long distances, as shown by the example of *Grapens* found in Săulești and Baraolt in Romania, which is connected to the German colonization of the region.⁹⁵ Moreover, cauldrons were deposited in the ground for safe-keeping in times of uncertainty, with precious contents placed inside the pot, in sets with other metal vessels, or individually.

Western Pomerania has so far been found to be easternmost locality on the Baltic coast where cauldrons were produced. Until now, no traces of cauldron production have been discovered in Szczecin; however, producers of

pots are recorded in that city as early as at the beginning of the 14th century.

Acknowledgements

The author wishes to express his thanks to Karolina Stań and Mateusz Szeremeta from the Museum of Archaeology and History in Stargard; Marceł Tureczek, University of Zielona Góra; Rafał Simiński, University of Szczecin; Mikkel Kielsen, Viborg Museum; Sławomir Słowiński, National Museum in Szczecin; Grzegorz Kurka and Błażej Bubnowicz, Kamień Pomorski History Museum and Cyprian Rysz, for their invaluable assistance in searching for source materials and in the preparation of illustrations. I am also grateful to Erki Russow from Tallinn University for preliminary research into the possible locations of cauldron production sites in contemporary Estonia, and to Paweł Gan from the Bio- and Archeometric Laboratory of the Institute of Archaeology and Ethnology of the Polish Academy of Sciences for sharing his knowledge about the analysis of the chemical composition of alloys and production waste from workshops in Stargard in which bronze cauldrons were cast.

Bibliography:

Archival sources:

National Museum in Szczecin:

Department of Archeology, Ref. No. 1588.

State Archive, Szczecin:

Archives of the Dukes of Szczecin, Ref. No. I/4908.

Imperial (Reich) Chamber Court, Ref. No. 558.

Manuscripts and Legacies, Ref. No. 1335.

The collection of Martin Wehrmann, Ref. No. 96.

References:

- Ansorge J. 1998 Über eine Notbergung auf dem Friedhof der Marienkirche in Greifswald, *Archäologische Berichte aus Mecklenburg-Vorpommern* 5, 159–164.
- Ansorge J. 2005a Katharinenberg 36 – ein Wickhaus in der Stralsunder Stadtmauer, *Archäologische Berichte aus Mecklenburg-Vorpommern* 12, 117–131.
- Ansorge J. 2005b Stralsund, Hansestadt, Fpl. 81, *Bodendenkmalpflege in Mecklenburg-Vorpommern* 52 (2004), 716.
- Ansorge J. 2006 Greifswald, Hansestadt, Fpl. 132, *Bodendenkmalpflege in Mecklenburg-Vorpommern* 53 (2005), 429–430.
- Ansorge J. 2010 Stargarder Straße 39: archäologische Untersuchungen auf dem ehemaligen mecklenburgischen Fürstenthof in Neubrandenburg. Mit einem Exkurs über die Neubrandenburger Juristenfamilie Krauthof im 17. Jahrhundert, *Bodendenkmalpflege in Mecklenburg-Vorpommern* 57 (2009), 369–408.

⁹⁵ Poppa 2010.

- Ansorge J., Rütz T. 1999 Hansestadt Greifswald, Lange Straße 47. Ein Grundstück auf dem ehemaligen Stadtgraben, *Bodendenkmalpflege in Mecklenburg-Vorpommern* 46 (1998), 297–317.
- Anund J. 1997 The Bronze Industry of Medieval Scandinavia. The Evidence and the Social Position of the Artisan, (in:) G. de Boe, F. Verhaeghe (eds), *Material Culture in Medieval Europe. Papers of the Medieval Europe Brugge 1997, Conference 7*. I.A.P. Rapporten 7, Zellik, 21–31.
- Anund J. 2000 Gjuterimaterialet, (in:) R. Hedvall (ed.), *Stadsgårdar i den senmedeltida stadsdelen Sanden, Vadstena. Vadstena stad och kommun Östergötland Dnr: 41-2200-1995, 96/054, 97/064, 421-1405-1998*. Rapport UV ÖST 26, Linköping, 114–116.
- Anund J., Berquist U., Bäck M., Pettersson K. 1992 A Medieval Cauldron-Foundry. Craftsmanship and Craftsmen in Patern, Uppsala, (in:) L. Ersgård, M. Holmström, K. Lamm (eds), *Rescue and Research. Reflections of Society in Sweden 700–1700 A.D.* Riksantikvarieämbetet Arkeologiska undersökningar Skrifter 2, Stockholm, 221–251.
- Auler J., Hupka D. 2012 „...Ehnr Häfen auff dreyn beyn“. Ein gut erhaltener Bronzegrapen mit Gießerzeichen aus dem Landkreis Ludwigslust-Parchim, *Die Kunde* (NF) 63, 111–122.
- Bagmihl J.T. 1847 *Pommersches Wappenbuch* 3, Stettin.
- Bergold H., Bäck M. 2007 *Grytgjutare i Västerås. Fragment av kvarteret Kleopatras historia*, Örebro.
- Blümcke O. 1884 Die Handwerkszünfte im mittelalterlichen Stettin, *Baltische Studien* 34, 81–240.
- Blümcke O. 1908 Der finanzielle Zusammenbruch Stettins zu Anfang des 17. Jahrhunderts, *Baltische Studien* (NF) 12, 11–102.
- Bramstäng Plura C., Carlsson K., Rosén C. 2013 *Nio tomter i Jönköping. Småland, Jönköpings stad, kvarteret Dohjorten (Druvan), RAÅ 50*. UV Rapport 119, Mölndal.
- Bronisch G., Ohle W. 1939 *Die Kunst- und Kulturdenkmäler der Provinz Pommern. Kreis Kammin Land*, Stettin.
- Brüggemann S. 2016 Stralsund, Hansestadt, Lkr. Vorpommern-Rügen, Fpl. 405, *Bodendenkmalpflege in Mecklenburg-Vorpommern* 62 (2014), 459.
- Buggenthin I. 1998 Glockengießer und ihre Zeichen in Mecklenburg vom 14. bis 17. Jahrhundert, *Hammaburg* (NF) 12, 239–260.
- Bülow [G.] von 1879a Inventarien der S. Johanniterordenscomthurei Wildenbruch aus dem Jahren 1547 und 1560, *Baltische Studien* 29, 1–32.
- Bülow [G.] von 1879b Verlassenschaftsinventar der Herzogin Sophia von Pommern, Erbin des Königs Erich von Schweden und Wittve des Herzogs Erich II von Pommern. 1497., *Baltische Studien* 29, 456–465.
- Bülow [G.] von 1880 Severin Frederici aus Arnswalde übergibt der Lucie Rulows in Stettin sein Hausgeräth zur Aufbewahrung, *Baltische Studien* 30, 214–216.
- Bütow H. 1937 Die Königsberger Glocken und Königsberger Glockengießer. Ein Beitrag zur Glockenkunde, *Die Neumark* 12, 21–66.
- Darjes E. 2012 Neukalen, Lkr. Demmin, Fpl. 10, *Bodendenkmalpflege in Mecklenburg-Vorpommern* 59 (2011), 460–462.
- Drescher H. 1967 Grapen aus Bronze im Altonaer Museum, *Altonaer Museum in Hamburg* 5, 53–77.
- Drescher H. 1968a Mittelalterliche Bronze-Grapen aus Lübeck, *Der Wagen. Ein lübeckisches Jahrbuch*, 164–171.
- Drescher H. 1968b Mittelalterliche Dreibeintöpfe aus Bronze. Bericht über die Bestandsaufnahme und Versuch einer chronologischen Ordnung, *Rotterdam Papers. A Contribution to Medieval Archaeology* 1, 23–33.
- Drescher H. 1969 Mittelalterliche Dreibeintöpfe aus Bronze. Bericht über die Bestandsaufnahme und Versuch einer chronologischen Ordnung, *Neue Ausgrabungen und Forschungen in Niedersachsen* 4, 287–315.
- Drescher H. [1982] Zu den bronzenen Grapen des 12.–16. Jahrhunderts aus Nordwestdeutschland, (in:) J. Wittstock (ed.), *Aus dem Alltag der mittelalterlichen Stadt. Handbuch zur Sonderausstellung vom 5. Dezember 1982 bis 24. April 1983 in Bremer Landesmuseum für Kunst- und Kulturgeschichte (Focke-Museum)*. Hefte des Focke Museums 62, Bremen, 157–174.
- Drescher H. 2017 Eine Grapengießerwerkstatt des 13. Jahrhunderts in Lübeck, Breite Straße 26, und Vergleichsmaterial aus Rostock, Magdeburg, Odense, Visby und Uppsala, (in:) H. Drescher, U. Drenkhahn, *Studien zum Bronzeguss und zur Keramik im mittelalterlichen Lübeck*. Lübecker Schriften zu Archäologie und Kulturgeschichte 31, Lübeck, 9–172.
- Dziekoński T. 1963 *Metallurgia miedzi, ołowiu i srebra w Europie Środkowej od XV do końca XVIII w.*, Wrocław–Warszawa–Kraków.
- Engeström R. 1974 Medeltida bronsgjuteri på Gotland en nyupptäckt verkstad i kv. Priorn i Visby, *Gotländskt Arkiv* 46, 51–65.

- Frankowska-Makała M. 2004a Srebrne ozdoby ze skarbu z Podzamcza w Szczecinie, (in:) S. Groblica (ed.), *Odra – przeszkoda czy pomost w ekspansji kulturowej? II Polsko-Niemieckie Spotkania Archeologiczne. Materiały z konferencji w Dychowie 29 kwietnia – 1 maja 2004 r.* Biblioteka Archeologii Środkowego Nadodrza 2, Zielona Góra, 317–331.
- Frankowska-Makała M. 2004b Średniowieczne srebrne ozdoby w skarbie ze szczecińskiego Podzamcza, (in:) M. Glińska, R. Makała (eds), *Terra transoderana. Sztuka Pomorza Nadodrzańskiego i dawnej Nowej Marchii w średniowieczu. Materiały z Seminarium Naukowego poświęconego jubileuszowi 50-lecia pracy w muzealnictwie szczecińskim Zofii Krzymuskiej-Fafius, 7–8 czerwca 2002*, Szczecin, 203–215.
- Frankowska-Makała M. 2006 Do kogo mogły należeć srebrne ozdoby ze szczecińskiego skarbu?, (in:) E. Cnotliwy, A. Janowski, K. Kowalski, S. Słowiński (eds), *Nie tylko archeologia. Księga poświęcona pamięci Eugeniusza „Gwidona” Wilgockiego*, Szczecin, 271–278.
- Fries H. 2012 Güstrow, Lkr. Güstrow, Fpl. 405, *Bodendenkmalpflege in Mecklenburg-Vorpommern* 59 (2011), 444–446.
- Fries H. 2014 Made in Güstrow. Eine mittelalterliche Produktionsstätte für Metallguss entdeckt, *Archäologische Berichte aus Mecklenburg-Vorpommern* 21, 107–117.
- Gan P. 2016 Charakterystyka materiałoznawcza wybranych zabytków metalowych, (in:) M. Majewski (ed.), *Archeologia Stargardu. Badania na obszarze dawnego kościoła augustiańskiego*. Archeologia Stargardu 2 (2), Stargard, 357–363.
- Gan P. 2017 Charakterystyka materiałoznawcza wybranych zabytków metalowych, (in:) M. Majewski, K. Stań (eds), *Archeologia Stargardu. Badania na Rynku Staromiejskim*. Archeologia Stargardu 3, Stargard, 159–164.
- Gaziński R. 1993 Wojna Szczecina ze Stargardem o handel morski (1454–1464), *Materiały Zachodniopomorskie* 49, 173–192.
- Gläser M., Mührenberg D. 1998 „Moderner“ Grapenguß um 1200 in der Lübecker Breiten Straße, *Hammaburg* (NF) 12, 225–231.
- Hasse M. 1981 Neues Hausgerät, neue Häuser, neue Kleider. Eine Betrachtung der städtischen Kultur im 13. und 14. Jahrhundert sowie ein Katalog der metallenen Hausgeräte, *Zeitschrift für Archäologie des Mittelalters* 7 (1979), 7–83.
- Hoche T., Fries H. 2004 Anklam, Lkr. Ostvorpommern, Fpl. 217, *Bodendenkmalpflege in Mecklenburg-Vorpommern* 51 (2003), 578.
- Hoffmann V. 2006 Pasewalk, Lkr. Uecker-Randow, Fpl. 200, *Bodendenkmalpflege in Mecklenburg-Vorpommern* 53 (2005), 444.
- Irsigler F. 1979 Hansischer Kupferhandel im 15. und in der ersten Hälfte des 16. Jahrhunderts, *Hansische Geschichtsblätter* 97, 15–35.
- Kaute P. 2006 Neubrandenburg, Stadt, Fpl. 233, *Bodendenkmalpflege in Mecklenburg-Vorpommern* 53 (2005), 439–440.
- Kaute P., Manske M. 2017 Greifswald, Hansestadt, Lkr. Vorpommern-Greifswald, Fpl. 197, *Bodendenkmalpflege in Mecklenburg-Vorpommern* 63 (2015), 370–373.
- Kaute P., Schäfer H. 2000 Archäologische Untersuchungen in Stralsund. Lobshagen, *Archäologische Berichte aus Mecklenburg-Vorpommern* 7, 192–204.
- Kehn W. 1968 *Der Handel im Oderraum im 13. und 14. Jahrhundert*, Köln–Graz.
- Keller C. 2015 Das Bonner Rheinufer im hohen Mittelalter. Zum Siedlungsumfeld des Münzschatzes von 1302. Mit einem Beitrag von Manfred van Rey, (in:) Numismatische Gesellschaft Bonner Münzfreunde, *Die Turnosgroschen aus dem Münzschatz vom Boeselagerhof Bonn*. Bonner Numismatische Studien 2, Bonn, 25–78.
- König S. 2002 Untersuchungen zur Gusstechnik mittelalterlicher und neuzeitlicher Glocken aufgrund archäologischer Befunde in Europa, (in:) R. Röber (ed.), *Mittelalterliche Öfen und Feuerungsanlagen. Beiträge des 3. Kolloquiums des Arbeitskreises zur archäologischen Erforschung des mittelalterlichen Handwerks*, Stuttgart, 143–163.
- Konze M., Rütz T. 2008a Ribnitz, Lkr. Nordvorpommern, Fpl. 100, *Bodendenkmalpflege in Mecklenburg-Vorpommern* 55 (2007), 353–357.
- Konze M., Rütz T. 2008b Was nach dem großen Brand übrig blieb. Schmelzöfen, Kapellen und das Rathaus. Ergebnisse der Grabung auf dem Markt und Kirchplatz von Ribnitz, *Archäologische Berichte aus Mecklenburg-Vorpommern* 15, 141–164.
- Kosegarten J.G.L. 1856–1857 Sieben und zwanzigster Jahresbericht, *Baltische Studien* 16, 1–94.
- Krabath S. 2002 Die mittelalterlichen Bundmetallschmelzöfen in Europa. Vergleichende Studien aufgrund archäologischer, schriftlicher und ikonographischer Quellen, (in:) R. Röber (ed.), *Mittelalterliche Öfen und Feuerungsanlagen. Beiträge des 3. Kolloquiums des Arbeitskreises zur archäologischen Erforschung des mittelalterlichen Handwerks*, Stuttgart, 115–142.
- Lemcke H. 1906 *Die Bau- und Kunstdenkmäler des Regierungsbezirks Stettin 7: Der Kreis Pyritz*, Stettin.

- Lesiński H. 1975 Rozwój portu na tle stosunków handlowych Szczecina od XIII do początku XX wieku, (in:) B. Dziedziul (ed.), *Port szczeciński. Dzieje i rozwój do 1970 roku*, Warszawa–Poznań, 11–49.
- Majewski M. (ed.) 2003 *Ludwisarstwo stargardzkie i pomorskie XIV–XVII wieku. W 350. rocznicę odlania ostatniego dzwonu w Stargardzie. Katalog wystawy*, Stargard.
- Majewski M. 2005 *Ludwisarstwo stargardzkie XV–XVII wieku*, Stargard.
- Majewski M. 2006 Późnośredniowieczne odlewnictwo brązowe na Pomorzu w świetle źródeł historycznych i archeologicznych. Wstęp do badań, (in:) E. Cnotliwy, A. Janowski, K. Kowalski, S. Słowiński (eds), *Nie tylko archeologia. Księga poświęcona pamięci Eugeniusza „Gwidona” Wilgockiego*, Szczecin, 279–292.
- Majewski M. 2011 Prace ludwisarza trzebiatowskiego Jürgen Tetzlaffa i nieznanego wyrób konwisarza trzebiatowskiego, (in:) J. Kochanowska (ed.), *Trzebiatów. Spotkania pomorskie 2010*, Trzebiatów, 121–129.
- Majewski M. 2013 Późnośredniowieczny warsztat ludwisarski odkryty na kwartale IX w Stargardzie, (in:) H. Paner, M. Fudziński (eds), *XVII Sesja Pomorzoznawca 2: Od późnego średniowiecza do czasów nowożytnych*, Gdańsk, 45–69.
- Majewski M., Stań K., Szeremeta M., Wojciechowska I. 2016 Suchań, gm. loco, pow. stargardzki, ul. Boczna 7, *Stargardia* 10 (2015), 500–501.
- Mangelsdorf G. 1990 Töpfer und Töpferhandwerk an der mecklenburgisch-vorpommerschen Ostseeküste im Spiegel historischer und archäologischer Quellen des späten Mittelalters, *Zeitschrift für Archäologie* 24, 269–277.
- Metzen F., Schirren C. M. 2014 Kessel, Töpfe und Grapen. Ergebnisse der archäologischen Begleitung von Sanierungsarbeiten an der Swinow bei Gützkow, Lkr. Vorpommern-Greifswald, *Archäologische Berichte aus Mecklenburg-Vorpommern* 21, 81–90.
- Molenda D. 1989 Eksploatacja rud miedzi i handel miedzią w Polsce w późnym średniowieczu i w początkach nowożytności (do 1795 r.), *Przegląd Historyczny* 80 (4), 801–814.
- Mulso R. 2000a Archäologische Belege zum mittelalterlichen Handwerk in Rostock, (in:) U. Müller (ed.), *Handwerk-Stadt-Hanse. Ergebnisse der Archäologie zum mittelalterlichen Handwerk im südlichen Ostseeraum, Greifswalder Mitteilungen*. Beiträge zur Ur- und Frühgeschichte und Mittelalterarchäologie 4, Frankfurt am Main, 191–219.
- Mulso R. 2000b Ein abgebranntes Holzhaus des 13. Jahrhunderts mit Nachweisen handwerklicher Tätigkeit von der Rostocker Sackpfeife, *Archäologische Berichte aus Mecklenburg-Vorpommern* 7, 248–258.
- Mulso R. 2006 Archäologische Nachweise zum mittelalterlichen Handwerk in Rostock, (in:) M. Gläser (ed.), *Lübecker Kolloquium zur Stadtarchäologie im Hanseraum 5: Das Handwerk*, Lübeck, 285–302.
- Mührenberg D. 2000 Mittelalterliche Handwerk in Lübeck im Spiegel archäologischer Funde und Befunde, (in:) U. Müller (ed.), *Handwerk-Stadt-Hanse. Ergebnisse der Archäologie zum mittelalterlichen Handwerk im südlichen Ostseeraum, Greifswalder Mitteilungen*. Beiträge zur Ur- und Frühgeschichte und Mittelalterarchäologie 4, Frankfurt am Main, 221–237.
- Poettgen J. 2010 *Handbuch der deutschen Glockengießer und ihrer Werkstätten bis zum Jahre 1900 in den ehemaligen deutschen Ostprovinzen Pommern, Ost- und Westpreußen und Schlesien mit Berücksichtigung der im westlichen Deutschland vorhandenen Leihglocken unter Verwendung des von Hans Georg Eichler (†) verfaßten Handbuchs der Stück- und Glockengießer im mittleren und östlichen Deutschland*, Greifenstein.
- Popp A. 2010 Anklam, Lkr. Ostvorpommern, Fpl. 232, *Bodendenkmalpflege in Mecklenburg-Vorpommern* 57 (2009), 483–484.
- Poppa C.I. 2010 Vasul medieval de bronz (Grapen) de la Săulești, *Terra Sebus. Acta Musei Sabasiensis* 2, 235–242.
- Rasmussen K.L., Skytte L., Jensen A.J., Boldsen J.L. 2015 Comparison of Mercury and Lead Levels in the Bones of Rural and Urban Populations in Southern Denmark and Northern Germany During the Middle Ages, *Journal of Archaeological Science. Reports* 3, 358–370.
- Redlin [U.] 1896 *Beiträge zur Geschichte der Marienkirche in Stargard* 2, Stargard (Pommern).
- Rennwanz J. 2017 Wyniki analizy archeobotanicznej, (in:) M. Majewski, K. Stań (eds), *Archeologia Stargardu. Badania na Rynku Staromiejskim*. Archeologia Stargardu 3, Stargard, 223–233.
- Ros J. 2012 *Kulturlager i Västerås och ett gjuveri från 1300-talet. Ombyggnad av Domkyrkoesplanaden och angränsande gator. Arkeologisk förundersökning*. Stiftelsen Kulturmiljövård Rapport 28, Västerås.
- Russow E. 2018 Tükike keskaegset linnakultuuri Lihula külje alt, *Läänemaa Muuseumi Toimetised* 21, 77–91.
- Rütz T. 2002 Die archäologischen Untersuchungen auf dem Gelände des ehemaligen Heilig-Geist-Hospitals in Greifswald (1989–1997), (in:) G. Mangelsdorf (ed.), *Aus der Frühgeschichte des südwestlichen Ostseegebietes*. Greifswalder Mitteilungen. Beiträge zur Ur- und Frühgeschichtliche und Mittelalterarchäologie 5, Frankfurt am Main, 57–179.

- Rütz T. 2005 Grapen, Glocken, Kupferkessel. Bunt- und Edelmetallhandwerk im Spiegel archäologischer Befund, (in:) H. Jöns, F. Lüth, H. Schäfer (eds), *Archäologie unter Straßenpflaster. 15 Jahre Stadtkernarchäologie in Mecklenburg-Vorpommern*. Beiträge zur Ur- und Frühgeschichte Mecklenburg-Vorpommerns 39, Schwerin, 295–300.
- Samariter R. 2000 Hansestadt Stralsund, Mühlenstraße 22. Mittelalter und Neuzeit, *Archäologische Berichte aus Mecklenburg-Vorpommern* 7, 240–248.
- Samariter R. 2005 Stralsund, Hansestadt. Fpl. 93, *Bodendenkmalpflege in Mecklenburg-Vorpommern* 52 (2004), 716–717.
- Schäfer H. 1995 Eine Greifswalder Grapengießwerkstatt des 14. Jahrhunderts in der Brüggstraße 25a, *Bodendenkmalpflege in Mecklenburg-Vorpommern* 42 (1994), 151–169.
- Schäfer H. 1996 Untersuchungen auf dem Kirchgrundstück Domstraße 53 in Greifswald, *Bodendenkmalpflege in Mecklenburg-Vorpommern* 43 (1995), 135–158.
- Schäfer H. 1999 Nonnendorf, Lkr. Ostpommern, Fpl. 25, *Bodendenkmalpflege in Mecklenburg-Vorpommern* 46 (1998), 655.
- Schäfer H. 2000a Stralsund, Hansestadt, Fpl. 63, *Bodendenkmalpflege in Mecklenburg-Vorpommern* 47 (1999), 527.
- Schäfer H. 2000b Archäologische Quellen zum mittelalterlichen Handwerk in den Städten Mecklenburg-Vorpommerns, (in:) U. Müller (ed.), *Handwerk-Stadt-Hanse. Ergebnisse der Archäologie zum mittelalterlichen Handwerk im südlichen Ostseeraum, Greifswalder Mitteilungen*. Beiträge zur Ur- und Frühgeschichte und Mittelalterarchäologie 4, Frankfurt am Main, 53–80.
- Schäfer H., Schäfer C. 1994 Die St. Katharinenkirche zu Rostock. Erste Ausgrabungsergebnisse unter besonderer Berücksichtigung der Baulandgewinnungsschichten von 1234 bzw. kurz danach, *Bodendenkmalpflege in Mecklenburg-Vorpommern* 41 (1993), 141–169.
- Schulze I. 2006 *Ritzungen von Laienhand – Zeichnungen mittelalterlicher Bildhauer und Maler? Figürliche Glockenritzzeichnungen vom späten 13. Jahrhundert bis zur Zeit um 1500 in Mittel- und Norddeutschland*, Leipzig.
- Sil B., Burdziej M. 2015 Stargard, ul. Marii Skłodowskiej-Curie, Gdańska i Światopelka, obszar dawnej kaplicy i cmentarza św. Jakuba, stan. 11a (AZP 32-10/167), *Stargardia* 9 (2014), 394.
- Skyllberg E., Anund J. 2003 I feodala och urbana kontexter; metallhanteringen ca. 1000–1600 e. Kr., (in:) L. Berg, H. Forshell, A. Söderberg (eds), *I gruva och grav. Metallhantering från bronsålder till nyare tid*, Stockholm, 17–29.
- Słowiński S., Wilgocki E. 2004 Przyczynek do poznania obrotu pieniężnego miast zachodniopomorskich w średniowieczu. Monety ze skarbu z Podzamcza w Szczecinie, (in:) S. Groblica (ed.), *Odra – przeszkoda czy pomost w ekspansji kulturowej? II Polsko-Niemieckie Spotkania Archeologiczne. Materiały z konferencji w Dychowie 29 kwietnia – 1 maja 2004 r.* Biblioteka Archeologii Środkowego Nadodrza 2, Zielona Góra, 305–316.
- Stań K. 2016 Stargard, Stare Miasto, ul. Szewska, stan. 11 (AZP 32-10/166), *Stargardia* 10 (2015), 488.
- Thomas N., Bourgarit D. 2014 Les techniques de production des batteurs et fondeurs masans au Moyen Age (XII^e–XVI^e siècles), (in:) N. Thomas, I. Leroy, J. Plumier (eds), *L'or des dinandiers. Fondeurs et batteurs masans au Moyen Age*. Cathiers de la MPMM 7, Bouvignes-Dinant, 43–63.
- Tureczek M. 2011 *Leihglocken. Dzwony z obszaru Polski w granicach po 1945 roku przechowywane na terenie Niemiec*, Warszawa.
- Tureczek M. 2015 *Campanae, quae in confinio sonant. Studium z dziejów ludwisarstwa na pograniczu śląsko-brandenbursko-pomorskim w XIII–XVIII wieku*, Zielona Góra.
- Vellev J. 1988 *Et middelalderligt bronzestøberi i Odense – og noget om middelalderens klokker og gryder*, Moesgård.
- Vellev J. 1998 Eine mittelalterliche Bronzegießwerkstatt in Odense – und etwas über Glocken und Grapen des Mittelalters, *Hammaburg* (NF) 12, 195–224.
- van Vilsteren V.T. 1998 Voor hutspot en de duivel; over de betekenis der ‘zoogenaamde Spaansche legerpotten’, *Nieuwe Drentse Volksalmanak* 115, 42–70.
- van Vilsteren V.T. 2000a ‘Die potten in deze ruwe veenen’. Aanvullende vondsten van zgn. Spaansche legerpotten, *Nieuwe Drentse Volksalmanak* 117, 61–79.
- van Vilsteren V.T. 2000b Hidden, and Not Intended to Be Recovered. An Alternative Approach to Hoards of Mediaeval Coins, *Jaarboek voor Munt- en Penningkunde* 87, 51–63.
- van Vilsteren V.T., Jöns H. 2013 Der Verstecken begreifen – von Schatz-, Verwahr- und Opferfunden / Begraben begreifen – over schatvondsten, deposities en offers, (in:) J.F. Kegler (ed.), *Land der Entdeckungen. Die Archäologie des friesischen Küstenraums / Land van ontdekkingen. De archeologie van het Friese kustgebied*, Aurich, 397–407.

- van Vilsteren V., van Os B., Pappot A. 2019 Twee broertjes van brons. Over laatmiddeleeuwse potjes uit Donderen en Neuss, *Nieuwe Drentse Volksalmanak. Jaarboek voor geschiedenis en archeologie* 136, 201–212.
- Wachowiak B. 1981 W zjednoczonym księstwie pomorskim (1478–1648), (in:) S. Gierszewski (ed.), *Historia Słupska*, Poznań, 113–183.
- Wehrmann M. 1899 Geschichte des Jageteufelschen Collegiums in Stettin. 1399–1899, *Baltische Studien* (NF) 3, 1–64.
- Wehrmann M. 1901 Aus Inventarien pommerscher Amtshäuser und Schlösser (um 1500), *Zeitschrift für Kulturgeschichte* 8, 281–286.
- Werner O. 1977 Analysen mittelalterlicher Bronzen und Messinge, *Archäologie und Naturwissenschaften* 1, 144–220.
- Wiechmann R. [1999] Glockengiesser in Hamburg, (in:) D. Zbikowski, V. Plagemann (eds), *Die Kunst des Mittelalters in Hamburg. Aufsätze zur Kulturgeschichte*, Hamburg, 167–176.
- Wojciechowska I., Szeremeta M. 2020 *Do szewskiej pasji doprowadzeni. Stargardzki kwartał XXVIII w świetle badań archeologicznych*. Badania archeologiczne Muzeum Archeologiczno-Historycznego w Stargardzie, Stargard.
- Wywrot-Wyszowska B. 2019a Die Wiederverwertung von Rohstoffen und die Verwaltung von Produktionsabfällen in spätmittelalterlichen Ostseestädten im Spiegel archäologischer Quellen. Einige Bemerkungen am Beispiel Ausgewählter Gewerbe, *Fasciculi Archaeologiae Historicae* 32, 101–115.
- Wywrot-Wyszowska B. 2019b *Rzemiosło w późnośredniowiecznych miastach południowego pobrzeża Bałtyku. Studium archeologiczne*, Szczecin.
- Zerpe L. 2006 Trades of Craft in Medieval Visby, (in:) M. Gläser (ed.), *Lübecker Kolloquium zur Stadtarchäologie im Hanseraum 5: Das Handwerk*, Lübeck, 567–581.
- Zins H. 1967 *Anglia a Bałtyk w drugiej połowie XVI wieku. Bałtycki handel kupców angielskich z Polską w epoce elżbietańskiej i Kompania Wschodnia*, Wrocław–Warszawa–Kraków.
- Zuwachs der Sammlungen. 1894 *Monatsblätter der Gesellschaft für Pommersche Geschichte und Alterthumskunde* 8, 127–128.