

## CHAPTER 5 FAIENCE, 'EGYPTIAN BLUE' AND GLASS VESSELS

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Faience, 'Egyptian blue' ('blue frit') and glass vessels are grouped together in the present study, for several reasons. Similar vessel types were made using these materials. All three materials appear to be part of a continuum, are synthetic in composition with similar basic ingredients consisting of silica, calcite, alkalis and colourants, and employ pyrotechnology in their manufacture. Differences emerge in the variant combinations of soda or natron (alkali), lime (calcite) and silica used, and in the manufacturing processes which result in general variations in texture and visual appearance. Distinction between material identification of many objects is blurred, and analysis can reveal properties of two or even all three materials as generally defined in modern scholarship. The choice of one material label over another often can be considered an approximation of its ingredients. The ancient artisans did not have exact definitive formulae, and were unconcerned with the specifics of material identification.<sup>377</sup> Modern scholarship has wrestled with the problems of terminology, and various descriptive labels have appeared, not always correctly. 'Glass paste' and '*pâte de verre*' are terms sometimes employed to describe 'Egyptian blue,' faience and opaque glass, and 'frit' has been used for both 'Egyptian blue' and faience. 'Blue frit' is the older term for 'Egyptian blue,' and 'porcelain' is an early archaeological term for faience, whilst 'faience' sometimes is used indiscriminately for anything with a glaze.<sup>378</sup> 'Glass paste' also previously often had been used as a term for yet another separately distinct material, but the term actually is a misnomer: the material *is* glass, in a degraded state. Research has concentrated on the

various properties, ingredients and terminology for faience, 'Egyptian blue' and glass, and the objects themselves rarely have been discussed archaeologically or artistically except in general publications or exhibition catalogues. All were considered equivalent high status alternatives, *not* cheaper substitutes, for stone and other materials.<sup>379</sup>

### In Egypt

#### *Faience*

The specific technological processes of faience manufacture are not yet known, although various techniques have been proposed both for production of the core material and its glaze.<sup>380</sup> Generally, the core material consists chiefly of quartz sand together with natron as an alkaline binder, coated with a glazing solution of copper carbonate, sodium carbonate and powdered quartz. Additional and substitute ingredients varied widely, and no single solution can be quoted as a formula. The white or off-white to dark brown core material is multi-layered in section, with a powdery outer surface that wears quickly and easily unless glazed with a less porous material. The final result varies from soft and crumbly to an almost glass-like hardness.

Objects, including vessels, were made in a variety of techniques. A number of certain and possible kilns and workshop areas have been recovered for most periods, providing much insight into working methodology. By the New Kingdom, many vessels were produced in a prefabricated mould, when necessary in two or more separate component parts luted together with a 'slurry' of wet faience solution before

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<sup>377</sup> The most recent and comprehensive discussions of the materials, their techniques, terminology and problems are LEE and QUIRKE 2000:108–111 ('Egyptian blue' pigment); NICHOLSON and HENDERSON 2000 (glass; see also p. 205 for 'Egyptian blue') and NICHOLSON and PELTENBURG 2000 (faience; see also pp. 177–178 for 'Egyptian blue'); all have extensive further bibliographies. Earlier general discussion can be found in LUCAS and HARRIS 1962:156–167 (faience), 179–194 (glass), 340–344 ('Egyptian blue' pigment); RIEFSTAHL 1968:1–7; BROVARSKI *et al.* 1982: 140–141, 159–162; BIMSON and FREESTONE 1987:*passim*; more specifically for faience are FOSTER 1979; KACZMARCZYK and HEDGES 1983; FRIEDMAN 1998:*passim* and, for glass, HARDEN 1968;

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1981:23–31; GOLDSTEIN 1979:24–34. 'Egyptian blue' rarely is discussed separately except as a pigment, even in LUCAS and HARRIS 1962 and by various authors in NICHOLSON and SHAW 2000, but see COONEY 1976:37.

<sup>378</sup> There are a considerable number of other terms, chiefly attempts at more detailed description. FOSTER 1979:9–21 comments on some, together with a discussion of ancient terms for the variety of material(s); see also NICHOLSON and PELTENBURG 2000:177–178.

<sup>379</sup> FRIEDMAN 1998:42–43.

<sup>380</sup> See, most recently, the overall development of different production techniques discussed by NICHOLSON and PELTENBURG 2000:*passim*, and STOCKS 2003:225–233.

the initial firing. Others were ‘core-formed’ like glass or otherwise modeled by hand, and even some wheel-turned vessels are reported although the material is not particularly malleable to the touch. Decoration could be surface-moulded, incised or painted prior to coating with the surface glaze. Glaze is added prior to the second firing, and merges into the core without sharp definition upon heating, although the distinctive glaze and core clearly are visible at breaks. A variety of different coloured glazes are known, and are sometimes combined in a painterly rather than linear decorative composition. Various copper ores, especially malachite, produced rich turquoise and deep blue background colours, and manganese dioxide produced the black, brown and dark purple painted decoration. These remained the norm until early New Kingdom experimentation began to produce a variety of other colours, including red, yellow, light green, purple and opaque white, especially after the introduction of glassworking during the reign of Thutmose III.

The earliest known faience is from Tepe Gawra and Tell Arpachiyah in northern Mesopotamia, dated to the late 5<sup>th</sup> millennium BC. In Egypt, the earliest faience was found at Predynastic Nagada and Badari, dated within the 4<sup>th</sup> millennium BC. It remains debatable whether knowledge of the technique was acquired from Mesopotamia or was a local independent re-discovery in Upper Egypt.

The earliest Egyptian objects are small and generally solid such as beads and amulets, but by Dynasty I small figurines and vessels also were being produced.<sup>381</sup> The earliest vessel types include model vases of various shapes, all of them small and roughly ‘core-made,’ and a probable jar lid. The fragment of a large vase recovered at Abydos, bearing the name of the Dynasty I king Aha, is an exception to the rule of small scale of faience objects at this

time.<sup>382</sup> After this initial burst, however, vessels of faience are quite rare until the Middle Kingdom.<sup>383</sup> Numerous other objects, increasingly larger in scale and especially large architectural inlays, continued in production throughout the Old Kingdom and into the First Intermediate Period.

During the Middle Kingdom the range in both scale and quality of faience manufacture increased considerably. In addition to a considerable variety of other objects, both open and closed vessel types were made. Forms, mostly thick-walled, include open bowls, dishes and cups, closed forms such as cylinder and *hs*-jars, alabaster, kohl pots and other cosmetic containers, ring- or ‘pot’-stands, vessel and stand sets,<sup>384</sup> and a number of simple but fancy forms.<sup>385</sup> Almost all vessel types strongly reflect contemporary forms in other media, especially pottery but also stone and metal forms, from which they were derived. Many had separate fitted lids. Incised, inlaid and painted decorative designs are common, some with inscriptions and mostly dark blue on a lighter background. Notably, however, elaborate and large scale vessels were not yet produced.

This tradition continued throughout the Second Intermediate Period, although there are fewer examples on which to draw. A large collection of faience from Kerma, strongly influenced by Egyptian wares but at that time (late Middle Kingdom–beginning of Dynasty XVIII) controlled by the indigenous Nubian (Classic Kerma) population, includes a number of vessels with horizontal ribbing, called ‘rilled decoration,’ in imitation of basketwork (see Fig. 11).<sup>386</sup> This type of moulded decoration is rare, and usually accompanied by painted decoration in imitation of basketwork contrast weaving. Few other examples are from excavated contexts, but are dated within the Second Intermediate Period–early Dynasty XVIII.<sup>387</sup> The vast majority of these vessels

<sup>381</sup> KACZMARCZYK and HEDGES 1983:A-82–A-83, A-86–A-88, C-4 #14-107-29, 14-107-30, 16-107-27, 16-107-28, C-7 #20-134-12, 20-134-16; C-8 #20-134-48, fig. 31:a–f; NEEDLER 1984:303–305 #225–227 (all dated to ‘Naqada III–Early Dynastic’). Rather crude small human figures recovered in the Early Temple area of Abydos are dated to the Early Dynastic period; see NEEDLER 1984:349–350 #278–279. An example of a model vessel is FRIEDMAN 1998:69 fig. upper right, 178 #10.

<sup>382</sup> FRIEDMAN 1998:75 fig. upper, 179 #13.

<sup>383</sup> RIEFSTAHL 1968:3–4. They are not even mentioned by NICHOLSON and PELTENBURG 2000:179–181 from the Early Dynastic period until the Middle Kingdom.

<sup>384</sup> VON BISSING 1902:110 #III (*‘Mittleres Reich’*); FOSTER 1979:35; BOURRIAU 1988:128–132 #122–126; FRIEDMAN 1998:239 #149; SPURR, REEVES and QUIRKE 1999:22 #17.

<sup>385</sup> KEMP and MERRILLEES 1980:132 fig. 43:59–63; FRIEDMAN 1998:207 #67, 218 #93(?).

<sup>386</sup> REISNER 1923:2:115 fig. 182:13–16, 160–161 Type VI.

<sup>387</sup> See also BROVARSKI *et al.* 1982:142 #138, 151 #157; FRIEDMAN 1998:218 #92; SPURR, REEVES and QUIRKE 1999:36–37 #47–48 for some Dynasty XVIII examples, all suggested to be from Tuna el-Gebel. Note the differences between these and Palestinian vessels of the same period (*‘Hyksos’* to early Dynasty XVIII), seen in SAGONA 1980. The vessel from Armenoi (KARETSOU *et al.* 2000 100 #76) more likely

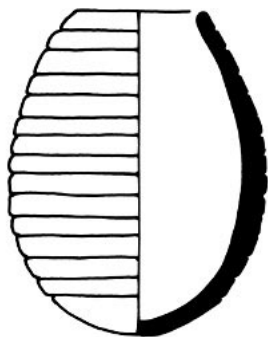


Fig. 11 Rilled cup, faience, H: 10 cm, from Kerma, Nubian with Egyptian influence, Second Intermediate Period-early Dynasty XVIII (REISNER 1923:II:155 fig. 182:13)

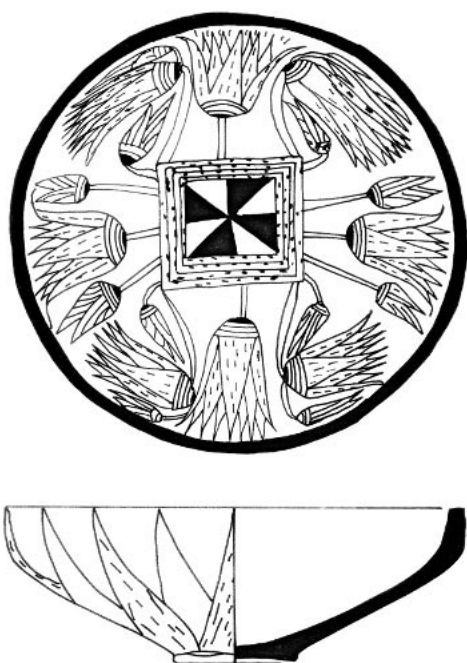


Fig. 12 'Pond-bowl,' faience, Dia (rim): 17.3 cm, from Abydos tomb F15, Egyptian, Dynasty XVIII (LACOVARA, D'AURIA and ROHRIG 1988:138 #76)

is of Palestinian origin or inspiration than Egyptian, unless it is from the Delta region or at least from northern Egypt (compare SAGONA 1980:113 fig. 3:19 and VIENNA 1994:98 #24), and probably an heirloom piece in context.

<sup>388</sup> Several have vaguely 'Aegean' designs but are local Kerma products; see REISNER 1923:II:pl. 45:2.1-2 3.1, 47:2.6. One has been identified as an Aegean import, either LM I or LH I in date. See SMITH 1965:fig. 59; WARREN and HANKEY 1989:138; FRIEDMAN 1998:233 #136.

<sup>389</sup> REISNER 1923:II:153-170 *passim*, fig. 182, pl. 45-47, especially pl. 45:1.1-2, 2.1-4, 3.1-2, 46:1.7, 47:2.2. Note, however, that FOSTER 1979:35-36 is yet another recent scholar who employs the dates and circumstances proposed by Reisner and later shown to be incorrect. The Kerma

with provenance are from Nubia, and it may be a design peculiar to the region. Also from Kerma are a large number of finely made sherds of various vessel forms. Decorative techniques shown in these fragments include a far more painterly approach, polychrome designs and 'light on dark' patterns,<sup>388</sup> partly due to recent technical improvements and partly to the indigenous culture that produced them.<sup>389</sup>

An even greater scale and variety of vessel types were introduced in the New Kingdom, again strongly influenced by contemporary pottery, stone and metal forms. Greater use was made of surface-moulded decoration. In addition to continuing Middle Kingdom vessel types, chalices, lentoid flasks, tazzae, jugs, pyxides, kohl tubes and sticks, zoomorphic and anthropomorphic vessel types, as well as a number of individual forms, were popular in the New Kingdom.<sup>390</sup> Technological experimentation produced an expanded colour repertoire and more painterly approach to decoration, including polychrome designs on a white background and 'light on dark' designs, in late SIP or early Dynasty XVIII.<sup>391</sup>

Shallow bowls with lotus petal designs on the exterior, first found and usually termed 'cups' in the Middle Kingdom, began to be decorated also on the interior by Dynasty XIII with a variety of elaborate centralised designs.<sup>392</sup> Their diameter can range from quite small (9 cm) to surprisingly large (>30 cm) and a variety of bowl profiles are known.<sup>393</sup> The emphasis on water - favourite motifs included lotus and papyrus plants, birds and fish, often emanating from a 'pond' in the centre, all viewed as if from above in formal arrangements of considerable variety - gave rise to their designation as 'pond bowls' (see Fig. 12). Most are symbolic of regeneration, and sometimes Hathor-motifs also are found. Later designs began to depict scenes of humans and animals in idyllic surroundings, especially after Dynasty XVIII. The for-

'hoard' most certainly is late Middle Kingdom-beginning of New Kingdom in date, a time when the site was under local - not Egyptian - control.

<sup>390</sup> VON BISSING 1902:110 #III ('*Neues Reich*'); FOSTER 1979: 36-37; BROVARIKI *et al.* 1982:140-151 #138-159, 221 #269, 221-222 #275-277, 224-225 #282, 226 #286; FRIEDMAN 1998:227-228 #121-122, 233 #135, 261 #195; SPURR, REEVES and QUIRKE 1999:26 #22 (*krateriskos*, called a 'thistle beaker'), 30-31#32-34; 33 #39; 37-40 #49 & 55.

<sup>391</sup> BROVARIKI *et al.* 1982:148-150 #149-154; FRIEDMAN 1998: 183 #23, 184 #25, 213 #82, 215 #90, 219 #94, 260 #194.

<sup>392</sup> BOURRIAU 1988:128 #122a, 131-132 #126; FRIEDMAN 1998:151 figs., 239 #149.

<sup>393</sup> STRAUSS 1974:12 fig. 1, *passim*.

mal motif arrangements generally date to Dynasty XVIII and earlier, while the scenic designs usually are of late Dynasty XVIII–XX date.<sup>394</sup> Rim decoration seems to have followed suit, with the solid rim band of the earlier vessels replaced by dotted rims in late Dynasty XVIII. Foreign shapes also were imitated, including the Minoan rhyton and Mycenaean stirrup jar and two-handled flask, and decoration too was influenced by foreign designs.<sup>395</sup>

Vessels rarely can be assigned a date range shorter than an entire dynasty or even ‘Middle Kingdom’ or ‘New Kingdom’ designations, unless by a datable context or a specific feature limits its individual dating range by comparison with others in similar or other media.

### ‘Egyptian Blue’

‘Egyptian blue’ (or ‘blue frit’)<sup>396</sup> consists of numerous finely ground particles of components similar to faience, suspended in a wet binding agent. Basically it is a mixture of mainly cuprorivaite [ $\text{CaCu}(\text{Si}_4\text{O}_{10})$ ] with copper wollastonite [ $(\text{Ca}, \text{Cu})_3(\text{Si}_3\text{O}_9)$ ], silica [ $\text{SiO}$ ] and glass<sup>397</sup> and/or a calcium-copper tetrasilicate [ $\text{CaO.CuO}_4\text{SiO}_2$ ] in a very limited matrix of glass.<sup>398</sup> Three basic hues have been cited, dark blue, light blue, and diluted light blue, and each has a slightly different component ratio.<sup>399</sup> The material can be moulded or modeled by hand when wet, then heated to fusion but not vitrification as in glass, being fired at the lower temperature of 850–1000° C.<sup>400</sup> It sometimes can be mistaken for glass, especially if the latter has weathered, and indeed the two materials are quite closely related. The Greeks later called it *kyanos* and Vitruvius *caeruleum*. It seems to have been in production at least until his time.<sup>401</sup>

The majority of Egyptian objects seem to have been manufactured in a two-stage firing procedure, the particles being fired and reground before the

object was heated for moulding or formed by other means. It also was employed as the main blue pigment colour from at least Dynasty IV. Unlike glass, ‘Egyptian blue’ is not clear or even opaque when viewed, and unlike faience is uniformly coloured in section. Each individual heat-hardened object is of generally even composition in section, although it can darken towards the surface. The texture can range from extremely fine to quite coarse, the latter especially on raw lumps rather than objects. The vast majority of objects are of a finely ground texture indicative of the second firing. The inconsistent combination of ingredients and degrees of fineness allow enormous variation in composition and material identification, and it sometimes even is identified as faience as well as glass. Its quality generally improved from the Old to Middle Kingdom. ‘Egyptian blue,’ as indicated by its name, normally is coloured blue to blue-green, resulting from the inclusion of copper carbonate. Individual objects are more or less uniform in hue, but the colour intensity varies widely in any group of objects. The varying intensity is caused by variations in particle fineness, and the greenish colour often can be the result of chemical changes over time.<sup>402</sup> Only one possible manufacturing area may have been identified in 1928, as debris only, at Dynasty XIX–XX Qantir.<sup>403</sup>

‘Egyptian blue’ seems to have developed in Egypt, and the vast majority of the sparse literature is devoted to its constituent ingredients and manufacturing processes rather than study of the artefacts actually produced in the material. It is first attested in the Early Dynastic period as beads, amulets and other small objects including at least one vessel,<sup>404</sup> and by the Old Kingdom as a pigment. It also is known from a later date in the Near East and the Eastern Mediterranean, chiefly as a colouring agent.<sup>405</sup> Small figurines also were made, and

<sup>394</sup> See BROVARSKI *et al.* 1982:141–145 #138–144; FRIEDMAN 1998:211–212 #76–79; SPURR, REEVES and QUIRKE 1999:28–29 #26–31.

<sup>395</sup> BROVARSKI *et al.* 1982:152–158 #160–169, but also BELL 1983. See also FRIEDMAN 1998:228 #123–124; SPURR, REEVES and QUIRKE 1999:27 #25; 32–33 #37–38.

<sup>396</sup> ‘Blue frit’ is the older term; the preferred term, employed here, now is ‘Egyptian blue.’

<sup>397</sup> LEE and QUIRKE 2000:105 Table 4.1. For its use as a pigment, see pp. 108–111.

<sup>398</sup> NICHOLSON and PELTENBURG 2000:177–178.

<sup>399</sup> TITE, BIMSON and COWELL 1987:42; LEE and QUIRKE 2000:109.

<sup>400</sup> See TITE, BIMSON and COWELL 1987:39–46.

<sup>401</sup> See, for example, GROSE 1989:358 fig. 170. Vitruvius was active c. 46–30 BC.

<sup>402</sup> See MUSCARELLA 1974:#193; LEE and QUIRKE 2000:110.

<sup>403</sup> FRIEDMAN 1998:61.

<sup>404</sup> UC 15345-6, from Umm al-Ga‘ab, Abydos; see FRIEDMAN 1998:17, 19, 21 n. 428.

<sup>405</sup> Lumps of ‘Egyptian blue’ pigment have been found at Knossos (see below, n. 428), and also from Mycenae (NMA 1344) from the Acropolis, Pylos (NMA 5673) and Tiryns (NMA 1606) on the Mainland. At Pylos, the blue colour on the fresco sample was established as ‘Egyptian blue’ (BLEGEN *et al.* 1966–1973:II:230) and at Akrotiri on Thera (LEE and QUIRKE 2000:111). Additionally, a lump of ‘Egyptian blue’ was found in a brazier at Katsamba; see KANTA 1980:328 #4.

continued into larger scale by the New Kingdom.<sup>406</sup> By the late Middle Kingdom, both open and closed vessel types in this material are recorded,<sup>407</sup> the types strongly influenced by contemporary vessel forms in other media, especially stone. This typology expands greatly in the New Kingdom, when types included lids, *krateriskoi*, small pots complete with lids and shallow bowls and cosmetic dishes, some zoomorphic in form.<sup>408</sup> All are mould-made, many in two or more separate moulds pieced together to create closed shapes and luted with 'slurry.' Decoration consists entirely of moulded or occasionally incised features. They were never painted, as faience vessels often were, but occasionally incised areas were filled with contrasting colours for highlighting detail.<sup>409</sup> The surface normally is matte and smooth.

### Glass

Glass production is a later development of the manufacture of faience somewhere in the Near East (possibly Mitanni) sometime in the 16<sup>th</sup> c. BC, probably the accidental result of achieving the correct conditions for glass when firing faience. Knowledge of the technique soon spread to Egypt. A few small objects, virtually all beads, are earlier in date than Thutmose I,<sup>410</sup> but the earliest datable vessel in Egypt is a clearly imported body fragment recovered at Tell el-Dab'a in a dump context with 'Minoan' fresco fragments and a scarab inscribed with his name.<sup>411</sup> The earliest datable Egyptian vessels are inscribed with the name of Thutmose III,<sup>412</sup> whilst the earliest glass sculptures (apparently an Egyptian invention, and possibly made using the *ciré perdue* method) are two heads of Amenhotep II.<sup>413</sup>

The distinction between 'glass-making' and 'glass-working' requires repeated emphasis, as the two terms often are used interchangeably but in fact refer to two different processes. Glass-making is the process by which the constituent ingredients are turned into the glass material, whereas 'glass-working' is the process by which this material is worked into the desired shape and presentation by any of several different methods according to the result desired by the artisan. 'Glass-working' can be practiced without the knowledge of 'glass-making,' if the glass material is imported from elsewhere. This also is true for the other pyrotechnic materials.

It is assumed that Thutmose III brought back some trained glassmakers from his incursions into the Near East, who then introduced the technique to local artisans, but the earliest large scale glass production seems to have been at Amenhotep III's palace at Malkata, apparently as a royal monopoly. The earliest Egyptian vessels already show advanced technological skill in glass vessel manufacture. Glass was a very expensive and rare commodity in both Egypt and elsewhere in the earlier New Kingdom period, valuable in its own right, as well as being a substitute material in lieu of various precious stones. Later, glass was far more accessible, and hence less expensive.<sup>414</sup> The exact formula remains unknown but, based on analyses, is a combination of a silica base, with an alkali (soda or potash) addition of perhaps 20% to lower the firing temperature, a lime agent to stabilise the combination, and other materials as colourants.<sup>415</sup>

Open vessels such as bowls and cups were manufactured by adding successive layers of powdered glass onto a prefabricated and continually heated

<sup>406</sup> LILYQUIST and BRILL 1993:8; FRIEDMAN 1998:182, 184 #26; SPURR, REEVES and QUIRKE 1999:41 #59. A crocodile figurine from Lisht (MMA 07.227.19) apparently is not of 'Egyptian blue' but something intermediate between that and glass; LILYQUIST and BRILL 1993:12–13, *pace* FRIEDMAN 1998:207. As glass was not made in a deliberate process at this time, perhaps it and the other objects they observed merely were intended to be 'Egyptian blue' but the formula was not exact or the object fired at an unusually high temperature. The variety of objects, including vessels, made of this material in the New Kingdom and later can be seen in COONEY 1976:37–42; see also BROVARSKI *et al.* 1982:321–232 #301.

<sup>407</sup> LILYQUIST and BRILL 1993:8, 19 fig. 5 (all but left).

<sup>408</sup> MUSCARELLA 1974:#193, 202; BROVARSKI *et al.* 1982:159–160 #170–171; FRIEDMAN 1998:39 fig. 16; SPURR, REEVES and QUIRKE 1999:26 #23 (*krateriskos*, called a 'thistle beaker'); PARIS 2002:99–100 #35.c.

<sup>409</sup> E.g., the 'Egyptian blue' apes found at Mycenae and Tiryns inscribed with the cartouche of Amenhotep II; see Cline 1991b. Details are highlighted in black and yellow.

<sup>410</sup> See BECK 1934; a revised and updated list of early glass objects is by PELTENBURG 1987:17. Also note comments by LILYQUIST and BRILL 1993:5–9, *passim* although see also NICHOLSON and HENDERSON 2000:195.

<sup>411</sup> VIENNA 1994:248 #323; BIETAK 1997:117, n. 67.

<sup>412</sup> NOLTE 1968:Frontispiece:a, pl. I:5–7; BROVARSKI *et al.* 1982:163 #173.

<sup>413</sup> NICHOLSON and HENDERSON 2000:196.

<sup>414</sup> REEVES 1990:275 notes that "glass, at least in the 18<sup>th</sup> dynasty, was perhaps ... a desirable commodity [for tomb robbers], though it was generally ignored by the intruders of the late New Kingdom."

<sup>415</sup> NICHOLSON and HENDERSON 2000:197–199, and *passim*.

mould, unlike faience and ‘Egyptian blue’ which could be poured.<sup>416</sup> However, the overwhelming majority of vessels were closed shapes manufactured by ‘core-forming,’ a technique involving a moulded clay-and-dung core over one end of a metal rod, covered with a coating of heated glass which was then formed into the basic finished shape. Recent experimentation has shown this method to be a variation of the ‘heating powdered glass’ technique, rather than ‘true’ ‘core-forming’ technology, as the glass could not be sufficiently molten.<sup>417</sup> Decoration was then added, usually consisting of thin rods of contrasting colour wound on and around the vessel as ‘trails.’ The surface then was marvered smooth using a flat surface. Variations included dragging the multi-coloured surface with a pointed object in order to adjust the trails into specific patterns. Any necessary features such as handles, feet and rim were made from thicker glass trails, attached at the appropriate places and then maneuvered to the appropriate shape and position. The vessel then was hardened by annealing, before the core material was broken up and scraped out.

NOLTE (1968) remains the most comprehensive investigation into Egyptian glass vessel forms, decoration and chronology.<sup>418</sup> A large variety of forms developed very shortly after the technology reached Egypt, including kohl pots, goblets, jugs, *krateriskoi*, *amphoriskoi* and flasks. The technique of dragging differentially-coloured glass trails already had been introduced before the end of Thutmose III’s reign,<sup>419</sup> and further experimentation soon resulted in controlled manipulation of the trails to form a variety of different patterns. Marvering was the most popular technique throughout the New Kingdom, the combination of white and yellow trails over a solid dark

blue background being especially popular. Yellow and even white background colours with ‘dark on light’ decoration are known, but are rare<sup>420</sup> before the reign of Tutankhamun. With the exception of some early (reign of Thutmose III) undecorated examples, monochrome vessels also are rare prior to the reign of Tutankhamun, sometimes with the extremities picked out in a differing colour. The most popular forms are flasks (including handleless and pomegranate forms but especially the lentoid type), *amphoriskoi*, *krateriskoi* and palmiform kohl tubes, but a considerable number of ‘fancy forms’ including zoomorphic types also are known. As noted by Fossing, all known vessel types were containers for oils, ointments or cosmetics,<sup>421</sup> undoubtedly due to the material’s impermeability. A number of foreign ceramic shapes were imitated in glass, including the Cypriote ‘bilbil’ – a characteristic also noted for faience.

### On Crete<sup>422</sup>

The subject of Aegean faience has been investigated most thoroughly by FOSTER (1979), and of Aegean glass objects by HOOD (1978).<sup>423</sup> Analysis of the material itself has undertaken by FOSTER and KACZMARCZYK (1982), for ‘Egyptian blue’ by PANAGIOTAKI *et al.* (2004) and, for glass, recently by Julian Henderson.<sup>424</sup>

The earliest faience on Crete is mid-3rd millennium B.C. in date, namely beads found at Mochlos, Trapeza, and several *tholoi* in the Mesara (Kalathi-ana, Koumassa and Platanos).<sup>425</sup> It is debatable whether the technique was introduced onto Crete from elsewhere or was a local re-discovery. The former is more likely, probably from Syria. The beads themselves may even be imported; this too is debatable. Objects were consistently small, solid forms

<sup>416</sup> Solid objects also were made using prefabricated moulds, and by using the rare and complicated ‘mosaic’ technique. The variety of objects other than vessels made in the New Kingdom is legion; some are illustrated in RIEFSTAHL 1968:18–48 #14–47: *passim*; GOLDSTEIN 1979:78–88 #123–164; BROVARIKI *et al.* 1982: *passim*. The ‘mosaic’ technique is illustrated in RIEFSTAHL 1968:pl. III:16; see also BROVARIKI *et al.* 1982:164 #176.

<sup>417</sup> NICHOLSON and HENDERSON 2000:203–204.

<sup>418</sup> Other catalogues (with discussion) include GOLDSTEIN 1979:52–77 #10–122; BROVARIKI *et al.* 1982:163–168 #173–191, 219 #265. See also FOSSING 1940:5–22; HARDEN 1968.

<sup>419</sup> NOLTE 1968:pl. I:6, 9.

<sup>420</sup> E.g., LILYQUIST and BRILL 1993: *passim*.

<sup>421</sup> FOSSING 1940:23. Glass, unlike virtually every other material used in the ancient world, is impermeable to liquids and

oils. Travertine, another favourite material for oils, ointments and cosmetics, could be slightly to somewhat porous depending on the quality of the stone.

<sup>422</sup> See Distribution Map 14.

<sup>423</sup> Both HOOD (1978:136) and Foster provide further references. The subject of Aegean glassmaking also is discussed in the several references listed in n. 377, above.

<sup>424</sup> See NICHOLSON and HENDERSON 2000:220.

<sup>425</sup> On the Mainland, a bead from EH Molyvo Pyrgos is the only piece of faience known prior to the Shaft Graves of LH I, probably imported from Anatolia; see FOSTER 1979:34. Note that the beads from Porti mentioned by her could be as late as MM IB–II in date, as they were found in tholos  $\gamma$ . The Pezoules Kephales beads {443}, possibly not of faience, may be MM IA or later.

until the beginning of the Neo-Palatial period. At that time larger, more complicated forms were achieved, including vessels, multi-coloured figurines, mosaics and plaques. Manufacturing technology initially seems to follow that of Mesopotamia, and then sometime during MM IIIB switches to the different methodology used in Egypt.<sup>426</sup>

A number of 'Egyptian blue' objects, all beads of different shapes, are known on Crete, some of undoubted Aegean forms not found in Egypt. Thus, whilst some of these beads should be of indigenous production, others in this material should be imported.<sup>427</sup> Raw lumps of this material also have been recovered.<sup>428</sup>

Glass objects are known in the Final Palatial and End Palatial periods both on Crete and the islands, and earlier on the Mainland in LH I-IIA tombs at Mycenae, Kakovatos and Thorikos.<sup>429</sup> These include beads and pendants, small plaques, inlay pieces and other ornaments.<sup>430</sup> Vessels are rare, and with one exception are confined to closed shapes, almost all having trailed decoration, from Crete, Rhodes, and closed vessel fragments from Mycenae (possibly a *kra-teriskos*) and Nauplion on the Mainland. The technique of glass-working was introduced to the Aegean, probably from the Near East if stylistic comparisons

are made. This seems limited to casting small objects using moulds, not manufacturing glass itself or core-forming vessels of glass.<sup>431</sup> Julian Henderson's analysis of some "Minoan glasses of *c.* fourteenth century BC" (i.e., roughly LM IIIA1-2), indicates they appear to have both high and low magnesia levels, similar to both his analysed Egyptian and Near Eastern glass.<sup>432</sup> As so far published, this merely illustrates the common use of similar soda-lime constituent ingredients at this time, but does not argue for or against indigenous Minoan glassmaking. The 175 glass ingots, possibly made in Egypt, found in the Uluburun shipwreck indicate the strong possibility of raw material importation into the Aegean at this time (last quarter of the 14<sup>th</sup> century BC, LM IIIA2 in Minoan terms),<sup>433</sup> although clearly Aegean objects made of glass were being produced in the Aegean.

### *Pre-Palatial*

The faience bowl identified by Seager in an EM IIA tomb floor deposit at Mochlos {404}, unfortunately not preserved, is one of only two faience vessels reported at this early date. If the Minoans possessed the knowledge of faience manufacture at this time, it would have been insufficient to have produced so large an object as a bowl, since all others reported are

<sup>426</sup> FOSTER and KACZMARCZYK 1982:149-151. They suggest this may have been due to importation of some raw materials from Egypt for Minoan manufacturing use, and Minoan adoption of some Egyptian methodologies, specifically centered at the MM IIIB period in their study (analysis of material ranging in date from MM IIIA to LM I). Nonetheless, chemical differences can be noted between Minoan and Egyptian faience.

<sup>427</sup> See also {1-2}, {152} and possibly {443} for 'Egyptian blue' objects other than vessels. See also Chapter 9.

<sup>428</sup> A few small lumps of raw 'Egyptian blue' are known from LM IA Poros (KARESTOU *et al.* 2000:106-107 #84.5α) and Knossos, from near the LM IB Royal Road ivory workshop (Knossos AA, KSM RR/58/153; RR/58/438; RR/H/60/5) and from the surrounding town (Knossos II, KSM HH/57/11; HH/58/104). They also may or may not have been imported. See also CADOGAN 1976:18; HOOD 1978:84. Analysis of Theran blue paint showed the inclusion of tin, indicating the use of bronze rather than copper before the end of LM IA, whereas the earliest attestation of this feature in Egypt is somewhat later, in the reign of Thutmose III. The significance of this is unclear; see LEE and QUIRKE 2000:109, 110-111. The blue pigment used in fresco painting also undoubtedly was 'Egyptian blue,' and it may also have been employed as an agent for staining ivory.

<sup>429</sup> BARAG 1970:187-193; WEBB 1987:*passim*. These objects probably are imports from Mesopotamia or its sphere of influence, but might be local versions of the types.

<sup>430</sup> Moulds for these objects have been recovered at Knossos and Palaikastro on Crete, as well as on Chios and at Mycenae; see GROSE 1989:57.

<sup>431</sup> CADOGAN 1976:18-19 notes "glass waste" in the LM IB Knossos Royal Road (North) workshop (Knossos AA.1), and suggests this is "the first evidence for Aegean glass making," although 'glass working' is more probable. Additionally, PLATON 1971:218 states that pieces of melted glass were found in the workshop area in the south wing of the LM IB palace (Kato Zakro A), but has doubts on its identification as it "could have resulted from the fire that enveloped the area;" perhaps it was faience that had been subjected to higher temperatures from the fire. Only in the latter part of LM IB is glass-working introduced to Egypt on a large scale during the reign of Thutmose III, thus it is most likely that glass casting was introduced to the Aegean (both Crete and the Mainland) from the Near East rather than from Egypt.

<sup>432</sup> NICHOLSON and HENDERSON 2000:220, fig. 8.13. The results of the analyses themselves are not yet published. Earlier analyses by Robert Brill indicate the composition of Mycenaean glass is identical to that of Egyptian New Kingdom blue glass (BASS 1986:282 n. 55; see also GROSE 1986:282), whilst recent investigations by NICHOLSON, JACKSON and TROTT (1997) and REHREN and PUSCH (1997) both point to the strong probability of an Egyptian origin for the ingots.

<sup>433</sup> PULAK 1998:202-203. Note the preferred spelling of the site name.

small and solid. Only one other faience vessel is known from a Pre-Palatial context, the probably Egyptian ‘cylinder jar’ **{396}** in the burial cave at Maronia, and the only Proto-Palatial example, the Minoan vase with gold foot and top from the Knossos palace dated to MM IIB, is a miniature but 7.2 cm. tall.<sup>434</sup> Other EM context faience objects are limited to beads. MM faience products also are quite small, again chiefly beads and inlay pieces,<sup>435</sup> suggesting the Minoans did not yet work faience in large scale or make open shapes even in the Proto-Palatial period. The Mochlos bowl certainly must have been imported. As its shape is unrecorded, its possible origin elsewhere and any possible Minoan derivations in alternate media cannot be suggested. One would wonder, in fact, if Seager had been mistaken in his identification either of the material or the artefact, had it not been for the Maronia vessel.

No ‘Egyptian blue’ vessels are reported, and glass is not yet produced in the ancient world.

#### *Proto-Palatial*

No imported faience or ‘Egyptian blue’ vessels are reported; see discussion above. Glass is not yet produced in the ancient world.

#### *Neo-Palatial*

Imported faience and ‘Egyptian blue’ vessels are limited to Knossos in this period, indicative perhaps of the limited accessibility of this product on the island.<sup>436</sup> Numerous fragments of at least three and possibly more bowls **{268}** were recovered in a tomb at Mavro Spelio. They probably but not certainly were interred during Neo-Palatial, although the tomb ceramics range between LM IA (mature) and LM IIIC.<sup>437</sup> Egyptian parallels apparently date some of the imported vessels perhaps as early as the SIP.

Greater precision for many pieces is difficult due to their extremely worn and fragile condition and small scale. Those that can be dated appear to be no later than early Dynasty XVIII and thus probably were made (and perhaps interred) not later than LM IB and the reign of Thutmose III, but this cannot be demonstrated conclusively. They are included in this section for that reason.

Some fragments might be Minoan versions of Egyptian types, most notably the rim fragment of a carinated bowl **{268 (A)}** with earlier shape parallels of Minoan manufacture both in stone and clay.<sup>438</sup> However, this particular fragment is far more likely to have been an Egyptian import, as both the shape and running spiral motif are known in Egyptian faience bowls of similar date.<sup>439</sup> Other recognisable fragments found with it in the tomb undoubtedly are imports, although the smaller fragments are, of course, debatable. If any are Minoan (and a definitive answer may be possible only by material examination), they are the only Minoan faience vessels known in this period.

Numerous fragments of imported faience vessels were recovered in the LM IB workshop and/or shrine deposit in the Royal Road excavations at Knossos **{182–192}**, including an open bowl, several potstands, a large vessel rim and small closed containers. Several have the rilled decoration characteristic of Kerma vessels dating to the Second Intermediate Period (in Egyptian terms) and a limited repertoire of Egyptian closed vessels dated to Dynasty XVIII. Also found here were fragments of a large closed vessel of ‘Egyptian blue’ **{193}**, and a small collection of further faience fragments probably of Minoan origin. The large rim **{186}** suggestively may be of a rhyton.

All faience vessels with Egyptian characteristics almost certainly are imported.<sup>440</sup> The use of separate potstands of such small dimensions and stature in

<sup>434</sup> EVANS *PM* I:252, fig. 198a; HOOD 1978:132; FOSTER 1979:61–62, pl. 1, fig. 1.

<sup>435</sup> EM material otherwise is limited to beads and possibly a few seals, see FOSTER 1979:34, 117. Some inlays and an arm fragment are known from MM IB Knossos. Other than these objects, a few seals and ‘sheep-bells,’ Proto-Palatial faience objects also are limited to beads until MM IIB, the date assigned to the famous ‘Town Mosaic.’ See also HOOD 1978:132.

<sup>436</sup> The supposed rhyton rim fragment from Kythera **{583}** should not be considered an Egyptian product.

<sup>437</sup> They might have been interred during Final Palatial or, less likely, End Palatial times.

<sup>438</sup> **{172; 164}**. See Chapter 4, Appendix A.5.

<sup>439</sup> E.g., PETRIE 1906b:pl. 146:9–10, 12–14; PETRIE and BRUN-

TON 1924b:pl. LXIII:Group 1723:J; STRAUSS 1974:50 fig. 52. Nonetheless, the carinated profile is uncommon, and those with a tapered rim profile equally so. Running spirals also are found on Egyptian derivations of Aegean vessels (BROVARSKI *et al.* 1982:154–155 #161, 157 #168) and other decorative elements.

<sup>440</sup> PENDLEBURY 1930b:9 #10a also describes an unpublished faience fragment with “glaze gone” found at Aghia Triadha as from a kohl pot. He provided no context or date if, indeed, any could be ascertained. It is not included in the present catalogue as it could not be located or identified but, if Egyptian, it would be the only example of a kohl pot on Crete. It is noted only as a handwritten addition to Pendlebury’s personal copy, now in the Villa Ariadne library, Knossos.



particular is not a Minoan characteristic,<sup>441</sup> and there are numerous Egyptian parallels for the Knossos finds in faience and in 'Egyptian blue.' Nor is there any evidence for Minoan use, derivation or adaptation to local types of 'pond-bowl' decoration, including the central 'pool' and floral outgrowth {268 (C)}, rilling {183–185}, nor even the enclosed dash-filled triangle decoration indicating lotus petals {190–191} on Crete, although all these features are common in Egypt at the time.

#### *Final Palatial*

No faience vessels were recovered in Final Palatial contexts<sup>442</sup> and only one of 'Egyptian blue,' a pot-stand fragment from Knossos {238} found in LM II housing traces north of Hogarth's LM I houses. Unlike the faience pieces discussed above, it has the moulded (not painted) decoration more typical of 'Egyptian blue.' Like the others, however, it inspired no imitations and provides no insights into chronological considerations.

Whilst sometimes considered of local manufacture,<sup>443</sup> glass vessels must be imported, if only due to their very paucity on the island; it is highly unlikely these are the only survivors of a greater quantity and repertoire of indigenous products. They are the only glass vessels of this period reported from the island, although others have been found from elsewhere in the Aegean in 'LH III' contexts that *may* have been

contemporary.<sup>444</sup> Despite Hood,<sup>445</sup> glass vessels probably were not manufactured in the Aegean during the Bronze Age,<sup>446</sup> although small glass objects definitely were. All other glass objects are small and comfortably solid, some complicated in design, but all were made using a mould.<sup>447</sup> There seems to be no evidence for Minoan – and indeed Aegean – 'core-formed' objects of any kind.

The glass vessel recovered on the LM IIIA1 floor at Kommos House X {334}, possibly part of a shrine, is the only certain LM IIIA1 glass find on Crete.<sup>448</sup> The two Kalyvia vessels, a flask {89} and *krateriskos* {92}, are dated to LM IIIA only, so may be considered most likely Final Palatial in deposition; the cemetery at least exhibits continuity, so should be discussed together with the Final Palatial material.

The lentoid flask is a universal form at this time, found in Egypt, Syro-Palestine and Cyprus. As Harden notes, the flask types normal outside Egypt are rare in Egypt itself (and *vice versa*),<sup>449</sup> and it is likely that vessels found in the Near East and Cyprus were locally produced. As both Cretan flasks are unusual and without direct parallel in Egypt, Syro-Palestine or Cyprus, or in fact paralleled by Minoan ceramic flasks, their ultimate origin cannot clearly be argued.

On Crete, lentoid ceramic footed flasks are known at this time, and are dated almost exclusive-

<sup>441</sup> Minoan stands are entirely different, normally tall tubular clay vessels of cultic use. See BETANCOURT 1985:pl. 32:A–B; GESELL 1985:fig. 134–135, 140–149 for some examples.

<sup>442</sup> Unless bowl fragments {268} were interred in this period.

<sup>443</sup> E.g., GOLDSTEIN 1979:36.

<sup>444</sup> Imported vessels from elsewhere in Greece include a jug and *amphoriskos* from LH III Tomb 35 at Ialysos (Rhodes), and several vessel fragments, some apparently *krateriskoi*, from Mycenae Chamber Tomb 11, another unpublished tomb and without context, from Tomb 5 at Megalo Kastelli (Kadmeion Thebes), and another *krateriskos* at Nauplion, from LH III contexts. All but one are core-formed with dragged trail decoration. Although possibly not all Egyptian, none are indigenous products. See MARINATOS 1927–1928b:68–70, 81–83; FOSSING 1940:24–25; HARDEN 1968:49 n. 16; 1981:165 n. 8; CLINE 1994:246–247 #1026–1027; PHILIPPAKI, SYMEONOGLOU and FARAKLAS 1967:pl. 160:α; XENAKI-SAKELLARIOU 1985:73 #Γ 2387 (8), pl. 11:2387(8); also 214–215 #Γ 2984, pl. 99:2984, the last apparently mono-coloured and possibly not a vessel. Four fragments of a mono-coloured blue glass handle also were recovered at Gla in an unclear context in front of the entrance to the 'Melathron'; see IAKOVIDES 1989:108, 255, 318, pl. 39.α.

<sup>445</sup> HOOD 1978:136.

<sup>446</sup> The sole possible exception is a 'cast' and polished, mono-

coloured and scalloped glass bowl from an LH I–IIA tholos at Kakovatos on the Mainland (NMA 5671), often thought to be of local manufacture but which may be Near Eastern; see FOSSING 1940:25–26, fig. 15; HOOD 1978:136; GROSE 1998:56. This would be contemporary with LM IA–B on Crete, and earlier than, or just overlapping, the introduction of glassworking in Egypt. Its profile is quite thick, with a deep small hole on the rim edge for an attachment, and it either was cast in a mould or possibly ground to shape. Its context date alone suggests it is either contemporary with, or earlier than, the earliest Egyptian glass objects and perhaps is the earliest glass vessel in the Aegean. It certainly is not Egyptian.

<sup>447</sup> Faience/glass moulds have been recovered from various locations, including Mycenae and End Palatial Knossos; see HOOD 1978:136.

<sup>448</sup> The "frammento di pasta vitrea azzurra appartenente a un vaso, cui si era data probabilmente la forma di conchiglia" reported by PARABENI (1904:745 #8) in the 'Tombe degli Ori' (Aghia Triadha B) apparently is of faience rather than glass, according to LA ROSA 2000:89. Its dating is uncertain, but it likely is LM I as are the other two faience vases in shell form, e.g., KARETSOU *et al.*:97 #69–70 from Myrtilos Pyrgos and Kato Zakro.

<sup>449</sup> HARDEN 1968:49 n. 16.

ly to LM IIIA1 although the earliest is dated to LM II; these, however, are globular.<sup>450</sup> The glass flask from Kalyvia {89} thus is generally contemporary in context date with the local Cretan clay globular footed flasks. Footed lentoid flasks, loosely similar to the glass vessel, are known earlier on Crete.<sup>451</sup> The handles of all indigenous clay and stone Minoan flasks loop from neck to shoulder, conforming in position to those on flasks found in Egypt, Cyprus and the Near East, in clay, stone, glass and faience. In this respect, the Kalyvia flask {89} must be seen as an anomaly both on Crete and elsewhere if the restoration is correct.<sup>452</sup> While its origin thus cannot be ascertained, however, it is unlikely to have been made on the island. Its presence on the island, and that of the Kommos fragments (probably of a globular short-footed jar/jug/bilbil form) {334}, merely have introduced another vessel material to Crete, but one which was not exploited there.

The three-handled *krateriskos* from Kalyvia {92}, unique on Crete but like those from Rhodes and Thebes, is much more likely to be Egyptian, although certainty is impossible. Numerous complete vessels have been recovered on Cyprus, and may have been made there. The form is found, but was not produced, elsewhere in the Aegean.<sup>453</sup>

#### *End Palatial*

The enigmatic ‘bottle’ {264} from an LM IIIA2 grave at Zapher Papoura is one of only two glass vessels reported, although it is no longer preserved and its form not ascertainable. The other, the amphoriskoid

lentoid flask from Karteros {101}, is from a LM IIIA2/B transitional–IIIB tomb context, and so must be placed within the End Palatial period.<sup>454</sup>

The flask apparently is a unique vessel; no direct parallel can be cited. Thus it and the Zapher Papoura ‘bottle’ can serve only to illustrate that glass vessels still were available (at least in the Knossos region) at this late date. The form of the unpreserved ‘bottle’ from Zapher Papoura {264} may not have been a flask and, if so, would provide a fifth glass vessel, and glass vessel form, to be found on Crete.

#### *Post-Palatial*

No examples can be cited.

#### **Commentary**

As far as can be determined, Egyptian faience, ‘Egyptian blue’ and glass vessels inspired no derivative forms on Crete or indeed the Aegean.<sup>455</sup> Faience vessels are well known on Crete but none betray evidence of an Egyptian origin for their presentation. ‘Egyptian blue’ was not used as a material for the manufacture of vessels on the island, although it was employed as a colouring agent for paint; the few objects known should all be imported. It may be also that the ‘lumps’ found at Knossos and elsewhere also were imported, presumably for use as a paint colourant. Although objects of glass were made on the island, there is no evidence for Minoan glass vessel production.

The presence of these imported vessels does little to aid in a more precise intercultural chronology.

<sup>450</sup> TZEDAKIS 1971. The clay form seems to have been an indigenous development, but perhaps was partly influenced by the glass vessel form. Some appear to be of early LM IIIA2 date. The footed alabaster globular flask from LM IB Kato Zakro (PLATON 1971:141:fig.) may be an extremely early prototype of the globular form in stone, but note its short neck and oval mouth, the latter indicating its origin in clay.

<sup>451</sup> E.g., from LM IA Gournia (HAWES *et al.* 1908:pl. VII:36) and the famous LM IB ‘oetypus flask’ from Palaikastro (BETANCOURT 1985:pl. 20:G). These too have a short neck and oval mouth.

<sup>452</sup> The handle position of the fragmentary Kommos vessel {334}, if any, is unknown as none was preserved.

<sup>453</sup> In glass and in stone, but see discussion in n. 444, above. See also *krateriskos* {255}.

<sup>454</sup> Additionally, a pale blue opaque chip of glass was found in an LM IIIB level of the Poros settlement on Crete; it was identified as “from the Levantine glazing area as distinct from Egypt” (KANTA 1980:328 #3), and so is not included

in the present catalogue. It does, however, emphasise the probability of multiple different origins for the other glass vessels found on Crete.

Glass vessels of similar date from elsewhere in Greece are a lentoid flask from LH IIIB Kadmeion Thebes (LAMBROU-PHILLIPSON 1990:297 #311, pl. 77:311, similar shape to {89}, if this not cited by her in error for the *krateriskos* mentioned in n. 444, above, as she does not include the *krateriskos* in her catalogue), and a fragment of a large unidentified vessel in very early LH IIIC Tomb 34 at Perati (NMA 8214; IAKOVIDES 1969:I:324 #Δ88, II:381, pl. 99.β; BROWN 1975:62 #13). Other vessels and fragments provided only with an ‘LH III’ dating as listed in n. 444 above, also may be of this period.

<sup>455</sup> Faience and ‘Egyptian blue’ objects other than vessels are discussed where relevant (Chapters 7–9 and 15). No glass objects other than vessels are included in the present catalogue.

The only possible objects to have done so are those of glass, which clearly do not predate the reign of Thutmose III and do not appear on Crete prior to LM IIIA1, interestingly and perhaps indicatively enough at a port site in a wealthy house beside the port itself (and in a wealthy tomb not too far inland of it). LM IIIA1 is earlier than the earliest large scale Egyptian glass production, still a royal monopoly, at Malkata. The Kommos vessel, at least, must have been acquired from a very high-placed source indeed.

It is interesting, in this respect, that indigenous cast *objects* of glass (including, perhaps, the Kakovatos bowl) may have appeared in the Aegean in contexts earlier than their apparently deliberate indigenous production in Egypt during the reign of Thutmose III, suggesting knowledge of the glass-casting technique using preformed moulds was acquired from the Near East rather than Egypt. It was only a small step from the lengthy Aegean tradition of casting metals. The core-forming technique never seems to have been practiced in the Aegean.