

Paul T. Nicholson u.a.

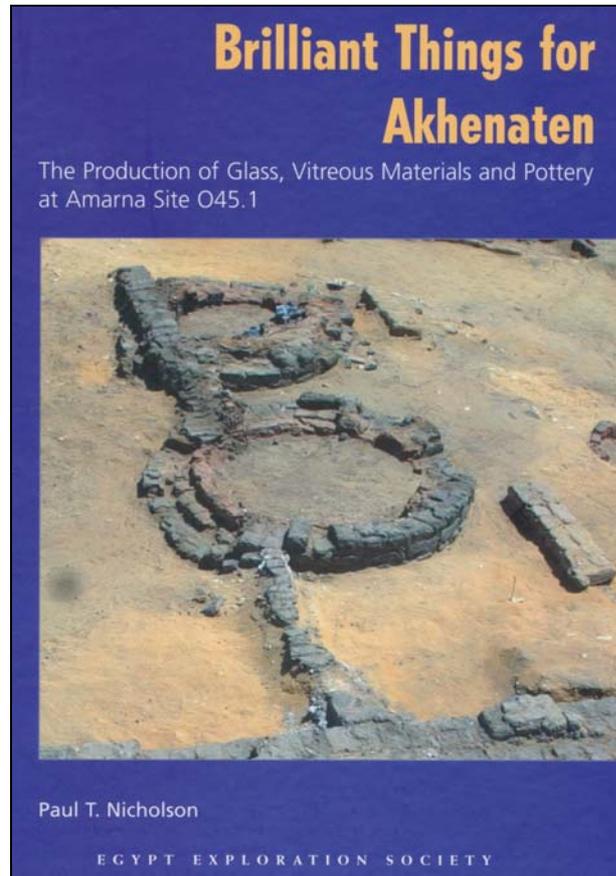
2007

Brilliant Things for Akhenaten - The Production of Glass, Vitreous Materials and Pottery at Amarna Site O45.1

Auszug aus Chapter 1, The Coming Of Glass To Egypt, S. 1 - 9

Abb. 2009-2/xxx

Paul T. Nicholson, Brilliant Things for Akhenaten, Einband



Paul T. Nicholson

With contributions by

Rainer Gerisch, Rowena Hart, Gareth D. Hatton,
Caroline M. Jackson, Ian Mathieson,
Phillipa Payne, Jerome C. Rose,
Andrew J. Shortland & Michael S. Tite
Illustrations by Elina Brook, Dorn Carran,
Ian Dennis, Zadia Green, Howard Mason, James
Newbould, Hendrikje Nouwens & Frances Taylor
Photographs by Caroline Jackson, Paul Nicholson,
Gwil Owen & Anna Stagg

Excavation Memoir 80

Egypt Exploration Society 2007

© The Egypt Exploration Society 2007

ISBN 978-0-85698-178-4

Front Cover: Site O45.1 looking east. Kilns 2 and 3 are clearly visible in the centre of the photograph. „Kiln 4“ is to the south of „Kiln 2“ and „Kiln 6“ is visible at the extreme south where the boundary wall runs up to it. Part of the **potter's workshop** can be seen at the extreme bottom left. [s. unten Abb. 2000-2/024]

Rear Cover: **Clay mould** (find no. 30547) for making a faience cartouche of the early name of the Aten.

**Sold at the offices of the
Egypt Exploration Society
3 Doughty Mews, London WC1N 2PG**

available also from:

**Oxbow Books Ltd
10 Hythe Bridge St, Oxford OX1 1HN
www.oxbowbooks.com**

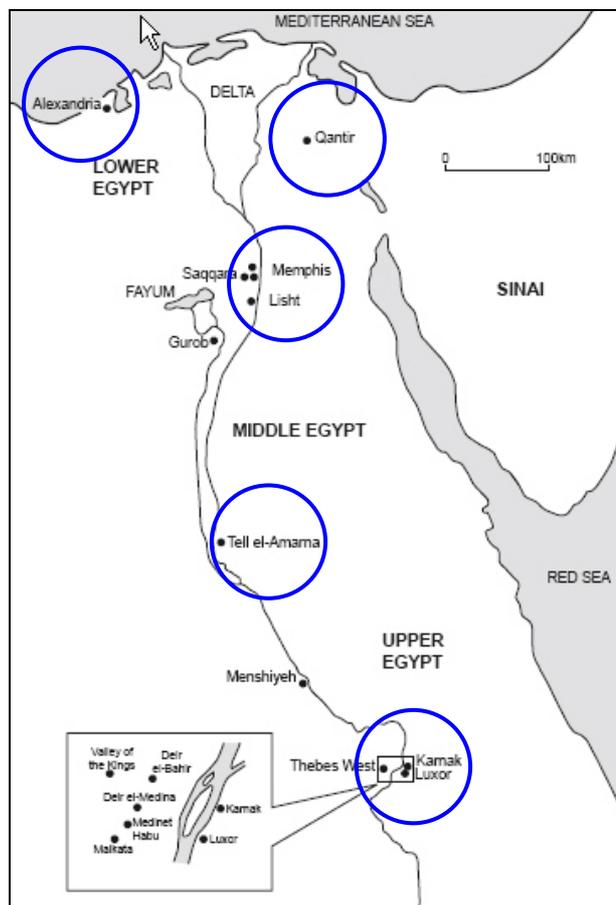
**The David Brown Book Company
PO Box 511, Oakville, CT 06779, USA
(Phone: 860-945-9329; Fax: 860-945-9468)**

Contents

Acknowledgements.....	I
Introduction.....	V
Section I: The Amarna Glass Project	
Chapter 1: The Coming of Glass to Egypt.....	1
Chapter 2: Archaeological and Technological Evidence	13
Chapter 3: Excavations at Site O45.1	27
Paul T. Nicholson & Rowena Hart	
Chapter 4: The Furnace Experiment.....	83
Paul T. Nicholson & Caroline M. Jackson	
Chapter 5: Compositional Analysis of the Vitreous Materials Found at Amarna	101
Caroline M. Jackson & Paul T. Nicholson	
Chapter 6: A Reconstruction of Glass Production at Amarna.....	117
Chapter 7: A Reconstruction of Faience Making at Amarna Site O45.1.....	133
Chapter 8: A Reconstruction of Pottery Production at Amarna Site O45.1	149
Chapter 9: Conclusion	157
Appendices	
Appendix 1: Geophysical Report.....	161
Ian Mathieson	
Appendix 2: Report on the Faunal Material from Site O45.1	165
Phillipa Payne	
Appendix 3: Charcoal Remains	169
Rainer Gerisch	
Appendix 4: Human Remains.....	177
Information Provided by Jerome Carl Rose	
Appendix 5: Data Tables	179
Caroline M. Jackson & Paul T. Nicholson	
Appendix 6: Scientific Examination of Vitreous Materials and Associated Ceramics	183
Andrew J. Shortland, Gareth D. Hatton & Michael S. Tite	
Section II: Finds Catalogue.....	191
List of finds in numerical order	299

List of finds by primary material..... 337
 Bibliography..... 377
 Index..... 389

Map 1.1. Map of glassmaking sites in Egypt
 S. 2



SG: Nicholson schildert die Ergebnisse der **Ausgrabungen in Amarna**, Ägypten, **1993-2003**. Im „**Amarna Glass Project**“ der „**Egypt Exploration Society**“ sollte systematisch und mit modernsten Methoden nach Produktionsplätzen für Glas, Fayence und Töpferwaren sowie Scherben usw. gesucht werden. Viele Funde wurden ergraben, spektakuläre, antike Gläser wurden nicht gefunden. Im hier dokumentierten Kapitel I, Glas kommt nach Ägypten, gibt Nicholson einen Überblick über die Funde seit Petrie 1894 und eine Bewertung nach dem neuesten Stand der Forschung. Glasproduktion in **Amarna** unter der kurzen Herrschaft von **Amenhotep IV** / Akhenaten / Echnaton (**1352-1336 B.C.**) kann sicher nachgewiesen werden. Für die Glasproduktion unter den Vorgängern **Thutmose III** bis **Amenhotep III** (**1479-1352 B.C.**) konnten bisher keine Produktionsstätten gefunden werden. Sicher waren aber seit Amenhotep III einheimische **Glasmacher** in Werkstätten des Palastes tätig. Glasmacher unter Thutmose III waren sehr wahrscheinlich Handwerker, die nach seinen Feldzügen, die über Palästina und Syrien bis nach **Mittani** führten, „mitgebracht“ wurden [Nicholson S. 3 f.]. Sie haben sicher geholfen, eine einheimische Glasproduktion aufzubauen. Unter **Ramses II** (**1279-1213 B.C.**) wurde in **Qantir** / **Piramesse** Glas im „großen Stil“ produziert [Nicholson S. 21 ff.].

Chapter 1
The Coming Of Glass To Egypt, S. 1-9

Introduction

This chapter [1] examines the **origins of the glass industry in ancient Egypt** and attempts to assess, independently of the recent work at Amarna, whether or not it is likely that there could have been an industry actually **making glass rather than simply working it as early as the time of Thutmose III (1479-1425 B.C.)**. The locations of places mentioned in the text are shown on Map 1.1.

Early Glasses

There have been **many reports of glass in Egypt before about 1500 B.C.** (Lucas 1926, Beck 1934, Shortland 2001). However, many of the pieces cited - such as the famous „**Bull Mosaic**“ of Princess Khnumet [2] and the **lion head amulet** inscribed for Nubkheperre [3] - are now known to be of **materials other than glass**. Moreover, such **genuinely early pieces** as are known do not seem to represent a deliberate and regular production of glass, but rather may be the **result of accidents during the production of faience or frit**.

Two glass fragments from the tomb of Thutmose I (1504-1492 B.C.; tomb KV38) may represent **early imports** or belong to the time of his reinterment by **Thutmose III** (Roehrig 2005:67) [4]. However, Roehrig (2005:67) suggests that they might equally be the result of **booty from the campaigns of Thutmose I in the Near East or trade with the region** since other beads dating from the time of Ahmose through to Thutmose II (1492-1479 B.C.) are known from the excavations of the Metropolitan Museum of Art. Other early pieces of glass, including the well known **flask** [5] from the **tomb of Maiherperi** (KV36) which is believed to be an **import**, and probably a **royal gift**, have recently been discussed by Lilyquist (2005) who also provides a timely summary of **contact with the Near East around the reign of Hatshepsut** (1473-1458 B.C.).

SG: Herrscher nach Nicholson [& Wikipedia]

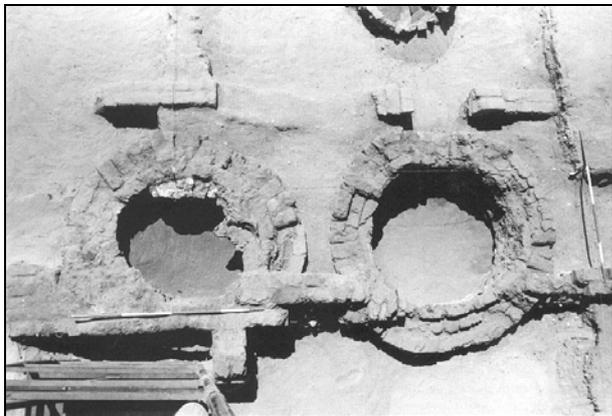
18th Dynasty, New Kingdom:

Ahmose I.....	1550-1525 B.C.
Amenhotep I.....	1525-1504 B.C.
Thutmose I.....	1504-1492 B.C.
Thutmose II.....	1492-1479 B.C.
Hatshepsut.....	1473-1458 B.C.
Thutmose III.....	1479-1425 B.C.
Amenhotep II.....	1427-1400 B.C.
Thutmose IV.....	1400-1390 B.C.
Amenhotep III.....	1390-1352 B.C.
Amenhotep IV / Akhenaten.....	1352-1336 B.C.
Semenchkare.....	1337-1333 B.C.
Tutankhamun.....	1333-1323 B.C.
Ay [Eje II].....	1323-1319 B.C.
Horemheb.....	1319-1292 B.C.
Ramesses I.....	1291-1290 B.C.

There are, however, several pieces which may be especially relevant to the present discussion but whose status must for the moment remain unclear. These are **two**

name beads [6] bearing inscriptions mentioning **Hatshepsut** and her steward **Senenmut** (Reeves 1986) which are now in the British Museum and a further example in the Metropolitan Museum of Art, along with two coloured examples [7]. The colourless beads were originally thought to be of rock-crystal, but are in fact of **clear colourless glass** and, although without a properly documented context, may originally have come from the foundation deposits of the Hathor shrine of Hatshepsut at Deir el-Bahri, believed to date from Year 7 of her reign (Reeves 1986:388). Since raw glass is naturally coloured with a greenish or brownish tinge due to impurities such as iron it must be **decolourised** in order to obtain such clear objects as these beads. **Decolourisation is a sophisticated process and virtually all the glass known from ancient Egypt has a strong body colour, usually light or dark blue.** That colourless glass could have been produced so early, either in Egypt or elsewhere, suggests a remarkable sophistication in this early glass industry. It is, of course, possible that the lack of colour results from very pure batch materials alone (below).

Abb. 2000-2/024
2 zylindrische antike Glasöfen aus Amarna
[Nicholson 2007, Einband: „kilns“ & „pottery workshop“ - Öfen für Glasmacher oder für Töpfer? - S. 83 ff. & S. 95 ff.:
im Experiment konnte Glas erschmolzen werden!]
Mauerwerk aus ungebrannten Lehmziegeln
D innen 1,50 m
ausgegraben 1993-94, Südseite oben
innen Lehmziegel mit Glasresten
aus Jackson 1998, S. 13



The composition of the **beads** has been analysed and has been found to be „**compositionally similar to analyses of glasses from Tell el Amarna**“ (Bimson and Freestone 1988:11) [8]. This does not necessarily mean that the glass was made in Egypt, the beads may simply have been inscribed there, and indeed colourless glass from an inscription on a queen's canopic jar of the Amarna period [9] has a different composition (Bimson and Freestone 1988:12), though it is similar to other glasses from Amarna [10]. The **colourless glass of the canopic jar** has twice the amount of lime present in the name beads. It may be that we are seeing an early stage of glass imported into Egypt and a later stage of local production, the change occurring during the Amarna period. Alternatively we may be seeing an Egyptian industry already established by the time of Hatshepsut and later changing its recipes to better utilise local raw ma-

terials. This may be indicated by the work done by Rehren (2000a), which suggests that the **Hatshepsut / Thutmose III glasses were made by carefully selecting raw materials and then melting the total batch**, whereas those of **Amenhotep II** and after use a different approach which Rehren (2000a:17) describes as „**partial batch melting**.“

Abb. 2000-2/025
Schema des zylindrischen Glasofens aus Amarna
Mauerwerk aus ungebrannten Lehmziegeln
D innen 1,50 m
In einem Ofen, der nach dem Fund aufgebaut wurde, konnte Soda-Glas in runden Barren mit Sand aus Amarna, Seetang aus Wales und lokalem Heizmaterial bei 1100-1150 Grad C erschmolzen werden
der Sand aus Amarna ist besonders kalkreich, s. Karte Baines das Feuerloch zeigte nach Norden, damit der in Amarna häufige Nordwind das Feuer anfachte
aus Jackson 1998, S. 14

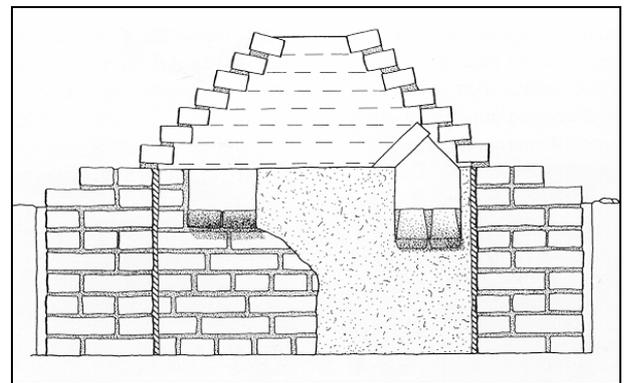
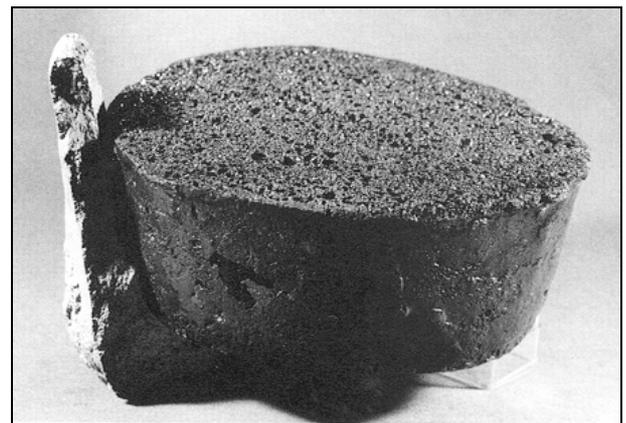


Abb. 2000-2/026
Bruchstück eines zylindrischen Gefäßes aus Amarna (links u. unten)
aus Jackson 1998, S. 23
gefunden auf der Oberfläche, mit dem Abguss eines Glasbarrens aus Ulu Burun
(ein antikes Schiffswrack vor der Südküste der Türkei mit Waren, darunter Glasbarren)
Gefäß H 11,0 cm, D 16,0 cm



Whatever the position regarding the production of these glasses it is of interest that both the **beads** and the **canopic jar**, which were intended for a royal wife, have **royal connections**. The same is true of a **light blue glass bead** of unknown provenance [11] which bears on one side the **name of Ahmose** (1550-1525 B.C.) and on the other that of **Amenhotep I** (1525-1504 B.C.) (Brovarski et al. 1982: 169). The piece is regarded by Brovarski et al. as possible evidence for a co-regency bet-

ween these, the first two rulers of the **New Kingdom**, and the authors claim that „xray spectrometry yielded findings consistent with the analysis of known 18th Dynasty parallels” (Brovarski et al. 1982:69). That the piece is seen as evidence for a co-regency might well suggest that it is of early date, and it is implied that it is contemporary with the rulers whose names it bears. This would suggest that from the very beginning of the **Egyptian New Kingdom glass and royalty were inter-linked** (though this does not of course preclude the ownership of glass objects by private individuals of status). If the piece were made in Egypt the industry would be put earlier than has thus far been realised, however, the authors do not cite the x-ray analyses to which they refer and in any case the fact that it **matches with other 18th Dynasty glasses does not necessarily mean it was made in Egypt**. Indeed its colour and possible early date may argue otherwise (below).

The question of the establishment of either glassmaking or regular glassworking is a vexed one, and there has been a **general consensus that glass comes to Egypt as a developed craft, perhaps a century old** (Tatton-Brown and Andrews 1991:26), and that „with dramatic suddenness, glass makes its appearance also in Egypt” (Oppenheim 1973:262). The idea that the **craft was imported from beyond Egypt** seems to have been first published by Petrie (1925) who states that „as soon as **Egypt overran Syria, artificers were brought in, about 1500 B.C.**, and glassmaking became a flourishing and varied industry” (Petrie 1925:72). However, it is clear from Newberry (1920:158) that the idea that glass was not an Egyptian invention pre-dated Petrie’s publication. Newberry himself (1920) was firmly of the view that there was no evidence for this foreign inspiration, but he was already in the minority. Harden (1968:48) took the view that **glass was an imported craft** and he specifically mentioned the borders of **Mesopotamia**, in other words the region which is usually referred to as the **Kingdom of Mitanni**. [wikipedia.org/wiki/Mittani]

The idea of glass being imported from this region was strengthened on linguistic grounds by Oppenheim (1973). In his article he stresses that **two Akkadian words previously identified as „precious stone“ (mekku and ehli-pakku) might refer to glass. Ehli-pakku is sent from Mitanni to Egypt** and features as such in the **Amarna Letters**. The Egyptian king is always the one requiring mekku or ehli-pakku and it is clear from one of the letters [12] that the two words refer to the same thing. Indeed Petrie states that there „was little difficulty in **attributing to the Syrians the glasswares which were imported into Egypt prior to 1500 B.C.**” (Petrie 1926: 230) [13].

Such glass wares are illustrated at a number of sites, the **most famous** of which is the representation in the **Annals of Thutmose III** at Karnak. These texts describe the campaigns of Thutmose III, and the 8th and 9th campaigns, which saw **Egyptians reaching Mitanni**, are of particular interest as a **likely source of glass and glass workers**. In the Annals [14] the **king lists glass after gold and silver**, suggesting its importance (Nolte 1968:12-13). Some of the glass is shown as circular pie-

ces of fairly consistent size, perhaps **ingots** [Barren], whilst other pieces are shown as irregular **lumps** [Brocken]. The apparent **raw glass** is described as „**Menkheperre lapis lazuli**“ [15] to distinguish it from genuine lapis lazuli. Bianchi et al (2002:20) speculate that the King may have been so impressed by this new material that he chose to add his throne name to it. Not only is there **deep blue glass in imitation of lapis lazuli**, but also green glass shown as round cakes. These two are given the **king’s throne name**, this time as „Menkheperre turquoise / malachite“ [16].

Bianchi et al. (2002:20) convincingly argue that the **green glass** is meant in opposition to the **blue** which must have been considerably darker (though its colour is now lost on the Karnak relief), which one would expect given that it is meant to represent lapis lazuli. The authors estimate that 60 kg of the dark blue glass as ingots are represented plus a further 55 kg as lumps. Some 83.72 kg is estimated for the lighter blue / green glass (Bianchi et al 2002:21). The authors note that this distinction is interesting, since **most of the vessels from the time of Thutmose III are in light blue**, rather than dark and that the finds may therefore be unrepresentative.

Also shown are **finished vessels in „Menkheperre turquoise / malachite“**. Bianchi et al. (2002:22) argue that vessels of such size are never found in genuine turquoise or malachite, but **only in vitreous materials**. However, it is worth pointing out that although the vessels appear large, they are not drawn to scale, as can be seen by comparing them to the size of the supposed ingots. Furthermore, the shapes do not closely resemble any known glass vessels from the Egypt of Thutmose I-II, though there are **vague similarities to the famous marbled goblet from the tomb of the foreign wives of Thutmose III** at the Wadi Qabbanet el-Qirud [17] (see Lilyquist 2003, Lilyquist et al. 1993). The Petrie Museum also houses fragments of a faience vessel from Sinai [18] which is not a typically Egyptian shape and which seems to be derived from a metal proto-type. The scene may therefore represent **vessels in vitreous materials other than simply glass**.

Philip (2000:129) notes that **fragments of glass vessel are known from Alalakh on the border between Syria and Turkey at around 1600 B.C.**, suggesting that the knowledge of core-formed vessels was already established there (contrary to the statements made by Kozloff 1992:374).

The tomb of Rekhmire (TT100), Vizier under **Thutmose III** and **Amenhotep II** (1427-1400 B.C.) at Thebes also contains relevant scenes. On the west wall of the hall in the second register from the top (Davies 1944:Plate XXI) are shown **two vessels „apparently of glass”** (Davies 1944:28) which are amongst **tribute brought by Syrians** (Retenu). It is worth pointing out that, although glass may be a likely candidate for these vessels, they are, in detail, unlike any other glass vessels known to the author, and are arguably more similar to wooden dummy vessels representing stone [19].

The other tomb worthy of note in this context is that of Amenmose (TT89). This tomb supposedly dates from the reign of **Amenhotep III** (1390-1352 B.C.) but includes a scene of **Thutmose III** (Brock 2000:130). The presence of this ruler in a supposedly later tomb is seen by Brock (2000:137) as perhaps connected with scenes showing glass in tombs of his time, notably that of Rekhmire. The tomb of Amenmose shows what are believed to be **dark blue glass ingots**, although they are stated to be **lapis lazuli**, and are not given the Menkheperre prefix. They appear **similar to the supposed ingots from the Annals of Thutmose III** at Karnak [20]. The appearance of Thutmose III in this later tomb is strange, and one must wonder whether a scene has simply been copied, or even an unfinished tomb of that date been reused. Little weight should be attached to this scene for the moment.

It is clear, however, that **Mitanni was a source of glass**, and one **which Egypt was exploiting into the Amarna period**, as is evidenced by the Amarna letters. However, **this does not mean that all glass was imported to New Kingdom Egypt or that the Egyptians could not make their own glass** as some have suggested (Newton and Davison 1989:62). Such a conclusion overlooks Petrie's (1925:72) view that „**artificers were brought in**”.

One should look now at those **actual examples of glass vessels known to be of the reign of Thutmose III** and examine how they relate to the local versus imported debate.

Shortland (2001:214-15) follows Nolte (1968:46-50) in attributing **12 vessels or vessel fragments of glass** to the reign of **Thutmose III**. Of these, two belong to the same vessel [21], whilst another, though relevant to the discussion, is believed to be glassy faience rather than glass [22]. In other words, there are actually **only 10 examples of glass vessels** from this reign. Shortland (2001:215-16) notes that the commonest body colour is **light blue**. He goes on to note that this is not surprising because so much light blue glass was being imported. However, his evidence for this comes from the Annals of Thutmose III, a figure which he gives as 10913.8 dbn or **993 kg** (2001:213). This is indeed a significant figure and **implies glass production, albeit outside Egypt**, on a hitherto unexpected scale. However, Shortland's reading of this figure from the Annals is probably incorrect, the actual figure being probably 913 dbn or **83.72 kg**, as quoted by Bianchi et al. (2002:20).23

The scene shows **24 lumps of „Menkheperre lapis lazuli”**, which may be **dark blue glass** or **Egyptian blue**, no weight is given but Bianchi estimates each lump at 2.5 kg yielding some 60 kg of dark blue glass (Bianchi 2002:20-21). To this must be added the similar material from a third tray shown in the scene, whose text is only partly preserved, to give a figure of at least 115 kg of dark blue glass.

It would seem then (contra Shortland) that **more dark blue glass was imported than light blue**, and yet most of the vessels we have (which account for nowhere near the 83.72 kg let alone the 993 kg figure) are light blue.

Shortland (2001:217) rightly notes that dark blue may also be achieved using high levels of **copper**, and it would be interesting to know whether the single known dark blue piece [24] is **coloured with copper or cobalt**.

This raises the question of where all the dark blue glass has gone. **Why do we have only one piece from the reign of Thutmose III** when it seems that it was commoner than the light blue? Could it be that the dark blue glass was made into beads or other small items which have largely been ignored? Such **dark blue glass** as occurs in inlays from the **tomb of the foreign wives of Thutmose III** seems to be coloured by **cobalt** (Lilyquist 2003:124-25) though this is, of course, a tiny sample of all those beads known. Could most of the material have been worked and sent out of Egypt to vassal states whilst the genuine lapis remained in the country? As Kemp (pers. comm.) has pointed out, much of what is shown in the Karnak reliefs is now lost, and it is certainly true that this must be the case for much of the glass. As a recyclable material it is also possible that some of it was melted down and used again.

Abb. 2000-2/038 (Maßstab ca. 100 %)

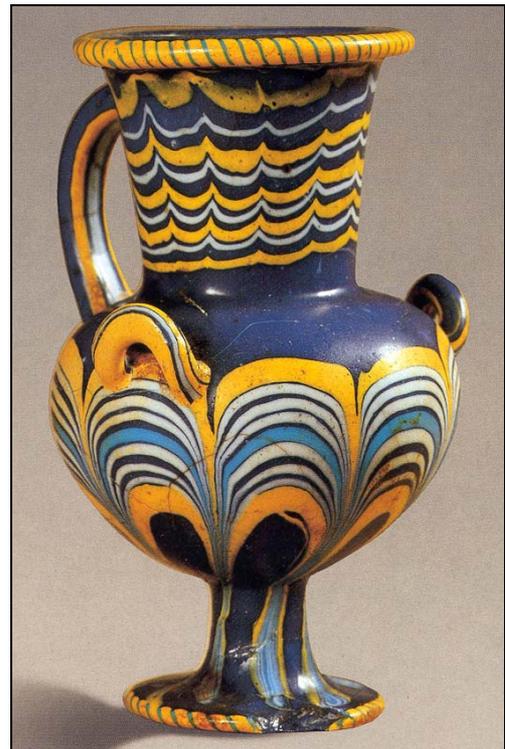
Krateriskos

opak-dunkelblaues Glas, weiße, gelbe u. hellblauen Glasfäden
H 9,5 cm

aus Sakkära, 18. Dyn., 1400-1350 v. Chr.

Kairo, Ägypt. Museum

aus Wildung 1984, Kat. Nr. 60, S. 128



The Thutmose III Vessels

Attention should also be paid to the vessels dated to the reign of Thutmose III (1479-1425 B.C.), since the security of the dating of some may be open to question. These are shown in Table 1.1 (below)[25].

Most secure are those vessels from the tomb of the foreign wives of Thutmose III in the Wadi Qirud. These vessels comprise the **marbled vessel of glassy fai-**

ence [26], which though relevant is not of glass, the **lotus chalice bearing the incised cartouche of Thutmose III** [27] and according to Nolte (1968:48) the **kohl vessel** [28]. However, this latter was actually purchased by the Metropolitan Museum of Art in 1926, having originally been acquired by Hood around 1860. Lilyquist (2003) does not list this last vessel as part of the contents of the tomb, which would be reasonable if it were not located until August 1916 as she states (2003:27). Her view (Lilyquist pers. comm.) [29] is that the vessel is a miniature ointment jar „certainly not from the Wady Qurud” (sic). All that can be said of the piece therefore is that it was bought in Qurneh around 1860, and is of a style which is not dissimilar to other vessels of the time of Thutmose III. Thus we have **only one glass vessel from the Wadi Qirud tomb**.

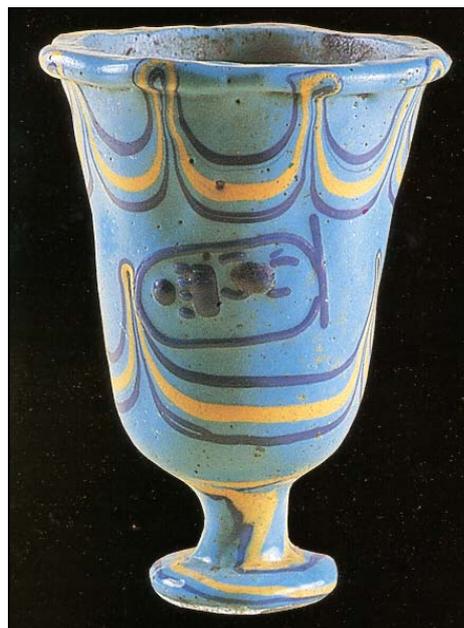
Table 1.1. Glass of Thutmose III.
* Indicates Wadi Qirud provenance

Number	Shape / Type	Body colour	Technology
Munich AS630	Chalice	Light Blue	Core-formed
Ashmolean E2451	Chalice	Light Blue	Core-formed
MMA23.9*	Lotus Chalice	Light Blue	Cast and cold worked
BM 24391	Kohl pot with lid	Light Blue	Drilled and cold worked
UC 19657	Kohl pot (no lid)	Light Blue	Drilled and cold worked
MMA26.7.1179	Kohl pot (no lid)	Light Blue	Drilled and cold worked
Cairo 24959	Kohl pot (lid only)	Dark Blue	Cold worked
Cairo 24961	Handled vessel	Light Blue	Core-formed
Cairo 24960 & Brooklyn 53.176.4	Rounded vessel	Light Blue	Core-formed
BM 47620	Jug	Light Blue	Core-formed with powdered glass decoration
MMA26.7.1175*	Krateriskos	Marbled“Glassy faience”	probably core formed

The **royal tomb** itself (KV34) was discovered by Victor Loret on February 12th, 1898 (Reeves 1990a:19) but there is evidence that the tomb had at some time been **heavily plundered** (1990a:23). **Four pieces of glass** are associated with the tomb. There is a **dark blue glass lid** [30] and a **light blue core-formed vessel** with handle support [31]. These definitely come from the tomb, as does a **light blue fragment of core-formed vessel** with yellow and dark-blue decorative band [32] now in Cairo. This piece is usually reckoned to be from the same vessel as that now in the Brooklyn Museum [33] which is the same in colour and decoration, though it does not join with the Cairo fragment. It is therefore reasonable to assume that it came from the original burial.

There is, however, a **further piece of glass** which has also been **associated with the tomb** [of Thutmose III]. This is the exceptionally well preserved **juglet** now in the British Museum [34]. This piece is in **light blue and decorated with dark blue, yellow and white**. The yellow has been used to enamel a floral motif on the vessel as well as to add an inscription for Thutmose III himself. According to Cooney (1976:71), no contemporary record of the acquisition of the piece by the museum exists, although Budge (1925:391) states that it probably came from the burial of the king. Cooney accepts this view and suggests that it came to the museum between 1870 and 1872, during which time the royal cache (DB320) was being looted (Cooney 1976:71). The unusual decoration, which is arguably **more „Near Eastern“ than Egyptian** (but see now Roehrig 2005:69), and the light blue body colour, as well as the inscription, all argue for a Thutmose III date. Thus, although the provenance cannot be accepted without question, it does seem likely that it belonged to the pharaoh concerned.

Abb. 2000-2/035 (Maßstab ca. 100 %) Glaskelch Thutmosis III. (1479-1425) opak-hellblaues Glas, gelbe und dunkelblaue Glasfäden H 8,1 cm Der Kelch „trägt den Namen des Königs Thutmosis III. und ist damit das älteste sicher datierte Glas der Welt“ wohl aus Theben, 18. Dynastie, 1479-1425 v. Chr. München, Staatl. Sammlung Ägypt. Kunst aus Eggebrecht 1987, S. 195



One more **vessel** also bears the **premonen of the king**, and is now in the **Munich collection** [35]. This is a **light blue core-formed chalice decorated in dark blue and yellow and with the cartouche of the king in dark blue**. The cartouche itself is at something of an angle and the hieroglyphs are grouped toward the top edge of the name-ring. The rim is uneven. The piece once belonged to the Dodwell collection and was bought in 1832, probably at Thebes (Newberry 1920; Nolte 1968:48). It is not possible to give a more definite provenance to the piece, though I would agree with Nolte (1968:49) that it is contemporary with Thutmose III and not a later piece belonging to the Theban ruler **Menk-**

heperre of the 21st Dynasty. The quality of the glass seems altogether better than comparable later glasses. Nonetheless, one should bear in mind that the **piece lacks a definite provenance**.

Of a similar form is a plain **light blue chalice** from the Ashmolean collection [36]. The piece comes from Tomb 58 at Gurob (Loat 1904:7). It has been dated to the reign of Thutmose III, largely by **comparison with the Munich piece**. Thus, although it has a provenance, its dating largely relies on the unprovenanced Munich piece. So, although the comparison seems a fair one, one must proceed with caution.

Abb. 2000-2/007 (Maßstab ca. 250 %)

Kopf Amenophis II. ?

opak-blaues Glas, H 4 cm

Ägypten, 18. Dynastie, 1435-1415 v. Chr.

Corning Museum of Glass, Corning, NY

aus Charleston 1990, S. 21



Last in the Thutmose III group are **two kohl pots**. One of these [37] comes from Riqqeh cemetery B and, although illustrated in the publication (Engelbach 1915:16 and pl. 12 no. 14), the rest of the contents of the tomb are not published. Thus the dating is based on the fact that stone kohl pots of this type were popular during the reign of Thutmose III. The vessel has provenance but the **dating cannot be relied upon**. That same dating is then used to provide the date for an unprovenanced piece in the British Museum [38], a **light blue vessel with its rim, foot and lid decorated with gold leaf**. The vessel was acquired by the museum in 1892 (Nolte 1968:47). These two vessels must be regarded as having the **least satisfactory dating of all**.

In **summary** then, the two kohl pots rely only on style for their dating. The Ashmolean chalice relies on the Munich chalice, itself unprovenanced - though probably

of Thutmose III. The British Museum juglet has no provenance, and though the dating seems very probable, it cannot be certain. The ointment vessel in the Metropolitan Museum [39] is no longer regarded as from the Wadi Qirud burials and so cannot be dated with certainty. The Metropolitan Museum's lotus chalice is the only certain glass vessel from the tomb of the foreign wives. This **leaves four fragments**, three of which are certainly from the tomb of the king himself [40] and one which is almost certainly from the tomb, as it seems to be the same vessel as one of these certain pieces [41].

During the course of this study it has been possible to examine **one additional vessel** which may also belong to the reign of **Thutmose III**. This piece was collected by Sir John Gardner Wilkinson (1797-1875) and subsequently donated to Harrow School [42]. The piece is in **light blue glass with yellow and dark blue trail decoration**, and its form is very similar to the piece in the Ashmolean collection. If the dating of the Ashmolean and Munich pieces is correct then it is likely that this piece also dates to the reign of Thutmose III (for a more detailed discussion of the vessel and its origin see Nicholson 2006a).

Abb. 2000-2/008 (Maßstab ca. 180 %)

Kopf Amenophis III.

opak-blaues und gelbes Glas, H 3,8 cm

München, Staatl. Sammlung Ägypt. Kunst

aus Kühne 1999, S. 468, Abb. 14



Clearly, the status of some of the Thutmose III glass is uncertain and in the absence of analytical studies of all of the pieces **caution must be exercised**. However, it may be possible to make some observations on technological grounds, and group the pieces accordingly.

The **two kohl pots**, whose attribution to Thutmose III is arguably least secure, both seem to be cast and then drilled; that is, the **technology is closely akin to the working of stone whose form they imitate**. The same holds true of the kohl or ointment vessel originally thought to be from Wadi Qirud, but whose provenance and date have been shown to be uncertain. The lid from a kohl pot found in the tomb of Thutmose III [43] is also cold-worked, suggesting that it belongs with this little group. The elegant lotus chalice from the Wadi Qirud burial is also cast and cold-worked.

The British Museum juglet has no exact parallel (see however Roehrig 2005:69) though its shape is similar to the - apparently much larger - vessel shown in the Tomb of Rekhmire (TT100) and discussed above. Its very accomplished decoration, of a type not otherwise known from Egypt, suggests a **foreign source**. It is core-formed, however, and so treated in a manner distinct from stone.

Also **core-formed** are the **two chalices** now in **Munich** and the **Ashmolean Museum**. Although one of these has a cartouche, the workmanship is much less confident than we see on the juglet. The other fragments all come from core formed-vessels, the standard of workmanship is good, but not as high as in the British Museum juglet.

Abb. 2000-2/030 (Maßstab ca. 100 %)

Syrische Göttin Astarte

gepresstes Glas, ursprüngl. dunkelblaues Glas, L 8,5 cm

Nordsyrien, 1400-1200 v. Chr.

British Museum, London

aus Lierke 1999, S. 67



It might tentatively be suggested that what we see here **amongst the Thutmose III glasses are an early stage in which glass is treated as stone and is worked cold, perhaps from imported ingots. This cold technology is gradually replaced by hot-working inspired by vessels such as the juglet.** This vessel may have been **imported into Egypt or made in Egypt by foreign craftsmen** brought in to establish such an industry. In the two core-formed chalices and the core-formed vessel fragments from KV34 we may see the **earliest steps in a native Egyptian core-formed glass industry** (c.f. Shortland 2001:220) [44].

It is, of course, possible that some of these steps went on almost simultaneously, but the fact that **coldworking of vessels, particularly drilling them, dies out after this time may be significant.** Unfortunately, only a few of the important vessels attributed to this reign have been subject to analysis. Those which have been exami-

ned lend some support to the view; thus the Brooklyn fragment [45] contains **cobalt**, likely to come from the Egyptian oases (Shortland 2001:218, Lilyquist et al. 1993:36-37). Shortland (2001) regards the piece as Egyptian.

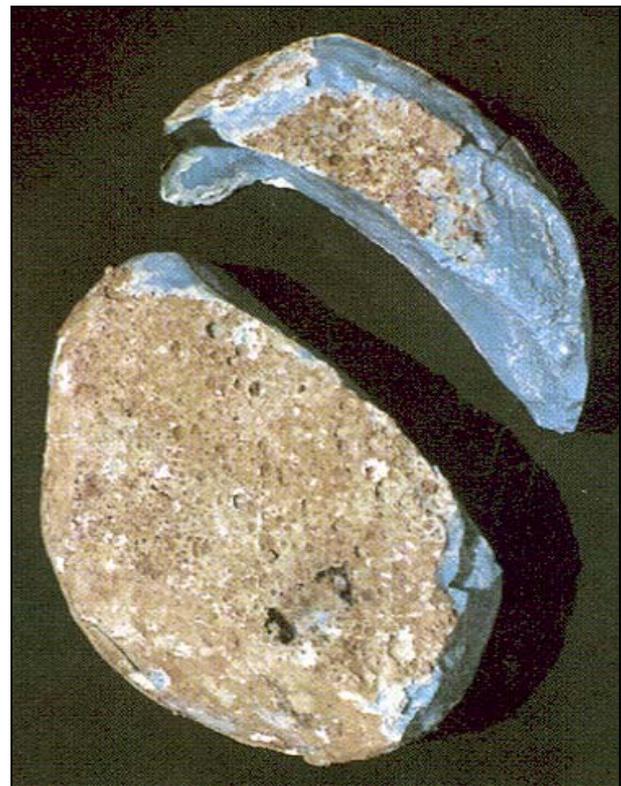
Whilst I would agree with Shortland (2001) that (leaving aside the problems of date and provenance for some pieces) we are seeing the earliest experiments in glass production in Egypt, it still appears to me that this **experiment may be inspired by foreign glass workers.** Shortland's interesting observation (2001:220) that the **core-formed vessels from Egypt are appearing at roughly the same time as they occur in Mesopotamia**, and therefore might be an Egyptian invention, is an interesting, but as yet, unproven one. The key to this might be the analysis of the British Museum juglet, which, if foreign, might suggest a greater standard of competence than that demonstrated by the chalices and vessel fragments from KV34.

Abb. 2002-2/267

Klumpen mit opak-blauem Glas

Tell Braq, 16. Jhdt. v. Chr.

aus Fortin 1999, S. 152



Against this background we should again consider the **Hatshepsut and Senenmut name beads.** It would be tempting to suggest that there was indeed a flourishing and sophisticated glass industry already established in Egypt when Thutmose III came to the throne, and that this develops into the core-formed vessel industry which we then see. However, it seems that the colourless beads are perhaps the result of a particularly well refined glass batch and that they, too, were then **worked as stones**, just as were the kohl vessels.

The Glass of Amenhotep II and Thutmose IV

As early as the reign of **Amenhotep II** (1427-1400 B.C.), the **refinement of the quality of glass production had already begun** (Nolte-Reifor 1967:151, Rehren 2000a:17). From the tomb of Amenhotep II (KV35) itself come **76 vessels which are exceptional for their size**, the largest [46] being some 40 cm in height (Nolte 1968:54 and Taf. II:2). The body colour of these vessels tends to be from dark to **translucent copper blue**, though there are some **light blue** examples along with **white** and „**Tyrian Purple**“ (Nolte-Reifor 1967:151) and **brown**. Decoration is usually in **yellow, white and light blue or green**. **Marbled patterns** are common but there are also **garlands** and **arcades** as well as early attempts at **feathering**. „**Mosaic patterns**“ (Nolte-Reifor 1967:151) are also present, as on the **rosettes** seen on the two unusual **ribbed or lobed vessels** from the tomb [47].

The reign of Amenhotep II can be seen as a time of transition from - apparently - small-scale production, albeit becoming increasingly refined, to **larger groupings of glass workers**, which Nolte (1968) has attempted to identify as **workshops** on the basis of stylistic similarities between products. It need not be supposed that the production of glass was suddenly on a very much larger scale, however. It may be that what we are seeing is the **completion of the establishment of an Egyptian glass industry**, one which was now **working glass primarily as a material in its own right, rather than treating much of it as a substitute for stone and to be worked in the same manner**. This change may also be reflected in the technology, and Rehren (2000a, 2000b) argues that materials were no longer carefully selected, but that a „partial batch melting“ system was employed.

This new era begins with the reign of **Thutmose IV** (1400-1390 B.C.) from whose tomb (KV43) come **35 vessels**. None of these are on the same scale as those from the burial of Amenhotep II but two thirds of them (Nolte-Reifor 1967:151) are of **dark blue glass** which uses **cobalt** as a colorant. This is surely significant, since there is a **source of cobalt in Egypt** itself, and though it may have been exploited earlier, the reign of Thutmose IV may mark its first major exploitation. These **sources are in the Dakhla and Kharga oases** (Kaczmarczyk 1986; 1991:195) of the Western Desert and would perhaps have required **military expeditions** to exploit them, something already well established for quarrying operations.

This new era also sees the firmer establishment of the vessel shape corpus, with **krateriskoi** and **amphoriskoi** dominant, and the **end of lotus chalices and drilled kohl vessels**. **Thread decoration is confined to yellow, white and blue**, and the **garland** and **feather** patterns become established as the decorative norm. Within these norms Nolte (Nolte-Reifor 1967, Nolte 1968) has sought to identify particular **Werkkreise**. These make use of the characteristics of the decoration, since particular craftsmen are likely to have particular ways of thread-trailing, and particular patterns would only remain in fashion for a certain time. Shapes and colours are also attributed to particular time periods.

The **burial of Thutmose IV also marks the last great find of glass in a funerary context**; most of that known from subsequent reigns has been found on **settlement sites**. Because of the uneven nature of settlement excavation in Egypt it is not possible to put too much weight on this apparent change, but it is tempting to assume that a local industry is now producing glass on a somewhat greater scale than previously, so that it is more widely **available**, albeit only within elite circles.

It can be suggested that **access to raw materials**, such as **cobalt**, was probably a **royal prerogative**, and that access to **glass is a mark of status**, although Kemp (pers. comm.) has rightly pointed out that sumptuary laws would be needed if access to cobalt and glass were to be deliberately controlled. However, given that cobalt may have had to be acquired by expeditions, access to it may have been restricted simply by access to the supply. Since glass was also a relatively new material, and one which often used cobalt, it too would have been in limited supply and most likely to find its way into the hands of the **wealthiest individuals**. Here it differs from **blue-painted pottery**, which was also coloured with cobalt. The pottery technology was relatively simple, and the end product correspondingly less expensive, despite its exotic colourant. Glass, in contrast, was less common because it was a new, and perhaps controlled, technology and used the expensive colourant material.

Thus we find, from the time of the **very earliest sculpture in glass, a royal portrait head of Amenhotep II** [48] (Goldstein 1979). It seems possible that, by assembling the makers of glass and the materials for its production, the Palace had some control over the dissemination of glass to its most worthy courtiers. This apparently began in this same reign when Amenhotep II presented a **glass shabti** to his First Steward Kenamun [49] (Cooney 1960:11). A similar presentation is known from the subsequent reign of **Thutmose IV**, who presented a **similar piece** to the royal tutor Hekareshu [50] (Cooney 1960:11). Although there may have been no formal prohibition on the use, or even making, of glass outside Palace circles, the limitation of its supply and the limitation of access to certain materials may have had the effect of making glass a material for the upper echelons of society, at least in its earliest stages.

Glass in the reign of Amenhotep III

The reign of **Amenhotep III** (1390-1352 B.C.) marks a departure from the pattern of evidence which has been discussed so far. His reign „was one of the **most prosperous and stable in Egyptian history**. His great-grandfather, Tuthmosis III [sic], had laid the foundations of the Egyptian empire by his **campaigns into Syria, Nubia and Libya**. Hardly any military activity was called for under Amenhotep“ (Clayton 1994:115).

Amenhotep III comes to the throne at the height of an established and consolidated empire and quickly establishes himself as the archetypal oriental potentate (see Kozloff et al. 1992). If we are right in believing that **glass came to Egypt largely as a result of the conquests of Thutmose III**, then the subsequent two reigns may be seen as **establishing and developing this in-**

dustry such that under Amenhotep III it is ripe for expansion.

Expansion does not, however, imply cheapening. Glass is still a **product of royal interest**, as is witnessed by the **blue glass head**, believed to be of **Amenhotep III**, now in the Miho Museum in Japan [51] (Goldstein www1), continuing the fashion for high status sculpture in glass. Indeed, it may be that such **moulded and then cold-worked**, objects represent a hitherto undervalued aspect of Egyptian glass production - the **moulding of softened glass**. This would allow the **making of objects at lower temperatures** than might normally be expected.

Links with **Mitanni** (known to the Egyptians as Naharin) continued by a diplomatic marriage of **Amenhotep III** to Gilukhepa, a daughter of **Tushratta King of Mitanni**, in his tenth regnal year. She arrived in Egypt with a retinue of some 317 persons, and is but one example of the ongoing, and increasing, foreign presence at the court of Amenhotep. Such outside influences, combined with the growing wealth of Egypt through the exploitation of **Nubian gold** and through **foreign trade**, led to a period of artistic and craft development.

It is perhaps not surprising then, to find that **glassmaking appears to have been one of the crafts taking place in Amenhotep III's palace** complex at **Malkata** (Chapter 5). Malkata is certainly no ordinary settlement, and the royal interest in glass is obvious. It is also apparent that excavation of non-funerary sites has much to tell us about the early stages of glass production, and one should not overlook the likelihood that similar installations may have existed earlier. Instead of dealing with only a few fragments of vessel glass there are now **many hundreds known from Malkata** and elsewhere (Nolte 1968:65), reflecting the opulence of the reign.

There is **much similarity in the glass from Malkata and that from Amarna**, suggesting that at least some of the craftsmen may have moved to the new city during the reign of **Amenhotep IV / Akhenaten** (1352-1336 B.C.).

Despite general similarities, A. P. Kozloff in preparing for the exhibition Egypt's Dazzling Sun, examined over **1000 fragments and complete vessels** and found „a definite evolution in the design, color [sic], and technical execution of core-formed glass vessels from Malqata to el-Amarna" (Kozloff 1992:375). Vessels from Malkata were (1) predominantly **cobalt blue**, (2) more **opaque** than those from Amarna, (3) often fitted with **feet** which were separately made and attached, (4) provided with **pommel handles** on jars, (5) often bearing **unmarvered decoration**, (6) frequently with **spiral formed two-tone rods** used on rims, lips, shoulders or handles and (7) were normally of **elegant shape** (Kozloff 1992:376). The shapes were small **jars** and small **amphorae**, as well as palm-column **kohl tubes**.

The **finished Amarna pieces show far fewer examples of cobalt blue glass** with two-tone rims etc., and Kozloff considers examples of these to be imports from Malkata „or they may have been made early on by the Amarna glassmakers, if these individuals were themself-

ves transplants from Malqata [sic]" (Kozloff 1992:376). There are also types of glass from Amarna which are unknown at Malkata, and the following were distinguished (1) **mid-blues** and **blue-greens** coloured with **copper** are in quantity equal to the **cobalt blues**, (2) **greater translucency** in blue glasses except where made **milky by lead**, (3) thin, angular or S-shaped handles on **Krateriskoi**, (4) greater variety of colours, notably opaque yellow, white and red, especially yellow or white with inset blue and white „eye" shapes and crisscrossed rods of blue and white, (5) well marvered surface decoration, (6) heavier more squat proportions and (7) so-called pilgrim flasks and hemispherical bowls are more common and palmcolumns less popular (Kozloff 1992:376).

The Werkkreise

In the **1960s Birgit Nolte** attempted to define a series of Werkkreise (Nolte-Reifor 1967, Nolte 1968). It should be borne in mind, however, that most of this material comes from funerary contexts, and that - with the exception of Amarna - there is **insufficient evidence from actual workshops** on which to base such a classification and as Kemp (pers. comm.) has pointed out, the absence of good evidence from Memphis presents major difficulties for a classification of this kind. Kozloff's (1992) observations go beyond those of Nolte in terms of dating, but the Nolte classification is still widely referred to and it is worthwhile summarising it here for the period up to and **including the reign of Amenhotep IV** [Echnaton].

Werkkreis I covers the period from **Thutmose IV** to **Amenhotep IV**. It began production at an unknown site under Thutmose IV, moved to Malkata, and thence to **Amarna**. The Krateriskos is the preferred shape, and less commonly the Amphoriskos or lentoid flask, which first appears under Amenhotep III. The dominant base colours are sky blue and dark blue with contrasting decorative threads in white, yellow and blue tones. The decorative patterns are highly consistent with finely drawn out feathering on the necks and garlands on the bodies (Nolte-Reifor 1967:151).

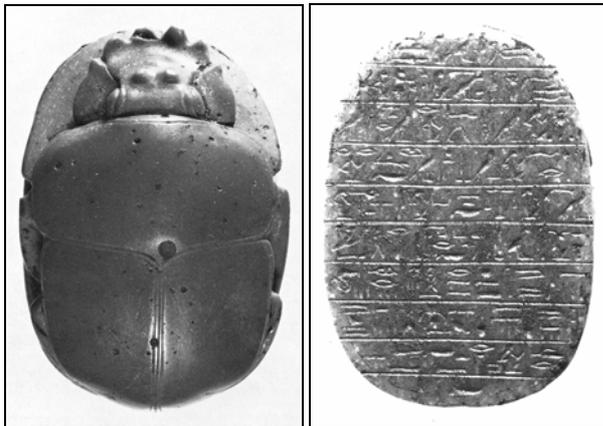
Werkkreis II begins early in the reign of **Amenhotep III** and continues into that of **Amenhotep IV**. The workers are believed to be based first at Malkata and then at **Amarna**. As might be expected from the proximity of this workshop to Werkkreis I at Malkata, there was influence between the two workshops. The characteristic feature here is the garlands which form elegant swirls on the necks and bodies of Krateriskoi, Amphoriskoi and lentoid flasks. Yellow, white and sky blue appear on dark blue to translucent copper blue body glasses. Very rarely white or sky blue base glass is also used (Nolte-Reifor 1967:151-52). Note that dark blue is now a predominant body colour, perhaps confirming that exploitation of the Western Oases for cobalt was now well established.

Werkkreis III is also dated to **Amenhotep III and IV**. The body colour is most commonly dark blue, more rarely sky blue, and the forms are Amphoriskoi, Krateriskoi and occasionally bottles with handles as well as

jugs. The decoration is in yellow, white, sky and dark blue. The vessel necks and bodies are decorated with very fine feather patterns, sometimes accompanied by arcades or garlands. The decorative scheme is sometimes divided into two by horizontal threads (Nolte-Reifor 1967:152).

As well as the **core-formed vessels** there are also **mosaic glass bowls**, and - exclusively from Amarna - small gold-yellow or faint-blue pieces with layered eyes, dripped on circular layers of glass of varying dimensions and colour.

Abb. 2000-2/032 (Maßstab ca. 100 %) Herz-Skarabäus der Tuju aus Theben-West, Tal der Könige opak blaues Glas und grünlicher Feldspat, L 5,3 cm Ägypt. Museum Kairo Tuju war die Großmutter Echnatons [ca. 1400 v. Chr.] aus Nofretete 1976, Kat. Nr. 33



Conclusions

It appears that the **development of glass in Egypt is bound up with influences from outside the Nile Valley**, and that the material - perhaps because of its exotic nature - is quickly a focus of royal patronage, and possibly monopoly.

Most of the evidence for glass in this earliest phase comes from **funerary contexts**. This may reflect the limited utilisation of glass in Egypt at this time, but may equally be a factor of the **limited investigation of settlement sites**. The matter of funerary contexts, and indeed the **social status of glass**, may be settled by the investigation of a cemetery belonging to the ordinary people of Amarna begun in 2006. Whilst this post-dates the earliest glass in Egypt, it may give an indication of just how widely glass was used beyond elite contexts.

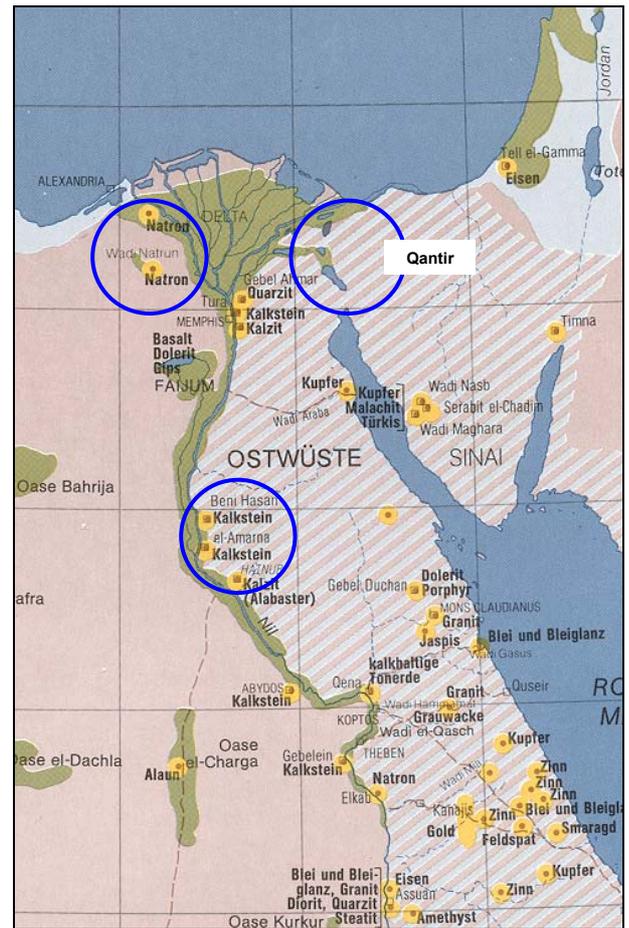
When **settlements** are examined it would not be surprising to find the establishment of at least **limited workshops** as early as the time of **Thutmose III**. However, it is to the reign of **Amenhotep III** (1390-1352 B.C.) that one must look for our **earliest evidence of production sites**. Manufacturing evidence forms the subject of the next chapter.

Buch Rückseite:

This book examines the **coming of glass to Egypt** and its relationship to the production of faience and pottery, particularly at Amarna site O45.1. The text combines

excavated evidence with experimental archaeology and laboratory analyses to give a **reconstruction of the production of glass and other materials at Amarna**, both in terms of technology and social context. The excavations carried out by **Flinders Petrie at Amarna** (1891-1892) are reassessed in the light of the new work and finds from that time put into a broader perspective.

Abb. 2000-2/019 Karte „Die natürlichen Rohstoffe des alten Ägypten“, Ausschnitt Amarna liegt ungefähr in der Mitte des Ausschnitts am Nil Wadi Natrun liegt süd-westlich des Nil-Deltas Qantir liegt süd-östlich des Nil-Deltas am rechten oberen Rand liegt Palästina, aus dem das Rohglas für die ägyptischen Glasmacher gekommen sein könnte aus Baines 1980, S. 21



Dr. Paul Nicholson is Senior Lecturer in Archaeology in the **Cardiff School of History and Archaeology** at the **University of Cardiff**. He has undertaken fieldwork for the Egypt Exploration Society at Amarna, Kom Helul (Memphis) and in the Sacred Animal Necropolis at North Saqqara, in addition to participating in excavations elsewhere in Egypt. Dr. Nicholson's particular **research interests are in early technology and archaeological science** and his recent publications include Ancient Egyptian Materials and Technology (co-edited with Ian Shaw, 2000) and The British Museum Dictionary of Ancient Egypt (co-authored with Ian Shaw, 1995, reissued 2003). Several papers on the excavation of the glass factory at Amarna have appeared including one in the Journal of Glass Studies 37 (1995).



Abb. 2002-2/279

Karte Vorderer Orient 15. - 14. Jhdt. v. Chr., blauer Kreis: Mitanni, aus Özgüç 2002, S. 304/305

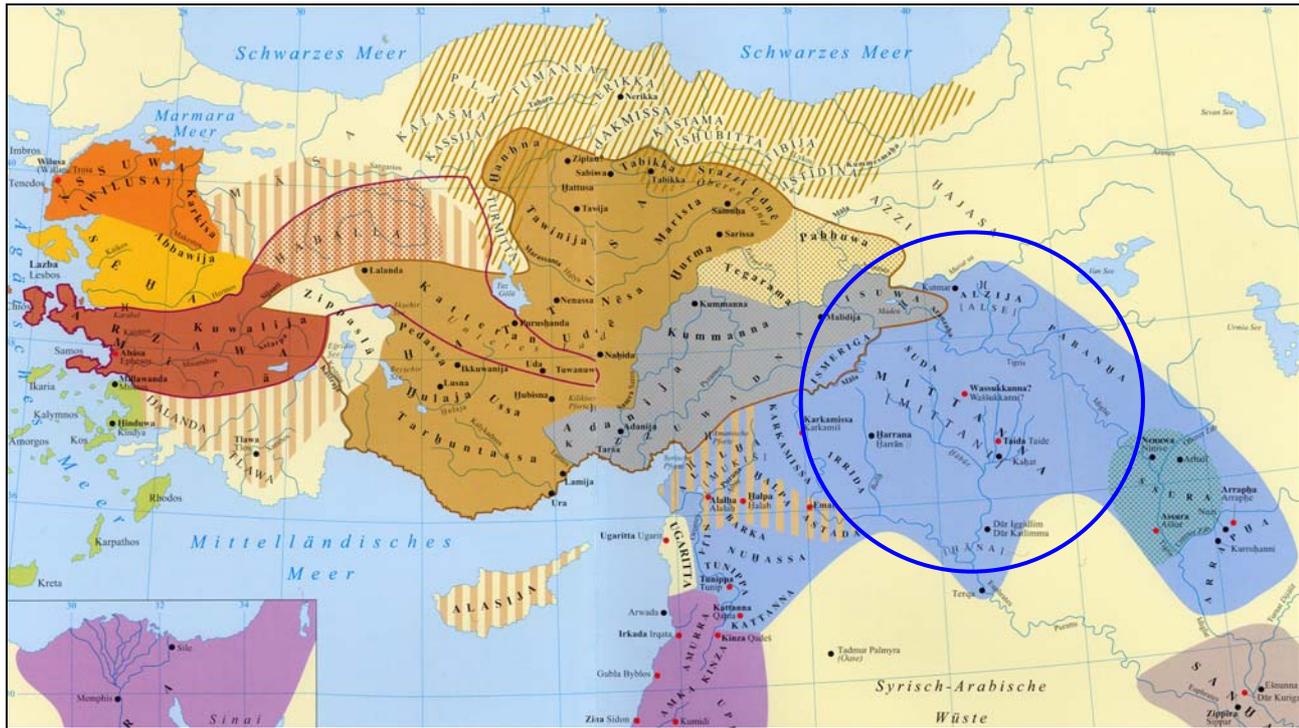
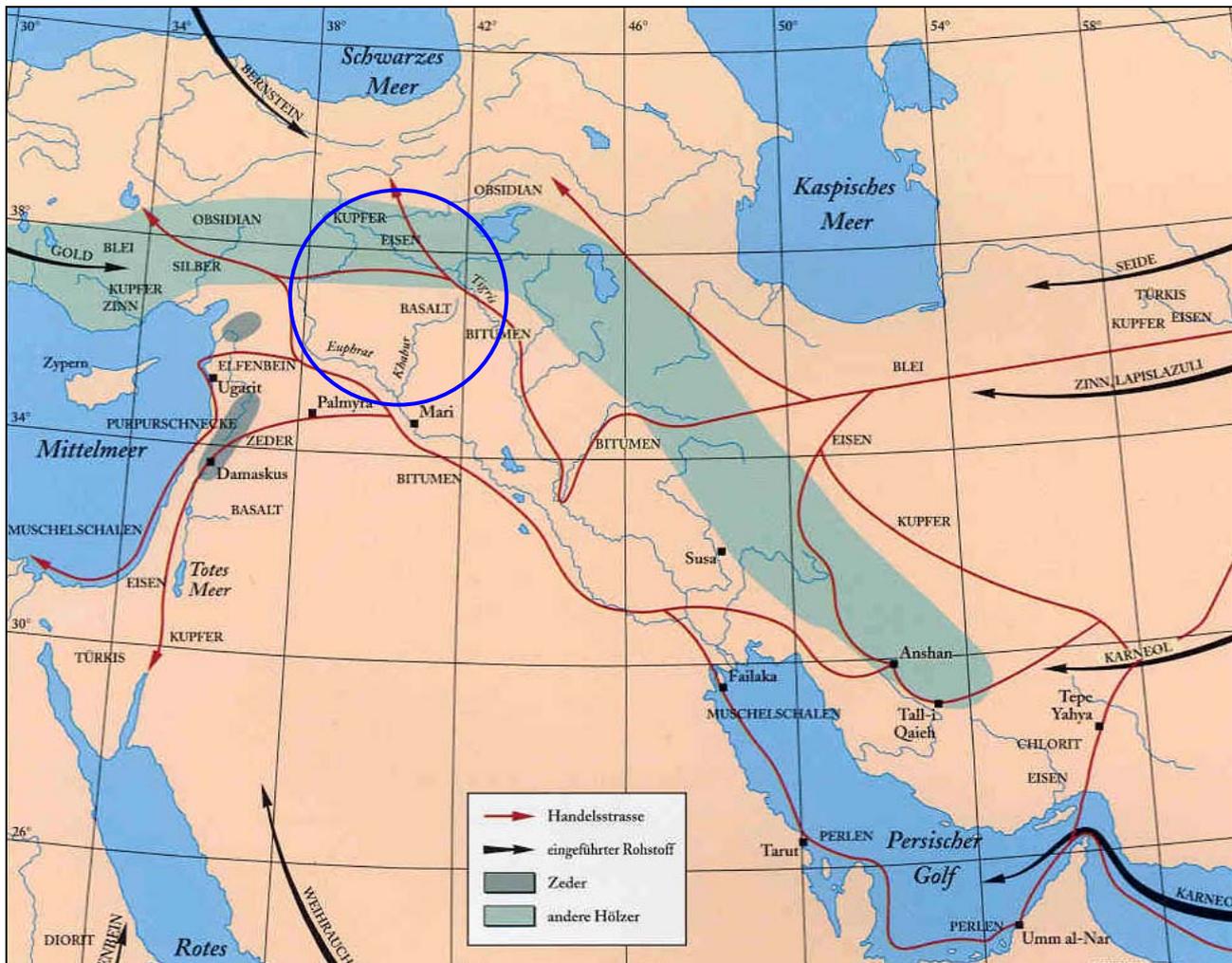


Abb. 2002-2/280

Karte mit Rohstoffen und Handelsrouten im Alten Orient, blauer Kreis: Mitanni, aus Fortin 1999, S. 155



Literaturangaben aus PK 2000-2 ... / Auszug

Baines 1980	Baines, John u. Málek, Jaromír, Weltatlas der alten Kulturen, Ägypten, München 1980
Barag 1962	Barag, Dan P., Mesopotamian Glass Vessels of the Second Millennium B.C., Journal of Glass Studies, Jg. 4, Corning 1962
Barag 1970	Barag, Dan P., Mesopotamian Core-Formed Glass Vessels (1500-500 B.C.), in: Oppenheim, A. L., Hrsg. u.a., Glass and Glassmaking in Ancient Mesopotamia, Corning 1970, Reprint 1988
Charleston 1990	Charleston, Robert J., Masterpieces of Glass, A World History from the Corning Museum of Glass, New York 1980/1990
Eggebrecht 1987	Eggebrecht, Arne u.a., Ägyptens Aufstieg zur Weltmacht, Ausst.-Katalog, Hildesheim 1987
Fortin 1999	Fortin, Michel, Syrien - Wiege der Kultur, Ausstellungs-Katalog, Mainz 1999
Freestone 1999	Freestone, Ian C. u. Gorin-Rosen Yael, The Great Glass Slab at Bet She'arim, Israel: An Early Islamic Glass Making Experiment?, J. of Glass Studies, Jg. 41, 1999, Corning 1999, S. 105-116
Harden 1988	Harden, Donald B., Glas der Cäsaren, Ausstellungs-Katalog, Mailand 1988
Jackson 1998	Jackson, Caroline M., Nicholson, Paul T. u. Gneisinger, W., Glassmaking at Tell el-Amarna: An Integrated Approach, in: Journal of Glass Studies, Jg. 40, Corning 1998, S. 11-24
Kühne 1999	Kühne, Klaus, Ars vitrea experimentalis. Möglichkeiten und Grenzen antiker Glasverarbeitung, in: Antike Welt, 30. Jg., 05/1999, Mainz
Lierke 1999	Lierke, Rosemarie, Antike Glastöpferei, Mainz 1999
Nicholson 1993	Nicholson, Paul T., Egyptian Faience and Glass, Buckinghamshire 1993
Nicholson 1995	Nicholson, Paul T., Glassmaking and Glassworking at Amarna: Some New Work, Journal of Glass Studies, Jg. 37, Corning 1995
Nicholson 1997	Nicholson, Paul T., Caroline M. Jackson u. Trott, K. M., The Ulu Burun Glass Ingots, Cylindrical Vessels and Egyptian Glass, Journal of Egyptian Archaeology, Jg. 83, 1997, S. 143-153
Özgülç 2002	Özgülç, Tahsin, (Hrsg. Kunsthalle Bonn), Die Hethiter und ihr Reich, Stuttgart 2002
Oppenheim 1973	Oppenheim, A. L., Towards a History of Glass in the Ancient Near East, Journal of the American Oriental Society, Jg. 93, 1973
Roaf 1990	Roaf, Michel, Weltatlas der alten Kulturen, Mesopotamien, München 1990
Stern 1994	Stern, E. Marianne u. Schlick-Nolte, Birgit, Frühes Glas der alten Welt. 1600 v. Chr. - 50 n. Chr.), Sammlung Ernesto Wolf, Bestands-Katalog, Stuttgart 1994
Turner 1954	Turner, W. E. S., Studies of Ancient Glass and Glass Making Processes. Part I, Crucibles and Melting Temperatures Employed in Ancient Egypt at about 1370 B.C., Journal of the Society of Glass Technology, Jg. 38, 1954, Nr. 183

Siehe unter anderem auch:

- PK 1999-2** Charleston, SG, **Erstes Milchglas aus Venedig; Auszug aus Charleston, Masterpieces of Glass**
- PK 2000-2** SG, **Eine Polemik: Köpfe von Pharaonen und Cäsaren aus Glas, gegossen, geschmolzen, gepresst, gedrückt, überfangen und dann geschnitten, geschliffen, poliert?**
Köpfe von Pharaonen aus Stein, Glas und Gold; Köpfe von Cäsaren aus Glas
Köpfe ägyptischer Pharaonen aus Glas:
immer noch ein Geheimnis der ägyptischen Glasmacher
- PK 2000-2** SG, **Literatur-Angaben zu den Artikeln über antikes Glas (Stand 2000)**
- PK 2000-3** Lierke, Ein paar Randnotizen zum Ausflug ins Altertum; Nachtrag zu PK 2000-2
- PK 2000-5** SG, Form-geblasenes Glas (**Schale Ennion**, 1 Jhdt. n.Chr.)
- PK 2001-3** Lierke, Mit 'Versuch und Irrtum' durch die Geschichte der **antiken Glastechnologie**
- PK 2001-3** SG, Rosetten und Glasperlen aus dem minoischen Kreta
- PK 2001-5** Lierke, Ägyptisches Glas aus Amarna; Nachtrag zu PK 2001-3
- PK 2001-5** SG, Türkis-opake Schale aus **Chorasan** - geschliffen oder gepresst?
- PK 2002-2** SG, **Kamen die ägyptischen Glasmacher der Amarna-Zeit aus Mitanni?**
Nachtrag zu PK 2000-2
- PK 2002-2** SG, Ägyptischer Halskragen mit Rosetten, Sammlung Ludwig, Basel
- PK 2002-3** Lierke, Edles Pressglas - ein Irrtum wird geklärt
- PK 2002-3** SG, Auszug aus Wamser 1998 und Stiegemann 2001, Glasfunde (formgeblasen und gepresst) aus byzantinischem Herrschaftsbereich
- PK 2002-3** Stern, Achaemenidische Glasschale im Inventar des Parthenon in Athen
- PK 2002-3** SG, Glasfunde (formgeblasen und gepresst) aus byzantinischem Herrschaftsbereich;
Auszug aus Stiegemann, (Hrsg.), Byzanz. Das Licht aus dem Osten. Kult und Alltag im Byzantinischen Reich vom 4. bis 15. Jahrhundert, Ausst.-Katalog, Mainz 2001
Wamser und Zahlhaas, (Hrsg.), Rom und Byzanz. Archäologische Kostbarkeiten aus Bayern, Ausstellungs-Katalog Prähistor. Staatssammlung, München 1998

- PK 2002-3 SG, Zur Herstellung der achaemenidischen Schalen aus Glas: "Cast and Cut?"
- PK 2002-3 Triantafyllidis, Neue Funde zur Herstellung von Glas im klassischen und hellenistischen Rhodos
- PK 2003-1 SG, Pressform für einen Schmuckanhänger aus Fayence aus dem alten Ägypten
- PK 2003-1 SG, Bianchi u.a., Reflections on Ancient Glass from the Borowski Collection - Bible Lands Museum Jerusalem [Überlegungen zu antikem Glas ...]
- PK 2003-1 SG, Eine in einer Hohlform geprägte Schale aus Quarzkeramik aus dem Iran ([Chorasan](#))
- PK 2003-1 SG, Türkis und Azur. Quarzkeramik im Orient und Okzident ([Chorasan](#))
Ausstellungskatalog Kassel 1999 von Ralf Busz und Peter Gercke (Hrsg.)
- PK 2003-1 SG, Auf der Suche nach den ältesten Rosetten der Welt
- PK 2003-1 SG, Becher aus Fayence und Ägyptisch Blau:
Vorbilder von Achaemenidischen Schalen aus Glas?
- PK 2003-2 Carboni, Verwendung von Glas als Dekoration in der Architektur der islamischen Welt
- PK 2003-4 Carboni, Beispiele für geschliffenes islamisches Glas 9. - 10. Jhdt.
- PK 2003-4 Carboni, Drei Medaillons mit eingepressten Motiven und Inschriften - Islamisches Glas
- PK 2003-4 SG, Beispiele für geschliffenes islamisches Glas 9. - 10. Jhdt. - Auszug aus Carboni, Glass from Islamic Lands, Al-Sabah Collection Kuwait National Museum, London 2001
- PK 2003-4 Whitehouse, Zwei Formen aus Metall für form-geblasenes Islamisches Glas
[Molds for Mold Blown Glass]
- PK 2004-1 Lierke, Über Diatrete und andere geschliffene antike Gläser -
Spurensuche und Folgerungen
- PK 2004-3 SG, Ausstellung „Nobiles Officinae“, Kunsthandwerk am Königshof der Normannen und Staufer in Sizilien im 12. und 13. Jhdt., Wien 2004
- PK 2005-4 SG, Lierke, Die Hedwigsbecher - Das normannisch-sizilische Erbe der staufischen Kaiser. Ein neues Buch zur Glasgeschichte
- PK 2006-3 SG, Ein interessantes Buch: Whitehouse, Sasanian and Post-Sasanian Glass in the Corning Museum of Glass, Corning 2005
- PK 2006-3 SG, Andenken-Plaketten an den Säulenheiligen Simeon Stylites in Syrien aus Pressglas
- PK 2007-3 Barovier Mentasti, Carboni, Emailliertes Glas zwischen dem Östlichen Mittelmeer und Venedig ([Schale Chorasan](#))
- PK 2007-3 Verità, Einfluss der Islamischen Tradition auf Chemie und Technologie von Glas aus Venedig
- PK 2008-3 SG, Ein interessantes Buch: Jonathan M. Bloom, Arts of the City Victorious - Islamic Art and Architecture in Fatimid North Africa and Egypt
- PK 2009-1 SG, OpaK-farbiger, marmorierter, unvollendeter Diatretbecher?
aus einer römischen Nekropole in Rumänien, 4. Jhdt. n.Chr.
- PK 2009-1 Othman, Die Techniken der Glasherstellung in Syrien in byzantinischer Zeit und ihre Entwicklungsphasen (mit Literaturangaben)
- PK 2009-1 Thiel, SG, Diatretbecher - „in mehreren Arbeitsschritten gepresst und nachgeschliffen“
- PK 2009-2 SG, 4. Internationales Glassymposium „Hochmittelalterliche Glasproduktion unter besonderer Berücksichtigung der Moselregion“ 2009 in Trier
- PK 2009-3 SG, [Afghanistan - les trésors retrouvés - Collections du musée national de Kaboul](#)
Ausstellung im Musée national des Arts asiatiques - Guimet, Paris, 2006-2007
Antike, römisch / syrische Gläser aus dem Schatz von Begram
- PK 2009-3 SG, Menninger, Untersuchungen zu den Gläsern und Gipsabgüssen aus dem Fund von Begram ([Afghanistan](#)), Würzburg 1996
-
- PK 2009-4 SG, Ein wichtiges Buch: Lierke, Die nicht-geblasenen antiken Glasgefäße ...
Deutsche Glastechnische Gesellschaft, 2009
- PK 2009-4 Barag, Socio-Economic Observations on the History of Ancient Glass
- PK 2009-4 Nicholson, Brilliant Things for Akhenaten -
[The Production of Glass, Vitreous Materials and Pottery at Amarna Site O45.1](#)
- PK 2009-4 SG, Antonaras, Roman and Early Christian Glassworking 1st c. B.C. - 6th c. A.D.
- PK 2009-4 SG, Annales du 17^e Congrès de l'Association Internationale pour l'Histoire du Verre
Anvers / Antwerpen 2006