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Peter Francis Jr.

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# BEADMAKING IN ISLAM: THE AFRICAN TRADE AND THE RISE OF HEBRON

Peter Francis, Jr.

*This paper complements one which appeared in volume 1 of this journal, as it also deals with beads in the Islamic world. However, the present work takes a somewhat different approach, being based primarily on historical sources. It also has a different geographical orientation, dealing with commerce between the Islamic world and the northern portion of Africa. Concentrating mostly on the period from the 12th to the 20th century, it documents the rise of a new beadmaking center at Hebron, in the West Bank. The name "Kano beads" has recently been assigned to one class of Hebron beads, and their history is an object lesson in the complexities of the bead trade.*

## INTRODUCTION

The bead trade was an important element of commerce during the Early Islamic Period which lasted from the 7th to the 12th century. It extended east from the Islamic heartland into Asia, and west and south into the African kingdoms beyond the Sahara Desert. Major sources of the beads used in this trade were glassmaking centers in the Islamic world, which had inherited their craft from the Classical world.

However, this trade changed dramatically from the 12th to the 16th century. Glass beadmaking declined after the 12th century and came to be concentrated in a new center, Hebron. The rise of European traders along the West-African coast slowly eroded the monopoly of the North-African traders. Here we explore those changes.

A note on some of the terms used in this paper may help to avoid confusion. The names Ghana and Mali can apply to ancient kingdoms in West Africa or to modern states of that name. In both cases, the text makes it clear which is being discussed. More

complex is the term "Sudan." Taken from the Arabic, *Bilad es-Sudan* (Land of the Blacks), it has referred to a large geographical area and two countries, one of which is now Mali. When the geographical area is being discussed -- roughly between the Senegal River and the Nile, and the Sahara Desert and the equator -- it will be distinguished by sector: the western Sudan reaches to the bend of the Niger River; the central Sudan stretches from there to and including Darfur; and the eastern Sudan is the area beyond Darfur to the Nile Valley (Fig. 1). The term "Sudan" without any modifier refers to the modern country of that name.

## THE MUSLIM BEAD TRADE WITH AFRICA

When Arabs were sweeping across North Africa in the late 7th and early 8th centuries, the first West-African state -- the ancient kingdom of Ghana -- was developing south of the Sahara. Trade between North and West Africa, which had been conducted for a long time, was stimulated by the wealth in gold and slaves in the western regions which could be exchanged for goods that were fairly cheap in North Africa, such as salt. Beads were also commonly brought south across the Sahara. They became a staple in the trans-Saharan trade during the Early Islamic Period.

Yaqut (ca. 1124) wrote of merchants from Sijilmasa (Morocco) going to ancient Ghana: "Their wares are salt, bundles of pine wood,... blue glass beads, bracelets of red copper, bangles and signet rings of copper, and nothing else" (Levtzion and Hopkins 1981: 169). Al-Idrisi (ca. 1154) described the same trade as including "different kinds of beads of glass" (Levtzion and Hopkins 1981: 128). Two

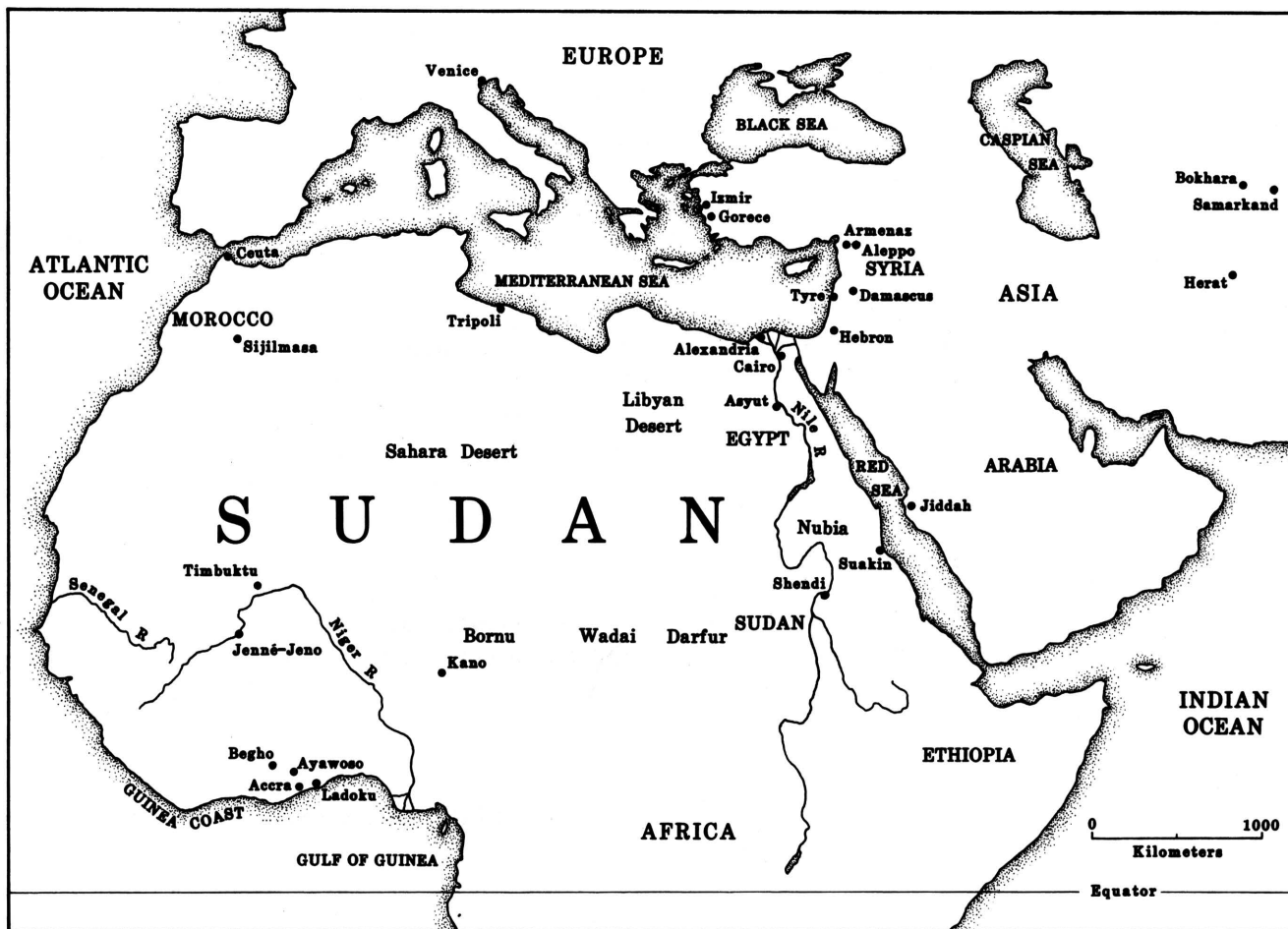


Figure 1. Map of the Middle East and northern Africa showing places mentioned in the text (drawing by D. Kappler).

centuries later (ca. 1353), Ibn Battuta told his readers: "The traveler, in these countries [the western Sudan], has no need to burden himself with provisions for the mouth [i.e., food], or mets, or ducats, nor of drachmas; one must carry with him a morsel of rock salt, ornaments or trinkets of glass, which they call *nazhm*, or rangee, and a few aromatic substances" (Defremery and Sanguinetti 1922: 394).<sup>1</sup>

No comprehensive study has yet been done on the beads traded during this period. At Jenné-Jeno, the capital of ancient Mali, excavations produced very few beads (McIntosh and McIntosh 1984: 90; S. McIntosh: pers. comm.), but beads looted from this and related sites that are presently on the antiquities market are mostly of three types. There are wound beads, especially round translucent blue ones with white circles and often also white zones, or cylindrical or barrel-shaped beads of black or

dark glass, often decorated with white or yellow spirals; the same beads are present at Fustat (Old Cairo) in some numbers, and might reasonably be assumed to have been made there (Francis 1989c: Plate ID). There are also "torus folded" beads, now understood to be products of the Early Islamic Period (Francis 1989c: 29), as well as the small, drawn, Indo-Pacific beads, ultimately from South or Southeast Asia.

Some of these beads have been excavated as far south as Begho, the only site in modern Ghana mentioned by the early Arabic travelers and geographers (Posnansky 1971: 115-8). Included are round wound beads of black glass decorated with white circles, matching some found at Fustat, and Indo-Pacific beads. Both groups were found in early levels (11th to 12th centuries) at the site (Francis 1990: 4).

Beads of glass were not the only sorts in this trade. Al-Idrisi noted garnet and mother-of-pearl beads in the trade (Levtzion and Hopkins 1981: 128), and discussed the bead trade originating from Septa, Morocco, now the Spanish enclave of Ceuta: "At Septa they fish for the coral tree which is unequaled by any kind of coral extracted in any regions of the seas and at Septa there is a market where it is cut, polished, made into beads, pierced and strung. From there it is exported to all lands, but carried mostly to [ancient] Ghana and all the lands of the Sudan, because in those lands it is much used" (Levtzion and Hopkins 1981: 130).

The character of the bead trade in West Africa was drastically changed as the Muslims lost out to the growing power of European traders. This was a long and gradual process, and exactly how quickly it happened has yet to be learned. At Begho it appears to have been rather rapid. In the "artisan's quarter," dated ca. 1480 to 1600, the six beads found there by archaeologists were all European, including a seven-layered chevron (Francis 1990: 4). This is what we would expect on Ghanaian coastal sites of the same period, and is exactly what we find at places like Ladoku, the Dangme capital, and Ayawoso, the Ga capital. The beads uncovered at these three sites could have come from North American sites of the same age (Francis 1990: 4). Certainly by the early 19th century, European explorers such as Mungo Park (1815: 160-1) in 1805 and Heinrich Barth (1965: Vol. 1, 516; Vol. 2, 513) between 1849 and 1855 recorded only the use of European beads in the interior of Africa.

However, the eastern Sudan was a different story. There the Muslims were able to continue dominating the bead trade for much longer than in the western Sudan. In many parts of the eastern Sudan, Europeans found it very difficult to gain access. Not only was the bead trade in Muslim hands, but many of the beads were made in Islamic lands.

To illustrate this, we shall consider areas now incorporated into the modern countries of Sudan and Chad. In the 18th, 19th, and even early 20th centuries, they were independent kingdoms. These kingdoms are Nubia, in the eastern part of Sudan; Darfur, in the western part of Sudan; and Wadai, in the eastern part of Chad (Fig 1).

Four travelers to these areas recorded considerable information on the local bead trade in the years between 1792 and 1873. The earliest was the Englishman William Browne, the first European to enter Darfur. He resided there, mostly against his will, from 1792 to 1796, and left us a list of goods brought into Darfur from Egypt by the Jellaba merchants (Browne 1799: 302-3). The second is El-Tounsy,<sup>2</sup> a learned "sheik" born in Tunisia. He went to Cairo, then joined his father in Darfur in 1803, leaving in 1811 for a further year in Wadai where Europeans were forbidden. His books on Darfur (El-Tounsy 1845: 208-10) and Wadai (El-Tounsy 1851: 333-9) both have fairly long sections on beads. Our third traveler is John Lewis (Johann Ludwig) Burckhardt, an intrepid, well-traveled Swiss explorer who wandered throughout the Middle East, even visiting Mecca disguised as a Muslim savant, so well acquainted had he become with the language and customs of the regions. We shall examine his voyage to Nubia, especially his observations on beads at Shendi (Shendy), the great mart of the region (Burckhardt 1822: 269-70). Finally, Gustav Nachtigal visited Darfur and Wadai on a mission for the King of Prussia. He had a long and highly involved career in Africa, later as the administrator who annexed Togo, the Cameroons, and parts of Namibia for Germany. His volume on Wadai and Darfur (Fisher, Fisher and O'Fahey 1971) contains many scattered references to beads.

Beads identifiable as to origin which are discussed by these travelers fall into seven categories:

- 1) *Amber*. All four travelers affirmed the demand for amber, including El-Tounsy in both Darfur and Wadai. El-Tounsy (1851: 333) reported that at Wadai clear amber was the most valued, and Burckhardt (1822: 270) said that it was the only type wanted in Nubia. On the other hand, Nachtigal (Fisher, Fisher and O'Fahey 1971: 247, 254), coming from the west, spoke of milky amber being preferred in Wadai and west Darfur, but not in east Darfur. The amber, no doubt, came from the region of the Baltic Sea, but was most likely cut in Margouch, a quarter of Cairo, as reported by the French after the Napoleonic invasions (France 1829: Vol. 18, 400), and later by Clot-Bey (1840: 316) who may have been simply copying the earlier and more extensive work.

- 2) *Coral*. Along with amber, only coral is recorded by all the travelers, including El-Tounsy in Darfur and Wadai. Burckhardt (1822: 270) remarked that it was of low quality. El-Tounsy (1825: 208; 1851: 336) said there were two types of beads in use in Darfur and Wadai: the cylindrical *gass* and the small, round *mouderdem*. As with the amber, the coral was also cut in Margouch, Cairo (Clot-Bey 1840: 316; France 1829: Vol. 18, 400); the source of the raw material would have been the Mediterranean.
- 3) *Carnelian, agate, and reysh*. These three are grouped together because of their common source. Burckhardt and Nachtigal mentioned carnelian, Browne noted agate, and Burckhardt and El-Tounsy (in both Darfur and Wadai) mention *reysh*. The latter is banded agate, most likely that known as *babaghoria* in India, long a popular bead material with Muslim traders (Francis 1986b). Burckhardt (1822: 269-70) discussed *reysh* in some detail, relating that the beads went from Surat (a port near Cambay, India, where they were cut) to Jiddah, Arabia, where they were bought by the merchants of Suakin, the port of Nubia (just south of modern Port Sudan) for 15 Spanish dollars a thousand. They sold them at Shendi for 48 dollars, whence they were taken further inland and exchanged for six female slaves, who were then sold at Shendi for 150 dollars. El-Tounsy (1845: 206) also mentioned that the beads came from India. The bead trade of India was by this time firmly in the hands of the Muslims (Francis 1982: 21-7).
- 4) *Khaddur*. These beads were observed at Darfur by El-Tounsy (1845: 210) who said that they were long and red or white. He had more to say about them at Wadai, where he added blue to their color spectrum and stated that they were more valued than at Darfur (El-Tounsy 1851: 339). Nachtigal (Fisher, Fisher and O'Fahey 1971: 201) provided the most complete description of these "hidden" beads: "Imports from Cairo include the large red clay beads which, with the name *khaddur*, "hidden," are used as women's ornaments [in Wadai], worn under their clothing around the waist."
- 5) *European glass beads*. The false coral, listed by El-Tounsy in Darfur and Wadai and by Nachtigal, came from Venice, according to Burckhardt (1822: 207), who noted that it was sold to "western countries" (i.e., Darfur and Wadai). In both Darfur and Wadai, El-Tounsy (1845: 208; 1851: 336) discussed the *dem-er-raf* (nosebleed) bead, a cheap red-glass bead from Europe worn especially by the poor in Wadai. Nachtigal often mentioned glass beads without specifying their origin, while Browne (1799: 302) noted beads of Venice without specifying their type. Burckhardt (1822: 269) discussed European beads the most, including a white glass bead made in Bohemia called by the Italians *Contaria d'Olanda* (beads of Holland). He estimated that 400 to 500 chests of Venetian glass beads, each chest weighing ten hundredweight, were sold annually in Cairo. If this figure is correct, it would amount to 448,000 to 560,000 pounds of beads (204 to 254 metric tons) per year.
- 6) *Beads of plant materials*. Burckhardt was the only one of our informants to mention beads made from plant materials. The items he brought to barter included "several dozen of wooden beads" which he peddled on the street, as a Damer (northern Nubia) (Burckhardt 1822: 155, 239). He began his long section on beads at the Shendi market with the words: "I have already mentioned the use of beads in these countries, as a kind of currency. The most common are small wooden beads, made by the turners of Upper Egypt, which are bought up chiefly by the Bedouin and other peasants" (Burckhardt 1822: 269). He also listed beads made in Egypt from the doum-palm kernel, worn as a symbol of religious fervor.
- 7) *Mongur and harish*. At Darfur, El-Tounsy (1845: 209-10) described some rough glass beads called *mangour* and *harich* which he said were from Syria. At Wadai, he also described the *mangour* as being rough and coming from Galilee (El-Tounsy 1851: 334-5). Browne (1799: 303) mentioned "coarse glass beads made at Jerusalem, called Hersh and Munjir." Burckhardt (1822: 269) added: "Glass beads (*Kherraz*) have not the same currency here as they have in Abyssinia and Darfour, though they are constantly seen in the market. The better sort are of Venetian manufacture, but the greater part are made at El Khalil (or Hebron, near Jerusalem)."

In sum, of the beads used in the trade of the eastern Sudan during the late 18th to late 19th centuries, only European glass beads have unequivocal origins outside the Muslim world. If Burckhardt's figures can be believed, beads of European origin may well have made up a substantial part of the trade, but the observations of Browne and El-Tounsy indicate that they were of secondary importance in the interior kingdoms. Nor were they the most universal beads. That credit goes to amber and coral, the former ultimately from Europe, but both cut principally in Cairo. The most expensive beads were apparently the *reysh* or agate beads of India. The *mongur* and *harish* stand alone as the only glass beads recorded as being made in the Muslim world, and we shall focus on them subsequently.

#### GLASS BEADMAKING IN THE ISLAMIC WORLD TO THE 14TH CENTURY

As discussed elsewhere (Francis 1989c: 27-9), Fustat (Old Cairo) was a beadmaking center of importance. It was famed for its glass, as noted by the Persian Nassiri Khosrau during a visit in the middle of the 11th century: "They [at Fustat] also make a transparent and very pure glass which resembles an emerald which they sell by weight" (Schefer 1970: 151-2). That glass beads were among the products of Fustat is clear from both contemporary records (Goitein 1961) and archaeological discoveries (Francis 1989c: 28-9).

After Fustat was put to the torch in 1168, glassmaking continued in the ruins of the city. Ibn Douqmaq (ca. 1400) noted that there were glasshouses in Fustat (Clerget 1934: 270), and evidence of one such glasshouse set up in the ruins was uncovered by Scanlon (1981: 60-1). But glassmaking was on the wane and beadmaking seems to have ceased (Francis 1989c: 29). Certainly there is no mention of beadmaking in the description of the Cairene glass industry derived from the studies of the French during the Napoleonic interlude:

The glass of Cairo... is as imperfect as the pottery: one counts four establishments of this type in el-Hasaneyn, el-Faoualeh, and near the French quarter [all in Cairo] and another at Giza: they make the balloons, retorts, and *ma-*

*tras* for making and distilling sal ammoniac, common bottles, flares for ordinary lamps and others for illuminations, flat colored glass for use in the baths, glass mortars and polishers (France 1829: Vol. 18, 397).

Fustat was not the only Islamic glass beadmaker in the Early Islamic Period. There are several other glassmaking cities known from this time, and beads may have been made at some of them. They include Damascus, Aleppo, Acre, Es-Samaryia, Antioch (Engle 1973b), and Tripoli (Schefer 1970: 42, n. 1). Lamm (1959: 376) noted that Islamic glass has a "cosmopolitan character" and that glassmakers probably moved around a great deal. Glassmaking was not confined to a single group. In Fustat, it was largely in the hands of Jews, but Copts and Muslims also made glass (Goitein 1961: 171, 187; 1973: 24). Jews also made glass in Tyre and Antioch, located in present-day Lebanon and Turkey, respectively, but whether they were the only glassmakers there is not known (Benjamin 1905: 538, 541; 1983: 77, 79).

Tyre, known for its glassmaking since Classical times, apparently also made beads. Engle (1973b: 21), quoting Lamm, quoting al-Muqaddasi around 985, said that Tyre exported "sugar, glass jewelry in the form of beads and bracelets and vessels of wheel-cut glass." An Arabic edition of al-Muqaddasi could not be found for consultation, but a recent translation in French mentions Tyre's exports as being: "*le sucre [sugar], la verroterie, les verres incrustes et les objets fabriques*" (Miquel 1963: 219). The term *la verroterie* refers to small glass trinkets and usually includes beads; we note, however, that there is no mention of wheel-cut glass.

The last we hear of glassmaking in Tyre is at the end of the 12th century. Benjamin of Tudela (1983: 79), a Spanish Jew who was probably a textile merchant, wrote: "The Jews [of Tyre] own sea-going vessels, and there are glass makers amongst them who make that fine Tyrian glass-ware which is prized in all countries." Benjamin visited Tyre in the 1160s, a time when William, the Archbishop of the city, wrote: "A very fine quality of glass... is marvelously manufactured... [in Tyre and] is carried to far distant places and easily surpasses all products of the kind" (Engle 1974: 35).

Tyre was caught in the center of a virtual world war, the Crusades, directed as much against the Byzantine Empire as against the Muslims; both Seljuk Turks and Egyptians were set against by Western Europe. Tyre was captured in 1124 by Venetians, and for periods of different lengths was part of the Kingdom of Jerusalem. It was finally lost to the Europeans in 1291. Whether it was war or danger of war, or the earthquake of 1170 reported by William that caused the glassmakers to leave is not known.

There has been a persistent story that when the glassmakers left Tyre, they moved to a new place not far from Aleppo in present-day Syria, which they named Armenaz, after the suburb of Tyre where they had lived (Lamm 1959: 376). Details of this story have been called into question (Engle 1973a), but there is no doubt that Armenaz was a glass beadmater, at least in the present century. J. Gaulmier, who visited the village in the 1930s, found glassmaking there depressed, with 15 people in four shops making only glass bottles (Engle 1973a). In 1979, there were only two shops in operation. Older workers, however, confirmed that they and their fathers had made beads and bangles some 50 years before. Despite a thrilling motorcycle ride with one of the younger workers through the village in an attempt to locate some of the old beads, none could be found (Francis 1981: 38).

The demise of the Damascus glass industry is better documented. The invasion by Timur (Tamerlain) in 1402 resulted in the forced expatriation of artisans to grace his Central-Asian capital, Samarkand. The memoirs of Ibn Arabshah (Sanders 1936: 161), who was taken at the age of eight with the craftsmen, and of Al-Hacen (1906: 439), who visited Samarkand at its height, include long lists of these artisans. Clavijo, who visited Samarkand in 1403-06, said Timur had brought "men who made bows, glass, and earthenware, so that of these articles Samarcand makes the best" (Nesbitt 1879: 651). A glass beadmater shop of this age has been excavated in Samarkand (Besborodov and Zadneprovsky 1965: 129).

The glassmaking family operating in Herat, Afghanistan, in 1978 claimed to have moved there from Bokhara in 1917, perhaps having left Samarkand in the 18th century when it was largely desolated and under Bokhara control (Francis 1979: 7), though beadmater was known elsewhere in the region

(Besborodov and Zadneprovsky 1965: 131). There is apparently still a small bead industry in Uzbekistan at present (Pl. VA).

In sum, the glass craft that the Muslims had largely inherited from the classical world lost most of its former glory. What was once a large, flourishing bead industry centered especially at Fustat, Tyre and probably Damascus declined markedly in the space of two or three centuries. The remnants of this industry at Armenaz and Samarkand-Bokhara-Herat never approached the greatness of the former glassworks.

## THE RISE OF HEBRON

But people need glass and, as we all know, they especially need glass beads. Thus, though truncated, the Muslim glass and glass-bead industry survived in a new location: Hebron, just a few kilometers south of Jerusalem.

Hebron is one of the oldest cities in the world. Flavius Josephus, the extraordinary Jewish historian and military commander, wrote at the end of the first century A.D.: "Now the people of the country [Palestine] say, that [Hebron] is an ancients city, not only than any in that country, but than Memphis in Egypt, and accordingly its age is reckoned at two thousand three hundred years" (Whiston n.d.: 700). In the Bible and/or tradition, Hebron is connected with Abraham, Moses and Solomon, among other famous names. It contains the reputed graves of Abraham, Issac, Jacob and Adam, four patriarchs holy to three religions: Judaism, Christianity, and Islam.

Because of its importance to the devout, Hebron has long been a place of pilgrimage. Throughout the Middle Ages, European pilgrims streamed there before or after visiting Jerusalem. Among those who left memoirs of their journeys were Bishop Arcuff (ca. 700), Willibald (721-27), Bernard the Wise (867), Saewolf (1102-3), Sigeud the Crusader (1107-11), Benjamin of Tudela (1160-73), Sir John Mandeville (1322-56), Berthrandon de la Brocquiere (1432-33), and Henry Maundrell (1697), none of whom mention glassmaking at Hebron (Wright 1968: *passim*). It is known that glassmaking was established by the 14th century, so later pilgrims simply did not notice or mention the industry. In the case of Benjamin of Tudela, who did note glassmaking at Tyre, he may

have been silent about glassmaking if it was in the hands of Muslims, as it is today, since he was looking for Jewish communities. However, it should also be noted that al-Muqaddasi (Miquel 1963: 199-202), writing as complete an economic geography as possible in the middle of the 10th century, discussed Hebron at some length, but made no mention of glassmaking there.

The first written accounts of glassmaking at Hebron appear in the 14th century. Early in that century Estori Farchi noted glassmakers there, a statement that was echoed or cribbed by Chelo of Aragon in 1333 (Engle 1973b: 24). In 1345, Niccolo da Poggibonsi was the first of many religious pilgrims to note the glassworks there (Heyd 1959: 711). Engle (1974: 75) believes that glassmaking at Hebron may be much older, perhaps dating back to Roman times, but there is no evidence for such an age, and the silence of so many visitors, especially al-Muqaddasi, argues against it.

Hebron became a supplier of glass to the immediate region and, in time, to other Muslim lands. Henry Castella (1974: 129), who visited Egypt between November 1600 and February 1601, saw merchants from Hebron bringing glass products to sell at Cairo. In 1792, Browne (1799: 75) noted the importation of glass to Cairo from the area: "From Syria arrive cotton, silk, crude and manufactured, soap, tobacco, beads of glass." Burckhardt (1822: 269) wrote: "El Khalil (or Hebron, near Jerusalem)... furnishes the whole of southern Syria, and the greatest part of Egypt, and of Arabia, with glass-ware." One other note on Hebron's production and trade is found in a work by Perrot and Chipiez (1885: 328-9):

I [apparently Perrot] remember seeing some fine bracelets of blue glass sold in the precincts of the Holy Sepulchre at Jerusalem; in form and color some among them reminded me of antique jewels. My curiosity was aroused. I asked where those things were made, and they told me at Hebron, where glass works still existed by which a very large trade was carried on, their manufacture being exported by Arab and Jewish traders, even as far as the Soudan. The character of these objects is always the same: little vases and other vessels, earrings and nose-rings, bracelets, anklets, and armllets [amu-

lets?], among the last named some whose types have certainly been handed down from a remote antiquity. One is a human eye, the eye of Osiris; another represents a human hand with two extended fingers; this is a charm against the evil eye, and is known as the Kef-Miriam, "the Hand of Mary."

The reader may have noted that not all of the reports of imported glass or glass beads specifically mention Hebron. In fact, various places are mentioned by the writers we have cited (Table 1).

We may postulate two explanations for these various reported origins of glass products. One is that, in the 18th century, there was more than one Islamic glass and glass-beadmaking center. Syria is twice mentioned, and that could refer to Armenaz. We have no information on glassmaking in Jerusalem or Galilee at that time.

The more likely explanation is that all of the glass came from Hebron. Syria was a dominant power in the region, though it was under Ottoman hegemony. Browne's Jerusalem may only be a record of where merchants bought Hebron products (just as Perrot found them there first). El-Tounsy's Galilee could be a slip of the pen; Hebron is in Judea rather than Galilee. Such misidentifications of bead origins are by no means unusual; Burckhardt, for example, said that the agate beads used in the slave trade came from Surat, which was only exporting Cambay beads.

Aside from Armenaz, of whose output and history we really know nothing, there are no recorded glassmakers in the area but Hebron. Browne (1799) visited Jerusalem, Damascus and Tyre (but neither Hebron nor Armenaz), and never mentioned glassworking. In the mid-19th century, Olin (1846) also visited these places, but only mentioned glassmaking in Hebron: "[It] was stormed by the Egyptian army, under Ibrahim Pasha in the year 1834, when it was in rebellion against the government.... Its trade and manufacturers have suffered in an equal degree, and many of the shops are quite destroyed. There are still some manufacturers of glass..." (Olin 1846: 87). The same negative data are to be found in this century. Travel books often mention glassmaking at Hebron (e.g., Baedeker 1912: 111; Meistermann 1923: 359), but never anywhere else.



**Table 1. Recorded Origins of Glass or Glass Beads.**

<i>Product</i>	<i>Date</i>	<i>Destination</i>	<i>Origin</i>	<i>Source</i>
Glass	1600–1601	Egypt	Hebron	Castella
Glass beads	1792	Egypt	Syria	Browne
Glass beads	1792–1796	Darfur	Jerusalem	Browne
Glass beads	1803–1811	Darfur	Syria	El-Tounsy
Glass beads	1811–1812	Wadai	Galilee	El-Tounsy
Glass beads	1814	Sudan	Hebron	Burckhardt
Ornaments	1885	Sudan	Hebron	Perrot

### HEBRON AND HER "CHILDREN"

In addition to its paramount position as glass-maker for the Arab world, Hebron also became an exporter of glass technology (Francis 1989a: 78; 1989b: 8). The Ottoman Empire encouraged the movement of craftsmen around its dominions, and in two cases beadmaking apparently was carried from Hebron to other locations where it still exists today. In every case, glass is presently only remelted from bottles.

One of these locations is in western Turkey. The story gathered from Zakai Erdal, a leading beadmaker of Gorece, Turkey, is that around 1880, two workers, Salim Halil and Hüsnu, migrated to Izmir from Lebanon intending to make bangles (an old Hebron product) and eventually concentrated on beads. Around 1930, the beadmakers were strongly encouraged to leave the neighborhood and settled in the village of Gorece (Francis 1979: 2-3). Later, disagreements between various parties led to one beadmaker moving to Bodrum (Z. Erdal 1979: pers. comm.), and another to Kamelpasha (Weinberg 1968; *see also* Sismanoglu 1978). As Erdal could not name the place in Lebanon from which Salim ve Halil and Hüsnu (both Turkish names) came when I asked him directly, I now strongly suspect that they came from Hebron, though they may have set up briefly somewhere in Lebanon before moving to Turkey. A more recent account of their history states that the Turkish beadmakers came from the "eastern Mediterranean," first settling in Izmir between 1940 and 1945 (Küçükerman 1988: 42).

Stylistically the Turkish and Hebron production is closely allied, especially the "evil eye" beads, traditionally blue tabular beads exhibiting yellow and white concentric circles (Pl. VB). They were being produced in Hebron by 1885, as described by Perrot (1885: 328-9). Some from the 1920s are to be seen in both the Beck collection at the Museum of Archaeology and Anthropology at Cambridge University, and the Girard collection in the Museum of International Folk Art in Santa Fe, New Mexico (Pl. VC). Van der Sleen (1975: 115) said that these beads were being made at Hebron, though on what basis it is difficult to tell. They are apparently not being made in Hebron today (Engle 1990: pers. comm.).

The other glass beadmaking industry associated with Hebron is something of a restitution, because it is located in Cairo, once a leading beadmaker of the Muslim world. The major glassworkers of Cairo belong to the family of the Al-Daours; they do not make beads. Beads are made by their cousins, the Al-Tahhuns. "During the Ottoman period a grandfather [of the Al-Tahhuns] emigrated to work in a factory at Al-Khalil (Hebron), in Palestine. He stayed there for many years and was married into the al-Da'or family, afterwards returning to Egypt" (Henein and Gout 1974: x).

This may be the reason why the Al-Tahhuns alone make beads on a small scale in Cairo (Fig. 2). On the other hand, Arkell (1937: 302-3) reported that in his time, no one in Cairo made beads. He had, however, met Mohamed Farrah, a glassworker who had been trained in Hebron. The establishment where Farrah worked was located at Bab Foutah, where beads are being made today. An attractive current product is a



**Figure 2.** Glass beadmaking in Cairo, 1988. The setup is very similar to that used at Gorece, Turkey, and, other small beadmaking establishments, no doubt including Hebron. The beads are wound on the iron mandrel in the furnace, then removed to be shaped. When done they are knocked off into the small annealing chamber at the right. The blue beads in the center are rejects (photo by P. Francis, Jr.).

bead of swirled glass which closely resembles those made in Hebron in the 1920s. Interviews with the beadmakers in 1988 did not elicit any new information on their origins. Nonetheless, the Hebron connection seems to be of some standing and at least one of those who had been apprenticed there must have brought beadmaking back to Cairo.

### THE BEADS OF HEBRON

In our discussion of the beads used in trade in the eastern Sudan, we identified only two glass beads that were made in the Islamic world (Pl. VD), almost certainly in Hebron. The most complete description of these beads is found in the works of El-Tounsy. In Darfur he observed:

Around the waist and against the skin, the Fors wear different sorts of glass beads. Among the rich women the beads are the size of a nut, and are called *rougad-el-fagah* (the sleep of tranquility); among the women of medium means, it is the *mangour* and among the poor women the *harich* or the *khoddour*. These types of jewelry are made in Syria. The *rougad-el-fagah* is perfectly polished and of green color, or blue, or yellow.

The *michahreh* is a black glass bead spotted with white points; it is a variety of *mangour* but it is smaller, with a rougher surface and the same size.

The *harich* resembles a *mangour* and a *michahreh*, but the size of chaplet beads [small

rosary beads], rough and grooved with striations (El-Tounsy 1845: 209-10).

In Wadai, El-Tounsy (1851: 334-5) related:

The *mangour* is a round glass bead exported from Galilee. The Fons wear them frequently around the waist, next to the skin, five or seven turns of this bead strung on cords. The mangour is green, or yellow, or black and speckled. The black is better known under the name *michahreh*.

The *rougad-el-fagah* is more expensive than the mangour, larger, smoother and more beautiful. Also the rougad-el-fagah is found as secret jewelry by the Fons of comfortable means, and the mangour by the Fons of medium means.

The *mangour* is about the size of an ordinary nut and the rougad-el-fagah of a larger nut. Both are of terracotta covered with a glaze like that of faience. But the rougad-el-fagah is of more perfect work, better glazed and looks most agreeable and is more expensive. The mangour is rough, crinkled on the surface and grossly glazed. It is also sold cheap.

El-Tounsy or his translator apparently made an error in the last paragraph. Nowhere else is the *mongur* said to be made of anything but glass.

Long after William Browne and El-Tounsy visited Darfur, A.J. Arkell, the British administrator-turned-archaeologist and bead lover, published a seminal paper on these beads. He began by describing them this way:

There may be found to-day in Darfur, in the possession of women of the generation that is passing away, numbers of large opaque glass beads of which the colours are usually yellow or green, more rarely blue, and very occasionally black with coloured spots.

These beads are called *mongur* in local Arabic, and *galding* in the Fur language.

They are quite out of fashion and the younger generation will have nothing to do with them, occasionally referring to them with contempt as the jewellery of slaves. Anyone who has them will give them away and will usually refuse to take anything for them. They will very soon

have vanished from the land, and it is therefore advisable that a record should be made before this happens.

These beads may be found on the sites of villages that were inhabited 50 to 100 years ago....

They are practically never worn. I have occasionally seen a single green one worn on a string round the ankle by old women as a cure for rheumatism (Arkell 1937: 300).

In addition to the *mongur* and *harish* (which are but smaller versions of the former), some sources also mentioned the *michahreh*, which El-Tounsy said have white spots, though Arkell found them only with a mixture of yellow, green or blue spots. Arkell (1937: 300, n. 1) also noticed that some green *mongur* had been squared off and the corners flattened; i.e., they are cornerless cubes. These are imitations of green-jasper cornerless cubes, of which Schienerl (1985) enquired, and are now known to date at least to the Early Islamic Period (Francis 1989b: 32). These imitations have been found in Egypt (Francis 1986a) along with the usual *mongur*.

Arkell combed old texts looking for references to these beads and made other enquires. Some had been found along the *Darb al-Arba'in* (the forty-day road), a trade route that crossed the desert from Asyut, Egypt, to Darfur, and he visited what he claimed to be all the glass factories of Cairo. He found no evidence for beads having been made there in recent times. Mohamed Farrah, the glassmaker who had been trained in Hebron, said that the *mongur* were probably Hebron products.

Arkell never got to Hebron but enlisted the aid of J.W. Crowfoot and W.B.K. Shaw to visit the glass-makers there. The beads then in production which were sent back by Shaw and pictured by Arkell (1937: XXIVb) resemble the *mongur* in color, form, opacity, and technique which Arkell called "wire-wound," having seen the process in Venice (they are, in fact, furnace-wound). Crowfoot met two retired glass-workers who assured him that the *mongur* were once made in Hebron and that beads like them are found in old graves around the city.<sup>3</sup>

Arkell sent some of the beads to Horace Beck, who affirmed that they were probably of Medi-

terranean glass, but thought that they did not resemble Hebron manufacture. Arkell (1937: 305, n. 2) suggested that this was because the Hebron glassworkers were no longer making their own glass. This would appear to be correct. The *mongur* and related beads were probably made from locally produced glass, using alkalies from the Dead Sea; late in the 19th century melting down glass bottles replaced glassmaking. The beads from Hebron in Beck's collection are unlike the *mongur* or the beads that Shaw sent Arkell. Rather, they are small tabular "evil eye" beads (Pl. VC) and beads of colored glass swirled together (personal observation).

At the end of the last footnote on the last page of Arkell's (1937: 305) article is a most intriguing observation:

It may be of interest to record that I have obtained a few examples indistinguishable from the *mongur* from pilgrims and other wanderers from Northern Nigeria, and I have come across one or two Hausa bead peddlers who have been buying up these *mongur* in Darfur for resale in Nigeria, so that it is almost certain that some of these beads have found their way from Hebron to Nigeria.

Indeed, those familiar with the West-African bead trade would most likely call the *mongur* "Kano beads." Liu (1982) introduced this term, employed by Hausa bead traders in Sudan who claimed that the beads came from, or were even made in, the great, venerable market city of Kano in northern Nigeria. Eyo (1979: 57) may have had these beads in mind when he said that glass beads were made at Kano, as well as Bida, without describing them. There appears to be no foundation whatsoever for believing that beads were made in Kano; the name is merely a trader's term.

Liu (1982: 27) also mentioned a communication from Alastair Lamb (1980: pers. comm.) to Elizabeth Harris which stated that he thought these beads were European. He had first thought they might be Dutch, but grew to doubt that, saying that some were made in Venice, while not citing any reasons for his assertion which must now be called into serious question. He did add the interesting information that these beads were also being sold in modern Ghana.

We are now in a position to trace something of the commerce of the *mongur* and associated beads over the last few centuries. It is not known when they were first made, but it must have been at least by the mid-18th century, since they were so firmly established in Darfur by the time of Browne's visit in 1792. From Hebron they were taken by both Jewish and Arab traders to Cairo. They were apparently used in Egypt, as they are still found there occasionally. From Cairo they went up the Nile, either all the way to Shendi to be sold throughout the eastern Sudan, or to Asyut and across the *Darb al-Arba'in* to Darfur and on to Wadai.

They may not have gotten across northern Africa. G.F. Lyon (1821: 152), who traveled from Tripoli to Bornu (west of Wadai), Wadai, and the eastern Sudan between 1818 and 1820, did not mention them in his long enumeration of beads, which he ended by lamenting: "I have been thus particular for the information of future travellers, as the beads we took with us were unsaleable, and the above are always to be purchased at Tripoli."

Arkell (1937: 304) thought that the import of these beads to Darfur may have ended during the "unsettled times" of the Madhist movement and the subsequent battle of Khartoum with the English, based on the ages of the women who had them and of the abandoned villages where they were found. The fact that Nachtigal (Fisher, Fisher and O'Fahey 1971) did not mention them while in Wadai and Darfur in 1873 and 1874, strongly suggests that they were no longer being traded at that time. Though this is negative evidence, his narrative is very detailed, and he recorded the names, uses, and values of many beads; the absence of *mongur* beads in the presence of his thoroughness may well mean that they were no longer articles of commerce. Certainly the beads described by Perrot and Chipiez (1885: 328-9) were quite different types, and the *mongur* seem not to have been made then. A date between 1850 and 1870 would seem a likely time for the cessation of their production.

By the time that Arkell was investigating these beads, they were old and old-fashioned. They had depreciated in value, and no one wanted them anymore, at least in Darfur. This may have been because they were no longer imported or there may simply have been a change in fashion. But someone saw some value in the *mongur*. The Hausa traders,

famed from the western to the eastern Sudan and far beyond, bought them up, presumably for a song (it is also possible that they had been traded into Hausa territory before this time, as well). It was apparently these traders who had the ends of the beads beveled so as to fit more snugly on the strands (Pl. VD). They found a market for them in Kano, and no doubt elsewhere. They were appreciated anew and sold at least as far as Ghana and, of course, have entered the modern American bead trade. They are also enjoying a resurgence in Sudan and now fetch high prices, their origins having been completely forgotten.

### SUMMARY AND CONCLUSIONS

The trade in beads was a major part of commerce in the Early Islamic Period, during which glass beads made in the Muslim beadmaking centers, glass beads from Asia, and coral beads processed in North Africa were of considerable importance in commercial dealings with the kingdoms of West Africa. In later centuries, Europeans supplanted the Muslims in this region, though we have yet to learn how quickly this happened. In the eastern Sudan, however, Muslims dominated the bead trade much longer. The beads that can be identified in this trade were mostly made in the Islamic world or at least processed there, though European glass beads were gaining ground.

At the end of the 12th century, the once-flourishing glass-bead industry of the Early Islamic Period began a gradual decline. For various reasons, Fustat, Tyre and Damascus lost their glass industries within a few centuries of each other, disappearing by the beginning of the 15th century. Their remnants, Armenaz succeeding Tyre and the Central-Asian beadmakers succeeding Damascus, never regained the eminence of the old industries.

At least by the 14th century, a new glassmaking center arose at Hebron, the origins of which have yet to be learned. By 1600, it was supplying glass to Egypt and probably other neighboring countries. In addition to being the major glass beadmaker of the Muslim world for centuries, Hebron has apparently spawned at least two other beadmaking industries. One is now scattered in several places in western Turkey. The other, ironically, has come "home" to Cairo.

One of the striking elements of the Early Islamic Period was the self-sufficiency of the bead trade

(Francis 1989c). The most popular beads were made in or at the edges of the Islamic world, and carried by Muslim sailors, especially Persians, far afield through the Indian Ocean, and by Muslim traders across the Sahara to the kingdoms of the western Sudan. Beginning in the 16th century, Europeans began to supplant the Muslims as chief supplier of beads to much of the world. In a few centuries the glass beads of Venice and Bohemia, the latter with production often geared especially to the Muslim market (Francis 1988: 42), became paramount. However, within regions still controlled by Muslim traders, beads from the Muslim world remained important. These included amber and coral, the former from Europe, but both cut in Cairo; agates from western India, now firmly in Muslim hands; clay, wooden, and doum-nut beads made in Egypt; and the *mongur*, *harish* and associated glass beads from Hebron.

The story of the glass beads made in Hebron is one of the more interesting finds of this study. It is a comment on the whims of fashion, as well as a useful reminder that the secondary trade of beads -- which can be documented for nearly all parts of the world -- can confound researchers. The history of these beads serves as an object lesson of the unending appeal of the oldest of all decorative goods and of the dangers of researching beads only through the tales carried by bead dealers.

### ENDNOTES

1. Quotations from sources written in French have been translated into English by the author.
2. The spelling of "El Tunisi" would be more proper, considering modern orthographic practices. The translator's spelling of "El-Tounsy" has been retained here for convenience.
3. If these are Muslim graves, that would be most unusual, as Muslims do not normally bury the dead with ornaments or goods of any sort.

### REFERENCES CITED

- Arkell, A.J.  
1937 Hebron Beads in Darfur. *Sudan Notes and Records* 20(2):300-5.

**Baedeker, Karl**

1912 *Palestine et Syrie*. K. Baedeker, Leipzig.

**Barth, Heinrich**

1965 *Travels and Discoveries in North and Central Africa, Being a Journal of an Expedition Undertaken under the Auspices of H.B.M.'s Government in the Years 1849-1855*. Centenary ed. Frank Cass, London.

**Benjamin [son of Jonas; of Tudela]**

1905 The Peregrination of Benjamin the Sonne of Jonas, a Jew. In *Hakluytus Postumus or Purchas His Pilgrimes*, edited by Samuel Purchas, Vol. 8, pp. 523-93. James MacLehose and Sons, Glasgow.

1983 *The Itinerary of Benjamin of Tudela*. Joseph Simon, no place.

**Besborodov, M.A. and J.A. Zadneprovsky**

1963 Early Stages of Glassmaking in the U.S.S.R. *Slavia Antiqua* 12:127-42.

**Browne, William G.**

1799 *Travels in Africa, Egypt, and Syria from the Years 1792 to 1798*. Cadell, Davis, Longman, and Rees, London.

**Burckhardt, John L.**

1822 *Travels in Nubia*, 2nd ed. John Murray, London.

**Castella, Henry**

1794 Voyage en Egypt de 25 Novembre 1600 - 6 Février 1601. In *Voyages en Egypt des années 1597-1601*, edited by Serge Sauneron, pp. 113-223. Institut Français d'Archéologie Orientale du Caire, Cairo.

**Clerget, Marcel**

1934 *Le Caire, Étude de Géographie Urbaine et d'Histoire Économique*, Vol. I. Schendier, Cairo.

**Clot-Bey, A.-B.**

1840 *Aperçu Général sur l'Égypte*. Fortin, Masson, Paris.

**Defremery C. and B.R. Sanguinetti**

1922 *Voyages d'Ibn Batouttah*. Vol. 4. L'Imprimerie Nationale, Paris.

**Engle, Anita**

1973a Armenez in Syria and its Role in the Medieval Glass Industry. *Readings in Glass History* 2:1-17.

1973b 3,000 Years of Glassmaking. *Readings in Glass History* 1:1-26.

1974 Benjamin of Tudela and the Glassmakers -- A New Perspective. *Readings in Glass History* 4:32-41

**Eyo, Ekpo**

1979 *Nigeria and the Evolution of Money*. Central Bank of Nigeria and The Federal Department of Antiquities, Lagos.

**Fisher, Allan G.B. and Humphrey J. Fisher, with Rex. S. O'Fahey**

1971 *Sahara and Sudan, Volume Four: Wadai and Darfur by Gustav Nachtigal*. University of California Press, Berkeley.

**France. Commission de monuments d'Égypt**

1829 *Description de l'Égypt ou Recueil des Observations et des Recherches que ont été faites en Égypt pendant l'expédition de l'armée Française*, 2nd ed. C.L.F. Panckoucke, Paris.

**Francis, Peter, Jr.**

1979 Third World Beadmakers. *World of Beads Monograph Series* 3.

1981 Bead Report V: Beads in Turkey, Part I. *Ornament* 5(2):38-9, 58.

1982 Indian Agate Beads. *World of Beads Monograph Series* 6.

1986a A Bit More on the Cornerless Cube. *Bead Forum* 8:8-10.

1986b Baba Ghor and the Ratanpur Rakshisha. *Journal of the Economic and Social History of the Orient* 29:198-205.

1989a Bead Report: Bead Peregrinations. *Ornament* 13(2):78-82.

1989b Beads in the Islamic World. *Margaretologist* 2(3):7-8.

1989c Beads of the Early Islamic Period. *Beads* 1:21-39.

1990 Beads in Ghana (West Africa). Part 1. *Margaretologist* 3(1):1-12.

**Goitein, S.K.**

1961 The Main Industries of the Mediterranean Area as Reflected in the Records of the Cairo Geniza. *Journal of the Economic and Social History of the Orient* 4.

1973 *Letters of Medieval Jewish Traders*. Princeton University Press, Princeton.

**Al-Hacen**

1906 Extracts of Alhacen his Arabicke Historie of Tamerlan. In *Hakluytus Postumus or Purchas His Pilgrimes*, edited by Samuel Purchas, Vol. 11, pp. 401-68. James MacLehose and Sons, Glasgow.

**Henein, Nessim Henry and Jean-François Gout**

1974 *Le Verre Soufflé en Égypte*. Institut Français d'Archéologie Orientale, Paris.

**Heyd, W.**

1959 *Histoire du Commerce du Levant au Moyen-Âge*. Vol. 2. Adolf Hakkert, Amsterdam. Originally published in 1885/6.

**Küçükerman, Önder (Maggie Q. Pinar, transl.)**

1988 *Glass Beads: Anatolian Glass Bead Making, The Final Traces of Three Millennia of Glass Making in the Mediterranean Region*. Turkish Touring and Automobile Association, Istanbul.

**Lamm, Carl J.**

1959 Glass... Islamic. In *Encyclopedia of World Art*, Vol. 6, pp. 375-6. McGraw-Hill, New York.

**Levtzion, N. and J.F.P. Hopkins (eds.)**

1981 *Corpus of Early Arabic Sources for West African History*. Cambridge University Press, Cambridge.

**Liu, Robert K.**

1982 Amira Françoise: Living with Beads in the Sudan. *Ornament* 5(4):24-7.

**Lyon, G.F.**

1821 *A Narrative of Travels in Northern Africa in the Years 1818, 19, and 20*. John Murray, London.

**McIntosh, S.K. and R.J. McIntosh**

1984 The Early City in West Africa: Towards an Understanding. *African Archaeological Review* 2:73-98.

**Meistermann, P. Barnabe**

1923 *Guide de Terra Sancta*. Auguste Picard, Paris.

**Miquel, André (transl. and ed.)**

1963 *Al-Muqaddasi: Ahsan at-Taqasim Fi Ma'rifat al-Aqalim (La Meilleure Répartition pour la connaissance des Provinces)*. Institut Français de Damas, Damascus.

**Nesbitt, Alexander**

1879 Glass History. In *Encyclopaedia Britannica*, Vol. 10, pp. 647-55. Samuel L. Hall, New York.

**Olin, Stephen**

1846 *Travels in Egypt, Arabia Petraea, and the Holy Land*, 8th ed. Vol. 2. Harper and Brothers, New York.

**Park, Mungo**

1815 *The Journal of a Mission to the Interior of Africa, in the Year 1805*. John Murray, London.

**Perrot, Georges and Charles Chipiez (transl.), and Walter Armstrong (ed.)**

1885 *History of Art in Phoenicia and its Dependencies*. Vol. 2. Chapman and Hall, London.

**Posnansky, Merrick**

1971 Ghana and the Origin of West African Trade. *Africa Quarterly* 9(2):110-25.

**Sanders, J.H. (transl.)**

1936 *Ahmed Ibn Arabshah: Tamerlane or Timur the Great Amir*. Luzac, London.

**Scanlon, G.T.**

1981 Fustat Excavations: Preliminary Report, 1972. Part 1. *Journal of the American Research Center in Egypt* 18:57-84.

**Schefer, Charles**

1970 *Sefer Nameh: Relation du Voyage de Nassiri Khosrau*. Philo Press, Amsterdam.

**Schienerl, Peter**

1985 Cornerless Cube Stone Beads in Egypt and Palestine. *Bead Forum* 7:8-9.

**Sismanoglu, Samin**

1978 The Glass Bead Making in Western Anatolia. ICOM Committee for Conservation, *Papers of the 5th Triennial Meeting*, Zagreb.

**Sleen, W.G.N. van der**

1975 *A Handbook on Beads*. Liberty Cap Books, York, Pennsylvania. Originally published in 1967.

**El-Tounsy (Dr. Perron, transl.)**

1845 *Voyage au Darfour*. Duprat, Paris.

1851 *Voyage au Ouadây*. Duprat, Bertrand, Franck, Renouard and Gide, Paris.

**Weinberg, Gladys D.**

1968? Furnace for Bead-making at Kurudere Koyo, Kemalpasa, Izmir. Unpublished manuscript. Corning Museum of Glass, Corning, New York.

**Whiston, William (transl.)**

n.d. *The Works of Flavius Josephus*. Beardsley, Auburn, New York. Originally published in 1737.

**Wright, Thomas**

1968 *Early Travels in Palestine*. K.T.A.V., New York. Originally published in 1848.

Peter Francis, Jr.

Center for Bead Research

4 Essex Street

Lake Placid, N. Y. 12946



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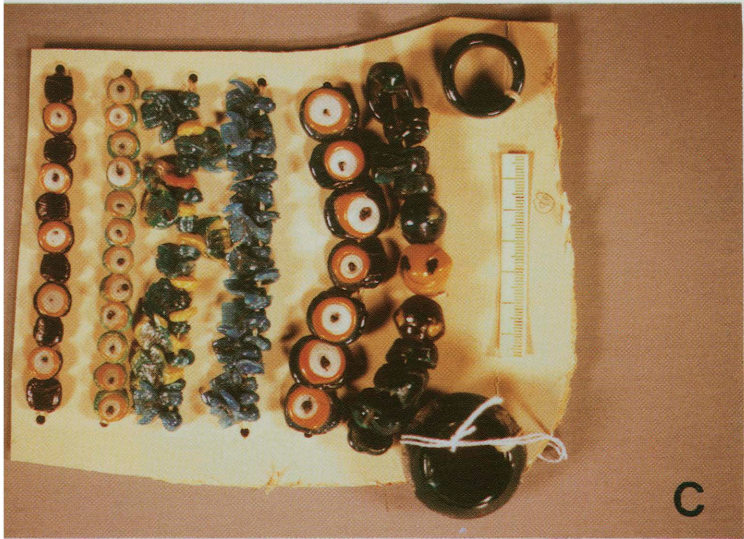
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