

CROSS-CULTURAL BEAD ENCOUNTERS AT THE RED SEA PORT SITE OF BERENIKE, EGYPT. PRELIMINARY ASSESSMENT (SEASONS 2009–2012)

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Abstract: A macroscopic analysis of the bead and pendant assemblage from Berenike (excavated in seasons 2009–2012) provides not only a preliminary bead typology and chronology, but contributes to the study of the multicultural character of the Red Sea port of Berenike from the Ptolemaic through the early Byzantine period. The presence of diverse marine and terrestrial organics, semi-precious stones and manmade materials used in crafting beads indicates a substantial supply from coastal and inland desert dwellers, as well as from overland and overseas traders. Part of the products found at Berenike must have been designated for permanent and temporary residents of the town. Other objects originated from, or were destined for African, Arabian or Asian markets.

Keywords: beads, pendants, Ptolemaic, early/late Roman, Berenike, glass, multiculturalism

As a port where people of many ethnicities, religions and cultures met and lived in close proximity, Berenike is an excellent example of a cosmopolitan harbor. In his characteristic of the urban population of the port, the excavator Steven E. Sidebotham wrote: “Those who dwelt in Berenike, either briefly or as more or less permanent settlers, came from throughout the ancient world, including Egypt, the Mediterranean, Axum, sub-Saharan Africa, and the kingdoms of southern Arabia, Nabataea, and Palmyra. Indian sailors

or merchants, and likely their Sinhalese contemporaries, visited Berenike and either stayed for a few months, arriving in early summer and catching the monsoon back to India in August, or resided there on a more permanent basis” (Sidebotham 2011: 69). Multicultural contacts would involve both elites and non-elites, e.g. crews of merchant ships, teams passing through the desert,¹ craftsmen, and nearby dwellers providing supplies and services to residents of this cosmopolitan port, which lay at the edge of the desert.

¹ For evidence of relatively small groups of travelers and animals moving back and forth throughout the year, and for the operations of the Nikanor family business of medium-scale private transport, see Adams 2007: 221–234.

The cosmopolitan nature of this port site is attested by the archaeological remains of personal adornment, namely, beads and pendants which were made, owned, traded, and lost here.

About 2000 beads and pendants were excavated during the field seasons in Berenike in 2009–2012.² They came from contexts attributed to the early and late phases of the occupation of the site.

The **early phase** covers the Ptolemaic and early to mid-Roman periods in Egypt, from the 3rd century BC to the 3rd century AD, and it is contemporary to the Meroitic period in Nubia. Trench BE11-77 at Berenike was a Ptolemaic/early Roman rubbish dump with plenty of beads, and seems to have contained successive loads of waste from a workspace producing, among other things, personal adornments (Zych and Sidebotham 2011). Beads were found in the disturbed late Roman fill of the “Square Feature” (BE10/11-70), in an area outside the northwestern corner of the 5th century AD “Lotus Temple” (BE12-87) and behind its back wall (BE12-81) (for recent archaeological reports on these features, see Rądkowska, Sidebotham and Zych 2013; Zych et al. 2014; Sidebotham et al. 2015, in this volume). The rest of the material was recorded from a number of other Ptolemaic and early Roman trenches, both in the harbor bay (BE09/10-54, BE10-63–65, BE10-67, BE10-69, BE11-

71, BE11-78) and in the rubbish dump (BE09-56, BE09-57, BE10-58, BE10-60, BE11-74, BE11-76).

The **late-phase** occupation covers the late Roman and early Byzantine periods in Egypt and the post-Meroitic period in Nubia (4th–beginning of 6th century AD). Most of the beads and pendants, and materials used in their production came from a rubbish dump (BE10-59) located in a late Roman commercial-residential area and contained Sasanian glass as well as pottery of Egyptian, Roman, Mesopotamian, Aksumite, and Eastern Desert Blemmyan origin (Zych and Sidebotham 2010). Many beads were picked up from the “Lotus Temple” (BE10/12-61).

The variety of materials found is very meaningful. Small, perforated beads and pendants were made of organics of both marine (e.g., seashell, coral) and terrestrial origin (e.g., ostrich eggshell), stones (e.g., quartz, chalcedony, carnelian), and man-made materials (clay, glazed composition/faience, glass), and varied in percentage by place of excavation or date.

An overview of the raw materials used in their manufacture, and the techniques used to make them, should allow for a broader view discussing their provenance and circulation. It is a glimpse of the tastes of the Berenike market, both of the customers and their providers.

OVERVIEW OF RAW MATERIALS

MARINE MOLLUSK SHELL

Some simply perforated Red Sea *Engina mendicaria* shells were recorded from

Ptolemaic and early Roman Berenike contexts [*Fig. 1:2*]. Such shells, with punched and pierced or parasite holes,

² For details concerning the contexts and their dating and for a more comprehensive bead material study, see Zych 2011 (season 2009) and Then-Obłuska forthcoming a (seasons 2010–2011).

were recorded from Mons Porphyrites (Hamilton-Dyer 2007: 348–349, Fig. 14.8, Cat. 50, 54, 55) and Mons Claudianus (Hamilton-Dyer 2001: 363, Cat. 98).

Perforated short, truncated barrels³ (BE11-77/002/009) and short cones cut from *Conus* sp. **shell apices** [Fig. 1:1] are the most characteristic feature in early Roman Berenike.⁴ Since *Conus* sp. with their apices removed have not been noted from early Roman Berenike contexts to date, it might be that worked apices were brought in from elsewhere. Interestingly, short truncated cones or barrels of seashell are very rare finds in the Nile Valley (The Museum of Archaeology University of Stavanger, SJE 25/70:3, personal observation; Petrie, Brunton, and Murray 1923: Pl. lxi:24). Some examples were found at Adulis (Zazzaro 2013: 96, Fig. 17.3 on the right), at Marsa Nakari (MN01-099#112/0011, personal observation), and at early Roman Quseir, port trench 14 (Hamilton-Dyer 2011a: 166, Cat. 231, 1st–2nd century AD⁵). They were noticed at late Iron Age Nush-i Jan in Iran (Curtis 1984: Fig. 19:482–483). However, they are very common finds at sites along the South Arabian peninsula in Yemen and Oman (Beck 1944: Pl. XLI Hadramaut; Corboud et al. 1996: Pl. 28 Bithnah; Morrison 1991: 384 Shabwa; Lischi and Pavan 2012: Figs 1–2 Khor Rori; Potts 1991: 121, Figs 213–214 Tell Abraq; De Waele 2007: 304 Ed-Dur; Yule 2001: Fig. 5.8.1 Samad al Shan; Mouton 2008: Fig. 100:13 Mleiha).

Objects made of seashells representing a broad variety of Gastropoda came from contexts attributed to the **late Roman** phase in Berenike. They were perforated by cutting off or grinding the spire, or by punching or drilling through a body whorl. Some of them were preserved threaded on either string (also of palm fiber) or knotted leather thong fragments.

Red Sea/Arabian Sea mollusk shells

Most of the shells found are identified as Red Sea species (Rusmore-Villaume 2008). *Engina mendicaria* have either the whorl body perforated or the spire removed [Fig. 1:5]. Gastropoda with the **apex removed** are represented by: *Conus taeniatus* [Fig. 1:13], *Conus* sp. [Fig. 1:7], and *Pyrene flava* [Fig. 1:9]. Small *Marginella* [Fig. 1:6] and *Ancilla* sp. [Fig. 1:3]⁶ shells are most commonly worked into beads. Much larger are the single specimens of *Conomurex fasciatus* [Fig. 1:11], and *Oliva* [Fig. 1:10]. *Oliva* sp. examples have been found at the port of Adulis (Zazzaro 2013: 96, Fig. 17.2 middle row).

Seashells with **perforated body whorls** represent the following Red Sea species: *Planaxis savignyi* [Fig. 1:8] and *Nerita sanguinolenta* [Fig. 1:4]. A large shell from the *Cypraeidae* family has two perforations on one side [Fig. 1:12].

A cowry of the *Erosaria* (*Cyprea*) sp. [Fig. 1:14] has the **lateral back removed**. Similar objects were found at Bir Umm Fawakhir (Meyer 2014: 20, Pl. 18a) and at Adulis (Zazzaro 2013: 96, Fig. 17.2 lower row).

³ Bead shapes follow a classification published by H. Beck (1928).

⁴ For worked seashell beads from a previous Berenike season, see Francis 2000: 211.

⁵ Whittaker 2006: 84–87 for the dating of trench 14.

⁶ These little seashells were found threaded on leather thong fragments at Quseir (RN 180), Chicago, Oriental Institute Museum, personal observation.

List of beads illustrated in *Fig. 1*, giving context, material and dimensions in mm
Abbreviations: W – width, L – length, T – thickness, D – diameter, HD – hole diameter

Red Sea/Arabian Sea shells and nacre

1. *BE12-84/007/PB047* *Conus* sp.
W16, HD2
2. *BE10-69/001/PB001* *Engina mendicaria*
W9.6, T8.4, L16.4, HD1.7–2.4
3. *BE10-59/004/PB032* *Ancilla* sp.
W4.2, T3.7, L7.5, HD1.5
4. *BE10-59/001/PB014* *Nerita sanguinolenta*
W12.2, T8.8, L14.9, HD1.8
5. *BE10-59/001/PB002* *Engina mendicaria*
W8.8, T7.7, L11.5, HD3.3
6. *BE10-59/004/PB032* *Marginella* sp.
W6, T5, L10, HD0.8–2.5
7. *BE10-59/999/PB012* *Conus* sp.
W5.7, T5.5, L7.1, HD1.4
8. *BE10-59/004/PB032* *Planaxis savignyi*
W5.9, T5, L9, HD2.5
9. *BE10-59/004A/PB035* *Pyrene flava*
W7.7, T7, L12, HD3.4
10. *BE10-59/001/PB006* *Oliva* sp.
W10.2, T8, L19.5, HD1.6
11. *BE10-59/002B/PB022* *Conomurex*
fasciatus
W20.9, T18.5, L36.5, HD7.8
12. *BE10-59/001/PB006* *Cypraeidae*
W26.2, T21.5, L45, HD6.7–11.2
13. *BE10-59/004/PB032* *Conus taeniatus*
W6.4, T5.7, L9.7, HD1.7
14. *BE10-59/001/PB001* *Cyprea annulus*
W12.4, T7.5, L17.2, HD5.4–7.9
15. *BE10-59/001/PB002* *Pteria macroptera*
nacre
W13.5, T1.2, L22.1

Red Sea/Gulf pearl

16. *BE10-59/004/PB032* Pearl
D1.9, L1.8, HD0.5

Mediterranean Sea shell

17. *BE10-59/001/PB002* *Nassarius*
gibbosulus
W7.7, T6.1, L12, HD2.8–3.7

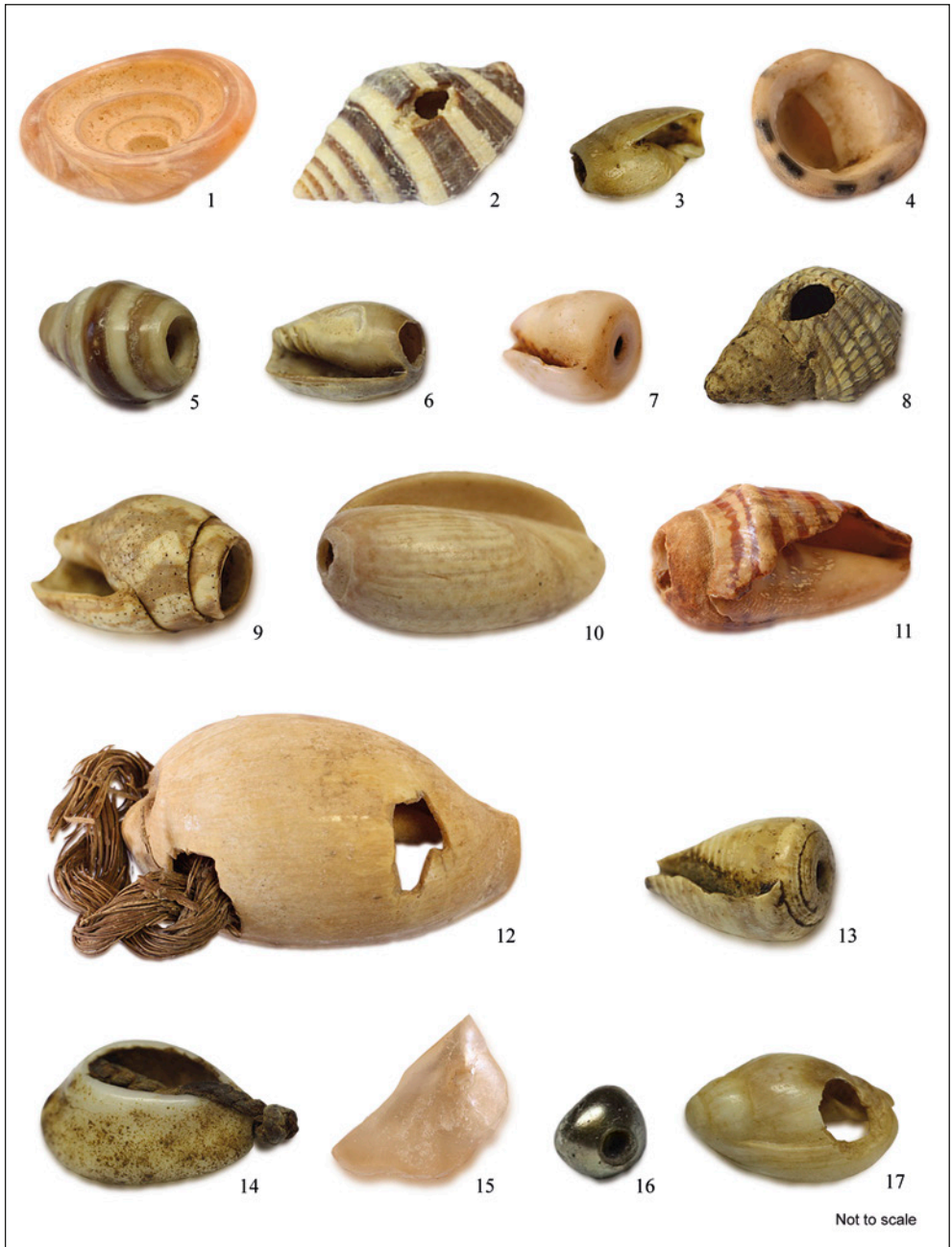


Fig. 1. Beads: 1–15 – Red Sea/Arabian Sea shells and nacre; 16 – Red Sea/Gulf pearl; 17 – Mediterranean Sea shell (Photos J. Then-Obluska)

Mediterranean Sea mollusk shells

Nassarius gibbosulus [Fig. 1:17] is the only definite shell species of Mediterranean Sea provenience, although some of these species may well occur in other sea basins as well. Considering their presence in 4th century AD Nile Valley Blemmyan graves (Then-Obluska forthcoming b), their appearance in contemporary Berenike contexts is hardly a surprise.

NACRE

Nacre, also known as mother-of-pearl, is an organic–inorganic composite material produced by some mollusks as an inner shell layer; *Pteria macroptera* is the Red Sea species used most probably for pendant-making at Berenike.⁷ Two partly perforated fragments were preserved at the late Roman Berenike site [Fig. 1:15].

PEARL

One tiny pearl was recorded from a late Roman context at the site [Fig. 1:16]. The costliness of pearls is brought home by the famous dinner given by Cleopatra, during which, to impress Marc Antony, the queen dissolved a pearl in vinegar and then drank it. Pliny reported that pearls were among the most valued gemstones in both India and Arabia (Pliny, *NH* 9.54). In the Roman period, pearls are believed to have come from the Persian Gulf (Dubin 2009: 55). This statement is supported by a Talmudic reference to the “bringing up” of pearls at the Persian port of Mashmahij, usually identified with one of the Bahrain islands (Simpson 2003: 67). They were said to be destined for the North Indian market. *Periplus*

Maris Erythraei (36) spoke of pearls being exported from Oman and Kane in Arabia to Barygaza in India.

According to Giorgius Cedrenus, a Greek monk and annalist, India was a source of pearls in the 4th century AD (Simpson 2003: 67). Although the Persian Gulf, or the Gulf of Mannar between India and Sri Lanka, seems to be the most probable source of the Berenike pearls (Francis 2000: 223), the Red Sea is also a known source and the tiny seed pearl found at the late Roman Berenike could reflect local activity. Three species were gathered for pearls and mother-of-pearl: *Pinctada radiata*, *Pteria macroptera* and *Pinctada margaritifera* (Carter 2005: 140). Nacre of the latter was also recorded from Berenike (compare Fig. 1:15).

CORALS

Two unusual solitary coral items made of *Heteropsammia cochlea* (Spengler) might have been used for pendants in early Roman Berenike [Fig. 2:1]. The spiral grooves are made by the sipunculid worm that lives within the shell, and probably helps move the coral around on the sea floor (M. Richmond, personal communication). Its natural perforation allows the commensal sipunculid worm to move in and out of the calyx. They are quite common on sandy or sea-grass reef beds, at 7–10 m depth and in clear water. Their distribution includes the West Indian Ocean, Red Sea, and West Pacific Ocean (Richmond 2011: 162). *Heteropsammia* corals are illustrated among early Roman organics from Quseir (Hamilton-Dyer 2011a: 162, Fig. 13.5 No. 140).

⁷ For mother-of-pearl inlay pieces and a pendant found in Late Sasanian Qasr-i Abu Nasr, or Old Shiraz fortress, see Whitcomb 1985: 209, Pls 53, 54, Fig. 70.f.

Beads made of *Corallium* were recorded from **late Roman and early Byzantine** contexts [Fig. 2:2, 3]. They were found at contemporary inland sites along the Egyptian (Boston, Museum of Fine Arts, Inv. 04.1960; 04.1963 from Akhmim) and Nubian Nile Valley (Emery and Kirwan 1938: Pls 43–44 from royal Qustul and Ballaña), and in the Western Desert at Kharga Oasis (New York, Metropolitan Museum of Art, accession numbers 31.8.32, 4th century; 25.10.20.95, 25.10.20.96; 31.8.4; 31.8.6; 31.8.7, 4th–7th century). They were also recognized in one of the hoards of necklaces from Yemeni Qane (AD 100–300) (Pickworth 2010: 293–297, Pl. 116).

Coral beads were one of the main Mediterranean products (*Corallium rubrum* sp.) imported into Roman and Coptic Egypt and, according to the *Periplus Maris Erythraei* (28), coral was exported through Roman Egypt to Kane (in Arabia), and also to India (Barygaza, Muziris, and Nelkynda) (Francis 2002a: 156). They were also known at the Chinese court from that same time period.

Documentary sources reveal the use of coral in amulets and as a fertility symbol in ancient Rome. It was also worn as a talisman around the neck, particularly by children (Ward 2008: 145). Coral seems to have attributions of special powers in preventing hazards at sea (Evans 1922: 24).⁸ According to Pliny and to bishop of Seville St. Isidore, quoting the Roman writer, “magicians stated that coral resists thunderbolts, if it is to be believed.”⁹

⁸ According to the Greek *Nautical Lapidary* ascribed to Astrampsychus, coral wrapped around the masthead of a ship with the skin of a seal counteracted wind and waves, and all sea disturbances.

⁹ Chalcedony worn by a child would also prevent their being shipwrecked in the deep, and a crystal was supposed to protect against large waves and storms (Evans 1922: 31).

FOSSILIZED CORAL

A few fossilized coral beads are quite large, of irregular flattened cylinder shape and grayish color. Their perforations may have been made by parasites. The beads measure 5.9–10.1 mm in thickness and 5.8–6.6 mm in length. At Berenike, they were found in both **early and late Roman** contexts [Fig. 2:11].

FISH TOOTH

Many fish teeth were found in **late Roman** contexts. Three perforated objects possibly derive from the Red Sea wrasse or seabream fish [Fig. 2:4]. Teeth of the latter are the most abundant remains at Berenike and Quseir (Hamilton-Dyer 2011b: 264). Fish tooth beads are almost absent from Nile Valley sites and seem to be limited to Berenike and the coast.

TURTLE SHELL

Turtle shell is mentioned many times in the *Periplus Maris Erythraei*, both as an exported and imported product in many Red Sea and Indian ports. Turtle shell was associated in textual sources with the activity of the Red Sea coastal group, the Ichthyophagoi (*Peripl. M. Eryth. 4*), who brought it to Adulis, a principal market for the Troglodytes (Pliny, *NH* 6.34). The 1st century AD *Periplus* (30) mentioned the Romans using the shells of several varieties of turtle for different functions. Above all, turtle shell was used to decorate large objects, veneering beds, sideboards, dining couches, and doors. It has been noted that turtle shell “of which the parts over the belly, whichever are useful, do

List of beads illustrated in *Fig. 2*, giving context, material and dimensions in mm
Abbreviations: W – width, L – length, T – thickness, D – diameter, HD – hole diameter

Red Sea and Mediterranean Sea**organics**

1. *BE12-84/004/PB012 Heteropsammia*
coral
W11.6, T4.6, H14.9, HD2.0
2. *BE10-59/001/PB007 Corallium* coral
D3.8, L3.7, HD0.9
3. *BE12-61/059/PB038 Corallium* coral
D4.3, L7.3, HD1.1
4. *BE10-59-004/030* fish tooth
D3.8, T2.9, HD1.2
5. *BE10-59/001/PB002* turtle shell
W7.7, T5.7, L20
6. *BE11-76/004/PB013* turtle shell
W8, T6.8, L13.9, HD3.2–3.5

East African organics

7. *BE11-74/004/PB006* ostrich eggshell
D7.3, L1.8, HD2.1
8. *BE10-59/004/PB030* ivory
D9.1, L10.7, HD1.6; 2.2

**Eastern Desert(?) stones:
perforated from one end**

9. *BE11-77/999/PB014* agate
D5.9, L2.9, HD0.8; 1.4
10. *BE11-70/030/PB037* agate
D5, L6.9, HD1.2
11. *BE10-59/001/PB002* fossilized coral
D7.9–10, L5.8, HD1.9; 1.5
12. *BE10-59/001/PB002* gypsum selenite
W24.8x40, T2.3, HD2.5
13. *BE10-59/001/PB002* steatite
W18, T5.9, H9.6, HD1.8
14. *BE10-59/001/PB002* carnelian
W7.2, T6.7, L10, HD1.3; 2.7
15. *BE11-77/001/PB002* amethyst
D4.6, L3.6, HD0.9; 1.2
16. *BE11-71/014/PB026* chalcedony
D3.1, L3.7, HD0.6

Zabargad Island stone

17. *BE11-77/001/PB004* peridot
W7.6, T5, H11.2

**Eastern Desert/Indian(?) stones:
perforated from both ends**

18. *BE10-63/65/001/PB001* rock crystal
D7.8, L7.7, HD1; 1.3
19. *BE10-64/002/PB002* garnet
D5.2x4.2, L5.7, HD1.4

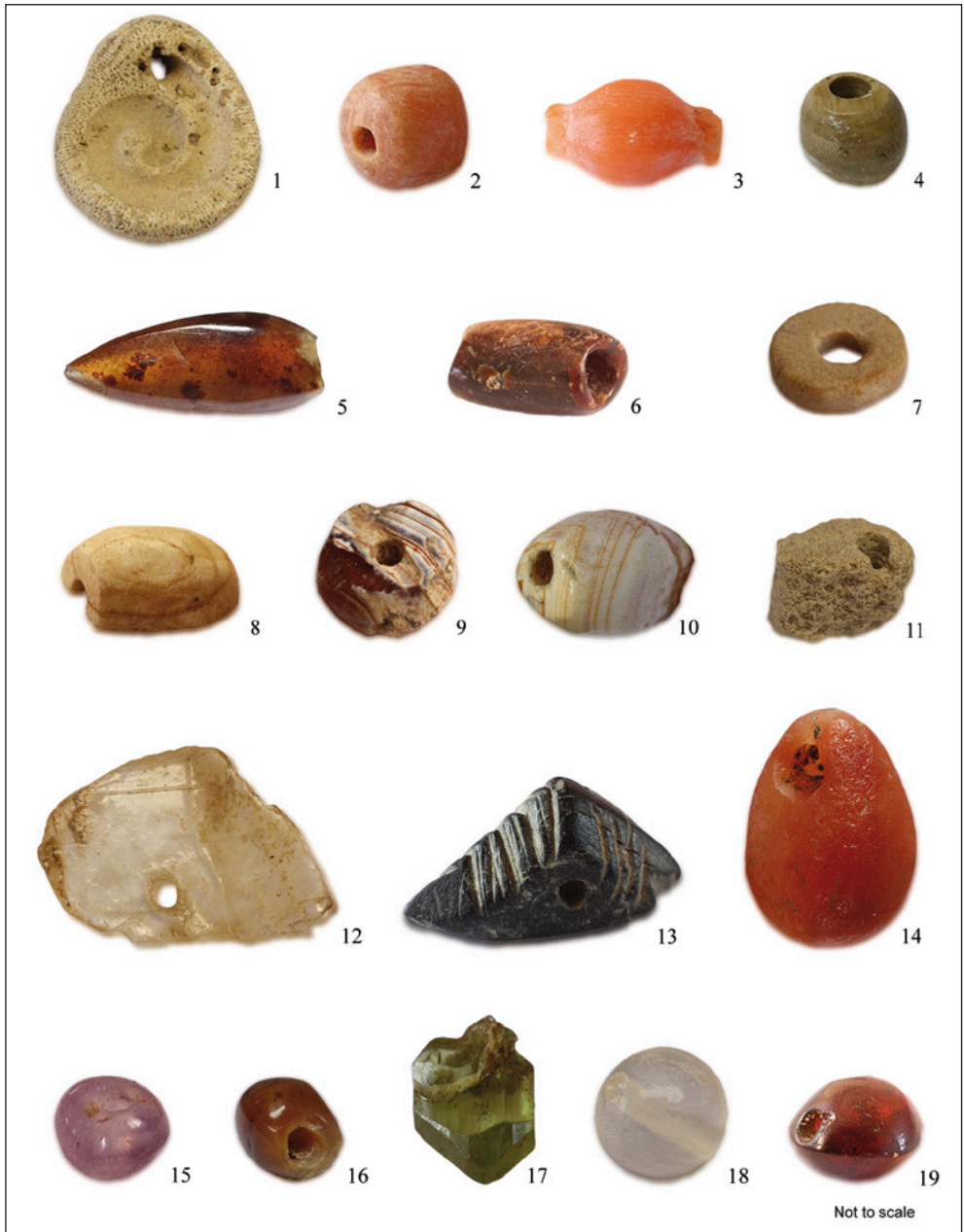


Fig. 2. Beads of organics: 1–6 – Red Sea and Mediterranean Sea, 7–8 – East African; beads of stone: 9–16 – Eastern Desert(?), 17 – Zabargad Island, 18–19 – Eastern Desert/Indian(?) (Photos J. Then-Obluska)

not take [regular] cutting; besides they are rather tawny. On the other hand, whatever can be used for small boxes, small plaques, small disks, and similar items, gets cut up completely" (*Peripl. M. Eryth.* 30).

An early Roman long tubular bead [*Fig. 2:6*] and late Roman pointy pendant fragment [*Fig. 2:5*] belong to the adornment category. The latter was drilled from both ends, which resulted in the double parallel shape of the perforation. A decorated dish made of turtle shell, and found in Egypt, would confirm high skills in turtle shell working in the early Roman period (London, British Museum, No. 2009, 5014.1, AD 100–200).

As evidenced by preserved semi-worked objects and waste, turtle shell¹⁰ was worked at Berenike (Gwiazda forthcoming). Perforated disks were found at both the port sites of Berenike (Gwiazda forthcoming) and Quseir.¹¹ Although their function is uncertain, they might have been simply fishing items or waste in the production of leather items (Hamilton-Dyer 2011a: 159). Indeed, turtle shell disks might have been leftovers from the production of small rings used for personal adornment.¹² Many such rings, approximately 14 mm in diameter, were found together with late Roman glass beads¹³ at Gurob (London, The Petrie Museum UC58113), at Byzantine Qau (London, The Petrie Museum UC74113),

and in the 4th century AD Tomb XCVIII at al-Bagawat, Kharga Oasis (MET 31.8.36a–p). Whether, however, their sides were linked together into a chain or they were finger and toe rings remains unsure.

OSTRICH EGGSHELL

The Ostrich or Common Ostrich (*Struthio camelus*) is either one or two species of large flightless birds native to Africa. Ostriches inhabit the southern desert areas of Egypt, the Sudan and the savanna south of the Sahara. However, we know that *Struthio c. syriacus*, the Arabian Ostrich or Middle Eastern Ostrich, was formerly very common in the Arabian Peninsula, Syria, and Iraq, although it is now extinct.

Ostrich eggshell disks [*Fig. 2:7*] are a very rare find in **Ptolemaic and early Roman** Berenike contexts. At contemporary sites, however, single ostrich eggshell beads with diameters from 10 mm to 13 mm were noticed in Yemen's Shabwa burials (Morrison 1991: 384) and a single example comes from Aksum (Morrison 1989: 177, No. 128). They are almost absent from Meroitic burial sites in the Lower Nubian Nile Valley (Then-Obluska 2014a), and no ostrich eggshell has been recognized from early Roman Myos Hormos (Quseir al-Qadim). Moreover, no ostrich eggshell beads have been found at Khor Rori (Sumhuram, Oman) (S. Lischi, personal communication).

¹⁰ Some of Berenike's turtle shell disks are partly delaminated due to arid conditions. The color and flaky texture suggest these could be made of loggerhead sea turtle scutes (*Caretta caretta* sp.) (K.A. Björndal, personal communication). Other objects were made of hawksbill or green turtle shell.

¹¹ Turtle shell disks cut of hawksbill turtle shell were found during Oriental Institute University of Chicago excavations in Quseir al-Qadim and they were ascribed to a late Ayyubid–early Mamluk context (RN 167, 168) (Chicago, The Oriental Institute Museum, personal observation).

¹² For Roman turtle shell bangles from Egypt, see London, The Petrie Museum UC74054, UC51738 (Qau), UC73580, UC73989; for Byzantine bangles from Egypt, see London, The Petrie Museum UC51732 (Qau), UC56354-5, UC56367, UC58134.

¹³ Compare the late Roman rod-pierced 'flower' bead type: *Fig. 5:37* below.

Together with perforated mollusk shell objects, disk and short cylinder ostrich eggshell beads became more common in Berenike during the **late Roman period**, the time of Blemmyan presence at the site. Three short disk and short cylinder beads, still on their original string, were picked up from late Roman trash (*BE10-59/001/PB001*). The beads were a characteristic type in the Lower Nubian Nile Valley from the 4th century AD. Together with larger retouched disks, they are also found on burial sites associated with the Fourth Cataract graves of the Early Makurians (Then-Obluska 2014a: Pl. 2; forthcoming b). Ostrich eggshell beads can be associated with a long-lived Nubian tradition.

BONE

Three bone beads were barrel-shaped [*Fig. 2:8*] and drilled from both ends. Two of these, from a **late Roman** context, seem to be made of ivory.

STONE

Stone beads from Berenike were made of raw materials, which include both macro-crystalline (amethyst, quartz) and micro-crystalline stone (agate, carnelian), as well as garnets.

Written sources point to India as a source of semiprecious stone and many beads found at Berenike were made of imported stones. Contrary to the opinion on the Eastern Desert origin of carnelian, this stone is found in the Nile terrace gravels of the Fourth Cataract region in northern Sudan. Similar deposits have also been reported along the Nile in Nubia near Wadi Halfa (Harrell 2010: 72–74; 2012:

13). Although amethyst beads are said to derive from India, sources are known from the Eastern Desert's Wadi el-Hudi, 35 km to the southeast of Aswan and 230 km west of Berenike (Shaw 2007), and Wadi Abu Diyeiba, near Quseir (Wendrich et al. 2003: 57; Harrell et al. 2006).¹⁴ Lustrous flakes of gypsum selenite can be found locally (Harrell 1996: 107; 2007: 173). Rock crystal deposits occur across the Eastern Desert (Harrell 2012: 4). Remains of rock crystal processing in workshops from the 5th to 7th centuries AD have been attested for Alexandria (Rodziewicz 1984: 243, Fig. 71,353). Controlled by the Blemmyes, Mons Smaragdus (the Sikait-Zabara mining district) with its green beryl mines is situated not far from the main track between Koptos and Berenike (Harrell 1996: 112; 1998: 142–143; 2007: 170). Hexagonal rock crystal and greenish beryl fragments represent raw materials most probably worked in Berenike (Then-Obluska forthcoming a). The peridot crystal from a Ptolemaic context [*Fig. 2:17*] is evidence of contacts with the Red Sea island of Zabargad, which was an exclusive source of peridot in antiquity (Harrell and Bloxam 2010; Finlay 2006: 160–163). Pliny connects the discovery of peridots with Troglodyte pirates (Pliny, *HN* 37.32). Garnets are found in many parts of Egypt, but they are especially common in deposits of mica schist in the Gebel Mitiq and Wadi Gimal in the Eastern Desert, as well as in the muscovite-granite at Sikait, just to the south of the beryl mines. However, their quality is rather poor and there is no gem-quality garnet known in Egypt

¹⁴ Many amethyst chunks were found in early Roman context at Quseir al-Qadim (Myos Hormos) (Chicago, The Oriental Institute Museum, personal observation).

(J.A. Harrell, personal communication). Deposits with good quality almandine garnet are found in northern Sudan's Fourth Nile Cataract region (Harrell 2012: 3).

On the other hand, stone imports from Iran and especially India were known in Roman times. Barygaza markets offered, among other things available in that region, agate and carnelian destined for export to Egypt (*Peripl. M. Eryth.* 48–49 and 51; Harrell 1998: 143). Almandine-pyrope-rich garnet beads from Ed-Dur and Samad al Shan in Oman are confirmed by laboratory results as imports from Sri Lanka/India or Tanzania (Rösch et al. 1997: 763–783). Also, chemical analyses connect the 5th and 6th centuries Merovingian garnets with sources in Sri Lanka (Francis 2000: 213, 222; Drauschke 2010: 51, notes 36, 37).

Independent of the provenance of the materials used, the stone beads were perforated using different tool materials depending on the region or tradition of production. They can be drilled using stone drills, a copper/bronze rod with abrasive, as well as with diamond tipped (single- and double-diamond tipped) drills. The latter technique belongs to the Indo-Pacific tradition. More sophisticated methods of examination were not available at the site, hence the following simplified division, either drilled from one end or from two, can be made within the two general periods.

Stone beads drilled from one end

Most of the stone beads from the **Ptolemaic and early Roman** Berenike were perforated using the Egyptian and Nubian

technique. They were drilled from one end, which resulted in a truncated shape of the perforation.

Sawing traces next to the larger hole opening, seen on many beads, attest to a technique using a saw to facilitate drilling of a bead. The process of perforating was hastened by pecking a small depression on the surface at the other end of a bead. In Berenike the saw traces can be observed on unburnished short and standard barrels made of agate [*Fig. 2:9*].

A few small highly polished beads were made of amethyst [*Fig. 2:15*], carnelian (*BE11-77/999/PB011*) and chalcedony. A tiny, highly polished irregular barrel bead [*Fig. 2:16*], drilled from one end, was a common type in Nubian Meroitic contexts, although made of carnelian (Then-Obłuska 2015: 33). This type was also observed at the early Roman port site of Quseir (Chicago, The Oriental Institute Museum, personal observation).

Among standard and long barrels, made of agate, one was found unfinished, partly perforated from one end [*Fig. 2:10*].

The tradition of drilling beads from one end was carried over into the **late Roman period**, and is commonly found in post-Meroitic Nubia. The presence of a drop-shaped carnelian pendant [*Fig. 2:14*], a type common in the Nubian repertoire (Then-Obłuska 2014a: Pl. 2), is quite remarkable in a late Berenike context. It was found together with a triangular incised bead, probably made of black steatite [*Fig. 2:13*].

The technique of drilling from one end could be employed also for stones of lesser hardness, such as steatite and gypsum selenite¹⁵ [*Fig. 2:12*].

¹⁵ Perforated gypsum selenite plaques were found at Quseir al-Qadim (Chicago, The Oriental Institute Museum, personal observation).

Stone beads drilled from both ends

A few stones from **early Roman** Berenike were drilled from both ends. The perforation in these cases has a double cylindrical shape. This technique can be observed in a rock crystal globular bead [*Fig. 2:18*].

An early Roman garnet lens-shaped bead was drilled from both ends over the edge of the bead end [*Fig. 2:19*]. Although it was recorded in both early and late contexts in Berenike, similar stone beads, identified as carnelian, were found in 2nd century BC–1st century AD Wadi al-Makhdarah in Yemen (De Maigret and Antonini 2005: Fig. 40d, object Y.87. MNQ.T1/8). Wadi al-Makhdarah also produced lens-shaped beads identified as amethyst (Haerinck 2001: Pl. G2, Object 153); the same can be said for Ed-Dur in Oman (Haerinck 1998: 296–297).

At **late Roman** Berenike, most stone beads were found drilled from both ends [*Fig. 3:1–10*], the perforation taking on a double parallel or hourglass shape. The stones have been identified as carnelian, rock crystal, green beryl and garnet.

Carnelian dominated the bead assemblage from late Berenike. Light and dark red, yellow-orange to reddish-orange, and colored by the presence of iron oxide, it can be found roughly formed into many different shapes: long cylinder [*Fig. 3:8*], bicone [*Fig. 3:10*], faceted square bicone [*Fig. 3:6, 7*], irregularly faceted [*Fig. 3:9*], and faceted hexagonal bicone [*Fig. 3:5*]. Long faceted bicones are also found in contemporary post-Meroitic graves (Then-Obluska 2014a: Pl. 2:215–216).

The emerald crystal bead from Berenike appeared in its natural hexagonal shape [*Fig. 3:4*]. Many of the Berenike stone beads are made of garnet used, for example, for biconical beads [*Fig. 3:3*].

Other garnet beads are distinguished by their elongated tabular shape and exceptional polishing. They were probably tumble-polished [*Fig. 3:1, 2*] (Petrie 1927: 3, Fig. I.5 London, Petrie Museum, Inv. UC40653b). One of them seems to be made of almandine, typically red with a brownish tint, resembling the color of a ruby. A similar bead, identified as amethyst, was found at Ed-Dur (Haerinck 2001: Fig. G2, Object 153).

CLAY

One bead found in **early Roman** Berenike was made of red clay [*Fig. 3:12*]. Pink clay beads were recorded from early Roman Elephantine (Rodziewicz 2005: 35) and in Meroitic graves on Sai Island and at Sedeinga (Then-Obluska 2015: 33).

A clay plumb-bob pendant probably from **late Roman** Berenike [*Fig. 3:13*] is an outstanding find. It can be compared with the “terracotta” pendants known from Rajghat, Kausambi and Arikamedu in India (Jyotsna 2000: 68).

GLAZED STEATITE

Half of a scarab found in a Ptolemaic context was made of green-glazed steatite [*Fig. 3:11*]. The double parallel shape of the perforation of this soft stone is clearly visible in its section. The Berenike example bears a hieroglyphic text with the coronation name of the Twenty-first Dynasty pharaoh Siamun (Sidebotham and Zych 2012: 40).

FAIENCE/GLAZED COMPOSITION

The production of faience/glazed composition objects in the Ptolemaic period, including beads, has been demonstrated at Tell Atrib (Welc 2014) and Memphis

List of beads illustrated in *Fig. 3*, giving context, material and dimensions in mm
Abbreviations: W – width, L – length, T – thickness, D – diameter, HD – hole diameter

**Eastern Desert/Indian stones:
perforated from both ends**

1. *BE10-59/001/PB009* garnet
W4.8, T3, L5.8, HD1
2. *BE10-59/999/PB012* garnet
W4.9, T3.5, L5.5, HD1.4
3. *BE10-59/001/PB017* garnet
D5.5, L5.5, HD1
4. *BE10-59/002/PB019* emerald
W3.4, T3.2, L3.8, HD1.2
5. *BE12-61/071/PB076* carnelian
D7.0, L6.0, HD1.5
6. *BE10-59/004/PB034* carnelian
W6.9, T6.2, L12, HD1.2
7. *BE10-59/001/PB004* carnelian
W8.2, L17.6, HD1.4
8. *BE10-59/001/PB007* carnelian
D4.3, L8.9, HD1.5
9. *BE10-59/001/PB005* carnelian
W3.8, T3.5, L3.6, HD0.8; 1.3
10. *BE10-59/001/PB009* carnelian
D4.5, L5.6, HD1

Egyptian glazed steatite

11. *BE11-77/001/PB001*
W approx. 10, T5.6, L11.9, HD1.3

Clay

12. *BE11-76/999/PB027*
D7.9, L8.9, HD1.9
13. *BE10-59/001/PB008*
W8.6, L13.7, HD1

Egyptian faience

14. *BE10-64/004/PB004*
D4.3, L2.6, HD2.2
15. *BE11-76/999/PB022*
D5, L2.6, HD2.1
16. *BE11-76/999/PB022*
D4.6, L2.7, HD2.1
17. *BE10-60/001/PB002*
D3.2, L1.9, HD1.2
18. *BE11-76/003/PB005*
W4.3, T2.3, L8.2, HD1.0
19. *BE11-76/007/PB032*
D6.9, L3.8, HD1.9
20. *BE11-71/012/PB019*
D6.2, L3.7, HD1.8
21. *BE11-73/002/PB002*
D approx. 10, L9.2, HD approx. 5.2
22. *BE11-77/001/PB002*
W6.4, T4.5, L5.4, HD1.2
23. *BE11-68/003/PB009*
W17.4, T4.5, L19.4, HD1.5
24. *BE11-77/002/PB009*
D4.8, L8.5, HD1.8



Fig. 3. Beads: 1–10 – Eastern Desert/Indian stones; perforated from both ends; 11 – Egyptian glazed steatite; 12–13 – clay; 14–24 – Egyptian faience (Photos J. Then-Obluska)

(Nicholson 2002; 2013). While faience bead production disappeared in Egypt by the late Roman period, the tradition survived in Nubia, where faience beads were produced until medieval times (Then-Obluska 2013b; 2014a). Almost all the faience beads recorded from Berenike come from Ptolemaic and early Roman contexts; some are from the late Roman ones.

Undecorated faience

Disk and short cylinder faience beads of many colors constitute most of the bead finds from **Ptolemaic and early Roman** context in Berenike (trench BE11-77). As in contemporary Meroitic bead assemblages (Then-Obluska 2015: 33), the type continued into the early Roman period (compare below) [Fig. 3:14–17].

Contrary to beads with the glaze partly worn off [Fig. 3:20], other short bicones are characterized by a very glossy blue glaze [Fig. 3:19]. They measure between 6.9–10.5 mm in diameter and 4.6–5.9 mm in length. A long rectangular tabular bead of faience [Fig. 3:18] was already noted from an early Roman context at Berenike (Zych 2011: Cat. 78b, Fig. 12-75, Phase III, late 1st to early 2nd century AD). Some standard and long tubular cores are not glazed [Fig. 3:24]. The glaze may have worn off, or else they are unfinished, indicating on site production in late Ptolemaic times.

The **late Roman** contexts (BE10-59/001/PB006) have yielded standard and long blue glazed tubular beads, measuring up to 5.7 mm in diameter and up to 6.7 mm in length. They recall contemporary Nubian examples (Then-Obluska 2014a: Pl. 2:210, 211).

Decorated faience

A rectangular tabular bead from **Ptolemaic**

and early Roman context, whitish at the core and with traces of blue/green glaze on the surface, was decorated with straight intersecting grooves on one or both sides [Fig. 3:23]. Similar examples were noted from Meroe (Dunham 1963: Fig. S-IXd; Beg. West 27, 90–10 BC; Boston, Museum of Fine Arts, Inv. No. 22-2-460m) and Tell Atrib in Egypt, where faience objects were produced (Welc 2014: Cat. 299, first half of 2nd century BC).

Two slightly flattened beads decorated with incisions were also found in Ptolemaic contexts [Fig. 3:22].

Half of a blue bead, once a grooved barrel melon type, was found in an early Roman context at Quseir [Fig. 3:21] (Meyer 1992: 41, Pl. 14, No. 370 [Chicago, The Oriental Institute Museum, personal observation]). Another example comes from Alexandria (Kucharczyk 2011a: 65, Fig. 8:3, layer dated to the 2nd–3rd century AD).

GLASS

The Wadi Natrun sites are known as the primary glass making center in Egypt (Nenna et al. 2005; Nenna 2007), but are difficult to date because of the scarcity of finds; they are considered to be of late Roman date (Henderson 2013: 231). Kilns of primary glassmaking centers were also found southwest of Alexandria (Nenna, Picon, and Vichy 2000; Rodziewicz 2009: 93–95). According to the *Periplus Maris Erythraei* (6), Diospolis, presumably Diospolis Magna, that is, Thebes, was a place of colorful glass ‘stone’ manufacturing. This may be a reference to production of mosaic glass or to the addition of colorants to imported ready-made glass (Henderson 2013: 230). In any case, Alexandria was apparently a source of

mosaic glass in the early and late Roman period (Kucharczyk 2011a). Moreover, the chemical composition of some mosaic glass cane sections used for beads that were found in China and Pakistan indicated their early Kushan Bara, Pakistan provenance (Dussubieux and Gratuze 2003: 318–319; Liu et al. 2012 and references). Finally, so-called Jatim beads, thought to be made in eastern Java, and found in Berenike (Francis 2002a: 190) and in the late 5th to early 6th century AD Korea, were produced using mosaic cane sections (Lankton, Lee, and Allen 2005).

Grooved stone molds for segmenting drawn tubes along with glass waste were found in early and late Roman Alexandria (Kucharczyk 2011a: 63–64, Fig. 8:1 2nd–3rd century AD; Rodziewicz 1984: 146–159, 241–242, Figs 265–266, Pl. 72, Nos 359–366, end of 5th–6th century AD). The shape of the early Roman molds suggests the production of collared beads, which were the primary shape for gold-in-glass beads from that period (compare below). Gold-in-glass beads are said to be produced in early Roman Elephantine (Rodziewicz 2005: 34–35) and at Meroe in Nubia (Markowitz 2012: 198).¹⁶ What is more, production of gold-in-glass beads was confirmed through laboratory analysis of glass chemical composition of some examples from Bara in Pakistan (2nd century BC–2nd century AD). They were distributed throughout the early Kushan region and on its fringes (Dussubieux and Gratuze 2003: 318–319; 2013).

Glass canes and lumps could have been brought from the secondary workshops

of Byzantine Alexandria and its surroundings, and could have been worked and finished (sliced, folded, pierced, marvered) locally (Francis 2007). As experimental studies show, it is likely that the glass could be melted in a crucible or heated in an iron pan and attached to a pontil (e.g., Aschenbrenner 1997; Sablerolles, Henderson, and Dijkman 1997). Berenike produced evidence of possible glass-working and beadmaking in the form of a drawn glass lump with attached traces of a metal pontil (*BE94-001-002-PB9*, personal observation), a glass chunk (*BE94-001-003-PB10*, personal observation), a glass slab (Kucharczyk 2011b: 92, Fig. 9-2), a fragment of a long red-coated translucent drawn glass tube (Zych 2011: Cat. No. 72), and a swirled red, black and white globular glass lump (*BE11/999/PB021*).

A large part of the late Roman glass bead assemblage could be of Indo-Pacific origin (Francis 2002a: 48). Monochrome beads made of drawn glass and characterized by more or less rounded ends (see below) stand in support of this hypothesis.

Drawn glass beads

Drawn tubes could be segmented on molds or pinched into single and multiple sets according to Mediterranean traditions (Francis 2002a). Such drawn beads with constricted ends as found at Berenike were monochrome, compound or composite glass.

Drawn and segmented glass: monochrome

Single and multiple-segment translucent blue beads from early Roman Berenike are the most common examples in this category of glass [*Fig. 4:9*].

¹⁶ For some doubts on gold-in-glass bead production on Elephantine, see Arveiller-Dulong and Nenna 2011: 175, note 28. It should be said as well that there is no evidence for gold-in-glass bead production at Meroe.

In the late Roman Berenike the small drawn segmented beads range from 1.6 mm to about 5.0 mm in diameter. Glass tubes in red, dark blue and yellow were found in late contexts at Alexandria. These are also the most common colors of drawn segmented beads at late Berenike [Fig. 4:4–8] and the Lower Nubian sites (Then-Obluska forthcoming b).

Possibly pinched drawn beads are characterized by small perforations and appear in larger sizes, measuring up to 8.5 mm in diameter and up to 8.4 mm in length. They are of many colors: translucent dark blue [Fig. 4:12], opaque blue, opaque dark red [Fig. 4:11], translucent purple [Fig. 4:13] and opaque yellow.

Drawn and segmented glass: bichrome and polychrome

Many beads segmented from compound drawn glass tubes appeared during the early phase, at Berenike as well as at many contemporary sites. A drawn translucent green layer overlies an opaque light green one [Fig. 4:16]. Translucent colorless drawn tubes can be coated with a red [Fig. 4:18] or yellow layer [Fig. 4:17]. The red-over-colorless beads at Berenike have already been mentioned (Zych 2011: Cat. No. 72, Fig. 12-69) and are found at many Nubian sites dated to the Meroitic period (Then-Obluska 2015). Other types are represented by multiple segmented drawn beads of a translucent, dark layer covered with an opaque brownish one [Fig. 4:19].

Beads with a striped pattern over a monochrome glass core were recorded at Berenike and at many locations all over the ancient world [Fig. 4:20, 21]. These are

generally dated to the early Roman period, about the 1st century AD (Zych 2011: 147, Cat. No. 75, Berenike; Dunham 1957: Fig. 89: 21-12-129b-6, Fig. 67,B; Boston, Museum of Fine Arts 24.768 Meroe; Mandruzzato 2008: 159, Aquileia type IX3; Spaer 2001: 117, Cat. 198 and references; Price 1992: 457, Fig. 353:15–16, Knossos; Vila 1967: Fig. X, No. 86, Aksha; Lankton 2003: 80 for later dating in the 2nd–4th century AD).

From early Roman contexts in Berenike stems a bead that gives the false impression of containing gold foil, but the effect is actually the result of the unusual high iridescence of its blue/green bands [Fig. 4:22]. The manufacturing method of the bead with a longitudinal manipulated wave pattern is not certain. It could be a drawn cane with opaque white and iridescent green/blue stripes applied. Although made of mosaic glass, otherwise called agate or ribbon glass, similar specimens are characterized by bands of gold foil covered by colorless glass (Lankton 2003: 56, Fig. 6.4; Spaer 2001: 109; Pellicer Catalán 1963: Fig. 22.23 from a Meroitic grave at Nag Shayeg, Nubia¹⁷). A similar specimen from Taxila, Pakistan, was ascribed to the 1st century AD (Beck 1941: Pl. IX,38).

Drawn and segmented metal-in-glass

Metal-in-glass beads from Egypt, Nubia and elsewhere, which are referenced in detail, belong in the drawn and segmented category (Arveiller-Dulong and Nenna 2011: 176 and references; Harlow 2000: Fig. 64m,r, for large gold-in-glass beads from a 4th century burial at Aksum).

¹⁷ Madrid, The National Archaeological Museum, Inv. 1984-79.VI-16 o 1980-102-12; the beads are displayed in the Nubian part of their exhibition, personal observation.

Gold-in-glass beads were recently found in the “Utsukushi” burial mound dating from the 5th century AD in Nagaoka near Kyoto. Tests by the Nara National Research Institute for Cultural Properties have revealed that the three glass beads were probably made in the Roman Empire sometime between the 1st and 4th century AD (Tamura 2012).

A small drawn and single-segment gold-in-glass barrel bead was recorded already in a **late Ptolemaic** context in Berenike (BE10-63/65/002/PB002). **Early Roman** examples are represented by small and larger single-segment beads [Fig. 4:29], as well as double- and triple-segment beads [Fig. 4:26]. Elongated barrel-shaped bodies could have been associated with collars [Fig. 4:25] or, additionally, be fluted [Fig. 4:23] (Thiaudière 2010: Cat. 184, Saï, 1st to 3rd century AD). A flattened tabular gold-in-glass bead body is missing one collar [Fig. 4:24] (Alekseeva 1978: Fig. 26:70, Type 25, 1st to 3rd century AD). Collared beads belong to characteristic Hellenistic and early Roman gold-in-glass types and are found in contexts dated to the 1st–3rd centuries AD (Alekseeva 1978: 32, Type 22, Fig. 26:24; Arveiller-Dulong and Nenna 2011: 154, Cat. 199). They were also recorded from Yemen (Morrison 1991: 382).

In **late Roman** Berenike contexts, gold-in-glass beads appear as single- [Fig. 4:28], double- and octuple-segment beads. The latter is of much smaller diameter. Some beads appear as silver-in-glass [Fig. 4:30].

Drawn and rounded glass: bichrome

Drawn black beads with longitudinally applied white stripes were found in the **late phase** at the site [Fig. 4:31, 32]. In contrast to early Berenike’s late 1st–early

2nd century AD drawn and segmented trail-decorated tubes (Zych 2011: 146, Cat. No. 71c), the late Berenike ones were made by cutting up drawn tubes and heat-rounding the ends.

Drawn and rounded glass: monochrome

In contrast to the segmented Mediterranean type drawn beads, many drawn tubes may have been cut and more or less heat-rounded. A few such beads were noted in probably **Ptolemaic** loci (BE11-77/001/001–003). They were mainly in translucent dark blue color. The **early Roman** examples were dark blue, yellow, dark purple and opaque red [Fig. 4:41].

Monochrome drawn, cut and rounded beads were the most common glass bead type in **late Berenike** contexts (late Roman refuse dump in trench BE10-59) explored in season 2010 (637 objects) [Fig. 4:33–40], constituting 53.7% of all glass beads and 45.5% of all beads from late Berenike contexts in 2010. Semi-translucent and translucent green, usually translucent light blue/green, semi-translucent yellow and opaque yellow dominate the color palette. Other colors include opaque orange, black, opaque dark red, white translucent dark blue, and amber. The blue/green and orange are usually very tiny beads, 2 mm or smaller in diameter. The remaining ones range from approximately 2 mm to 5 mm in diameter.

Beads with rounded ends were common finds on the Indian subcontinent (e.g., Francis 2002a; Kanungo and Brill 2009: 16–17, Fig. 8). The color palette of Sri Lankan beads has been noted in the Egyptian Nile Valley (Arveiller-Dulong and Nenna 2011: 182 Cat. 224:1, 187 Cat. 231:24, 26, 28, 30, 33, 35, 37, 39, 188 Cat. 232 described as green stone or

List of beads illustrated in *Fig. 4*, giving context, material and dimensions in mm
Abbreviations: W – width, L – length, T – thickness, D – diameter, HD – hole diameter

**Egyptian glass and metal-in-glass:
drawn and segmented**

1. *BE10-59/001/PB017*
D3.5, L11.6, HD1.1
2. *BE10-59/002/PB027*
D4.6, L4.2, HD2.2
3. *BE10-59/001/PB017*
D3.4, L2.9, HD0.9
4. *BE10-59/004/PB030*
D4.0, L2.9, HD1.0
5. *BE10-59/001/PB003*
D4.8, L2.8, HD1.7
6. *BE10-59/002/PB027*
D6.5, L3.9, HD2.4
7. *BE10-58/003/PB003*
D4.4, L1.3, HD1.6
8. *BE10-59/001/PB006*
D3.9, L6.2, HD1.5
9. *BE11-76/999/PB027*
D3.9, L7.9, HD1.0
10. *BE10-59/001/PB005*
D8.5, L7.6, HD1.4
11. *BE10-61/013/PB041*
D6.7, L8.0, HD1.8
12. *BE10-59/002/PB019*
D5.5, L5.7, HD2.5
13. *BE10-59/001/PB001*
D6.5, L6.0, HD2.1
14. *BE10-59/001/PB007*
D3.2, L5.2, HD1.3
15. *BE10-59/001/PB007*
D2.8, L4.0, HD1.3
16. *BE11-73/002/PB002*
D3.1, L3.7, HD1.2
17. *BE11-76/003/PB008*
D5.1, L4.4, HD1.3
18. *BE11-76/999/PB025*
D5.5, L4.4, HD2.3
19. *BE11-76/006/PB015*
D4.4, L10.1, HD1.5
20. *BE10-58/002/PB002*
D12.4, L11, HD3.7
21. *BE11-76/999/PB022*
D4.3, L5.8, HD0.7
22. *BE12-84/015/PB035*
D5.9, L7.4, HD1.4; 1.7
23. *BE12-84/004/PB012*
D7.7, L9.5, HD2.6
24. *BE11-70/029/PB029*
W10.4, T6.2, L10.8
25. *BE11-76/001/PB001*
D3.8, L7.0, HD0.9
26. *BE12-84/001/PB002*
D3.8, L13.8, HD0.8
27. *BE11-73/002/PB003*
D7.9, L11.5, HD0.7
28. *BE10-59/001/PB015*
D4.3, L3.1, HD0.9
29. *BE11-78/001/PB001*
D6.6, L6.9, HD1.1
30. *BE10-59/001/PB014*
D6.4, L4.3, HD1.5

**South Indian/Sri Lankan(?) glass:
drawn, cut and rounded**

31. *BE10-59/001/PB017*
D4.7, L1.9, HD1.6
32. *BE10-59/001/PB005*
D6.5, L4.3, HD1.3
33. *BE10-59/001/PB017*
D2–4.5, L1.4–3.0, HD0.9–1.2
34. *BE10-61/003/PB035*
D3.5, L3.6, HD1.5
35. *BE10-59/001/PB006*
D4.0, L2.9, HD1.0
36. *BE10-59/001/PB006*
D2.8, L1.4, HD1.1
37. *BE10-59/001/PB006*
D3.3, L1.9, HD1.0
38. *BE10-59/001/PB007*
D3.0, L1.8, HD1.0
39. *BE10-59/001/PB008*
D5.4, L2.8, HD1.7
40. *BE10-59/001/PB017*
D3.7, L1.5, HD1.2
41. *BE09-54/006/PB007*
D5.5, L4.5, HD1.8

EGYPT



Fig. 4. Beads: 1–30 – Egyptian glass and metal-in-glass: drawn and segmented; 31–41 – South Indian/Sri Lankan(?) glass: drawn, cut and rounded (Photos J. Then-Obtuska)

glass of Egyptian production), as well as at many Nubian Nile Valley sites (Then-Obłuska forthcoming b). Indian/Sri Lankan glass beads are said to be found at 4th century Aksum and Matara (Harlow 2000: Figs 62c, 64q,t, 65a 4th century burial at Aksum). Last but not least, such beads have been confirmed by chemical laboratory analyses from Merovingian (5th–7th centuries AD) burials in France (Poulain, Scullier, and Gratuze 2013; see below for more references).

Rod-formed glass

Wound glass: monochrome

The **early Roman** wound glass beads are represented by spheres [Fig. 5:2] and faceted hexagonal cylinders [Fig. 5:4] (Zych 2011: 148, Cat. No. 81; Meyer 1992: Fig. 14, No. 372 Quseir). Monochrome wound biconical blue beads can be covered with silver iridescence [Fig. 5:3]. The latter kind are known from the early Roman period (Lankton 2003: Fig. 6.0: 564; Zych 2011: 146, Cat. No. 70, Fig. 12-67).

In one case a translucent light green glass was marvered on one side and shaped into a scarab with details of the beetle's physiognomy defined, including the wing case [Fig. 5:5]. Such amulets of mosaic glass analogically shaped into scarabs were known from the Hellenistic and Roman periods (Arveiller-Dulong and Nenna 2011: 288–289; Malloy 1974: Nos 14–15 [Christie's Lot 347]).

The layers behind the wall of the "Lotus Temple" yielded many over-fired beads (the set included already discussed early Roman collared [Fig. 4:24] and late Roman drawn and rounded glass beads), as well as pendants and their fragments. One burnt, complete example of a large glass pendant shows a spherical wound body with attached loop [Fig. 5:1]. Specimens similar in shape and size come from a Middle Imperial period Palmyrene grave (Higuchi and Izumi 1994: 91, Fig. 67, 47), from a grave in Tyre (Chéhab 1986: Fig. XXXVII, 170, beginning of 2nd–first quarter of 4th century AD), and from the late Roman and Byzantine necropolis at Khirbat Yajuz in northern Jordan (Eger and Khalil 2013: 167, Pl. 3.23). Large spherical bases with attached loops made of black glass (W. 18–24 mm, H. 23–32 mm) come from 3rd century AD Braga, Portugal (da Cruz 2009: Fig. 3: 4.1.1–4.1.4).¹⁸

Distinctive wound dark blue single and double-coiled rings [Fig. 5:7, 9] recorded from the **late Roman** phase of Berenike were also found at Blemmyan, Nobadian (Chicago, The Oriental Institute Museum, Inv. OIM 42035, about AD 330/340–370/380; Strouhal 1984: Fig. 151, P 3039) and Aksumite sites (Harlow 2000: Figs 192e,d).

Among the late Roman rod-formed objects, fragments of two types of pendants can be identified. A dark blue rim

¹⁸ Different examples come from the late Roman period in Egypt (Arveiller-Dulong and Nenna 2011: 232–233, Cat. No. 314.17 black body with spotted decoration, late Roman period), the Black Sea region (Aleksieva 1978: 74, Fig. 34:33, Type 192, 4th century AD, made with the same technique, but much smaller than the Berenike examples), Palestine (California Institute of World Archaeology [CIWA] GLS.VS.00691, Palestine AD 400–500, www.virtual-egyptian-museum.org), and from Egyptian Tell Dafana (Petrie 1888: 79; British Museum No. 1887, 1220.2). Smaller in size, transparent glass pendants with conical and globular bases and attached loops were collected from various plundered tombs at the Meroitic cemetery in Karanog/Aniba (Woolley and Randall-MacIver 1910: 258, Object 7935; Silverman 1997: 302–303 and Penn Museum, Inv. E7925).

with a fragment of a handle [Fig. 5:14] was part of a rod-formed miniature juglet pendant usually dated to the 4th and the beginning of the 5th century AD (Arveiller-Dulong and Nenna 2011: 64–72; Schlick-Nolte 2002: 78, No. V-33a–f; Mandruzzato 2008: 74–75; Spaer 2001: 178). A broken-off ribbed loop, which was fused over a rod [Fig. 5:13], most probably protruded once from a disk pendant formed in a mold (Spaer 2001: 187, Cat. 424).

Wound glass: bichrome and polychrome

In some wound beads from the **Ptolemaic and early Roman** period stratified eyes were inserted into the translucent [Fig. 5:17] or light blue body [Fig. 5:16]. In both examples the eyes were made with alternating, three white and two translucent layers, and a central blue translucent spot. Stratified eyes applied on blue cores, but with seven eyes, were popular in the Late Period, Ptolemaic and early Roman period in Egypt (Arveiller-Dulong and Nenna 2011: 168–169, Cat. No. 209.2 6th–3rd century BC, 220–221, Cat. Nos 299.26, 72, 74, 79, 1st century BC–1st century AD) and in the Meroitic period in Nubia (Dunham 1963: 152, Fig. S, Type XIj; W 159 (50–55)?). Examples from the Northern Black Sea region were also dated from the 1st century BC to the 1st century AD (Alekseeva 1975: Type 68, Pl. 14:21–23). Similar wound glass beads with stratified eyes were recorded from Taxila, Pakistan (Beck 1941: Pl. I:14), from Persepolis, Iran (Dubin 2009: 382, note II, Object 23, Pl. 334, Fig. 23 300 BC), from Xu Jialing, China (Gan et al. 2009: Fig. 24.1 500BC), Niya in Xinjiang, China (Lin 2010: 204, Fig. 4, 1st century BC–4th century AD), and Sen-Mu-Sai-Mu grotto site, Kuche county, China (Liu et al. 2012:

Fig. 2: XJ-34, later 2nd century AD to early 3rd century AD, Eastern Han Dynasty). The latter fell in a chemical compositional group defined for Sasanian glass (Liu et al. 2012: 2137).

The eye bead in Fig. 5:15 was made of a wound, white opaque body and decorated with three applied blue spots. A bead like it was also found at Meroitic Ballaña, in a grave dated to the end of the 1st century AD (Chicago, The Oriental Institute Museum, personal observation).

Some elongated beads of translucent brown glass have a white central trail applied [Fig. 5:21]. Interestingly, such long beads with a central white trail are displayed in women's necklaces on painted plaster masks from Egypt (Walker 2000: Cat. Nos 137, 141–142, about AD 100).

A late Roman cylindrical black, rod-formed, wound pendant fragment with centrally placed loop or loops, now broken off, was trail-decorated. The yellow trail was spirally applied in straight lines around the ends with a diagonal line in the center [Fig. 5:20]. It measured 6.4 mm in diameter and 17.44 mm in preserved length. Similar examples have been dated to the 4th century AD (Mandruzzato 2008: 79, No. 153; Spaer 2001: 102, Fig. 47).

Two outstanding objects are fragments of another type of 'eye' bead [Fig. 5:18, 19]. These are round, tabular eye beads composed of a translucent purple core, with a white round disk attached on both sides, and decorated with one large, purple glass dot in the center. Although no direct parallel has been found, the beads seem to be similar to one from Veshnaveh, Iran (Bagherpour Kashani 2014: 103, Plate 11, ChG 1847 and references) and they are an imitation

List of beads illustrated in *Fig. 5*, giving context, material and dimensions in mm
Abbreviations: W – width, L – length, T – thickness, D – diameter, HD – hole diameter

Egyptian/Middle Eastern glass

Rod-formed

1. *BE11-70/030/PB044*
T18.4, H24.3, HD3.5
2. *BE10-65/004/PB004*
D6.7, L6.8, HD1.3
3. *BE11-77/999/PB013*
D7, L6, HD2; 1.2
4. *BE10-58/003/PB003*
D7, L12, HD1.5; 2.8
5. *BE11-77/001/PB003*
W6.4, T4.2, L7.7, HD1.7
6. *BE10-59/004/PB032*
D6.9, L6.6, HD2.5
7. *BE10-59/001/PB015*
D6.6, L3, HD3.4
8. *BE10-59/999/PB011*
D4.7, L14.2, HD1.7
9. *BE10-59/004/PB032*
D13.2, L11, HD4.7
10. *BE10-59/999/PB011*
W5.6, T4.5, L9, HD2.5; 1
11. *BE10-59/001/PB008*
W6.4, T4.5, L8.5, HD1.8; 0.7
12. *BE10-59/001/PB018*
W7.4, T4.6, L10.2, HD2.4; 1.3
13. *BE10-59/002/PB020*
W16, T14.8, H11.7, HD6x4
14. *BE10-59/001/PB014*
D10.2, HD0.9
15. *BE11-73/002/PB002*
D8.6, L7.6, HD2.5
16. *BE11-999*
D7, L8, HD approx. 2
17. *BE11-76/999/PB021*
D7.7, L6.4, HD2.7
18. *BE10-59/001/PB015*
D8, T3.4, L5.8, HD1.5; 1.3
19. *BE10-59/001/PB007*
D6.6, L6.4, HD2.9
20. *BE10-59/999/PB011*
D6.4–8.1, L17.4-preserved, HD3.6
21. *BE11-78/003/PB004*
D6.7, L20, HD1.5
22. *BE10-59/002/PB019*
D8.2, L7.7, HD2.5; 3.2
23. *BE10-59/002/PB019*
D5.6, L6.3, HD1.0; 2.0
24. *BE09-57/008/PB018*
D6.5, L6.8, HD2.1; 2.7
25. *BE11-79/001/PB004*
D5.3, L5.1, HD0.8; 1.6
26. *BE11-74/004/PB006*
D6.6, L8.3, HD1.6; 2.3
27. *BE10-58/002/PB002*
D5.7, L12.2, HD1.6
28. *BE10-59/001/PB009*
D5.7, L5.6, HD1.5; 1.8
29. *BE12-84/008/PB020*
D5.4, L4.3, HD1.3; 1.9

Rod-pierced

30. *BE10-59/001/PB017*
D3.4, L3.7, HD1.4; 1.9
31. *BE10-59/001/PB001*
D5.1, L5.1, HD1.4; 2.1
32. *BE10-59/001/PB008*
D3.3, L3.0, HD1.7
33. *BE10-59/001/PB018*
D6.0, L6.1, HD1.8; 2.1
34. *BE10-59/001/PB016*
T4.8, H6.3-preserved, HD0.9
35. *BE10-59/001/PB007*
D5.6, L4.1, HD1.0; 1.5
36. *BE10-59/001/PB007*
D3.8, L3.7, HD1.6; 2.0
37. *BE10-59/004/PB032*
W9.0, T3.5, L7.7, HD1.7; 2.5
38. *BE10-59/999/PB011*
W7.4, T4.1, L7.0, HD1.2; 2.3
39. *BE10-58/002/PB002*
W9.0, T3.6, L9.0, HD1.7
40. *BE12-80/006/PB018*
W11.3, T6.0, L10.1, HD1.5; 2.0
41. *BE12-80/006/PB018*
W10.7, T4.3, L11.4, HD 1.2; 2.0
42. *BE10-58/002/PB002*
D5.4, L8.6, HD1.8; 2.5

EGYPT



Fig. 5. Beads of Egyptian/Middle Eastern glass: 1–29 – rod-formed; 30–42 – rod-pierced (Photos J. Then-Obluska)

of objects known from Persian assemblages (Stöllner, Slotta, and Vatandoust 2004: 675, Cat. 291d “Parthisch/sassanidisch”).¹⁹

Folded glass: monochrome

Many of the **late Roman** monochrome glass beads from Berenike seem to be folded and marvered into biconical shapes. Among them are short-, standard- and long bicones [Fig. 5:22, 23], as well as oblates.

Folded glass: bichrome and polychrome

Compared to their rod-pierced counterparts (compare below, Fig. 5:42), folded green-yellow ‘date beads’²⁰ [Fig. 5:26] were common finds in Egypt, including Alexandria and Berenike, as well as in Nubia, but they seldom occurred elsewhere (Lankton 2003: 58; Kucharczyk 2011a: 66, Fig. 8:9 folded ‘date bead’ from Alexandria, from a layer dated to the 2nd–3rd century AD; Francis 2002b: 15, Fig. 1; Arveiller-Dulong and Nenna 2011: 176, Cat. 224.4; Spaer 2001: 102, 111–112, Cat. 160a–c, 161, early 2nd century AD; Winter 2013: 19, Fig. 3:2 for late Roman and Byzantine period examples).

Zone beads are mosaic strips with central white bands. They were simply folded around a rod, which resulted in a visible, single longitudinal seam. A few such beads were found in **early** Berenike contexts [Fig. 5:24] (Zych 2011: 145, Cat. Nos 68a–e, 69). They are usually dated to the 1st–2nd century AD and can be found as far as the Black Sea (Alekseeva 1978: Fig. 27:3) and Taxila in Pakistan (Beck 1941: Fig. IX:29, 1st century AD blue and white bead).

A blue bead with central white trail was made by folding a decorated glass strip [Fig. 5:25]. From early Berenike comes a colorful striped mosaic strip folded into elongated beads [Fig. 5:27]. Similar examples were recorded from early Roman contexts (Lankton 2003: 65, Fig. 7.2; Alekseeva 1978: Fig. 27). A mosaic strip with red background and white-bordered black eyes was folded into a globular bead [Fig. 5:29]. Similar beads have been dated to the 1st–2nd century AD.

A few **late Roman** Berenike beads were made of folded purple strips decorated with an irregularly and deeply applied white trail [Fig. 5:28] (see Stöllner, Slotta, and Vatandoust 2004: 675, Cat. 290g for a similar bead from Parthian/Sassanid Persia).

Rod-pierced glass

Rod-pierced glass: monochrome

Oblate transparent beads, made by rod-piercing followed by folding, are found in **early** Berenike levels (*BE11-74/004/PB006*) and are a common type at Nubian Sai in the Meroitic period, the 1st–3rd century AD (personal observation).

Many glass blobs, most probably pierced and then folded around a rod, were found dating to the **late Roman** phase. They could be shaped into oblates [Fig. 5:31] or additionally marvered (i.e., pressed onto a flat surface) resulting in biconical, and square biconical shapes. A similar translucent, purple bicone found at Qustul was dated to the late 4th century (about AD 370/380–410) (Chicago, The Oriental Institute Museum, Inv. OIM 20257, personal observation).

¹⁹ For a Persian tabular glass eye bead, see van der Sleen 1973: 66, Pl. II, Fig. 21.

²⁰ They look rather like lotus buds as observed on New Kingdom faience objects (e.g., Friedman 1998: 86).

Among faceted glass beads at Berenike, the ‘cornerless cube’ (a shape made up of four faceted lozenges and eight triangles) is the most common [*Fig. 5:30, 32*]. Cornerless cube beads were made using many techniques (they could be wound or rod-pierced, folded and marvered) and in a variety of colors, mostly in dark blue, purple, and green. They have been found in deep blue or green colors at numerous excavations, obviously imitating precious stone. Many are found interspersed on gold chains (Spaer 2001: 74, Cat. 48–49). In Lower Nubia, glass ‘cornerless cubes’ appeared in the Meroitic period (Williams 1991a: *Fig. 47c,f*; Part 2, *Fig. 63 b,s*; Dunham 1963: *Fig. S-VIIIe*) and their use continued into the next few centuries (Brunton 1930: *Fig. 40:50*; Arveiller-Dulong and Nenna 2011: Cat. Nos. 224:15, 230:4, 244–245, 246–247; Woolley and Randall-MacIver 1910: *Fig. 40:8010, 7837, 7868, 7826B, 7766*, Boston, Museum of Fine Arts, Inv. 42.14). Opaquered “rectangular beads with a square cross-section and chamfered corners” were found with a 4th century AD Axum burial (Harlow 2000: *Fig. 64k,l*).

Among rod-pierced pendants, a fragment of one blue glass tear-drop was preserved [*Fig. 5:34*]. Such rod-pierced glass pendants can be observed in the post-Meroitic Nobadian repertoire (Then-Obluska forthcoming b).

Rod-pierced glass: bichrome and polychrome

The term ‘flower’ bead represents rod-pierced and marvered mosaic cane sec-

tions.²¹ They are tabular and rounded or heart-shaped, slightly compressed at the point of perforation. One with a red center and irregular radial, crowded white and blue petals has been found in an early Berenike context [*Fig. 5:39*].²²

Face beads, which are mosaic beads with a human portrait,²³ are represented by two tabular²⁴ rod-pierced mosaic cane sections [*Fig. 5:40, 41*]. Many beads with face²⁵ designs are found throughout the ancient world and they are usually dated to about the 1st century AD (e.g., Alekseeva 1982: Pl. 48; Arveiller-Dulong and Nenna 2011: 177 and references; Bianchi and Schlick-Nolte 2002: 149–150, EG-34-bis a–h; Spaer 2001: 124 and references; Dunham 1957: Beg. N.XV, *Fig. 89, 21-12-130d*, MFA 21.12473.4; Beg. N.XV, *Fig. 89, 21-12-129b-2*, MFA 24.764; 1963: Tomb Beg. W 165b, 23.788; Woolley and Randall-MacIver 1910: 75; Lankton 2003: 57, *Fig. 6.7* and references; Stern and Schlick-Nolte 1994: 414–415, No. 155-6; Goldstein 1979: 274, No. 820; Cooney 1976: 138, Cat. 1711; Haerincx 2001: Pl. 116:212; Nenna 1999: 186; Antonini 1999: 64, *Fig. 19*; Antonini de Maigret 2012: *Fig. 98* Barâqish, Yemen, temple of Nakrah; Dubin 2009: 60–61; Witecka 1994: 80–81, Pls II:12, V:1; Manzo 2005: 54, *Fig. 8*; Säve-Söderbergh 1981: Pl. 97:4; Buljević 2002: 318, Cat. 7, tabular face bead found in one of the few not looted graves in the Western necropolis in Split, Archaeological Museum in Split, No. 19). A necklace made from rod-pierced tabular mosaic face beads was found with

²¹ For the difference in the terms mosaic and millefiori glass, see Spaer 2001: 312–313.

²² For other early Roman patterns of so-called flower beads, see Then-Obluska 2014b.

²³ For different ‘theater mask’ glass, see Mahnke 2008 and, e.g., Antonaras 2012: Cat. 472–474.

²⁴ For spherical beads with mosaic face strips, see, e.g., Arveiller-Dulong and Nenna 2011: 177 and references.

²⁵ For interpretation of face beads, including a Medusa head, see, e.g., Lankton 2003: 57; Liu 2014.

an 8–10-year-old boy's burial at Meroe, Nubia (Dunham 1963: Fig. 108 J, Tomb Beg. W308, No. 27, 23.830b, SNM 2167; Kormyševa 2006: 199, Cat. No. 200). A weathered face bead is illustrated from Veshnaveh, Iran (Bagherpour Kashani 2014: Pl. 9, ChG 1115a). An outstanding mosaic bead made of local glass, featuring a woman's face was found in early Kushan (1st century BC–2nd century AD) Bara, Pakistan (Dussubieux and Gratuze 2003: 317–319, Fig. 277d–f). There are also some mosaic face beads found in 4th century AD contexts in Europe (Lankton 2003: 57 and references) and in Nubia (Säve-Söderbergh 1981: Pl. 97:4). However, in the last case this may be a reused Meroitic item.

Rod-pierced 'date beads', which are counterparts to the folded type mentioned above, occur both in early and late contexts (compare above and below). The early Berenike bead was made by drawing a delicate mosaic pattern of lengthwise yellow, green and purple trails. Most probably it was rod-pierced when hot, since the perforation on the polychrome end has slightly moved. A yellow strip was added at one end [Fig. 5:42].

The **late Roman** Berenike examples of white banded mosaic strips could have been rod-pierced and then folded around the rod [Fig. 5:33], resulting in two seams that are discernible next to the larger perforation opening.

Examples of double toned, multiple striped mosaic beads from late Berenike were rod-pierced. They were marvered

into small bicones or barrels with stripes of white and blue [Fig. 5:36], or white and purple color [Fig. 5:35]. Striped rod-pierced beads were recorded at Egyptian sites (Boston, Museum of Fine Arts 02.818 Abydos, Roman Imperial Period, 30 BC–AD 364; Meyer 2014: 83, Fig. 40 l, Pl. 34c Bir Umm Fawakhir, 5th–6th century AD). They were also found in the Nobadian grave at Qustul cemetery, which is dated to AD 370/380–410 (Then-Obłuska forthcoming b).

'Flower' beads with a red-bordered yellow or white center were found in late Berenike contexts [Fig. 5:38]. The type with radial petals in yellow and green [Fig. 5:37] was also found at Lower Nubian sites dated mainly to the mid and late 4th century AD: at Wadi Qitna (Strouhal 1984: 225, Fig. 152, P 3027, mid-4th century AD, that is, about AD 330/340–370/380), Qustul (Williams 1991b: 143 and 300c, late 4th century, that is, about AD 370/380–410), Ballaña (Williams 1991a: 235, Fig. 48,h, although published as Meroitic, the beads are from the post-Meroitic period reuse of the grave, Williams 1991b: 401), as well as at Bagawat in Kharga Oasis (New York, Metropolitan Museum of Art, Accession Number 31.8.6, 4th–7th century) and late Roman Gurob in the Fayum (London, Petrie Museum UC58113).

A few rod-pierced green-yellow 'date beads' were recorded from a **late Roman** rubbish dump (e.g., BE10-59/001/003). Similar specimens have been recorded at Bir Umm Fawakhir (Meyer 2014: 83, Fig. 40m–n, Pl. 34b).

DISCUSSION

The rich bead assemblage that was excavated at Berenike in the 2009–2012 seasons demonstrates not only a wide range

of short- and long-distance contacts, but also confirms the diversity of a cosmopolitan port society, and the intense inter-

actions of Berenike with her neighbors in the early and late periods.

Preliminary results suggest that the patterns from the **Ptolemaic** period may be slightly different, comprising overwhelming quantities of faience beads, some Egyptian and a few Indo-Pacific glass beads. Moreover, Eastern Desert agate beads with sawing traces, an ostrich eggshell disk, the Red Sea worked shell, and the Zabargad peridot were also recorded. The presence of assorted marine and terrestrial organics, stones and semi-precious stones in the bead assemblage points to the substantial influence of the Red Sea and the Arabian Sea coastal and inland desert dwellers in all periods of Berenike occupation. Agatharchides of Cnidus, writing in the 2nd century AD, mentioned Ichthyophagoi, Elephantophagoi, Kreophagoi, Rhizophagoi, Spermaphagoi, Strouthophagoi and Troglodytes as Eastern Desert dwellers (Burstein 1989). Their contacts with port communities sites are confirmed not only in the written sources (Tomber 2005; Thomas 2007; Nalesini 2012), but also in the dispersion of their regional products. Taking under consideration their names, they must have had access to diverse natural resources and geographic spaces, which they most probably shared (Nalesini 2012: 77). Interestingly, Troglodytes were associated in the sources with the discovery of peridot at Zabargad Island (Pliny, *NH* 37.32). Troglodytes traded gems and carbuncles or carnelian were traded by the Garamantes (Wilson 2012: 416). Turtle shell was associated in textual sources with the activity of a Red Sea littoral society, the Ichthyophagoi (*Peripl. M. Eryth.* 4), who brought it to Adulis, a principal mart for the Troglodytes (Pliny,

NH 6.34). Moreover, the Ichthyophagoi provided fish to inland Roman desert sites (Thomas 2007: 151) and most probably also seashells, which were worn as amulets by Troglodyte women (Nalesini 2012: 77). It might have been both the coastal Ichthyophagoi and Troglodyte middlemen who were responsible for providing the ports in Adulis, Berenike and Quseir with live turtles or turtle shells.

This maritime-derived material culture is shared not only by the Red Sea (Hamilton-Dyer 2011a; Thomas 2007), but also by Arabian Sea coastal sites. Worked seashell disks, short cylinders and cones from the **early Roman** bead assemblages in the Red Sea ports are almost lacking in those recorded from the Nile Valley, but they are especially characteristic along the South Arabian Peninsula in Yemen and Oman, at sites which have attested maritime contacts with Indians, Parthians, and Romans during the period we are concerned with here. In addition lens-shaped garnet beads have been recognized at Berenike and in Yemen, and pearls are said to have come from the Persian Gulf (Casson 1989: 85). On the other hand, many of the Eastern Mediterranean/Egyptian glass beads can be recognized from Arabian sites (e.g., De Maigret and Antonini 2005; De Waele 2007; Corboud et al. 1996; Morrison 1991; Jasim 2006). Last but not least, the presence of South Arabian pottery at Berenike (Tomber 2008; 2011; 2012), and a papyrus letter to a mother at Berenike from her son who was returning from Arabia, would confirm the on-going contacts between Arabia and Berenike (Sidebotham and Wendrich 2002: 41).

There is only one mention in literary sources indicating that glass beads were

most probably part of an overseas trade at this time, and that they were destined for local inhabitants. According to the *Periplus Maris Erythraei* (6), Adulis was a market for articles destined not only for the local dwellers (called Barbaroi) and the resident foreign merchants, but also for the king. "...numerous types of glass stones [probably beads?] and also of glass in many colors of the kind produced in Diospolis...; copper honey pans for ... cutting up into armlets and anklets for certain of the women..." seem to be intended for the local dwellers. According to Eivind Heldaas Seland (2010: 36), this text attests to a lively Adulis trade in everyday articles such as glass beads and inexpensive jewelry. However, "glass stones" could be interpreted as glass canes and ingots which would pass through Berenike's port before reaching overseas markets. Although Alexandria is reputedly a source of mosaic glass in the early Roman period, Diospolis Magna was another possible candidate. These early Roman mosaic glass beads have been found throughout the Roman world and far beyond (e.g., Then-Obluska 2014b). While early Kushan Bara glass beads and other (Dussubieux and Gratuze 2003; Liu et al. 2012; Lin 2010: 209) could not be confirmed from Berenike simply by macroscopic study, the Sri Lankan/South Asian monochrome drawn bead has been laboratory-evidenced at Red Sea Quseir (Then-Obluska and Dussubieux forthcoming).

According to Appian of Alexandria (2nd century AD), Palmyrene traders brought Indian and Arabian goods from the Persians and distributed them in Roman territory (Parker 2008: 182). Parallels for glass pendants, similar to the over-fired remains found at Berenike,

come from Roman and early Byzantine Palestinian and Syrian burial sites, including Palmyra. There is evidence of Palmyrene activity at the Berenike site at the beginning of the 3rd century AD (Sidebotham, Hense, and Nouwens 2008: 137–139, 354; Sidebotham 2011: 74).

The distribution of Sasanian objects in the **late Roman** period might have been partly in Arabian hands (Power 2012). Although no direct parallel has been found for glass tabular white and purple "eye" beads, they seem to be imitations of objects known from Iranian bead assemblages (Stöllner, Slotta, and Vatandoust 2004: 675, Cat. 291d, "Parthisch/sassanidisch"). Similar stone "cat's eye" onyx inlays were used as eyes in the gold terminal of a bull's head (H. 6 cm, W. 4.1 cm, Th. 2.7 cm) and in gold roundels as seen in the British Museum's Yemeni collection (Simpson 2002: 122, Cat. 137). Nevertheless, similar glass beads were found from Veshnaveh, Iran (Bagherpour Kashani 2014: Pl. 11, ChG 1847). While pottery and a few cut glass fragments found at Berenike indicate the presence of Sasanian objects (R. Tomber, personal communication; Kucharczyk 2011b: 110, Cat. Nos 69, 70, Figs 9–31, 32), the Sasanian provenance of the above-mentioned glass beads should be treated with caution. Nevertheless, the bead made of Sasanian glass as found at Quseir (Then-Obluska and Dussubieux forthcoming) and the find of an 'etched' carnelian bead in a late 4th–5th century burial in the Nubian Fourth Cataract region provide some evidence of contacts between Northeast Africa and Iran (Then-Obluska 2013a).

Many types of beads and pendants found at Berenike would support the idea of close contacts between the Nubian Nile

Valley and Berenike during the late period. Finds of ostrich eggshell beads as well as Red Sea mollusk shells and coral beads and pendants in **late Roman** Berenike contexts can be associated with the activity of Eastern Desert dwellers between the Nile and the Red Sea coast. At this time the high percentage of ostrich eggshell beads and seashell pendants at Berenike is comparable with Nubian Nile Valley assemblages (Then-Obłuska 2014a). Ostrich eggshell beads are especially common in burials ascribed to Nobadians and Blemmyes (Then-Obłuska forthcoming b). Textual sources attest to intensive diplomatic contacts between the Blemmyes and their neighbors (e.g., Updegraff 1988; Dijkstra 2005; Obłuski 2013; 2014). The Blemmyan Eastern Desert dwellers seem to have been excellent at playing the role of middlemen between the Nobadian Nile Valley and cosmopolitan Berenike. Their pottery, the so-called Eastern Desert Ware, is recorded in all the strategic regions: the Red Sea ports, the Eastern Desert and the Nile Valley up to the Fourth Cataract region (Barnard 2008). They played an important role in the Red Sea trade centered on the harbor of Berenike (Dijkstra 2005: 48). For example, their association with an Alexandrian merchant is recorded in the *Historia Augusta* (Firmus, 3.3), which recounts that in the second half of the 3rd century AD, Firmus, a wealthy merchant from Alexandria, made his money in the Red Sea 'Indian trade' and was rumored to have contacts among the Blemmyes (Power 2012: 24). According to Olympiodorus of Thebes, they controlled the emerald mines at Mons Smaragdus, and later on they provided the 'Ethiopians' with emeralds for their trade with India. The Blemmyes served as guides for those passing from

Nobadia through Makuria's desert terrains (Then-Obłuska 2013a). Therefore, the presence of some stone and glass bead types, seashell pendants and ostrich eggshell beads at late Berenike and at Nubian sites is not surprising, and most probably was a result of Blemmyan activity between the Red Sea coastline and the Nile Valley. The Blemmyes may also be responsible for providing the Nubian Nile Valley dwellers with stone and glass beads which are said to be of Asian provenance.

Stone beads drilled from both ends became more common in **late Roman** Berenike and Nubia. They might have been perforated with diamond chip drills, a technology of Indian origin (Kenoyer 2003). Indo-Pacific drawn glass beads have been recognized at many sites on the maritime routes along the African and Arabian coastlines to India and far beyond (e.g., Francis 2002a; Lischi and Pavan 2012; Jiayao 2000; Lin 2010: 208; Brabänder 2010 and references). Judging from the Nile Valley and Eastern Desert bead assemblages, there must have been a great demand for glass beads in the late Roman period (Francis 2000; 2002a; 2007; Then-Obłuska 2014a). Although glass bead workshops are known from late Roman Alexandria, some glass fragments and manufacturing debris suggest local bead production at Berenike. Nevertheless, late Roman and early Byzantine glass bead assemblages in Berenike and late Roman Marsa Nakari are dominated by possible Indo-Pacific beads. At Berenike some of them were found originally strung as uniform necklaces and their fragments. They might also have been imported and distributed in this way.

It has been recognized that Indian craft techniques were used on both

locally available and Indian materials at Berenike and Myos Hormos (Sidebotham 2011: 261–262). As literary sources and archaeological remains prove, ports were the place for many types of foreign trade diasporas with residents marrying abroad or settling to carry on trade or work in the crafts (Tomber 2008: 223; Seland 2010; 2012; 2013; 2014). The transfer of craftsmen has been suggested for specializations like elephant trainers or iron smelters (Haaland 2013: 152; 2014). Indian craftsmen and influences seem to be involved in the building projects of

Meroitic Nubia, where reliefs of Indian-inspired, hybrid depictions of the local Meroitic lion god, Apedemak, can be observed (Haaland 2013: 152; 2014). According to Peter Francis (2002a; Howard 2012), glass bead makers from Arikamedu moved along the Indo-Pacific maritime routes. The question is if they could have been present at Berenike and involved with the production of monochrome drawn and rounded glass beads. No evidence for this has yet been found so it appears likely that these beads were imported.

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REFERENCES

PRIMARY SOURCES:

- Agatharchides of Cnidus, *On the Erythraean Sea*, transl. by S. M. Burstein, London: Hakluyt Society, 1989.
- Periplus Maris Erythraei*, text with introduction, translation, and commentary by L. Casson, Princeton, NJ: Princeton University Press, 1989.
- Pliny the Elder, *The natural history of Pliny* I–VI, transl. by J. Bostock and H. T. Riley, London: Henry G. Bohn, 1855–1857.

SECONDARY SOURCES:

- Adams, C. E. P. (2007). *Land transport in Roman Egypt: A study of economics and administration in a Roman province*. Oxford: Oxford University Press.
- Alekseeva, E. M. (1975). *Antičnye busy severnogo Pričernomor'â I* [*Ancient beads of the northern Black Sea I*]. Moscow: Izdatel'stvo "Nauka" [in Russian].
- Alekseeva, E. M. (1978). *Antičnye busy severnogo Pričernomor'â II* [*Ancient beads of the northern Black Sea II*]. Moscow: Izdatel'stvo "Nauka" [in Russian].
- Alekseeva, E. M. (1982). *Antičnye busy severnogo Pričernomor'â III* [*Ancient beads of the northern Black Sea III*]. Moscow: Nauka [in Russian].
- Antonaras, A. (2012). *Fire and sand: Ancient glass in the Princeton University Art Museum*. Princeton, NJ: Princeton University Art Museum.
- Antonini, S. (1999). Statuettes from the excavations of the temple of Nakrah (Temple A) at Barâqish (Republic of Yemen). *Arabian Archaeology and Epigraphy*, 10(1), 58–68.
- Antonini de Maigret, S. (2012). *South Arabian art: Art history in pre-Islamic Yemen* [= *Orient & méditerranée* 10]. Paris: De Boccard.
- Arveiller-Dulong, V., and Nenna, M.-D. (2011). *Les verres antiques du Musée du Louvre III. Parures, instruments et éléments d'incrustation*. Paris: Somogy.
- Aschenbrenner, T. G. (1997). Glasperlenherstellung — wie könnte sie vor sich gegangen sein? In U. von Freeden and A. Wiczorek (Eds.), *Perlen. Archäologie, Techniken, Analysen. Akten des Internationalen Perlensymposiums in Mannheim vom 11. bis 14. November 1994* [= *Kolloquien zur Vor- und Frühgeschichte* 1] (pp. 315–320). Bonn: R. Habelt.
- Bagherpour Kashani, N. (2011). *Studies of ancient depositional practices and related jewellery finds, based on the discoveries at Veshnaveh a source for the history of religion in Iran* (unpubl. Ph.D. diss.). Ruhr University Bochum.
- Barnard, H. (2008). *Eastern desert ware: Traces of the inhabitants of the eastern deserts in Egypt and Sudan during the 4th–6th centuries CE* [= *BAR IS* 1824]. Oxford: Archaeopress.
- Bates, O., and Dunham, D. (1927). Excavations at Gammai. In E. A. Hooton and N. I. Bates (Eds.), *Varia Africana IV* [= *Harvard African Studies* 8] (pp. 1–121). Cambridge, MA: Peabody Museum of Harvard University.
- Beck, H. C. (1928). I. Classification and nomenclature of beads and pendants. *Archeologia (Second Series)*, 77, 1–76.
- Beck, H. C. (1941). *The beads from Taxila*. Delhi: Manager of Publications.

- Beck, H. C. (1944). Report no. 134. In G. Caton-Thompson, *The tombs and Moon temple of Hureidha (Hadhramaut)* [=Reports of the Research Committee of the Society of Antiquaries of London 13] (pp. 96–101). Oxford: Society of Antiquaries, London.
- Bianchi, R. S., and Schlick-Nolte, B. (2002). Catalogue of ancient Egyptian glass objects. In R. S. Bianchi (Ed.), *Reflections on ancient glass from the Borowski Collection: Bible Lands Museum Jerusalem* (pp. 123–156). Mainz am Rhein: Philipp von Zabern.
- Brabänder, K. (2010). Southeast Asia: Platform of early glass trade. In B. Zorn and A. Hilgner (Eds.), *Glass along the Silk Road: From 200 BC to AD 1000. International conference within the scope of the “Sino-German Project on Cultural Heritage Preservation” of the RGZM and the Shaanxi Provincial Institute of Archaeology, December 11th–12th 2008* (pp. 143–152). Mainz: Verlag des Römisch-Germanischen Zentralmuseums.
- Brunton, G. (1930). *Qau and Badari III*. London: British School of Archaeology in Egypt.
- Buljević, Z. (2002). Toaletni i nakitni oblici [Some cosmetic and jewellery items]. In E. Marin (Ed.), *Longae Salonae I* (pp. 313–326). Split: Arheološki Muzej [in Croatian].
- Carter, R. (2005). The history and prehistory of pearling in the Persian Gulf. *Journal of the Economic and Social History of the Orient*, 48(2), 139–209.
- Chéhab, M. (1986). Fouilles de Tyr. La necropole IV. *Bulletin du Musée de Beyrouth*, 36, 1–268.
- Cooney, J. D. (1976). *Catalogue of Egyptian antiquities in the British Museum IV. Glass*. London: British Museum Publications.
- Corboud, P., Castella, A.-C., Hapka, R., and im Obersteg, P. (1996). *Les tombes protohistoriques de Bithnah: Fujairah, Emirats Arabes Unis*. Mainz am Rhein: Philipp von Zabern.
- Curtis, J. (1984). *Nush-i Jan III. The small finds*. London: British Institute of Persian Studies.
- da Cruz, M. (2009). Black glass jewellery from Bracara Augusta. In K. Janssens, P. Degryse, P. Cosyns, J. Caen, and L. Van’t dack (Eds.), *Annales du 17^e Congrès de l’Association internationale pour l’histoire du verre* (pp. 96–102). Antwerp: University Press Antwerp.
- De Maigret, A., and Antonini, S. (2005). *South Arabian necropolises: Italian excavations at Al-Makhdarah and Kharibat al-Ahjur (Republic of Yemen)*. Rome: Istituto italiano per l’Africa e l’Oriente.
- De Waele, A. (2007). The beads of ed-Dur (Umm al-Qaiwain, UAE). *PSAS*, 37, 297–308.
- Dijkstra, J. H. F. (2005). *Religious encounters on the southern Egyptian frontier in Late Antiquity (AD 298–642)*. Groningen: Rijksuniversiteit Groningen.
- Drauschke, J. (2010). Byzantine jewellery? Amethyst beads in East and West during the Early Byzantine Period. In C. Entwistle and N. Adams (Eds.), *Intelligible beauty: Recent research on Byzantine jewellery* (pp. 50–60). London: British Museum Press.
- Dubin, L. S. (2009). *The history of beads: From 100,000 B.C. to the present* (rev. and expanded ed.). New York: Abrams.
- Dunham, D. (1957). *Royal tombs at Meroë and Barkal* [=Royal Cemeteries of Kush 4]. Boston: Museum of Fine Arts.
- Dunham, D. (1963). *The west and south cemeteries at Meroë* [=Royal Cemeteries of Kush 5]. Cambridge, MA: Harvard University Press.
- Dussubieux, L., and Gratuze, B. (2003). Nature et origine des objets en verre retrouvés à Begram (Afghanistan) et à Bara (Pakistan). In O. Bopearachchi, C. Landes, and C. Sachs (Eds.),

- De l'Indus à l'Oxus: archéologie de l'Asie centrale* (pp. 315–323). Lattes: Association imago-musée de Lattes.
- Dussubieux, L., and Gratuze, B. (2013). Glass in South Asia. In K. Janssens (Ed.), *Modern methods for analysing archaeological and historical glass I* (pp. 399–413). Chichester: John Wiley & Sons Ltd.
- Eger, C., and Khalil, L. A. (2013). Bead jewellery of Late-Roman and Byzantine time in the province of Arabia: The beads and pendants of glass, stone, and organic materials from the rock chamber necropolis at Khirbat Yajuz, Jordan. *Zeitschrift für Orient-Archäologie*, 6, 156–181.
- Emery, W. B., and Kirwan, L. P. (1938). *The royal tombs of Ballana and Qustul*. Cairo: Government Press.
- Evans, J. (1922). *Magical jewels of the Middle Ages and the Renaissance, particularly in England*. Oxford: Clarendon Press.
- Finlay, V. (2006). *Jewels: A secret history*. New York: Ballantine Books.
- Francis Jr., P. (2000). Human ornaments. In S. E. Sidebotham and W. Z. Wendrich (Eds.), *Berenike 1998: Report of the 1998 excavations at Berenike and the survey of the Egyptian Eastern Desert, including excavations at Wadi Kalalat* (pp. 211–225). Leiden: Research School of Asian, African, and Amerindian Studies (CNWS).
- Francis Jr., P. (2002a). *Asia's maritime bead trade: 300 B.C. to the present*. Honolulu: University of Hawai'i Press.
- Francis Jr., P. (2002b). Beads. In J. L. Bacharach (Ed.), *Fustat finds: Beads, coins, medical instruments, textiles, and other artifacts from the Awad collection* (pp. 12–31). Cairo: American University in Cairo Press.
- Francis Jr., P. (2007). Personal adornments. In S. E. Sidebotham and W. Z. Wendrich (Eds.), *Berenike 1999/2000: Report on the excavations at Berenike, including excavations in Wadi Kalalat and Siket, and the survey of the Mons Smaragdus Region* (pp. 251–257). Los Angeles, CA: Cotsen Institute of Archaeology, University of California, Los Angeles.
- Friedman, F. D. (Ed.). (1998). *Gifts of the Nile: Ancient Egyptian faience*. New York: Thames and Hudson.
- Gan, F., Huangsheng, C., Yongqing, H., Bo, M., and Donghong, G. (2009). Study of the earliest eye beads in China unearthed from the Xu Jialing Tomb in Xichuan of Henan Province. In F. Gan, R. H. Brill, and S. Tian (Eds.), *Ancient glass research along the Silk Road* (pp. 457–470). New Jersey: World Scientific.
- Goldstein, S. M. (1979). *Pre-Roman and early Roman glass in the Corning Museum of Glass*. Corning, NY: Corning Museum of Glass.
- Gwiazda, M. (forthcoming). Working turtle shell on the fringes of the Mediterranean world. Waste products and finished objects from Berenike and Sikait. In S. E. Sidebotham and I. Zych (Eds.), *Berenike 2010–2011. Report on two seasons of excavations at Berenike, including survey in the Eastern Desert and reports on earlier work [=PCMA Excavation Series 4]*. Warsaw: PCMA UW.
- Haaland, R. (2013). Iron working in an Indian Ocean context. In J. Humphris and T. Rehren (Eds.), *The world of iron* (pp. 146–155). London: Archetype Publications.

- Haaland, R. (2014). The Meroitic Empire: Trade and cultural influences in an Indian Ocean context. *African Archaeological Review*, 31(4), 649–673.
- Haerincq, E. (1998). International contacts in the southern Persian Gulf in the late 1st century B.C./1st century A.D.: Numismatic evidence from Ed-Dur (Emirate of Umm Al-Qaiwain, U.A.E.). *Iranica Antiqua*, 33, 273–302.
- Haerincq, E. (2001). *Excavations at ed-Dur (Umm al-Qaiwain, United Arab Emirates) II. The tombs*. Leuven: Peeters.
- Hamilton-Dyer, S. (2001). Objects of bone, horn and shell. In V. A. Maxfield and D. P. S. Peacock, *Mons Claudianus: Survey and excavation, 1987–1993*, II.1. *Excavations* [=FIFAO 43] (pp. 356–368). Cairo: Institut français d'archéologie orientale.
- Hamilton-Dyer, S. (2007). Worked bone, ivory and shell. In D. Peacock and V. A. Maxfield, *The Roman Imperial quarries: Survey and excavation at Mons Porphyrites, 1994–1998*, II. *The excavations* (pp. 337–354). London: Egypt Exploration Society.
- Hamilton-Dyer, S. (2011a). Worked faunal materials. In D. P. S. Peacock and L. K. Blue (Eds.), *Myos Hormos — Quseir al-Qadim: Roman and Islamic ports on the Red Sea II. Finds from the excavations 1999–2003* [=BAR IS 2286] (pp. 155–166). Oxford: Archaeopress.
- Hamilton-Dyer, S. (2011b). Faunal remains. In D. P. S. Peacock and L. K. Blue (Eds.), *Myos Hormos — Quseir al-Qadim: Roman and Islamic ports on the Red Sea II. Finds from the excavations 1999–2003* [=BAR IS 2286] (pp. 245–288). Oxford: Archaeopress.
- Harlow, M. (2000). Glass, beads and pendants. In D. W. Phillipson (Ed.), *Archaeology at Aksum, Ethiopia, 1993–7* [=British Institute in Eastern Africa Memoir 17] (pp. 337–342, 458–460). London: British Institute in Eastern Africa.
- Harrell, J. A. (1996). Geology. In S. E. Sidebotham and W. Z. Wendrich (Eds.), *Berenike 1995: Preliminary report of the 1995 excavations at Berenike (Egyptian Red Sea Coast) and the survey of the Eastern Desert* (pp. 99–126). Leiden: Research School CNWS, School of Asian, African, and Amerindian Studies.
- Harrell, J. A. (1998). Geology. In S. E. Sidebotham and W. Z. Wendrich (Eds.), *Berenike 1996: Report of the 1996 excavations at Berenike (Egyptian Red Sea Coast) and the survey of the Eastern Desert* (pp. 121–148). Leiden: CNWS.
- Harrell, J. A. (2007). Geology. In S. E. Sidebotham and W. Z. Wendrich (Eds.), *Berenike 1999/2000: Report on the excavations at Berenike, including excavations in Wadi Kalalat and Siket, and the survey of the Mons Smaragdus Region* (pp. 166–174). Los Angeles, CA: Cotsen Institute of Archaeology, University of California, Los Angeles.
- Harrell, J. A. (2010). Archaeological geology of Hosh el-Guruf, Fourth Nile Cataract, Sudan. *GAMAR*, 7, 71–84.
- Harrell, J. A. (2012). Gemstones. In W. Wendrich (Ed.), *UCLA Encyclopedia of Egyptology*. Retrieved from <http://digital2.library.ucla.edu/viewItem.do?ark=21198/zz002czx1r> [accessed: June 2014].
- Harrell, J. A., and Bloxam, E. (2010). Egypt's evening emeralds — peridot mining on Zabargad Island. *Minerva*, 21(6), 18–22.
- Harrell, J. A., Sidebotham, S. E., Bagnall, R. S., Marchand, S., Gates, J. E., and Rivard, J.-L. (2006). The Ptolemaic to early Roman amethyst quarry at Abu Diyeyba in Egypt's Eastern Desert. *BIFAO*, 106, 127–162.

- Henderson, J. (2013). *Ancient glass: An interdisciplinary exploration*. Cambridge: Cambridge University Press.
- Higuchi, T., and Izumi, T. (Eds.). (1994). *Tombs A and C: Southeast necropolis Palmyra, Syria, surveyed in 1990–92* [=Publication of Research Center for Silk Roadology 1]. Nara: Research Center for Silk Roadology.
- Howard, M. C. (2012). *Transnationalism in ancient and medieval societies the role of cross-border trade and travel*. Jefferson, NC: McFarland.
- Jasim, S. A. (2006). Trade centres and commercial routes in the Arabian Gulf: Post-Hellenistic discoveries at Dibba, Sharjah, United Arab Emirates. *Arabian Archaeology and Epigraphy*, 17(2), 214–237.
- Jiayao, A. (2000). Glass beads found at the Yongningsi Temple. *JGS*, 42, 81–84.
- Jyostna, M. (2000). *Distinctive beads in ancient India*. Oxford: Archaeopress.
- Kanungo, A. K., and Brill, R. H. (2009). Kopia, India's first glassmaking site: Dating and chemical analysis. *JGS*, 51, 11–25.
- Kenoyer, J. M. (2003). The technology of stone beads: Bead and pendant making techniques. In J. W. Lankton, *A bead timeline: A resource for identification, classification and dating I. Prehistory to 1200 CE* (pp. 14–19). Washington, DC: Bead Society of Greater Washington.
- Kormyševa, E. E. (2006). *Gods and divine symbols of the ancient Sudanese civilization: Catalogue of the Sudan National Museum in Khartoum*. Moscow: Institute of Oriental Studies.
- Kucharczyk, R. (2011a). Glass from Area F on Kom el-Dikka (Alexandria). Excavations 2008. *PAM*, 20, 56–69.
- Kucharczyk, R. (2011b). Glass. In S. E. Sidebotham and I. Zych (Eds.), *Berenike 2008–2009: Report on the excavations at Berenike, including a survey in the Eastern Desert* [=PCMA Excavation Series 1] (pp. 83–111). Warsaw: PCMA UW.
- Lankton, J. W. (2003). *A bead timeline: A resource for identification, classification and dating I. Prehistory to 1200 CE*. Washington, DC: Bead Society of Greater Washington.
- Lankton, J. W., Lee, I.-S., and Allen, J. D. (2005). Javanese (Jatim) beads in late fifth to early sixth-century Korean (Silla) tombs. In *Annales du 16^e Congrès de l'Association Internationale pour l'Histoire du Verre, London, 7–13 September, 2003* (pp. 327–330). Nottingham: AIHV.
- Lin, Y. (2010). A scientific study of glass finds from the Niya Oasis. In B. Zorn and A. Hilgner (Eds.), *Glass along the Silk Road: From 200 BC to AD 1000. International conference within the scope of the "Sino-German Project on Cultural Heritage Preservation" of the RGZM and the Shaanxi Provincial Institute of Archaeology, December 11th–12th 2008* (pp. 203–210). Mainz: Verlag des Römisch-Germanischen Zentralmuseums.
- Lischi, S., and Pavan, A. (2012). Le perle di Sumhuram: appunti per una tipologia di vaghi di collana dall'Arabia meridionale. *Egitto e Vicino Oriente*, 35, 175–192.
- Liu, R. K. (2014). Nubian mosaic face beads: The enigma of variations. *Ornament*, 37(5), 40–46.
- Liu, S., Li, Q.H., Gan, F., Zhang, P., and Lankton, J. W. (2012). Silk Road glass in Xinjiang, China: Chemical compositional analysis and interpretation using a high-resolution portable XRF spectrometer. *Journal of Archaeological Science*, 39(7), 2128–2142.

- Mahnke, C. (2008). *Alexandrinische Mosaikglaseinlagen: die Typologie, Systematik und Herstellung von Gesichterdarstellungen in der ptolemäischen Glaskunst* [=Philippika 22]. Wiesbaden: Harrassowitz.
- Malloy, A. G. (1974). *Egyptian scarabs*. New York: Alex G. Malloy.
- Mandrizzato, L. (Ed.). (2008). *Vetri antichi del Museo archeologico nazionale di Aquileia: ornamenti e oggettistica di età romana, vetro pre- e post-romano* [=Corpus delle collezioni del vetro nel Friuli Venezia Giulia 4]. Venice: Comitato nazionale italiano Association Internationale pour l'Histoire du Verre.
- Manzo, A. (2005). Aksumite trade and the Red Sea exchange network: A view from Bieta Giyorgis (Aksum). In J. Starkey (Ed.), *People of the Red Sea: Proceedings of Red Sea Project II, held in the British Museum, October 2004* [=BAR IS 1395] (pp. 51–66). Oxford: Archaeopress.
- Markowitz, Y. J. (2012). Nubian adornment. In M. M. Fisher, P. Lacovara, S. Ikram, and S. D'Auria (Eds.), *Ancient Nubia: African kingdoms on the Nile* (pp. 186–199). Cairo: American University in Cairo Press.
- Meyer, C. (1992). *Glass from Quseir al-Qadim and the Indian Ocean trade* [=SAOC 53]. Chicago: Oriental Institute of the University of Chicago.
- Meyer, C. (2014). Dipinti, coins, and small finds. In C. Meyer (Ed.), *Bir Umm Fawakhir III. Excavations 1999–2001* [=OIP 141] (pp. 77–90). Chicago: Oriental Institute of the University of Chicago.
- Morrison, H. M. (1989). The beads. In S. C. Munro-Hay, *Excavations at Aksum: An account of research at the ancient Ethiopian capital directed in 1972–4 by the late Dr. Neville Chittick* [=British Institute in Eastern Africa Memoir 10] (pp. 168–178). London: British Institute in Eastern Africa.
- Morrison, H. M. (1991). The beads and seals of Shabwa. Syria, 68(1), 379–392.
- Mouton, M. (2008). *La Péninsule d'Oman de la fin de l'Âge du Fer au début de la période sassanide, 250 av.–350 ap.* JC [=BAR IS 1776; Society for Arabian Studies Monographs 6]. Oxford: Archaeopress.
- Nalesini, O. (2012). Sacred places and beings of the Red Sea littoral societies. In D. A. Agius, J. P. Cooper, A. Trakadas, and C. Zazzaro (Eds.), *Navigated spaces, connected places: Proceedings of Red Sea Project V. Held at the University of Exeter, 16–19 September 2010* [=BAR IS 2346] (pp. 77–84). Oxford: Archaeopress.
- Nenna, M.-D. (1999). La verrerie. In P. Lombard (Ed.), *Bahreïn, la civilisation des deux mers: de Dilmoun à Tylos. Exposition présentée à l'Institut du monde arabe du 18 mai au 29 août 1999* (pp. 181–191). Paris: Institut du monde arabe.
- Nenna, M.-D. (2007). Production et commerce du verre à l'époque impériale: nouvelles découvertes et problématiques. *Facta. A Journal of Roman Material Culture*, 1, 125–147.
- Nenna, M.-D., Picon, M., Thirion-Merle, V., and Vichy, M. (2005). Ateliers primaires du Wadi Natrun : nouvelles découvertes. In *Annales du 16^e Congrès de l'Association Internationale pour l'Histoire du Verre, London, 7–13 September, 2003* (pp. 56–63). Nottingham: AIHV.
- Nenna, M.-D., Picon, M., and Vichy, M. (2000). Ateliers primaires et secondaires de verriers en Égypte à l'époque gréco-romaine. In M.-D. Nenna (Ed.), *La route du verre: ateliers primaires et secondaires du second millénaire av. J.-C. au Moyen Age* [=Travaux de la Maison de l'Orient

- 33] (pp. 97–112). Lyon: Maison de l’Orient Méditerranéen-Jean Pouilloux.
- Nicholson, P. T. (2002). Hellenistic/Roman faience production at Memphis, Egypt. In G. Kordas (Ed.), *Hyalos = Vitrum = Glass: History, technology and conservation of glass and vitreous materials in the Hellenic world* (pp. 141–145). Athens: Glasnet Publications.
- Nicholson, P. T. (2013). *Working in Memphis: The production of faience at Roman period Kom Helul* [=EES Excavation Memoirs 105]. London: Egypt Exploration Society.
- Obluski, A. (2013). Dodekaschoinos in Late Antiquity. Ethnic Blemmyes vs. political Blemmyes and the arrival of Nobades. *Der Antike Sudan*, 24, 141–147.
- Obluski, A. (2014). *The rise of Nobadia: Social changes in Northern Nubia in late Antiquity* [=JJP Supplement 20]. (I. Zych, Trans.). Warsaw: Raphael Taubenschlag Foundation.
- Parker, G. R. (2008). *The making of Roman India*. Cambridge: Cambridge University Press.
- Pellicer Catalán, M. (1963). *La necrópolis meroítica de Nag-Shayeg, Argín (Sudán)* [=Memorias de la Misión Arqueológica Española en Nubia 2]. Madrid: Dirección General de Relaciones Culturales.
- Petrie, W. M. F. (1888). *Tanis II. Nebesbeh (am) and Defenneh (Tahpanhes)* [=Egypt Exploration Fund Memoir 4]. London: Truebner.
- Petrie, W. M. F. (1927). *Objects of daily use: With over 1800 figures from University College, London*. London: British School of Archaeology in Egypt.
- Petrie, W. M. F., Brunton, G., and Murray, M. A. (1923). *Lahun II*. London: B. Quaritch.
- Pickworth, D. (2010). The hoard from the area 5. In J.-F. Salles and A. V. Sedov (Eds.), *Qāni’: le port antique du Hadramawt entre la Méditerranée, l’Afrique et l’Inde. Fouilles russes 1972, 1985–89, 1991, 1993–94* (pp. 293–306). Turnhout: Brepols.
- Potts, D. T. (1991). *Further excavations at Tell Abraq: The 1990 season*. Copenhagen: Munksgaard.
- Poulain, D., Scullier, C., and Gratuze, B. (2013). La parure en verre et en ambre de la nécropole mérovingienne de Saint-Laurent-des-Hommes (Dordogne). *Bulletin de l’Association Française pour l’Archéologie du Verre*, 2013, 72–79.
- Power, T. (2012). “You shall not see the tribes of the Blemmyes or of the Saracens”: On the other “barbarians” of Late Roman Eastern Desert of Egypt. In H. Barnard and K. Duistermaat (Eds.), *The history of the peoples of the Eastern Desert* (pp. 323–339). Los Angeles: Cotsen Institute of Archaeology Press.
- Price, J. (1992). Hellenistic and Roman glass. In L. H. Sackett, *Knossos: from Greek city to Roman colony. Excavations at the unexplored mansion II* [=British School at Athens Supplementary volume 21]. Athens: British School of Archaeology at Athens.
- Rądkowska, J. K., Sidebotham, S. E., and Zych, I. (2013). The late Roman harbor temple of Berenike. Results of the 2010 season of excavations. *PAM*, 22, 209–228.
- Richmond, M. D. (2011). *A field guide to the seashores of Eastern Africa and the Western Indian Ocean islands* (rev. 3rd ed.). Stockholm: SIDA.
- Rodziewicz, E. (2009). Ivory, bone, glass and other production at Alexandria, 5th–9th centuries. In M. M. Mango (Ed.), *Byzantine trade, 4th–12th centuries: The archaeology of local, regional and international exchange. Papers of the thirty-eighth Spring Symposium of Byzantine Studies, St John’s College, University of Oxford, March 2004* (pp. 83–95). Farnham: Ashgate Publishing.

- Rodziewicz, M. (1984). *Les habitations romaines tardives d'Alexandrie: à la lumière des fouilles polonaises à Kôm el-Dikka* [=Alexandrie 3]. Warsaw: Éditions Scientifiques de Pologne.
- Rodziewicz, M. (2005). *Elephantine XXVII. Early Roman industries on Elephantine* [=AV 107]. Mainz am Rhein: Philipp von Zabern.
- Rösch, C., Hock, R., Schüssler, U., Yule, P., and Hannibal, A. (1997). Electron microprobe analysis and X-ray diffraction methods in archaeometry: investigations on pre-Islamic beads from the Sultanate of Oman. *European Journal of Mineralogy*, 9, 763–783.
- Rusmore-Villaume, M. L. (2008). *Seashells of the Egyptian Red Sea: The illustrated handbook*. Cairo: American University in Cairo Press.
- Sablerolles, Y., Henderson, J., and Dijkman, W. (1997). Early medieval glass bead making in Maastricht (Jodenstraat 30), the Netherlands: An archaeological and scientific investigation. In U. von Freeden and A. Wiczorek (Eds.), *Perlen. Archäologie, Techniken, Analysen. Akten des Internationalen Perlensymposiums in Mannheim vom 11. bis 14. November 1994* [=Kolloquien zur Vor- und Frühgeschichte 1] (pp. 293–313). Bonn: R. Habelt.
- Säve-Söderbergh, T. (1981). *Late Nubian cemeteries* [=Scandinavian Joint Expedition to Sudanese Nubia 6]. Copenhagen: Scandinavian University Books.
- Schlick-Nolte, B. (2002). Catalogue of ancient glass vessels. In R.S. Bianchi (Ed.), *Reflections on ancient glass from the Borowski Collection: Bible Lands Museum Jerusalem* (pp. 47–109). Mainz am Rhein: Philipp von Zabern.
- Seland, E. H. (2010). *Ports and political power in the Periplus: Complex societies and maritime trade on the Indian Ocean in the first century AD* [=BAR IS 2102]. Oxford: Archaeopress.
- Seland, E. H. (2012). Trade and Christianity in the Indian Ocean during Late Antiquity. *Journal of Late Antiquity*, 5(1), 72–86.
- Seland, E. H. (2013). Networks and social cohesion in ancient Indian Ocean trade: Geography, ethnicity, religion. *Journal of Global History*, 8(3), 373–390.
- Seland, E. H. (2014). Archaeology of trade in the Western Indian Ocean, 300 BC–AD 700. *Journal of Archaeological Research*, 22(4), 367–402.
- Shaw, I. (2007). Late Roman amethyst and gold mining at Wadi el-Hudi. In T. Schneider and K. M. Szpakowska (Eds.), *Egyptian stories: A British Egyptological tribute to Alan B. Lloyd on the occasion of his retirement* [=Alter Orient und Altes Testament 347] (pp. 319–328). Münster: Ugarit-Verlag.
- Sidebotham, S. E. (2011). *Berenike and the ancient maritime Spice Route*. Berkeley: University of California Press.
- Sidebotham, S. E., Hense, M., and Nouwens, H. M. (2008). *The Red Land: The illustrated archaeology of Egypt's Eastern Desert*. Cairo: American University in Cairo Press.
- Sidebotham, S. E., and Wendrich, W. (2002). Berenike: Archaeological fieldwork at a Ptolemaic-Roman port on the Red Sea coast of Egypt 1999–2001. *Sabara*, 13, 31–44.
- Sidebotham, S. E., and Zych, I. (2012). Berenike: Archaeological fieldwork at a Ptolemaic-Roman port on the Red Sea coast of Egypt 2011–2012. *Sabara*, 23, 29–48.
- Sidebotham, S. E., Zych, I., Rądkowska, J. K., and Woźniak, M. (2015). Berenike Project. Hellenistic fort, Roman harbor, late Roman temple, and other projects. Archaeological work in the 2012 and 2013 seasons. *PAM*, 24/1, 297–324.

- Silverman, D. P. (Ed.). (1997). *Searching for Ancient Egypt: Art, architecture, and artifacts from the University of Pennsylvania Museum of Archaeology and Anthropology*. Dallas, TX: Dallas Museum of Art.
- Simpson, S. J. (2002). *Queen of Sheba: Treasures from Ancient Yemen*. London: British Museum Press.
- Spaer, M. (2001). *Ancient glass in the Israel Museum: Beads and other small objects*. Jerusalem: Israel Museum.
- Stern, E. M., and Schlick-Nolte, B. (1994). *Early glass of the ancient world: 1600 B.C.–A.D. 50. Ernesto Wolf collection*. Ostfildern: Verlag Gerd Hatje.
- Stöllner, T., Slotta, R., and Vatandoust, A. (Eds.). (2004). *Persiens antike Pracht: Bergbau, Handwerk, Archäologie. Katalog der Ausstellung des Deutschen Bergbau-Museums Bochum vom 28. November 2004 bis 29. Mai 2005*. Bochum: Deutsches Bergbau-Museum.
- Strouhal, E. (1984). *Wadi Qitna and Kalabsha-South: Late Roman–early Byzantine tumuli cemeteries in Egyptian Nubia I*. *Archaeology*. Prague: Charles University.
- Tamura, T. (2012). Investigation on the materials/structure of a multi-layered glass bead. *Nabunken News*, 46. Retrieved from <http://www.nabunken.go.jp/english/report/46-6.html> [accessed: June 2014].
- Then-Obluska, J. (2013a). A few millimeters via thousands of kilometers: An Asian “etched” carnelian bead in Early Makurian Nubia, Sudan. *Der Antike Sudan*, 24, 117–123.
- Then-Obluska, J. (2013b). Medieval transcultural medium: Beads and pendants from Makurian and post-Makurian Dongola in Nubia. Preliminary assessment. *PAM*, 22, 679–720.
- Then-Obluska, J. (2014a). The code of the hidden beads: From the Kerma to the Islamic Period according to the Fourth Cataract material from the Gdańsk Archaeological Museum Expedition excavations. In J.R. Anderson and D.A. Welsby (Eds.), *The Fourth Cataract and beyond: Proceedings of the 12th International Conference for Nubian Studies [=British Museum Publications on Egypt and Sudan 1]* (pp. 1069–1090). Leuven: Peeters.
- Then-Obluska, J. (2014b). An early Roman mosaic glass “flower” bead from Musawwarat. *Der Antike Sudan*, 25, 69–72.
- Then-Obluska, J. (2015). Beads and pendants from Sedeinga, Nubia. *BEADS. The Journal of the Society of Bead Researchers*, 27, 29–45.
- Then-Obluska, J. (forthcoming a). Beads and pendants. In S. E. Sidebotham and I. Zych (Eds.), *Berenike 2010–2011. Report on two seasons of excavations at Berenike, including survey in the Eastern Desert and reports on earlier work*. Warsaw: PCMA UW.
- Then-Obluska, J. (forthcoming b). Short and long distance contacts of Late Nubia: A view through a bead hole. In *Proceedings of the 13th International Conference for Nubian Studies*.
- Then-Obluska, J., and Dussubieux, L. (forthcoming). Glass bead trade in the Early Roman and Mamluk Quseir ports — A view from the Oriental Institute Museum assemblage. *Archaeological Research in Asia*.
- Thiaudière, C. (2010). La bijouterie méroïtique. In M. Baud (Ed.), *Méroé: un empire sur le Nil* (pp. 136–140). Paris: Musée du Louvre.
- Thomas, R. I. (2007). The Arabaegypti Ichthyophagi: Cultural connections with Egypt and the maintenance of identity. In J. Starkey, P. Starkey, and T. J. Wilkinson (Eds.), *Natural*

- resources and cultural connections of the Red Sea: Proceedings of the Red Sea Project III held in the British Museum, October 2006* [=BAR IS 1661] (pp. 149–160). Oxford: Archaeopress.
- Tomber, R. (2005). Troglodites and Trogodites: Exploring interaction on the Red Sea during the Roman Period. In J. Starkey (Ed.), *People of the Red Sea: Proceedings of Red Sea Project II, held in the British Museum, October 2004* [=BAR IS 1395] (pp. 41–49). Oxford: Archaeopress.
- Tomber, R. (2008). *Indo-Roman trade: From pots to pepper*. London: Duckworth.
- Tomber, R. (2011). Pottery. In S. E. Sidebotham and I. Zych (Eds.), *Berenike 2008–2009: Report on the excavations at Berenike, including a survey in the Eastern Desert* [=PCMA Excavation Series 1] (pp. 115–116). Warsaw: PCMA UW.
- Tomber, R. (2012). From the Roman Red Sea to beyond the Empire: Egyptian ports and their trading partners. *British Museum Studies in Ancient Egypt and Sudan*, 18, 201–215.
- Updegraff, R. T. (1988). The Blemmyes I: The rise of the Blemmyes and the Roman withdrawal from Nubia under Diocletian. In H. Temporini and W. Haase (Eds.), *Aufstieg und Niedergang der Römischen Welt* II.10.1 (pp. 44–106). Berlin: de Gruyter.
- van der Sleen, W. G. N. (1973). *A handbook on beads*. York, PA: Liberty Cap Books.
- Vila, A. (1967). *Aksha II. Le cimetière méroïtique d'Aksha*. Paris: Klincksieck.
- Walker, S. (Ed.). (2000). *Ancient faces: Mummy portraits from Roman Egypt*. New York: Metropolitan Museum of Art.
- Ward, G. W. R. (Ed.). (2008). *The Grove encyclopedia of materials and techniques in art*. Oxford: Oxford University Press.
- Welc, F. (2014). *Tell Atrib 1985–1995, IV. Faience objects* [=PAM Monograph Series 5]. (I. Zych, Trans.). Warsaw: University of Warsaw Press.
- Wendrich, W. Z., Tomber, R. S., Sidebotham, S. E., Harrell, J. A., Cappers, R. T. J., and Bagnall, R. S. (2003). Berenike crossroads: The integration of information. *Journal of the Economic and Social History of the Orient*, 46(1), 46–87.
- Whittaker, P. (2006). Trench 14. In D. P. S. Peacock and L. K. Blue (Eds.), *Myos Hormos – Quseir al-Quadim: Roman and Islamic ports on the Red Sea I. Survey and excavations 1999–2003* (pp. 84–87). Oxford: Oxbow Books.
- Williams, B. (1991a). *Meroitic remains from Qustul cemetery Q, Ballana cemetery B, and a Ballana settlement* [=Oriental Institute Nubian Expedition 8]. Chicago: Oriental Institute of the University of Chicago.
- Williams, B. (1991b). *Noubadian X-Group remains from royal complexes in cemeteries Q and 219 and from private cemeteries Q, R, V, W, B, J, and M at Qustul and Ballana* [=Oriental Institute Nubian Expedition 9]. Chicago: Oriental Institute of the University of Chicago.
- Wilson, A. (2012). Saharan trade in the Roman period: Short-, medium- and long-distance trade networks. *Azania: Archaeological Research in Africa*, 47(4), 409–449.
- Winter, T. (2013). The glass vessels, beads and metal artifacts from the burial cave at 'En Ya'al, Jerusalem. *Atiqot*, 76, 15*–22* [in Hebrew with English summary].
- Witecka, A. (1994). Catalogue of jewellery found in the Tower-tomb of Atenatan in Palmyra. *Studia Palmyreńskie*, 9, 71–91.

- Woolley, L., and Randall-MacIver, D. (1910). *Karanòg; The Romano-Nubian cemetery*. Philadelphia: University Museum.
- Yule, P. (2001). *Die Gräberfelder in Samad al Shān (Sultanat Oman): Materialien zu einer Kulturgeschichte*. Rahden/Westf.: M. Leidorf.
- Zazzaro, C. (2013). *The ancient Red Sea port of Adulis and the Eritrean coastal region: Previous investigations and museum collections* [=BAR IS 2569]. Oxford: Archaeopress.
- Zych, I. (2011). Finds. In S. E. Sidebotham and I. Zych (Eds.), *Berenike 2008–2009: Report on the excavations at Berenike, including a survey in the Eastern Desert* [=PCMA Excavation Series 1] (pp. 117–162). Warsaw: PCMA UW.
- Zych, I., Rađkowska, J. K., Crespo Liñeiro, I., and Sidebotham, S. E. (2014). The “Square Feature” in the harbor: Excavations in Berenike 2010–2011. *PAM*, 23/1, 245–264.
- Zych, I., and Sidebotham, S. E. (2010). Temples, dogs and rubbish. The 2010 season in Berenike. University of Delaware–PCMA expedition. *PCMA Newsletter*, 2010. Retrieved from <http://www.pcma.uw.edu.pl/pl/newsletter-pcma/2010/hellenistic-and-graeco-roman-period/berenike-egypt/> [accessed: June 2014].
- Zych, I., and Sidebotham, S. E. (2011). Berenike Project. University of Delaware. PCMA expedition. *PCMA Newsletter*, 2011. Retrieved from <http://www.pcma.uw.edu.pl/pl/newsletter-pcma/2011/hellenistic-and-graeco-roman-period/berenike-egypt/> [accessed: June 2014].