From East to West : The Early Roman Glass Industry

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This paper is intended as a discussion document in which I raise various questions concerning the functioning and development of the Roman glass industry. I take as my starting-point the research carried out over many years by Marianne Stern, and my comments here are meant not as a critique of but as a tribute to her work. Her numerous publications are both stimulating and very instructive. They are also extremely sound since they are based on the physical evidence, whether that is literary and epigraphic source material, archaeological finds, museum collections, or practical experience of glass working. It is particularly appropriate to mention here her recent long article in the *American Journal of Archaeology* since it discusses in some detail the case of prismatic bottles with base stamps, which was the principal focus of the 2001 colloquium at Aix-en-Provence (Stern 1999, esp. p. 467-469). However, the article is much more wide-ranging than this implies, and it stands as a good example of how Stern has carried our understanding of Roman glass forward in recent years. At the same time, of course, the article serves to highlight the immense gaps in our knowledge and the ways in which limited data may be used to draw seemingly contradictory conclusions.

There can be no doubt that circumstances conspired to launch the Roman glass industry on its meteoric rise. The invention of glassblowing coincided in a very fortunate way with the establishment of Roman control over the whole of the Mediterranean world, added to which glass became "fashionable" in Roman aristocratic circles during Augustan times. The details remain patchy, so that one is left wondering, for example, how this new industry, where most of the early blown glass vessels were small bottles and cups, could also produce large and highly sophisticated pieces such as the Portland Vase (Stern 1999, esp. p. 447 and 479). The conclusion must be that, while commercial glassblowing spread rapidly throughout the empire, the industry also quickly became diversified and specialised. In other words, the industry functioned in different ways at different levels. Was there also a clear distinction in terms of scale and proficiency between the western and eastern industries?

Many, including Stern, believe so. I, however, am not so certain, and it may be argued that the existing evidence provides a distorted picture. So, for example, sites such as Cosa (Grose 1974; Grose 1977, p. 16-27; Grose 1982, p. 24-29; Grose 1983) have supplied important data about the early Italian industry, but are they truly representative? The archaeology of the Roman world is skewed heavily towards the West. Much more attention has been given to minor finds, including glass, from sites in Italy and the western provinces than in the East, where architecture and sculpture dominate the archaeological perspective. Destruction and abandonment layers from the Augustan limes in Germany, the cities buried by the eruption of Vesuvius, and the gradual conquest of Britain have proved a rich source of material from which to develop closely dated chronologies, especially for the first century. There is little equivalent evidence from the East, where urban occupation was much more intense and sustained. Excavations at sites such as Ephesus, Dura Europos and now Zeugma, however, have produced useful destruction levels that provide good dated material for the third century. Work in Israel provides the major exception to this rule, notably with the finds from destruction layers associated with the Jewish revolt in the 60s. Roman shipwrecks that contained glass in their cargoes are another important source of dated material. However, all nine of the examples mentioned by Stern come from the western Mediterranean, whereas in terms of history of glass as a whole the most significant wrecks – Ulu Burun and Serçe Limanı – were found off the south coast of Turkey (Stern 1999, p. 473; Pulak 2001, esp. p. 25-30; Özet 1998 p. 32, nos. 1-2; p. 160-176, nos. 110-125; van Doorninck 1990). Sadly, the underwater archaeologists based at Bodrum (ancient Halicarnassus) have found numerous Roman wrecks but have not investigated them in any detail.

In short, it may be stated that the richness and diversity

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All dates are AD, unless otherwise stated.

of the glass industry in the eastern Mediterranean during the first century is still poorly understood. Stern has argued that "glasses made in the West were exported to the East", and it is worth bearing in mind that early Roman cameo glass vessels, probably produced mainly in Rome itself, have been found in the eastern half of the empire (Stern 1999, p. 474; Painter, Whitehouse 1990, p. 141-143, no. A3; p. 150-153, no. A8; for another western vase, found in a tomb of Augustan date at Kayseri [ancient Caesarea Cappadociae], see Lightfoot 1990a, p. 91-93 and fig. 1, 5). However, this falls far short of admitting "the dominance of Italy and the West in early glass-blowing" as a whole. Trade in luxury glass was empire-wide, but parallels between other, more mundane types of glass may be explained as easily by the movement of craftsmen, the sharing of ideas, and the copying of fashions as much as by the exchange of the goods themselves. Other factors, too, are involved.

Large storage jars and vases are well known in the West both from cemeteries where they found a secondary use as cinerary urns and from illustrations on Pompeii wall paintings. Few examples, by contrast, can be cited from eastern contexts. In addition to the example published by Gladys Weinberg now in Athens (Weinberg 1992, p. 121-122, no. 91 [provenance unknown]), an urn with M-shaped handles was found by accident in a sarcophagus at Corinth in the late 1960s (Wiseman 1969, p. 87, pl. 32.1), while a third example, said to be from Alexandria, Egypt, is now in the Metropolitan Museum (see below, cat. no. 1, fig. 1, 1). Another large urn (unpublished), complete with lid, was seen in 1987 on display in the Çankırı Museum (ancient Gangra in Paphlagonia, a major centre for Roman military recruitment); I noted at the time that the urn still contained ashes and was sealed with lime plaster. Whether or not these are imports from the West, the rarity of such finds in the East surely has as much to do with local burial practices as with glass production.

It has long been argued that early Roman mould-blown glass production was concentrated in two areas – the Syro-Palestinian region and Italy. Recently, however, Stern has argued against the usual theory that Ennion and his peers migrated from Sidon to northern Italy, and there is growing acknowledgement that some types of mould-blown vessels were made elsewhere (Stern 1995, p. 71-72). So, for example, it "seems likely" that the so-called mythological beakers were made in a workshop " located somewhere along the well-populated coast of Asia Minor " (Wight 1994, p. 27). Does this not mean that craftsmen, whether native, immigrant, or itinerant, were just as active there in inventing mould designs attractive to the local market as their counterparts, who made gladiator and chariot beakers, were in the West? It seems inherently likely that other designs, such as the Ajax flask, the fish bottle, and the small melon-shaped juglets and amphoriskoi, were products of the eastern industry too.[1]

Other groups of free-blown vessels are also eastern. Many years ago Nina Sorokina argued that flasks, bottles, amphorae, and aryballi with the distinctive "collared" rim were made in western Asia Minor (Sorokina 1990, p. 57). Vessels with this type of rim are infrequently found in the West, but they had a very wide distribution in the East – from the Black Sea and the Balkans to Cyprus and Syria. They are a good example of the vitality and diversity of the glass industry in the East. Sorokina associated the shape of the collared rim to Pergamene ceramics, and it is certainly worth considering what other influences came from eastern pottery (Sorokina 1990, p. 55). I take as one example the case of carinated perfume bottles. These are a relatively common form of early Roman glass and were produced by a variety of techniques – casting, free-blowing, and mould-blowing. Some in mosaic and gold-band glass are clearly luxury items.[2] But, in addition, plainer varieties were also produced; so, for example, the Metropolitan Museum's collections include five free-blown examples (see below, cat. nos. 2-6, figs. 1, 2-6), while there is also a mold-blown example from Cyprus (see below, cat. no. 7, fig. 1, 7). These may all be derived from the luxury, cast (and blown) examples, produced by different craftsmen in separate workshops and at different places and times. If one looked through catalogues of Roman pottery, however, one would find it hard to find a parallel – and one of the problems is, again, that compared with the western sigillata wares relatively little is still known about ceramic production in the Roman East. I can, however, offer an exact red-gloss parallel, found at Amorium in eastern Phrygia (fig. 1, 8).[3] Admittedly, in this case it is equally possible that potters took the glass bottle as their prototype, but this would not have happened if the type were not already common in Asia Minor.

I would maintain, therefore, that not all of the innovations and advances in glassworking during the first century necessarily originated in the West. The variety of new forms and uses to which glass was put in the East in late antiquity has been well illustrated by Stern, but that is not to say that a vibrant glass industry did not exist there during early imperial times (Stern 1999, p. 481-484). A case in point is engraving. Who, why, and where the practice of adding linear decoration to blown vessels developed are

[1] For the most recent discussion of the Ajax flask, see Whitehouse 2001, p. 49-51 no. 523 (who erroneously states that the correct identification of the scenes with the life of Ajax, son of Telamon, was first made by Susan B. Matheson, not Aynur Özet (cf. Özet 1993, p. 144).

[2] See, for example, Oliver 1967, p. 23-24, nos. 1 and 8, figs. 14-15 (both in the Metropolitan Museum of Art). A monochrome cast example in opaque deep blue exists in the Royal Scottish Museum, Edinburgh (A1880.18.16). It comes from the Piot Collection, which consists principally of glass from the eastern Mediterranean

[3] Red-gloss sigillata bottle; H. 7.3 cm; D. (rim) 2.1 cm; D. (body) 4.7 cm; D. (base) 2.0 cm; surface find in 1988, probably from the necropolis; deposited in Afyon Museum in 1993 (K. Env. 12); unpublished. I thank Mr. Mevlüt Üyümez of the Afyon Archaeological Museum for supplying these details.

questions that remain unanswered. One of the best and most commonly cited examples of such decoration is provided by the so-called " Hofheim Cup ", dated by finds at sites in Germany and Britain to the mid-first century.[4] Other cups of this type are well dated by their discovery at Pompeii and Herculaneum. One might, then, be given to believe that the introduction of linear decoration was a western phenomenon. But such decoration is clearly a continuation of the habit of putting horizontal grooves on cast vessels, a practice that had originated in the East. It is, therefore, interesting to note a group of cylindrical beakers found at Herculaneum (Scatozza Höricht 1986, p. 42-43, nos. 73-76, Form 23). The closest parallels I can find to this type all come from the East — some 19 examples exist in the Izmir Museum alone, and others are known in museums at Afyon, Bergama, Eskiş≤ehir, and Tire (Lightfoot 1989, p. 27-28, nos. 12-14; Lightfoot 1990b, p. 9 and figs. 4-5; Gürler 2000, p. 67-69, nos. 85-89). Indeed, the type is so common in western Asia Minor that one is more inclined to believe that they were made there than that they were imported in bulk. It remains a mystery as to why craftsmen went to the trouble of putting such fine decoration on a whole series of blown perfume bottles and larger storage jugs, as well as on cups and beakers, but a feasible explanation is that it was from force of habit and a general expectation of customers to see "quality" glass treated in this way. The practice of glassmakers passing on their wares for glasscutters to decorate certainly existed in the East before it appeared in the West. I would, therefore, argue that there is a good chance that some types of cut decoration originated there and were copied by western craftsmen.

Likewise, it is difficult to say what are the earliest examples of the use of trailed decoration on blown glass. Initially, it would seem, marvered trails were preferred, following the tradition set by the Greek core-formed industry. Was it a craftsman in Italy or in the East who first decided to leave the trails in relief on the blown vessels he had produced?[5] Certainly, it may be argued that the traditions and techniques of core-formed glassmaking had a great influence on the early free-blown glass industry. Not only is trailed decoration on blown glass a direct descendant of that found on core-formed glass, but the manipulation of hot glass to form handles and bases for free-blown vessels must also derive ultimately from their use on Hellenistic core-formed bottles of Group III and especially on the amphoriskoi that were produced in some profusion during the second half of the second and throughout the first century BC. The location of the centres that produced these vessels is still debated, but they were certainly located in the eastern Mediterranean (Grose 1989, p. 122). The details of the relationship between the declining core-formed industry and the burgeoning blown one are not recoverable from the surviving evidence, but clearly the skills of core-formed glassmakers were not lost but rather put to new uses.

This is not to say, however, that the cast glass industry did not play a major role in the development of early blown glassware. Some of the technical innovations, as well, presumably, as the development of new markets and products, may be attributed directly to those involved in the production of cast glass, which remained popular well into the first century (Grose 1977, p. 13-15). Experimentation and innovation are significant features of both the cast and the blown industry during the late first century BC and beyond, and there would seem to be no good reason to think that the demand that stimulated the growth in glass production was any greater in the Latin West than in the Greek East. The sudden popularity of glass in Rome and Italy may, indeed, have been a factor. Likewise, the needs of the Roman army may have stimulated the growth of industries in northern Italy, Gaul, and eventually Germany, but glassmaking centres in the East must have had comparable stimuli. The major cities of the eastern Mediterranean – Smyrna, Ephesus, Perge, not to mention the metropoleis of Antioch-on-the-Orontes and Alexandria – must have provided major markets for glass, while Roman soldiers stationed in the East would doubtless have been as appreciative of glass tablewares and containers as their counterparts in Germany or Britain were. Compared with the West, however, the evidence for glass on military sites in the East is meagre (Lightfoot 1993, p. 33-37).

Once glass-blowing had been invented and glass vessels could be mass-produced at a fraction of the cost of cast and core-formed wares, there must have been an enormous increase in the production of raw glass and in the trade in glass. The question is, therefore, not one of discussing the relationship between the various producers of glass vessels but of imagining an empire-wide network encompassing the whole glass process – from raw materials to finished products. The more labourers, craftsmen, merchants and shippers that became involved in the glass business, the more efficient and cost-effective the whole system must have been. So, it is not impossible to imagine that the glass industry was organised along similar lines to those that allowed for the regular supply of corn from Egypt, oil and wine from Spain, and wild beasts from every corner of the known world.

Instead of concentrating on the identification of eastern

[4] Price, Cottam 1998, p. 71-73. For similar cups found in the East, see Lightfoot 1990b, p. 8-9 and figs. 1-3 (with refs.); Özet 1998, p. 50 no. 17; Gürler 2000, p. 66-67, nos. 82-84; Stern 2001, p. 73, no. 16 (with refs.).

[5] One may note the existence of a few core-formed vessels decorated with unmarvered threads. Two such fragments have been found at sites in Italy and Sicily, but the dating may suggest that these examples are too early to have had a direct influence on the Roman glass industry; see Grose 1982, p. 22-23, fig. 1. By contrast, the deposit of cast and blown glass found during excavations in the Jewish Quarter of the Old City of Jerusalem in 1970 included a bottle "with a spiraling glass thread"; see Grose 1977, p. 12.

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Fig. 1 — **1** : Large jar. H. (vessel) 27.3 cm; (lid) 7.3 cm. The Metropolitan Museum of Art, Gift of J. Pierpont Morgan, 1917 (17.194.147a,b) ; **2** : Carinated bottle. H. 7.0 cm. The Metropolitan Museum of Art, Gift of Henry G. Marquand, 1881 (81.10.265) ; **3** : Carinated bottle. H. 7.6 cm. The Metropolitan Museum of Art, Gift of Henry G. Marquand, 1881 (81.10.289) ; **4** : Carinated bottle. H. 8.6 cm. The Metropolitan Museum of Art, The Edward C. Moore Collection, Bequest of Edward C. Moore, 1891 (91.1.1354) ; **5** : Carinated bottle. H. 10.8 cm. The Metropolitan Museum of Art, The Edward C. Moore Collection, Bequest of Edward C. Moore, 1891 (91.1.1355) ; **6** : Carinated bottle. H. 9.2 cm. The Metropolitan Museum of Art, Gift of J. Pierpont Morgan, 1917 (17.194.164) ; **7** : Carinated bottle. H. 9.1 cm. The Metropolitan Museum of Art, The Cesnola Collection, Purchased by subscription, 1874-76 (74.51.53) ; **8** : Red-gloss sigillata carinated bottle. H. 7.3 cm. Afyon Museum (Amorium 1993, K. Env. 12). Photo: Tug&rul Çakar.

and western groupings within the Roman glass industry, it may be more instructive to investigate the relationship of glass production to that of similar objects in other media. Manufacturers of early Roman glass, having quickly learnt to appreciate the versatility of their medium, drew their inspiration from a wide variety of sources. It is important to realise that a free exchange of ideas and techniques existed not only amongst glassworkers but also between them and craftsmen working in metal, pottery, stone, and organic materials such as wood and wickerwork. With the invention of glass-blowing this versatility, combined with the ready passage of goods and people from one end of the Roman world to the other, allowed glass to gain a universal appeal – an appeal that remains as strong today as it was in the first century.

Catalogue of examples in the Metropolitan Museum of Art (Abbreviations: H. height, GD. greatest diameter, D. diameter)

1. Large jar (*olla*) with M-shaped handles (fig. 1, 1)

Second half of the 1st to early 2nd century. Said to be from Alexandria, Egypt.[6] Formerly Julien Gréau Collection. Gift of J. Pierpont Morgan, 1917 (17.194.147a,b).

Vessel: H. 27.3 cm; GD. 22.2 cm; D. rim 15.9 cm; D. base 10.8 cm.

Transparent blue-green. Blown.

Thick, partially tubular rim, folded down, round, up and pressed into sides of mouth. Flaring neck. Ovoid body tapering to pronounced, open base ring. Concave base. Two large, thick rod handles applied to the shoulder from left to right, worked into vertical, M-shaped loops and railed off back along the top of each handle.

Broken and repaired with large holes in body and some areas of fill.[7] Areas of creamy iridescent weathering.

Lid: H. 7.3 cm; GD. 14.9 cm.

Transparent pale green. Blown.

Rounded edge, turned down and slightly inward. Uneven, concave body. Conical shoulder. Cylindrical neck. Solid, round knob with tooling marks and impressions on top.

Intact, except for weathering chips around edge and an internal crack on the neck and shoulder. Soil-encrusted milky weathering, partially flaked off.

Published: Froehner 1903, p. 204, no. 1533, pl. CCLXXV; Eisen 1927, p. 152, pl. 9a.

References: Fremersdorf 1958b, p. 47, pl. 101.

Form: Isings form 63.

Parallels: *Fitzwilliam* 1978, p. 38-39, nos. 72-73; Ziviello 1990, p. 52 and fig. 1, 5, from Pozzuoli (Puteoli), Italy, with references to other finds from the Bay of Naples; Bonomi 1996, p. 184, no. 417, and p. 185, no. 421; Dilly, Mahéo 1997, p. 65, no. 9, pl. 2; Price, Cottam 1998, p. 138-140, fig. 59.

Discussion: The difference in colour between the vessel and the lid is unusual, since the two elements usually form a matching pair. The chips in the lid may suggest some use before its burial.

2. Carinated bottle (fig. 1, 2)

First half of the 1st century. Said to be from Mainz (Moguntiacum), Germany. Formerly Charvet Collection. Gift of Henry G. Marquand, 1881 (81.10.265).

H. 7.0 cm; GD 3.3 cm; D. rim 1.9 cm.

Translucent blue. Blown.

Flaring rim with lip rounded in the flame. Cylindrical neck, tooled in around its base. Narrow, uneven horizontal shoulder with pronounced bulge below. Upper part of body conical with slightly pushed-in sides; below carination, shallow, uneven sides curve in to a small, slightly concave base.

Intact. Most of surfaces covered with iridescent weathering.

Published: Froehner 1879, p. 77 and 116, pl. IX,53.

References: Fremersdorf 1958a, p. 40 and pl. 61.

Form: Isings form 7; De Tommaso 1990, p. 72-73, types 51-52.

Parallels: Matheson 1980, p. 22, no. 57 (with refs.); for other examples from the West (possibly made at Aquileia), see Bonomi 1996, p. 57, nos. 84-5 (from tombs in the Canalbianco necropolis at Adria); Dilly, Mahéo 1997, p. 104, no. 245, pl. 14; Newby, Schut 1999, p. 40, no. 35.[8]

Discussion: Carinated bottles of this type have been variously dated, with some scholars preferring the latter half of the first century and even the early second century. However, the fact that examples are known in gold-band and cast glass indicates that they probably originate in the Augustan period. It is also interesting to note that, while there are finds from the Rhine frontier, they not appear amongst the corpus of glass from Roman Britain, which might perhaps be taken to suggest that their main period of production predates the conquest in 43.

3. Carinated bottle (fig. 1, 3)

[6] Froehner refers to two similar vessels from the same context, but the present whereabouts of the second urn are unknown.

[7] Sadly, these losses have occurred since the vessel was acquired by the Museum. They do not appear in the photograph in fig. 1.

[8] There are similar examples in the Ashmolean Museum, Oxford (1931.4), and the British Museum (GR1856.12-26.1200, GR1856.12-26.1201, GR1856.12-26.1264, GR1868.1-10.459, GR1878.12-30.79, GR1878.12-30.80, GR1839.10-2.15, and GR TB305, from Aegina); see also Platz-Horster 1976, p. 28 no. 30, described as "formgeblasen (Vorform)"? Another example, now in the Eskiş≤ehir Archaeological Museum, was found in the Kocakızlar Tumulus, near ancient Dorylaeum (Turkey); see Atasoy 1981, 12 illus.

First half of the 1st century A.D. Said to be from Mainz (Moguntiacum), Germany. Formerly Charvet Collection. Gift of Henry G. Marquand, 1881 (81.10.289).

H. 7.6 cm; GD. 5.2 cm; D. rim 1.3 cm.

Translucent yellowish-brown. Blown.

Cylindrical neck, tooled in around its base. Rounded shoulder with pronounced bulge below. Upper part of body conical; below carination, sides slant in to a concave base.

Cut down at neck so that rim is entirely missing. Broken and repaired; one large hole in lower section of body. Thick, milky weathering, flaked off in many places, leaving dulled, iridescent surfaces.

Published: Froehner 1879, p. 77 and 116, pl. IX,54.

References: Fremersdorf 1958a, p. 40, pl. 61.

4. Carinated bottle (fig. 1, 4)

First half of the 1st century A.D. The Edward C. Moore Collection, Bequest of Edward C. Moore, 1891 (91.1.1354).

H. 8.6 cm; GD 5.1 cm; D. rim 1.3 cm.

Translucent blue. Blown.

Flaring rim with lip rounded in the flame. Slender, cylindrical neck, tooled in around its base. Rounded shoulder. Upper part of body conical with slightly pushed-in sides; below carination, sides curve in to a small, almost flat base.

Intact. Milky iridescent film over most of surfaces.

Unpublished.

5. Carinated bottle (fig. 1, 5)

First half of the 1st century A.D. The Edward C. Moore Collection, Bequest of Edward C. Moore, 1891 (91.1.1355).

H. 10.8 cm; GD. 6.4 cm; D. rim 1.8 cm.

Transparent pale purple. Blown.

Flaring rim with lip rounded in the flame. Slender, cylindrical neck with tooling marks around its base. Horizontal shoulder. Upper part of body conical with slightly concave sides; below carination, sides curve in to a small, concave base.

Part of rim missing. Brilliant iridescent weathering over most of surfaces.

Unpublished.

6. Carinated bottle (fig. 1, 6)

First half of the 1st century A.D. Formerly Julien Gréau Collection. Gift of J. Pierpont Morgan, 1917 (17.194.164).

H. 9.2 cm; GD. 4.6 cm; D. rim 1.6 cm.

Translucent blue. Blown.

Flaring rim with lip rounded in the flame. Cylindrical neck, slightly tooled in around its base. Horizontal shoulder with pronounced bulge below. Upper part of body conical with slightly pushed-in sides; below carination, uneven sides curve in to a slightly concave base.

Part of rim missing. Dulled, weathered surfaces.

Published: Froehner 1903, p. 188, no. 1360, pl. CLVII,12.

References: Fremersdorf 1958a, p. 40, pl. 61.

7. Carinated bottle (fig. 1, 7)

Mid-1st century A.D. Found in a tomb at Idalium (Dali), Cyprus. The Cesnola Collection, Purchased by subscription, 1874-76 (74.51.53).

H. 9.1 cm; D. 5.7 cm; D. rim 2.1 cm; D. base 3.3 cm.

Transparent pale blue-green. Body blown into a three-part mould, comprising two side panels and a cup-shaped base; neck and rim free blown.

Tubular rim, folded out, over and in, extending unevenly into neck. Tall cylindrical neck, aslant to body, with slight tooled indent at its base. Upper part of body conical and slightly concave; below carination, sides curve in to a projecting, circular base.

On the upper part of the body, two faint grooves flanked by ridges; below the carination, twenty-nine petal-like tongues alternating with darts in raised outline. On base, two raised concentric circles around a small depression with central knob.

Broken at neck with parts of neck missing. Heavily weathered and pitted on all surfaces.

Published: Cesnola 1903, pl. CVII,5

References: Myres 1914, no. 5262.

Parallels: For three other mould-blown examples, see Stern 1995, p. 148-149, no. 49 and n. 1.

Discussion: Possibly from the same mould as the example in the Toledo Museum of Art (1923.444).

Whereas other carinated glass bottles, whether cast or free-blown, do not have handles, this mould-blown variety clearly did – as evidenced by the one-handled example in the Cyprus Museum in Nicosia (Vessberg 1952, p. 130, pl. VI,18). It may be that this change in form (and function ?) was influenced by the practice of adding handles to other small mould-blown bottles (such as the hexagonal bottles with high relief), which turned them into one-handled jugs and amphoriskoi.

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