

FURNACE-WOUND GLASS BEAD PRODUCTION AT SCHWARZENBERG AM BÖHMERWALD, UPPER AUSTRIA

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Exploratory excavations carried out in Schwarzenberg am Böhmerwald, Upper Austria, uncovered the remains of an unrecorded glassworks. Part of a furnace was exposed, along with glass beads and buttons, as well as holloware and flat glass fragments from the 17th and early 18th centuries. This article describes the finds and their relationship to the nearby Sonnenschlag glassworks where similar beads and glassware fragments have been collected. Both sites are related to the beadmaking industry in the nearby Bavarian and Bohemian forests, which experienced a veritable bead boom around 1700.

INTRODUCTION

The village of Schwarzenberg am Böhmerwald is located in northern Upper Austria which is in the Bohemian Forest and thus part of a large historical glassworks landscape that includes the Bohemian Forest (Šumava), the Bavarian Forest, the northern Waldviertel in Lower Austria, and the northern Mühlviertel in Upper Austria (Figure 1). The finding of large quantities of glass beads (Figure 2) south of the property at Schwarzenberg 93 (now Zinngießerweg 3) led to the archaeological investigation of the site in 2017, on the initiative of local researcher Franz Haudum. This revealed the remains of an early modern glassworks not recorded in the archives. Now known as “Glashütte Gegenbach” (the Gegenbach glasshouse), the site is problematic as it corresponds formally and chronologically to the Sonnenschlag glassworks which is located only about a kilometer away on the same manor (Ort Schwarzenberg). The archival documents concerning the Schwarzenberg glassworks were, therefore, subjected to a renewed, precise examination, to determine the relationship. This work was coupled with a systematic recording of the extensive finds and the chemical analysis of selected glass items. While a detailed report on the site has already been published (Haudum and Tarcsay 2019), this article presents explicit new information regarding the recovered glass beads and their production.



Figure 1. The location of Schwarzenberg am Böhmerwald in Upper Austria (drawing: Kinga Tarcsay).

HISTORY OF THE SCHWARZENBERG GLASSWORKS

The village of Schwarzenberg was under the dominion of Schlägl Abbey where glasshouses are known to have been present since the 16th century. Franz Haudum (2019:204-233) reviewed, evaluated, and discussed the documentation on the huts in detail as part of the project. Archival material provides the following sequence of glassworks in the vicinity of Schlägl Abbey:

Schlägl (ca. 1525)

- a) “Glashütte auf der Glaserin” on the Glashüttenteich, ca. 1525.

Schwarzenberg (1638-1861)

- a) “Landgrafhütte” on the Sonnenschlag, 1638 to ca. 1700 (Figure 3, A).
- b) The excavated glassworks “Gegenbachhütte” or “Paterlhütte,” pre-1700 to 1716 (Figure 3, B).
- c) “Schläglerhütte am Schwarzenberg,” 1719-1749 (Figure 3, C).



Figure 2. Beads collected at the Gegenbach glassworks site (property of the landowner) (photo: Kinga Tarcsay).

- d) The non-existent “Obere Hütte” in Oberschwarzenberg. According to Haudum (2019), this glasshouse, which appears in older publications, never existed and its inclusion in lists of regional glassworks is the result of misinterpretation of location information by earlier researchers (Figure 3, D).
- e) “Rosenbergerhütte” or “Fieglmüllerhütte” in Oberschwarzenberg, 1821-1861 (Figure 3, E).

Sonnenwald (1750-1900)

- a) “Kloster Schläglische Glashütte” in Sonnenwald, 1750-1816.
- b) “Wagendorfferhütte” in Sonnenwald, 1832-1900.

The earliest glassworks in the vicinity of what is now Schwarzenberg was built in 1638 for the Schlägl Abbey by the well-known glassmaker Hans Waltguny (Weilguni) from Harmanschlag, Lower Austria. He had previously been commissioned to construct several other notable glasshouses in Lower Austria and southern Bohemia whose products are well known archaeologically: Glashütte Harmanschlag (Tarcsay 2003), Glashütte Reichenau im Freiwald (Tarcsay 2008a), and Glashütte Wilhelmsberg (Fröhlich 1994).

Just a year later, Christoph Reichenberger took over what is now known as the Sonnenschlag glasshouse. He was followed by his stepson Georg Landgraf in 1654, and later by his son Johann Anton Landgraf who, in 1691, married Rosina Müllner, daughter of the well-known glass master Michael Müllner of the Helmbach glassworks from 1695 to 1716 (Haudum 1980:18; Krinzing 1921:212-213). Before Georg Landgraf was able to hand over the glassworks to his son Johann Anton in 1692, the abbot of Schlägl Abbey

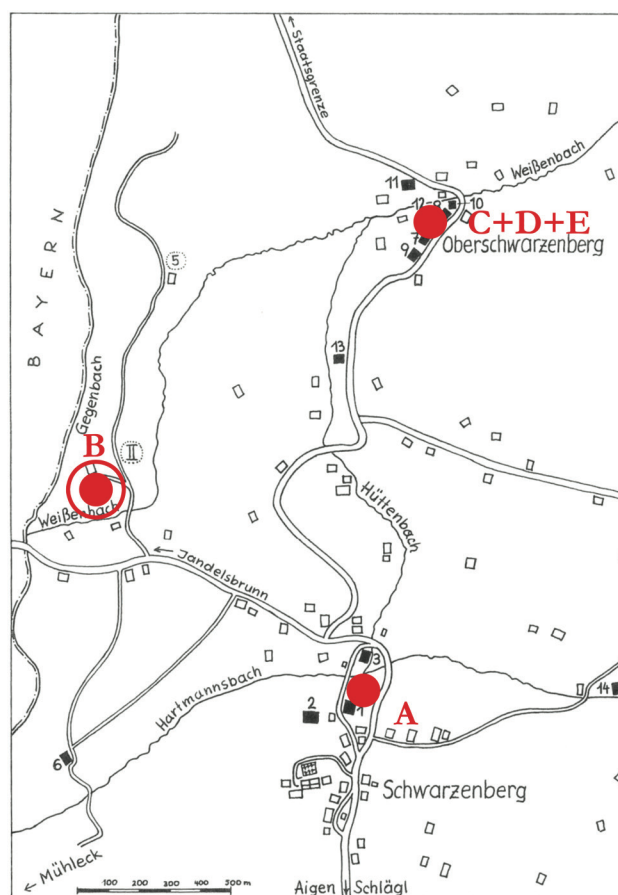


Figure 3. Historical glassworks in the vicinity of Schwarzenberg am Böhmerwald (refer to the list of glassworks for their identity) (drawing: Franz Haudum and Kinga Tarcsay).

visited and conducted an investigation which unearthed all kinds of negligence and unauthorized excesses so that the transfer was delayed until 1695 (Haudum 2019:218-219).

While the inherited estate had considerable livestock, the glass furnace was in a rather poor state, as Michael Müllner, the father-in-law, portrayed in letters. Nevertheless, Johann Anton was apparently able to make the glassworks function well. In 1701, for example, the abbot of Engelszell ordered 8000 disc window panes from the Schlägl abbot, and in 1702 Johann Antoni Landgraf had the great honor of delivering a large chandelier to the imperial hall built by Carlo Antonio Carlone between 1693 and 1695 in the Kremsmünster Benedictine monastery (Haudum 2019:209).

Archival documents from the 1660s and 1670s reveal some of the items produced earlier at the Sonnenschlag glassworks. These include beer, lidded, and vinegar glasses, wine bottles, offering ewers or jugs, urine glasses, and various types of flat glass (Haudum 1980:19, 1986:15; Krinzing 1921:213-214). Also, from at least 1701 onwards, numerous beadmakers (*Betlmacher*) employed at

Schwarzenberg are named in the parish registers (Haudum 2019:225-226).

The list of the products made under Johann Anton Landgraf's leadership from 1704 to 1709 includes large quantities of window panes, glasses decorated with cut coats of arms, gold and ruby stems, and "cut French foliage" or blue appliques, as well as "*Stangenglas*" (tall, narrow beakers), lidded glasses, confectionery bowls, jugs, and polished bottles, but there is no mention of beads (Haudum 2019:219- 220).

In 1711, Landgraf complained that he urgently needed good ash to make lime and crystal glass, glass beads and window panes, and hoped to be able to continue making the coveted beads (Haudum 2019: 220-221). Unfortunately, economic problems ultimately forced him to sell all of his properties in Sonnenschlag and he moved to southwestern Upper Austria where he founded the Freudenthal glassworks at Weißenkirchen im Attergau (Haudum 2019:229-232). In the "*Schläglerhütte am Schwarzenberg*" that followed, only one beadmaker (*Petlmacher*) appears in the first production listing from 1720-1721; possibly no more beads were produced thereafter (Haudum 2019:225-226).

The reason for the construction of the Gegenbach glassworks and the date it occurred remains unclear, but new observations by F. Haudum (2019:218-222) indicate that the two glasswork sites in Schwarzenberg may be sequential. This inference is based on a letter from the abbot of Schlägl Abbey to Landgraf in 1711 which mentions two glassworks, a "previous" glasshouse and the "current" one. Although this testifies to the existence of a new glasshouse in 1711, it does not provide any information regarding the location, date, or reason for the relocation of the furnace which, according to Haudum (2019:218-222), is probably the Gegenbachhütte.

The location of the Sonnenschlag glasshouse is clearly identifiable from the historical documentation and surface finds. Numerous glass artifacts in various collections are said to come from the site, where more recent investigations have also been carried out. In addition to various hollowware and flat glass fragments, the assemblage also includes a large quantity of beads (Figure 4) and production waste which largely correspond in shape and color to the material recovered from the Gegenbach glassworks (Tarcsay 2003:89, Figure 5, 2019:260-262).

THE ARCHAEOLOGICAL INVESTIGATION OF THE GEGENBACH GLASSWORKS

Two small test units were excavated at the site in 2017 under the direction of Wolfgang Klimesch (Archeonova) to verify the postulated glassworks location, following geomagnetic surveys (Figure 5).



Figure 4. Beads from the Sonnenschlag glassworks (Ulrichsberg Culture House, Upper Austria) (photo: Kinga Tarcsay).

Test trench 1 revealed part of the base of a furnace which abutted a huge boulder over 3 m in diameter. The furnace had a semicircular end, the exposed portion of which was 3.8 m long and about 4.5 m wide. The masonry, of which only the lowest layer remained, consisted of unaltered granite boulders and cobbles set without mortar. The walls were well defined and 70 cm thick (Klimesch 2019) (Figure 6). Associated with them were fragmentary and strongly secondarily-fired bricks which generally served as components of cooling furnaces. Standardized and grooved glass furnace bricks, made of melting-crucible clay and known from other sites, are not present (Tarcsay 2008a:76-80, R-O3 to R-O7).

As the structure was not completely excavated, it was not possible to clearly differentiate between collapsed and intact building structure in the interior, though a transverse wall running almost north-south was noted and may have served as a partition in the firebox. A stone slab in the west end is likely part of the adjacent work platform. The majority of the finds came from the destruction horizon of the furnace and the thin layer of humus above it.

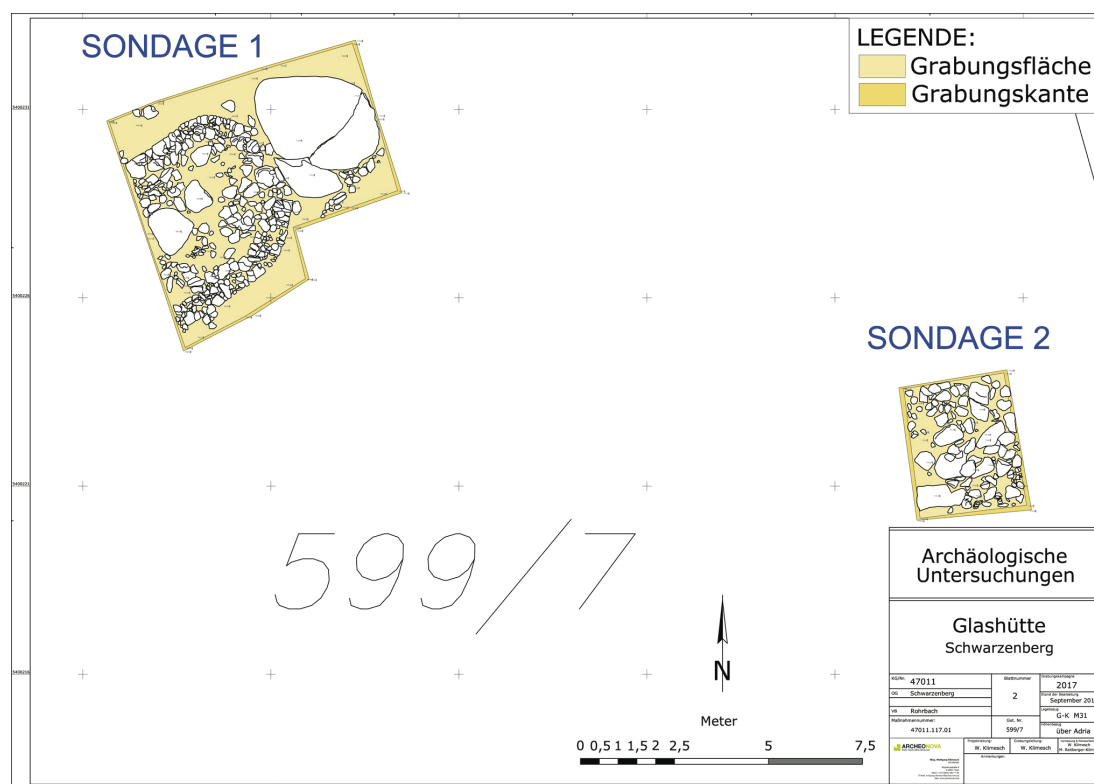


Figure 5. Ground plan of the excavation units at the Gegenbach glassworks site (drawing: Wolfgang Klimesch, Archeonova).

Trench 2, about 15 m to the southeast, uncovered a burned layer under the humus which overlay hewn and unhewn granite stones. A thin layer of ash covering the stony subsoil may be interpreted as a forecourt with fire residues from another furnace that is likely located under an adjacent stone mound. Numerous finds were recovered from the unit, particularly glass slag (Klimesch 2019).

Conclusions regarding the function of the furnace or the reconstruction of individual work processes cannot be

drawn at present due to the limited scope of the excavation, which did not fully uncover either structure. Possibly there was a half-round glass furnace separated from an attached furnace component by the north-south transverse wall. Such a structure is characteristic of the “Bohemian glass furnace type,” at least during the 17th century (Tarcsey 2008a:50-56). To clarify this, it will be necessary to completely uncover the entire structural complex, or at least the furnace.

Unfortunately, there are no analogous excavated bead furnaces that correspond in time and space to the Gegenbach remains to allow them to be identified as an actual beadmaking oven. At Nová Ves in the Bohemian-Moravian Highlands, for example, where the son of Michael Müllner (the brother-in-law of Johann Anton Landgraf) was a glass master from 1703 to 1720, and where similar beads were made, large areas of the glassmaker’s settlement were exposed but not the actual glassworks area with the furnaces (Hrubý et al. 2009). Similarly, while a 3 x 3 m glass furnace was uncovered at the Ochsenkopf in the Fichtelgebirge region of northeastern Bavaria where beads, buttons, and spindle whorls were made from Proterobas around 1640 (Karklins et al. 2016:23, Figure 6; Steppuhn 2008), the structure differs from that at Schwarzenberg in that it has a rectangular floor plan.



Figure 6. The foundations of the Gegenbach furnace (photo: Wolfgang Klimesch, Archeonova).

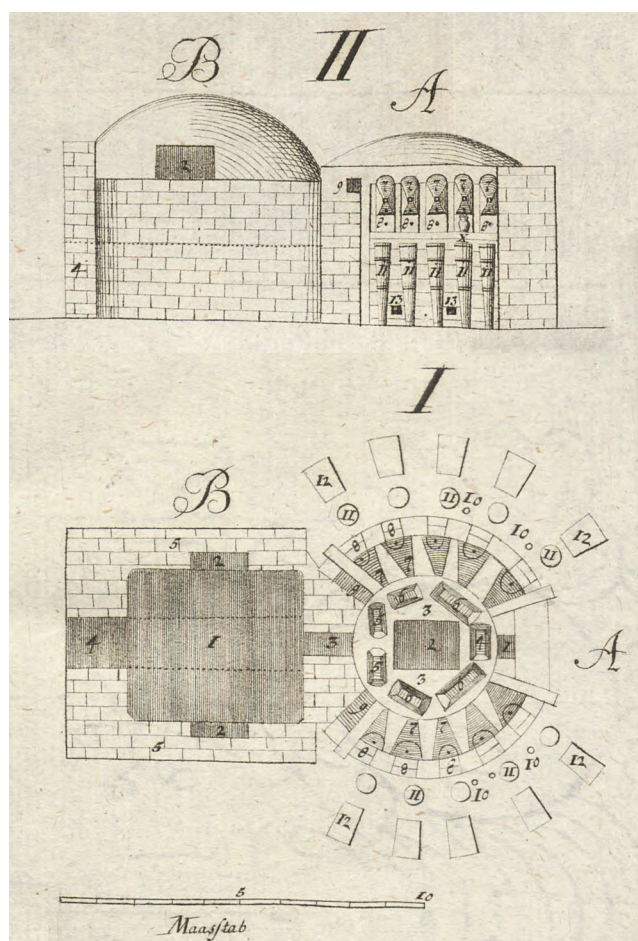


Figure 7. Floor plan and elevation of a *Paterlofen* (Flurl 1792; Bayerische Staatsbibliothek München, BHS II C 8 a, Tafel III, urn:nbn:de:bvb:12-bsb10706849-7).

The oldest known image of a beadmaking furnace (*Paterlofen*) dates from the late 18th century and shows the “button oven” (*Knopfofen*) at the “Paterlhütte” Warmensteinach, also located in the Fichtelgebirge (Figure 7) (Flurl 1792: Plate III). The combined type of glass furnace has an arrangement similar to the above-mentioned “Bohemian furnace.”

THE GEGENBACH GLASSWORKS FINDS

Despite the relatively small size of the two test excavations, they yielded a large number of finds, with hollowware and flat glass represented by very small fragments. In that this material is only a small, non-quantifiable sample, only a few conclusions may be drawn regarding the furnace’s production spectrum.

For the initial evaluation, which was largely carried out by the author, the artifacts were sorted and recorded

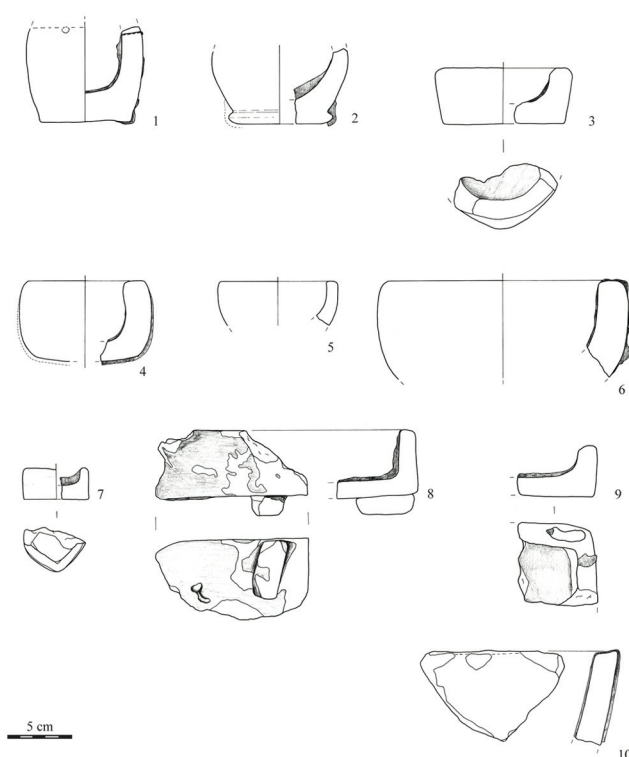


Figure 8. Glass melting crucibles: 1-6) small with curved walls and a round cross section; 7) very small with spout; 8-9) small rectangular with flat base; 10) rim fragment of a large, conical crucible with a round cross section (drawing: Ines Ruttner).

according to form groups. The detailed cataloging of the finds is a desideratum for a possible follow-up project. This also applies to the recovered ceramics, since only artifacts relevant to glass technology have been recorded so far. The few metal finds were processed by Christina Schmid (2019) of the Upper Austrian State Museum. There are no objects specific to the furnace, such as glass processing tools.

Glass Melting Crucibles

The recovered glass melting crucible fragments primarily represent small handmade vessels with round cross-sections that are hard-fired like stoneware. There are also small short pots (rim diameter: 8-14 cm, height: 6-6.5 cm) (Figure 8, nos. 1-6) and half of a miniature vessel with vertical walls and an extended spout (height: 2.5 cm) (Figure 8, no. 7). Other fragments belong to small, rectangular melting pots with flat bottoms, straight walls (height: 4-5 cm), and small stubby feet (Figure 8, nos. 8-9). These small melting pots may be related to bead production, but are also documented at glassworks where only hollowware was produced. They were probably used for trial melting or for melting small amounts of glass. Only a few rim fragments

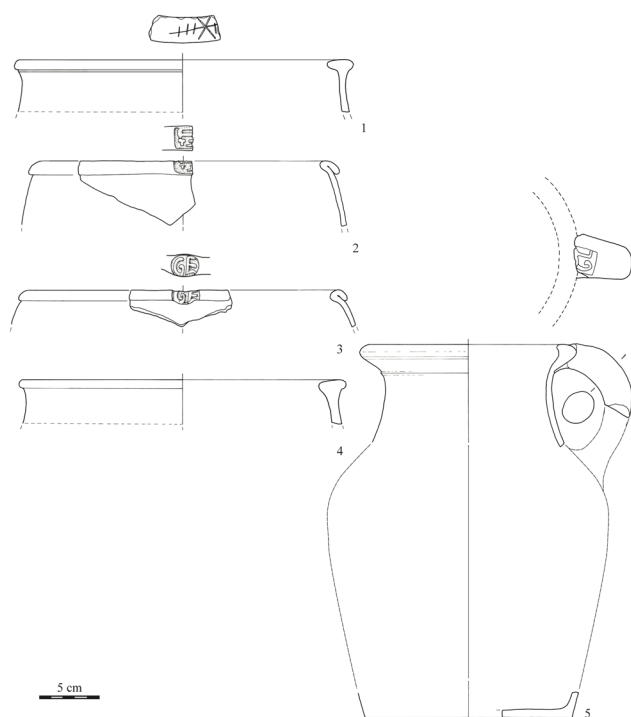


Figure 9. 1-4) pot-shaped cooling vessels; 5) possible jug-shaped cooling vessel (drawing: Ines Ruttner).

come from larger conical crucibles with a straight rim (rim diameter: ca. 32-34 cm) (Figure 8, no. 10). The raw glass remnants in the pots are colorless, blue, amber, and opaque pink (Tarcsey 2019:240).

Cooling Vessels

For easier handling, finished glassware was placed in ceramic vessels with perforated walls and then placed in the cooling furnace to ensure gradual cooling (Frey 2015:85-183; Tarcsey 2008a:236-246). Pot-shaped forms predominate and are made of oxidation-fired, quartz-tempered clay. They generally have incurved, club-shaped rims (Figure 9, nos. 1, 4) or rims folded over onto the exterior face (Figure 9, nos. 2, 3) (average rim diameter: ca. 27-30 cm); only individual wall fragments are perforated.

A large jug can also be assigned to the cooling vessel category based on its composition and manufacturing technique (rim diameter: 18 cm) (Figure 9, no. 5). This previously unrecorded shape could have been used specifically in bead production.

A representation of such a cooling vessel can be seen in the engraved image of the Warmensteinach bead/button furnace (Figure 10). The accompanying text reads: an “X”

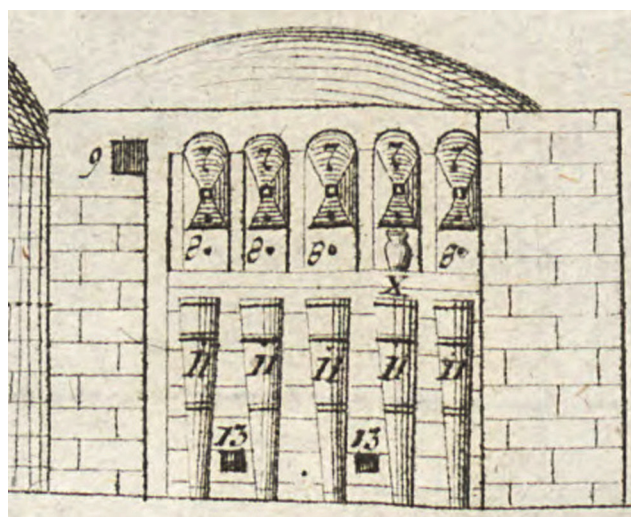


Figure 10. Detail of the Flurl elevation plan of a cooling furnace with a cooling vessel under the fourth working hole (X).

on the floor plan marks “a small earthen vessel” into which the workers dropped the finished buttons through small holes (“8”) “where these buttons must slowly cool” (Flurl 1792: Plate 3.II.A). The contour of the depicted vessel with a constricted neck corresponds to that of the jug described above, but the vessel in the engraving has no handle. These vessels were inset in the furnace wall beneath the work ports. Photographs of the furnace of the last beadmaking works in Warmensteinach from the 1930s show jugs to the left and right of the work ports, but they apparently had a different function (Herrmann 2008; Karklins et al. 2016:20-22, Figures 3-5).

The rims of the cooling vessels from Schwarzenberg are stamped with the mark of Hafner of Passau which dates to the last third of the 17th century and the beginning of the 18th century (Figure 9). Thus, the purchase of ceramic cooling vessels from this well-known production location is verified (Tarcsey 2019:240-242).

Production Wasters

The glass wasters are colorless to opal white, bluish, greenish, dark green, emerald green, amber, blue, and purple chunks of raw glass. Moils (the unwanted tops of blown objects) of green, opaline, and amber glass indicate that the blowpipes had an average diameter of 12 mm. Their presence indicates the manufacture of hollow glass in the enumerated colors.

The waste products of glass processing include teardrop-shaped remnants, threads, twisted rods, cuttings, tubes, and distinctive three-lobed segments, as well as the

remains of bead production (*see below*). Among the twisted rods and segments is a colorless piece with a fine ruby-red thread inside. This find reveals the processing of ruby-red glass rods at the Gegenbach glassworks, but their actual production here remains uncertain due to the absence of ruby-red raw glass among the wasters. Ruby-red cuttings and rods, as well as ruby-flashed glass fragments, were also recovered from the neighboring Sonnenschlag glassworks.

Hollowware

The recovered hollowware is primarily represented by very small fragments. Nevertheless, with a few exceptions, they can be assigned to clear shape groups on the basis of their characteristics (Tarcsey 2019:244-245). The older group consists of colorless glasses *à la façon de Venise*, simpler vessels made of light green and blue glasses, all with thin walls and exhibiting slight iridescence. These are Renaissance-era glasses, for which very good equivalents can be found at the glassworks of southern Bohemia and the Waldviertel, for example, at least until the 3rd quarter of the 17th century (Tarcsey 2008a:294-295).

The more recent shape groups include clear colorless glass, the development of which between 1670 and 1700 marked a change in glass technology. These characteristic Baroque glasses comprise thick-walled, conical beakers and goblets, sometimes adorned with various cut designs such as wreaths, of clear glass with internal ruby decoration, opaque white glass with blue, combed, or marbled patterns, as well as thick-walled mass-produced goods made of green glass. This hollowware group corresponds very well with the products of the South Bohemian glassmakers that were primarily associated with the Müllner family (Tarcsey 2019:263-264).

Since the hollowware finds are mostly represented by very small fragments and often only represent individual pieces, it is difficult to make a reliable distinction between local production and imported cullet, especially since the multiple occurrence of identical shapes is a decisive criterion when determining the products made on site. Due to the limited quantity of the recovered material, it cannot be ruled out that the older glass is cullet, possibly brought in from the neighboring Sonnenschlag glassworks.

Flat Glass

The glass finds include a large number of fragments of different types of flat glass. Among them are many bull's-eye pane remnants that may not be local products but were also

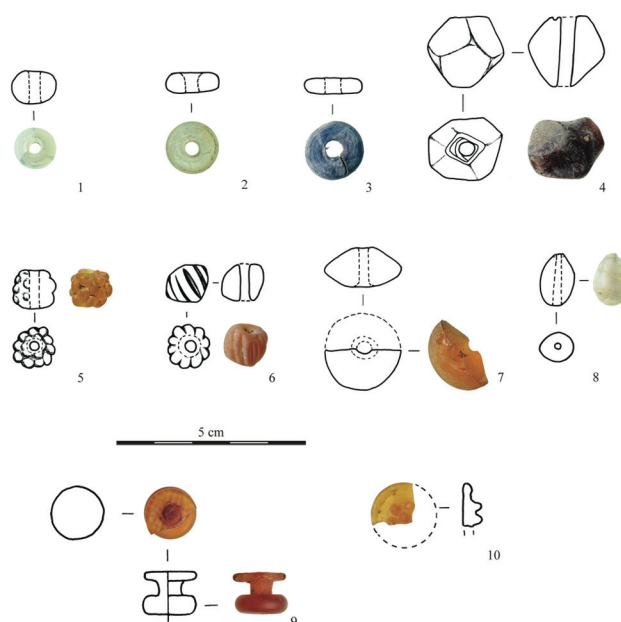


Figure 11. The bead (nos. 1-8) and button (nos. 9-10) types recovered from the Gegenbach glassworks (drawing: Ines Ruttner; photo: Alexandra Bruckböck, Upper Austrian State Museum).

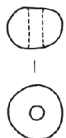


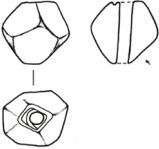




brought in as cullet. Of local origin are plate glass wasters: round, high-quality glass panes which – in contrast to the bull's-eye panes – do not have an annoying pontil mark in the center thanks to a special manufacturing technique (Tarcsey 2008a:193-195, 2008b).

Beads

The Gegenbach glassworks production spectrum is characterized by wound beads made of colorless, opalescent white, yellow to orange/amber, blue, or emerald green glass. Round, oblate, oval, disk, pentagonal-faceted, mulberry/raspberry, ribbed, and biconical types have been recorded so far (Table 1; Figures 11-12). The round/oblate and faceted types predominate with more than 300 examples each, while the disk, biconical, and oval specimens are represented by only one or two specimens. Identical beads were also collected at the Sonnenschlag glassworks (Figure 4).

Production waste includes tapered glass segments (Figure 13) as well as malformed beads with “tails” (Figure 14), revealing that the beads were made by winding them on a mandrel directly from the crucible (for a detailed description of the production process, *see* Karklins et al. 2016). While still in a viscid state, the newly formed beads could be shaped by pressing them with a small paddle. In the case of the mulberry beads, it may be that the knobbed patterns (Figure 15) were imparted through the use of a

Table 1. Characteristics of the Glass Beads from the Gegenbach Glassworks Excavations.

Form	Quantity*	Color	Dimensions	Kidd Type**
 Round to oblate	341	Colorless to opal, emerald green, amber, blue	Diameter: 7-10 mm, also 13-14 mm	WIb
 Donut	12	Colorless to opal, amber	Diameter: 8-14 mm, Length: 5-7.5 mm	WId
 Disk	1	Blue	Diameter: 15.5 mm	flatter than WId
 Pentagonal faceted	300	Colorless to opal, emerald green, amber, blue	Length: 6.5-12 mm, also 15-20 mm	WIic
 Mulberry/ raspberry	52	Colorless to opal, emerald green, amber, blue	Diameter: 8-13 mm	WIId
 Ribbed	27	Colorless to opal, emerald green, amber,	Diameter: 8-12 mm	WIIE
 Bicone	1.5	Amber	Diameter: 12-21 mm, Length: 6-10 mm	WIik
 Oval	2	Amber, opal	Length: 12 mm, Diameter: 7-9 mm	WIc
* Two bead halves were counted as a single bead. ** Kidd and Kidd (1970).				

small ceramic stamp (Figure 16). Such a stamp, with which berry nubs were stamped on vessel walls, was found at the

Reichenau glassworks (1601-1686?) in Freiwald, Lower Austria (Tarcsey 2008a: R-K1, 235-236, Figure 184).



Figure 12. Color varieties of the Gegenbach beads (photo: Alexandra Bruckböck, Upper Austrian State Museum).

In addition to the general production waste from bead production were beads that were likely discarded due to certain quality criteria. Numerous beads have the finest hairline cracks from which they break easily and sometimes even fall apart in storage. This damage could have been caused by conditions in the ground, but more likely it was caused by their being cooled too quickly after production (Figure 17).

Buttons

Like other beadmakers, Gegenbach also produced buttons. Two varieties have been recorded. One, made of amber-colored glass, has a waffle pattern on the flat disk face (Figure 11, no. 9). These have also been recovered from the Sonnenschlag glassworks and from Bohemian sites (Fröhlich 1989: Plate 7, no. 12). The second, also amber-colored, has several berry knobs on the broken flat disk face (Figure 11, no. 10) (Fröhlich (1989: Plate 7, no. 7). The shank is missing.

THE CHEMICAL COMPOSITION OF THE GEGENBACH PRODUCTS

Based on purely macroscopic criteria, the Gegenbach glass clearly reflects the change from Renaissance

glass to Baroque clear glass, which appeared during the 1670s and 1680s. This assessment is confirmed by the chemical analysis of 22 glass samples carried out by Dana Rohanová (Department of Glass and Ceramics,



Figure 13. Production waste from beadmaking, Gegenbach glassworks (photo: Kinga Tarcsay).



Figure 14. Malformed beads from the Gegenbach glassworks (inv. no. B 73451/41) (photo: Alexandra Bruckböck, Upper Austrian State Museum).

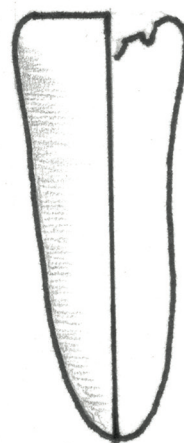
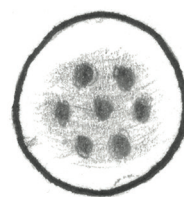
University of Chemistry and Technology, Prague) using a scanning electron microscope equipped with an energy dispersive spectrometer (SEM/EDS) and X-ray fluorescent spectrometry (XRF) (Rohanová 2019:251-256).

Two glass groups are represented. The first was produced using non-purified beech ash as a flux and the composition is close to that of Renaissance glass. Nearly colorless and light green glasses were decolorized by the high MnO content of the beech ash during the melting process. Green glass was colored using copper, blue glass was colored with iron and manganese under specific melting conditions, and brown glass was probably colored the same way as the brown and yellow glass in the following group.

The second glass group, refined with arsenic (As_2O_3), was produced beginning in the 4th quarter of the 17th century and is typical Baroque glass. A subgroup comprising colorless glass was melted using pure raw materials (sand,



Figure 15. Mulberry/raspberry bead showing the recognizable imprint of a knobbed-berry stamp, Gegenbach glassworks (Photo: Kinga Tarcsay).



1 cm



Figure 16. Ceramic knobbed-berry stamp, Glashütte Reichenau am Freiwald (M216/41) (photo: Kinga Tarcsay; drawing: Eva Saidi).

potash or tartar, and limestone) with the addition of arsenic. It could be characterized as “crystal” glass. A subgroup of opaque glasses employed ash derived from sheep bones as an opacifier; Flurl (1792:72) describes how transparent, apparently colorless, buttons made of glass mixed with bone ash were rendered opaque milk-white by subjecting



Figure 17. Spherical beads of opal glass, many of them broken, Gegenbach glassworks (photo: Kinga Tarcsay).

them to a secondary firing. Dark green glass was colored intentionally with a higher content of iron together with copper oxide. Yellow and brown glasses – well known as “amber glass” – were likely colored with a tetrahedral complex compound containing Fe^{3+} and S^{2-} , under reduction conditions during the melting process.

INTERPRETATION OF THE GEGENBACH GLASSWORKS

Due to the wide range of recovered glass products, the original idea that there was only a small bead furnace (*Paterlofen*) at the Gegenbach glassworks – based on the presence of many beadmakers (*Bettmakers*) at the site from 1701 to 1714 – had to be abandoned in favor of a larger glassworks with more varied production.

The similarity of finds at both the Gegenbach and Sonnenschlag glassworks raises the question of why the two glassworks, which are only about one kilometer apart, apparently existed at about the same time. A plausible explanation for this could be the “stationary forest glassworks” and associated “succession places” postulated by Kirsche (2005:128-137) for the early modern glassworks in the Ore Mountains of Saxony. The stationary glassworks were built in remote forest regions and existed for longer periods of time. Part of the “heritage” of the glassworks were additional glass ovens, the so-called succession places, so that production could be relocated if necessary. Kirsche (2005:128-137) states that this type of situation existed from the middle of the 16th century to around 1720. A similar situation is evidenced by the four former furnaces at the Reichenau glassworks in Freiwald, Lower Austria, which operated concurrently in the 16th century a short distance from each other (Tarcsay 2008a:293). The chronologically appropriate analogies as well as the similar archaeological finds suggest that the

Gegenbach hut may be interpreted as the succession place of the Sonnenschlag glassworks, thus explaining the lack of another hut name in the historical sources.

While the finds from both sites tend to suggest that the two glassworks are coeval, Franz Haudum’s renewed critical review of the historical sources reveals that there was obviously a chronological sequence of the “former” Sonnenschlag works and the “present” Gegenbach furnace. Ultimately, only further historical and archaeological research will clarify this situation.

CONCLUSION

Bead production at Schwarzenberg am Böhmerwald is documented from the 17th century until the closing of the Gegenbach glassworks in 1716, and at least until 1720/1721 at the Schlägler am Schwarzenberg glasshouse. Due to the apparently significant production of beads, the Schwarzenberg glassworks belong to the so-called *Paterlhütten* (“bead huts”) whose typical products since the Middle Ages were beads for jewelry and rosaries (*Pat[t]erln*). The production of wound glass beads is likely to have been largely the same here from the Middle Ages to the 18th century. Only a single person with a few tools and a small furnace port was required to wind beads, but he could produce several thousand in a day.

The bead huts – which can be identified through archival material, place names, or archaeological investigations – operated in the southern Bohemian Forest, the Upper Palatinate Forest, the Bavarian Forest, the Grätzen Mountains, the Bohemian-Moravian Highlands, and the northernmost Mühlviertel (Fröhlich 2015; Haller and Schopf 2018). Among the huts are those that produced only beads (and buttons), but also those at which, as apparently at Schwarzenberg, they were only one of several product lines (Fröhlich 2015; Lněničková 1996:30-31). Mauritius Vogt (1712:141) noted increased attention to the production of glass beads in southern Bohemia, including the Bohemian Forest, around 1700 (Haudum 2019:224-225). From 1704/1705 on, large quantities of beads were also produced further south, near the border with Upper Austria, in Aich near St. Gilgen am Wolfgangsee in Salzburg (Wintersteiger 2007:26-28).

Glass beads corresponding to those from Schwarzenberg were also produced in southern Bohemia (Figure 18) at the Alte Schlemmerhütte/Tomášova glassworks in Winterberg/Vimperk (1689-1722) (Blau 1956:215; Fröhlich 1989:9-10, 2015:434) and the Stegerhütte/Štegarova hut near Wallern/Volary (end of the 17th century) (Fröhlich 1989:16-17, 2015:434), as well as at the somewhat secluded hut at Nová



Figure 18. Location of the beadmaking glassworks in the Bohemian Forest with a similar production spectrum, 17th-18th centuries (drawing: Kinga Tarcsay).

Ves in the Bohemian-Moravian Highlands (1691-1721) (Hrubý et al. 2009). As previously mentioned, Johann Anton Landgraf's brother-in-law worked at the latter glassworks, as well as at the Bodenmaiser glassworks, and finally took over the Helmbachhütte from his father (Haudum and Tarcsay 2019:225; Hrubý et al. 2009:482), so that similar bead production can also be assumed at the latter works.

According to F. Haudum (2019:222-226), glass bead production in the Bavarian-Bohemian region experienced a boom around 1700. The beads were exported in large quantities to Passau and Vienna, as well as to Holland, Spain, and Portugal, from where they were exported overseas, especially to the Americas and India. That few of these beads have so far been found in domestic and burial contexts in Austria suggests that they were mainly produced for export.

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