INSIGHT INTO THE 17TH-CENTURY BEAD INDUSTRY OF MIDDELBURG, THE NETHERLANDS

Hans van der Storm and Karlis Karklins

During the first half of the 17th century, several beadmaking establishments operated in the city of Middelburg in the southwestern corner of the Netherlands. Bead wasters recovered from several find sites in the old part of the city reveal the diversity of the product line which featured beads decorated with straight and spiral stripes. Several chevron types were also produced. There are similarities with wasters found at contemporary beadmaking sites in Amsterdam, indicating that both production centers made similar bead varieties. Few of the bead varieties represented have correlatives in the areas of North America that were under Dutch control, leaving one guessing what market the Middelburg beads were destined for. In that the city was a major center for the Dutch East India Company, it may be that their market was in that part of the world. Unfortunately, comparative material from South and Southeast Asia is currently lacking.

INTRODUCTION

During the 17th century, a number of glassworks in Holland produced drawn glass beads for the international market (Hudig 1923; Karklins 1982). These were located in Amsterdam, Haarlem, Rotterdam, Zutphen, and Middelburg, and likely elsewhere as well. While the Amsterdam industry and its products have been well studied (e.g., Baart 1988; Gawronski et al. 2010; Karklins 1974, 1982, 1985; van der Sleen 1963, 1967), this is not the case with the other beadmaking centers, primarily due to a lack of material evidence. Fortunately, a sufficient quantity of production tubes, beads, and rods have been uncovered at several sites in the old part of Middelburg, a walled and moated city located in the Province of Zeeland in the southwest corner of the Netherlands, providing insight into what was being produced there.

HISTORICAL BACKGROUND

Govaert van der Haghe, a native of Antwerp, appears to have been the first beadmaker in Middelburg (and Holland for that matter), establishing a glassworks there in 1581. The establishment was suitably situated between the city wall and the harbor on the "Cousteynschen Dijk" near the Segeerspoort, the city gate (Figure 1). Its purpose was to produce glassware in the manner of Antwerp (Hudig 1923:23). The business flourished and, in 1597, van der Haghe petitioned the city for a larger lot because he intended to produce long colored glass tubes for the manufacture of beads (*lange coleure wercken van getten*) and similar items, and to employ more workers. He was granted the requested property; construction involved tearing down the round of the old city gate which had lost its importance due to the expansion of the city at this time (Hudig 1923:24).

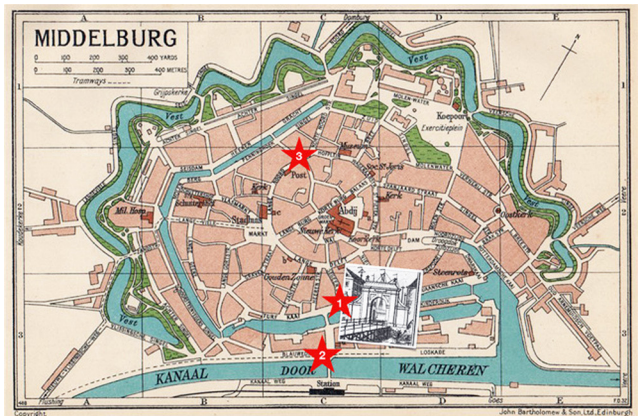

Figure 1. The old part of Middelburg showing the location of: 1) the Segeerspoort, the city gate near which the early glassworks were erected, 2) the Blauwedijk/Kousteense Dijk find site, and 3) the Blindenhoek and Noordstraat find sites (after Muirhead and Muirhead 1933).

Van der Haghe died in 1605 and was succeeded by Anthonio Miotti, a capable Venetian who was descended from a long line of glass and bead manufacturers (Hudig 1923:25). Business was such that in 1618 he purchased additional land behind his property to erect three new dwellings (Hudig 1923:26). Then, in 1623, for reasons unknown, he abandoned the Middelburg factory and

established glassworks in Namur and Brussels (Hudig 1923:27).

With the Zeeland patent now vacant, Wilhelmus Wynants of Amsterdam requested permission in 1626 to build a new glassworks to practice the art of glass blowing in the same manner as the Miotti works. It was constructed near the old one at the Blauwedijk between Oude Segeerstraat and Vlissingsche Poort. The business apparently operated until around 1642 when Willem Verpoort took over the glassworks from the city. That same year, the city signed a contract with Joanis Francisco Promontorio, a Venetian, to "perform glass blowing and making in the same way as Wynants and Minjottes [Miotti]." This undertaking seems to have failed. Additionally, in 1646 the Blauwedijk works reverted to the city, which sold it to a Nathaniel Oudermerk. There is no mention of beadmaking in Middelburg after this date (Hudig 1923:27-28).

Figure 2. Some of the beads, tubes, and raw glass as recovered from the Blindenhoek find site in 1998 (courtesy of Zeeuws Archeologisch Depot, Middelburg).

THE FIND SITES

The material discussed in this article was recovered from a number of find sites in Middelburg (Figure 1). Several hundred beads and beadmaking wasters were recovered from several areas in the Blauwedijk/Kousteense Dijk area on the south side of the city near the Walcheren Canal. Around 200 specimens are in the collections of the Rijksdienst voor het Oudheidkundig Bodemonderzoek, Amersfoort, and 49 are in the possession of Hans van der Storm. All of the van der Storm specimens and 48 representative specimens from the Rijksdienst assemblage (Karklins et al. 2001) were examined for this study.

Another principal find spot is situated on Blindenhoek near its intersection with Noordstraat, two streets on the northwest side of the old circular city center. A large quantity of glass tubes and some rounded beads was found there, along with pieces of raw blue glass (Figures 2-3). Similar material was found nearby on Noordstraat (Figure 4).

Some beads and wasters were obtained from diggers who did not want to divulge the location of find sites and these are marked as "unspecified" in the descriptions that follow. It is, however, likely that they came from the Blauwedijk/Kousteense Dijk area.

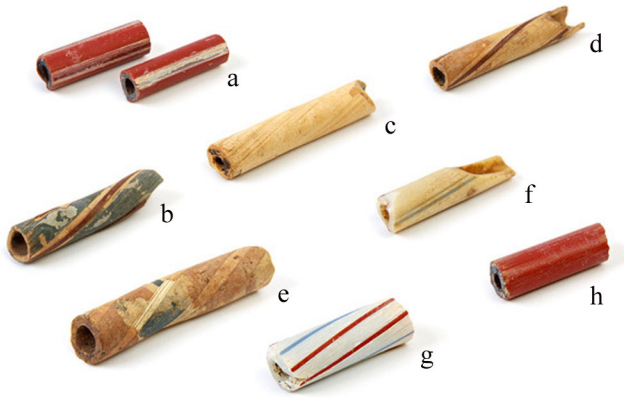

Figure 3. A selection of the Blindenhoek beads or production tubes (photo: Hans van der Storm).

Figure 4. Examples of the beads or production tubes from the Noordstraat find site (photo: Hans van der Storm).

THE MIDDELBURG FINDS

The Middelburg bead study collection consists of 133 tubular beads and bead production tubes, 6 malformed rounded beads, and 11 glass rod segments. Since it is difficult in many cases to differentiate actual tubular beads from production tube remnants, they are considered to be tubular

beads for the purposes of classification. This is based on the system developed by Kenneth E. Kidd and Martha A. Kidd (1970) as expanded by Karklins (2012). Varieties and types that do not appear in the Kidds' lists are marked by one (*) or two (**) asterisks, respectively, followed by a sequential letter for ease of reference. Colors are generally designated using the names and codes provided in the *Munsell Bead Color Book* (Munsell Color 2012). Diaphaneity is described using the terms opaque (op.), translucent (tsl.), and transparent (tsp.). Opaque beads are impenetrable to light except on the thinnest edges. Specimens that are translucent transmit light but diffuse it so that an object (such as a pin in the perforation) viewed through them is indistinct. A pin in the perforation of a transparent bead is clearly visible. Regarding measurements, L=length and D=diameter.

Despite the relatively small size of the collection, there are 53 varieties, most of which are decorated with stripes (Figure 5). Not all varieties are illustrated.

Ia – Tubular, Single Layer, Undecorated

Ia1. Tubular; op. barn red; n=1. L: 20.1-21.5 mm; D: 4.9-6.0 mm. Source: Blauwedijk.

Ia2. Tubular; op. black; n=1 (Figure 5, e3). L: 21.5 mm; D: 4.9 mm. Source: unspecified.

Ia15. Tubular; tsl. bright blue; n=1. L: 43.7 mm; D: 5.8 mm. Source: Blauwedijk.

Ia*(a). Tubular, op. medium shadow blue; numerous linear bubbles in the glass; n=1 (Figure 6). L: 14.1 mm; D: 2.7 mm. Source: unspecified.

Ia19. Tubular; tsp./tsl. bright navy; n=4 (Figure 5, a1-2, j2). L: 20.1-39.3 mm; D: 2.8-14.1 mm. Source: unspecified.

Ia20. Tubular; tsp./tsl. dark navy; n=4 (Figure 5, a3-5). L: 20.4-33.7 mm; D: 3.0 mm. Source: unspecified.

Figure 5. A sampling of the beads or production tubes recovered from find sites in Middelburg (photo: Hans van der Storm).

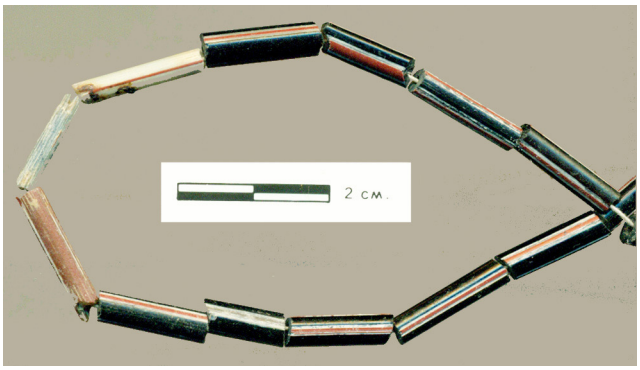

Figure 6. Tubular beads from an unspecified find site in Middelburg (photo: Karlis Karklins).

Ia21. Tubular; tsl. rose wine; n=1. L: 42.1 mm; D: 3.3 mm. Source: Blauwedijk.

Ib – Tubular, Single Layer, Straight Simple Stripes

Ib*(a). Tubular; op. barn red; 12 op. white stripes; n=1. L: 27.7 mm; D: 15.5 mm. Source: Blauwedijk.

Ib*(b). Tubular, op. barn red; six op. light orange stripes; n=2 (cover, upper left). L: 17.-18.4 mm; D: 9.6-10.7 mm. Source: unspecified.

Ib4. Tubular, op. black; three op. white stripes; n=1 (Figure 5, f5). L: 8.2 mm; D: 4.4 mm. Source: unspecified.

Ib10. Tubular, op. white; three thin red stripes; n=1 (Figure 6). L: 17.9 mm; D: 3.1 mm. Source: unspecified.

Ib*(c). Tubular; op. light blue; eight red stripes; n=1 (Figure 5, c1). L: 16.6 mm; D: 9.2 mm. Source: unspecified.

Ib*(d). Tubular; tsl. dark navy; 10 red and 10 white stripes; n=1 (Figure 5, j3). L: 12.3 mm; D: 7.1 mm. Source: unspecified.

Ib*(e). Tubular; op. dark navy; 12 white stripes; n=1 (Figure 5, f3). L: 26.9 mm; D: 8.2 mm. Source: unspecified.

Ib' – Tubular, Single Layer, Spiral Simple Stripes

Ib'*(a). Tubular; op. white; two op. barn red and two tsp. bright navy spiral stripes; n=1. L: 28.3 mm; D: 5.3 mm. Source: Blauwedijk.

Ib'*(b). Tubular, op. white; two sets of one red spiral stripe alternating with two light blue spiral stripes; n=4 (Figure 4, d-e; Figure 5, g1). L: 21.5-27.0 mm; D: 5.5-7.0 mm. Source: Noorderstraat, Blindenhoek; unspecified.

Ib'*(c). Tubular, op. white; two sets of one light blue spiral stripe alternating with two red spiral stripes; n=1 (Figure 3, g). L: 18.9 mm; D: 5.9 mm. Source: Blindenhoek.

Ib'*(d). Tubular, op. white; two red stripes alternating with two, closely spaced, light blue spiral stripes; n=1 (Figure 3, f). L: 25.6 mm; D: 6.0 mm. Source: Blindenhoek.

Ib'*(e). Tubular; op. bright copen blue; three spiral white stripes; n=3 (Figure 3, e; Figure 5, h1, i1-2). L: 21.4-33.0 mm; D: 5.4-7.6 mm. Source: unspecified.

Ibb – Tubular, Single Layer, Straight Compound Stripes

Ibb1. Tubular; op. barn red; three blue-on-white stripes; some specimens are flashed in greenish glass; n=4 (Figure 5, k2-3). L: 15.1-34.7 mm; D: 5.2-5.8 mm. Source: unspecified.

Ibb2. Tubular, op. black; three red-on-white stripes; n=18 (Figure 4, f; Figure 5, e2, f2, 4, 6-7; Figure 6). L: 11.1-26.1 mm; D: 3.1-5.0 mm. Source: unspecified.

Ibb*(a). Tubular, tsl. green; three red-on-white stripes; n=1. L: 11.9 mm; D: 4.1 mm. Source: Blindenhoek.

Ibb*(b). Tubular; op. medium turquoise blue; three white-on-red stripes; n=1. L: 38.6 mm; D: 6.3 mm. Source: Blauwedijk.

Ibb*(c). Tubular, op. light blue; three red-on-white stripes; n=5 (Figure 5, g4). L: 11.0-18.9 mm; D: 4.2 mm. Source: unspecified.

Ibb*(d). Tubular, op. bright navy; three red-on-white stripes; n=1 (Figure 5, j1). L: 42.2 mm; D: 5.8 mm. Source: unspecified.

Ibb*(e). Tubular, op. dark navy; three red-on-white stripes; n=6 (Figure 5, j4-5). L: 14.1-14.4 mm; D: 4.1-5.2 mm. Source: unspecified.

Ibb' – Tubular, Single Layer, Spiral Compound Stripes

Ibb'*(a). Tubular; op. black; three spiral red-on-white stripes; n=1 (Figure 5, f1). L: 19.6 mm; D: 5.7 mm. Source: unspecified.

Ibb'*(b). Tubular; op. white; three spiral blue-on-red stripes; n=1 (Figure 5, g5). L: 19.6 mm; D: 5.6 mm. Source: unspecified.

Ibb'*(c). Tubular; op. light blue; three red-on-white spiral stripes; n=18 (Figure 3, b-d; Figure 4, a-c, g-h, j-k; Figure 5, g2-3, i3-4). L: 25.8-49.0 mm; D: 5.0-7.5 mm. Source: Noorderstraat, Blindenhoek; unspecified.

Ibb'*(d). Tubular; tsl. sky blue; three red-on-white spiral stripes; n=1. L: 38.7 mm; D: 6.2 mm. Source: Blauwedijk.

IIIa – Tubular, Multi-Layered, Undecorated

IIIa1. Tubular; op. barn red exterior/op. black core; flashed in clear glass; n=4. L: 32.3-39.0 mm; D: 2.2-4.8 mm. Source: Blauwedijk.

IIIa3. Tubular; op. barn red exterior/tsl. green core; n=7 (Figure 3, h; Figure 4, i; Figure 5, b1-5). L: 9.0-43.7 mm; D: 3.3-6.6 mm. Source: Noorderstraat, Blindenhoek; unspecified.

IIIa7. Tubular; tsl. light gray exterior/op. white middle layer/tsl. light gray core; n=1. L: 52.7 mm; D: 2.7 mm. Source: Blauwedijk.

IIIa12. Tubular; tsp./tsl. bright navy exterior/op. white middle layer/tsp./tsl. bright navy core; n=3. L: 27.4-54.4 mm; D: 3.1-6.0 mm. Source: Blauwedijk.

IIIb – Tubular, Multi-Layered, Straight Simple Stripes

IIIb*(a). Tubular; op. bluish-white exterior/tsp. dusty aqua blue core; three red and three bright navy stripes; flashed in clear glass; n=2. L: 25.3-50.7 mm; D: 2.8-3.3 mm. Source: Blauwedijk.

IIIb*(b). Tubular; op. white exterior/tsp. dusty aqua blue core; four red and four bright navy stripes; flashed with tsp. light gray glass; n=1. L: 25.2 mm; D: 4.4 mm. Source: Blauwedijk.

IIIb*(c). Tubular; tsp./tsl. bright navy exterior/op. white middle layer/tsp./tsl. bright navy core; six white stripes; n=2. L: 27.5-28.5 mm; D: 4.2-6.2 mm. Source: Blauwedijk.

IIIb*(d). Tubular; tsp./tsl. bright navy exterior/op. white middle layer/tsp./tsl. bright navy core; 14(?) white stripes; n=1. L: 18.0 mm; D: 16.3 mm. Source: Blauwedijk.

IIIb9. Tubular; op. bright navy exterior/op. white middle layer/op. bright navy core; 10 white stripes; n=1 (Figure 5, c3). L: 16.3 mm; D: 14.6 mm. Source: unspecified.

IIIbb – Tubular, Multi-Layered, Straight Compound Stripes

IIIbb1. Tubular, op. barn red exterior/op. black core; three black-on-white stripes; n=1 (Figure 6). L: 18.9 mm; D: 3.5 mm. Source: unspecified.

IIIbb4. Tubular, op. barn red exterior/tsl. green core; three black-on-white stripes; n=3 (Figure 3 a; Figure 5, b2). L: 14.3-15.7 mm; D: 4.2-4.6 mm. Source: Blindenhoek; unspecified.

IIIbb5. Tubular, op. barn red exterior/tsl. green core; three blue-on-white stripes; n=1. L: 13.6 mm; D: 3.5 mm. Source: Blindenhoek.)

IIIbb' – Tubular, Multi-Layered, Spiral Compound Stripes

IIIbb'*(a). Tubular; op. barn red exterior/tsl. green core; three spiral blue-on-white stripes; n=2 (Figure 5, k4-5). L: 15.7-29.1 mm; D: 5.4-5.5 mm. Source: unspecified.

IIIk – Tubular, Multi-Layered, Chevron, Undecorated

IIIk*(a). Tubular; chevron bead with four layers: tsp. bright navy exterior/op. white/op. redwood /tsp. light gray core; the ridges of the second layer show through as straight stripes; n=2 (Figure 5, h3; Figure 7). L: 21.0-53.9 mm; D: 3.6-5.0 mm. Source: unspecified.

Figure 7. Two chevron bead production tubes (photo: Hans van der Storm).

IIIm – Tubular, Multi-Layered, Chevron, Rounded by Grinding

IIIm*(a). Oval; chevron bead with seven layers: tsl. bright navy exterior/op. white/op. barn red/op. white/tsp. bright blue/op. white/tsl. bright blue core; n=1 (Figure 8). L: 36.0 mm; D: 17.3 mm. Source: stray find near Middelburg.

Figure 8. Oval seven-layer chevron bead found near Middelburg (photo: Hans van der Storm).

IIInn – Tubular, Multi-Layered, Chevron (Porcelain Appearance), Straight Simple Stripes

IIInn(a).** Tubular; chevron with four layers: op. white exterior/op. red/op. white/op. red core; six red and six bright

navy stripes; n=9 (Figure 5, c2; Figure 7). L: 16.1 mm; D: 12.8 mm. Source: unspecified.

IIInn(b).** Tubular; chevron with five layers: op. white exterior/op. red/op. white/op. red/tsp. turquoise green core; six red and six bright navy stripes; n=1. L: 17.4 mm; D: 16.4 mm. Source: Blauwedijk.

IIIp – Tubular, Multi-Layered, Chevron, Straight Simple Stripes on Second Layer

IIIp(a).** Tubular; chevron with five layers; thin tsp. light gray exterior/op. white/op. barn red/op. white/op. barn red core; six op. barn red and six tsl. bright navy stripes; n=1. L: 17.4 mm; D: 11.3 mm. Source: Blauwedijk.

IIIp(b).** Tubular; chevron with five layers; thin tsp. light gray exterior/op. white/op. barn red/op. white/tsp. light gray core; six op. barn red and six tsl. bright navy stripes; n=1. L: 21.9 mm; D: 15.3 mm. Source: Blauwedijk.

IIIp(c).** Tubular; chevron with five layers; thin tsp. bright turquoise exterior/op. white/op. barn red/op. white/tsp. bluish core; six op. barn red and six tsl. bright navy stripes; n=1. L: 17.0 mm; D: ? mm. Source: Blauwedijk.

IVb – Non-Tubular, Multi-Layered, Straight Simple Stripes

IVb34. Barrel shaped; tsp./tsl. bright navy exterior/op. white/tsp./tsl. bright navy core; 16(?) op. white stripes; n=1. L: 17.5 mm; D: 12.8 mm. Source: Blauwedijk.

IVn – Non-Tubular, Multi-Layered, Chevron, Straight Simple Stripes

IVn*(a). Barrel shaped; chevron with four layers; tsl./op. dark navy exterior/op. white/op. barn red/tsl. medium turquoise blue core; four op. barn red, four op. white, and four op. sunlight yellow stripes; n=1. L: 16.7 mm; D: 14.0 mm. Source: Blauwedijk.

IVnn – Non-Tubular, Multi-Layered, Chevron (Porcelain Appearance), Straight Simple Stripes

IVnn4. Barrel shaped; chevron with four layers; op. white exterior/op. barn red/op. white/op. barn red core; six op. barn red and six ts1. bright navy stripes; production error (one flat side); n=2. L: 12.5-15.0 mm; D: 13.0-15.3 mm. Source: Blauwedijk.

IVp – Non-Tubular, Multi-Layered, Chevron, Straight Simple Stripes on Second Layer

IVp(a).** Barrel shaped; chevron with five layers; tsp. blue-tinted exterior/op. white/op. barn red/op. white/tsp. turquoise core; six op. barn red and six tsl. bright navy stripes; n=2. L: 13.5-16.2 mm; D: 15.7-19.4 mm. Source: Blauwedijk.

Glass Rods

These may have been used to create stripes on beads or to decorate hollowware. Some may represent the sealed ends of production tubes where the bubble forming the hole did not extend.

1. Op. barn red; n=2. L: 21.9-59.8 mm; D: 3.9-9.6 mm. Source: Blauwedijk.

2. Op. barn red exterior/tsl. green core; n=1 (Figure 5, c4). L: 59.8 mm; D: 9.6 mm. Source: unspecified.

3. Tsl. white exterior/tsl. light gray core; n=1 (Figure 5, d1). L: 47.4 mm; D: 3.3 mm. Source: unspecified.

4. Tsl. oyster white exterior/op. red/tsl. oyster white/tsp. light gray core; flashed in clear glass; n=3 (Figure 5, d2-3, e1). L: 35.3-41.7 mm; D: 4.4-4.9 mm. Source: unspecified.

5. Op. light gold; n=1. L: 33.7 mm; D: 3.4 mm. Source: Blauwedijk.

6. Tsl. dark navy; three spiral white stripes; n=1 (Figure 5, h2). L: 35.4 mm; D: 7.9 mm. Source: unspecified.

7. Melted white, red, and blue glass; n=1 (Figure 5, k1). L: 16.3 mm; D: 5.1 mm. Source: unspecified.

DISCUSSION

Beads with straight and spiral stripes dominate the Middelburg bead study collection, comprising 80% of it. Undecorated varieties make up the remaining 20%. Chevron beads with four to seven layers are represented by 10 varieties and constitute 8.2% of the assemblage. Most are decorated with stripes, either on the surface or on the second layer under a layer of clear glass.

Regarding color, specimens with blue bodies predominate (42%) with white (22%), red (18%), and black (18%) making up the rest. Green and purple beads are each represented by a single specimen.

It is noteworthy that almost all the tubes are more than 4 mm in diameter, suggesting that the glassworks involved did not produce seed beads but only larger beads rounded using

the *a speo* method (Karklins 1993). The few tube segments that are under 4 mm in diameter appear to be actual beads (bugles) rather than production tube remnants (Figure 6).

The presence of only six beads malformed during the heat-rounding process is unusual as such rejects are numerous among the wasters at other contemporary European beadmaking sites, such as Kg9-10 in Amsterdam (Karklins 1985) and the Hammersmith Embankment in London (Karklins, Dussubieux, and Hancock 2015). Is this due to careful rounding procedures or were the tubes chopped into bead lengths at one place and the rounding done at another with wasters from each process going to different dumps? Some beads with minor defects were certainly exported along with the good ones as such beads have been recovered in small quantities at a number of sites in the northeastern United States that would have been within the Dutch sphere of influence (Karklins 1993).

Comparing the Middelburg bead assemblage to those from other contemporary beadmaking sites, there are quite a few correlatives (28 varieties) in the Kg9-10 collection (Karklins: pers. obs.) which is attributed to the first Two Roses glasshouse that operated on the Keizersgracht from 1621 to around 1657, when the operation was moved to a new site on the Rozenstraat (Baart 1988:69, 71). There are far fewer correlatives (8 varieties) with those recovered from wasters associated with the Carel-Soop works which was in operation on the Kloveniersburgwal from 1601 to 1624, but the sample size is much smaller (Bradley 2014:56-57). Similarly, there were equally few matches with varieties recorded at the second Two Roses glassworks (Gawronski et al. 2010:44, 112-121). Thus, while all three glassworks produced some similar varieties, the closest correlation to the Middelburg assemblage is Kg10 and that the two assemblages likely date to about the same time period.

At the Hammersmith glassworks, which operated in London during the second quarter of the 17th century, there are only five correlatives – all common undecorated seed bead varieties (Karklins, Dussubieux, and Hancock 2015). While some of the tubular striped varieties are superficially similar, they differ in the number of stripes or the color of the different layers.

While there are correlatives at Native American sites in regions under Dutch control during the 17th century, it is currently impossible to differentiate those that might have originated in Middelburg from those which were produced in Amsterdam.[1] It is noteworthy that there are few examples at aboriginal sites of beads with spiral stripes, whereas they are so common in the Middelburg assemblage. Similarly, an examination of the beads excavated at the former Dutch colony of St. Eustatius in the Caribbean revealed only one striped bead, one which is not replicated in the Middelburg collection (Karklins and Barka 1989:62). If these beads were not sent to New Netherland or the Caribbean, where did they go? In that Middelburg was an important center of the Dutch East India Company (VOC) during the 17th century (Figure 9), likely destinations are South Africa and South and Southeast Asia. Unfortunately, there is presently no comparative material available from that period to confirm this.

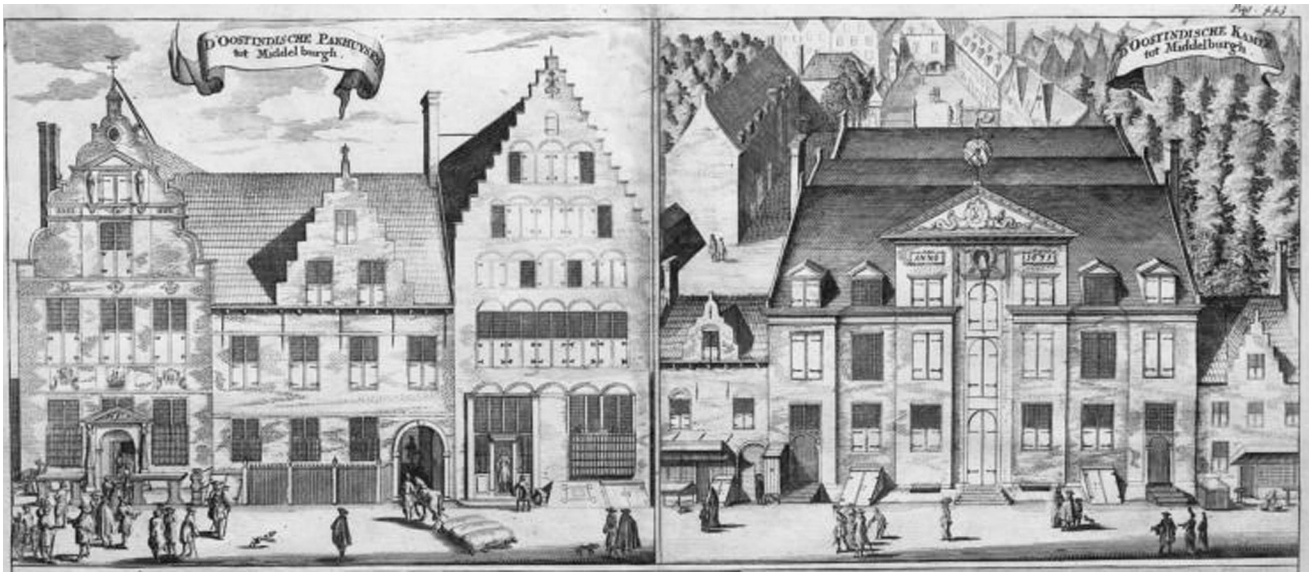

Figure 9. Two of the main VOC structures in Middelburg: left: warehouses; right: the main office building (Smallegange 1696:443).

CONCLUSION

While the Middelburg finds greatly increase our knowledge of the Dutch bead industry, much remains to be learned. In that the Middelburg study sample is small compared to what has been excavated in Amsterdam, there is no way to determine how the Middelburg glasshouse production output compared to that of Amsterdam. We also know nothing of the products of the other Dutch beadmaking centers. Questions also remain concerning the relatively brief span of the Dutch beadmaking industry which only lasted about three quarters of a century. Was it that it could not compete with the prolific Venetian beadmakers, or those in France, or were there other reasons? Only further archaeological and archival research can answer these questions.

ENDNOTE

1. Neutron activation (INAA) and laser ablation (LA-ICP-MS) analysis of production tube wasters from the Middelburg collection held by the Rijksdienst voor het Oudheidkundig Bodemonderzoek, the Kg10 material in the collections of Bureau Monumenten & Archeologie (BMA), Gemeente Amsterdam, and the Hammersmith material at the Museum of London Archaeology revealed that practically all the samples were composed of soda-lime-silica glass, but exhibited differences in their trace elements. This suggests that while the beads at all three sites were made using very similar recipes, all likely based on Venetian formulas, they were made using raw materials from different sources (Karklins, Dussubieux, and Hancock 2015:21; Karklins et al. 2001). Further study of the trace elements in the various bead glasses may eventually allow us to more accurately source glass beads.

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Hans van der Storm
Amsterdam
The Netherlands
hastorm@icloud.com

Karlis Karklins
Ottawa, ON
Canada
karlis4444@gmail.com