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Medieval and early modern glass in the Moravian-Silesian borderlands : summary

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Medieval and early modern glass in the Moravian-Silesian borderlands

Introduction and objectives of the work

The main aim of the paper is to provide a comprehensive overview of medieval and early modern glass in the Moravian-Silesian borderlands in the context of the surrounding regions, i.e. today's Polish part of Silesia, Moravia and Bohemia, as well as to place it in the broader context of contemporary development in Europe. The published work is focused on the presentation of glass products and their transformation over the course of almost five centuries – from the 13th to the first half of the 17th century. Not only hollow glass is presented here, but also window glass and small glass objects such as mosaic tesserae and glass rings. A specific group are children's toys made of glass, especially marbles, but also miniature glass vessels, which are only sporadically found in medieval contexts. Each of these glass groups brings with it its own questions and methodological problems that must be taken into account during the research analysis.

However, we cannot be satisfied only with the typological and chronological characteristics of the glass assemblages and neglect their remaining information potential. Attention is therefore primarily focused on the evaluation of archaeological material in relation to trade connections and contacts, for which scientific analyses are also used, but also to the social context of the finding environment.

The geographical area of interest of the work is the Moravian-Silesian border, i.e. the territory including the so-called Czech Silesia with Moravian enclaves and the northern part of the historical territory of Moravia. This area largely overlaps with the current Moravian-Silesian Region. More attention is paid to the territory of the town of Opava and its surroundings, as most of the glass assemblages come from

archaeological excavations of the historical centre of Opava.

The foundation stone of the study was medieval and early modern glass from 18 sites (from almost 50 findspots) obtained mainly during archaeological excavations or surface prospecting over the past 60 years. In addition to glass sets from Czech Silesia, the work also includes several assemblages of finds from sites that are located in the north of the historical territory of Moravia (e.g. Rýmařov, Sovinec, Janovice). The reason for the inclusion of these collections is their good information value and contribution to the interpretation of the overall situation in the Moravian-Silesian borderlands. Most of the assemblages were analysed for the first time, but already published collections were also included in the evaluation. The newly analysed assemblages have contributed to a significant expansion of sources, not only by a quantitative increase in the already evidenced forms of hollow glass, but also by identifying several types of vessels hitherto unknown in the Moravian-Silesian borderlands. The evaluation of the material was complicated by the different methodology and quality of the documentation of archaeological excavations, which is often related to the absence of dating supports.

Typological and chronological evaluation of glass

The material was divided into four chronological horizons based on the circumstances of finding. The first two periods (13th century – 1st half of the 14th century, 2nd half of the 14th century – 1st half of the 15th century) are represented by purely medieval forms. In the third period, Gothic and Renaissance glass

forms occur side by side (2nd half of the 15th century – 1st half of the 16th century) and the fourth period already represents glass in the fully developed Renaissance style (2nd half of the 16th century – 1st half of the 17th century). The glass objects were dated using the stratigraphic context of archaeological features, the age of individual deposits based on the accompanying material, or the method of absolute dating. Increased attention was paid to assemblages with sufficient dating supports based on well-documented archaeological contexts. About 20 assemblages had such characteristics.

For each of the above-mentioned periods, well-arranged typological tables have been drawn up. The original intention to refine the chronology of medieval and early modern glass and to divide it into periods defined by natural historical or social milestones had to be abandoned. This is due to the absence of dates for a large part of the contexts or the complete absence of information about the circumstances of finding. For the basic typological and chronological evaluation of medieval glass, the typology according to Hedvika Sedláčková was used, for Renaissance glass an own typology was created with regard to the possibilities of the source material.

Changes in the assortment of glassware and the glass trade based on the testimony of archaeological sources

Trade and the associated activities of the nobility, burghers and church dignitaries played an important role in the social and economic development of Silesian towns in the Middle Ages and the early modern period. Wrocław, which was located at the crossroads of the Kłodzko Road and the road from Vienna to Gdańsk, was an important trade centre of Silesia, just as Świdnica, Legnica, Nysa and Racibórz.

From the very beginnings of the town, the inhabitants of Opava were also involved in trading activities (Müller – Žáček 2006, 54–56). Opava benefited from its position on the Moravian-Silesian border, which led to its rapid development in the first two centuries after the founding of the town. Some merchants and prominent Opava residents turned to Wrocław and tried to establish themselves there, which would open up the possibility of trade with Northern and Western Europe. The paths of the Opava burghers, who wanted to make a name for themselves, also led to other important towns, such as Nysa and Kraków. In the 14th and 15th centuries, the inhabitants of Opava traded in

salt and lead in addition to precious fabrics, and exported Moravian, Austrian and Hungarian wine to the east. Other luxurious commodities, including oriental spices, exotic crops, fabrics, but also lead and copper, are listed in a decree issued by the Opava City Council in 1434 (Müller – Žáček *et al.* 2006, 121–122). The tightening of trade regulations in Opava and other towns in the 1420s and 1430s is a reflection of economic problems.

In the 15th century, long-distance trade also underwent transformation, which reflected the changes in the importance of trade routes and transported goods. The intensified pressure of the Kraków burghers for a dominant position in trade with the Orient resulted in the transfer of trade routes, when a large part of the merchants began to use the northern route to Wrocław via Lublin, Warsaw and Poznań, which was too distant for the inhabitants of Opava. In addition, the chances of Opava merchants to succeed in Silesia in the competitive environment of the stronger Wrocław and Świdnica merchants were decreasing, which is why at least some of them tried to shift their activities to Kraków.

The beginning of the 1470s was marked by disputes between the kings of Hungary and Bohemia and fights for the Bohemian throne, which also affected the economic situation of Silesian towns. The situation calmed down slightly in 1474 after the victory over the Bohemian-Polish troops, after which Matthias Corvinus introduced a number of reforms in Silesia (Radek 2015, 211). In the convention of King Matthias and Vladislaus Jagiellon from 1474, it was agreed, among other things, that trade routes from Silesia to Hungary should be safe for merchants. The fact that the situation was not ideal is evidenced by the complaint of Nuremberg merchants who were robbed in the vicinity of Bautzen and asked for protection on their way to Silesia (Radek 2015, 215). The positive impact of Matthias's actions in Silesia was the restoration of contacts with Venice through the Kingdom of Hungary. The rise of the Jagiellonian dynasty further strengthened Hungary's trade contacts with the lands of the Bohemian, Polish and Lithuanian Crowns (Kozák 2012, 166–167). At the beginning of the 16th century, in addition to traditional commodities such as wine and salt, Opava also traded in cattle, and the importance of Opava cloth-makers also increased.

In the period before and after the Battle of White Mountain, Opava counted among relatively large towns, which is also confirmed by the estimate of the property of estates and towns in Silesia from 1636 (Matějka 1967, 53). Written reports from the

beginning of the 2nd half of the 16th century show Opava as a town with developed textile production intended for export. An important role was played by brewing, which was also one of the export crafts. The advantageous geographical location between Moravia and Silesia made Opava an important trade hub and market centre. There were three types of markets in Opava: a narrowly local, permanent regional and international market (*Matějek 1967, 68*). However, the largest part of crafts operated at the level of the regional market. One of the commodities involved in the regional and international market was glass products.

Determining the origin of glass products is essential for understanding the glass trade and the commercial and cultural contacts in general. An important role is played by analyses of the elemental composition of glass, which, together with typological analysis, provide a valuable tool for determining the provenance of vessels. However, due to the high level of mobility of some members of medieval and early modern society, we must keep in mind that not all objects of foreign provenance had to reach the Moravian-Silesian borderlands as a result of trade activities. Some of the vessels could have been brought by the Opava burghers as a souvenir from their travels or pilgrimages.

The glass objects presented in this paper can be divided into two basic groups based on their origin, namely glass of domestic origin (Silesian, Moravian or Bohemian) and glass imported from other countries. In the period under review, from the 13th century to the mid-17th century, the proportional representation of these groups changed significantly (Graph 4). While in the 13th to the middle of the 14th century imported glass products predominated, in the second half of the 14th and in the 15th century, on the contrary, Silesian and Bohemian glass was exported beyond the borders of the Lands of the Bohemian Crown. In the Renaissance, the transfer of ideas, technologies and designs prevailed over the transport of goods. However, this does not mean that in Czech Silesia, there are no documented glass products of foreign provenance during the Renaissance and, conversely, that in the case of Gothic glass we lack adaptations of foreign models in the domestic environment. The essence is that in the case of Renaissance glass, as far as morphology is concerned, the regional differences in glass production are erased. Under the influence of Venetian glassmaking, the same glass forms and decorative techniques were “modern” in a relatively large area of Europe.

13th century – 1st half of the 14th century

At the end of the Early Middle Ages, glass products were mainly represented by small objects, especially rings, finger rings and beads, while hollow glass is almost absent. In the course of the 13th century, we can observe an increase in the number of glass finds in the area of the Moravian-Silesian border in connection with the colonization of the country. Nevertheless, there is relatively little evidence of glass products from this period, but this situation can be largely influenced by the research methods used.

Both hollow and window glass have been documented at several locations in the centre of Opava, in Ostrava and at the castles of Landek near Ostrava and Koberštejn. The finds, mainly of window glass, come from the Church of St. Martin in Bohušov, the Church of St. Benedict in Krnov-Kostelec and from the Dominican monastery in Opava.

The vessels characteristic of this period are beakers with snail-like coiled prunts made of brown and yellow glass and bottles with a tubular body-ring made of violet, brown or colourless glass. Exceptional finds are represented by enamelled beakers, which are evidenced by two specimens in Opava (Fig. 6). The origin of two prunted beakers made of colourless glass can already be dated to the first half of the 14th century. The first of them is a miniature beaker from a farm building in the area of the Dominican monastery (Fig. 7: 13; see *Malíková – Skalická 2016*), which may have been used to drink spirits. Due to its small size, the possibility that it is a toy cannot be ruled out. The second specimen is a soda-ash glass beaker with a tall cylindrical body (Fig. 7: 12; Tab. 5: CI; *Břečková 2017, tab. 1: A1*) from the Masařská Street 6. All of the above-mentioned vessels belong to imports. A bottle or cup (*scheuer*) with an optic decor of fine ribs from the Dominican monastery and probably a bowl with massive ribs made of brown glass, which has analogies in Sicily, are also of foreign provenance.

The 13th century to the first half of the 14th century represents the period with the highest proportional representation of imported glass products, which can be explained by the still nascent regional glass production and the development of long-distance trade contacts during the reign of the Přemyslid dynasty. The Veneto region became a trading area of great significance, where an important glass-making centre was established. The bottles with a tubular body-ring, the ribbed bottle, the prunted beakers and the enamelled beakers, which were a very luxurious item, come from the northern Italian glassworks. Most of the analysed

soda-ash glass vessels were found to have a composition characteristic of Venetian glassworks.

In addition to the products of Venetian glassworks, however, we can in this period already encounter glass of German origin, the occurrence of which may be related to the arrival of colonists in Silesia. These are mainly corroded fragments of vessels made of green, yellow or greenish glass. Links to German glassworks are also evidenced by a rich set of multicoloured stained glass from the Dominican monastery. In addition to these imported glass products, there are also heavily corroded fragments of vessels whose origin in the Czech lands cannot be ruled out. From the contexts of the 13th century, this category mainly includes small fragments of unspecified vessels, fragments of plain beakers and beakers with an optic decor in the form of ribs.

However, a large part of the material consists of corroded fragments of glass vessels, whose original form often cannot be determined due to their poor state of preservation. Among them are also fragments of plain beakers, small or tall beakers with an optic decor of ribs, and probably also bottles. Based on the nature of the corrosion, their origin in domestic, German or generally Central European glassworks cannot be ruled out.

From the 14th century onwards, the occurrence of the first beakers with applied vertical threads and tall pruned beakers – the so-called Bohemian-type beakers, testifies to the development of regional glassmaking. These vessels are mainly evidenced at several locations in Opava, for example in the Masařská Street 6, but it is very likely that some fragments from Ostrava and from Landek Castle can also be dated to this period. The typological spectrum of vessels from the Moravian-Silesian borderlands in this period is similar to the assemblages from Brno, although glass appears in greater numbers in Brno.

A large part of the finds consists of window glass, which in this period is represented mainly by fragments of window panes of various colours, some of which were decorated with paintings. In the Church of St. Martin in Bohušov, more than 100 fragments of medieval window glass were found in the layer from 1476–1486 (Fig. 51: 14–15). The windows of the Church of St. Benedict in Krnov-Kostelec were already glazed in the 13th century as well (*Sedláčková 2009a*, 172–173). Window glass has been used in Opava since the beginning of the development of urban settlement, from the 2nd half of the 13th century.

A unique find is represented by more than 400 pieces of window panes of various colours from the

Church of St. Wenceslas at the Dominican monastery in Opava (see *Vaňurová 2020b*, 141–146). Among the multitude of stained glass, several dozen fragments were found, which apparently went through the heat during one of the fires that affected the monastery. Some of the panes show traces of the original contour painting. Analyses of selected window panes made of amber, slightly greenish, green, violet and emerald green glass decorated with sepia enamel (*schwarzlot*) revealed that the stained glass was made of a pot-ash-lime glass type referred to as *wood-ash glass*. This glass was produced in Germany between 1000 and 1400 (Tab. 4: B1–B5; see *Wedepohl – Simon 2010*). It is therefore probable that the church was already equipped with glass windows during its completion in the first half of the 14th century.

In addition to hollow and window glass in the 13th century, glass rings that were popular in the Early Middle Ages still survive in the Moravian-Silesian borderlands (see *Vaňurová 2019*). A single corroded ring was found at the Dolní náměstí Square in the context of the second half of the 13th century (Fig. 62: 3), while at least 50 rings come from the Dominican monastery (Fig. 61; Fig. 62: 2, 4–6). With one exception, all specimens from Opava can be assigned to type A (according to *Olczak 2000*, 311–322), which represents simple undecorated rings. The rings are imperfectly made, have an irregular circular shape and a small diameter, which precludes their being used as finger rings. Such rings were widespread from the end of the 12th century, but especially in the 13th century.

At the investigated sites in Opava, glass from the period from the 13th century to the beginning of the 14th century, compared to finds from other materials, appears sporadically and in a very fragmentary state of preservation, which leads us to the idea that it was a very rare commodity. However, as it turned out during the analysis of the glass assemblage from the premises of the Dominican monastery in Opava, the number of finds from this period was much higher in the deposits that were floated. Most of the glass fragments from the 13th and 14th centuries are small in size, usually heavily corroded, and therefore they may not have been captured during research. I suppose that at other sites in Opava, more glass fragments from this period would also have been captured if the deposits were floated. Of course, this does not mean that glass was not a luxury trade item in the given period, but only that when interpreting the assemblages, we must keep in mind the limitations resulting from the different research methods used.

2nd half of the 14th century – 1st half of the 15th century

In the second horizon – from the second half of the 14th century to the mid-15th century – there was a significant change in the assortment of table glass in the Moravian-Silesian borderlands and the proportional representation of individual forms. Compared to the previous period, the products of Bohemian glassworks dominate significantly, while imported glass almost disappears. Individual assemblages contain several pieces of vessels and window glass. At the same time, we can see a deepening of differences between Moravia and Czech Silesia, where we observe similar tendencies as in the Polish part of Silesia.

Larger collections are known, for example, from the Masařská Street 6 in Opava, from Mnišská – Mezi Trhy streets, from cesspits 504 and 505 in the Drůbeží trh Street, from the inner courtyard between the Pekařská and Kolářská streets, and from the Kolářská Street. In Ostrava, glass from the 2nd half of the 14th to the middle of the 15th century is evidenced in significantly greater numbers than in the previous period, but in most cases, these are small fragments. The finds from Vartnov Castle and from Rýmařov – Hrádek also fall within this period.

Although historical written reports document the involvement of Silesian merchants in long-distance trade, in the case of glass, these trade contacts are minimal. Imported glass is evidenced sporadically, only by a few soda glass beakers and bottles from Opava and a beaker from yellow binary lead glass found in the Drůbeží trh Street, which may have come from German glassworks (Fig. 14: 11; Tab. 5: A23). There could be several reasons for such a significant decrease in imported glassware, namely the ability of regional glass production to meet the growing demand for glass and the better affordability of domestic glass, as well as the regulation of trade in luxury commodities (Müller – Žáček *et al.* 2006, 121–122).

The dominant form of glass vessels became the Bohemian-type beakers that were part of almost all high and late medieval assemblages, which testifies to the great potential of regional glassworks. On the basis of the assemblages analysed so far and a comparison of the stratigraphy of the cesspits, it has been confirmed that beakers with snail-like coiled prunts are chronologically older than beakers with crescent-shaped to linear prunts (Břečková 2017, 275–276). Along with the simplification of prunts, there are also changes in the proportions of vessels – the height of the plain body part increases and the extent of the decorated

area decreases. In the assemblages from the Moravian-Silesian borderlands, the flute-shaped variant of the Bohemian-type beakers predominates, while the club-shaped beakers are represented only by individual pieces, for example in the Drůbeží trh Street and Masařská Street 6 in Opava. These glass beakers were more widespread in Bohemia and Polish Silesia. The largest collection of Bohemian-type beakers was retrieved from cesspit No. 5 in the Masařská Street 6, where over 90 glass beakers with crescent-shaped or irregularly coiled prunts were found (Fig. 18) and several fragments with applied pincer trails. The height of the beakers usually ranged between 40 and 50 cm, but the tallest specimens reach up to 55 cm (see Břečková 2017, 260–262, 278–279). Due to the use of the cesspit throughout the 15th century and the uniform character of its infill, it is not possible to determine a more precise dating of individual glass beakers. This assemblage can probably be interpreted as rubbish from a medieval tavern or evidence of the activity of a merchant at this site. In addition to the above-mentioned beakers, the assemblage of finds also contained two imported prunted beakers made of colourless and greenish-blue glass (Fig. 21) and a bottle with a tubular body-ring made of colourless soda-ash glass.

In addition to the above-mentioned Bohemian-type beakers, fragments of bottles with a pear-shaped or spherical body can also be considered products of domestic glassworks. An interesting piece of evidence for craft production is the find of waste after the processing of window panes in the Drůbeží trh Street in Opava, which proves the activity of a glazier at the site in the first half of the 15th century. In cesspit No. 505, over 300 fragments of window panes made of slightly greenish glass with manufacturing traces (Fig. 73) and parts of lead frames were recovered from layers 148 and 150, in addition to discs with bent or simple sealed edge (see Vaňurová 2021c, 262–263). These glass panes were made of potash-lime glass and were probably brought to Opava from one of the regional glassworks (Tab. 6: A4).

2nd half of the 15th century – 1st half of the 16th century

In the course of the third horizon, the position of glass was already changing from a luxury item to an article of daily use available to a wider population. The changes in the assortment of glass products responded to an increased demand. In the 2nd half of

the 15th century, Renaissance influences penetrated Moravia and Silesia, which was also reflected in the range of glass products. The Moravian-Silesian borderlands saw again the occurrence of soda-ash table glass imported from Venice, especially bottles with a tubular body-ring and prunted beakers, and newly also potash-lime glass from Hungarian glassworks. In addition, the spectrum of drinking glass newly comprised lower vessels of smaller volume, which were suitable for wine consumption. Wine, both Moravian, Austrian and Hungarian, was one of the commodities traded by Opava merchants. It is therefore possible that the glassware intended for wine consumption spread along with viticulture from these areas. However, the trade with the Kingdom of Hungary was reciprocal – among the goods exported from Opava was lead, for example.

Glass from German glassworks was also imported to the Moravian-Silesian borderlands, as evidenced by the finds of prunted beakers called *Krautstrünke* (“cabbage-stalk beakers”) and *Stangengläser* (“pole glasses”), bottles and slightly conical beakers. Conversely, glass from Silesian glassworks was exported to Poland through Wrocław and other large towns. The advantage of Silesian glass, compared to glass from England, Germany, Venice, the Netherlands and other more distant regions, was its lower price. Local glassmakers probably drew inspiration from the German environment in the production of funnel-shaped beakers on a base made of a spiral-coiled glass trail, which heralded the advent of glass in the Renaissance style.

Compared to the assemblages from Moravia, where in the first half of the 16th century we observe a hiatus in the continuity of the use of glass products, in the assemblages from the Moravian-Silesian borderlands, such a significant decrease was not recorded. Several assemblages from Opava, but also from Krnov, Rýmařov, Cvilín near Krnov and Sovinec can be dated to the 1st half of the 16th century. A representative collection for this period is the finds from cesspit No. 500 in the Drůbeží trh Street, where “Gothic” and “Renaissance” elements intertwine in the decoration and morphology of glass vessels.

The Bohemian-type beakers still dominate among glassware. However, there are no longer beakers decorated with carefully coiled prunts, the production of which could have taken two glassmakers several hours, but only beakers with simpler crescent-shaped to linear prunts. Some of the beakers with crescent-shaped to linear prunts or with applied diagonal pincer trails, which were found in cesspit No. 5 in

the Masařská Street, can be dated to the 2nd half of the 15th century at the earliest. In other assemblages from Opava, for example in cesspit No. 504 in the Drůbeží trh Street and cesspit No. 512 in the inner courtyard between the Pekařská and Kolářská streets, both of these decorative styles also appear together on beakers. Sporadically, another new decoration in the form of garlands or zigzags is applied to glass beakers. An almost complete Late Gothic beaker with this decoration has been preserved in the Kolářská Street (Fig. 22: 3) and fragments of another beaker come from the Cvilín Castle near Krnov.

Due to the significant dominance of Bohemian-type beakers, this type of medieval glass was examined in more detail both from the typological and morphological point of view and from the point of view of the elemental composition of the glass. Earlier conclusions were confirmed that the beakers decorated with carefully coiled prunts already appear in older contexts from the 14th century, while beakers with simpler crescent-shaped prunts are chronologically younger. As expected, all Bohemian-type beakers were made of potash-lime glass, but based on the CaO/K₂O ratio, it was possible to distinguish three groups (Graph 12–13). The first group, with a CaO content above 15 wt.% and K₂O above 20 wt.%, includes beakers with coiled prunts, beakers with crescent-shaped to slightly coiled prunts and one beaker decorated with applied pincer trails. The second group, characterized by a lower proportion of alkaline components (13–16 wt.% CaO, 17.7–20.5 wt.% K₂O), consists of beakers with crescent-shaped to small linear prunts. The third group consists of only two beakers from the Masařská Street 6, which were already made of glass according to a Renaissance recipe, in the first half of the 16th century at the earliest (Tab. 7: A20, A43). It is a tall beaker with crescent-shaped prunts and a beaker decorated with horizontal bands bordered by plain trails and filled with linear prunts, which counts among rare finds. These beakers provide reliable evidence for the long survival of this traditional type of drinking glass.

These three groups of Bohemian-type beakers were easily identifiable even when comparing the Al₂O₃ content, the different values of which point to different sources of glass sand. According to D. Rohanová, who compared the composition of potash-lime glass vessels from Brno, Olomouc, Opava, České Budějovice, Chrudim and Jihlava (*Sedláčková ed. 2018*, diagrams 4 and 5), the differences in the chemical composition of glass from these locations point to different sources. Even within medieval Opava, it has now been possible

to identify several different sources from which the Bohemian-type beakers were imported to the town in the Middle Ages. However, the evaluation is complicated by the long period of time (14th century to the beginning of the 16th century) from which the analysed beakers originate. Based on the results of the analyses, it is not possible to distinguish to what extent the different composition of the glass reflects the origin in different glassworks and the changes in the composition of the glass batch within the horizon of almost two centuries.

In addition to the Bohemian-type beakers and undecorated vessels, vessels with optic decor are also spreading, because their time-saving production enabled to make large quantities of them. A specific group of glass products from the 1st half of the 16th century is represented by Olomouc-type beakers with a lobed base and a body usually decorated with an optic decor of ribs. These beakers were widespread mainly in Olomouc and its surroundings, while in the area of the Moravian-Silesian borderlands they are among the unique finds. They were found only at Hrádek in Rýmařov (*Karel 1993*, tab. 2: 1; *Sedláčková 2000*, 183) and in the Sklené glassworks in the Šumperk region (*Himmelová 1994b*; *Merta 1994*). Optic decor was identified, for example, on a bottle from the inner courtyard between the Mnišská – Mezi Trhy streets, on a pilgrim flask from the Church of the Holy Spirit and on several table bottles, a jug or ewer and a pilgrim flask from cesspit No. 500 in the Drůbeží trh Street in Opava.

In archaeological contexts within the area of interest, jugs, ewers and pilgrim flasks did not begin to appear more frequently until the 2nd half of the 15th century. During this period, we first encounter vessels referred to as flytraps. The new forms also include kuttrolfs and goblets of various variants. In the Moravian-Silesian borderlands, several unique goblets from the end of the 15th century to the first half of the 16th century have been found, which differ in design, production technology and origin. A unique Venetian goblet, made of only two parts – a bowl and a foot, was found at Sovinec Castle (Fig. 19: 15; *Vaňurová 2020a*, 199–202). On the basis of analogies, it can be dated to the interval from the turn of the 15th and 16th centuries to the first third of the 16th century, i.e. to the time when the castle was held by the Pňovský family of Sovinec, whose representatives ranked among the political elite. A number of complete goblets of this type have been preserved in museum collections around the world. New in this period are goblets made of potash glass. A goblet found in cesspit No. 1 at the

Horní náměstí Square in Opava, made from a single glass bubble, probably comes from the first half of the 16th century (Fig. 19: 14). A ribbed beaker/goblet from the Kolářská Street (*Sedláčková 2004b*, 238, cat. no. 104, obr. 8) and fragments of a goblet from Cvilín Castle near Krnov (*Sedláčková 2004a*, 372–373, obr. 1: 58) probably come from German glassworks.

Changes were again reflected in the window glass, where we sporadically come across crown glass discs with optical decor. With the exception of a few specimens from the inner courtyard between the Pekařská – Kolářská and Mnišská – Mezi Trhy streets in Opava (*Břečková 2017*, 269–270, obr. 9: 3), they are evidenced only at Cvilín Castle near Krnov (*Sedláčková 2004a*, 374, obr. 3: 11). In the context of the Czech lands, window glass decorated in this way counts among the rare finds.

2nd half of the 16th century – 1st half of the 17th century

In the second half of the 15th century, the Czech lands were recovering from the consequences of the Hussite revolution and civil wars, so it was not until the accession of the Habsburgs to the Bohemian throne in 1526 that the cultural influences of the Italian Renaissance penetrated more intensively into this territory. However, Moravia had already absorbed Renaissance influences earlier through the court of Matthias Corvinus. The 16th century was a period of cultural and economic development that culminated during the reign of Rudolf II, whose court attracted artists, intellectuals and merchants from all over Europe. One of the branches that reached an unprecedented upswing was glassmaking. In the fourth horizon, from the 2nd half of the 16th century to the 1st half of the 17th century, archaeological assemblages include only glass of purely Renaissance forms and design. Compared to high medieval glass, the collections of Renaissance glass are fewer in number. One of the causes may be a change in waste management and cleaning of cesspits. In addition, we know from written reports that glass shards were collected in Silesia and transported to glassworks to be remelted. This practice may be another reason for the smaller number of glass objects than in the Middle Ages.

When comparing the assemblages from the Moravian-Silesian borderlands with the surrounding regions, we can observe similar tendencies resulting from the great mobility of early modern glassmakers, who played an important role in the dissemination of technological

innovations and new decorative techniques. Optic decor, which was already used in the Middle Ages, achieved great popularity in the Renaissance period. In the examined material from the Moravian-Silesian borderlands, it was used on various forms of hollow glass, especially on beakers, goblets, bottles, flytraps and others. Other popular decorative techniques were engraving with a diamond point and painting with coloured enamels, which is evidenced, for example, on tall beakers on a hollow bell-shaped foot and goblets from Opava, Krnov and Janovice. Moreover, these representative vessels were often provided with dates or inscriptions. In addition to these new or rediscovered decorative methods, the decor based on medieval traditions continues to be applied to Czech glass.

Glass from the 2nd half of the 16th century to the first half of the 17th century was found in Krnov, Bruntál, Ostrava and at a number of locations in Opava, such as the Horní náměstí Square (Štěrbová – Pavelčík 1997), the Dolní náměstí Square 18 (Fig. 76; Tengerová 1997a), in the Drůbeží trh Street and in the inner courtyard between the Horní náměstí Square, Pekařská and Kolářská streets (see Vaňurová 2023a). Other finds come from Pekařská and Kolářská streets. In addition to these urban sites, Renaissance glass is also evidenced in aristocratic residences, namely at the castles of Starý Jičín and Sovinec, and at the mansion in Janovice (Karel 2011, 182–183; 2017, 91–104).

The vast majority of glass from the Moravian-Silesian borderlands is made of slightly greenish to almost colourless glass, which can be considered the products of domestic glassworks. Almost all Renaissance assemblages include tall undecorated beakers on a hollow bell-shaped foot, as they represented a cheap and easily accessible form of drinking glass. Specimens richly decorated with enamel, sometimes supplemented with gilding or dates, are found more rarely. A popular decorative pattern was lilies of the valley complemented by a figural motif. As an example, we can mention beakers from the inner courtyard between the Pekařská – Kolářská streets (Fig. 32), from the Drůbeží trh Street and the Dolní náměstí Square in Opava. However, they are also evidenced in Ostrava, Janovice and at Cvilín Castle near Krnov.

While the beakers on a hollow bell-shaped foot were often used more for representative purposes, lower beakers with a cylindrical or slightly barrel-shaped body were common table glass. The assemblages from the Moravian-Silesian borderlands are dominated by beakers of domestic provenance made of greenish glass, plain or with optic decor, such as we know, for example, from Dolní náměstí Square 18

(Tengerová 1997a), Horní náměstí Square (Štěrbová – Pavelčík 1997) and from the inner courtyard between the Pekařská and Kolářská streets. Several beakers are also known from Ostrava, Krnov (Sedláčková 2015, 321) and Bruntál (Šrámková 2012b, 65–70).

However, the most abundant type of hollow glass are goblets of various variants, especially simple goblets with a rod-shaped stem and a base of a coiled trail and goblets with a bell-shaped foot (Figs. 36–37). Both of these types appear with different forms of the bowl, either plain or with optic decor. Only a few goblets from Opava, Krnov and Cvilín Castle are decorated with enamel or engraving. Among the more luxurious glassware, inspired by Venetian glassmaking, are goblets with optically decorated nodes with the motif of lion mascarons or ribs, such as are known from Opava (Fig. 38) and Janovice mansion.

Among the new shapes, which first appeared on the Moravian-Silesian border in the 16th century, is an almost complete beer stein with engraved decoration from Krnovská Street (Fig. 39). Of the other beer steins, mostly only fragments have been preserved. Jugs and ewers are evidenced by only a few pieces, while a large part of the assemblages consists of table and storage bottles, mainly with pear-shaped or spherical bodies, and four-sided bottles. Exceptional specimens include four-sided bottles with engraved decoration, fused-in trails of different colours (Fig. 42), or specimens made of filigree glass.

Vessels made of opaque red or blue glass appear sporadically in the examined assemblages. A unique find is a beaker from opaque red glass with a trail wound around its body (Fig. 34: 4) and another beaker from blue opaque glass from the Horní náměstí Square in Opava (Fig. 34: 7). A specific form of hollow glass, classified as technical glass, are suspension oil lamps. At least a part of the extensive collection of oil lamps that were found during investigation of the Dominican monastery and were used to illuminate the Church of St. Wenceslas comes from the Renaissance period (see Králová – Vaňurová 2021, 18–21). We meet them sporadically in the secular environment in Moravia and Silesia.

There are only a few vessels that can be considered to be of foreign origin, but none of them have been analysed for their elemental composition to confirm this theory. These vessels include, for example, a gilded goblet from Kolářská Street and the aforementioned beaker made of opaque blue glass, but also vessels decorated with filigree, such as we know from the mansion in Janovice. Soda-potash-lime composition of glass similar to Venetian *Common glass* and *Vitrum*

blanchum was found only in two samples of window discs from Opava. Most of the finds, however, are vessels made of greenish glass, which was produced in Bohemian, Moravian and Silesian glassworks. Analyses of selected samples of Renaissance-style glass from Opava revealed that glass was imported to the town from various, as yet unidentified glassworks,¹ all of which produced potash-lime glass of a similar composition with the addition of NaCl. Only two vessels were made of lime-potash glass. Even in regional glass, however, we observe foreign influences. For example, the knowledge of opaque glass production spread to the Czech lands from France and the Netherlands, while the inspiration from Venetian glassmaking is evident in goblets with lion mascarons and in filigree glass. Nevertheless, in addition to a few luxurious vessels and enamelled goblets, simpler products intended for a wide range of consumers, such as small cylindrical beakers, tall beakers and goblets without decoration or with optic decor, absolutely dominate.

When studying medieval and early modern glass, we must not forget its other characteristics, which, however, are not as easily defined as the typological, morphological or technological specifications. The most important ones are the function and use of glass products in households or in a church environment. In addition to their common use for direct consumption and serving of liquids and food or for storage, glass vessels could also have had another social function, namely to demonstrate the status of their owner. Especially in the 13th and 14th centuries, when glass was just spreading across the highest social classes, glass products were among the reliable indicators of the social environment. In the high and late medieval periods, we observe a gradual transition of glassware from the category of exclusively luxury trade goods (intended to represent and demonstrate social status rather than to be regularly used for dining) to the category of relatively common household equipment of burghers and nobles. Exceptions are, for example, the richly decorated welcome goblets and beakers.

Archaeometry of glass

The examination of glass artefacts was not limited to a typological and chronological evaluation. Ideally, archaeologists should establish interdisciplinary cooperation with natural sciences or technological disciplines when analysing glass assemblages. An important role is played by the archaeometric survey of archaeological glass, which can reveal a lot about glass

production, as well as the technologies and the raw materials used. For this reason, analyses of the elemental composition of selected archaeological glass artefacts were carried out.

The work includes analyses of a total of 66 glass finds from Opava, some of which have already been published (*Rohanová – Kumstová – Jeníková 2012*, tab. 1–2; *Sedláčková – Rohanová et al. 2016*, tab. 18). 40 of these samples belong to Gothic-style glass (Tab. 4–8), 26 to the early modern glass made according to the Renaissance recipe (Tab. 9–13). The analyses were carried out using the SEM/EDS and XRF methods, which are described in Chapter 2.4.

Glass from the Moravian-Silesian borderlands can be divided into three basic groups according to its chemical composition, namely soda-ash, potash-lime and lead glass (see Chapter 8). Products made of soda-ash glass have already been evidenced in the Moravian-Silesian borderlands since the 13th century, especially fragments of beakers and bottles made of brown and colourless glass. The brown glass bottle from the Drůbeží trh Street (Tab. 5: A24) was made from a glass batch composed of sand and ash of salt-tolerant plants. The brown colour of the glass was caused by the high manganese content. The composition of this bottle differs from Venetian glass (Graph 9), and its origin must therefore be sought elsewhere. The same ratio of MnO/FeO oxides was found in soda-ash glass coloured with manganese from Brno and Bratislava, which leads to the assumption that these oxides got into the glass from the same source. This source could have been mineral raw materials from Umbria or from locations where iron ore was mined (*Sedláčková – Rohanová – Lesák – Šimončíčová Koášová 2014*, 240, tab. 3a, 3b, 4a, 4b). The colourless glass used for the production of pruned beakers and bottles with a tubular body-ring has a composition similar to brown soda-ash glass (*Břečková 2017*, tab. 1: A1, A154; tab. 2: A3, A4; *Rohanová – Kumstová – Jeníková 2012*, 353–356), but it already corresponds to Venetian glass of the *Vitrum blanchum* and *Common glass* types (Tab. 5: A5, A35, CI, C3, C4, C154). In the Renaissance assemblages, we also can find products made of soda-ash glass of these two types, as evidenced by the window discs from the inner courtyard between the Horní náměstí Square and Pekařská – Kolářská streets and from the Dolní náměstí Square (Tab. 13: A29, A41). In Bohemia and Moravia, the production of soda-ash glass has not yet been proved.

In the Middle Ages, regional glassworks produced potash-lime glass from a glass batch composed of beech ash, sand and potash (*Pánová 2017*, 85). One

of the oldest potash glasses in the Moravian-Silesian borderlands is the stained glass from the Church of St. Martin in Bohušov (Tab. 3) with a very low SiO_2 content. The oldest medieval potash glass from Opava is also characterized by a lower SiO_2 content (around 50 wt.%) and a high content of K_2O , but also CaO and P_2O_5 (Tab. 4: A1, B1–B5, B8). The results of the analyses point to one production district or one production technology. The composition of the samples corresponds to potash-lime glass, the so-called *wood-ash glass* (Wedepohl – Simon 2010), which was produced in German glassworks between 1000 and 1400. As early as the 14th century, regional potash-lime glass made from a glass batch composed of 1 part sand, 0.5 part ash and 0.5 part potash appeared in the Czech lands. This group encompasses all Bohemian-type beakers from Opava, a ribbed bottle, window panes from the Drůbeží trh Street and a disc with optic decor from the inner courtyard between Horní náměstí Square and Pekařská – Kolářská streets (Tab. 6–8).

In the Renaissance, Central European glassworks produced glass from a glass batch composed of quartz, beech ash and potash. Limestone in the form of CaCO_3 was newly added to the glass batch to replace potash. Increased Na_2O content over 0.5 wt.% indicates that NaCl was also intentionally added to the glass in order to improve the melting process (Sedláčková – Rohanová et al. 2016, 233–234). Almost all of the analysed vessels of Renaissance forms from Opava are made of potash-lime glass with the addition of NaCl (Tab. 9–12). However, based on the comparison of the $\text{CaO}/\text{K}_2\text{O}$ and $\text{Al}_2\text{O}_3/\text{SiO}_2$ ratios, it is possible to distinguish several glass groups in the material from Opava (Graph 16, 17).

An interesting finding was made by comparing the chemical composition of medieval and early modern potash-lime glasses from the Moravian-Silesian borderlands. Graph 15 clearly shows how the individual glass groups overlap with regard to their dating. The oldest glass from the 13th and 14th centuries partially overlaps with the first group of Bohemian-type beakers. The second group of Bohemian-type beakers is approaching and partially overlapping with Renaissance-style glass forms. This finding is certainly related to the places of production of the vessels in question. Interesting connections can also be observed when comparing the composition of Renaissance glass depending on the typology and decoration of the analysed vessels. Beakers and goblets decorated with painting, gilding or other more elaborate decor, such as goblets with relief-decorated nodes, were made of glass with a higher proportion of Na_2O ,

while vessels without decoration contained less of it. Thus, we observe here the relationship between the quality of the glass and the complexity of the decoration or the overall design of the vessels. A correlation between these two characteristics was also found in the assemblages from Brno.² The correlation between the Na_2O content in glass and the complexity of vessel decoration indicates that already in glassworks, a distinction was made between vessels intended for decoration and simpler, undecorated vessels, intended for wider social classes.

The third chemical type represented in the examined material is lead glass, which can be divided into binary lead glass and potash-silica-lead glass. A yellow glass beaker from the Drůbeží trh Street was made of binary lead glass (Tab. 5: A23), but the unanalysed fragments of yellow glass from the Dominican monastery may also belong to the same group. The production of lead glass is evidenced in Germany, for example in Erfurt, where glass of a similar composition to the Opava specimen was produced in the 13th century (Mecking 2013, tab. 3; Wedepohl – Krueger – Hartmann 1995). The use of potash-(silica)-lead glass in the Moravian-Silesian borderlands is evidenced by a window pane from the Church of St. Martin in Bohušov (Tab. 3: A3; Sedláčková 2011c, 303).

Conclusion

In the Middle Ages and the early modern period, glassmaking was one of the branches in which long-distance trade contacts and the exchange of experience, the adoption of models and inspirations played an important role. Therefore, the evaluation of glass finds cannot be limited to individual regions, but it is necessary to place them in the broader context of the history of the Czech lands and Central Europe. However, the analysis and evaluation of materials from individual regions is still the cornerstone for further interpretations at the regional and international level.

Although in my work I have tried to capture the development tendencies of glass in the territory of the Moravian-Silesian borderlands and its importance as an article of trade, a number of questions remain unsolved. It is mainly the issue of distribution of glass products to individual locations. To gain a deeper understanding of the problem, it will be necessary to focus on the research of medieval and early modern glassworks, which, despite their great information potential, represent an almost unexplored field.

Notes:

- 1) The material from Opava was compared with available samples from the glassworks in Pusté Žibřidovice, Nová Seninka, Stříbrnice and Velké Vrbno.
- 2) According to D. Rohanová's findings, the painted and otherwise decorated vessels were made of good-quality glass. I am thankful for personal communication.

