

Late Gothic and Early Renaissance Glass from Bratislava, ca. 1450–1550

Pozdně gotické a raně renesanční sklo z Bratislavy ca 1450–1550

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This article follows in the tracks of a paper on glass in Bratislava in ca. 1200–1450 (Sedláčková et al. 2014). The reasons why the text was divided into two studies are the differences in glassmaking in the two chronological horizons. After the mid-15th century Venetian glassmaking resumed its leading position in Europe; at the same time, there was a distinct rise of regional production centres. Changes did not only concern the shapes of vessels but also the production technology and the related chemical composition of glass. Glass from the transition period between the Gothic and the renaissance in Slovakia is yet to be assessed in full, which is an obvious drawback as Bratislava in particular had a highly convenient geographical and political position in terms of import from different regions: Venice, Hungary, German glassmaking areas as well as Bohemia and Moravia. This article demonstrates, on the basis of typological and chemical analyses, how this position was reflected in finds from refuse pits located by the houses of the upper social strata.

glass – late Gothic – chemical analyses – Venetian glass – Hungarian glass – German glass – Bohemian glass

Príspevok navazuje na časť venovanou sklu v Bratislave v období ca 1200–1450 (Sedláčková et al. 2014). Jedným z dôvodů rozdelení do dvou studií je odlišná sklárská problematika v obou časových horizontech. Po polovině 15. století získalo benátské sklárství opět vedoucí roli v Evropě a zároveň probíhal výrazný vzestup a emancipace regionálních produkčních center. Změny se netýkaly pouze vzhledu nádob, ale také technologie výroby a s tím souvisejícího chemického složení skla. Sklu z období přechodu gotiky a renesance na Slovensku nebyla dosud věnována pozornost, což představuje dosti citelný deficit, protože konkrétně Bratislava měla velmi výhodnou pozici geografickou i politickou pro zásobování z různých oblastí – z Benátek, Uher, německých sklárských regionů i z Čech či Moravy. Príspevok na základě typologického rozboru a chemických analýz ukazuje, jak se tato pozice města projevila v nálezech z odpadních jímek u domů vyšších společenských vrstev.

sklo – pozdní gotika – chemické analýzy – benátské sklo – uherské sklo – německé sklo – české sklo

This article¹ follows the study “Medieval Glass from Bratislava (ca 1200–1450) in the Context of Contemporaneous Glass Production and Trade Contacts” from the same authors, i.e. Hedvika Sedláčková, Dana Rohanová, Branislav Lesák and Petra Šimončíčová Koošová, published also in *Památky archeologické* (Sedláčková et al. 2014).

1. Catalogue of features, contexts and characteristics of the glass series²

1.1. Bratislava Castle, Zámocká no. 2, reg. no. 862, plot no. 860/1, National Cultural Monument (NCM), Central Heritage Register no. (CHR) 28/1, palace (Fig. 1: 1)

Research history

1836–37 eight small test pits around the palace; pit 7 was located on the north terrace. Below a backfill of 2.5–3 m early settlement layers were unearthed with finds from the Eneolithic, the La Tène periods and the early Middle Ages (Janšák 1948).

1953–1955: test research into cellar areas of the south and east wing of the palace. Original Gothic well was unearthed in the courtyard (Píffl 1954).

1958–1962: systematic research into the castle complex within a reconstruction was conducted by B. Polla, Archaeological Institute of the Slovak Academy of Sciences (SAS), and T. Štefanovičová, Bratislava City Museum (Štefanovičová 1975, 7–9, Fig. 1).

1987–1999: on the north terrace by the palace frontage, part of a garden pavilion – orangery was uncovered. The research was conducted by the Bratislava Castle Administration – Development Department A-BH, and the National Heritage Office of the Slovak Republic (Fiala — Semanko — Šulcová 1987; 2001).

2008–2011: general archaeological research into the castle courtyard in relation to the reconstruction and

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² In the characteristics of the series, individual specimens are placed with production regions, which is explained in the following chapters. The authors believe that this information is highly important for the assessment of each series as a whole.

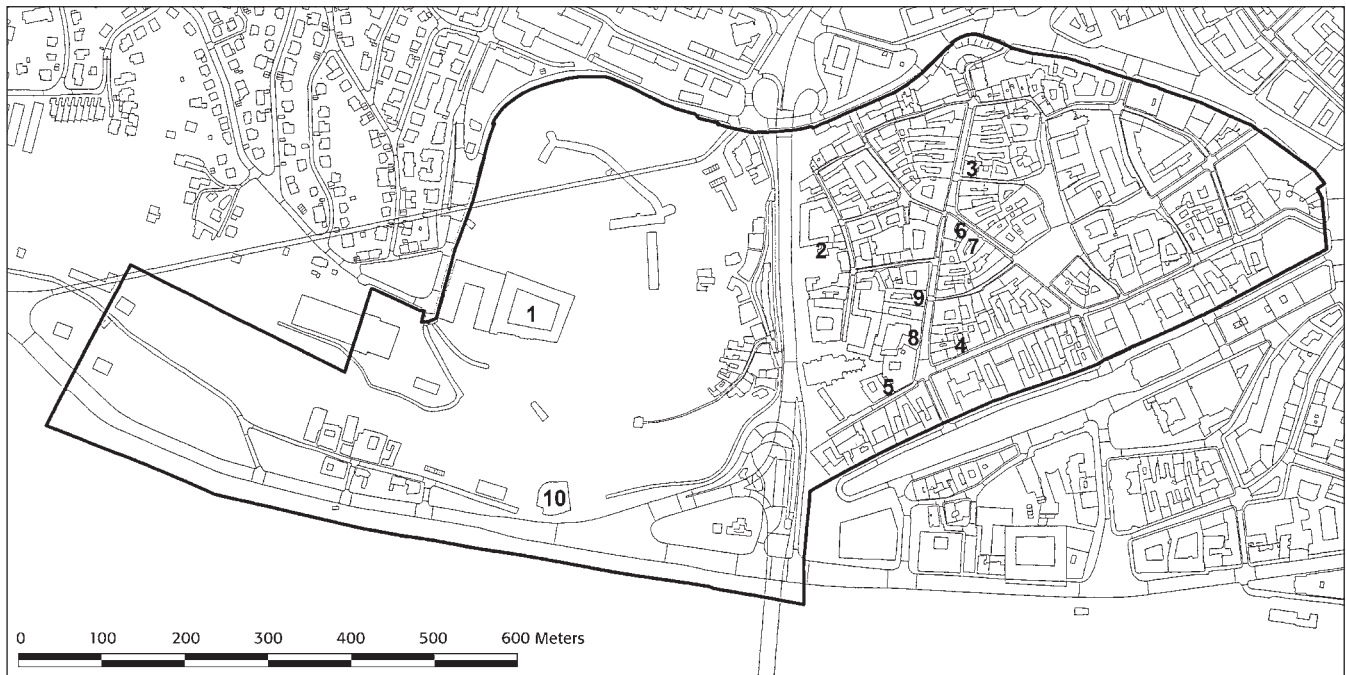


Fig. 1. Map of Bratislava. **1** – Bratislava Castle; **2** – Kapitulská 16; **3** – Michalská 6; **4** – Panská 16; **5** – Panská 24; **6** – Sedlárska 4; **7** – Sedlárska 6; **8** – Ventúrska 3; **9** – Ventúrska 7; **10** – Vodná veža. Drawn by the authors and editorial staff. — **Obr. 1.** Mapa Bratislavy s prehľadom lokalít. **1** – Bratislavský hrad; **2** – Kapitulská 16; **3** – Michalská 6; **4** – Panská 16; **5** – Panská 24; **6** – Sedlárska 4; **7** – Sedlárska 6; **8** – Ventúrska 3; **9** – Ventúrska 7; **10** – Vodná veža. Kresba autoři a redakce.

renovation of the palace and part of further masonry features at Bratislava Castle was carried out by the Municipal Institute of Heritage Care in Bratislava (Lesák — Kováč — Vrtel 2012), in 2013–2014 by the Via Magna s. r. o. archaeological society and the Municipal Institute of Heritage Care in Bratislava. Since 2015 research has been conducted by the Archaeological Institute of the SAS in Nitra.

Location

Bratislava Castle, a national cultural monument, is situated in the western part of the Urban Protected Area (UPA) in Bratislava.

Social milieu

The castle, originally an early and high medieval fortified seat, was restored under King Sigismund of Luxembourg who acquired the country and the crown through his marriage to the last queen of the Anjou dynasty. The reconstruction of the external fortifications was started in 1420 under the guidance of Konrád of Erling; stone fortifications with cannon bastions and stone gates were built in 1427–1430.

After 1431 the castle was converted into a two-floor building; an old stone tower was incorporated into the ground plan. After Sigismund's death in 1437 the reconstruction did not continue but part of the building was used for residential purposes, probably also under Ladislaus the Posthumous. The importance of the city grew after the Battle of Mohacs. In December 1526 Ferdinand I was elected the King of Hungary in Bratislava, and in 1531 he made Bratislava (Prešporok) the coronation city. The castle above it housed the coronation jewels from 1522 and was to become a permanent resi-

dence of the sovereign (Višváder 2010, 25–26; Holčík 2014, 19–35).

Context

A featured identified in the SE cellar of the palace.

1.1.1. Refuse pit 105/09

Ground plan: masonry refuse pit, not related to the south perimeter masonry of the palace.

Dimensions: internal dimensions 200 x 150 x 50 cm, wall thickness 50 cm.

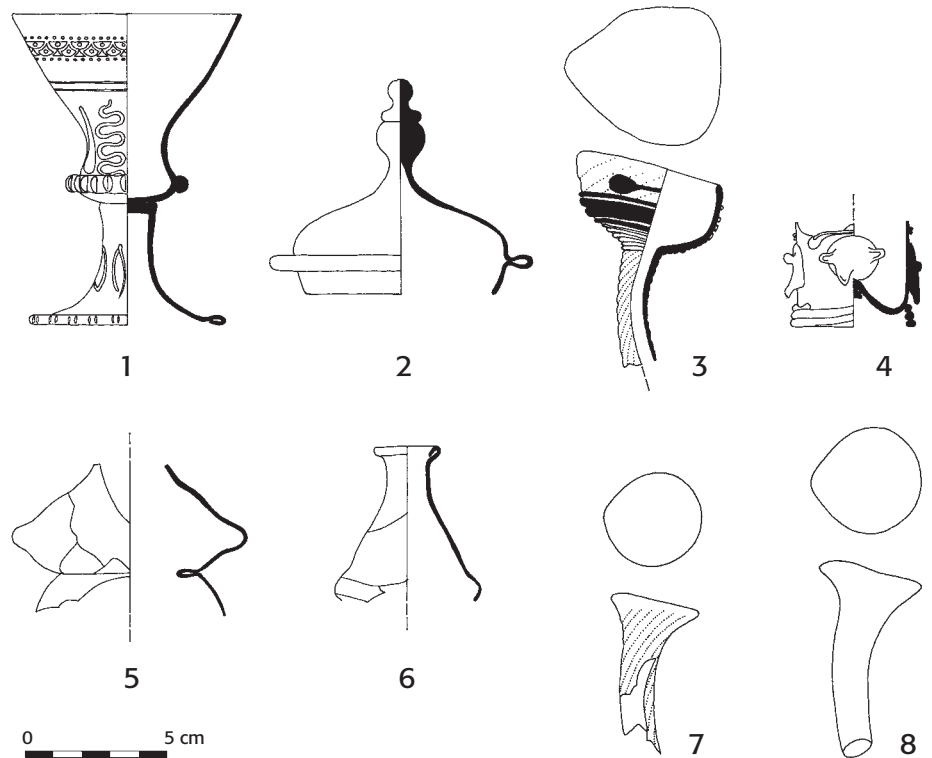
Fill: household waste of organic origin with fragments of ceramics and glass.

Characteristics of the glass series

The series illustrates the three main circles of Bratislava glass. Venetian imports are represented by a decorated goblet with a lid, Hungarian glass by a bottle with ribs and a bowl-shaped rim wound with a blue trail. A beaker of blue-green glass with four prunts in the shape of animal heads on a foot of a coiled trail comes from a glasshouse in the present-day Germany, possibly from Schwarzwald (Figs. 2: 1–4; Photo 1).

A goblet, technically speaking a footed beaker with a lid, has a chalice-shaped cup wound with a pincer trail by the bottom with a hollow foot without a knob. It is decorated on the rim by a border of white and red points between which is a band of golden scales with white points. Below a pair of lines of red and blue enamel are six vertical zigzag lines (snakes) in alternating red and blue, separated by vertical white lines. There are six ovals of white lines on the foot and a pair

Fig. 2. Bratislava Castle, feature 105/09. 1st half of 16th century. Drawn by H. Sedláčková, technical support L. Sedláčková. — **Obr. 2.** Bratislavský hrad, objekt 105/09. 1. polovina 16. stoloetia. Kresba H. Sedláčková, technická úprava L. Sedláčková.



of points on the perimeter. The lid is not decorated (goblet rim \varnothing 8.2 cm, foot \varnothing 7.0 cm, h. 11.1 cm, lid rim \varnothing 6.7 cm, h. 7.6 cm).

Part of an arched neck with a bowl-shaped rim with a spout with optic-blown ribs has survived of a table bottle or *kuttrolf*. The glass was originally clear with blue-green tint and is covered in whitish corroded layer, the trail on the rim is blue (rim \varnothing 5.0–5.5 cm, neck \varnothing 1.2 cm).

The bottom section of a cylindrical beaker on a coiled-glass foot is of blue-green glass with stains caused by corrosion. Four prunts have the shapes of animal heads, above them is a fine rich blue trail (body \varnothing 4.0 cm, body fragment h. 3.7 cm).

Dat.: first half of the 16th century.

Held by: MÚOP Bratislava (temporarily).

Lit.: *Barta et al. 2011*, 115.

1.1.2. Earlier finds

Research in 1958–1979 yielded finds of mainly renaissance character (*Maruniaková 1989*). Only a few fragments and body fragments of vessels can be related to the period before the mid-16th century, particularly the fragment of a goblet in the shape of a foot with ribs of greenish glass; the foot features on Venetian goblets from Bardejov (*Fürjová — Janovičková 1988*, 622, Figs. 1: 1 and 3). Bottles with a body-tubular ring and the bottom barrel-shaped part of the body of clear greyish sodium-ash glass might also come from this period (Figs. 2: 5 and 6; *Maruniaková 1989*, 297, Fig. 1: c), as well as some *kuttrolfs* (Figs. 2: 7 and 8; *Maruniaková 1989*, 306, Fig. 6). In the light of the mentioned extent

of archaeological research, the small amount of glass appears strange, notably the absence of glass before the late 15th century.

Dat.: first half of the 16th century.

Held by: Archeologické múzeum SNM Bratislava.

Lit.: *Fürjová — Janovičková 1988*; *Maruniaková 1989*.

1.2. Kapitulská no. 16, reg. no. 121, plot no. 442, NCM-CHR no. 70/1, burgher house (Fig. 1: 2)

Research history

1976: archaeological research of the Municipal Heritage Care and Conservation Administration (*Baxa 1980*).

Location

Burgher house in the western part of the historical centre, a historical-urban block of houses no. 13, in the Bratislava UPA. The block is demarcated by the streets Kapitulská, Na vršku, Klariska, Kapucínská, Židovská and Rudnayovo námestie Square (*Križanová — Ondreščáková 1971*).

Social milieu

The present plot no. 442 has had, since the mid-15th century, a number of owners. Part of the glass finds comes from the second quarter of the 16th century. The documented owner in 1532–1533 was *Her Thomen Benecifiat* and the house was later referred to as *domus benecifialis* (1542–1543). The owner thus must have been a nobleman or clergyman, possibly a canon, who received the plot from the king (*Obuchová — Štassel 1983*, 9–10; *Štassel 1988*, 169).

Context

A refuse pit was uncovered on the original medieval plot, in the NW corner by the town wall.

1.2.1. Refuse pit 1/76

Without closer specification.

Characteristics of the glass series

The refuse pit filled during the second half of the 16th century (Baxa 1980) contained body fragments of two older vessels: a beaker with an open-work foot with ten lobes, and a cylindrical *krautstrunk* (Figs. 12: 1 and 2; Tab. 3: A1, A2). The beaker with an open-work foot is of light blue-green glass and has three rows of fine rich blue trails marvered in the rim (rim \varnothing 7.2 cm, h. 8.0 cm). The *krautstrunk* of light green glass is preserved in the upper and bottom section with a bottom wound with a plain trail, the prunts have tips bent to the right (rim \varnothing 5.9 cm, bottom \varnothing 5.8 cm, h. ca. 10 cm). The glass composition and shape analogies show that both vessels were made in Germany.

Analyses: Tab. 3: A1 and A2, calcium-potassium-sodium glass.

Dat.: second quarter of the 16th century.

Lit.: unpublished.

Held by: MuM Bratislava.

1.3. Michalská no. 6, reg. no. 383, plot no. 29, NCM-CHR no. 107/1, burgher house (Fig. 1: 3)

Research history

1998: archaeological research of the Municipal Heritage Care Institute (Lesák — Resutík 2000, 68).

Location

The feature is located on a diagonal axis of the medieval town, on the main route of the street network formed below the castle in the second half of the 13th century. It is situated on the corner of Michalská and Biela streets. It is part of the historical-urban block of houses no. 2 in the Bratislava UPA demarcated by the streets Michalská, Biela, Zámocnícká and Františkánské námestie Square. It has an underground floor and four above-ground floors. On the basis of building-historical research it is presumed that the oldest core of the building on the plot was part of a homestead that belonged to the monastery of the Holy Cross in Heiligenkreuz, Austria (Horáková et al. 1984).

Social milieu

The history of the plot with a homestead, a house and a storage place in the high Middle Ages is recorded in written sources with interruptions from 1307 until 1522–1523 when it was owned by the Cistercian monastery in Heiligenkreuz. They regard the purchase of property, payment of taxes, and in 1311–1325 the construction of the Chapel of St. Catherine within the homestead. In 1372 the house and the chapel were rented by the town. In 1522–1523 the monastery agreed with the town first on the purchase of half of the house with

the chapel and the village of Vajnory, and subsequently on the purchase of the second half, in both cases for 1050 pounds of Viennese dinars.

When the sale was approved in 1525 by Hungarian King Ludvig II, the town divided the original homestead into two plots for burghers, and in 1528 a new street called Biela was reported (Horáková — Jankovič — Baláž 1984, 2–13; Lesák — Resutík 2000; Ševčíková 2004, 473).

The glass series comes from the period when the plot was owned by the monastery.

Context

Without closer specification.

1.3.1. Ice house, secondary refuse pit 1/98

Ground plan: square.

Dimensions: internal 130 x 130 cm, primary fill depth 80 cm, perimeter wall thickness 56 cm.

Fill: rich series of ceramics and glass.

Characteristics of the glass series

The refuse pit contained body fragments and fragments of at least 15 vessels. The only Venetian (or Italian) product was a large, almost complete beaker of the *berkemeyer* type with optic mold-blown decoration of diamonds. It is of clear light blue-green glass of the common glass type (rim \varnothing 11.2 cm, h. 13.5 cm, Fig. 3: 10; Photo 9; Tab. 1: A1; Hoššo 2003, Abb. 1: 14).

Seven *krautstrunks* with cylindrical bodies are evidenced by body fragments and fragments. With most of them, bottom sections with in-turned bottoms wound with a pincer trail have survived, in three cases with a trail below a bowl-shaped rim (Figs. 3: 2–4, 6, 8). One beaker had atypical prunts (possibly 12) in the shape of animal heads (Fig. 3: 5; Photo 11). Another beaker with a preserved bowl-shaped rim had vertical optic-blown ribs and the glass was originally colourless (Fig. 3: 7). The prunts are large and pincer (\varnothing 1.8–2 cm). The glass of almost all the vessels was completely corroded, only with one body fragment original clear light green glass has survived and with another light blue-green glass (Figs. 3: 3, 4). Chemical analysis of three body fragments and two loose prunts shows that it belongs with the group of potassium-calcium glass (Tab. 2: A1–A5).

The body fragment of an upper section of a beaker with a low bowl-shaped rim and small coiled prunts is of colourless glass, corroded (whitish peeling layers) (rim \varnothing 8.3 cm, Fig. 3: 1). A bottle with optic-blown ribs from which the bottom part of the body has survived is of greenish glass (Fig. 3: 9). A distinctly club-shaped beaker is represented by the fragment of the upper part with a cylindrical rim and prunts on the body. The colourless glass with areas of whitish peeling corroded layers has potassium-calcium composition (rim \varnothing 7.8 cm, Fig. 3: 11; Photo 12; Tab. 2: A7). A foot of glass (corroded – opaque dark grey) might have belonged with another beaker of the same type (\varnothing 11 cm, Fig. 3: 12).

Three biconical bottles have survived in large fragments of upper and bottom sections, one of them was

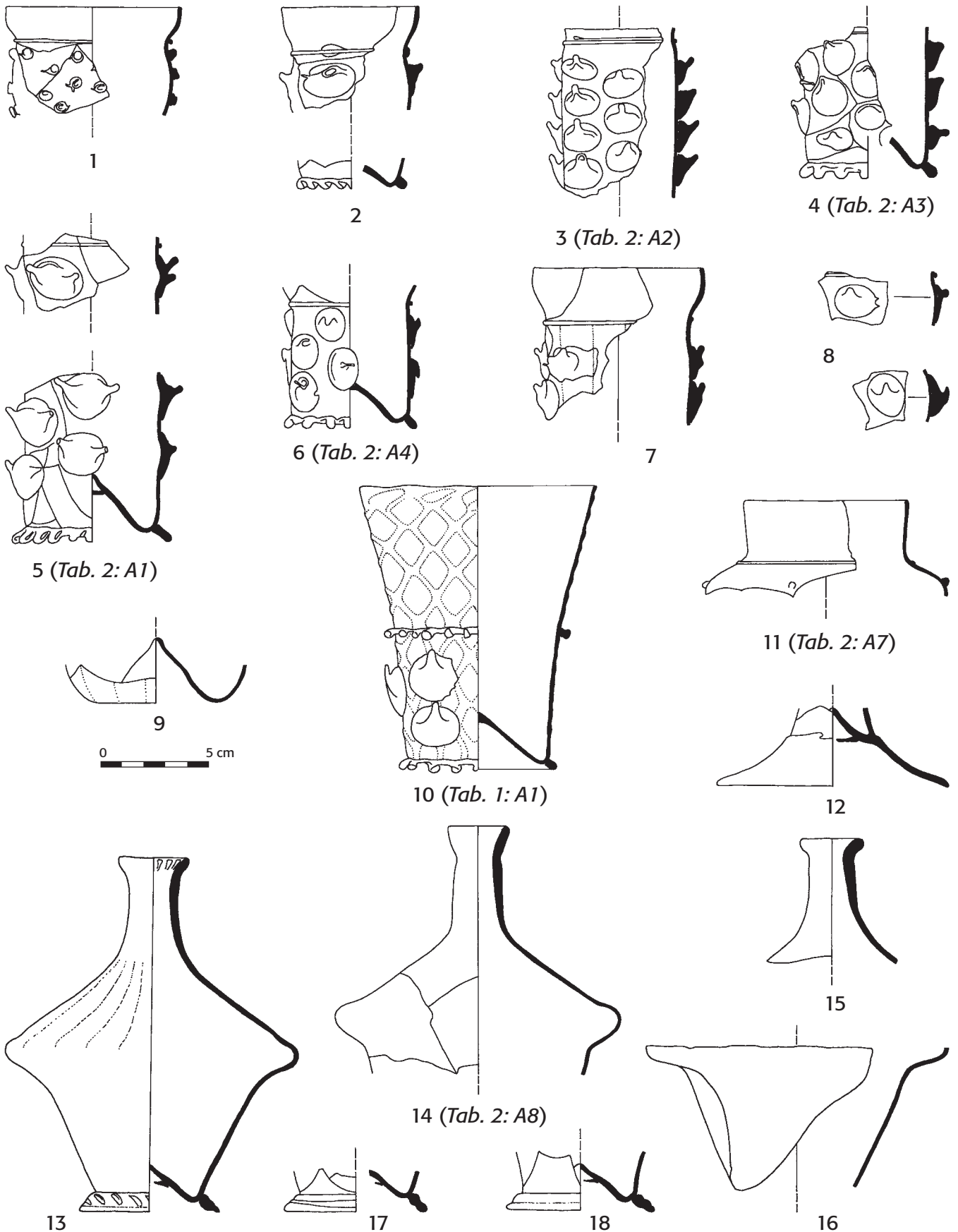


Fig. 3. Bratislava, Michalská 6, feature 1/98. Last decades of 15th – beginning of 16th century. Drawn by H. Sedláčková, technical support L. Sedláčková. — **Obr. 3.** Bratislava, Michalská 6, objekt 1/98. Poslední desetiletí 15. – počátek 16. století. Kresba H. Sedláčková, technická úprava L. Sedláčková.

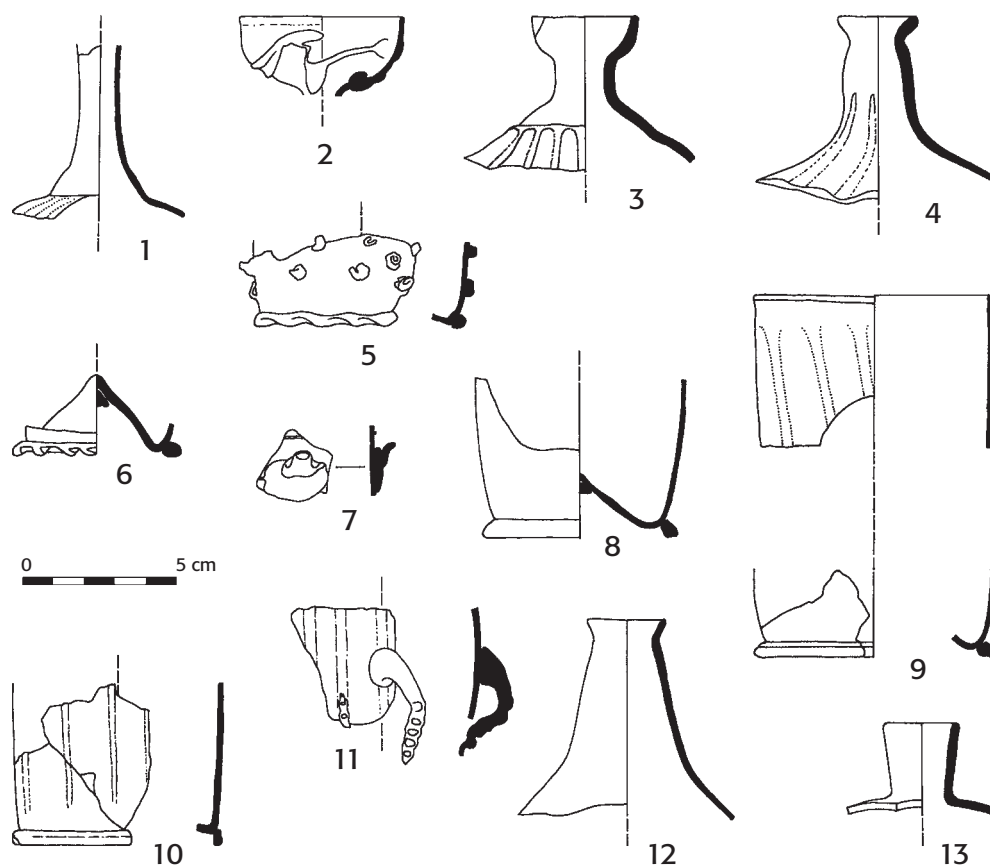


Fig. 4. Bratislava, Panská 16, feature 1/91. 1st half of 16th century. Drawn by H. Sedláčková, technical support L. Sedláčková. — **Obr. 4.** Bratislava, Panská 16, objekt 1/91. 1. polovina 16. století. Kresba H. Sedláčková, technická úprava L. Sedláčková.

reconstructed (Hoššo 2003, Fig. 2: 16). Fragments of the other two were impossible to assemble. All were of completely corroded light rusty orange glass. The vessels were small, the reconstructed specimen with optic-blown ribs on the upper section of the body was 17 cm tall (Figs. 3: 13–18; Tab. 2: A8), the other two were probably of the same height, judging from the similar dimensions of the bottoms (6.6 cm, 6.8 cm and 7 cm).

Analyses: Tab. 1: A1 berkemeyer of the common glass type; Tab. 2: A1–A6 *krautstrunks*; Tab. 2: A7 club-shaped beaker, Tab. 2: A8 biconical bottle.

Dat.: last decades of the 15th century – early 16th century.

Lit.: Lesák — Resutík 2000; Hoššo 2003, Fig. 1: 14; 2: 16. Held by: MÚOP Bratislava, acq. no. 45/98 (temporarily).

1.4. Panská no. 16 (until 1989 Nálepková), reg. no. 235, plot no. 323, NCM-CHR no. 140/1, burgher house called Pongrácz Palace (Fig. 1: 4)

Research history, Location, Social milieu, Context

Information about the above was given in regard to medieval glass. The building called *Pongrácz Palace* was erected on the present plot no. 323, identical with earlier plots with medieval constructions. The oldest written sources come from 1415 (Sedláčková et al. 2014, 223, 224).

1.4.1. Ice house, secondary refuse pit 1/91

Ground plan: approximately square.

Dimensions: 130 x 150 x X cm.

Fill: black humus-like crumbly earth.

Characteristics of the glass series

Settlement in the 13th and 14th centuries that preceded the construction of the renaissance *Pongrácz Palace* is evidenced by fragments of bottles with a body-tubular ring made of “brown” and colourless glass (Sedláčková et al. 2014, Figs. 6: 3, 4).

Fragments and body fragments of 13 vessels of various provenance come from the period between ca. 1500 and the mid-16th century; analyses of the chemical composition were not done. Vessels of Hungarian origin are represented by beakers with tiny coiled prunts (bottom sections of the body are wound with pincer trails, bottom \varnothing ca. 7 cm and 5.7 cm, Figs. 4: 5, 6; Hoššo 1997, Tab. V: 20), a *krautstrunk* (fragment of the body with a trail and one large flat pincer prunt of corroded glass, with a pearly corroded layer, Fig. 4: 7) and table bottles. Part of the body with ribs and a plain slender neck probably come from a bottle with a bowl-shaped rim, part of a bowl-shaped rim with a marvered zigzag trail has survived of a similar bottle (Figs. 4: 1, 2). Two bottles with ribs probably had pear-shaped bodies (Figs. 4: 3, 4; Hoššo 1997, Tab. V: 7, 11). The mentioned vessels are of blue-green glass covered in a thick corroded dark brown-grey layer. The necks of two storage jars are

Sample	Street	SiO ₂	Al ₂ O ₃	CaO	K ₂ O	Na ₂ O	MgO	MnO	Fe ₂ O ₃	P ₂ O ₅	TiO ₂	CuO	SO ₃	Cl	SrO	PbO	Minorite	Figure
A1*	Michalská 6	69.1	1.8	10.2	2.2	10.8	3.9	n.d.	*0.5	n.d.	n.d.	0.7	n.d.	n.d.	n.d.			Fig. 3: 10; Photo 9
A2	Sedlárska 4	67.6	0.6	5.1	2.6	20.6	1.6	0.3	0.2	0.1	<0.1	<0.1	0.3	0.8	<0.1	<0.1	ZnO <0.01	Fig. 5: 2; Photo 7
A3	Sedlárska 4	69.4	0.5	4.5	3.5	19.1	1.1	0.1	0.2	0.1	<0.1	n.d.	0.2	1.1	<0.1	<0.1		Fig. 5: 1; Photo 8
A4	Ventúrska 3, rp. 1/01	70.2	1	4.1	2.8	18.7	1.1	0.2	0.3	0.1	<0.1	<0.1	0.3	1.1	<0.1	<0.1		Fig. 8: 3
A5	Ventúrska 3, rp. 1/01	66.7	0.7	5.6	2.8	20.5	1.6	0.2	0.2	0.2	<0.1	<0.1	0.3	1.1	<0.1	n.d.		Fig. 8: 4; Photo 2
A6*	Ventúrska 3, rp. 1/01	68.3	0.8	7.3	2.5	16.1	2.9	0.5	*0.3	0.3	n.d.	n.d.	0.4	n.d.	n.d.	n.d.		Fig. 8: 1; Photo 4
A7*	Ventúrska 3, rp. 1/01	68.1	0.6	8.8	2.1	15	3.3	0.4	*0.3	0.2	0.1	n.d.	0.4	n.d.	n.d.	n.d.		Fig. 8: 2
A8*	Ventúrska 3, rp. 1/01	68.2	1.1	8.8	2.4	13.2	3.4	1.1	*0.5	0.2	n.d.	n.d.	0.3	n.d.	n.d.	n.d.		Fig. 7: 3; Photo 6
A9	Ventúrska 7, obj. 4	65.7	1.6	11.7	2.3	12.3	3.5	1.3	0.6	0.2	<0.1	n.d.	0.1	0.5	0.1	<0.01	ZrO ₂ , Co ₃ O ₄ , NiO <0,01	Fig. 10: 14

Tab. 1. Bratislava, sodium-calcium glass *SEM/EDS or XRF [wt%] (rp. = refuse pit, n.d. = not determined, *FeO). — **Tab. 1.** Bratislava, sodno-vápenaté sklo [hm%].

Sample	Street	SiO ₂	Al ₂ O ₃	CaO	K ₂ O	Na ₂ O	MgO	MnO	Fe ₂ O ₃	P ₂ O ₅	TiO ₂	CuO	SO ₃	Cl	SrO	PbO	Minorite	Issue
A10*	Olomouc, Riegerova 11	73	1.6	5.2	2.7	12.8	1.8	0.8	*0.3	0.6	0.2	n.d.	n.d.	1.1	n.d.	n.d.		Sedláčková /ed./ 1998, no. 18.1–1, an 1
A11	Brno, Petrov 2	72.4	2	6.6	2.9	16.4	< 2	0.6	0.3	n.d.	n.d.	<0.01	n.d.	1.4	<0.1	<0.1	ZnO < 0.1; Rb ₂ O < 0.01	Sedláčková 2007, fig. 25b
A12	Brno, Mečová 2	66.6	2.3	7	3.7	16.6	< 2	1.1	0.6	n.d.	n.d.	<0.1	n.d.	1.2	<0.1	<0.1	ZnO < 0.1	Sedláčková 2006, fig. 5a

Tab. 1a. Brno, Olomouc – sodium-calcium glass *SEM/EDS or μ -XRF [wt%] — **Tab. 1a.** Brno, Olomouc – sodno-vápenaté sklo [hm%].

Sample	Glass type	SiO ₂	Al ₂ O ₃	CaO	K ₂ O	Na ₂ O	MgO	MnO	Fe ₂ O ₃	P ₂ O ₅	TiO ₂	SO ₃	Cl	SnO ₂	PbO
CG	Common glass	65.5	1.6	10.6	2.8	12.6	3.7	1	0.7	0.3	<0.1	0.2	0.7	0.1	0.2
VB	Vitrum Blanchum	66.9	1	9.8	2.9	13.8	3.4	0.4	0.4	0.3	<0.1	0.3	0.8	n.d.	n.d.
C	Cristallo	70.5	0.7	4.9	2.9	17.2	1.8	0.3	0.2	0.2	<0.1	0.3	1	n.d.	n.d.

Tab. 1b. Venetian sodium-calcium glass, ca 1500 (Verità 2009) average composition [wt%] (n.d. = not determined). — **Tab. 1b.** Benátské sodno-vápenaté sklo, kolem 1500 (Verità 2009) průměrné složení [hm%].

of light green glass with corroded stains on the surface (Figs. 4: 12, 13).

A beaker with vertical droplets comes from a Bohemian glasshouse (fragment of the bottom section, glass completely corroded, brown-grey surface, bottom \varnothing 7 cm, Fig. 4: 10; Hoššo 1997, Tab. V: 19). Part of a slightly arched body with a stick-shaped handle pincer on the end has survived from a vessel with ribs of an unidentifiable shape; decoration on the body is evidenced by a small segment of a vertically applied pincer trail. The glass is corroded, the surface is beige (body \varnothing ca. 6.4 cm, Fig. 4: 11).

Cylindrical beakers with plain trails around the bottom, one with vertical optic-blown ribs and the other plain, are of light blue-green and colourless glass (bottom \varnothing 8 and 6.5 cm, Figs. 4: 8, 9; Hoššo 1997, Tab. V: 17). The first one might come from a German glasshouse, the provenance of the beaker of colourless glass is not clear: vessels of quality glass that resembled Venetian glass, namely hanging lamps, appeared in the first half of the 16th century.

Dat.: first half of the 16th century.

Lit.: Hoššo 1997, Tab. V: 7, 11, 17, 19 and 20.

Held by: MÚOP Bratislava, acq. nos. 131, 132 (temporarily).

1.5. Panská no. 24, reg. no. 231, plot no. 487, NCM-CHR no. 10702/1, burgher house (Fig. 1: 5)

Research history

1987: Rescue archaeological research of the Municipal Heritage Care and Conservation Administration in Bratislava and the Archaeological Institute of the SAS in Nitra (Baxa — Ferus 1988, 36).

Location

A three-storey two-wing burgher house of the L-shaped ground plan is situated on the right of the historical-urban block of buildings no.12 in the Bratislava UPA. The block is demarcated by the streets Panská, Ventúrska, Prepoštská, Kapitulská and Rudnayovo námestie Square. The house is on a narrow medieval plot. The oldest core of the house from the second half of the 13th century was identified during the research into the cellar on the west side of the plot (Horáková — Jankovič — Baláž 1984, 2–13; Ferus — Baxa 2006, 92).

Social milieu

The owners of the present plot no. 487 have been recorded since 1418. However, the earliest finds of glass are

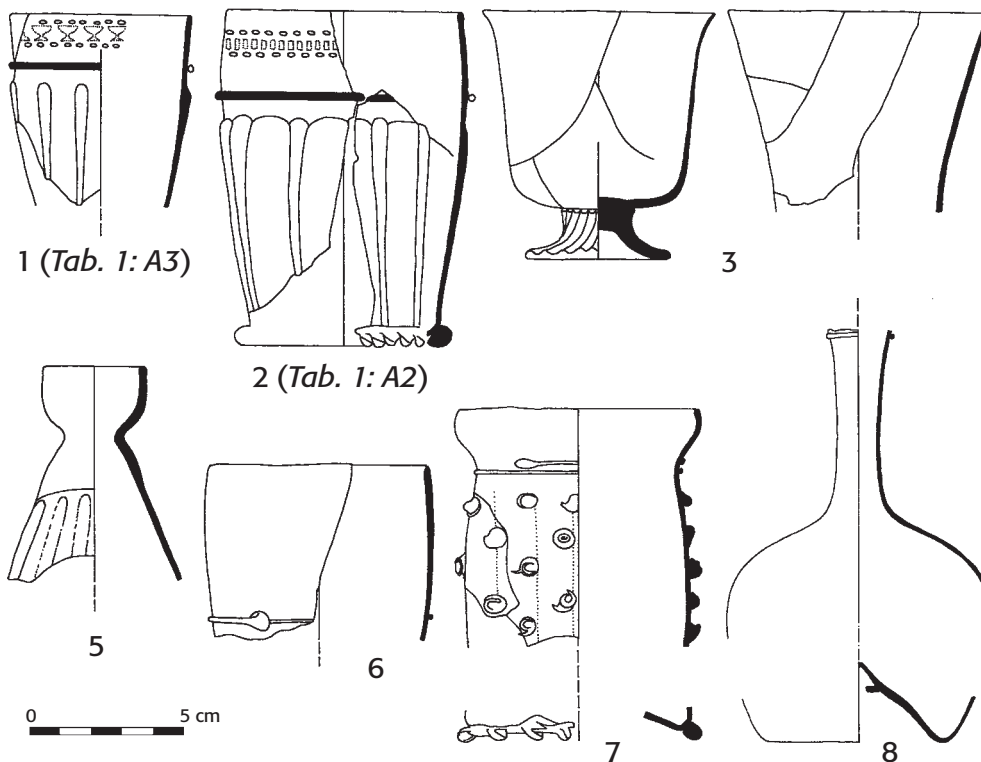


Fig. 5. Bratislava, **1–6** – Sedlárska 4, feature X/87–88. Last decades of 15th – 1st half of 16th century; **7–8** – Panská 24, feature X/87. Last decades of 15th – beginning of 16th century. Drawn by H. Sedláčková, technical support L. Sedláčková. — **Obr. 5.** Bratislava, **1–6** – Sedlárska 4, objekt X/87–88. Poslední desetiletí 15. – 1. polovina 16. století; **7–8** – Panská 24, objekt X/87. Poslední desetiletí 15. – počátek 16. století. Kresba H. Sedláčková, technická úprava L. Sedláčková.

related to *Peter Kursner* mentioned in 1457, or rather to *Katrey uxor* listed in 1482 and *Jacob Sneider Unnger* mentioned in 1503–1504. Peter Kursner owed in 1457 to the hospital of St. Ladislaus 25 golden florins, for which he gave his house and vineyard as a pledge. In 1492 the house owner (*Jacob Sneider Unnger*?) paid from the capital of 10 fl. the interest of 100 dinars to the tanners' guild and only returned the capital in 1513 (*Horáková — Jankovič — Baláž 1984, 2–13*).

Context

Eight features, storage pits and refuse pits, were investigated in the cellar area (*Baxa — Ferus 1988*).

1.5.1. Refuse pit? X/87

Without closer specification.

Characteristics of the glass series

Body fragments of two vessels have survived: a *krautstrunk* with optical ribs, with small coiled prunts and a bowl-shaped rim (rim \varnothing 8.0 cm), and an undecorated bottle with a bulbous body and a tall slender neck broken below a (probably) bowl-shaped rim (neck \varnothing 1.4 cm, bottom \varnothing 6.0 cm, h. ca. 13 cm). The *krautstrunk* is of yellowish glass with a corroded dark layer, the bottle is of colourless glass with a transparent brown corroded layer (*Figs. 5: 7 and 8*).

Dat.: last decades of the 15th century – early 16th century (in parallel with *Michalská 6, chap. 1.3.1*).

Lit: unpublished.

Held by: MÚOP Bratislava (temporarily).

1.6. Sedlárska no. 4, reg. no. 361, plot no. 344, NCM-CHR no. 217/1, burgher house (*Fig. 1: 6*)

Research history

1987–1988: Archaeological test research of the Municipal Heritage Care and Conservation Administration in Bratislava (led by K. Klinčoková).

Location

The burgher house is part of the historical-urban block of houses no. 10 in the Bratislava UPA. The block is demarcated by the streets Sedlárska, Ventúrska, Zelená and Hlavné námestie Square (*Kovačovičová-Puškárová — Husovská — Paulusová 1971*).

Social milieu

Archive material has not been published.

Context

A well on the ground floor, on the original medieval plot.

1.6.1. Well, secondary refuse pit? X/87–88

Without closer specification.

Characteristics of the glass series

An important series including four Venetian vessels, a beaker of the Bohemian type and probably a Hungarian bottle. Two beakers with ribs (made in moulds) survived as body fragments; they were of different sizes, with borders on plain rims made of *Cristallo* (rim \varnothing 6.1

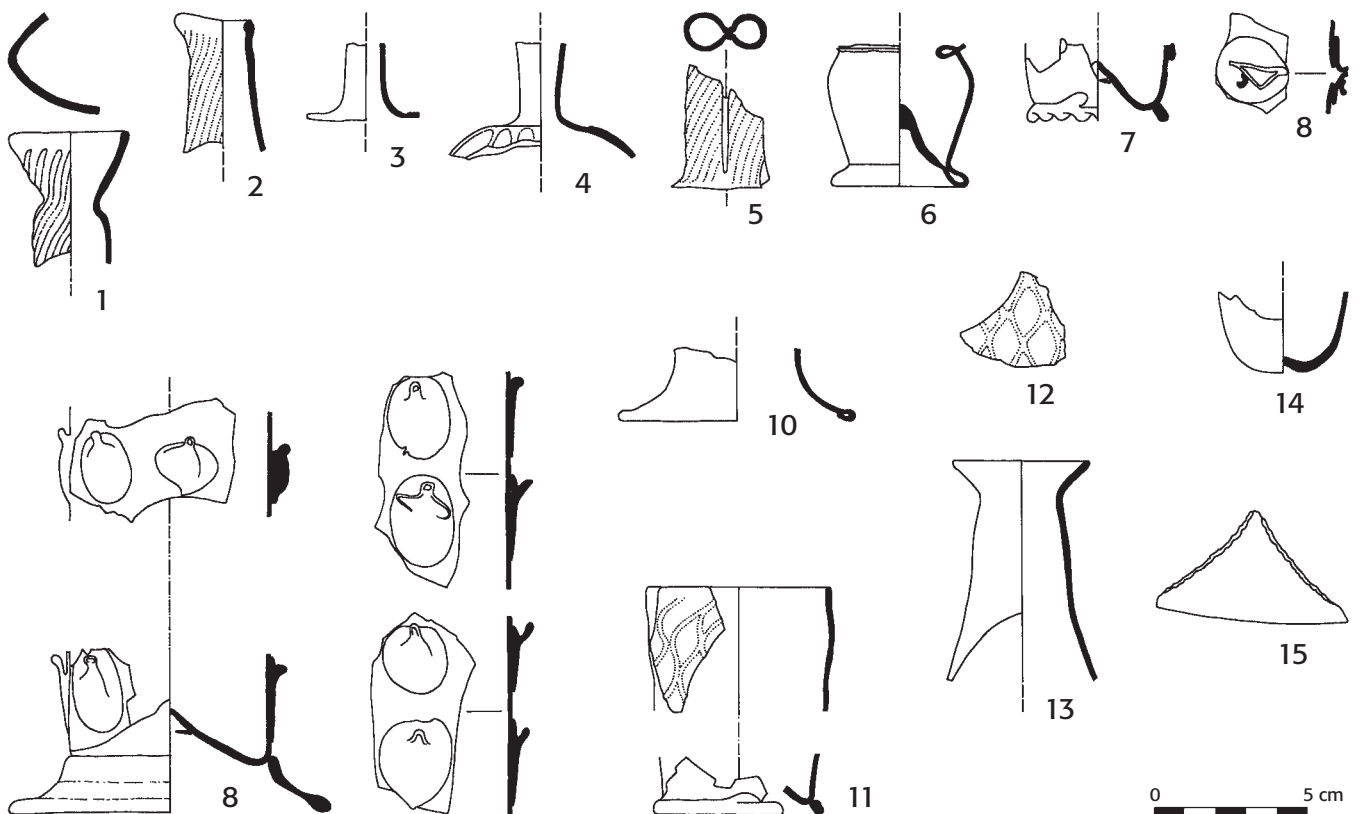


Fig. 6. Bratislava, Sedlárska 6, feature S 3/89. Last decades of 15th – mid- of 16th century. Drawn by H. Sedláčková, technical support L. Sedláčková. – **Obr. 6.** Bratislava, Sedlárska 6, objekt S 3/89. Poslední desetiletí 15. – polovina 16. století. Kresba H. Sedláčková, technická úprava L. Sedláčková.

and 7.9 cm, h. 11.3 cm, Figs. 5: 1 and 2; Tab. 1: A2 and A3). The border consists of two rows of points of white enamel. The larger beaker has a band of rectangles of gold-leaf between the points, the smaller one has gold-leaf cut into the shape of tiny goblets. The beaker on a ribbed foot is of rich blue glass, the footed beaker has a plain, chalice-shaped cup of colourless glass (rim \varnothing 7.8 cm, Fig. 5: 3). The body fragment of a tall plain funnel-shaped cup of colourless glass comes from a goblet (rim \varnothing 8.8 cm, Fig. 5: 4).

The beaker of the Bohemian type of light green-blue glass is represented by part of the plain, slightly in-turned rim wound with a trail (rim \varnothing 7.4 cm, Fig. 5: 6), the table bottle with ribs of colourless? glass covered in a brown-grey corroded layer is represented by the upper section with a bowl-shaped rim (Fig. 5: 5).

Analyses: Tab. 1: A2, A3 *Cristallo*.

Dat.: last decades of the 15th century – first half of the 16th century.

Lit: unpublished.

Held by: MÚOP Bratislava (temporarily).

1.7. Sedlárska no. 6, reg. no. 1362, plot no. 341, NCM-CHR no. 215/1, burgher house (Fig. 1: 7)

Research history, Location, Social milieu, Context

Sedláčková et al. 2014, 230

1.7.1. Well S 3/89

Ground plan: circular, stone, wreath-shaped.

Dimensions: internal diameter 120 cm, depth -560 cm from point 0 of research.

Fill: household waste.

Characteristics of the glass series

Information about finds of glass in the well filled in the 13th–18th centuries did not survive. In terms of typology, finds from the 13th–14th centuries were identified among them (Sedláčková et al. 2014, 230–232), as well as a group of glass from the late 15th century and the first half of the 16th century discussed below, and several renaissance vessels that are yet to be assessed.

Venetian glass is represented by a fragment of a *krautstrunk* of clear colourless glass; a blue applied trail remained by the broken tip of a large flat prunt (Fig. 6: 9).

The bottom section of a small beaker with prunts of colourless glass and with white corroded layer probably comes from a Hungarian glasshouse (bottom \varnothing 4.8 cm, Fig. 6: 7), as do several bottles of different variants of heavily corroded glass. The bottom part of a small bottle with a body-tubular ring presents a variant with a barrel-shaped bottom section (bottom \varnothing 4.6 cm, ring \varnothing 4/2.5 cm, Fig. 6: 6); a bottle and an ewer with ribs were originally of light green glass (Figs. 6: 1 and 2). Two bottles with ribs on the body had probably bowl-shaped rims (Figs. 6: 3 and 4), a fragment of a *kuttrolf* with two necks (Fig. 6: 5) and the neck of a storage bottle (Fig. 6: 13) survived as well.

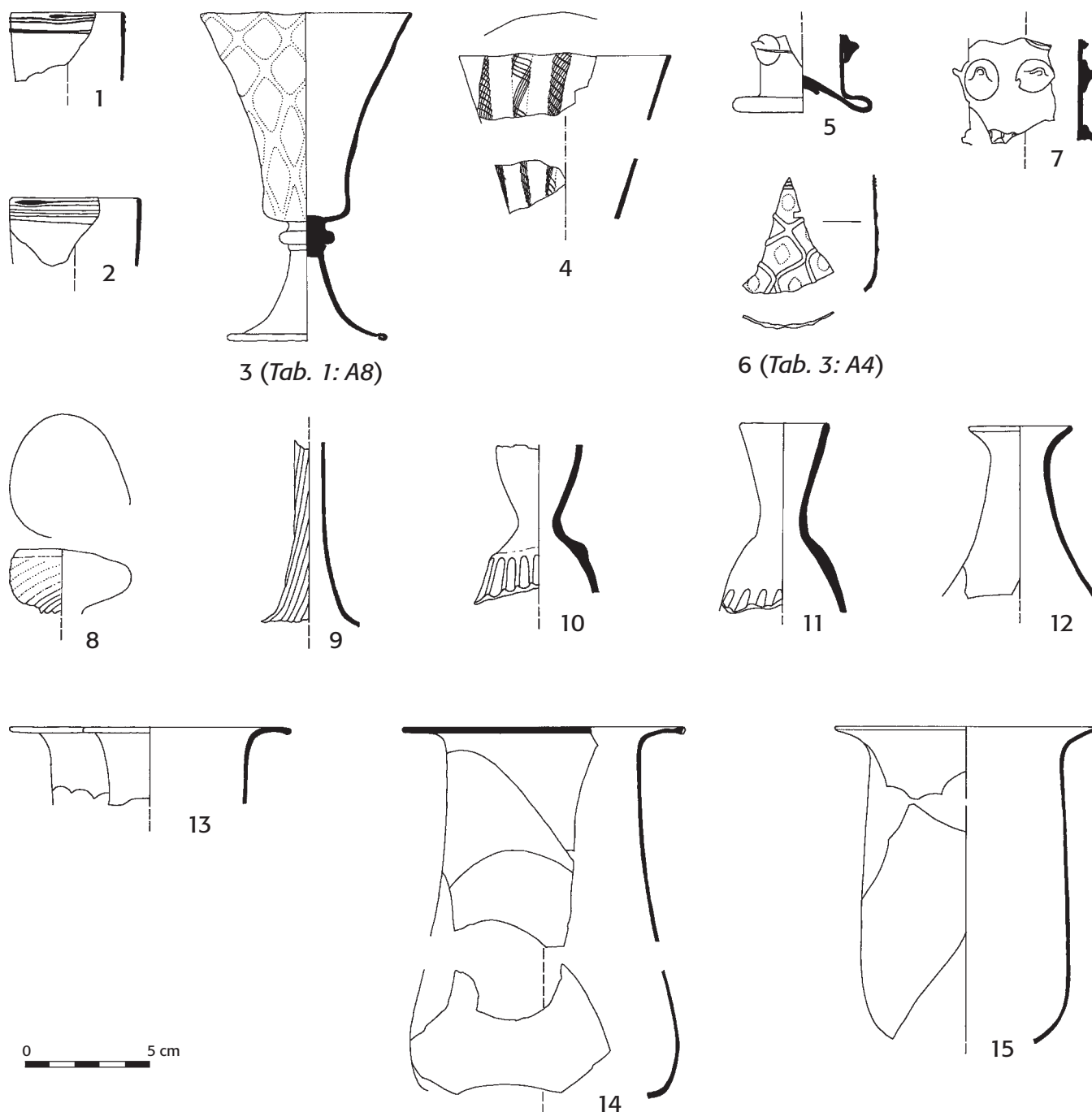


Fig. 7. Bratislava, Ventúrska 3, feature 1/01, layer -426 – -471 cm. 2nd quarter of 16th century. Drawn by H. Sedláčková, technical support L. Sedláčková. — **Obr. 7.** Bratislava, Ventúrska 3, objekt 1/01, vrstva -426 – -471 cm. 2. čtvrtina 16. století. Kresba H. Sedláčková, technická úprava L. Sedláčková.

A *stangenglas* on a low bell-shaped foot with large flat prunts is made of light green glass with corroded stains (foot \varnothing 10.8 cm, Fig. 6: 8) and a beaker with optical decoration of diamonds is of rich green glass (rim \varnothing 5.7 cm, Figs. 6: 11 and 12). The series closes with the bottom section of a hanging lamp of light green glass (body \varnothing 3.5 cm, Fig. 6: 14). Typologically, it is glass made in German glasshouses.

Dat.: last decades of the 15th century – mid-16th century.
Lit: unpublished.

Held by: MÚOP Bratislava, inv. nos. 100, 102, 104–106, 108 (temporarily).

1.8. Ventúrska no. 3 (until 1989 Jiráskova),
reg. no. 53, plot no. 481, NCM-CHR no. 49/2,
burgher house (Fig. 1: 8)

Research history

1965–1966: preliminary archaeological research in relation to the general reconstruction of the building (marked as Jiráskova Street nos. 5–7, Academia Istropolitana, Vallašek 1966; 1972).

2001: Rescue archaeological research (Lesák 2002; 2009).

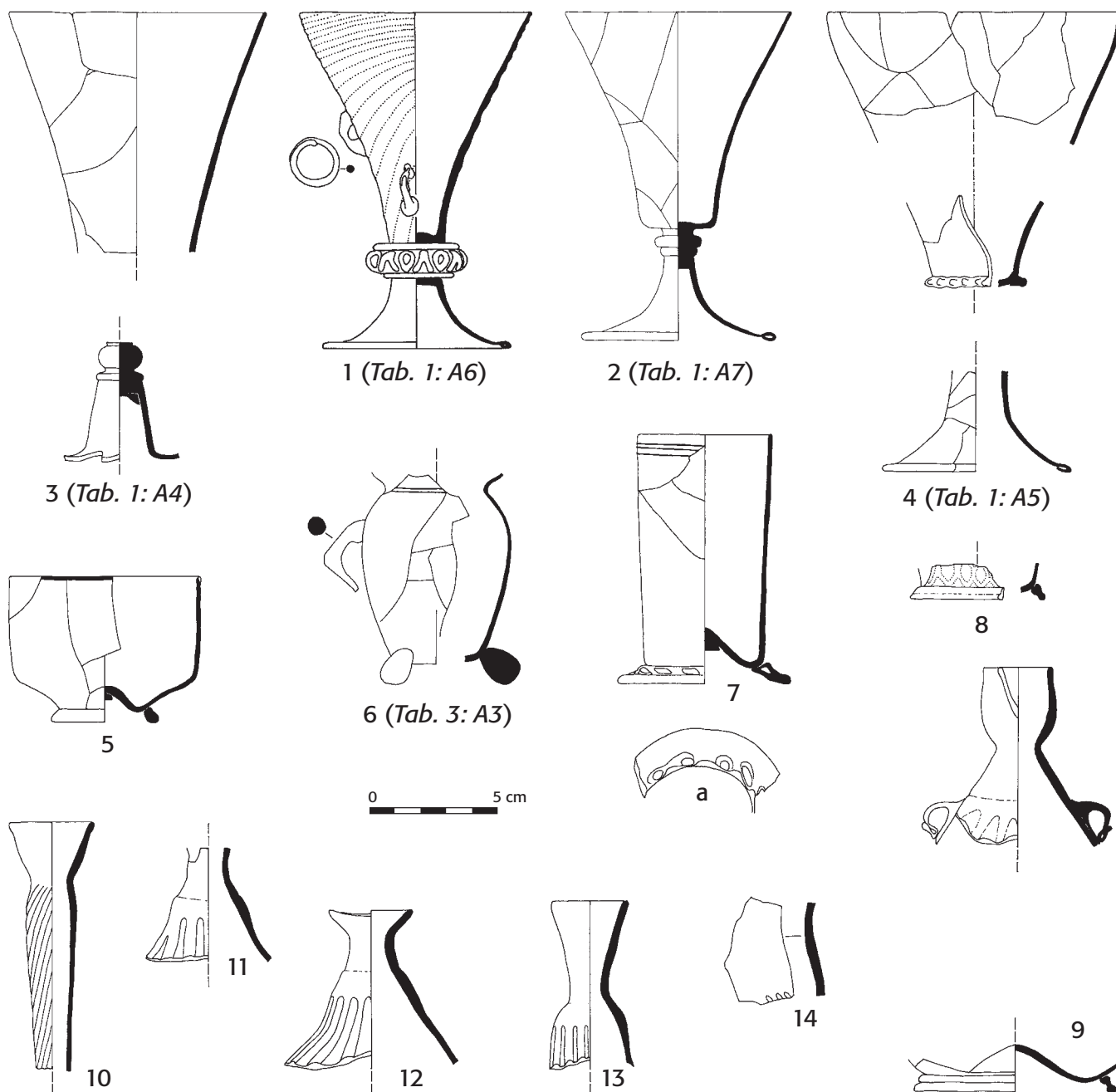


Fig. 8. Bratislava, Ventúrska 3, feature 1/01, layer -471 – -485 cm. Beginning of 16th – mid- of 16th century.. Drawn by H. Sedláčková, technical support L. Sedláčková. — **Obr. 8.** Bratislava, Ventúrska 3, objekt 1/01, vrstva -471 – -485 cm. Počátek až polovina 16. století. Kresba H. Sedláčková, technická úprava L. Sedláčková.

Location

The burgher house is located in the western section of the Bratislava UPA. It is part of the historical-urban block of houses no. 12 demarcated by the streets Panská, Ventúrska, Prepoštská, Kapitulská and Rudnayovo námestie Square (Jankovič 1984; Kotulová et al. 1984).

Social milieu

In 1446 the house was purchased from Štefan Gmaitl for 1000 florins by Bartolomej Kocherdorfer, while Gmaitl postulated the right of a reverse purchase for four years.

In 1473–1478 one half of the house was registered in the name of two professors of the Academia Istropolitana whose needs the building served. The Academia was established in 1465 by Matthias Corvinus and was active in 1465–1490. When its activities ceased in connection with the building, the following names are listed: for the year 1493 *Walasch Posa*, for 1508 *Johannes Tilay*, after 1513 *Bernhard Horvath Bikovich*, for 1535 Count *Jan Szalay* and for 1543 *Šimon Kairo*. The house underwent a major reconstruction from the first half of the 16th century until the first half of the 17th century (Jankovič 1984).

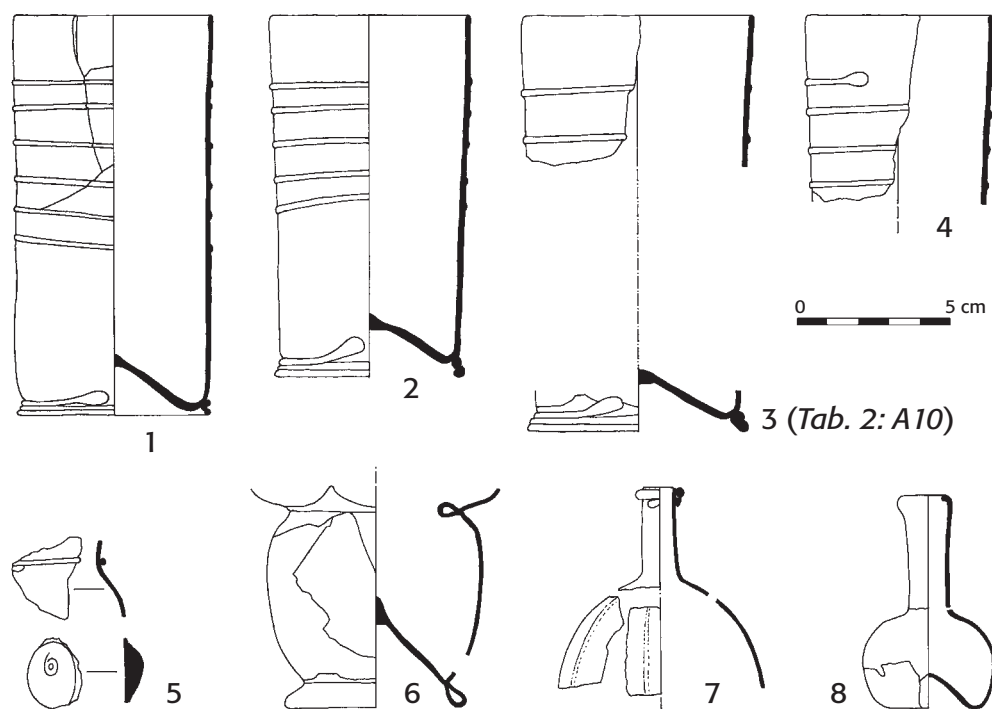


Fig. 9. Bratislava, Ventúrska 3, feature 2/01. Last decades of 15th – beginning of 16th century. Drawn by H. Sedláčková, technical support L. Sedláčková. — **Obr. 9.** Bratislava, Ventúrska 3, objekt 2/01. Poslední desetiletí 15. – počátek 16. století. Kresba H. Sedláčková, technická úprava L. Sedláčková.

Context

Archaeological research was conducted on the ground floor of the street wing, south of the main entrance. The room of an irregular plan had longer sides with the W–E orientation, 7.34 m and 7.24 m long, and the shorter sides 6.27 m by 5.12 m.

Investigated area S3/2001 with the well was located in the northwest corner of the room. The well, a secondary refuse pit, was filled from the early 16th century until ca. 1620. It was sheltered with a simple cylindrical vault with the N–S orientation, disturbed by a test pit in the 1960s. The bottom part of the fill originated before the mid-16th century (Lesák 2009, 25).

1.8.1. Well, secondary refuse pit 1/01

Ground plan: almost square, lining of quarry stone and Gothic bricks.

Dimensions: 130 x 125 x 485 cm, wall thickness 40 cm. Fill: fragments of ceramics and glass, paleobotanical material.

Characteristics of the glass series from layers

-426 cm – -471 cm and -471 cm – -485 cm

-426 cm – -471 cm: in the depth of -471 cm the layer was lined with charred wood and positioned directly on the oldest, “late Gothic” horizon in the latrine.

The layer contained at least 14 vessels including a goblet with optic mold-blown decoration of diamonds of glass of the *Vitrum Blanchum* type, i.e. of Venetian provenance (rim \varnothing 9.0 cm, h. 13.2 cm, Fig. 7: 3; Tab. 1: A8; Lesák 2009, 25, Fig. 1: 8). The funnel-shaped cup with white filigree (rim \varnothing 9.5 cm, Fig. 7: 4; Lesák 2009, Fig. 3: 12) is the oldest find of this luxury glass in Bratislava where it was later imported, particularly in the

second half of the 16th century (Rohanová — Sedláčková 2015).

The common repertoire comprised *kuttrolfs* and table bottles with ribs, originally of light green and blue-green glass (Figs. 7: 8–11). This group might also include the bottom section of a cylindrical beaker with large prunts of corroded glass (body \varnothing 4.6 cm, Fig. 7: 7; Lesák 2009, Fig. 3: 22).

The group of German glass consists of several beakers. The *stangenglas* beaker with large prunts is of rich blue glass and has a tubular ring by the bottom (bottom \varnothing 5.7 cm, body \varnothing 3.4 cm, Fig. 7: 5; Lesák 2009, Fig. 3: 21). The upper sections of two plain cylindrical beakers have fine blue trails wound around the rim (rim \varnothing 4, 6 and 5.3 cm, Figs. 7: 1 and 2; Lesák 2009, Fig. 3: 20). Only a fragment has remained of a cylindrical beaker made of potassium-sodium-calcium blue-green clear glass, with optic-blown decoration of diamonds (Fig. 7: 6; Photo 24; Tab. 3: A4; Lesák 2009, Fig. 2: 28).

The refuse pit fill contained fragments of several hanging lamps; body fragments of three specimens were also in layers dated to the period before the mid-16th century. A lamp of light blue glass has a rich blue trail marvered in the rim, another is of glass with green tint and the smallest fragment of this shape is of heavily corroded glass (Figs. 7: 12–14, rim \varnothing 11.4 and 10.6 cm).

-471 cm – -485 cm: homogenous organic brown layer above the bottom contained a series of table glass and kitchenware.

Fragments of two large Venetian goblets of *Cristallo* correspond to shapes that were made in the last decades of the 15th century (rim \varnothing 10.6 and 11.6 cm, Figs. 8: 3, 4; Photo 2; Tab. 1: A4, A5), while two small beakers

of *Vitrum Blanchum* are more recent. A goblet with diagonal optical ribs and two rows of handles with rings (only one has survived), with relief diamonds on a flattened hollow knob is a luxury product (rim \varnothing 9.2 cm, h. 13.4 cm, *Fig. 8: 1; Photo 4; Tab. 1: A6; Lesák 2009, 25*), while a goblet with a plain cup and a full ring on the stem is an ordinary specimen (rim \varnothing 8.8 cm, h. 12.5 cm, *Fig. 8: 2; Tab. 1: A7; Lesák 2009, 25, Fig. 1: 12*).

This layer also yielded *kuttrolfs* with diagonal ribs on tall slender necks with funnel-shaped rims (rim \varnothing 3.4 cm, *Fig. 8: 10*). Body fragments of upper sections belonged to four ribbed bottles (rim \varnothing 3.4 and 3.0 cm, *Figs. 8: 11–14*). A novel item is a body fragment of a pilgrim bottle (rim \varnothing 2.4 cm, bottom \varnothing 8.0 cm, *Fig. 8: 9*). These vessels are of greenish glass, now covered in dark brown corroded layer (*kuttrolf*), rusty brown (bottles) and light grey corroded layer (pilgrim bottle).

Blue-green potassium-sodium-calcium glass and fine, rich blue trails are well preserved on a low cylindrical bowl with a plain trail by the bottom and on an unusual barrel-shaped bowl, originally on three spherical legs (rim \varnothing 7.6 cm, h. 5.8 and 8.5 cm, *Figs. 8: 5, 6; Photo 23; Tab. 3: A3; Lesák 2009, 28, Figs. 3: 19, 13*). A plain cylindrical beaker with an open-work foot and a fragment of a beaker with optic blown-blown decoration of diamonds are of blue-green glass covered in a thick brown corroded layer (rim \varnothing 5.4 cm, h. 10 cm, *Figs. 8: 7, 8*).

There is not a significant typological difference between the glass vessels in the two layers, which is understandable, given their thickness of ca. 60 cm and the good durability of highly valued drinkware glass.

Analyses: *Tab 1: A4 and A5 Cristallo, Tab. 1: A6–A8 Vitrum Blanchum, Tab. 3: A3 and A4 calcium-potassium-sodium glass.*

Dat.: second quarter of the 16th century (-426 cm – -471 cm) and after 1500 (-471 cm – -485 cm).

Lit.: *Lesák 2009, Figs. 1: 8, 12; 2: 28; 3: 12, 13, 19–22.* Held by: MÚOP Bratislava (temporarily).

1.8.2. Refuse pit 2/2001

Ground plan: probably square, with timber lining preserved on the eastern side and on the northwest corner. Dimensions: cannot be identified due to the modern-age disturbance of the feature.

Fill: fragments of ceramics and glass.

Characteristics of the glass series

The finds of glass come from layer 160–168 cm. They are four unusual cylindrical beakers wound with trails in the upper section, fragments of a *krautstrunk*, a *kuttrolf*, a bottle with a body-tubular ring and a barrel-shaped bottom section, a ribbed bottle and at least two small bottles.

All specimens are of originally greenish or blue-green glass with a thick layer of dark brown-grey corroded layer; the series appears unified. Nonetheless, analyses revealed different chemical composition and origin. The cylindrical beakers probably come from the circle of Bohemian? or Moravian? glass. They are relatively large

and have bottoms wound with a trail (rim \varnothing 6.6 cm, 6.3 cm, 7.8 cm and 6.4 cm, bottom \varnothing 6.4 cm, 7.4 cm and 6.4 cm, h. of the reconstructed specimens 13.5 and 12.2 cm, *Figs. 9: 1–4; Photo 13; Tab. 2: A10*).

According to the chemical composition, Hungarian origin is only proved with the *kuttrolf*.³ The vessel has optic mold-blown ribs on an onion-shaped body and on a slender arched neck and an in-turned bottom without further modifications (rim \varnothing 5.2 cm, bottom \varnothing 6 cm, h. 14.5 cm, *Photo 16; Tab. 2: A9*). The other bottles are also of heavily corroded glass: fragments of a bottle with ribs and a slender plain neck wound with a trail on the rim (*Fig. 9: 7*), a body fragment of a bottle with a body-tubular ring (bottom \varnothing 6.1 cm, ring \varnothing 5.7/4.3 cm, *Fig. 9: 6*) and two small bottles, originally of greenish glass, one of which was possible to reconstruct (neck \varnothing 1.3 cm, bottom \varnothing 2.8 cm, h. ca. 7.2 cm, *Fig. 9: 8*). The *krautstrunk* is represented by two fragments from the neck with a trail and from the body with one large rounded prunt, the glass is completely corroded, beige tint (*Fig. 9: 5*).

Analyses: *Tab. 2: A9, A10 potassium-calcium glass.*

Dat.: last decades of the 15th century – early 16th century.

Lit.: *Lesák 2001a; 2002, 111–112.*

Held by: MÚOP Bratislava acq. no. 9/01 (temporarily).

1.9. Ventúrska no. 7, reg. no. 1266, plot no. 478, NCM-CHR no. 53/1, urban palace (*Fig. 1: 9*)

Research history, Location, Social milieu

Information about the above was listed in relation to medieval glass excavated on the plot (*Sedláčková et al. 2014, 235*).

Context

In room 19 (test pit IV/2001), in the western yard wing of the house, a hollow appeared in the north-western corner when the wooden floor was dismantled, marking a filled well (*Lesák 2001b; 2002*).

1.9.1. Well, secondary refuse pit 4/2001

Ground plan: circular, lining of dry quarry stone, cylindrical brickwork vault.

Dimensions: internal \varnothing 170 cm by the opening, 120 by the bottom, depth 390 cm (-140,5 – -530 cm). The levels of finds are counted from mark 140,50 above sea level. Fill: ceramics, glass, iron items, paleobotanical material.

Characteristics of the glass series

The fill had in the depth of 173–522 cm several layers that yielded almost forty vessels of the tableware character, i.e. table bottles and beakers, mostly of Hungarian and German provenance. Venetian (Italian) pro-

³ The vessel was removed from the pit almost complete, yet before 2009 it disintegrated into fragments and dust in the depository. Its reconstruction at the University of Chemistry and Technology Prague could not restore the original state.

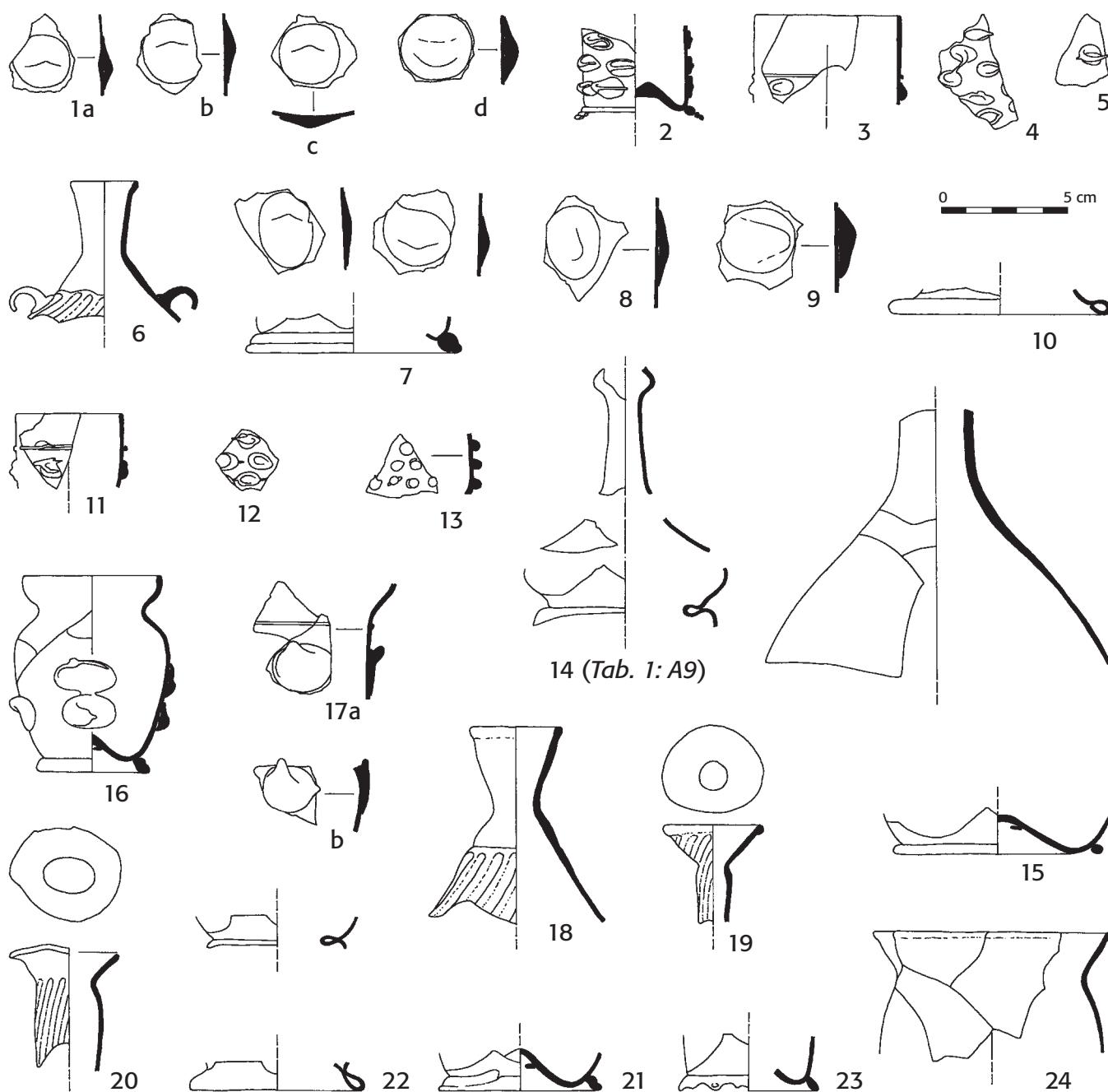


Fig. 10. Bratislava, Ventúrska 7, feature R/01, layers -173 – -418 cm. Beginning of 16th – mid- of 16th century. Drawn by H. Sedláčková, technical support L. Sedláčková. — **Obr. 10.** Bratislava, Ventúrska 7, objekt 4/01, vrstvy -173 – -418 cm. Počátek až polovina 16. století. Kresba H. Sedláčková, technická úprava L. Sedláčková.

ducts are represented by a single bottle with a body-tubular ring (Fig. 10: 14). Hungarian glass mostly occurred between the bottom and depth -418 cm, from this depth until -173 cm German glass prevailed; it got to the pit before the mid-16th century.

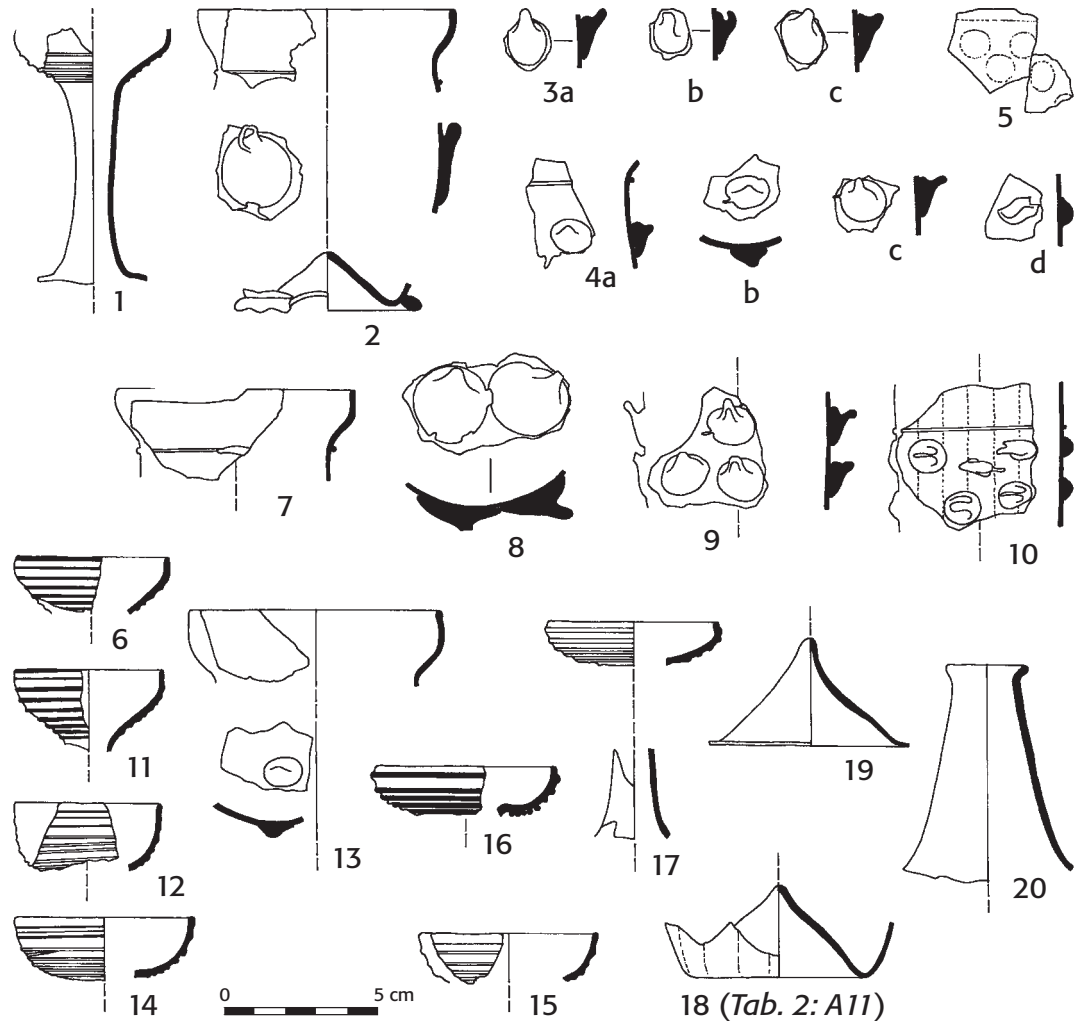
Layer 173–235 cm: bottle with a body-tubular ring? – fragment of a neck with part of a bulge of corroded glass, acq. no. 1/2001-1.

Layer 190–229 cm: fragments of a *krautstrunk* or *stangenglas* with large flat prunts of light green glass, corroded stains (Figs. 10: 1a–d), acq. nos. 2/2001-1, 2.

Layer 229–278 cm: body fragments of two small beakers with prunts and fragments of walls of blue-green clear glass and the upper section of a pilgrim bottle with optic mold-blown ribs of heavily corroded glass, originally colourless with green tint (Fig. 10: 2–6), acq. no. 3/2001-1–5.

Layers 278–303–314 cm: fragments of further beakers with prunts of blue-green clear glass, fragments of a *krautstrunk* with large flat prunts and a plain trail by the bottom of light green glass and a fragment of a bell-shaped foot possibly from a *stangenglas* of rich green glass (Fig. 10: 7–13), acq. nos. 6/2001-1–3, 10/2001-1–3.

Fig. 11. Bratislava, Ventúrska 7, feature 4/01, layers -418 – -522 cm. 2nd quarter of 16th century. Drawn by H. Sedláčková, technical support L. Sedláčková. — **Obr. 11.** Bratislava, Ventúrska 7, objekt 4/01, vrstvy -418 – -522 cm. 2. čtvrtina 16. století. Kresba H. Sedláčková, technická úprava L. Sedláčková.



Layer 344–390 cm: a body fragment of the upper section of a bottle with a body-tubular ring and a barrel-shaped bottom part of the body of colourless glass of the common glass type (ring \varnothing 6.2/4.8 cm, Fig. 10: 14; Tab. 1: A9) and a fragment of a funnel-shaped rim of a beaker. The body fragment of a large pear-shaped bottle had on the upper section clear, bright green glass, the bottom part with the bottom wound with a trail showed distinctly corroded glass (bottom \varnothing 8.5 cm, Fig. 10: 15). There were also fragments of a body with ribs of corroded grey glass (bottle or *kuttrolf*), acq. nos. 12/2001-1, 2, 18/2001-1, 19/2001-1, 2.

Layer 390–418 cm: a body fragment of a small *krautstrunk* with pairs of large prunts of rich green clear glass (rim \varnothing 5.6 cm, bottom \varnothing 4.6 cm, h. 8 cm, Fig. 10: 16). Fragments with large prunts of light green heavily corroded glass come from a cylindrical *krautstrunk* (Figs. 10: 17a, b). Table bottles are represented by upper sections of a bottle and a *kuttrolf* with ribs of heavily corroded glass, originally light blue-green (Figs. 10: 18, 19) and fragments of a neck, an in-turned bottom and a body with ribs from another *kuttrolf* of light green glass with a transparent brown corroded layer, acq. nos. 20/2001-1–5, 21/2001-1.

Layer 418–458 cm: this layer was the richest in finds and yielded several variants of bottles and beakers, most of them of heavily corroded glass. There were fragments of a bottle with ribs and a tubular spout in the rim of colourless glass with a layer of rusty brown corroded layer (Fig. 10: 20) and fragments of a bottle with a bowl-shaped rim of clear colourless glass with green tint and a blue trail on the rim (Fig. 11: 16). Another body fragment of a bottle is of heavily corroded glass with a trail on the rim (Fig. 11: 1). From this variant there are also numerous tiny fragments of plain necks, in-turned bottoms and arched bodies with ribs, chiefly of corroded glass. The body fragment of the upper and bottom section comes from a bottle with a body-tubular ring with a barrel-shaped bottom section of the body and is of completely corroded glass, beige (bottom \varnothing 7.6 cm, ring \varnothing 5.2/3.8 cm, Fig. 10: 22).

The bottom part of a beaker with a pincer trail by the bottom is of glass with green tint (bottom \varnothing 5.8 cm, Fig. 10: 23), a beaker with a plain trail by the bottom is of light green glass with stains caused by corrosion process (bottom \varnothing 6.6 cm, Fig. 10: 21). A reconstructed body fragment and further fragments evidence two to three *krautstrunks* of light blue-green glass, with a layer of whitish to beige corroded layer on the surface (rim



Photo 1. Bratislava Castle, refuse pit 105/09. Photo Miloš Strnad. — **Foto 1.** Bratislavský hrad, jímka 105/09. Foto Miloš Strnad.



Photo 2. Ventúrska 3, refuse pit 1/01 (Tab. 1: A5). Photo Miloš Strnad. — **Foto 2.** Ventúrska 3, jímka 1/01 (Tab. 1: A5). Foto Miloš Strnad.



Photo 3. Sedlárska 4, refuse pit X/87–88? Photo Miloš Strnad. — **Foto 3.** Sedlárska 4, jímka X/87–88? Foto Miloš Strnad.

Sample	Street	SiO ₂	Al ₂ O ₃	CaO	K ₂ O	Na ₂ O	MgO	MnO	Fe ₂ O ₃	P ₂ O ₅	TiO ₂	BaO	SO ₃	Cl	SrO	Minorite	Figure	Issue
A1*	Michalská 6	63.5	0.1	12.4	19.1	n.d.	2.4	0.4	*0.2	1.2	n.d.	0.2	0.4	n.d.	n.d.		Fig. 3: 5; Photo 11	Torňošová 2014
A2*	Michalská 6	93.8	1.1	1.2	0.8	n.d.	0.4		*1.1	n.d.	n.d.	0.8	n.d.	n.d.	n.d.		Fig. 3: 3	Torňošová 2014
A3*	Michalská 6	60.5	0.7	16.5	17.7	n.d.	2.4	0.4	*0.2	1.2	n.d.	0.2	0.4	n.d.	n.d.		Fig. 3: 4; Photo 15	Torňošová 2014
A4	Michalská 6																corroded; Fig. 3: 6	Torňošová 2014
A5*	Michalská 6	59.5	0.5	16.4	18.3	n.d.	3	0.4	*0.2	0.9	n.d.	0.5	0.4	n.d.	n.d.			
A6*	Michalská 6	58.3	0.5	14.3	22.3	n.d.	2.9	n.d.	*0.1	0.9	n.d.	0.5	0.4	n.d.	n.d.			
A7*	Michalská 6	66.2	0.6	12.2	17.3	0.2	3.3	0.5	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.		Fig. 3: 11; Photo 12	
A8*	Michalská 6	63.3	0.5	13.2	18.8	n.d.	3	0.4	*0.2	0.9	n.d.	0.5	0.4	n.d.	n.d.		Fig. 3: 14; Photo 10	
A9*	Ventúrska 3	56.8	0.9	15.1	22	n.d.	3.2	n.d.	*1	0.9	n.d.	n.d.	n.d.	n.d.	n.d.		Photo 16	Rohanová — Hrubá 2013
A10*	Ventúrska 3	55.7	1.5	16.5	19.2	n.d.	3.5	0.6	*0.7	2.3	n.d.	n.d.	n.d.	n.d.	n.d.		Fig. 9: 3; Photo 13	
A11	Ventúrska 7	54.3	1.6	18.4	20	0.2	2.7	0.7	0.4	0.7	<0.1	0.3	0.3	<0.1	0.1	ZnO, Rb ₂ O, CuO < 0.1; PbO, ZrO ₂ , Co ₃ O ₄ < 0.01	Fig. 11: 18	
A12	Ventúrska 3, obj. 1/01	49.2	2.3	19.1	22.6	0.7	2.8	0.6	0.6	0.9	<0.1	0.2	0.3	<0.1	<0.1	ZnO, Rb ₂ O, SnO ₂ < 0.1		
A13*	Ventúrska 3, obj. 1/01	69.6	0.4	11.3	11.1	4.1	2.2	0.5	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.			Torňošová 2014

Tab. 2. Bratislava, potassium-calcium glass*SEM Table /EDS or XRF [wt%] (*rp.* = refuse pit, *n.d.* = not determined, *FeO). — **Tab. 2.** Bratislava, draselno-vápenaté sklo [hm%].

Sample	Street	SiO ₂	Al ₂ O ₃	CaO	K ₂ O	Na ₂ O	MgO	MnO	Fe ₂ O ₃	P ₂ O ₅	TiO ₂	BaO	SO ₃	Cl	SrO	Minorite	Issue
A14*	Olomouc, Pavelčákova 22	54,4	4	14,5	20,8	0,8	2,6	0,4	*0,5	1,1	0,3	n.d.	n.d.	0,1	n.d.	CuO: 0,6	Sedláčková 2001, č. kat. 3.9.9, Anal 6
A15	Brno, Josefská 10	50,3	3,4	20,3	18	1	2,6	1,1	1,3	1,1	0,1	0,2	0,2	0,1	<0,1	Co ₃ O ₄ , ZnO, Rb ₂ O, CuO, ZrO ₂ , NiO < 0,1; Bi ₂ O ₃ < 0,01	Sedláčková — Rohanová et al. 2016; Tab 4: A022
A16*	Brno, Josefská 10	62,3	0,9	13,5	16,4	0,8	2,4	0,8	*1,8	0,8	n.d.	n.d.	0,3	n.d.	n.d.		Sedláčková — Rohanová et al. 2016; Tab 4: A021
A17	Brno, Petrov 2	59	1,9	13,7	20,3	< 3	3,6	0,6	0,5	n.d.	n.d.	n.d.	n.d.	<0,1	0,1	PbO, ZnO, Rb ₂ O, CuO < 0,1	Sedláčková 2007, Fig. 20: Pet 1–104
A18*	Maďarsko, Pomáz	57,4	0,8	13,9	22,9	n.d.	2,5	0,4	0,3	1,1	0,2	0,2	0,3	n.d.	n.d.		Černá A. 2015
A19	Chrudim, Hradební	62,3	2,3	17,5	11,6	0,5	2,5	0,7	0,7	1	0,3	0,2	0,3	0,1	0,1		Rohanová nepubl.
A20*	Olomouc, Hrnčířská	50,9	4,4	17,3	19,1	0,6	3,5	0,8	*1,1	1,3	0,5	n.d.	n.d.	0,1	n.d.	CuO: 0,3	Sedláčková 1998, Anal 5
A21*	Olomouc, Pavelčákova 22	54,9	3,9	15,3	19	0,5	2,5	0,7	*0,9	1	0,3	n.d.	n.d.	0,1	n.d.	CuO: 1,0	Sedláčková 1998, Anal 8

Tab. 2a. Potassium-calcium glass, Moravia (Olomouc, Brno), Bohemia (Chrudim) and Hungary (Pomáz) *SEM/EDS, XRF or μ -XRF [wt%]. — **Tab. 2a.** Draselno-vápenaté sklo (mimobratlavské nálezy: Olomouc, Brno /Morava/, Pomáz /Maďarsko/, Chrudim /Čechy/) [hm%].

ø 8.7 cm, Figs. 11: 2, 3a–c, 4a–d). One unusual shape is a plain pot-shaped beaker of corroded crumbly brown glass (rim ø 9.7 cm, Fig. 10: 24). A small fragment of corroded glass (opaque beige) comes from a beaker? with optic mold-blown decoration of lenses (Fig. 11: 5), acq. nos. 22/2001-1, 2. 23/2001-1-6, 26/2001-1-4, 27/2001-1-12.

Layer 418–458–522 cm: numerous fragments of ribbed bodies and body fragments of two bowl-shaped rims of bottles. One features a blue trail, the other has three blue upper trails and the others are colourless (Figs. 11: 11, 12). A fragment of a bowl-shaped rim and fragments of bodies with prunts come from three *krautstrunks* of light green glass with whitish stains caused by corrosion process (rim ø 8 cm, Figs. 11: 7, 8), a fragment with three pincer prunts is of grey corroded glass (body ø 8 cm, Fig. 11: 9). The fragment of another beaker has vertical optic-blown ribs and prunts with folded tips. It was made of colourless glass with green tint (body ø ca. 5.6 cm, Fig. 11: 10), acq. no. 25/2001-1-8.

Layer 458–491 cm: fragments of ribbed bottles of corroded and clear colourless glass with green tint.

Fragments of four bowl-shaped rims are wound with blue trails (one, Fig. 11: 16), one has three upper rows of blue trails and the others are colourless (Fig. 11: 14), and on two the trails are only colourless (Figs. 11: 15, 17). A fragment of a bowl-shaped rim and a fragment of the body with one small prunt have survived of a *krautstrunk*, the glass is corroded, light beige (rim ø 8.5 cm, Fig. 11: 13), acq. nos. 28/2001-1-4, 29/2001-1-4.

Layer 491–522 cm: almost complete in-turned bottom and part of the body with ribs from a bottle of clear colourless potassium-calcium glass with green tint (bottom ø 6 cm, Fig. 11: 18, Tab. 2: A11) and fragments of further bottoms of identical vessels. The conic body of a storage bottle is of corroded dark grey glass (rim ø 2.8 cm, Fig. 11: 20), acq. nos. 30/2001-1 and 36/2001-1.

Analyses: Tab. 2: A11 potassium-calcium glass.

Dat.: first half of the 16th century (to the depth of -314 cm finds from the second and third quarter of the 16th century prevail).

Lit.: unpublished.

Held by: MÚOP Bratislava (temporarily).

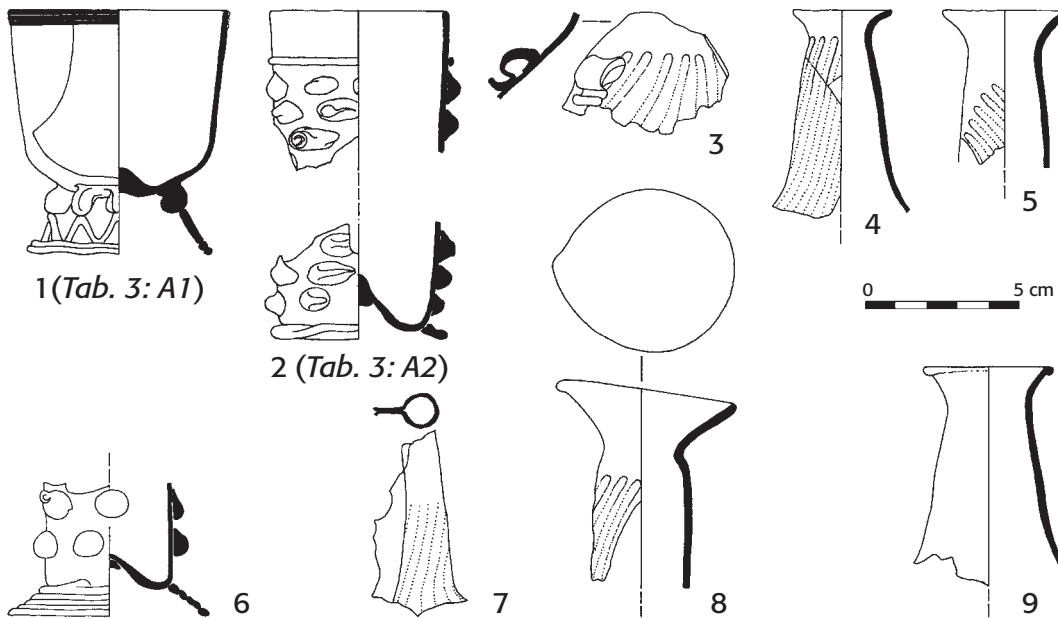


Fig. 12. Bratislava, **1, 2** – Kapitulská 16, feature 1/76. 2nd quarter of 16th century; **3–9** – Vodná veža, feature 1/74. 2nd quarter of 16th century. Drawn by H. Sedláčková, technical support L. Sedláčková. — **Obr. 12.** Bratislava, **1, 2** – Kapitulská 16, objekt 1/76. 2. čtvrtina 16. století; **3–9** – Vodná veža, objekt 1/74. 2. čtvrtina 16. století. Kresba H. Sedláčková, technická úprava L. Sedláčková.

1.10. Vodná veža, tollhouse (vernacular term referring to the heritage building), **Nábřeží arm. gen. L. Svobodu 2, plot no. 545, NCM-CHR no. 653/1 (unified title NCM – Veža strážna)** (Fig. 1: 10)

Research history

1964: localization of a fortification at Vydrická Street 46, 48, 50, Bratislava City Museum (Fiala — Plachá — Vallašek 1967).

1971: research during the demolition of the Podhradie quarter (A. Píffl).

1973–1984, 1988: systematic research into the Vodná veža complex (36 test pits), MSPS and OP (Klinčoková — Ferus 1982; 1989; Klinčoková — Ferus — Kamenická 1986; Baxa — Ferus — Klinčoková 1989; Polla — Vallašek 1991, 162, 164).

Location

The Vydrica suburban settlement that was part of the Podhradie quarter below Bratislava Castle and originally fell under its legislation. After 1390 Vydrica was joined with the town. Vodná veža (Water Tower) became part of the fortification system in the outer ward of the town walls and protected the western entrance to the town, above the ford. It was situated at the intersection of two historical trade routes, the Danube Road and the Amber Road (Klinčoková — Ferus 1989, 68; Šimončíčová Koóšová et al. forthcoming).

Social milieu

Archive materials convey the history of Vodná veža from the year 1254.⁴ It primarily served for the protection of the Danube ford, and it also was the first tollhouse. Toll was divided into three parts: one third went to the

abbey in Pannonhalma, one third to the abbey in Pilisi, and one third to the Bratislava governor (later to the town). The recipients usually hired their share. In the second half of the 16th century the place hosted an elitist company of men known as *stubengesselschaft*; the members would meet to discuss politics and drink wine (which was probably done there before). For the dating of the glass finds it is important that the building was, for strategic reasons, blown up by General Henri Duval Dampierre on 9 October 1620. After the destruction of the fortification, parts of the masonry were incorporated into new buildings (Klinčoková — Ferus 1982, 109–111; 1989, 68–69; Polla — Vallašek 1991, 162).

Context

Test pit S13/74 south of the south wall of Vodná veža uncovered square-shaped masonry from the Roman period, while the north-west section of the test pit unearthed a semi-circular gate with paving of irregular quarry stones. A well with a stone “wreath” was uncovered in the south-west corner of the pit (Klinčoková — Ferus 1982, 114; 1989, 71; Klinčoková — Ferus — Kamenická 1986, 12, 13).

1.10.1. Well, secondary refuse pit 1/74

Ground plan: circular, stone “wreath”.

Dimensions: external \varnothing 120/internal 60 cm, depth > -550 cm.

Fill: ceramics including Gothic goblets and tiles, glass.

Characteristics of the glass series

The finds of glass from the well were not registered according to depth or layers. They all come from the 16th century, and typologically a small group can be identified among them from the period before the mid-16th century, as well as glass from ca. 1550–1620 when the well ceased to exist.

⁴ Detailed history of Vodná veža and its material finds will be discussed in an article in *Archaeologia historica*.

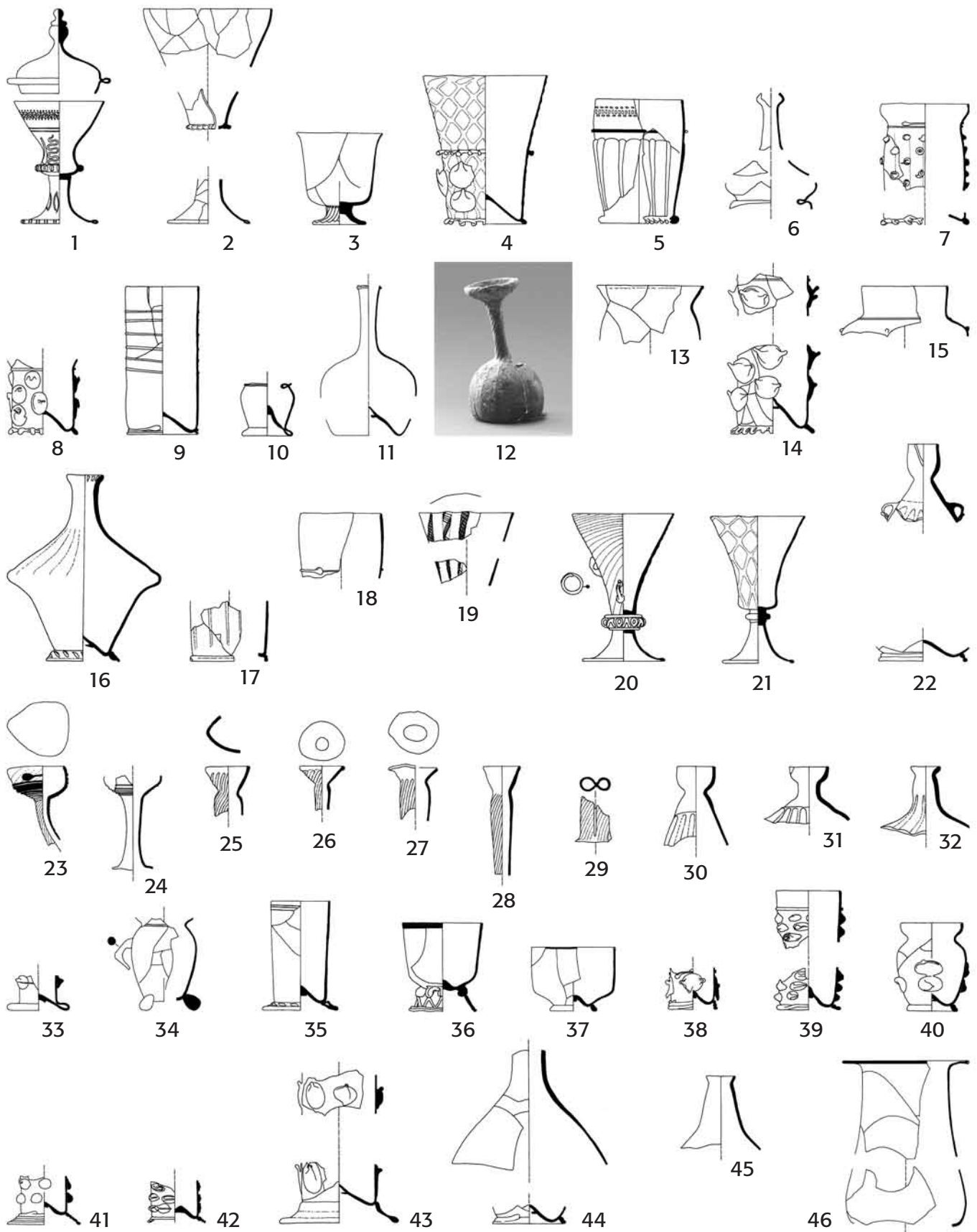


Fig. 13. Types of vessels in Bratislava from last decades of 15th – mid- of 16th century. Last decades of 15th – beginning of 16th century: **1–6** – Venetian glass; **7–13** – glass produced in today-Hungary; **14–16** – glass produced in Germany; **17–18** – Bohemian glass; 1st half of 16th century: **19–21** – Venetian glass; **22–32** – glass produced in today-Hungary; 2nd quarter of 16th century: **33–46** – German glass. Drawn by H. Sedláčková, technical support L. Sedláčková. — **Obr. 13.** Typy nádob v Bratislavě z posledních desetiletí 15. až poloviny 16. století. Poslední desetiletí 15. – počátek 16. století: **1–6** – benátské sklo; **7–13** – uherské sklo; **14–16** – německé sklo; **17–18** – Čechy; 1. polovina 16. století: **19–21** – benátské sklo; **22–32** – uherské sklo; 2. čtvrtina 16. století: **33–46** – německé sklo. Kresby H. Sedláčková, technická úprava L. Sedláčková.

The older group comprises vessels of blue-green glass with a transparent brown corroded layer typical of Hungarian glasshouses: a *stangenglas* on a foot of coiled trail (Fig. 12: 6), a *kuttrolf* with two necks with diagonal ribs (Fig. 12: 7) and several ribbed bottles (Figs. 12: 4, 5, 8, 9). Fragments of the upper section of a pilgrim bottle are also of blue-green glass, while a larger and possibly younger body fragment is of colourless glass covered in a white-yellow corroded layer (Figs. 12: 3, 10).

Dat.: first half of the 16th century.

Lit.: unpublished.

Held by: MÚOP Bratislava (temporarily).

2. Analysis of the finds in terms of typology and glass composition

The glass comes from features at Michalská 6 (1.3), Panská 16 (1.4), Panská 24 (1.5), Sedlárska 4 (1.6), feature 2 at Ventúrska 3 (1.8.2) and feature 4 at Ventúrska 7 (1.9) filled between the last decades of the 15th century and the mid-16th century, and from layers in features filled in longer time periods at Kapitulska 16 (1.2), Sedlárska 6 (1.7), feature 1 at Ventúrska 3 (1.8.1) and from the well in Vodná veža (1.10). There are also finds from Bratislava Castle, from earlier excavations conducted in the 20th century and in 2009 (1.1).

The period of the second half of the 15th century and the mid-16th century was exceptionally rich in glass. It was the period when regional glassmaking flourished in Europe and glass products became affordable for broad urban strata. Venice resumed its leading position in the innovation of production and in the introduction of new shapes and decoration techniques, and the city influenced and inspired glassmaking in the whole of Europe. One novelty in Venetian technology was *Cristallo*, completely colourless glass whose quality was based on the use of a leachant from soda ash and very low content of ash. Clear colour glass was produced as well, coloured with polyvalent metal ions: purple (Mn³⁺), blue (Co²⁺) and emerald green (Fe²⁺ and Cu²⁺). Opaque glass was white, light blue and blue-green opacified with compounds containing antimony, lead and/or tin or with the addition of bone meal (apatite). Decoration saw return to colour enamels and gilding and the revival of engraved decoration introduced in the ancient era, now with the use of the diamond point. Popular decoration techniques included *filigrano*, the marvering of opaque white sticks of lead glass opacified with particles of cassiterite (SnO₂), less often with red or blue sticks.

The development of glassmaking in Italy was not limited to Venice. There were also numerous glasshouses in Liguria and Tuscany whose production did not differ much from that of Venice. They produced glass of the same formula and shapes as those introduced in Venice. Apart from luxury vessels such as goblets and bowls for the upper classes throughout Europe, affordable goods included beakers with optic mold-blown decoration (Mendera 2002).

An important glassmaking circle took shape in the German lands where potassium-calcium glass was made.⁵ Mass production of cheap, popular glassware was enabled by the technique of optic mold-blown de-

coration. *Maigeleins*, *rippenbechers* and *kreuzrippenbechers* are documented among archaeological finds by thousands of specimens (Baumgartner — Krueger 1988, 296, 307, cat. nos. 357, 336 and 373). Tall club-shaped goblets and multi-sided *achtkantglas* beakers, beakers and *krautstrunks* of many forms were also popular. A novel feature that appeared in German glassmaking around 1500 was with an open-work foot and a coiled foot (Henkes 1994, 90, Fig. 60). Apart from green and blue-green calcium-potassium glass there was red opaque glass; blue glass was employed more and more often. Among numerous variants of table bottles, *kuttrolfs* with ribs are best known. Direct influence of Venetian glass can be also observed on the return of goblets; however, in German glassmaking these were represented by footed beakers (Baumgartner — Krueger 1988, 408–417). The variety of shapes, decoration and kinds of glass corresponds with the general spirit of the late Gothic style (overview of shapes, Prohaska-Gross 2002, 210–212, Fig. 2).

According to information from some locations, for example Most, glassmaking in Bohemia was in decline that manifested itself in archaeological series by a decrease in finds (Černá 2002, 108–109). This situation was most obvious in Prague where minimum finds are reported from the period after the mid-15th century (Žďárská 2014, 126). Yet some material from this period has been published from several Czech towns and castles (České Budějovice: Krajč 2007; Cheb: Šebesta 1979; Klatovy: Vondráčková 1996; Kutná Hora: Lehečková 1975; Most: Černá 1997; Plzeň: Frýda 2007; Tábor: Krajč et al. 1998; castles Radyně, Plzeň-jih District and Toužim, Karlovy Vary District: Frýda 1979; castles Rabí and Klenová, Klatovy District, Gutštejn, Tachov District: Frýda 2000).

A boom in the use of glass occurred in Hungary. During the reign of Matthias Corvinus, after 1476, the political, cultural and trade ties between the Venetian Republic and the Kingdom of Hungary were restored. Venetian glass made its way back to Hungary under Corvinus, King of Bohemia and Hungary and a keen admirer of the Italian renaissance. Glassware was commissioned for the king and the members of the highest secular and religious circles, and also sold by Venetian merchants in Buda (Balogh 1975, 300–301). Archaeological finds from Buda, Visegrád, Tát and other Hungarian towns and castles (Solyvár) evidence its spread in the second half of the 15th century all over the territory of the present-day Hungary (for finds see Gyürky 1986; 1991; Mester 1997; Megyeri 2012). There was also a significant amount of glass in Upper Hungary, today's Slovakia. Venetian glassmaking and the wealth of the towns are illustrated by six goblets with the emblem of Bardejov commissioned in Venice by the local council (Balogh 1975, 301). Fragments of ribbed foot of Venetian beakers have been published from research into the monastery in Krásna nad Hornádom near Košice and from Bratislava Castle (Füryová — Janovičková 1988, 621, Figs. 1: 1–4).

⁵ Glass, particularly from this period, was introduced in specialist circles in the 1930s by Franz Rademacher, who classified and defined basically all types and shapes of glass from German glasshouses (Rademacher 1933).

Nonetheless, domestic glass of potassium-calcium composition prevailed in Hungary, produced by numerous glasshouses. In the mid-15th century a glasshouse was established in Óbuda (now part of Budapest) by Italian master Antonius (*Gyűrky 2003*, 48), further glasshouses were unearthed: three in Diósjenő, the oldest one active from the 13th century until the 15th century, and glasshouses II and III from the second half of the 15th century until the first half of the 16th century (*Mester 1997; 2003; 2010*, 659). Two glasshouses were investigated in Visegrád, one from the second half of the 14th century and the first half of the 15th century, the other active in parallel with the more recent glasshouses in Diósjenő. The younger glasshouse (Rév utca 5) was a genuine factory comprising two workshops symmetrically located in a masonry building of 29 x 10 m. Each workshop had two rooms, one with an oval kiln for the manufacture of blown glass, the other contained a square-plan kiln probably for the cooling of products. The glasshouse produced window discs for the construction of Corvinus's palace in Visegrád in 1470–1490 and supplied hollow glass not only to the palace but also to Buda (*Mészáros 2008; 2010; 2014*). The latest investigated glasshouse is in Pomáz where at least five masonry buildings have been excavated, of the same dimensions as the "royal" glasshouse in Visegrád and active in the same period. One building has been investigated so far, also similar in its internal layout and glassmaking equipment to the glasshouse in Visegrád. The assortment was dominated by table bottles and beakers (*Megyeri 2015*, Tab. IV: 7).

The repertoire in Visegrád included painted window panes, bottles with a handle, beakers with bottoms wound with a pincer trail and goblets (*Mészáros 2010*, 684, Fig. 16). The finds from the glasshouse are bottles of different variants including those with a body-tubular ring and the bottom barrel-shaped part of the body, bottles with a bowl-shaped rim and *kuttröfcs*, beakers with prunts and *krautstrunks* (*Megyeri 2015*, Tab. VI–XII), same as in Pomáz (*Megyeri 2015*, Tab. XIV–XXIII). These products come from royal palaces in Buda and Visegrád, as well as from other locations in Hungary including Bratislava. The influence of Venice is particularly obvious in goblets and lids, though made of domestic potassium-calcium glass.

Unfortunately, information about glasshouses in the present-day Slovakia only comes from archive sources. In the observed period there were active glasshouses in Sklené near Teplice (1350 – early 18th century, *Gasper 1969*, 153–154, 156; *Bakošová — Pišútová 1978*, 154–155 no. 57), Sklené near Turčianské Teplice (1360–1579, *Gasper 1969*, 152–153; *Bakošová — Pišútová 1978*, 154 no. 56), near Bardejov (1473–1873, *Gasper 1969*, 144, 156; *Bakošová — Pišútová 1977*, 229 no. 2) and in Nová Huta near Bardejov mentioned in relation to the year 1545 (*Gasper 1969*, 156).

Two glasshouses established by Venetian glassmakers are documented near Vienna in the observed period. Nicolas Walch founded a glasshouse in 1486 under the patronage of Matthias Corvinus. Its main purpose was to produce glass whose price and quality would be comparable to Venice; it probably ceased to exist during the Turkish siege of Vienna in 1529. In 1530 a glasshouse

in Vienna was run by Niclas Pitti from Venice, others came into existence after the mid-16th century (*Page 2004*, 30). The assortment of these glasshouses is not known. However, import from the glasshouse in Hall, Tyrol in the second quarter of the 16th century can be excluded (1534–1635) as it produced glass of a different composition (mixed-alkali).

The situation in Moravia that was, beyond doubt, influenced by the country's incorporation into the empire ruled by Matthias Corvinus (1469–1490), is discussed in an extensive study charting the regional development of glass and influences affecting it. Venetian glass got to Moravia sporadically, to Brno and Olomouc, and glass products were imported from Hungary (bottles with bowl-shaped rims), yet the main assortment consisted of domestic products modifying the traditional Gothic beakers of the Bohemian type to suit the requirements of the arriving renaissance. One example of local glassmaking is a regional variant of tall goblets called beakers of the Olomouc type, manufactured in ca. 1480–1540 (*Sedláčková 2007*).

In terms of typology and chemical composition of glass, there were three groups of products in Bratislava: Venetian goods (14 specimens), vessels of potassium-calcium glass made in Hungary and those made in German glasshouses. In the second quarter of the 16th century there appeared a group of calcium-potassium glass from Germany, possibly connected with the incorporation of Hungary into the Habsburg monarchy. The last group indicates transition to the renaissance composition of glass. Products made in Bohemia also sporadically occurred in Bratislava in the first half of the 16th century (*Fig. 13*).

A representational series of glass that comprised all three glassmaking circles was excavated in pit 105/09 at Bratislava Castle, filled in the first half of the 16th century: a Venetian goblet decorated with enamels with a lid, a Hungarian bottle with a bowl-shaped rim and a German *stangenglas* with prunts in the shape of animal heads (*Photo 1*).

Venetian glass (sodium-calcium-potassium glass)

The metamorphoses of the Gothic style of glass products are best documented by **renaissance goblets** that are represented in Bratislava by nine examples. Typologically older variants that occurred in the last decades of the 15th century and in the early 16th century come from Bratislava Castle and Sedlárska 4, in refuse pit 1 at Ventúrska 3 two of the goblets were found. The goblet from the castle, 11 cm tall, counts among small specimens, and although it is decorated with gilding and colour enamels, the shape corresponds to the goblet of *Cristallo* from Ventúrska 3 only preserved in fragments (*Figs. 2: 1; 8: 4; Photos 1 and 2; Tab. 1: A5*). Goblets with chalice-shaped cups above a bottom wound with a pincer trail appear from the last decades of the 15th century. A richly decorated goblet with coats of arms is related to the kingdoms of Hungary and Bohemia; it was made for Matthias Corvinus around 1480 (*Strasser — Baumgärtner 2002*, 20, Fig. 2, no. 1). The above mentioned goblets with lids come from Bardejov, from the period around 1500, yet they have cups separated from the foot by a flattened hollow knob. An identical undec-

orated goblet is depicted in the painting *Lot with His Daughter* by Albrecht Altdorfer from 1537 (*Barovier Mentasti /ed./ 2006*, 106, Figs. 37, 38). The other goblet of *Cristallo* from Ventúrska 3 comes from the same period; it has a solid knob between a funnel-shaped cup and the foot. A body fragment of a funnel-shaped cup was excavated at Sedlárska 4 (*Fig. 8: 3; Tab. 1: A4; 5: 4*). Sedlárska 4 also yielded a footed beaker with a ribbed foot of blue glass, with a slightly opening cup of colourless glass (*Fig. 5: 3; Photo 3*). This combination is typical of Venetian goblets from the late 15th century and the early 16th century, as illustrated by some of the Bardejov goblets. From archaeological contexts, the mentioned ribbed foot of rich blue glass is known, from the monastery in Krásna, and a wealth of finds comes from locations in western Hungary (*Gyürky 1986; 1991; Mester 1997*).

The listed typologically older goblets might have got to Bratislava during the reign of Matthias Corvinus. This is particularly true about finds from Ventúrska 3, where the Academia Istropolitana operated under the king's patronage in 1464–1490.

Goblets with the cup and foot separated with a knob, i.e. “genuine” goblets consisting of three parts, only became standard around 1500. In Bratislava they are represented by three specimens from the first half of the 16th century, from the refuse pit at Ventúrska 3. Almost complete vessels of the glass of the *Vitrum Blanchum* type are smaller than goblets made of *Cristallo*, they have the same dimensions and similar shapes. A luxury goblet with a funnel-shaped cup with optic mold-blown decoration of diagonal ribs has a large flattened hollow knob blown in a mould with diamonds. The cup originally had two rows of three applied handles with hanging rings, the foot is plain, bell-shaped (*Fig. 8: 1; Photo 4; Tab. 1: A6*). An analogy from the same area and period is the body fragment of a goblet with handles from Olomouc (*Sedláčková 2007*, 208, Fig. 27: OIDN20–03), fragments of cups with diagonal ribs come from Buda (*Gyürky 1986*, Fig. XXXVI: 1). The shape of the cup and the knob with diamonds correspond to goblets from the second quarter of the 16th century and younger (e.g. *Barovier Mentasti /ed./ 2006*, 111, Fig. 45).

The same shape of cup is represented by fragments with white filigree from the older layers of the refuse pit (*Fig. 7: 4; Photo 5*). It is the oldest goblet with this type of decoration in Bratislava that anticipated their popularity in the second half of the 16th century (*Rohanová — Sedláčková 2015*). Identical goblets come, for example, from Hall with dating to around 1500 (*Holzhammer 2001*, Taf. 72: 1) and from Trnava (Západoslovenské múzeum Trnava inv. no. 13281/A).

Cheaper products include two goblets of more simple rendering with small hollow rings on the stem that fully correspond to renaissance shapes. Both have funnel-shaped cups, slightly narrow in the middle, one with the optic-blown decoration of diamonds (*Figs. 7: 3 and 8: 2; Photo 6; Tab. 1: A8 and A7*). These goblets are mostly known from archaeological research in Slovenia (e.g. *Kos — Žvanut 1994*, Tab. 3: 22) and Buda (*Gyürky 1986*, Fig. XXXV: 2). Yet the origin of the goblet of the same shape from the first half of the 16th century from Isny im Allgäu is sought in France (*Scheschkewitz — Schmid 2015*, 150 and 155, Figs. 210, 218).

Venetian glass in Bratislava is further represented by **beakers with ribs**, a *berkemeyer* and a fragment of a *krautstrunk*. They all come from the last decades of the 15th century and the first decades of the 16th century. The body fragments of two beakers with ribs made of *Cristallo* and blown in moulds come from Sedlárska 4. They differ through their size and decoration of gold-leaf on the rim: the smaller one has unusual small goblets?, the larger one rectangles (*Figs. 5: 1, 2; Photos 7, 8; Tab. 1: A2, A3*). In Hungary they were found in large numbers in Buda (*Gyürky 1986*, Tab. XXVI: 5, 6 and others), Esztergom (*Gyürky 1991*, Fig. 32: 6) and Kőszeg (*Gyürky 1991*, Fig. 45: 3) and at Solymár Castle (*Megyeryi 2012*, 47, Fig. 64). In Moravia they come from Brno and Olomouc (*Sedláčková 2007*, Figs. 24: Pet1–182 and OlRie–1, 25a). Archaeological finds are dated to the period around 1500 and to the first half of the 16th century, as are the specimens from museum collections. However, judging from the depiction of this beaker in the painting by the Master of Marie of Burgundy *Libro delle Ore* from 1477–90, they were already made in the last decades of the 15th century (*Barovier Mentasti /ed./ 2006*, 50, Fig. 20). In this period, they were also probably imported to Hungary and Moravia.

The *berkemeyer* from refuse pit 1 at Michalská 6 is a relatively large beaker of clear light blue-green glass of the common glass type, with optic-blown decoration of diamonds and two rows of large flat prunts on the bottom part (*Fig. 3: 10; Photo 9; Tab. 1: A1*). This shape occurs from the first half of the 16th century especially in the German lands, and at the turn of the 16th and 17th centuries was considered, along with *roemers*, the culmination of prunted beakers (*Baumgartner — Krueger 1988*, 362–367; *Dumitrache 1990*, e.g. cat. nos. G 141–144, Figs. 16: 5–8; *Henkes 1994*, 71–74, cat. nos. 18.4, 18.5, 189–196). Nonetheless, *berkemeyers* of clear, light blue-green glass with optic-blown decoration of diamonds appear in the last decades of the 15th century. Fragments of one of them come, for example, from the royal palace in Buda (Budapest Történeti Múzeum, inv. no. 80.505). Complete specimens dated to the period around 1500 were published from the chateau in Heidelberg (*Gross 2015a*, 112, Fig. 162 on the right), from Braunschweig (*Bruckschen 2004*, 298, cat. no. 202, Fig. 46: 2) and from Lübeck (*Dumitrache 1990*, 38, cat. no. G 142, Fig. 16: 6). In Bohemia, a similar *berkemeyer* with diagonal ribs was in a well in Cheb, Mincovní Street (*Šebesta 1979*, 90, cat. no. 22; *Hejdová et al. 1983*, 255–256, Fig. 30).

From a *krautstrunk* of Venetian provenance at Sedlárska 6 only a fragment of the body with one large prunt survived. The glass is colourless, thin-walled, and by the broken tip of the prunt a small part of a trail of blue glass is preserved (*Fig. 6: 10*). It is a fragment of a luxury vessel found, for example, in the collections of the Museum of Decorative Arts in Prague; this one has prunts of colourless blue and emerald green glass (*Baumgartner — Krueger 1988*, 343, 344, cat. no. 414).

The assortment of products made of common glass includes a bottle with a body-tubular ring from refuse pit 4 at Ventúrska 7, and bottles from Bratislava Castle are probably of the same glass. Body fragments (*Figs. 2: 5, 6; 10: 14; Tab. 1: A9*) represent their variant spread, in particular, in the Balkans, until the early 17th cen-



Photo 4. Ventúrska 3, refuse pit 1/01 (Tab. 1: A6). Photo Miloš Strnad. — **Foto 4.** Ventúrska 3, jímka 1/01 (Tab. 1: A6). Foto Miloš Strnad.

Photo 5. Ventúrska 3, refuse pit 1/01. Photo Miloš Strnad. — **Foto 5.** Ventúrska 3, jímka 1/01. Foto Miloš Strnad.

Photo 6. Ventúrska 3, refuse pit 1/01 (Tab. 1: A8). Photo Miloš Strnad. — **Foto 6.** Ventúrska 3, jímka 1/01 (Tab. 1: A8). Foto Miloš Strnad.



Photo 7. Sedlárska 4, refuse pit X/87–88? (Tab. 1: A2). Photo Miloš Strnad. — **Foto 7.** Sedlárska 4, jímka X/87–88? (Tab. 1: A2). Foto Miloš Strnad.

Photo 8. Sedlárska 4, refuse pit X/87–88? (Tab. 1: A3). Photo Miloš Strnad. — **Foto 8.** Sedlárska 4, objekt X/87–88? (Tab. 1: A3). Foto Miloš Strnad.

Photo 9. Michalská 6, feature 1/98 (Tab. 1: A1). Photo Miloš Strnad. — **Foto 9.** Michalská 6, objekt 1/98 (Tab. 1: A1). Foto Miloš Strnad.

tury. Their manufacture of sodium-calcium (soda-ash) glass is reported from Ljubljana (Kos 2007, nos. 219–236; Šimek 2010, Fig. 1, 2). Several specimens are known from Moravia – from Brno, Opava and the Cvilín castle where this find is related to the stay of Matthias Corvinus's army (Sedláčková 2004, Fig. 1: 2). Bottles of the same shape were also made in Hungarian glass-houses, but of potassium-calcium glass (see further).

Regional products (potassium-calcium glass)

Vessels of potassium glass make up a much larger group that contains chiefly beakers and table bottles of different variants. In chronological terms, it is a group of vessels from the last decades of the 15th century and the early 16th century, or its first half, and a younger group from the second quarter of the 16th century with overlap to the second half of the 16th century conveyed below.

Products from the older group are mostly of heavily corroded glass, originally colourless with green tint, light green or blue-green. Typologically and by means of chemical analyses, four groups of different origin can be distinguished: from German glasshouses (I), from glasshouses in Bohemia (or Moravia) (II) and in Hungary (III); group IV with possible origin in today's Holland or Belgium is represented by bottles from Ventúrska 7 and 3 and, as comparative material, by a beaker from Brno. In some cases, analysis confirmed preliminary determination of origin on the basis of typology, in others it brought more questions and topics for further research.

Vessels of German provenance by the glass composition (I) – biconical bottles, a beaker with prunts in the shape of animal heads and a club-shaped beaker – are reported from Michalská 6. This origin cannot be doubted with three biconical bottles that are not known from the Czech lands, Upper and Lower Hungary and Lower Austria. A closest specimen comes from Cheb (Šebesta 1979, 132, Fig. 8). They are analogies of bottles with a body-tubular ring and were widespread especially in southern Germany from the late 13th century until the 16th century. Their production of light green “forest” glass is documented in glasshouses in Spessart. The oldest bottles did have a body-tubular ring but it gradually evolved into a collar reaching across the bottom conical part of the body. There were both undecorated shapes and bottles with optic-blown decoration of ribs. Their development, dating and spread as well as evidence in period paintings were investigated by Rita Hannig in relation to finds from Amberg and Regensburg (Hannig 2009, 101–104, 132–134, 182–184). Specimens from Michalská 6 (Figs. 3: 13–18; Photo 10; Tab. 2: A8) are closest to those from Amberg, dated to between the late 14th century and the mid-16th century (Hannig 2009, 203, Fig. 110; Taf. 6: 2; 30: 2).

Prunts in the shape of animal heads were a typical decorative element on German glass in the late Gothic, especially in the Rhine region. Their manufacture is confirmed in glasshouses in the Taurus mountains in the second half of the 15th century (Dornsweg: Steppuhn 2006, 131, Fig. bottom), the majority of finds only come from the first half of the 16th century and in the observed area are related to the import of “blue-green” glass (see further).

Of the whole series, only one beaker has prunts in the shape of animal heads. It was made of rich green glass apparent on the fracture only (Fig. 3: 5; Photo 11; Tab. 2: A1). It has the same cylindrical shape and style of the bottom as other beakers with common large prunts with pincer tips. It is a unique find, with a single analogy (the shape of prunts and corrosion manifestation) from Vienna, with dating to the 15th? century (Tarcsay 2002, 177, Fig. 3). A relatively larger number of beakers with this decoration only come from the period before the mid-16th century when animal heads appeared on “blue-green” glass (see below). Analysis confirmed typological determination of the vessel's origin in German glasshouses, possibly in the Rhine region.

A distinctly club-shaped beaker is documented by a fragment of the upper section with a cylindrical rim, small prunts on the body and a foot (Figs. 3: 11 and 12; Photo 12; Tab. 2: A7). Outside Bohemia, this shape is

common in northern Germany, for example in Lübeck where it is dated to the 15th/16th century (Dumitrache 1990, Figs. 31: 4; 32: 1, 2; cat. nos. 262–264). In this case German origin is also probable.

Glass made in Bohemia (II) was rare in Bratislava, same as in the previous period (Sedláčková et al. 2014, 251). It includes a body fragment of a beaker with vertical droplets from Panská 16 (Fig. 4: 10) and a fragment of a plain rim wound with a trail from a tall beaker of the Bohemian type from Sedlárska 4 (Fig. 5: 6). These are typical shapes of Bohemian glass that also appeared among finds after 1500, although it is not completely clear whether they were still produced then. According to the glass composition the group might comprise a *krautstrunk*, a prunt from another one from Michalská 6 (Fig. 3: 4; Tab. 2: A3, A5) and also cylindrical beakers from feature 2 at Ventúrska 3 (Figs. 9: 1–4; Photo 13; Tab. 2: A10). As the composition of the cylindrical beakers is similar to that of the beakers of the Olomouc type (Tab. 2a: A20 and A21) whose Moravian origin cannot be doubted, the Bratislava finds might also come from this area. However, while *krautstrunks* were common in Moravia, a cylindrical beaker wound with a trail is only known from Olomouc, and its composition corresponds to group III, i.e. Hungarian glass (Sedláčková 2001a, 416, cat. no. 3.9.8, Fig. 2: 7, Tab. 2A: 14). Yet this shape is not represented among finds published from Hungary.

Moravian origin can be also considered with two *krautstrunks* with optic-blown decoration of ribs from Michalská 6 and Panská 24. These beakers are almost identical in shape and are cylindrical, with a bowl-shaped rim; one has large pincer prunts, the other small coiled ones. Both are made of colourless glass with transparent brown corroded layer (Figs. 3: 7 and 5: 7; Photo 14). Their possible origin is perhaps evidenced by optical ribs on beakers of the Olomouc type as in Hungarian glasshouses this decoration was only employed with bottle shapes.

Further vessels such as beakers, *krautstrunks* and table bottles of different variants can be, on the basis of shape analogies and in several cases according to the glass composition, attributed to **glasshouses in Hungary** (III).

Fragments of **beakers with prunts** come from Michalská 6, Panská 16, Panská 24, Sedlárska 6 and Ventúrska 7. They are documented by upper or bottom sections of the bodies (Figs. 3: 1; 4: 5; 6: 7 and 10: 23). Their almost colourless glass (with green tint) is usually covered in a brown-grey or whitish layer caused by corrosion process. None of the beakers with prunts have been analysed, yet numerous analogies come from glasshouses in Visegrád and Pomáz, as well as from Buda, from the palace in Visegrád and from Solymár Castle (Megyeri 2012, Figs. 53–55).

Krautstrunks differ from beakers through large pincer prunts. The composition of a prunt from Michalská 6 corresponds to glass from the glasshouse in Pomáz (Tab. 2: A6); yet the glass of large body fragments with cylindrical bodies, possibly of the same origin, was partly corroded (Figs. 3: 2–4, 6; Photo 15; Tab. 2: A2, A4). Further specimens come from Panská 19 (Fig. 4: 7), from refuse pits 1 and 2 at Ventúrska 3 (Figs. 7: 7;



Photo 10. Michalská 6, feature 1/98 (Tab. 2: A8). Photo Miloš Strnad. —
Foto 10. Michalská 6, objekt 1/98 (Tab. 2: A8). Foto Miloš Strnad.



Photo 12. Michalská 6, feature 1/98 (Tab. 2: A7). Photo Miloš Strnad. —
Foto 12. Michalská 6, objekt 1/98 (Tab. 2: A7). Foto Miloš Strnad.



Photo 11. Michalská 6, feature 1/98 (Tab. 2: A1). Photo Miloš Strnad. —
Foto 11. Michalská 6, objekt 1/98 (Tab. 2: A1). Foto Miloš Strnad.



Photo 13. Ventúrska 3, feature 2/01 (Tab. 2: A10). Photo Peter Horanský. —
Foto 13. Ventúrska 3, objekt 2/01 (Tab. 2: A10). Foto Peter Horanský.

9: 5) and from Ventúrska 7 (Fig. 10: 23). Analogies for typical barrel-shaped *krautstrunks* with a bowl-shaped rim in different modifications can be encountered all

over Europe, with concentration in the German lands. Cylindrical shapes were less common, perhaps typologically older, judging e.g. by a find from Heidelberg from



Photo 14. Panská 24, feature X/87. Photo Miloš Strnad. — **Foto 14.** Panská 24, objekt X/87. Foto Miloš Strnad.



Photo 15. Michalská 6, feature 1/98 (Tab. 2: A4). Photo Miloš Strnad. — **Foto 15.** Michalská 6, objekt 1/98 (Tab. 2: A4). Foto Miloš Strnad.

the early 15th century (Prohaska-Gross 1992, 85, Fig. 97 bottom row, on the left).

In glasshouses in Visegrád and Pomáz active in the second half of the 15th century and in the first half of the 16th century *krautstrunks* made up the basic repertoire (Megyeri 2015, Tab. XI: 69–74; XXII: 185–214), which is confirmed by their spreading in Hungary. Finds also come from Moravia, from the Cvilín castle and Brno – Koblížná 4, náměstí Svobody and Petrov (Sedláčková 2007, 201–202, Figs. 20: Cvi, Kob105, NS115, NS521 and DPL531). The *krautstrunk* from Petrov even has the “Hungarian” composition of glass (Tab. 2a: A17, Sedláčková 2007, Fig. 20: Pet1). Kinga Tarcsay places the finds of *krautstrunks* from Vienna with the group of heavily corroded glass (III, Tarcsay 2002, 177, Formtaf. 3). In Austria they were also in Tulln and Krems (Tarcsay 2003, 169, Figs. 5 and 6).

Special shapes include a large pot-shaped vessel from Ventúrska 7 of completely corroded brown glass, with only analogies among finds from the Teleki palace at Buda Castle (Mester 2010, 654, Fig. 15: 9). A fragment of a cylindrical vessel from Panská 16 with optic-blown ribs and a hook-shaped stick-type handle pincer on the loose end is difficult to determine (Fig. 4: 11).

Table bottles – bottles with a body-tubular ring and the bottom barrel-shaped part of the body, bottles with a bowl-shaped rim and *kuttrolfs*, bottles with ribs and ewers make up a large group. A vast number of fragments have survived, yet the glass was, with a few exceptions, completely corroded and it was not possible to conduct analyses. These bottles were produced in large quantities by glasshouses in Hungary. **Bottles**

with a body-tubular ring were particularly popular; they come from Sedlárska 6 (Fig. 6: 6), Ventúrska 3, refuse pit 2 (Fig. 9: 6) and Ventúrska 7 (Fig. 10: 22). They were of the same shapes as bottles of sodium-calcium (soda-ash) glass (see above) but the glasshouses in Visegrád and Pomáz made them of potassium-calcium glass (Megyeri 2015, Tab. VII–IX: 20–38; Tab. XIV–XVII: 90–131). They were small shapes, possibly used as drinkware.

Bottles with a bowl-shaped rim and *kuttrolfs* with a single neck appeared at Bratislava Castle (Fig. 2: 5; Photo 1), Michalská 6 (Fig. 3: 9), Panská 16 (Fig. 4: 1, 2), Sedlárska 6 (Fig. 6: 5), Ventúrska 3 in feature 1 (Figs. 7: 8, 9; 8: 10) and in feature 2 (Photo 16; Tab. 2: A9). A large series comes from Ventúrska 7 (Figs. 10: 19, 20; 11: 1, 6, 11, 12, 14–18; Photo 17; Tab. 2: A11). The difference between the two shapes is rather insignificant and difficult to identify among fragments. The bottles are related to fragments that have plain rims and necks, often with a spout in the rim (Figs. 2: 3; 7: 8 and 9; 8: 10; 10: 19). In both cases the rims might be wound with trails (blue); a fragment from Panská 16 features an unusual zigzag line of an applied trail (Fig. 4: 2). One exception is an undecorated bottle from Panská 24 that is completely plain (Fig. 5: 8; Photo 18). Fragments of *kuttrolfs* with two necks were only preserved at Sedlárska 6 and in Vodná veža (Figs. 6: 5 and 12: 7). In both cases these might have been later admixtures.

Bottles with ribs on the body and a bowl-shaped rim wound with (usually) a blue trail occurred from the second half of the 14th century until the first half of the 16th century. In trans-Alpine Europe a number of regional



Photo 16. Ventúrska 3, feature 2/01 (Tab. 2: A9). Photo Peter Horanský. — **Foto 16.** Ventúrska 3, objekt 2/01 (Tab. 2: A9). Foto Peter Horanský.



Photo 18. Panská 24, feature X/87. Photo Miloš Strnad. — **Foto 18.** Panská 24, objekt X/87. Foto Miloš Strnad.



Photo 17. Ventúrska 7, feature 4/01. Photo Branislav Lesák. — **Foto 17.** Ventúrska 7, objekt 4/01. Foto Branislav Lesák.



Photo 19. Ventúrska 7, feature 4/01. Photo Branislav Lesák. — **Foto 19.** Ventúrska 7, objekt 4/01. Foto Branislav Lesák.

variants were produced: in Bohemia bottles with ribs and a slender neck wound with a trail from the second half of the 14th century (Drahotová et al. 2005, 100, Fig. 12: III.4; colour plate 9), while in Germany at least 30 bottles were in a refuse pit in Regensburg from the late 14th century (Baumgartner — Krueger 1988, 277

and 278, cat. no. 311), in Braunschweig and other towns in northern Germany there were similar bottles of light blue-green glass (e.g. Bruckschen 2004, 122, cat. no. 172, Fig. 40: 1). Numerous finds come from western Hungary, Lower Austria and Moravia. In Brno and in Moravia in the first half of the 15th century they

Sample	Street	SiO ₂	Al ₂ O ₃	CaO	K ₂ O	Na ₂ O	MgO	MnO	Fe ₂ O ₃	P ₂ O ₅	TiO ₂	BaO	SO ₃	Cl	SrO	Minorite	Figure
A1	Kapitulská 16	60.7	1.7	15.2	10.4	5.3	3.7	0.6	0.7	0.9	n.d.	0.3	0.3	n.d.	n.d.	CeO, V < 0.1	Fig. 12: 1; Photo 20
A2*	Kapitulská 16	57.6	2.2	16.6	12.9	4.4	3	1	*0.6	1.1	n.d.	0.3	0.2	n.d.	n.d.		Fig. 12: 2; Photo 21
A3	Ventúrska 3, rp. 1/01	53.6	2	18.3	14.3	4.3	3.3	0.7	1.2	0.9	<0.1	0.3	0.2	0.2	0.1	ZnO, Rb ₂ O, CuO, Co ₃ O ₄ , SnO ₂ < 0.1	Fig. 8: 6; Photo 23
A4*	Ventúrska 3, rp. 1/01	62.2	1.4	12.5	9.1	7.8	3.6	0.6	*1.5	0.7	n.d.	n.d.	0.2	n.d.	n.d.		Fig. 7: 6; Photo 24
A4a*	Ventúrska 3, rp. 1/01	63	1.6	11.6	8.4	7.4	3.5	0.6	*2.1	0.6	n.d.	n.d.	0.1	n.d.	n.d.	CuO: 0.6	

Tab. 3. Bratislava, blue-green glass, calcium-potassium glass *SEM/EDS or XRF [wt%] (rp. = refuse pit). — **Tab. 3.** Bratislava, modro-zelené, vápenato-draselné sklo [hm%].

Sample	Street	Type	SiO ₂	Al ₂ O ₃	CaO	K ₂ O	Na ₂ O	MgO	MnO	Fe ₂ O ₃	P ₂ O ₅	TiO ₂	BaO	SO ₃	Cl	SrO	Minorite	Issue
A5*	Mikulov, Brněnská D		64.7	1.4	12.7	9.5	5.8	3.2	0.5	*0.5	0.7	0.1	0.2	0.2	n.d.	n.d.		Sedláčková — Rohanová et al. 2016; Tab 4: A212
A6	Brno, Nám. Svobody 17		58	2.2	16.6	12.7	< 3	3	0.9	1.1	n.d.	n.d.	n.d.	n.d.	<0.1	0.1	PbO: 0.3; ZnO, Rb ₂ O, CuO < 0.1	Sedláčková 2007, fig. 22: DPL 531–039
A7	Brno, Nám. Svobody 17		57.1	2.3	18.1	12.2	< 3	3.4	0.8	1.2	n.d.	n.d.	n.d.	n.d.	<0.1	0.1	PbO: 0.3; ZnO, Rb ₂ O, CuO < 0.1	Sedláčková 2007, fig. 15d
A8	Brno, Rašínova 6		58.3	2.2	15.9	12.6	< 3	3.2	0.8	1.1	n.d.	n.d.	n.d.	n.d.	<0.1	0.1	PbO: 0.4; ZnO, Rb ₂ O, CuO < 0.1	Sedláčková 2007, fig. 22: Ra 513–2
A9	Pouzďřany anabaptistů setl.		63.3	1.2	17.7	13.6	< 3	< 2	0.9	1	n.d.	n.d.	n.d.	n.d.	0.2	0.1	PbO, ZnO, Rb ₂ O < 0.1; CuO < 0.01	Sedláčková 2007, fig. 22: Pou–1
A10	Salzburg, Vor der Griebe 3		59.6	2.5	16.9	9.2	< 3	3.4	1	1.1	n.d.	n.d.	n.d.	n.d.	<0.1	0.1	PbO: 0.3; ZnO, Rb ₂ O, CuO < 0.1	Sedláčková 2007, 203 note 7

Tab. 3a. Blue-green calcium-potassium glass, Moravia and Salzburg *SEM/EDS or μ -XRF [wt%] (n.d. = not determined, *FeO). — **Tab. 3a.** Modro-zelené vápenato-draselné sklo (mimobratislavské nálezy: Brno, Mikulov, Pouzďřany, Salzburg) [hm%].

started to replace older bottles with ribs and a funnel-shaped rim, and appeared until the mid-16th century (Sedláčková 2007, 211 a 212, Fig. 34). In Vienna they also occurred until the first half of the 16th century. The different quality of their glass (with low chemical durability) has led to the opinion that they were local imitations of Italian table bottles (Tarcsay 1999, 40, cat. nos. 131–132). Bottles from Bratislava, Brno and Vienna correspond to bottles from sites in western Hungary (Mester 1997, 85, 99, cat. nos. 194, 286; Gyürky 1991, 33, 107, Fig. 24: 5) that are considered products of local glasshouses (Gyürky 2003, 48, Figs. 2: 10; 3: 8, 9; 4: 5).

Of the two analysed Bratislava bottles or *kuttrolfs*, Hungarian composition was found with the specimen from Ventúrska 3, feature 2 (Photo 16; Tab. 2: A9). However, the composition of the bottom section of the other bottle that was one of a few not affected by corrosion process corresponds more to glass from western Europe, today's Holland and Belgium (Fig. 11: 18; Tab. 2: A11) or to the older central-European Gothic technology (basic formula of the Gothic period).

Finds from refuse pits included **table bottles and ewers with ribs**. Specimens from Panská 16 (Figs. 4: 3 and 4), Sedlárska 4 (Fig. 5: 5), Sedlárska 6 (Figs. 6: 1, 2, 4), Ventúrska 3, refuse pit 1 (Figs. 7: 10, 11 and 8: 11–14) and refuse pit 2 (Fig. 9: 7), Ventúrska 7 (Fig. 10: 20) and Vodná veža (Fig. 12: 8) are again of heavily corroded glass, originally light green or blue-green. They have short necks with bowl-shaped or funnel-shaped rims and arched (pear-shaped?) bodies with ribs. This variant of bottles was common in nearly the whole trans-Alpine Europe.

Pilgrim bottles were bottles with a flattened pear-shaped body with optic-blown ribs or diamonds and two handles below the neck. The rendering of the bottoms wound with trails indicates that they counted among

table glass. At the end of 1500, decorated specimens appeared among Venetian glass (e.g. Dreier 1989, 49, cat. no. 17) and in the 16th century they were popular in Germany; over 100 examples are known from museum collections, others come from archaeological research (Sartorius 1992, 116; Baumgartner — Krueger 1988, cat. nos. 535 and 536). In Bratislava body fragments come from Ventúrska 3, refuse pit 1 (Fig. 8: 10) and Ventúrska 7 (Fig. 10: 6; Photo 19), i.e. from the first half of the 16th century, and probably also from Vodná veža (Fig. 12: 3). In the second half of the 16th century these bottles were plentiful in Anabaptist manors in southern Moravia (Sedláčková 2001b, 49 and 50; 2003, 37, cat. no. 2). Outside this area they were relatively rare among renaissance glass.

It appears that glass vessels in the observed period were already a natural part of everyday life. Yet storage bottles that were only used as “packaging” for liquids were few in refuse pits. Their conic necks with out-turned rims signal that they had pear-shaped bodies, sometimes with ribs (Figs. 4: 4, 12; 6: 13; 7: 12; 10: 15; 11: 20; 12: 4, 5, 9).

Glass of the second quarter of the 16th century

The youngest vessels were made of glass of distinct colours: blue-green (Figs. 2: 4; 12: 1; Photos 1, 20 and 24), blue (Figs. 7: 5 and 8: 6; Photos 22 and 23), bright green (Figs. 6: 8; 10: 1–5, 11–13 and 16; 12: 2; Photos 21 and 25) and sporadically rich green (Fig. 10: 10). They differed from the older products through their chemical composition (calcium-potassium) with a higher content of Na₂O (Tab. 3). Glass of this type appeared in Austria (Vienna, Krems and Salzburg) in the early 16th century. In Bratislava it occurred later, before the mid-16th century or in its second half. It was found at Bratislava Castle, Kapitulská 16, Panská 16, Sedlárska 6



Photo 20. Kapitulská 16, feature 1/76 (Tab. 3: A1). Photo Miloš Strnad. —
Foto 20. Kapitulská 16, objekt 1/76 (Tab. 3: A1). Foto Miloš Strnad.



Photo 21. Kapitulská 16, feature 1/76 (Tab. 3: A2). Photo Miloš Strnad. —
Foto 21. Kapitulská 16, objekt 1/76 (Tab. 3: A2). Foto Miloš Strnad.



Photo 22. Ventúrska 3, feature 1/01. Photo Miloš Strnad. — **Foto 22.** Ven-
 túrska 3, objekt 1/01. Foto Miloš Strnad.

and Vodná veža. An accumulation of finds was at Ventúrska 3 in feature 1 and at Ventúrska 7.

The spectrum of shapes of this period is complemented with *krautstrunks* and *stangenglases*, with large flat prunts (Figs. 6: 8; 10: 1, 7–9 and 16). Small shapes have small prunts, with tips stretching to one side (Figs. 10: 2–5, 11–13; 12: 2, 6). A beaker from Bratislava Castle has prunts in the shape of animal heads (Fig. 2: 4; Photo 1).

Simple cylindrical beakers are plain (Figs. 7: 1, 2 and 8: 5), with optic-blown decoration of ribs and with diamond decoration (Figs. 4: 9; 6: 11 and 12; 7: 6; 8: 8; Photo 24), yet there were also special shapes such as a barrel-shaped beaker from Ventúrska 3, refuse pit 1 (Fig. 8: 6; Photo 23). They are regularly decorated with fine rich blue trails in the rim. The bottoms have thick plain trails instead of pincered ones (Figs. 6: 11; 8: 5; 10: 16). Novel features include foot spirally coiled from trails (Figs. 2: 4; 12: 6), hollow bell-shaped foot (Fig. 6: 8) and with open-work foot (Figs. 8: 7 and 12: 1; Photo 20), exceptionally a hollow ring (Fig. 7: 5; Photo 22).

The same shapes of vessels of the glass of the mentioned colours occur in large quantities in Germany. identical analogies can be found basically for every piece, for example, a beaker with prunts from Kapitulská 16 and a *krautstrunk* from Ventúrska 7 (Figs. 12: 2 and 10: 16) correspond with finds from Isny im Allgäu, dated to the period between the late 15th century and the first half of the 16th century (Scheschkewitz — Schmid 2015, 153, 154, Figs. 214, 217). Beakers with optic-blown decoration of ribs or diamonds were typical,



Photo 23. Ventúrska 3, feature 1/01 (Tab. 3: A3). Photo Miloš Strnad. — **Foto 23.** Ventúrska 3, objekt 1/01 (Tab. 3: A3). Foto Miloš Strnad.

Photo 24. Ventúrska 3, feature 1/01 (Tab. 3: A4). Photo Miloš Strnad. — **Foto 24.** Ventúrska 3, objekt 1/01 (Tab. 3: A4). Foto Miloš Strnad.



Photo 25. Ventúrska 7, feature 4/01 and Sedlárska 6, feature 3/89. Photo Branislav Lesák. — **Foto 25.** Ventúrska 7, objekt 4/01 a Sedlárska 6, objekt 3/89. Foto Branislav Lesák.

Photo 26. Ventúrska 3, feature 1/01. Photo Miloš Strnad. — **Foto 26.** Ventúrska 3, objekt 1/01. Foto Miloš Strnad.

in the 16th century, of south-western Germany (Gross 2015b, 126 and 126, Fig. 183). German Gothic glass frequently featured prunts in the shape of animal heads. Luxury *stangenglases* with trunks and garlands have hollow prunts, often of blue glass (Baumgartner — Krueger 1988, 399–407; Beutmann 2014, 159, Fig. 5: 7), small vessels, beakers with open-work foot and

scheuers have solid prunts, sometimes of red opaque glass (Baumgartner — Krueger 1988, 356–358, nos. 435–438, 383, no. 477).

Analogical vessel of German provenance occurred in Salzburg (Wintersteiger 1991, 386–398, esp. cat. nos. 501, 502, 504, 512, 516, 518, late 15th century – first half of the 16th century). The finds include a barrel-

shaped beaker with a handle similar to the one from Ventúrska 3 (Fig. 8: 6; Wintersteiger 1991, cat. no. 509). Vessels of blue-green glass from Krems are dated to the first quarter of the 16th century, including a beaker with prunts in the shape of animal heads (Tarcsay 2003, 170, Fig. 7). Another beaker with animal heads comes from Vienna (Tarcsay 1999, 19, Fig. 1, first half of the 16th century). In Bohemia a vessel with prunts in the shape of animal heads was excavated at Rábí Castle, Klatovy District in a series from the early 16th century (Frýda 2000, 118, no. 5, Fig. 2: 2).

In south Moravia beakers of blue-green glass with prunts and usually on a foot coiled from a trail occurred in Anabaptist settlements in Pouzdřany and Strachotín, i.e. before the mid-16th century. This group comprising *stangenglases*, beakers with optic-blown decoration and with prunts in the shape of animal heads is relatively prominent in Brno (Sedláčková 2007, 196, 197, 202, 203, Figs. 13, 14, 22, 23). The listed published finds have been supplemented with further specimens from the first half of the 16th century from Brno, Josefská 10. One analysed beaker had the composition and shape identical with the group of blue-green glass (Tab. 3: A16), yet the composition of another, optically of the same appearance, differs starkly (Tab. 3: A15). Doubtlessly, this means that vessels in this style were produced in several regions.

Judging from the finds in refuse pit 1 at Ventúrska 3, in Vodná veža and at Bratislava Castle (Maruniaková 1989, 330, Fig. 18a),⁶ households of the upper strata were equipped with glass **hanging lamps**. Three specimens come from the older layer at Ventúrska 3, several were in the younger layer. They were sizeable vessels with rim diameters around 11 cm, with horizontal rims and cylindrical, in some cases pear-shaped, bodies (Figs. 17: 12–14; Photo 26). The majority have in the rim a marvered trail of white, blue, less often red opaque (seal wax) glass. With a few exceptions, the glass is without bubbles and non-melted stones, almost colourless, greenish or bluish.

The culture of high-quality light fixtures made its way to Bratislava palaces and houses of wealthy burghers from royal palaces in Buda and Visegrád where several variants of lamps were employed, including the shapes known from Bratislava (Gyürky 1986, Tab. VI, VII; Mester 2010, 654, Fig. 15). Some lamps from Buda decorated below the rim with enamel points were evidently of Venetian origin (Budapest Történeti Múzeum, inv. no. 8851 1988). These lamps are not known from Moravia, and in contrast, other variants of lamps are not documented in Bratislava.

The dating of these lamps is complicated as they clearly had a long life; they even feature in series from the second half of the 17th century (e.g. in the refuse pit at Sedlárska 5). In refuse pit 1 at Ventúrska 3 they were in layers from the period before the mid-16th century. Yet analyses of several specimens from more recent layers at Ventúrska 3 and from Vodná veža, approximately from the 16th century, showed calcium-potassium glass of the renaissance type (Tab. 2: A13). This means that

⁶ In a drawn reconstruction, the upper section of a lamp was wrongly attached to the bottom part of a goblet with white filigree.

regional glasshouses manufactured these lamps after Venetian models, and apparently in large numbers.

3. Results of the Chemical Analyses of the Glass Composition

Sodium-calcium (soda-ash) glass (ca. 1500)

Analyses of archaeological glass from Bratislava (the methods of analysis see in Sedláčková et al. 2014) confirmed a relatively large proportion of sodium-calcium glass (SiO₂-Na₂O-CaO). In the period when central Europe saw the shift from the basic formula of the Gothic period to the renaissance one, the production of glass in Venice reached its peak. The composition of the analysed sodium-calcium glass corresponds to three main Venetian types (Verità 2009). These were common glass (CG), glass of the *Vitrum Blanchum* type (VB) and the high-quality *Cristallo* glass (C)⁷. The three types of Venetian glass differ visually, not only through their colour shades but also by their optical quality. For example, common glass has greenish, purplish or greyish shades, the *Vitrum Blanchum* glass sometimes has greyish or purplish shades but is usually colourless, while *Cristallo* with its homogeneity and transparency comes close to rock crystal (Verità 1985), is of high quality, colourless and well refined.

The work of M. Verità (2009; 1985) characterizes in detail the above types, also in chemical terms (see Table 1b). In order to describe the period glassmaking formulas, we tried, on the basis of published chemical analyses of raw materials (Verità 1985), to calculate the possible composition of the glass batch. We employed the results of analyses of ash that pointed towards the use of the *allume catino* ash from the *Salsola Kali* plant (Tab. I, A) and the *Soda di Catania* depurata made from it (Tab. I, C). For common glass, the presumed source of SiO₂ is river sand from the Belus river (Henderson 1985), for the *Vitrum Blanchum* glass and *Cristallo* we used for the calculation the chemical composition of siliceous pebbles from the Ticino area (Verità 1985, Tab. I, G).

Common glass (before the 14th century)

The mentioned raw materials in the weight proportion of 100 kg sand: 40 kg *allume catino* : 20 kg *Soda di Catania* and the composition of common glass (CG) calculated from them correspond well with Bratislava samples (Diagram A, a *berkemeyer* from Michalská 6, Tab. 1: A1, and a bottle with a body-tubular ring from Ventúrska 7, Tab. 1: A9). The bottle with a body-tubular ring was coloured to a greyish shade with the use of ca. 2 kg of MnO₂⁸. The *berkemeyer* was not coloured with MnO₂ but its bright green colour was achieved by the

⁷ Published as an invention by the Murano glassmaker Angelo Barovier (Verità 2009) in the mid-15th century; however, our calculations show that glass of the *Cristallo* type was more like enhanced *Vitrum Blanchum*.

⁸ Ash from seaside plants (*Allume catino*) contains, unlike beech wood ash, only traces of Mn (manganese). Manganese (as mineral pyrolusite MnO₂) was added to sodium-calcium glass for decolouring. In contrast, beech ash contains manganese and was not deliberately added to potassium-calcium glass.

addition of a compound of copper (Cu). Both analysed types of glass have a higher proportion of Al_2O_3 (around 2 wt%), just like previously published vessels of sodium-calcium glass with the Gothic recipe (Sedláčková et al. 2014). The calculation of the proportion of raw materials in the glass batch for common glass showed that sand with a high content of Al_2O_3 (up to ca. 5 wt%) was used, as well as CaO (around 10 wt%). These requirements would be well met, for example, by the sand from the Belus river that would also bring CaO in the glass batch. Speculations about sand of volcanic origin can be excluded as it contains too high a content of Al_2O_3 (Brems — Degryse et al. 2012).

Vitrum Blanchum (from 14th century)

From the proportion of CaO : Na_2O (Diagram A) it is obvious that the chemical composition of common glass and *Vitrum Blanchum* is similar in the content of alkali components and SiO_2 . The difference is in the content of Al_2O_3 . Glass of the *Vitrum Blanchum* type from Ventúrska 3 (Tab. 1: A6, A7, A8) and from Brno, Mečová (Tab. 1a: A12) has a lower content of Al_2O_3 in comparison with common glass (CG). The source of Al_2O_3 , as mentioned above, is sought in sand. If we take into account that for the melting of VB very clear siliceous pebbles (*cogoli* from Ticino) were used, then the source of CaO would be missing and it would have had to be added together with another raw material. The hypothesis about the addition of CaO by means of another material is also supported by the fact that the proportion of ash, the main source of CaO, was slightly lower. As for impurities, the main proportion of Fe_2O_3 was added through ash. Yet it was not always possible to decolour glass perfectly with added MnO_2 , as proved by the greyish and purplish shades of VB. Calculations revealed that the VB glass was melted from the glass batch that had, unlike the batch for common glass, a decreased proportion of ash in favour of *Soda di Catania*. Moreover, a raw material bringing CaO in the glass batch had to be added. The glass batch for VB, although it is not obvious immediately, presented a turning point in the glassmaking technology in Venice.

Cristallo (middle of 15th century)

Glass of the *Cristallo* type differed from the mentioned types by the higher proportion of SiO_2 and half the content of CaO and MgO, as shown by samples from Sedlárska 4 (Tab. 1: A2, A3) and Ventúrska 3 (Tab. 1: A4, A5), see Diagram A, and by comparative samples from Olomouc (Tab. 1a: A10) and Brno, Petrov (Tab. 1a: A11). The calculation of the proportions of materials in the glass batch for the production of sodium-calcium glass confirmed that *Cristallo* was melted from very pure sand or quartz pebbles leached ash (called *cogoli*), possibly from the Ticino region in Sicily, and from a small amount of ash (*allume catino*). In comparison with VB, part of the ash was replaced with leached ash. A raw material providing CaO had to be added in the glass batch. If it had not been so, the used sand would have contained CaO but no Al_2O_3 .

The types of glass mentioned above were produced in Venice for a long period of time, and it is not clear if these chemical variants of glass were made in parallel

and employed for different kinds of products, or one after the other, with the outdated types wiped out by the advancing technology. What is certain is that there was an important quality shift from common glass to *Vitrum Blanchum* (change in the source of SiO_2 and addition of a calcic material), and in the production of *Cristallo* the proportion of ash was lowered even more, in favour of leached ash (*Soda di Catania*).

Regional potassium glass⁹

The excavated products of **potassium-calcium** glass (from the last decades of the 15th century and the early 16th century, or its first half), created with the use of the **Gothic technology (recipe)**, were divided into 4 groups, after their possible origin (Diagram B). The basic ingredients of the Gothic glass batch were sand, beech ash and potash (K_2CO_3) in weight proportions 100 : 60 : 40 or 100 : 70 : 30, i.e. to 100 parts of sand 100 parts of a melting agent (flux) were added, divided between ash and a potash. The slightly different composition of the analysed Gothic glass results from the variability of the composition of beech ash in different regions (proportion of CaO : K_2O and the content of minority components). In the **renaissance** period lime (CaCO_3) started to be added in the glass batch as a substitute for expensive potash and part of ash, together with sodium salt (NaCl) for refining. This glass is called **calcium-potassium** glass. The Gothic and later also renaissance basic formula spread very quickly in central Europe and both were used relatively long. For example, the Gothic formula was in use from the mid-14th century until the mid-16th century (Sedláčková — Rohanová et al. 2016), and after this period the renaissance formula was employed almost exclusively until the third quarter of the 17th century.

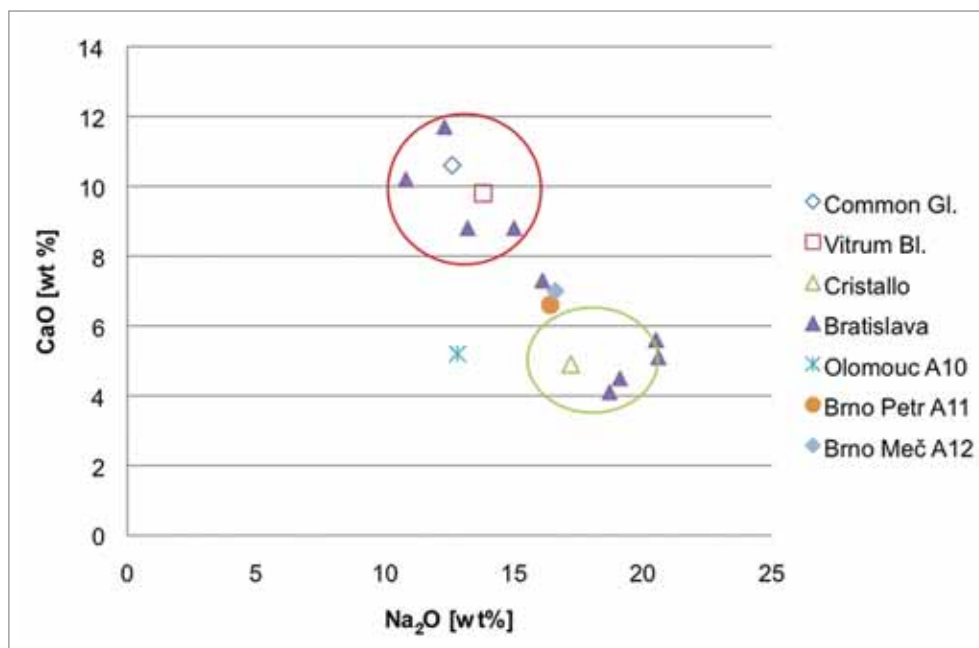
Potassium-calcium glass, the Gothic formula

Group I (see Diagram B). Vessels from Michalská 6, i.e. a *kraustrunk* with animal heads (Tab. 2: A1), a club-shaped beaker (Tab. 2: A7) and a biconical bottle (Tab. 2: A8) have a very similar chemical composition. The glass has a higher content of SiO_2 (ca. 62–66 wt%) and a relatively high content of K_2O . Finds outside Bratislava include a blue-green beaker with coiled trails from Brno, Josefská 10 (Tab. 2a: A16) whose chemical composition, however, does not rank it with the compared blue-green glass (see below), despite a relatively high content of Fe_2O_3 (1.8 wt%). Apart from the chemical composition, the typology also indicates that the mentioned vessels might have been produced in **Germany**.

⁹ Sedláčková — Rohanová et al. 2016, part 3: the terms Gothic and renaissance technology are explained in detail in the mentioned publication. Multiple analyses of glass and calculations of glass batches (i.e. formulas) showed that the production of glass in the individual periods (the Gothic, renaissance and baroque) was always characterized by a single basic formula (the same proportions of raw materials) of the glass batch, and thus also (very probably) by the used technology (melting temperature and the construction of the furnace). Although in the renaissance and baroque the variability in the glass composition expanded, it always concerned only a small segment of products (e.g. blue-green glass).

Diagram A. The CaO/Na₂O ratio in sodium-calcium (ash) glass imported from Venice around 1500 and its comparison with common glass, Vitrum Blanchum and Cristallo (after Verità 2009; blank marks).

Graf A. Poměr CaO/Na₂O v sodno-popelových sklech importovaných z Benátek kolem roku 1500 a jejich srovnání se skly typu Common glass, Vitrum Blanchum a Cristallo (podle Verità 2015; prázdné tvary značek).



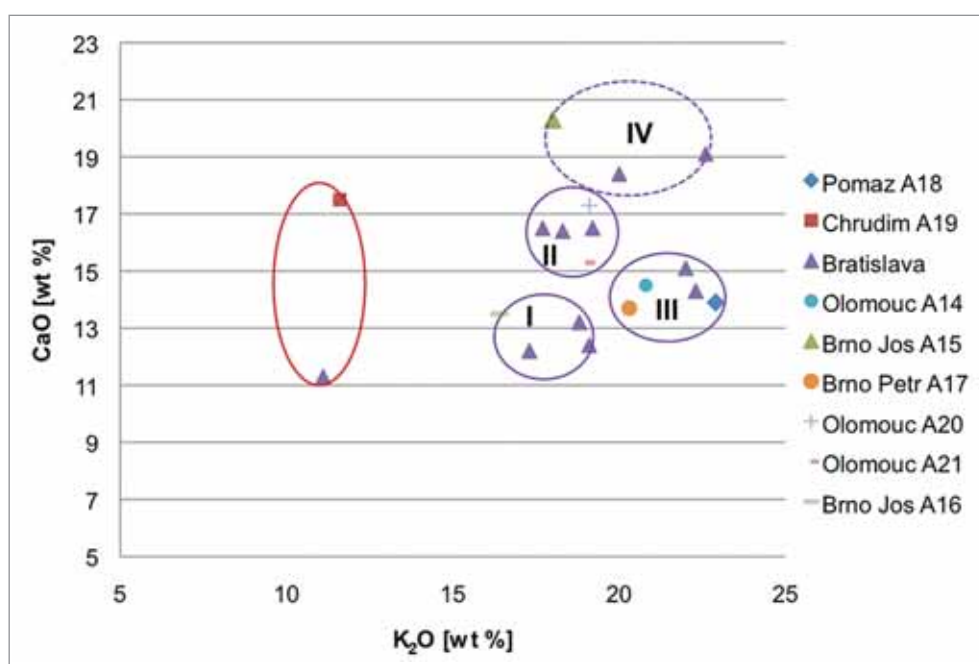
Group II (see Diagram B), with the CaO/K₂O ratio close to two finds from Michalská 6 (Tab. 2: kraustrunk A3 and prunt A5), and probably also cylindrical beakers from Ventúrska (Tab. 2: A10), was melted from the glass batch in proportions 100 kg of sand : 70 kg of ash : 30 kg of potash. As this corresponds to beakers of the Olomouc type from Hrnčířská and Pavelčákova streets in Olomouc (Tab. 2a: A20 and A21), it cannot be ruled out that these products come from **Moravia**.

Group III is typified by a higher content of K₂O and the proportion of CaO : K₂O lower than one. Similar glass was produced e.g. by the former glasshouse from the

turn of the 15th and 16th centuries in Pomáz in the **present-day Hungary**¹⁰ (Tab. 2a: A18; Černá, A. 2015). In all probability, this group also comprises the prunt from an unidentifiable beaker from Michalská 6 (Tab. 2: A6), a *kuttrolf* from Ventúrska (Tab. 2: A9), and among comparative glass samples a cylindrical beaker with a trail from Olomouc, Pavelčákova Street (Tab. 2a: A14) and a *kraustrunk* from Brno, Petrov (Tab. 2a: A17). Differences in the composition are not significant and it is

¹⁰ Samples of glass from Pomáz were kindly donated by Prof. József Laszlovszky from Central European University, Budapest.

Diagram B. The CaO/K₂O ratio in potassium-calcium glass. Purple circles mark glass of the Gothic technology (I–IV). Glass samples in the red circle represent the renaissance technology. — **Graf B.** Poměr CaO/K₂O v draselno-vápenatých skel. Fialové kruhy označují skla gotické technologie (I–IV). Vzorky skel v červeném kruhu mají blíž k renesanční technologii.



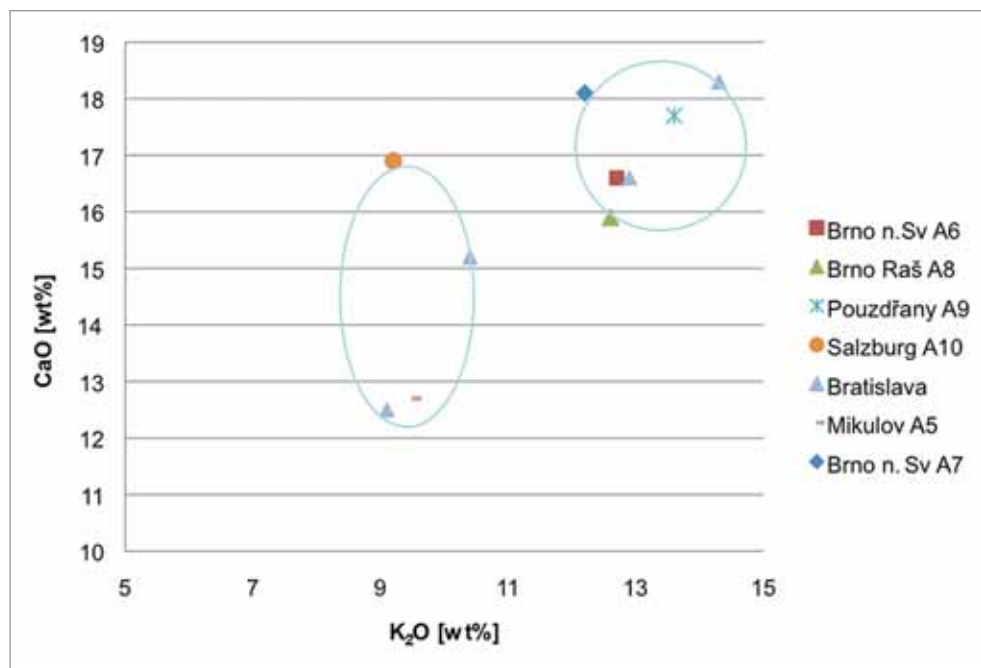


Diagram C. The CaO/K₂O ratio in blue-green calcium-potassium glass that was probably imported from the area of today's Germany (two production circles are obvious). These glasses were melted with the NaCl addition. — **Graf C.** Poměr CaO/K₂O v modrozelených vápenato-draselných sklech, která byla pravděpodobně importována z oblastí dnešního Německa. Jednalo se o dvě místa produkce. Tato skla byla tavena s přidavkem NaCl.

possible that unlike the previous group of glass a higher proportion of ash was replaced with potash. Typologically similar *kraustrunks* (Tab. 2: A2 and A4) are not depicted in *Diagram B* as they were completely corroded. Chemical durability of glass of the Gothic composition was generally very low.

Group IV: A beaker with ribs from Brno, Josefská 10 (Tab. 2a: A15) and bottles from Ventúrska 7 and 3 (Tab. 2: A11 and A12) have a high content of both CaO and K₂O and thus do not fit in the three groups above. Glass with a higher content of CaO was melted in the area of today's Holland and Belgium. It is possible, however, that the glass of Group IV was only an older Gothic formula with a higher content of alkali components in the glass batch.

Calcium-potassium glass, renaissance technology

A lamp with white filigree in the rim from Ventúrska 3 (Tab. 2: A13) dated to the turn of the 16th and 17th centuries and a sample of glass from Chrudim (Tab. 2a: A19) dated to the year 1550 represent the basic **renaissance formula** (*Diagram B* – red circle). It is characterized by a proportion of CaO : K₂O higher than one, a low content of K₂O and the content of SiO₂ over 60 wt%. It is obvious that CaO was added together with another raw material (CaCO₃). The lamp (Tab. 2: A13) also has a higher addition of sodium salt (NaCl), which points towards the area of today's Germany (together with blue-green glass, see *below*).

Blue-green glass

Blue-green glass (from the second quarter of the 16th century) represents the **renaissance formula** but slightly different from the formula used north of the Alps. Blue-green glass can be characterized as **calcium-potassium glass** (see *Diagram C*), as the CaO : K₂O ratio is higher than one (1.3–1.5). However, calculations revealed that CaO was not added in the form of another

raw material (CaCO₃). A *kraustrunk* from Kapitulská 16 (Tab. 3: A2) and beakers from Kapitulská 16 (Tab. 3: A1) and Ventúrska 3 (Tab. 3: A3, A4), as well as a comparative sample, a beaker from Mikulov (Tab. 3a: A5), were refined by a higher addition of sodium salt (NaCl) that probably also replaced expensive potash. Comparative samples from Mikulov and Brno (Tab. 3a: A6, A7 and A8) and beakers from Pouzdřany (Tab. 3a: A9) and Salzburg (Tab. 3a: A10) show slight deviations in their composition as they were measured by μ -XRF (K. Müller). However, they also contain a higher proportion of sodium chlorite salt (NaCl), and the CaO/K₂O ratio is the same as with samples from Bratislava. Blue-green glass probably comes from the region of today's Germany (as well as the lamp from Ventúrska 3, Tab. 2: A13). The typical colour was achieved by the addition of iron (blue-green form of the ion Fe²⁺) and reduction conditions of melting. Copper ions are only found in the glass in traces, i.e. copper was not used for colouring, with the exception of the blue trails on the beaker with optic mold-blown decoration (Tab. 3a: A4). This was clearly a sophisticated technology employed in several places or in two time periods (*Diagram C*). The chemical composition of blue-green glass is close to renaissance glass enhanced with decorations (e.g. filigree: *Rohanová* — *Sedláčková* 2015) found in the area of the central Danube Region.

4. Conclusion

Glass from Bratislava can be chronologically divided into series that originated in the last decades of the 15th century and in the early 16th century, and finds from refuse pits filled over long periods of time in which older vessels appear alongside blue-green glass imported in the second quarter of the 16th century (*Fig. 13*).

The older group includes series from Michalská 6 (1.3.1), Panská 24 (1.5.1) and Ventúrska 3, refuse pit 2

(1.8.2). The other refuse pits also contained younger glass, yet precious Venetian products such as the goblet with lid from Bratislava Castle (1.1.1), beakers from Sedlárska 4 (1.6.1) and some of the goblets in refuse pit 1 at Ventúrska 3 (1.8.1) might have been made in the last decades of the 15th century. Nonetheless, the refuse pits were mostly filled in the period when Bratislava (Prešporok) became the capital of Hungary and its political importance grew. Finds of glass from Bratislava Castle also come from this period, whatever the reasons for their absence in the early Middle Ages. Even, precious glass got to the refuse pit when Prešporok became the capital of Hungary (1531), the seat of the Hungarian Assembly and the coronation city (1536). The castle housed the crown jewels and was the residence of King Ferdinand I. The dating to the period after 1536 is enabled by the youngest vessel in the series, a beaker with animal heads of blue-green glass (1.1.1).

In socio-economic terms, the series were associated with the high religious and secular milieu, although their particular owners or users are not known. A religious dignitary, *Her Thomus Beneficiat*, possibly a canon, used glass at Kapitulska 16 (1.2.1). Glass at Michalska 6 corresponds to the period when the building was owned by the Cistercian monastery in Heiligenkreuz, i.e. before the third decade of the 16th century (1.3.1). The remaining glass vessels were used by owners from the secular milieu: the content of the refuse pit at Panská 24 (1.5.1) corresponds to the period when the house was held by *Katrey uxor* (1482) or *Jacob Sneider Unnger* (1503–1504, 1513?). Refuse pit 2 at Ventúrska 3 (1.8.2) might have been filled in the last years of the existence of the *Academia Istropolitana* (before 1490), or under the first recorded owners named *Walasch Posa* (1493) and *Johannes Tilay* (1508). The older layer in refuse pit 1 on the same site (1.8.1) came into existence under *Johann Tilay* (1508) and *Bernhard Horvath Bilkovich* (after 1513), the younger layer in the period when the owners were Count *Jan Szalay* (1535) and *Šimon Kairo* (1543). Regrettably, there is no information about the owners of the houses at Sedlárska 6 (1.7.1), Ventúrska 7 (1.9.1), Panská 16 (1.4.1) and Sedlárska 4 (1.7.1). Judging by their prestigious location in the city centre, they were probably owned by wealthy burghers.

The series from Vodná veža holds a special position as the building served as a tollhouse. The series originated before the mid-16th century and the last items got there around 1620. The owners, the abbey in Pannonhalma and Pilisi and the Bratislava governor (later the town of Bratislava) hired their shares. The *stubengesellschaft* society would meet there in the second half of the 16th century at the latest (see above).

The origin of the glass products on the basis of **typological analysis** appeared clear. After **chemical analyses** this determination remained valid, especially for the group of sodium-calcium (soda-ash) **Venetian glass**. The vessels of *Cristallo* manufactured from the middle of the 15th century make up a series completely unique beyond the borders of today's Hungary. The beakers and goblets from Sedlárska 4, two goblets from Ventúrska 3 (refuse pit 1) and a goblet with lid from Bratislava Castle are unparalleled in central Europe. This glass only sporadically occurred in Moravia (Brno

and Olomouc), and is not known from archaeological research in Vienna, Lower Austria and Bohemia including Prague, nor from e.g. Switzerland and Germany. Vessels of Venetian provenance confirm the high status of not only Bratislava but the whole territory of the present-day Slovakia. There were many of them, and presumably further specimens are held by museum depositories. The finds of this luxury glass are related to the reign of Matthias Corvinus who is generally credited with promoting the renaissance in Hungary and Moravia.

Most questions are connected with the large group of **potassium-calcium glass** that in terms of typology corresponds to the output of Hungarian glasshouses, and according to the chemical composition was made with the use of the **Gothic formula**. The formula was widespread in Germany and Bohemia, as well as in Moravia and Hungary. The differences in the chemical composition of glass between these regions are small and were caused by the slightly different composition of beech ash. The specification of the origin of the Bratislava vessels will be possible after the analyses of a large number of samples of clear origin that would provide an overview of the proportion of minority components. We have analysed a large number of glass samples from Lower Austria and today's Hungary, from the glasshouse in Pomáz and found out that only two samples among Bratislava finds correspond to the production of this glasshouse. However, there also operated glasshouses in Upper Austria, now Slovakia, whose production and glass composition are unknown. At the same time, it is apparent that glass from Bratislava only presents a certain, though important, segment among the wealth of finds from other Slovak towns and castles where the assortment of glass and its origin might be completely different.

In its style and chemical composition, vessels from the second quarter of the 16th century of **blue-green** calcium-potassium glass constitute an individual group. The glass was made of beech ash with the addition of NaCl that, apart from its refining properties, also probably partially replaced potash (early renaissance formula). However, their classification with **German** glass is only based on numerous shape analogies as analyses of similar vessels from Germany are not known to the authors. In theory, the glass might have also been manufactured in one of Austrian glasshouses, except for Hall in Tyrol that operated in 1534–1635 but produced glass of different composition (mixed alkali glass). There is no information about the glass composition and assortment of the glasshouses established in 1482 and 1530 near Vienna by Italian glassmakers. In any case, in contrast to Vienna where it appeared from the late 15th century and the early 16th century, blue-green glass got to Bratislava and Moravia with a delay. Its import to the neighbouring countries can be clearly linked to their affiliation in the Habsburg monarchy. Yet according to the results of analyses, blue-green glass also got to Moravia from other production centres than to Bratislava.

The study on glass from the period before ca. 1450 conveys that until the late 14th century finds in Bratislava did not differ from Moravian ones. In both cases

their core was Venetian glass. During the second half of the 14th century glass from the local and Bohemian glasshouses was used in Moravia more and more often, and this trend continued. In the second half of the 15th century the local production was influenced by import from Venice and from German glasshouses and was also influenced and possibly inspired by models from these glassmaking regions. The same tendencies are apparent in Bratislava where, however, glass from the local (Hungarian) glasshouses appeared somewhat later, in the mid-15th century. The table of types of glass (Fig. 13) in Bratislava and the overview of glass in Brno and Moravia under Matthias Corvinus and the Jagiello dynasty (Sedláčková 2010, 365, Fig. 5) show **joint trends** in the import of Venetian and German glass, though of different shapes and in different quantities. Above all, the local production in both countries was represented by starkly different shapes: in Moravia it followed the tradition of tall shapes of the beakers of the Bohemian type, while in Hungary low beakers and table bottles were popular.

Renaissance-style goblets came to the fore in the second quarter of the 16th century. While in Moravia the first domestic products appeared, in Bratislava there were Venetian goblets. Glass of the late Gothic style was fully replaced with renaissance glass after the mid-16th century.

Translation by Irma Charvátová

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Souhrn

Příspěvek¹¹ navazuje na část, věnovanou sklu v Bratislavě v období ca 1200 až 1450 (Sedláčková et al. 2014).

1. Katalog objektů, názorového prostředí a charakteristika souborů skla¹²

1.1. Bratislavský hrad, Zámocká č.p. 2, súp. č. 862, parcela č. 860/1, Národná kultúrna pamätka (NKP), Ústredný zoznam pamätkového fondu č. (č. ÚZPF) 28/1, palác hradný (obr. 1: 1)

Nález tohoto období pochází ze starších výzkumů, prováděných s přestávkami v letech 1936 až 1999 a ze zděné jímky 105/09, odkryté při plošném výzkumu v letech 2008–2011.

1.1.1. Jímka

obsahovala čtyři nádoby, zastupující hlavní proudy dovozu skla do Bratislavy: benátský pohár s víkem, uherský *kutrolf* a německou číšku s nálepy ve tvaru zvířecích hlaviček (obr. 2: 1–4; Foto 1).

Dat.: 1. polovina 16. stol.

¹¹ Práce byla podpořena grantem GAČR: P405/12/1411: Renaissance glass and beginnings of Baroque glassmaking in archaeological finds in the region of the Central Danube region.

¹² V rámci charakteristiky souborů uvádíme zařazení jednotlivých exemplářů do výrobních regionů, což zdůvodňujeme teprve v následujících kapitolách. Domníváme se, že tyto informace jsou z hlediska posouzení souboru jako celku velmi významné.

1.1.2. Z výzkumů v letech 1958–1979

pochází jen několik nádob z doby před polovinou 16. století – láhve s vnitřním prstencem a spodní soudkovitou částí těla a hrdla několika *kutrolfů* (obr. 2: 5–8).

Dat.: 1. polovina 16. stol.

1.2. Kapitulská č.p. 16, súp. č. 121, parcela č. 442, NKP-ÚZPF č.70/1, měšťanský dům (obr. 1: 2)

1.2.1. Jímka 1/76

Dvě nádoby z jímky, zaplněné během 2. poloviny 16. století, byly dle analogií vyrobeny během 1. poloviny 16. století – číška s prolomanou patkou a válcovitý *krautstrunk* (obr. 12: 1 a 2; Foto 20 a 21, analýzy Tab. 3: A1 a A2).

Dat.: 2. čtvrtina 16. století.

1.3. Michalská č.p. 6, súp. č. 383, parcela č. 29, NKP-ÚZPF č. 107/1, měšťanský dům (obr. 1: 3)

1.3.1. Lednice, druhotně odpadní jímka 1/98

obsahovala zlomky a torza nejméně 15 nádob – benátský *berkemeyer* ze skla typu common glass, sedm *krautstrunků* a číšek s nálepy, zlomky tří dvojkónických lahví, láhev s optickými žebry a zlomky kyjovité číše. *Krautstrunk* s nálepy ve tvaru zvířecích hlaviček, dvojkónické láhve a patrně i kyjovitá číše pocházejí z oblasti německých skláren, další nádoby jsou uherského původu (obr. 3, Foto 9–12 a 15, analýzy Tab. 2: A1–A8).

Dat.: poslední desetiletí 15. – počátek 16. stol.

1.4. Panská č.p. 16 (do r. 1989 Nálepkovala), súp. č. 235, parcela č. 323, NKP-ÚZPF č. 140/1, měšťanský dům, zvaný Pongrácz Palace (obr. 1: 4)

1.4.1. Lednice, druhotně odpadní jímka 1/91

Z jímky pocházejí torza a zlomky 13 nádob typologicky různého provenience: patrně z uherských skláren číška s nálepy a *krautstrunk* doložený nálepem, láhev s miskovitým ústím a láhve se žebry. Původ v Čechách má spodní část číšky s taženými kapkami, válcovitá číška z bezbarvého skla je patrně benátská, číška s optickými žebry z modrozeleného skla nejspíše německá (obr. 4).

Dat.: 1. polovina 16. stol.

1.5. Panská č.p. 24, súp.č. 231, parcela č. 487, NKP-ÚZPF č.10702/1, měšťanský dům (obr. 1: 5)

1.5.1. Odpadní jímka? X/87

obsahovala torza dvou nádob – *krautstrunku* s optickými žebry a hladké láhve, patrně s miskovitým ústím (obr. 5: 7 a 8; Foto 14 a 18).

Dat.: poslední desetiletí 15. – počátek 16. století (soudobé s Michalskou 6, 1.3.1).

1.6. Sedlárska č.p. 4, súp. č. 361, parcela č. 344, NKP-ÚZPF č. 217/1, měšťanský dům (obr. 1: 6)

1.6.1. Studna, druhotně odpadní jímka? X/87–88

vydala významný celek šesti benátských nádob – číšek se žebry, číšku na modré žebrované patce a kupu poháru, zlomek číše českého typu a stolní láhve se žebry, patrně z uherských skláren (obr. 5: 1–6; Foto 3, 7 a 8; analýzy Tab. 1: A1 a A2).

Dat.: poslední desetiletí 15. – 1. polovina 16. stol.

1.7. Sedlárska č.p. 6, súp. č. 1362, parcela č. 341, NKP-ÚZPF č. 215/1, měšťanský dům (obr. 1: 7)

1.7.1. Studna 3/89

byla používána od 13. do 18. století. Menší soubor skla lze typologicky datovat také mezi závěr 15. až polovinu 16. století: zlomek benátského *krautstrunku* s nataveným modrým vláknem na nálepu, číška s nálepy a stolní láhve včetně láhve s vnitřním prstencem a spodní soudkovitou částí těla pocházejí z uherských skláren; spodní část *stangenglasu* a číška s optickými routami zastupují

německé sklo. Neznámé provenience je spodní část závěsné lampy (obr. 6; Foto 25 vpravo dole).

Dat.: poslední desetiletí 15. – polovina 16. stol.

1.8. Ventúrska č.p. 3, (do r. 1989 Jiráskova) súp. č. 53, parcela č. 481, NKP-ÚZPF č. 49/2, měšťanský dům (obr. 1: 8)

1.8.1. Studna, druhotně odpadní jímká 1/01

byla zaplňovaná od počátku 16. století do ca 1620. Pozdně gotická vrstva nade dnem (-471 – -485 cm) obsahovala zlomky dvou benátských pohárů z *Cristalla* a dva poháry ze skla typu *Vitrum Blanchum*, několik *kutrolfů* a lahvi se žebry a torzo poutnické láhve. Z modrozeleného draselno-sodno-vápenatého skla německé provenience zde byla torza válcovitě číška na prolamované patce a soudkovité číšky (obr. 8; Foto 2, 4, 20 a 23; analýzy Tab. 1: A8 a Tab. 3: A4).

Z vrstvy oddělené od spodní části výplně zuhelnatělým dřevem (-426 – -471 cm) pochází nejméně 14 nádob: benátské poháry s optickými routami ze skla typu *Vitrum Blanchum* a zlomek kupy s bílým filigránem, číška s nálepy, *kutrolfů* a láhve se žebry jsou uherského původu a několik nádob z německých skláren, jedna i ze sytě modrého skla, jiný s optickým dekorem rout z draselno-sodno-vápenatého skla. Soubor doplňují torza tří závěsných lamp a stejné lampy se nacházely i v renesanční části výplně studny (obr. 7; Foto 5, 6, 22, 24 a 26; analýzy Tab. 1: A4–A7 a Tab. 3: A3).

Dat.: 2. čtvrtina 16. století (-426 – -471 cm) a po roce 1500 (-471 – -485 cm).

1.8.2. Odpadní jímká 2/01

měla ve vrstvě 160–168 cm několik nádob: čtyři neobvyklé válcovitě číšky ovinuté vlákny, *krautstrunk*, *kutrolf*, láhev s vnitřním prstencem a spodní soudkovitou částí těla, láhev se žebry a nejméně dvě drobné lahvičky. Podle složení skla číšky pocházejí z okruhu českého? skla, *kutrolf* z uherských skláren (obr. 9; Foto 13 a 16; analýzy Tab. 2: A9 a A10).

Dat.: poslední desetiletí 15. – počátek 16. stol.

1.9. Ventúrska č.p. 7, súp. č. 1266, parcela č. 478, NKP-ÚZPF č. 53/1, měšťský palác (obr. 1: 9)

1.9.1. Studna, druhotně odpadní jímká 4/01

byla hluboká 390 cm (-173 – -522 cm). Obsahovala téměř čtyři desítky nádob ze skla převážně uherského a německého původu. Pouze jedna láhev s vnitřním prstencem a spodní soudkovitou částí těla byla ze skla typu *common glass*. Do hloubky -418 cm převažovalo sklo německé provenience jako *krautstrunk* a *stangenglas*, poutnická láhev, vyskytla se zde i neobvyklá číška hrncovitě tvaru (obr. 10; analýza Tab. 1: A1). Ve vrstvách nade dnem byly zlomky několika stolních lahvi s miskovitým ústím, zlomky *krautstrunku*, jakož i hrdlo zásobní láhve (obr. 11; Foto 19 a 25).

Dat.: 1. polovina 16. století (do hloubky -314 cm převažují nálezy z 2. až 3. čtvrtiny 16. století).

1.10. Vodná veža, mýtna stanica (zažitý název památkového objektu), Nábřežie arm. gen. L. Svobodu 2, parcela č. 545, NKP-ÚZPF č. 653/1 (unifikovaný název NKP – Veža strážna) (obr. 1: 10)

1.10.1. Studna 1/74,

kteřá zanikla v roce 1620 a obsahovaly většinou renesanční sklo. Do skupiny skla z 1. poloviny 16. století typologicky patří nádoby z modrozeleného skla s hnědou průsvitnou zkorodovanou vrstvou, charakteristickou pro uherské výrobky: spodní část *stangenglasu* na patce ze svinutého vlákna, *kutrolf* se dvěma hrdélky a několik lahvi se žebry, případně i poutnické láhve (obr. 12: 3–9).

Dat.: 1. polovina 16. stol.

2. Analýza nálezů na základě typologie a složení skla

Do období závěru 15. až 1. poloviny 16. století patří soubory z Michalskej 6 (1.3), Panskej 16 (1.4), Panskej 24, (1.5), Sedlárskej 4

(1.6), z objektu 2 na Ventúrskej 3 (1.8.2) a objektu 4 na Ventúrskej 7 (1.9). Soubory z Kapitulskej 16 (1.2), Sedlárskej 6 (1.7), z objektu 1 na Ventúrskej 3 (1.8.1) a ze studny ve Vodnej veži (1.10) pocházejí z objektů dlouhodobě zaplňovaných a posuzované nálezy tvoří jen starší část souborů. Nyní jsou již také známy nálezy z Bratislavského hradu, a to ze starších výzkumů v rámci 20. století a z roku 2009 (1.1).

Benátské sklo je zastoupeno pohárem s víkem z Bratislavského hradu, několika poháry z jímký 1/01 na Ventúrskej 3 a torzem kupy ze Sedlárskej 4. Dva poháry z Ventúrskej 3 z *Cristalla* a kupa ze Sedlárskej 4 představují starší varianty pohárů, které známe již z doby Matyáše Korvína a pravděpodobně v této době se i do Bratislavy dostaly.

Tři další poháry z jímký 1/01 na Ventúrskej 3 ze skla typu *Vitrum Blanchum* představují typologicky mladší výrobky z 1. poloviny 16. století. Zlomek kupy je rovněž doložen pohár s bílým filigránem a je to nejstarší výrobek této skupiny v Bratislavě.

Tvarově můžeme k pohárům počítat i nádobu s kupou z bezbarvého skla na vysoké žebrované patce ze skla modrého, což je však v podstatě číška na nožce – „footed beaker“.

Dvě číšky se žebry a emailovým a zlaceným dekorem z *Cristalla* byly nalezeny na Sedlárskej 4, *berkemeeyer* ze skla typu *common glass* na Michalské 6.

Zlomek s nálepem je zastoupen rovněž *krautstrunk* na Sedlárskej 6. Nádobu z bezbarvého skla byla zdobena modrým sklem, které se dochovalo na hrotu nálepu.

Ze skla typu *common glass* byla vyrobena také láhev s vnitřním prstencem se spodní soudkovitou částí těla. Tato varianta byla rozšířená především na Balkáně a vyráběla se například ve sklárnách v Lublani.

Pro benátské nádoby nacházíme analogie zejména v nálezech v Uhrách, a to jak na území dnešního Maďarska, tak Slovenska. Několik exemplářů je známo i z Moravy, která krátce spadala pod vládu Matyáše Korvína, který obludu benátského skla do Uher i na Moravu přinesl. Mimo tuto oblast sklo tohoto typu z archeologických nálezů není známé.

Regionální výrobky z draselného skla tvoří větší skupinu, ve které jsou zejména číšky a stolní láhve. V jejím rámci lze odlišit skupinu, datovanou do závěru 15. až poloviny 16. století a sklo, vyskytující se ve druhé čtvrtině 16. století s přesahem do 2. poloviny.

Ve starší skupině bylo možné typologicky i na základě chemického složení odlišit sklo z německých skláren (I), ze skláren v Čechách (II) a v Uhrách (III). Sklo ze skupiny (IV) mohlo být vyrobeno v dnešním Holandsku nebo Belgii. V některých případech složení potvrzuje typologické určení, v jiných přináší otázky a náměty k dalšímu bádání.

Skupina staršího německého skla zahrnuje tři dvojkónické láhve, číšku s nálepy ve tvaru zvířecích hlaviček a kyjovitou číši a pochází z jímký na Michalskej 6. Nálezy dávají tušit úzké obchodní? kontakty majitele s německými zeměmi, kterým v této době byl cisterciácký klášter v Heiligenkreuzu městu. Průkazné jsou zejména dvojkónické láhve, vyráběné ve velkém množství v německých sklárnách od 13. do 16. století, východním směrem se však nevyškytují.

Na Panské 16 a Sedlárskej 4 byly nalezeny zlomky číšky s taženými kapkami a vysoké číše české provenience. Vedle těchto typických tvarů českého skla lze s jistotou rezervou uvažovat o stejném původu i u jednoho *krautstrunku* z Michalskej 6. U válcovitých číšek z jímký 2/01 na Ventúrskej 3 existuje pouze možnost českého původu, založená jen na složení, oporu v typologii však nemá. Výroba ve sklárnách na Moravě není vyloučena u dvou *krautstrunků* s optickými žebry z Michalskej 6 a Panskej 24, což je ovšem založeno pouze na optickém dekore, v této době používaném zejména na Moravě; v Uhrách byl aplikován pouze na stolních lahvičkách.

Většina číšek s nálepy, *krautstrunků* a stolních lahvi různých variant, mezi které patřily i láhve s vnitřním prstencem se spodní soudkovitou částí těla a konvičky byla dle tvarových analogií vyrobena v Uhrách. Vzhledem ke značnému poškození nádob korozí

bylo však provedeno jen málo analýz. Jsou zastoupeny v téměř každé jímce a odpovídají nálezům ze skláren ve Visegrádu a Pomázu, které pracovaly ve 2. polovině 15. – 1. polovině 16. století a zásobovaly královské dvory v Budě i Visegrádu, ale i jiná sídla v Uhrách.

Německé sklo se znovu objevuje v Bratislavě ve 2. čtvrtině 16. století, po začlenění do Habsburské monarchie. Nyní je to výrazná skupina nádob ze skla modrozelené, sytě a světle modré barvy, nebo sytě zelené barvy. Ve Vídni a v Salzburku se toto sklo vyskytuje již od počátku 16. století. Pro *krautstrunky*, *stangen-glas* na patce ze svinutého vlákna a jednoduché číšky hladké nebo s optickým dekorem nacházíme analogické tvary v jižním Německu již kolem roku 1500. Také na jižní Moravě se stejně jako v Bratislavě vyskytuje toto sklo později, na novokřtěnských sídlech až kolem poloviny 16. století. V bratislavském souboru pozornost upoutají zejména: číška s nálepy ve tvaru zvířecích hlaviček, hladká válcovitá na prolamované patce a neobvyklého soudkovitého tvaru na třech kulovitých nožkách. Kvalita skla je poměrně vysoká a od starších výrobků se odlišuje chemickým složením vápenato-draselného skla s vysokým obsahem Na_2O .

Již před polovinou 16. století se na Ventúrskej 3 a jímce 1/01 a ve Vodnej veži objevují také závěsné lampy, většinou z bezbarvého skla a se zataveným bílým, méně modrým nebo červeným vláknem v okraji. Jejich výskyt je doložen i během 2. poloviny 16. století a v podstatě stejné tvary známe i později. Lampy tohoto tvaru se používaly v Benátkách a také v Budě či na Visegrádu a také ve Vídni. Četné analýzy však prokázaly u exemplářů jak z Bratislavy tak z Vídne sklo draselno-vápenaté, renesančního typu, tedy z regionálních skláren.

Závěrem lze shrnout, že do Bratislavy se sklo dostávalo ve třech časových etapách: první vlna po roce ca 1480 přinesla relativně vysoký počet benátských nádob luxusního charakteru z *Cristalla*. Objevuje se také sklo z německých skláren, méně českých, ovšem převážně ze skláren v Uhrách. Tyto nálezy odrážejí dobu rozkvětu uherského království pod vládou Matyáše Korvína a dovoz benátského skla do země ve velkém množství. Druhá etapa probíhala v 1. polovině 16. století, kdy se sice nadále dovážely benátské poháry, ovšem nyní již levnější varianty ze skla typu *Vitrum Blanchum*. Nadále převažuje sklo ze skláren v Uhrách. Poprvé je doložena jímka se sklem také na Bratislavském hradu, ve které byl nalezen jak starší benátský malovaný pohár s víkem, torzo *kutrolfu* jako zástupce uherského skla a spodní část číšky se zvířecími hlavičkami z modrozeleného skla – reprezentant poslední vlny dovozu skla, nyní již ze skláren v Německu, ve 2. čtvrtině 16. století. Sklo se do jímky dostalo nejspíše po roce 1531/36, kdy se Prešporok stal hlavním městem Uher, sídlem uherského sněmu a byl sídlem panovníka – Ferdinanda I.

Z církevního prostředí pochází soubor skla na Kapitulskej 16 a také nálezy na Michalskej 6 mohou mít souvislost s cisterciáckým klášterem v Heiligenkreuzu. V případě světských majitelů, ať již jménem známých či v pramenech nezachycených lze předpokládat, že šlo o bohaté měšťany. Majitel z řad šlechticů se objevuje teprve v roce 1535 na Ventúrskej 3.

Výsledky chemických analýz skla výše uvedené závěry podpořily a ukázaly, že i v období let ca 1450–1550 převládá v nálezech z Bratislavy sklo draselno-vápenaté, vyrobené gotickou technologií. Regionální povaha skla není vyloučena, ale spíše se přikláníme k jeho importu z různých regionů centrální Evropy, a to i z důvodu tehdejší sociálně-ekonomické situace Bratislavy. Převládající import podporují i nálezy sodno-vápenatého skla (soda-ash glass), které s jistotou patří k benátským typům skla (*common glass*, *Vitrum Blanchum* a *Cristallo*) a také nálezy modro-zeleného vápenato-draselného skla s vyšším podílem oxidu sodného, které bylo importováno z Německa.¹³

¹³ Založeno na tvarových analogiích. Analýzy složení skla nebyly u většiny nálezů z Německa prováděny z důvodu jejich značného poškození korozi.

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