

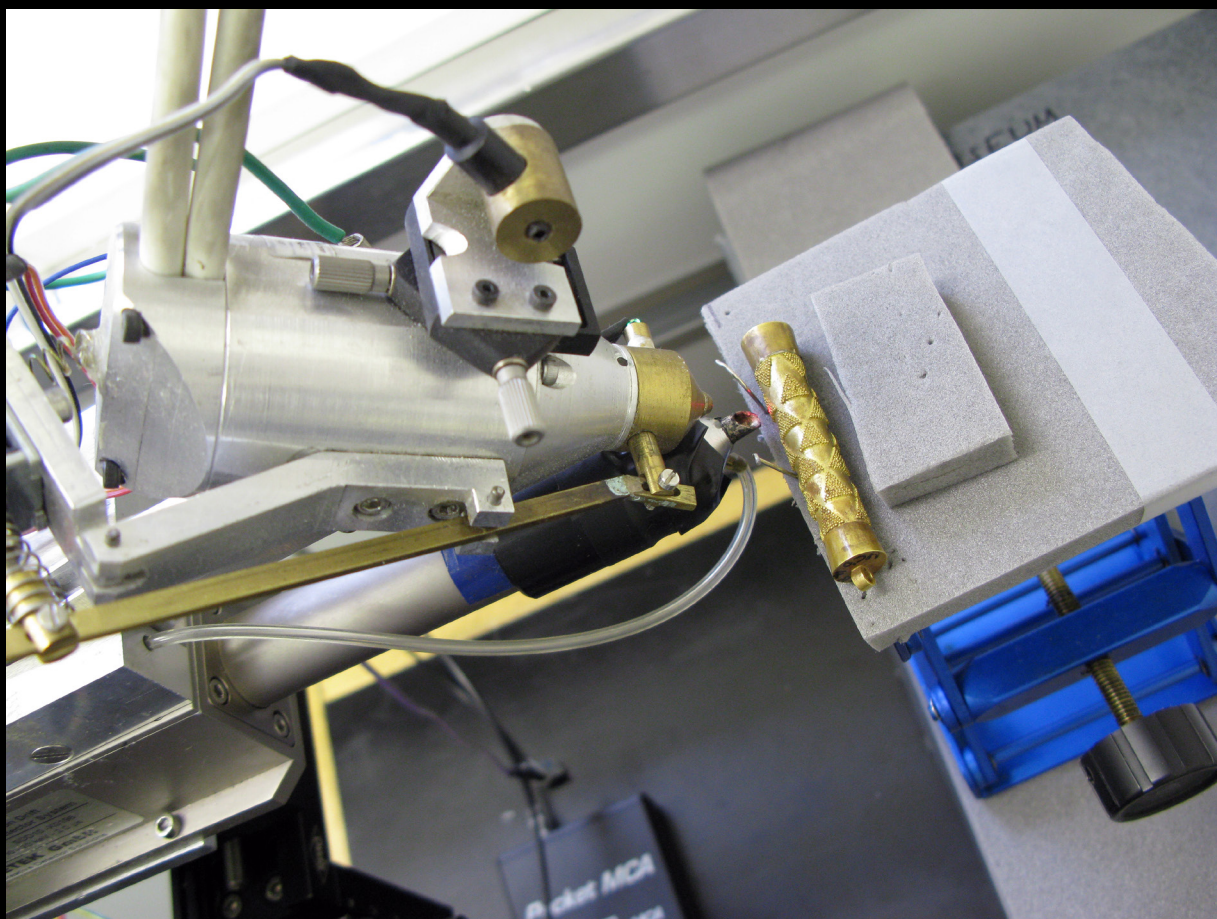


McDONALD INSTITUTE MONOGRAPHS

Ancient Egyptian gold

Archaeology and science in jewellery
(3500–1000 BC)

Edited by Maria F. Guerra, Marcos Martín-Torres
& Stephen Quirke



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with contributions from

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On the front cover: *Analysis of the gold cylindrical amulet from Haraga at The Petrie Museum of Egyptian Archaeology (UC6482) using a portable XRF spectrometer.*

On the back cover: *Details under the SEM of the triangular designs of granulation on the tube of the cylindrical amulet from Haraga.*

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Editorial foreword

This volume aims to present a wide range of perspectives on early Egyptian goldwork, integrating the complementary yet distinct approaches of archaeology, materials science, jewellery and Egyptology. On one level, our primary task has been to present new analytical data on the manufacturing technology and elemental composition of dozens of artefacts preserved at six European museums. At the same time, we have sought to anchor and contextualize this new information based on current research from three perspectives: an introduction to the fundamental geochemistry and material properties of gold, a reanalysis of historical sources and of goldwork manufacturing-techniques, and a guide to the key analytical techniques employed. In this way, we wish to ensure that the volume is accessible to specialists and students from different backgrounds. We anticipate that this body of material will provide a rich source of information for further interrogation and discussion in the future, and our concluding chapter offers a first synthesis of some key points emerging from this new research. There we focus particularly on the findings that seem to us most significant, alongside open questions and suggestions for future work. In so doing, we explicitly highlight some of the many strands beyond the scope of the work presented here, hoping that they may provide pointers for others. We emphasize that the volume is addressed not only to those interested in the archaeology of Egypt in the timespan covered, but equally to scholars researching past technologies and archaeological goldwork elsewhere, who may find technical observations of broader scope that could prompt cross-cultural comparisons.

In spite of the substantial amount of data compiled here for the first time, it is important to remind ourselves of some potential biases that are inherent to this work and may thus skew our interpretations. The most important of these concerns the selection of

objects. This project starts and, in many ways, remains throughout its course with the exceptional group of gold jewellery buried in Qurna, on the west bank of Thebes in Upper Egypt, with a woman and child whose names are unknown to us, at some point in the 17th or 16th century BC. Today the Qurna group is the most important Egyptian assemblage in the National Museum of Scotland, Edinburgh. In 2008, curator Bill Manley with materials scientists Jim Tate, Lore Troalen and Maria Filomena Guerra launched a programme of new analyses of the goldwork from the group. Already in this first investigation, the scope extended to comparison with jewellery from the preceding and following centuries (Tate et al. 2009; Troalen et al. 2009). With funding obtained from the CNRS, Guerra could then expand the range of collections involved in collaboration with Thilo Rehren at UCL, to include the UCL Petrie Museum of Egyptian Archaeology and the UCL Institute of Archaeology with its laboratory facilities, as well as the National Museums of Scotland and the British Museum as project partners (CNRS project PICS 5995 EBAJ-Au). On the initiative of Jim Tate, contact had been established already with colleagues Matthew Ponting and Ian Shaw at the University of Liverpool. As a result, the Garstang Museum is also participant in the wider project, together with the Manchester Museum, through the support of curator Campbell Price, and the Louvre Museum, through the support of curator H  l  ne Guichard and the late Sandrine Pag  s-Camagna, material scientist at C2RMF (Centre de Recherche et de Restauration des Mus  es de France). We wish to emphasize here the fundamental role of Sandrine Pag  s-Camagna in crucial stages of the project; without her participation the project could not have achieved a significant part of its aims – notably comparison between the Qurna group and the nearest securely dated examples of royal goldwork from the reigns of kings Kamose and Ahmose.

Other institutions participated with the provision of access to particularly specialized equipment: AGLAE facilities at C2RMF, Bundesanstalt für Materialforschung und –prüfung, and LIBPhys at NOVA University of Lisbon

With this new support, the research agenda was able to grow organically, adapting to fresh questions emerging from preliminary results, while contingent on the artefacts present in museums that were accessible to the project. Indeed, the history of the collections has been a significant factor, both enabling and constraining our research. The Louvre collections contain a range of jewellery from early excavations in Thebes, including representative material from the late second millennium BC settlement Deir al-Madina, and major works from 16th century royal burials uncovered during fieldwork directed by Auguste Mariette. The British Museum and the other participating museums in England and Scotland also preserve a mixture of material from documented excavations and earlier undocumented collecting practice. Here colonial history frames the kinds of material available. During and after the full British military occupation of Egypt (1882–1922), the Antiquities Service of Egypt under French Directors permitted officially recognized institutions to excavate in Egypt and, in return for the enrichment of the Egyptian Museum Cairo, to take a share of finds from excavations. Following division of finds in Egypt, excavation funding bodies based at Liverpool (since 1903) and London (since 1882) distributed finds to dozens of sponsoring museums (Stevenson 2019). The university museums in Liverpool and London were among the major recipients

of these finds, and also hold substantial excavation archives. The Qurna group itself and several other sets of jewellery analysed during the project are unusual examples of this pattern of dispersal, where the vast majority of items distributed belonged to the types of objects found in large numbers in fieldwork. The project was therefore able to investigate objects from a wide social spectrum, from palace production (Qurna group, Haraga fish and cylinder, items of kings Ahmose and Kamose from Thebes) to finds in cemeteries of regional rural towns and villages (Qau, Badari, Matmar). At the same time, in expanding the chronological scope of analyses forwards to the New Kingdom and back to the late prehistory of Egypt, the participating museums could not cover every social group for every period. Most notably, and perhaps surprisingly for those outside the museum circle, these collections hold none of the major goldwork from the age of the great pyramids, the mid-third millennium BC. At that period, the concentration of power at Memphis around kingship separates the royal court from the regions, and this is reflected in the tombs of the period and in the distribution of finds. Gold and gilt ornaments are more prominent in burials at the Memphite cemeteries: Giza and Saqqara. The single outstanding assemblage of Egyptian goldwork from the mid-third millennium BC is the unparalleled burial of material related to Hetepheres, mother of king Khufu; the finds are on display in the Egyptian Museum Cairo. Egyptologists from Cairo, Vienna, Boston, Hildesheim and Leipzig directed excavations at Giza; their museums received a share in finds (Manuelian 1999). The museums in our project, from Paris to Edinburgh,

Table 0.1. *Numbers of artefacts (museum inventory numbers) analysed by site and period.*

	Dyn 1-2	First IP	Middle Kingdom	Second IP(-Dyn18)	New Kingdom	?	Total
Memphis					2		2
Riqqa			4		7		11
Haraga			13 + 1?				14
Lahun			5				5
Ghurab					1		1
Sidmant			1		1		2
Amarna					8		8
Qau area		15		5			20
Abydos	4		2 + 2?	2		3	13
Naqada			2				2
Thebes			2	2 + 7?	4		15
*Qurna				12			12
Buhen			1				1
?		1	5	2	22		30
TOTAL	4	16	36	30	45	3	136

are not on that distribution map. With this and other lesser gaps, our sample, however extensive, cannot and does not claim to be random or representative of an underlying population of 'Egyptian goldwork'. On our chronological range from fourth to second millennia BC, there are peaks and troughs in the frequency of artefacts, and we encourage the reader to keep these in mind graphically, in order to assess our interpretations in context and to develop their own further research agendas (see Table 0.1).

Another delimiting factor in the selection of objects derives from our focus on technique, directing our attention predominantly to jewellery, rather than other gold elements such as the prominent use of sheets for gilding larger substrates of wood or plaster. Gold foils were included for comparative purposes, particularly in the investigation of composition, but to a lesser extent. Furthermore, within the rich repertoire of Egyptian gold jewellery, we took a particular interest in select assemblages, starting with the Qurna group itself, and within these certain specific features, such as the small beads found in the child's coffin and the adult's girdle. While these are fascinating manifestations of both technology and consumption, they are not necessarily representative of a broader corpus. We would also emphasize that we sought primarily artefacts with well-recorded archaeological contexts, as these evidently allow for more robust inferences, and provide the most secure foundations on which to build further research. Where the museums could provide access to material not from documented excavations, but acquired before 1970, we have included certain items if they helped to complete gaps in understanding, as a secondary circle of supplementary information. In each such case we have done our utmost to investigate their authenticity and source, but undeniably any interpretation based on an unprovenanced object will have to remain tentative. Indeed, one of our analytical investigations demonstrated the risks in building historical conclusions on material without documented

excavation context; a gold shell inscribed with the name of king Taa, who reigned close in time to the Qurna group, presents disconcerting features more consistent with modern rather than with ancient manufacture.

A final and equally important constraint concerns the background and expertise of the editors and contributors to this volume. While together we span interdisciplinary breadth, and have found synergies in our research, inevitably there remain areas beyond our interests and access, and indeed beyond the time scope of the project. For example, our data may be used as a starting point to address issues of provenance, but targeted consideration of the extraction methods and possible geological sources of gold is not addressed in detail in this volume. Instead, much more emphasis has been placed on issues of technology, and the application of the results to a concluding interpretation of the Qurna group. We look forward to seeing how others may take up such topics, and feel sure that the woman and child of Qurna will continue to pose new questions.

Finally, for the opportunity to share our discussions and findings with a wider research audience, we would like to express our gratitude to the McDonald Institute for Archaeological Research for including this volume in its series.

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Chapter 11

Towards a conclusion: Qurna in context

Maria F. Guerra

The puzzling Qurna jewellery assemblage is reassessed here from the technological point of view, with reference to the new data presented in this volume and gathered by analytical study of the Egyptian jewellery in the collections of the six museums involved in this project. Also considered in this discussion are published data on Egyptian

goldwork, jewellery produced in the same period in Egypt, as well as jewellery produced in surrounding areas with connections to Egypt. Many relevant artefacts included in the discussion are in the databases from the Metropolitan Museum of Art excavations at Thebes, recently published by C. Lilyquist.

Following the studies on the objects dated to the New Kingdom presented in Chapter 10 of this volume, we consider it important to return to the group of gold jewellery from the burial of a woman and a child excavated by Petrie (1909) at Qurna, on the west bank of Thebes in Upper Egypt. This group of jewellery, whose technological description is provided in this volume by L. Troalen, J. Tate and M. F. Guerra in Chapter 9.2, was the subject of several analytical studies carried out from 2007 onwards in Edinburgh and Paris (Tate et al. 2009; Troalen et al. 2009, 2010, 2014). By its unforeseen complexity, the Qurna group of jewellery was the starting point of this book.

Dated on stylistic grounds to the 17th Dynasty, the Qurna burial, considered extremely wealthy for the period, contained two coffins shown in Figure 11.1 (from Petrie 1909, pl. 23). One is a rectangular coffin containing the mummified body of a 2–3 year old child wearing a gold necklace, a pair of gold earrings, three ivory bangles and blue-glazed girdle and anklets, found as follows: ‘On the neck was a thread of 215 small gold ring-beads (...). At the right ear was a spoiled group of 3 gold rings stuck together, looking like a miniature ear-ring, and a similar group at the left. (...). On the left humerus were two ivory bangles (...). On the right humerus was one bangle (...). Round the waist was a string of small blue ring-beads (...), and round each ankle a string of similar beads.’ (Petrie 1909, 10). The other is a gilded *rishi* type coffin containing the mummified body of an 18–25 year old

woman wearing a gold collar, a pair of gold earrings, two pairs of gold armlets, an electrum girdle, a green steatite scarab, and an electrum button. The jewellery, shown in Figure 11.2 (from Petrie 1909, pl. 29), was found as follows: ‘Upon the body was a green scarab, with nofer in scrolls, tied by string on to the third finger of the left hand. [...] On each arm, just below the elbow joint, were two plain gold bangles [...]. Around the waist, outside the innermost cloth, was a girdle of electrum beads [...]. On the neck was a collar of four rows of small rings of gold. [...] On the neck of the inner garment was an electrum button.’ (Petrie 1909, 9–10).

Although the woman’s coffin inscription is damaged, not allowing the identification of the owner, the grave goods and the woman’s diet strongly suggested that she may have been ethnically Nubian rather than Egyptian (Eremin et al. 2000; Manley et al. 2002; Veldmeijer & Bourriau 2009; Manley 2011).

In this return to Qurna, and in order to provide new arguments that might shed new light on the origin of the gold objects, we try to go further in the discussion of this jewellery group based on the data that could be obtained by analytical study of other Egyptian jewellery since 2007. Also drawing on the countless technological studies initiated and carried out on that group of jewellery by Jim Tate and other colleagues, we seek to underline technical disparities or similarities in relation with other objects dated to adjacent periods that were studied in this volume. Therefore, among the many questions raised by the group of jewellery excavated at



Figure 11.1. *The two coffins of a young woman and a child excavated at Qurna by Petrie (1909, pl. 23).*

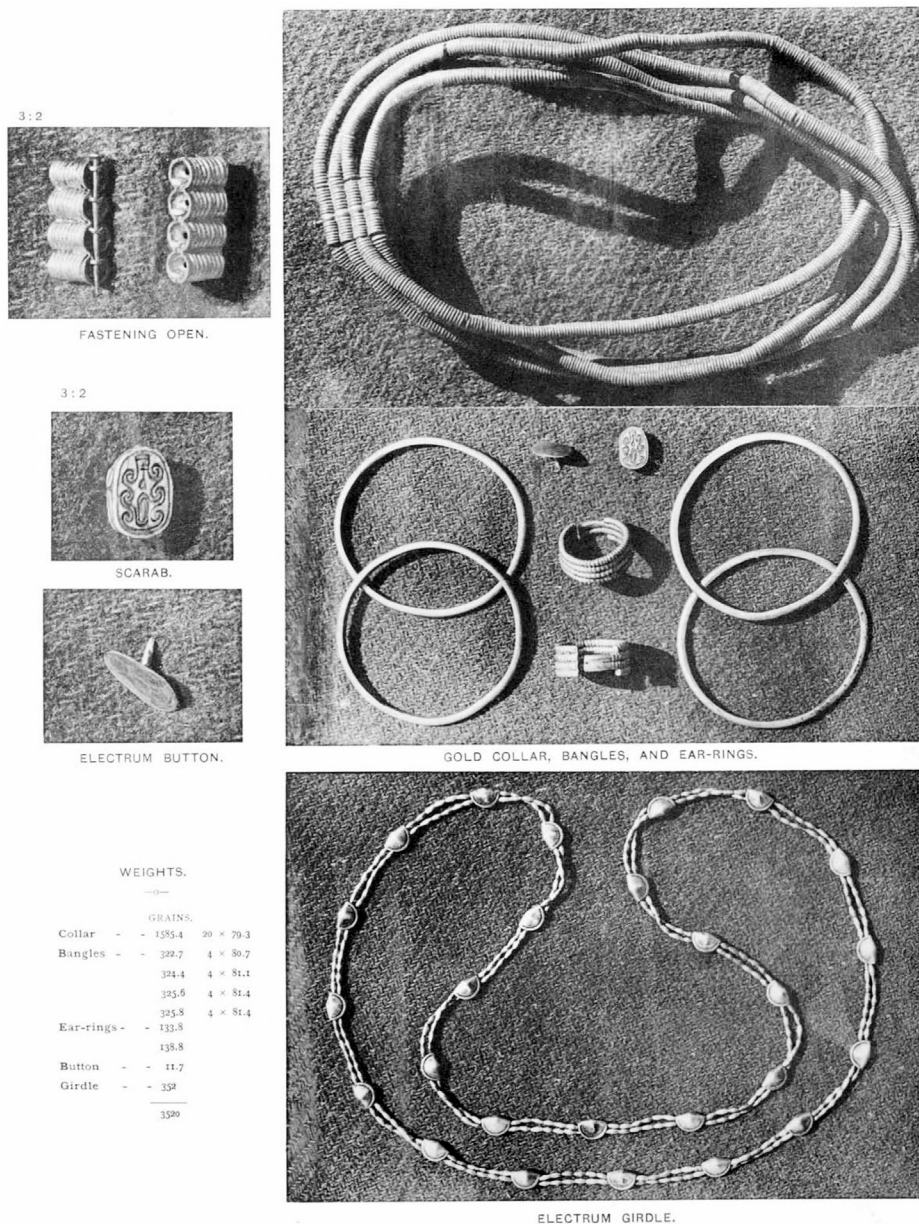


Figure 11.2. *The gold jewellery worn by the woman buried at Qurna as shown by Petrie (1909, pl. 29). On the top the gold collar with a detail of the fastening system. In the middle, the pair of gold ribbed earrings, the four gold bracelets, the steatite scarab and the electrum button. On the bottom, the electrum girdle.*

Qurna, we consider below those that can be approached from a technological point of view.

Published data on Egyptian gold alloys is also considered below, as is other relevant information on the jewellery produced during the same period in surrounding areas with connections to Egypt. In addition, the databases recently made available by C. Lilyquist (2020) on the Metropolitan Museum of Art excavations at Thebes were used in order to obtain information, with a special focus on jewellery found in female burials dated to the period concerned. It is however essential to keep in mind that, considering the large period covered, the number of studied Egyptian gold items used as ‘benchmark’ in this discussion is, after all, quite small. We must note in particular that the discussion below is constrained by the lack of information on Nubian jewellery-making technologies, given the absence of studied pieces. Therefore, the aim of this chapter is to bring some suggestions that might contribute to begin the debate. The many suggestions and incisive comments from Stephen Quirke very much improved the text.

The Qurna collar and the use of hard soldering in Egypt

Considered the main piece in the group of jewellery from Qurna, the adult’s collar is made of 1699 gold ring beads of 4.5 mm diameter strung in four strings. Although reminiscent of collars containing multiple rows of, for example, ostrich eggshell beads (e.g. Wilmsen 2015), a type of bead often excavated in Egyptian and Sudanese sites,¹ this collar is among the few in gold that resemble *shebiu* collars, a type that became common under Thutmes III (Binder 2008; Brand 2006).

In fact, this type of collar is characterized by the use of lenticular beads strung in two to five strings of different lengths (Binder 2008, 38–44). Tutankhamun’s triple string collar contains beads in yellow gold, in pink gold and in faience (Edwards 1976, no. 3). At present, the only one entirely in gold containing this type of beads seems to be the one-string collar of Kha, identified under X-radiography when the mummy was studied in the 1960s (Curto & Mancini 1968). Recent Multidetector Computed Tomography with 3D reconstruction and X-radiography of the mummy carried out at the Egyptian Museum at Turin (Bianucci et al. 2015) has provided high-resolution images which show that the collar does not seem to have a clasp.

Although it does not contain gold lenticular beads, but ring beads, some authors consider the Qurna collar as an early form of *shebiu* collar (Aldred 1971, 198). Unlike the one-string collar of Kha, the Qurna collar has a clasp, shown in Figure 11.3. As specified by Tate et al. (2009) in their analytical study of the collar, the clasp was made by soldering together by string a set of eight gold beads on each side. At the end of each set of soldered beads is soldered a cup-shaped element containing a gold loop (Goring et al. 2005). One gold pin passing through the loops fastens the system. The use of gold pins to ‘fix separate plates together’ is a fastening system often employed in New Kingdom jewellery (Maxwell-Hyslop 1971, 122–3), but a similar fastening system can be identified in Middle Kingdom productions, such as in one bracelet from Dahshur (52051 in Vernier 1907–27, 28, pl. 7). This type of clasp is contained in other Egyptian gold collars. Among them, one of those from the burial of Psusennes is said to be a late form of *shebiu* collar (Aldred 1971, 238, pl. 138; Andrews 1990, fig. 5). It contains five strings of gold

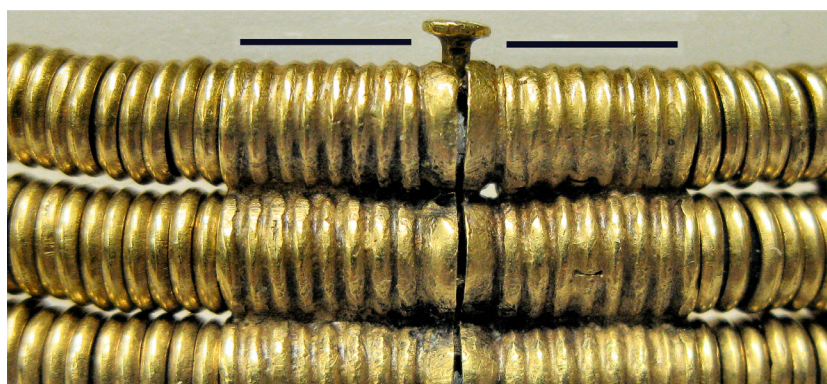
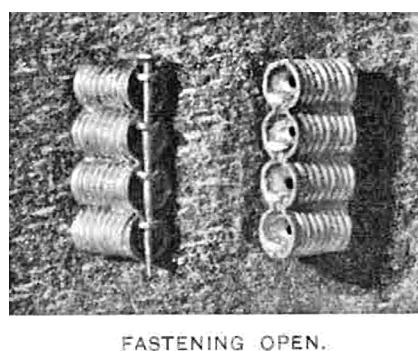


Figure 11.3. On the left, the fastening system of the Qurna collar (from Petrie 1909, pl. 29) consisting on series of hard soldered rings at both ends of each string to which are soldered cup-shaped terminals. On the right, is shown a detail of the eight beads and cup-shaped component soldered on each side of the four strings. A gold pin fastens the collar as it passes through the gold loops soldered to the cup-shaped components.

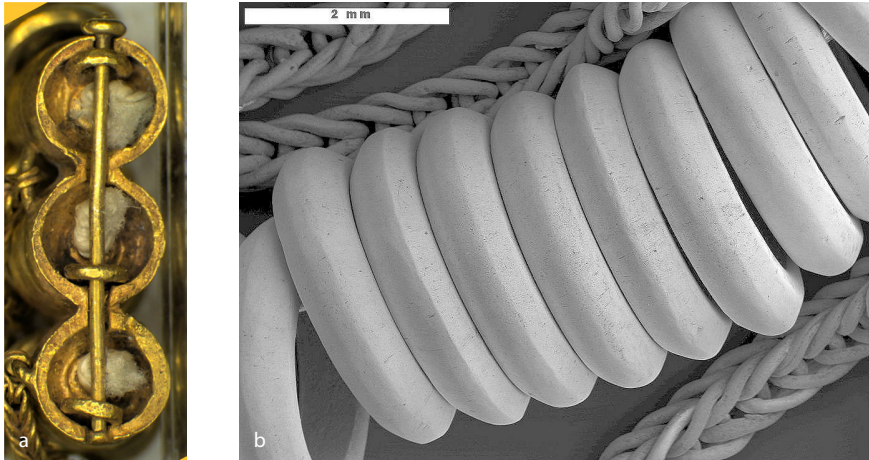


Figure 11.4. Details of the small collar EA14693, said for a statue, in the collection of the British Museum. (a) Under the stereomicroscope, the end where the three rings of the fastening system were soldered and the closing pin. (b) Under the SEM, the smooth surfaces of the ring beads.

convex truncated bicone disc beads (Montet 1942; 1946, 6–8, no. 482) and one clasp consisting of an inscribed folded plate to which, on the back, is soldered a set of seven beads by string. The clasp of another collar from the same burial, with three strings of gold beads, has a clasp also obtained by soldering together by string a set of gold beads on each side.

It is also interesting to mention one unprovenanced small collar in the collection of the British Museum (EA14693) dated to the 18th Dynasty (Andrews 1990, 181–2, fig. 169), which is said to be a miniature collar for a statue. Purchased in 1872 from Alessandro Castellani, it comprises two strings of ring beads of c. 3 mm diameter and one clasp identically made by soldering beads together, in this case five, at both ends of each string (Andrews 1990, 183). As in the case of the Qurna collar, one gold pin fastens the system by passing through the gold loops contained in the cup-shaped components soldered to each set of soldered beads (Fig. 11.4). The rings have a very smooth surface, as shown in Figure 11.4 under the SEM, smoother than the surface of the Qurna collar rings. Tate et al. (2009) present a comparison of these two collars with another string of gold ring beads of 6 mm diameter dated to 17th – early 18th Dynasties, a choker in the collection of the Metropolitan Museum of Art (16.10.314; no. 121 in Roehrig 2005). It was found on the female body discovered inside tomb R4, burial C1, Courtyard CC 41, excavated by H. Carter in the Lower Asasif in 1915–16 (Lilyquist 2020, no. 1138). The woman was also wearing a pair of penannular earrings in gold plated bronze (Lilyquist 2020, no. 1139; 16.10.312-3 in the Metropolitan Museum of Art). Roehrig & Patch (2005) mention two other female burials at the same site containing equivalent earrings and gold strings, one wearing a choker (recorded in the Cairo Museum: *Journal d'entrée du Musée* no. 45691) and the other a double-strand necklace (recorded in the Cairo Museum: *Journal d'entrée du Musée* no. 45661).

The gold choker² (Lilyquist 2020, no. 1407) was found with a pair of gold spirals (Lilyquist 2020, no. 1408; 16.10.546-7 in the Metropolitan Museum of Art) on the body contained in burial D2 in tomb R8. It is interesting to note that another pair of thicker spirals in gold-plated bronze were found on the body contained in burial D1 in tomb R8, but these are decorated with incised lines (Lilyquist 2020, no. 1404).

The choker from the Asasif is shown in Figure 11.5, where the irregularity of the ring beads and the



Figure 11.5. Choker of gold rings dated to the Second Intermediate Period - early New Kingdom (L. 33.5 cm; rings d. 0.6 cm) found in 1915–16 by A. M. Lansing at Thebes, Asasif, Courtyard CC 41, on the body contained in tomb R 4, Burial C 1. The Metropolitan Museum of Art, Acc. no. 16.10.314, Rogers Fund, 1916.

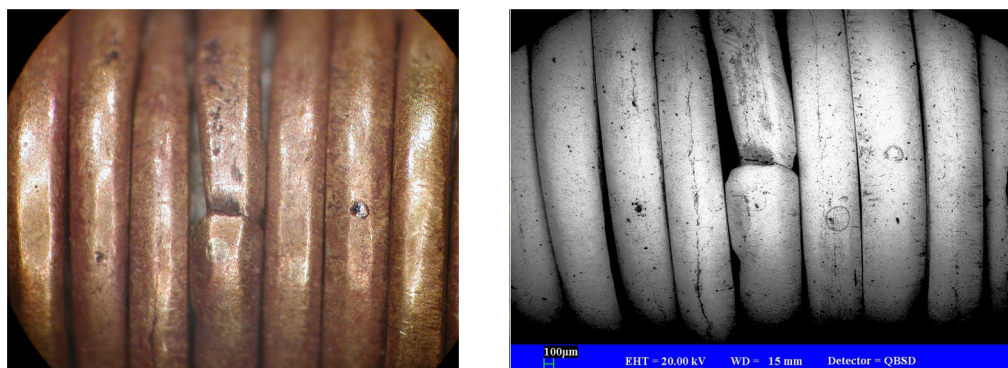


Figure 11.6. Details of the ring beads strung in the Asasif choker showing one PGE inclusion (fig. 6 in Tate et al. 2009, 10.4000/archeosciences.2102, used by permission of ArcheoSciences - PUR).

the cup-shaped components at the string ends (which might have been mounted upside-down) can be seen. Differences in finishing result probably from the work of different artisans. Some ring beads of the Asasif choker are shown in Figure 11.6, showing that they have a different shape from those in the Qurna collar (shown in Fig. 11.7), but do not present the smooth surface texture of those strung in collar EA14693 (in Fig. 11.4). Both the Asasif choker and the Qurna collar contain the tool marks observed for many of the tiny beads studied in this volume, including those contained in the Qurna child's necklace (see below). In Figure 11.7 are shown the tool marks visible on the outer face of the Qurna collar rings as well as the unfinished inner face of one of the rings and the smoothed edges.

The analytical studies reported in Tate et al. (2009) on the three collars have shown the use of quite different alloys. While the beads of the Qurna collar contain c. 11 wt% Ag and c. 2 wt% Cu, those of the Asasif choker contain c. 20.5 wt% Ag and c. 2 wt% Cu, and those of the British Museum collar only contain c. 2 wt% Ag and c. 1 wt% Cu.³ It is not only the composition and the shape of the beads that are

different, but the morphology of the joins is different too. In fact, as described in Tate et al. (2009), while bumps of solder are visible in some beads of the choker, the solder in the Qurna beads could only be analysed after etching the area of join (see Chapter 9.2). The copper contents increase in the joining areas of all three strings, reaching 8 wt% in the Qurna beads and 4 wt% in the choker beads. In one of the joins in the terminal parts of collar EA14693, copper reaches c. 13 wt%, with a small increase of the silver amount.

The use of hard soldering processes seems to be a common practice in Egypt. The analysis by Roberts (1973) of one sequin from Thebes in the collection of the British Museum, dated to c. 1400 BC, demonstrated the increase of the copper content in the join; Schorsch (1995) has shown the use of the same technique to assemble the gold beads contained in the necklace from the Middle Kingdom tomb of Wah. Analysis of joining areas in four items (believed ancient) from the tomb of the three foreign wives of Thutmes III by M. Wypyski (in Lilyquist 2003) confirmed the regular use in Egypt of solder alloys containing higher copper contents than the parts to be joined. The results

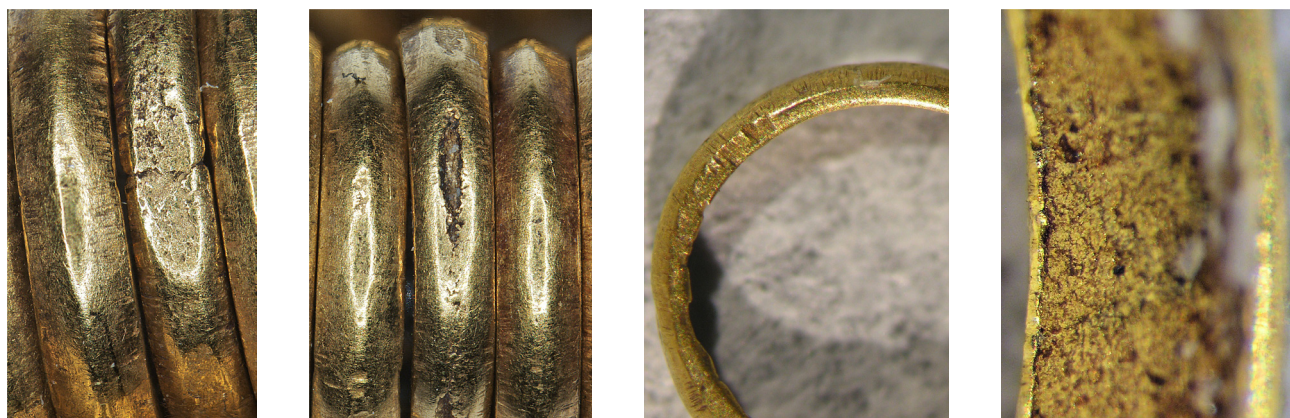


Figure 11.7. Ring beads strung in the Qurna collar (NMS A.1909.527.19) with tool marks and smoothed surfaces. For one of them is shown a detail of the outer face tool marks, the non-finished inner face and the smoothed ends.

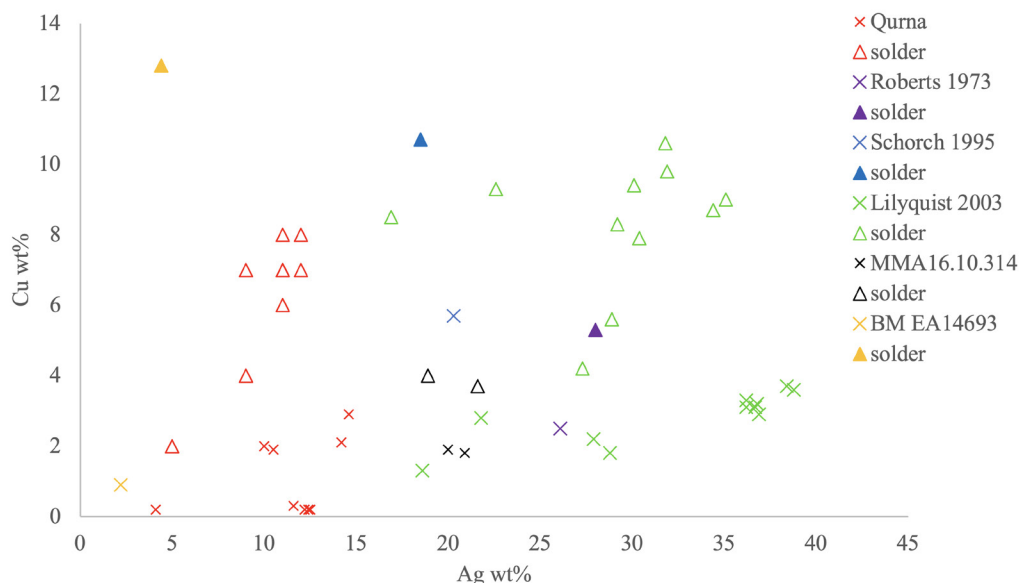


Figure 11.8. Silver versus copper contents obtained for the base and solder alloys of the Qurna jewellery (Chapter 9.2), a New Kingdom sequin (Roberts 1973), the gold Wha's necklace (Schorsch 1995), several jewellery items from the tomb of the three foreigner wives of Thutmes III (analysis by M. Wipinsky, in Lilyquist 2003), the Asasif choker and collar EA14693 (Tate et al. 2009).

published for the cited items were plotted in Figure 11.8 with the data obtained for the group of jewellery excavated at Qurna, for the Asasif choker and for the British Museum collar (published by Troalen et al. 2009, 2014; Tate et al. 2009; data on the Qurna jewellery is provided in Chapter 9.2 of this volume). Base alloys and solder alloys were represented separately for each object or group of objects to provide a clearer picture of the increase of copper in the analysed joins.

Only objects dated from the Middle Kingdom onwards were analysed in this volume for the solder alloys. Here also an increase of copper in the joining areas in relation to the parts to be joined was observed for the majority of them. Indeed, among those made before the New Kingdom only the cylindrical amulet with granulation (UC6482) from 12th Dynasty tomb 211 excavated at Haraga (discussed by M.F. Guerra and N. Meeks in Chapter 8.5) showed the use of a different solder alloy, containing instead high silver amounts. This amulet is among the earliest known Egyptian objects decorated with granulation, a technique that is believed to be introduced in Egypt during the 12th Dynasty (further discussion on granulation is provided in Chapter 8.5). Considering that the use of solder alloys containing high silver contents was observed for objects excavated at Ur (Smith 1930) and at Susa (Duval et al. 1987), M.F. Guerra and N. Meeks suggest in Chapter 8.5 the use of an 'imported' technology to decorate the amulet excavated at Haraga. It

is interesting to note that the two caps of the amulet are made from different alloys. The cap with the suspension ring and the suspension ring itself are made from a similar alloy but were soldered with an alloy containing higher amounts of both silver and copper; the other cap, reddish to the naked eye, contains higher copper contents than all the other components of the amulet. Therefore, this amulet might be a reuse of a granulated tube or a production (or a repair?) by two goldsmiths, conceivably representing the first steps in learning the art of granulation in Egypt.

The use of solder alloys containing higher amounts of both silver and copper than the parts to be joined was observed in this volume for a few items dated to the New Kingdom. We can mention the loop-in-loop chain found with the body of Khamwaset, buried in the Serapeum of Saqqara (studied by M. F. Guerra and S. Quirke in Chapter 10.7), which was soldered with an alloy containing higher silver amounts and a little more copper than the wires used to shape the links. The ribbed penannular earrings from tomb 1371 at Deir el Medina (described by M.F. Guerra in Chapter 10.3) have also showed an increase of both the silver and copper amounts in the joins. In Figure 11.9, the results obtained for the base and solder alloys of the Qurna group of jewellery and the objects studied in this volume are compared. We can observe the same pattern already revealed in Figure 11.8 for other Egyptian objects. The objects made before the

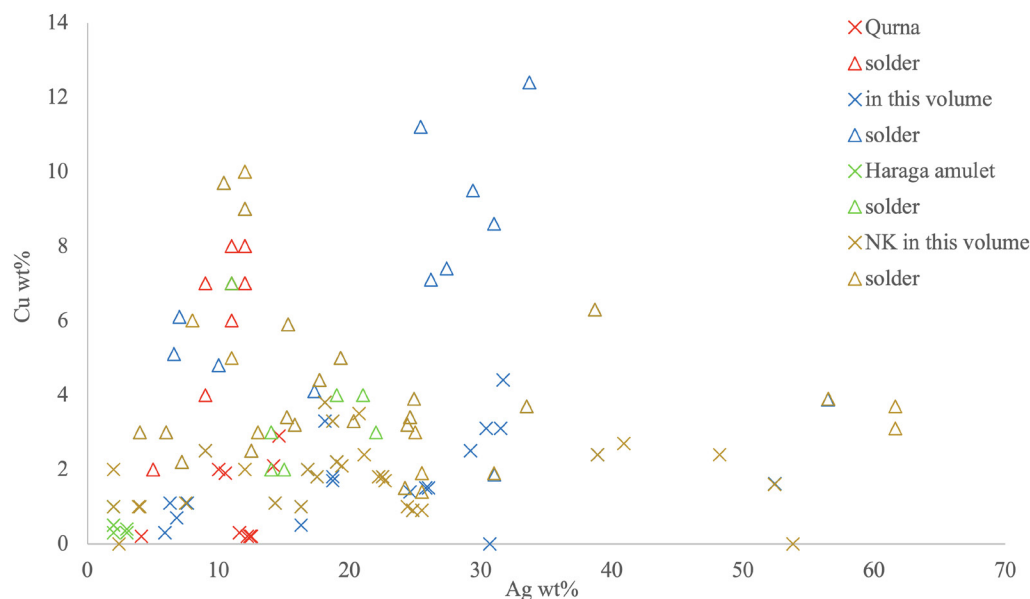


Figure 11.9. Silver versus copper contents obtained for the base and solder alloys of the Qurna jewellery (Chapter 9.2) and objects from different periods analysed in several chapters of this volume as mentioned in the text.

New Kingdom show an increase of the copper contents in the joins, with the exception of cylindrical amulet UC6482, plotted separately, which, as mentioned, is soldered with an alloy containing high silver amounts.

The pattern observed for the New Kingdom objects in Figure 11.9, equally plotted separately, illustrates the use of the two types of solder alloys. The use of different types of solder alloys from the New Kingdom onwards is predictable, because, with the increase of trade in the Eastern Mediterranean area, the number of techniques used in jewellery making is expected to increase in the Egyptian workshops. It is not only the increase of trade that might justify the evolution of the art of goldsmithing in Egypt; with social and political stability bringing economic prosperity, the request for expensive productions had likely increased. It seems likely that access in this period to a higher number of gold deposits, as suggested by Klemm & Klemm (2013), would have contributed to enlarging the number of skilled artisans working in the Egyptian workshops, which would require new organization of production, leading in turn to an improvement and by some means a 'globalization' of the art of goldsmithing.

Although the use of hard soldering processes was repeatedly revealed for the many objects presented in this volume, none of them displays the almost invisible joins of the Qurna collar ring beads; the only exception is the four armlets from Qurna, which are made from undecorated gold rods bent to circular rings and soldered at the ends (see Chapter 9.2). Therefore, the

adult's collar and armlets were mounted using the expected techniques for Egyptian jewellery, but by particularly skilled goldsmith(s). The use of solder alloys containing higher copper contents than the parts to be joined, only reveals the use of the traditional practice regularly employed in Egypt until, as far as it could be demonstrated in this volume based on the studied objects, the advent of the New Kingdom. In contrast, both the adult's and child's earrings in the same group of jewellery have quite thick joins, revealing the work of (an)other goldsmith(s) or workshop(s). These earrings raise many questions that are discussed below.

Egyptian tiny beads and the Qurna child's necklace

The child's necklace is a string of tiny gold beads. The surfaces of the beads contain similar tool marks to those identified at the surface of the many tiny beads analysed in this volume. These marks indicate that these beads were produced using a technique described in Chapter 7.3.1 by M. F. Guerra and N. Meeks, i.e. by wrapping narrow strips of gold in a spiral around a former of appropriate diameter, and then cutting longitudinally across the spiral with a sharp saw or blade to release individual beads of similar diameter (see Fig. 7.4). The beads could have then been enhanced using a finishing process involving abrasion, but no signs of solder could be identified in the joints of the many of them analysed.

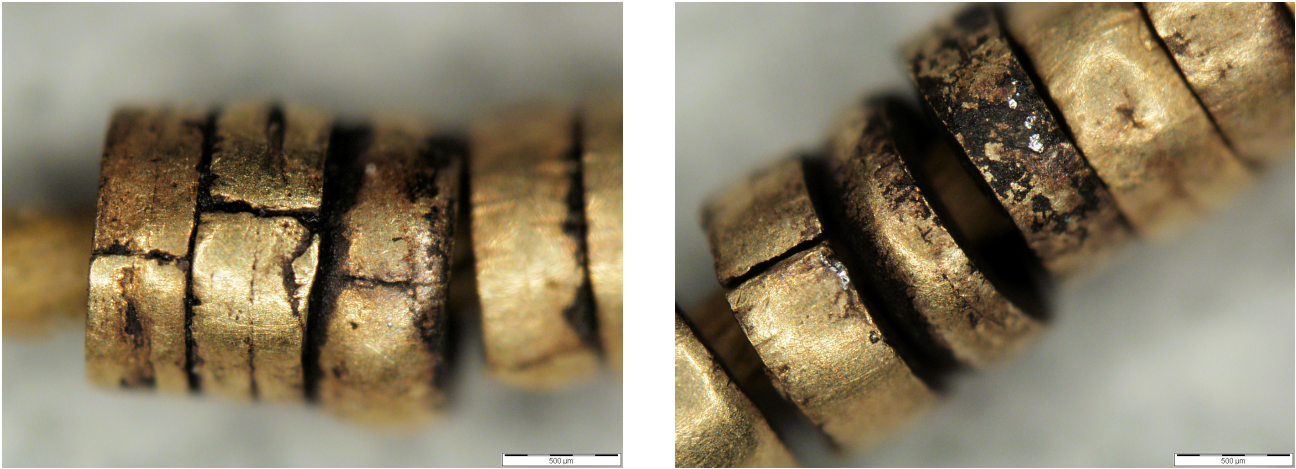


Figure 11.10. Some of the irregular tiny beads contained in the necklace of the child buried at Qurna (NMS A.1909.527.11). Some show tool marks on the edges and others PGE inclusions. The two tubular beads on the left are of similar shape.



Figure 11.11. Some of the very regular tiny beads contained in the string of beads UC18092 (Petrie Museum) found at Qau inside First Intermediate Period tomb 7923.

This technique, described by several authors (e.g. Reisner 1923a; Oddy 1984; Echt et al. 1991), is employed in Egypt since the Predynastic period. Indeed, the tiny beads strung in Predynastic diadem EA37532 in the collection of the British Museum, excavated at Abydos, and which is studied in Chapter 7.3.1, are made this way. The same technique was already in use at Varna, as discussed by Eluère (1990) and Echt et al. (1991), and therefore its use in Egypt is predictable. Further discussion on this sort of beads is provided by M. F. Guerra, M. Martín-Torres and S. Quirke in Chapter 7.4.

The variety of dimensions and shapes observed for the tiny beads strung in the Qurna child's necklace can be appreciated in Figure 11.10, where ring and tubular beads can be seen. They also contain variable number of PGE inclusions. They were not made in one batch for this necklace. In this, they are different from the whitish tiny beads contained in string UC18092 from Qau, dated to early First Intermediate Period,

which are very regular in form and shape as shown in Figure 11.11. Another string found at Badari and dated to the same period (UC20649), also studied in Chapter 7.4, identically contains very regular gold beads, which are also shown in Figure 11.11. The tiny beads strung in the child's necklace are more likely the result of many different batches and artisans' work. As discussed in the mentioned Chapters 7.3 and 7.4, Egyptian strings of beads quite often comprise beads of different shapes and dimensions, most likely resulting from mixing numerous batches from several artisans working in one or more workshops to produce the high number of tiny beads used as spacers in numerous strings. Therefore, ring and tubular beads were quite often found in strings from the same burial. While these two sorts of tiny gold beads are regularly observed in Egyptian strings, Reisner (1923a, 109) also identified their presence in strings excavated at Kerma, in Sudan. The same two sorts of beads can also be found among those in copper. Interestingly, among

the earliest copper objects made in Egypt are six tiny beads 'of two varieties' dated to the Badarian period, found in tombs 596 and 2229 excavated at Mostagedda (Brunton 1937, 37, 41, pls. 39.75W9, 86W15).

The use of two sorts of tiny beads seems to be a regular practice in Egypt, perhaps resulting from the work of several artisans or from reuse of components of ancient strings or from both. In the Qurna child's necklace, two beads shown in Figure 11.10 are similar and could be from the same production. As mentioned, some beads have several PGE inclusions others none, which may correspond to the use of gold from different deposits. Indeed, these tiny beads are also of different colours and therefore resulting from the use of quite different gold alloys (see Chapter 9.2). These facts lend support to the proposition that the tiny beads that form the child's necklace are more likely reused beads than beads made at the same time by different goldsmiths.

Many of the tiny beads strung in the child's necklace show marks of wear. These signs confirm

that, in contrast to the quite 'fresh' and regular ring beads strung in the adult's collar, those contained in the child's necklace are a reuse of beads from older strings.

Puzzling Qurna earrings

The earrings comprised in the Qurna group raise many questions, essentially because they are of quite unexpected types. On the one hand, the adult's earrings are made by assembling beaded hollow tubes and, on the other hand, the child's earrings, made of three-and-a-half gold rings soldered together, are asymmetrical.

The child's earrings are shown in Figure 11.12 under the stereomicroscope. They are named this way, because they were found near the child's ears and look like small spiral earrings of c. 0.3 cm high. Indeed, as mentioned by Petrie (1909, 10), they look like miniature earrings, but are groups of gold rings 'like the ring-beads of the woman's necklace but rather larger (.25 wide)' (c. 0.6 cm in diameter), as in the woman's

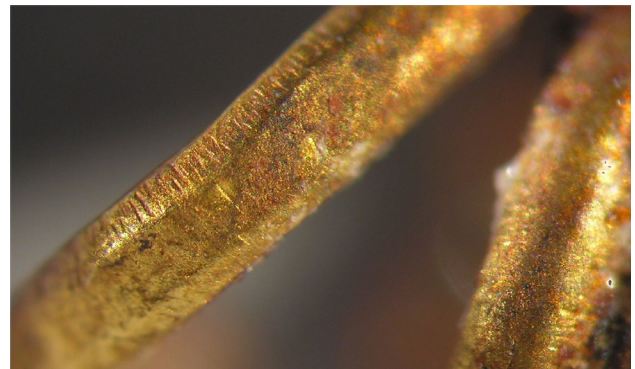


Figure 11.12. *The so-called Qurna child's earrings (NMS A.1909.527.43 + A) under the stereomicroscope, showing that they are different. On the left (top and bottom) is shown the front and back of one of them. On the right is shown the other and (bottom right) a detail of the tool marks on the borders of its rings.*



Figure 11.13. *The reverse of the pectoral from Middle Kingdom tomb 124 excavated at Riqqa (5966 in the Manchester Museum), with details of the suspension rings.*

necklace the rings are '.17 inch diameter' (c. 0.4 cm). The outer faces of the rings display the same tool marks as many other gold rings studied in this volume and the inner face was not finished. A closer look reveals that in one of the earrings the rings were cut to be given a particular form, as shown in Figure 11.12, perhaps in order to be integrated into a jewellery piece where they performed a particular function. The marks on one of the rings, which were not removed by a finishing process, could correspond to the cutting tool.

The two items could have 'fastened together', suggesting a necklace clasp (details on this attribution are given in Chapter 9.2), but they seem a little too small to fulfill this function. They could correspond to loops that were part of an undetermined jewellery piece, more likely, in particular the one that has not been cut, suspension rings that are often soldered to the back of amulets and pectorals, for example.⁴ In Figure 11.13 is shown the reverse of the pectoral from Middle Kingdom tomb 124 excavated at Riqqa (5966 in the Manchester Museum), which has two suspension rings, with details of one of these rings.⁵ These suspension rings are spirals, similar to the so-called child's earrings from Qurna. They are c. 0.6 cm in diameter like the Qurna earrings, and c. 0.5 cm high.

Technically poor, showing bumps of solder and, as noted by Petrie (1909, 10), with signs of partial melting around the join areas caused by crudely controlled soldering temperatures, the child's earrings: 'had been over-heated while on a mandril in the furnace for soldering; the solder had stuck them together, and they parted and began to drop away, being half melted'.

If the so-called earrings were small components of a jewel, they may have been overheated during the soldering process. For example, as mentioned, the suspension rings of pectorals are soldered to their back and can be overheated when soldering. Overheating is also possible when dismounting jewellery.⁶ If for any reason coming from the dismount of a pectoral,⁷ the suspension rings could have been overheated when removed. It is nevertheless difficult to make a suggestion about the function of the piece cut to a shape (Fig. 11.12), although in the case of a pectoral or pendant hanging from a string of beads it may be necessary to adjust by cutting to a precise shape one of the components of the suspension system. Another possibility is being a component of a hinged bracelet, part of the tubes where a closing pin passes.⁸ The ring components of the child's earrings are nevertheless assembled using the technique expected for an Egyptian workshop production: the solder contains higher copper contents than the parts to be joined (see Chapter 9.2). In short, the child's earrings suggest Egyptian pieces either spoiled during assembling, or put aside to be recycled because damaged.

In contrast to the child's earrings, and despite showing quite thick joins that were obtained using the Egyptian traditional hard soldering process, the adult's earrings are the work of a skilled goldsmith. They are shown in Figure 11.14. These ribbed penannular earrings are of a unique type, because they were made by assembling beaded tubes. Indeed, ribbed penannular earrings were regularly produced during the New Kingdom in Egypt using either triangular or rounded



Figure 11.14. The pair of beaded penannular earring from Qurna as shown by Petrie (1909, pl. 29) with a detail of the inner side of the gold tubes (NMS A.1909.527.18).

hollow tubes. One of the four Second Intermediate Period – early New Kingdom ribbed penannular earring with rounded hollow tubes, excavated in 1911 by Lord Carnarvon and H. Carter at Birabi, Thebes, in the collection of the Metropolitan Museum of Art, is shown in Figure 11.15. It is worth mentioning the similarity between the beaded tubes of the Qurna earrings and the decorated ends of the rounded tubes that constitute these (and others) ribbed penannular earrings.

Based on the earrings with triangular hollow tubes kept in several collections, it was possible to suggest in Chapter 10.3 that most probably the commonest ones were made by soldering four or six hollow tubes at their bases. As mentioned, the Qurna earrings are made by soldering four hollow tubes at their bases, therefore the main issues raised by these earrings can be summarized in one question, as follows: are the

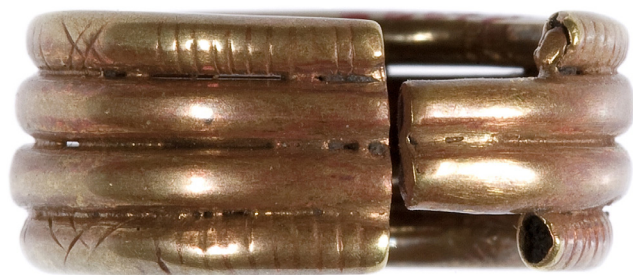


Figure 11.15. One of the four Second Intermediate Period - early New Kingdom ribbed penannular earring excavated in 1911 by Lord Carnarvon and H. Carter at Birabi. The Metropolitan Museum of Art, Acc. no. 26.7.1336-7. Edward S. Harkness Gift, 1926.

Qurna ribbed penannular earrings really typologically ‘exceptional’ in Egypt for a period of manufacture corresponding to 17th–early 18th Dynasties?

Although different from the ‘regular’ Egyptian ribbed penannular earrings, the Qurna earrings are from the typological point of view as surprising as the four earrings in gold and lapis lazuli found by H. Carter during the 1913–14 excavation for Lord Carnarvon at Mandara, Dra Abu al-Naga, Thebes in the collection of the Metropolitan Museum of Art (26.7.1355-8). One of them is shown in Figure 11.16. Pit tomb 74 at Mandara, contained the intact burial of a man and a woman, each in a coffin of the *rishi* type.⁹ Lilyquist (2020, no.1542-5) reports that the two pairs of earrings were recorded as found near the region of the woman’s head. The woman was also wearing a string of beads in gold and in blue faience containing feline-head shaped terminals (Lilyquist 2020 no 1546, Patch in Roehrig et al. 2005, 205 no.122; 26.7.1364 in The Metropolitan Museum of Art),¹⁰ two silver rings (reported in plain wire) and three scarabs and a cow-roid in gold mounts (Lilyquist 2020, nos. 1554 and 1556-9). According to Ben-Tor (in Lilyquist 2020), the seal-amulets present inside the burial belong broadly to the early 18th Dynasty, from the reign of Ahmose to the reign of Thutmes III. Further, one of two carnelian scarabs found on the chamber floor beneath the debris bears the name Thutmes, indicating a date of deposition no earlier than king Thutmes I (26.7.318 in The Metropolitan Museum of Art).¹¹

The earrings from tomb 74 at Mandara contain three strings of small beads in lapis lazuli that evoke the beaded tubes of the Qurna earrings (compare Figs. 11.14 and 11.16). The ends of the gold plate are decorated



Figure 11.16. Front and back of one of the early 18th Dynasty beaded penannular earrings from Mandara, Dra Abu al-Naga. Lord Carnarvon and H. Carter excavations, 1914. The Metropolitan Museum of Art, Acc. no. 26.7.1358. Edward S. Harkness Gift, 1926.

with incised parallel lines, a decoration observed in many other Egyptian ribbed penannular earrings, in particular those with rounded tubes and frequently in spiral rings (further details in Chapter 10.3). One spiral earring shown in Figure 11.17 belongs to the two pairs, one in gold and the other in electrum, found on the body inside burial E 4, Courtyard CC 41, Pit 3 excavated by Carter at Asasif in 1915–16 (Lilyquist 2020, nos. 846–7; 16.10.467–70 in The Metropolitan Museum of Art) that also contained three late Middle Kingdom – early 18th Dynasty scarabs. Spiral rings decorated with incised lines were also found in Sudan. One example is a bronze gold-plated pair (Lille III University L. 776) dated to the Classic Kerma Period, found near the ears of a body buried in Mirgissa (Quertinmont 2007). This type of decoration was quite frequently observed in armlets and bangles excavated in Egypt, such as those in silver from the second find excavated at Tell Basta by Edgar (1907), which have parallels in different periods (Lilyquist 2012, 18). Among them are the silver bangles or armlets contained in the hoard found in a corner of the courtyard of house T. 36.36 excavated at Tell el

Amarna (Pendlebury 1931; Frankfort & Pendlebury 1933). This hoard also contains ingots and other damaged and cut jewellery items.¹²

We can notice that the silver bangles excavated at Tell el Ajjul by Petrie (1931–4) have similar decorations. Negbi (1970) reports for Tell el Ajjul ten bracelets with decorated ends contained in hoard 1450, four in grave 447, four in hoard 1299, six in hoard 1312 (one cut for melting and another unfinished), and one fragment in hoard 1313. It is also relevant to consider two gold bracelets excavated at Megiddo, from stratum X, dated to 1650–1550 BC (Loud 1948). One, from tomb 3060, is decorated with incised lines, and another, from tomb 3054, has instead a wounded gold wire at each end (Loud 1948, pl. 226 nos. 2–3), which might correspond to a more elaborate decoration in the same ‘inspiration’. During the excavations at Byblos, Montet (1928–29) found inside tomb II one segmented gold torc (no. 635) and several bronze bangles in the Syrian Temple that are also decorated with incised lines.¹³ The latter were contained among other objects in a jar, known as the Montet Jar, reassessed by Tufnell & Ward (1966, fig.



Figure 11.17. Pair of gold spiral rings found in Courtyard CC 41, Pit 3, on the body contained in Second Intermediate Period – early New Kingdom burial E 4 at Asasif. Museum excavations, 1915–16. The Metropolitan Museum of Art, Acc. no. 16.10.467–8. Rogers Fund, 1916.



Figure 11.18. Details of the gold sheets closing the triangular tubes of the ribbed penannular earrings from tomb 1371 at Deir el-Medina (E 14435 in the collection of the Louvre Museum).

9). The scarabs contained in the jar were reassessed by Ward (1987) and then by other authors, notably Keel (1995), who suggested to date them to the early 12th Dynasty, a date confirmed by Ben-Tor (1998, 2003).

The woman buried in tomb 74 at Mandara was wearing two pairs of earrings; these, despite being perceived as 'Egyptian' and as 'ribbed' penannular earrings, are not mounted like the Egyptian 'traditional' ones. As mentioned, the traditional Egyptian ribbed penannular earrings of this period consist in general of hollow triangular or round tubes soldered

at the bases and closed with gold sheets. The closing gold sheets of the gold ribbed penannular earrings with round tubes from Birabi can be seen in Figure 11.15 and the closing gold sheets of the gold ribbed penannular earrings with triangular tubes from tomb 1371 at Deir el-Medina, in the collection of the Louvre Museum, are shown in Figure 11.18 (see Chapter 10.3 for further discussion). The closing gold sheets of the gold ribbed penannular earrings from Qurna are shown in Figure 11.19, where it can be seen that they were mounted in an Egyptian workshop tradition.

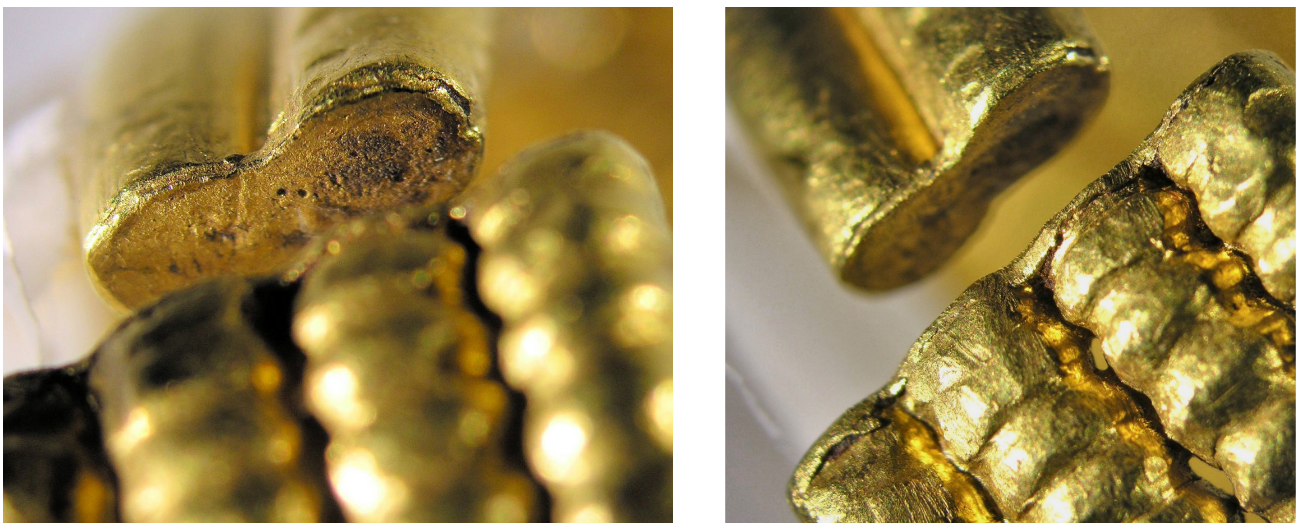


Figure 11.19. Details of the gold sheets closing the beaded tubes of the penannular earrings from Qurna. The texture of the gold sheet on the left corresponds to the use of high temperature when soldering.



Figure 11.20. Detail of the ribbed penannular earring from Riqqa (6146 in the collection of the Manchester Museum), showing the back gold sheet raised to form and close the triangular hoops.

Other Egyptian ribbed penannular earrings with triangular hoops are made using a different technology. They were made by joining V-shaped gold sheets onto a back gold sheet that is raised to close the hoops. This is the case of the two ribbed penannular earrings excavated at Riqqa (one detail is shown in Fig. 11.20), discussed in Chapter 10.3 and shown in Figure 10.10 (UC 31416 in the Petrie Museum and 6146 in the Manchester Museum), as well as three Second Intermediate Period-Early New Kingdom ribbed penannular earrings

found at Asasif by Lord Carnavron, inside burial 83, tomb CC 37 (26.7.1321-23 in the Metropolitan Museum of Art). Mention should also be made of a pair of gold plated penannular earrings found by A. M. Lansing on the body inside burial B5 in Courtyard CC 41, Pit 3 excavated at Thebes, which are decorated with four ropes of incised lines in the 'inspiration' of the ribbed specimens with four tubes (Lilyquist 2020, no. 772). It is interesting to compare these earrings with two gold fragments from hoard 1299 and tomb 1203 excavated at Tell el Ajjul, which are described by Petrie (1931-4) as part of hinged belts or headbands, and by Maxwell-Hyslop (1971, 122-3) as parts of more likely hinged bracelets (see Fig. 11.21b). The decoration of these components in repoussé resembles that of the Theban earrings, which are decorated with four threads of incised lines to recreate a ribbed decoration. Ribbed spacers that recreate four undecorated tubes seem to be in fashion at Megiddo in a period corresponding in Egypt to the early 18th Dynasty, because several were excavated in stratum IX. They are made either in gold (tomb 2121, Loud 1948, pl. 209 no. 34,) or faience (tombs 2010 and 5029, Loud 1948, pl. 210 no. 39 and pl. 211 no. 46). Maxwell-Hyslop (1971, 122-3) indicates for the gold fragments from Tell el Ajjul that the end of the gold plate was bent to obtain tubes and that 'gold pins were used to fix the separate plates together', a fastening system employed in other objects excavated at Gaza and often documented in New Kingdom jewellery. Examples are found among Ahhotep's bracelets, such as 52069-71 in Vernier (1907-27, 34-38, pl. 9), with the earlier form of hieroglyph 'iah' as in other jewellery items bearing the name of the queen, discussed in Chapter 9.4 by M. F. Guerra and S. Pagès-Camagna. This system is also the one used to fasten the Qurna collar (Fig. 11.3). It

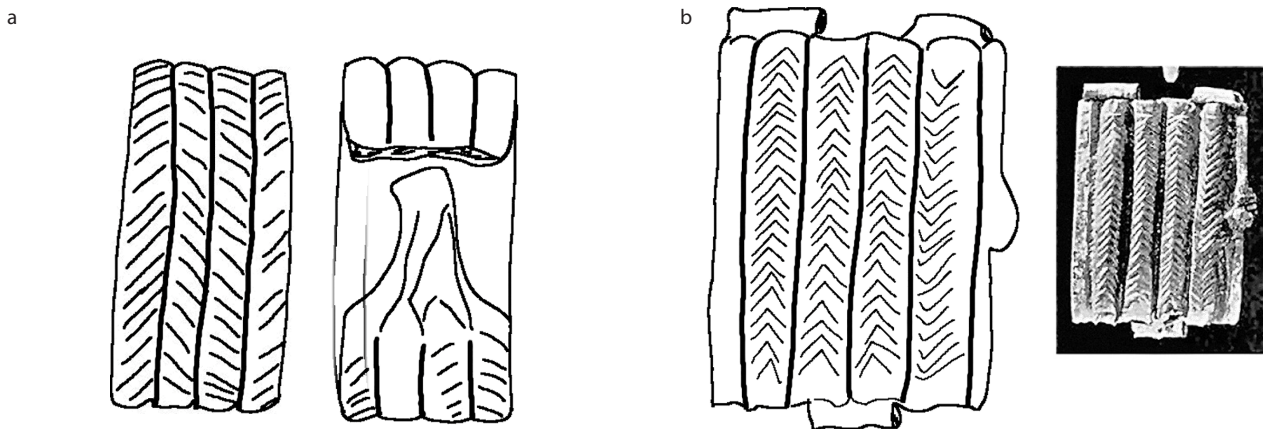


Figure 11.21. (a) One of a pair of earrings found by A. M. Lansing on the body inside burial B5 pit tomb 3 excavated at Thebes (Cairo Museum 45650; Lilyquist 2020, no. 772). (b) Fragment from a hinged bracelet or belt from hoard 1299 found by Flinders Petrie at Tell el Ajjul (Petrie 1931-4, pl.1. Drawings M.F. Guerra.

is interesting to notice, as mentioned above, that this fastening system was already in use during the Middle Kingdom, as shown by one bracelet excavated at Dahshur in 1894–5 by de Morgan (52051 in Vernier 1907–27, 28, pl. 7; Cairo Museum *Journal d'entrée du Musée* no. 38463).

Therefore, we can suggest that the Qurna and the Mandara earrings, found in burials dated closely to the same period, are equally 'exceptional' from the typological point of view when compared to the 'traditional' Egyptian production, even when those excavated at Riqqa and at Asasif are considered. In addition, both the woman buried at Qurna and the woman buried in tomb 74 at Mandara were also wearing quite impressive strings of beads. However, female burials in Egypt seem to contain frequently two pairs of ribbed penannular earrings. Passalacqua (1826) reported this fact in the case of a female burial excavated at Memphis. Among the items in the female's coffin found inside tomb 296 at Riqqa were four gold ribbed penannular earrings (Engelbach et al. 1915), and the woman buried in tomb 1371 at Deir el-Medina had one pair at each ear (Bruyère 1937). The recent X-ray imaging of the mummy of Kha's wife Meryt (Bianucci et al. 2015), shows that she is also wearing one pair of ribbed penannular earrings at each ear. The ribbed penannular earrings from one of the robbed tombs excavated during the 1914 season in cemetery C at Riqqa are also four (Engelbach et al. 1915). Vernier (1907–27) reports two pairs from the tomb of Ahhotep (52378–81 in Vernier 1907–27) and two pairs from a 19th Dynasty tomb excavated at Tell Basta (52382–5 in Vernier 1907–27). The presence in tombs of four earrings was also observed for the spiral ones, such as those excavated by H. Carter at Birabi and Asasif mentioned above. Interestingly, Maxwell-Hyslop (1971, 124, pl. 91) dates to the 19th–18th century BC four ribbed penannular earrings with gold rounded tubes in the museum of Beirut. They were contained in the so-called Syro-Egyptian treasure, a group of jewellery items made available to the Lebanese Republic in 1930 by the service of antiquities of Palestine, which had illegally crossed the Lebanese-Palestinian border around 1925 (Chéhab 1937). These gold earrings of c. 4 cm diameter (Chéhab 1937, nos. 14–17, pl. 5) consist of two hollow round tubes closed with gold sheets and one central small tube for insertion through the pierced earlobe in the 'Egyptian tradition'. Although this is not reported, the tubes seem to be joined at the bases by soldering in the same way as the 'typical' Egyptian earrings. Among many other objects, the treasure in the museum of Beirut also contains one gold pectoral bearing the name of Amenemhat III, one shell pendant in cloisonné decorated with a scarab, and the components of a

hinged bracelet very similar to one found at Dahshur by de Morgan (52019 in Vernier 1907–27).

In this sense, in addition to the significant typological differences observed between Egyptian 'traditional' ribbed penannular earrings and those excavated at Qurna, we can suggest another difference: the woman buried at Qurna, in contrast to the woman buried in tomb 74 at Mandara and many other mentioned female bodies, was only wearing one pair of ribbed penannular earrings. However, the woman buried at Thebes in burial B5, Pit 3, CC 41, was also wearing only one pair of penannular earrings, which could be explained by a different (perhaps chronologically separate) funerary tradition. It is thus difficult to provide further discussion on this question.

From the technological point of view, the ribbed penannular earrings excavated at Qurna are constructed similarly to the other earrings of the same type made in Egypt and studied in this volume. In fact, the four beaded tubes are hollow and joined at the bases using the expected hard soldering process for Egypt and a solder alloy containing higher copper contents than the parts to be soldered as expected for the period concerned. In addition, the two central tubes are longer for insertion through the pierced earlobe and the tubes are closed with gold sheets that cover all the aligned tube ends at each side of the hoop (Fig. 11.19). The only technological difference is the use of a quite pure gold alloy containing c. 95 wt% Au that was not identified in the other penannular earrings studied in Chapter 10.3 of this volume, but which could be identified in other Egyptian gold pieces. Further discussion of the Qurna alloys is provided below.

It is also noticeable that the Qurna earrings contain PGE inclusions, like all the other objects included in that group (see Chapter 9.2). The presence of PGE inclusions was observed for the majority of the objects studied in this volume, including ribbed penannular earrings such as those from tomb 1371 excavated at Deir el-Medina (Fig. 11.18), and M. Wypysky reported the presence of these inclusions in choker MMA 16.10.314 excavated at Asasif (mentioned in Tate et al. 2009). The presence of abundant PGE inclusions also at the surface of beads and amulets excavated at Meroë in the collection of the Museum of Fine Arts in Boston (MFA 21.12107), as reported by Gänsicke & Newman (2014), indicates that their presence cannot be used to separate 'Egyptian' from 'Nubian' productions.

PGE inclusions are less abundant in the New Kingdom Egyptian objects, at least in those studied by several authors in Chapter 10 of this volume, but, as mentioned, this might result from the increasing quantity of mined gold supplies made available by the expansion of the gold mining regions in Egypt since

the beginning of the New Kingdom, as suggested by Klemm & Klemm (2013, 606–9). The alluvial gold containing PGE inclusions was therefore being diluted in the workable gold mass by the increasing proportion of mined gold.

If the gold was ‘Egyptian’ and the earrings were made using ‘Egyptian’ technology, why are the Qurna ribbed penannular earrings different from the others?

As far as we know, comparators for the Qurna earrings have hitherto not been found in Egyptian burials from this period. However, it is possible to imagine that the Theban goldsmiths could have been inspired, for instance, when the Hyksos ruled northern Egypt, by imported jewellery that somehow could reach Thebes. It is also possible that foreign goldsmiths could have arrived (for instance from the north or through Nubia) into Thebes to work in the Egyptian workshops during this period. In this case, the jewellery produced would have particular shapes that were in fashion in another region, or would have been manufactured using technologies from other jewellery making traditions. However, as the techniques employed in the production of the Qurna earrings are the traditional Egyptian ones, it seems more likely that a goldsmith inspired by imported jewellery made the Qurna earrings as well as other ‘exceptional’ earrings excavated in Egypt and dated to this period, such as those found at Mandara.

Based on the gold beaded penannular earrings excavated at Tell el-Ajjul, such as the pair from tomb 2 (Petrie 1931–4, 4, pl. 15 in vol. 1) that is shown in Figure 11.22, it is tempting to suggest Western Asiatic earrings or jewellery as ‘source of inspiration’ for the Qurna earrings. Indeed, both the Qurna and the Tell el-Ajjul groups of jewellery contain in addition to the gold penannular earrings (one pair in both tombs), one perforated scarab inscribed with scrolls, shown in Figure 11.22. The Qurna mummy was wearing a green-glazed steatite scarab incised on the base with a hieroglyphic motif within a scroll-pattern border. Petrie (1909, 9) indicates that the scarab was tied to the left hand of the Qurna woman. However, he gives no indication for the scarab with a scroll-pattern border found inside tomb 2 at Tell el-Ajjul.

Beaded earrings might have derived from the Asiatic form of earrings containing strung beads (Hawkes 1961, 446). Petrie (1931–4, 8, pl. 15 in vol. 1) found inside tomb 187 at Gaza one pair of earrings made by stringing gold and stone beads. Interestingly, Negbi (1970, nos. 96–102) indicates that one single and three pairs of beaded earrings were excavated at Tell el-Ajjul, showing that these ear ornaments were relatively in fashion at Gaza. We can mention one pair found in Palace IV–V, inside the ‘Cenotaph’ (Petrie

1931–4, pls. 1–2 in vol. 2), together with, among other objects, a scaraboid in a gold mount and ten gold bangles decorated at the ends with incised lines. It is also interesting to mention one spacer bead from the same deposit said to be ‘for a necklace of eight strings of gold beads’ (Petrie 1931–4, 6, pls. 1–2 in vol. 2), which looks like eight assembled beaded tubes.

Beaded penannular earrings seem rare compared to twisted and segmented earrings. We can however cite one gold beaded earring excavated at Gezer by Stewart Macalister (1911–12, 261, pl. 136 no.16), which is similar to the pair from tomb 2 at Tell el-Ajjul. It is



SCARAB.

Figure 11.22. The pair of earrings and scarab from grave 2 in the city at Gaza (Petrie 1931–1, pl. 15) and (bottom) the scarab from Qurna (Petrie 1909, pl. 29).

still interesting to notice that Iron Age tombs 15 and 23 excavated at Marlik (Negahban 1966, 162–3, pl. 77 nos. 316–17) contained beaded tubular gold beads. Inside tomb 23 was found one bronze stamp seal stylistically similar to the Bronze Age seals of eastern Iran and Central Asia (Vahdati & Mucheshi 2019) providing a link with further Eastern productions.

The whitish and heavily worn Qurna girdle

As the Western Asian finds do not shed direct light on the Qurna jewellery, we reconsider below the Egyptian finds in order to assess how far the girdle may bring new evidence and how sumptuous was the group of jewellery of the Qurna woman. It is thus important to include in the debate the grave goods from burial A1, Pit 1, Courtyard CC 41 excavated by A. M. Lansing at Asasif during season 1915–16, which contained a group of jewellery as remarkable as the group excavated at

Qurna. The group, published by Lythgoe et al. (1917), is shown in Figure 11.23. Some parts of the drawing were replaced by photos of beads of the same type, made from the same material as the original ones, in order to emphasize the rich polychrome effect of the adornments.

Lansing card 3694 (39–41 in Lilyquist 2020) indicates that the coffin is recorded in the Egyptian Museum Cairo *Journal d'entrée du Musée* as probably 18th Dynasty, but Lansing noted 'more likely' 17th Dynasty. Among the items found on the body (Lilyquist 2020, nos. 643–50), are bronze gold-plated spiral earrings with the ends decorated with incised lines, one steatite scarab, one girdle, and several strings in faience, carnelian and gold (some found on the arms). As in the burials of women noted above, tomb A1, Pit 1 contained four earrings. The two-string gold necklace contains 1153 gold ring beads and a serpent's head-shaped gold clasp. Another string contains 72



Figure 11.23. The group of jewellery from burial A1, Pit 1, Courtyard CC 41 excavated at Asasif by A. M. Lansing during season 1915–16 (drawing M.F. Guerra based on Lansing 1917, fig. 12). In order to display the original polychrome effect of the group, parts of the items were colourized based on the materials mentioned by Lilyquist (2020, nos. 643–50).



Figure 11.24. Two of the chased wallet-shaped beads contained in the girdle from Qurna (NMS A.1909.527.17) showing different gestures using the same decoration technique. The very regular light and thin lines chased on the bead shown on the left contrast with the irregular and deep lines chased on the bead shown on the right.

gold barrel-beads. The two-string girdle is made by threading double acacia seed-shaped beads between groups of ten barrel beads (total c. 180).

When the two burials are compared, we can say that both women were buried with one collar comprising several strings of gold ring beads, gold penannular earrings, one girdle, and several armlets and bangles. The steatite scarab is simply reported as found at the left arm of the woman buried at Asasif. Ben Tor (in Lilyquist 2020, no. 650) indicates that the scarab is inscribed with 'Amunmes' and displays early 18th Dynasty features. However, Lansing (1917, 20) indicates that when all the tombs excavated at Asasif are considered, the commonest type of finger-ring has a scroll pattern inscribed and that 'single scarabs were invariably found to be fastened with string to the third finger of the left hand'. As reported by Petrie (1909, 9), a green steatite scarab with scrolls was tied by string to the third finger of the left hand of the Qurna woman.

It is also worth remembering that both girdles are 'whitish' and contain barrel beads as spacers. The Qurna girdle is made from silver-rich electrum and the girdle from burial A1 is reported by Lansing to be 'in silver'. The girdle from Qurna contains more or less regular wallet-shaped beads, probably corresponding to the work of different goldsmiths. Two of them are shown in Figure 11.24. The light regular chased lines that decorate one of them (on the left in the figure) contrasts with the deep irregular lines of the other bead (on the right on the figure). Lilyquist (2003) indicates that this type of bead is popular in the New Kingdom and reports two girdles from the tomb of the three foreigner wives of Thutmes III containing wallet-shaped beads (Lilyquist 2003, nos. 135 and 187). The girdle identified under X-radiography on the body of Kha's wife Meryt (Bianucci et al. 2015) also

contains gold wallet-shaped beads. In addition, among the many components from Ahhotep's tomb, Vernier reports thirteen big and four small gold wallet beads with two holes at each end for stringing in a double rope (52733 in Vernier 1907–27). The wallet beads seem to be regularly made in Egypt using one technology. This technology is employed in the manufacture of the wallet beads in string EA14696 in the collection of the British Museum, studied in Chapter 10.6 by N. Meeks, S. La Niece and M. F. Guerra. The bead halves are made by embossing the gold sheet, they are soldered and decorated with two rows of chased parallel lines. As with the seventeen beads found inside Ahhotep's tomb, those in the Qurna girdle and in string EA14696 have two holes to be strung in a double rope string. We notice that the girdle from Asasif burial A1 pit 1 contains double acacia seed beads to make a double string. In contrast to the Qurna and Asasif girdles, none of the other cited girdles contains barrel beads as spacers. They comprise instead threads of tiny gold beads, three strings in the girdles described by Lilyquist (2003, nos. 135 and 187) and five in Meryt's girdle (visible in Bianucci et al. 2015, figs. 8–9).

Acacia seed-shaped beads seem to have been popular in the Middle Kingdom. Indeed, Sathathorinet's girdle (16.1.5 in the Metropolitan Museum of Art) contains cowrie shell-shaped beads that alternate with groups of small acacia seed beads in gold, carnelian, turquoise and lapis lazuli; Senebtysy's girdle (07.227.13 in the Metropolitan Museum of Art) contains acacia seed beads in gold, carnelian and feldspar. However, one acacia seed-shaped carnelian bead in the Metropolitan Museum of Art collection (68.136.24) is included in a group of jewellery dated to the Second Intermediate Period (Lilyquist 2003, 306), showing that these beads were either in fashion for a long time, or they were included in strings that continued to be used



Figure 11.25. One of the wallet-shaped beads and some of the barrel beads contained in the girdle from Qurna (NMS A.1909.527.17), which show heavy signs of wear.

a long time after production. Neither Sathathoriunet's girdle nor Senebtysy's girdle contains barrel beads as spacers. In the first girdle, small acacia seed-shaped beads are used as spacers and, in the second one, large acacia seed beads are spaced with threads of tiny beads in different materials.

From the typological point of view, the components of the Qurna girdle as well as the way they were strung can be considered 'regular' for Egypt. Technologically, they are also a 'regular' Egyptian production. The barrel beads in the girdle are similar to other barrel beads studied in this volume and the wallet-shaped beads are as above mentioned made and decorated like any other Egyptian bead of this type. In addition, and as shown in Chapter 9.2, they are soldered using alloys containing higher copper contents than the parts to be joined, as expected for an Egyptian production. When the Qurna group of jewellery is considered, the girdle simply stands out by the pale yellow greenish colour of its components and the presence of marks of intense use-wear. The two wallet beads shown in Figure 11.24 show signs of

wear, but much less than the heavily worn wallet bead from the same girdle shown in Figure 11.25. However, the level of wear may be related to the original position of the beads in the girdle; when the girdle is worn for a certain period of time, the beads submitted to more friction show higher levels of wear than those protected from friction or subjected to less friction. In Figure 11.25 is also shown the damage caused to some barrel beads by friction and compression when wearing the girdle. Neither the composition of the alloys (and thus the colour) nor the damage caused to the beads by wear are comparable to those observed for the other objects in the same group of jewellery, as if the girdle had been originally made for another owner and extensively worn, perhaps by several persons in succession over a long period.

Two strings dated to the Second Intermediate Period from Qau and Badari contain barrel beads similarly worn, as shown in Figure 11.26. In the collection of the Petrie Museum, string UC26019 was found inside grave 3757 and string UC26275 inside intact burial 7323 (see Chapter 9.5). These beads are however



Figure 11.26. Some of the barrel beads from Second Intermediate Period strings UC26019 (on the left) and UC26275 (on the right) found at Badari tomb 3757 and Qau tomb 7323, respectively.

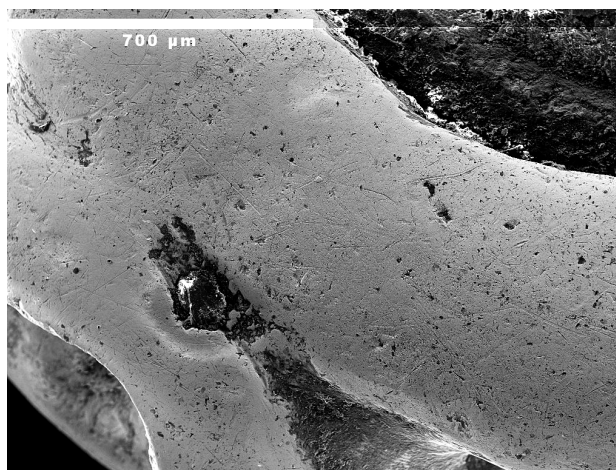


Figure 11.27. The heavily worn gold mount of lapis lazuli scarab bearing the name of Ahhotep (E3297, Louvre Museum), inscribed using the ancient form of hieroglyph 'iah'.

yellowish, those in string UC26019 contain a c. 19 wt% Ag and c. 2.5 wt% Cu, and those in string UC26275 c. 27 wt% Ag and c. 2.6 wt% Cu. Other objects dated to the 17th–early 18th Dynasties, studied in Chapter 9, show marks of intense use-wear. Two of them are in the collection of the Louvre Museum (see Chapter 9.4). One consists of three components of an armband found by A. Mariette with the body of Kamose and bearing the name of his brother Ahmose, and the other is the lapis lazuli scarab mounted in a gold frame bearing the name of Ahhotep. The heavily worn gold mount of the scarab is shown in Figure 11.27. As discussed in Chapter 9.4, similarly to several bracelets from the tomb of Ahhotep (52069–71 in Vernier 1907–27, 34–38, pl. 9), which have an equivalent fastening system to the Qurna collar, these two items have the moon sign written form of hieroglyph 'iah', which suggests that they were made before the other objects studied in this volume bearing the name of Ahhotep. The gold mount of the scarab is made in a high purity alloy like the Qurna adult's earrings and the cartouche bearing the name of Ahmose, containing 30 wt% silver, is pale greenish yellow like the Qurna girdle. Therefore, the intense use-wear observed for the Qurna girdle might not result from the fact that the object had a particular meaning and was for this reason 'kept in the family' for a long time, but simply from restricted access to certain material (silver? gold?) or particular know-how (jewellery making?) at a particular period or region.

Egyptian gold alloys and the Qurna group

In contrast to all the other items in the group of jewellery found on the body of the Qurna woman, which all contain more than 82 wt% gold, the girdle is made from an alloy containing less than 45 wt% Au. As mentioned, the wallet beads despite showing the work of more than one goldsmith and different levels of wear, are made using the same alloy. This alloy contains 52–53 wt% Ag and c. 3.7 wt% Cu. The composition of the barrel beads is less homogeneous. The silver contents range between 51 and 54 wt%, but the copper contents are quite variable (3–7 wt%). This may indicate the use of the 'same gold' to which different amounts of copper were added. The copper and silver contents provided in Chapter 9.2 for the Qurna jewellery are plotted in Figure 11.28 with those published by Tate et al. (2009) for the Asasif choker (16.10.314 in the Metropolitan Museum of Art) and the collar EA14693 (in the British Museum). The barrel beads and the wallet beads that constitute the girdle were plotted separately. Knowing that barrel beads were used as spacers in strings, a higher number was necessary and the compositional variation observed may therefore result from mixing numerous batches from one or several artisans working in one same workshop (undifferentiated from several workshops).

As mentioned above, other objects from the same period, such as the three components of an armband

found with the body of Kamose and bearing the name of his brother Ahmose, are made from gold alloys containing high silver contents. The use of this type of gold alloys in Egypt was observed for objects covering all the periods considered in this volume. Gale & Stos-Gale (1981), who have also shown the use in Egypt of silver alloys containing quite high copper and gold contents, already highlighted the use of such 'whitish' gold alloys.

As discussed in Chapter 5 by M. F. Guerra, the use of gold alloys containing high silver contents has also been observed for objects excavated in several other sites, such as Varna and Ur; however, in general, those objects contain less than 50 wt% Ag, and may therefore correspond to the natural composition of gold grains from local sources. Despite the high silver contents reported by Klemm & Klemm (2013) for Egyptian and Nubian gold, the amounts of silver in the gold objects show much higher values than those observed for the gold grains. Considering the alloys employed in the earliest periods in Egypt, M. F. Guerra and S. Quirke suggested in Chapter 7.3.2 the possible mixture of different parts of natural gold with different parts of silver and copper to obtain a gold 'palette'. This could be an aesthetic choice, and certain colours might have been 'in fashion' in particular periods. Indeed, some

objects in the collection of the Ashmolean Museum analysed by Gale & Stos-Gale (1981, Oxalid) containing almost no silver and *c.* 25 wt% Cu, suggest a mixture of one part of copper with three parts of high purity gold. The use of high purity gold in the production of objects could be demonstrated in this volume, even for the Predynastic period. The alloys employed in the manufacture of diadem EA37532 excavated at Abydos (studied by M. F. Guerra and N. Meeks in Chapter 7.3.1) and objects in the collection of the Ashmolean Museum Oxford (published by Gale & Gale 1981) indicate that this type of natural gold was accessible to the Egyptians, at least during certain periods or in specific regions.

We added to Figure 11.28 the data published for two gold nuggets, which match the composition of the largest number of analysed objects. One of them, in the collection of the Ashmolean Museum (E.455) and analysed by Stos-Fertner & Gale (1979), was found inside the early 3rd millennium BC stairway tomb 2 excavated at El Kab (Quibell 1908, 7). The other nugget, in the collection of the Museum of Fine Arts in Boston (23.311), contained in a pendant excavated at Meroë and dated to the Napatan Period, mid-1st millennium BC, was found inside tomb W. Beg. 859 (Gänsicke & Newman 2000, 2014). Interestingly, these

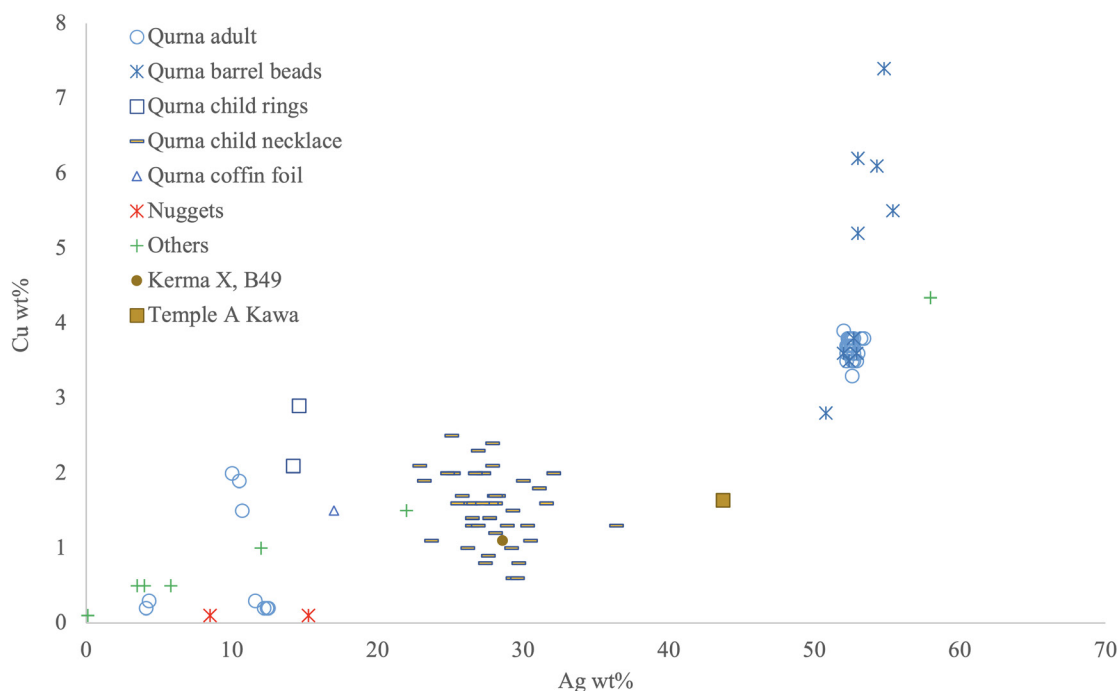


Figure 11.28. Silver versus copper contents obtained for the Qurna jewellery (data from Chapter 9.2), choker MMA 16.10.314 and collar BM EA14693 (from Tate et al. 2009), two gold nuggets, one from ElKab (analysed by Stos-Fertner & Gale 1979) and the other from Meroë (analysed by Gänsicke & Newman 2000), and several other published objects mentioned in the text.

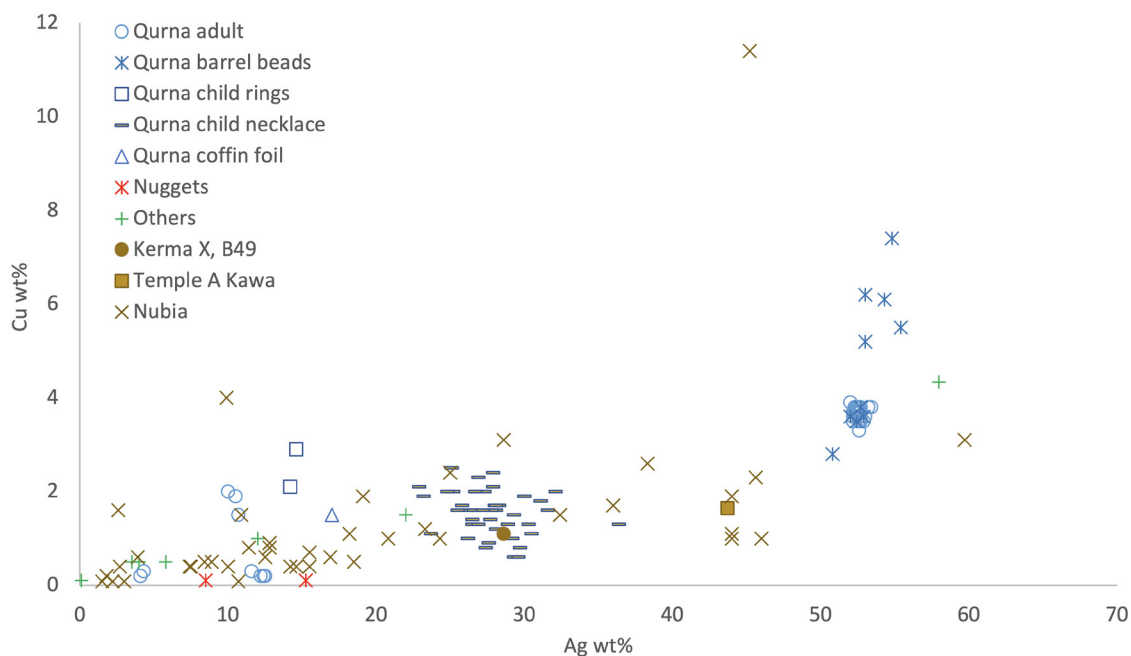


Figure 11.29. Silver versus copper contents obtained for the Qurna jewellery and the gold nuggets plotted in Figure 11.28 to which were added data published by Gänsicke & Newman (2000) for 1st millennium BC objects from excavations in Nubia in the collection of the MFA.

two nuggets contain undetectable amounts of copper (corresponding to less than 0.1 wt% Cu for the nugget excavated at El Kab). Similarly, copper was only observed for one of the analysed beads of Predynastic diadem EA37532. This confirms that also in Egypt native gold contains as expected very low copper contents. Indeed, Moles et al. (2013) observed an average value of 0.17 wt% Cu for 500 placer gold grains from the Mourne Mountains in Northern Ireland. Less than 0.3 wt% Cu was observed by Antweiler & Sutton (1970) for c. 150 gold grains from lode and placer deposits in the United States and by Nguimatsia et al. (2019) and Nono et al. (2021) for c. 250 gold grains from several placer deposits in Cameroun. Therefore, the presence of more than 1 wt% Cu in the Egyptian gold alloys should result from the intentional addition of this element (although unintentional addition during metallurgical processing is possible in particular cases).

Data published for objects dated to the Second Intermediate Period were also added to Figure 11.28. These are: the gilded coffin of Intef in the collection of the Louvre Museum (Colinart & Delange 1998); one unprovenanced pectoral in silver, gold, carnelian and glass (1981.159) in the Museum of Fine Arts in Boston (Newman 1990; Lacovara 1990, 2015); the gilded mask of Satdjehuty Satibu in the State Museum of Egyptian Art in Munich (Klemm & Klemm 2013); and one head band from Tell el Yahudiya and one ring from 'Pan

Grave' cemetery 1300 at Qau perhaps from grave 1301 (Brunton 1930, 7) in the Ashmolean Museum (Gale & Stos-Gale 1981).

Both the objects and the nuggets match the Qurna jewellery, with the exception of the large majority of the small beads in the child's necklace, which contain silver amounts between c. 23 and 36 wt%. Indeed, in Figure 11.28 the region corresponding to c. 25–50 wt% Ag only contains these tiny beads. Could this indicate a different origin for the gold? We added to the diagram two other objects. One is a gold bracelet dated to 1600 BC (20.1671 in Museum of Fine Arts) excavated at Kerma, found with body I inside B 49, in the sacrificial corridor of Tumulus K X (Gänsicke & Newman 2000; Reisner 1923b, 283, pl. 44). Its composition is contained in the area covered by the small beads of the child's necklace. The second object, which does not match the Qurna group (but which is in the c. 25–50 wt% Ag range), is a small statuette of a kneeling king attributed to the 19th Dynasty in the collection of the Ashmolean Museum (Gale & Stos-Gale 1981, Oxalid) found in Temple A excavated at Kawa (Macadam 1955, 149, pl. 82). Given the lack of analytical studies of Nubian gold objects dated to the period concerned by the Qurna jewellery, we compared in Figure 11.29 the Qurna items with the objects in the collection of the Museum of Fine Arts in Boston analysed by Gänsicke & Newman (2000), produced between 716 and 459 BC.

The aim of this comparison is only to ascertain whether the Egyptian and Nubian jewellery are produced with different alloys, but the Nubian objects cover all the compositional area defined by the Qurna alloys, even filling the 'compositional gap' observed in Figure 11.28. This shows that a wide variety of silver-rich gold alloys were in use in Nubia in the 1st millennium BC. These alloys could have also been used in earlier periods.

In Figure 11.30, we only considered Egyptian objects. We plotted with those considered in Figure 11.28 the Second Intermediate Period objects studied by several authors in Chapter 9 of this volume. A 'compositional gap' is again noticeable. While the area corresponding to the composition of the Qurna child's necklace is covered by other Second Intermediate Period productions, analysed objects made from gold alloys containing 32–50 wt% Ag are almost non-existent. The chemical pattern obtained for the objects dated to the Second Intermediate Period is difficult to explain. Therefore, it is interesting to consider this alongside the chemical pattern obtained for the objects dated to the New Kingdom.

In Figure 11.31, we plotted the New Kingdom objects presented by the different authors in Chapter 10 of this volume and other objects dated to this period contained in several publications. The published ones are: the items believed ancient from the tomb of the three foreign wives of Thutmose III (Lilyquist 2003); the unprovenanced gold fly pendants in the National

Museums Scotland collection (A.1977.140 A-P) probably part of one broad collar (Troalen et al. 2009); foils from the gilded coffins of Mesra and of Tamut Neferet (Colinart & Delange 1998), one necklace (Weil 1951), the pectoral of Khamwaset excavated at Memphis (Bouquillon 1995) and the gold foils contained in the gilder's book (Darque-Ceretti et al. 2011) in the collection of the Louvre Museum; several objects from the tomb of Tutankhamun (Abdrabou et al. 2019; Rifai & El Hadidi 2010; Scott 1927; Uda et al. 2014); the cylinder beads from the Hatshepsut temple foundation deposit in the collection of the Metropolitan Museum of Art (Frantz & Schorsch 1990); foils from the tomb of Yuya and Tjuyu analysed by Pollard (in Quibell 1908); ingots from the hoard excavated at Tell el Amarna analysed by Lucas (in Frankfort & Pendlebury 1933); the gilded coffin from tomb KV56, one shell pendant, one goblet fragment and one signet ring in the collection of the State Museum of Egyptian Art in Munich (in Klemm & Klemm 2013); one sequin from Thebes in the collection of the British Museum (Roberts 1973); one earring and two signet rings from Saqqara in the collection of the Brooklyn Museum (Williams 1924, nos. 28, 31, 45); several objects from the tomb of Nefertari (Markowitz et al. 1997; Hatchfield & Newman 1991) and other objects in the collection of the Museum of Fine Arts in Boston (Hatchfield & Newman 1991); one foil from the shrine of Tiye analysed by A. P. Greenough (in Bosse-Griffith 1985); the box of Amenhotep II (A.1956.113) in the

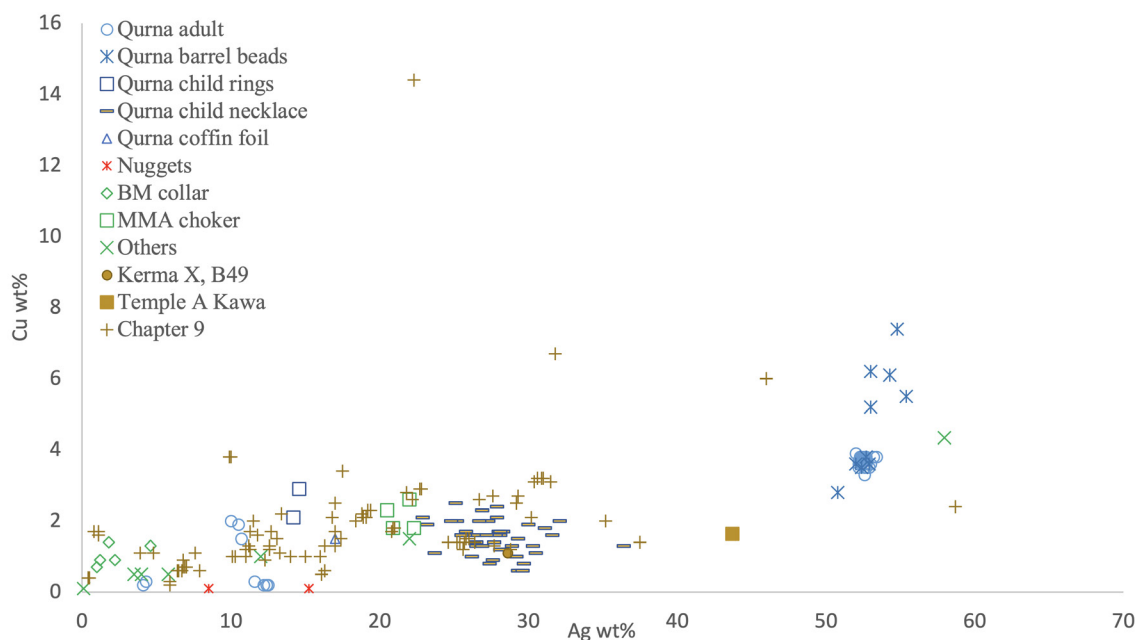


Figure 11.30. Silver versus copper contents obtained for the objects plotted in Figure 11.28 to which were added all the results obtained for the Second Intermediate period jewellery studied in Chapter 9 of this volume.

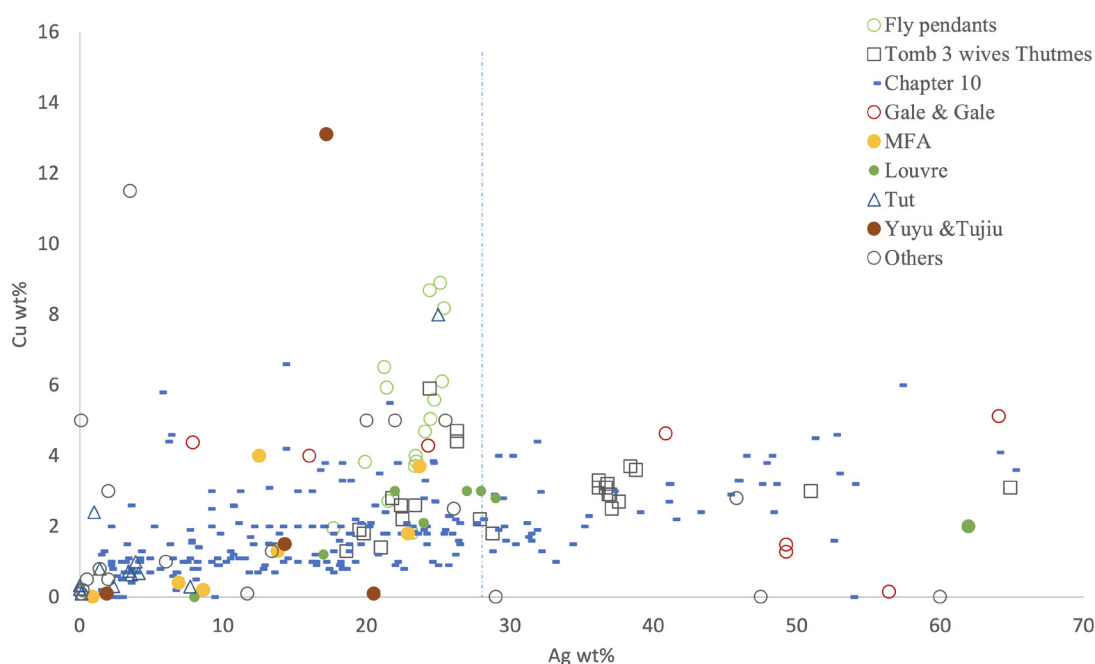


Figure 11.31. Silver versus copper contents obtained for all the New Kingdom jewellery studied in Chapter 10 of this volume to which were added published objects from the same period as mentioned in the text.

collection of National Museums Scotland (Gladstone 1901; Petrie 1895); and several objects in the collection of the Ashmolean Museum (Gale & Stos-Gale 1981, Oxalid). Among the latter are some from the tomb of Maket excavated at Lahun (Petrie 1891, 21–4), and beads from tomb group E 143 excavated at Abydos (Garstang 1901) and found on body B in tomb 19 excavated at Ehnasya (Petrie 1905, 4).

We can observe in Figure 11.31 that a wider variety of silver-rich alloys is used in the New Kingdom, but no ‘compositional gap’ is observed. The use in this period of alloys containing more than 50 wt% Ag is also revealed. Among the objects containing high silver contents we can cite one uraeus pendant and one shell pendant from the tomb of the three foreign wives of Thutmes III, one bead from tomb E 143 at Abydos, the pectoral of Khamwaset excavated at Memphis and scarabs and pendants from excavations at Madinat al-Ghurab. It is also interesting to notice that the fly pendants in the collection of National Museums Scotland (Troalen et al. 2009), probably part of one broad collar, are made using the same gold alloy (containing *c.* 25 wt% Ag). However, they contain increasing amounts of copper (all on a line in the diagram of Fig. 11.31), a colouring technique that was identified in jewellery dated to as early as the First Intermediate Period (discussed in Chapter 7.4). This indicates that several gold colouring techniques may have been used

during a large period (for further information on gold colouring techniques see Chapters 5 and 7).

Considering the objects from the tomb of Tutankhamun, as expected the gold sheet applied to several objects is made with quite high purity gold (Abdrabou et al. 2019; Rifai & El Hadidi 2010), necessary when hammering gold into sheet. The mask and the throne (Uda et al. 2014) are also made from high purity gold alloys, but one gold nail contains 25 wt% Ag and 8 wt% Cu (Scott 1927). The raw analytical data obtained by Bertsch et al. (2017) for gold sheet from the tomb are not available in the publication, the authors only provide a diagram representing the Ag/Au and Cu/Au ratios. We could represent in Figure 11.32 the Ag/Au and Cu/Au ratios provided by Bertsch et al. (2017) alongside the data obtained for the New Kingdom objects studied in Chapter 10 of this volume, and data published for the objects dated to this period previously mentioned. We can observe that the gold sheets from the tomb of Tutankhamun (inside two ovals in the diagram) match the area corresponding to the composition of the large majority of the New Kingdom jewellery and all the objects in the Qurna group, with the exception of the girdle (all ‘x’ outside the two ovals in the diagram).

Given the results obtained by comparison of the Qurna jewellery with New Kingdom and Second Intermediate Period productions, it seems significant

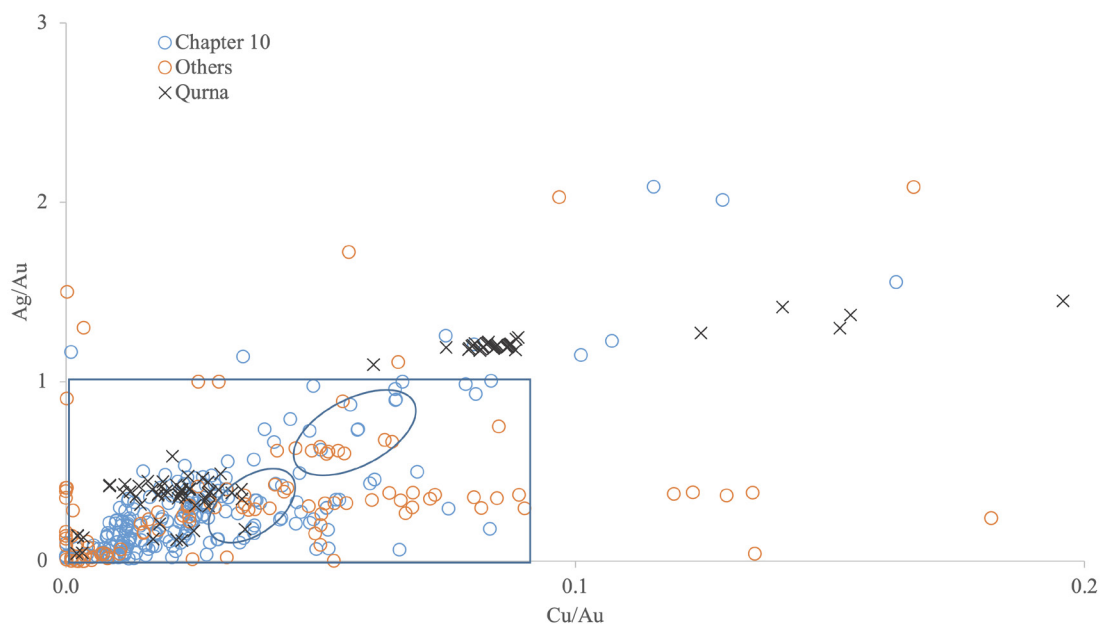


Figure 11.32. Ratio Cu/Au versus ratio Ag/Au obtained for the Qurna group in Chapter 9.2, for the New Kingdom jewellery studied in Chapter 10 and for other objects from the same period published by different authors as mentioned in the text. The circles indicate the ratios published by Bertsch et al. (2017) for gold sheet from the tomb of Tutankhamun.

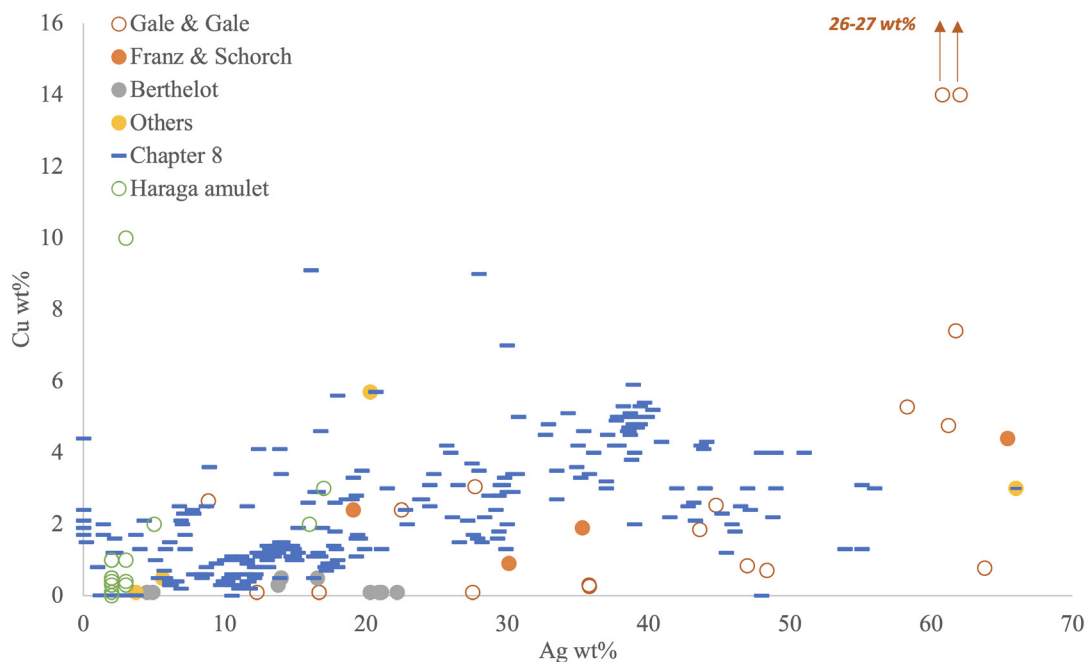


Figure 11.33. Silver versus copper contents obtained for all the Middle Kingdom jewellery studied in Chapter 8 of this volume to which were added objects from the same period published by several authors as mentioned in the text.

to go back in time and consider the data obtained for Middle Kingdom productions. Indeed, several objects attributed to the Middle Kingdom studied in Chapter 8 of this volume were made using alloys quite rich

in silver. In Figure 11.33, these objects were plotted with the Qurna jewellery group and other Middle Kingdom objects. We included data published by Berthelot (1906, 20–3, 62–5) for items from the coffins

of Auibra Hor and his daughter Nubheteptikhered, for Mereret's treasure box (all excavated at Dahshur) and for the coffin of Djehutynakht (excavated at Bersha); by Schorsch (1995, 132) for one bead from the gold necklace of Wah and by Frantz & Schorsch (1990) for the coffins of Nephthys and Ukhhotep and the box of Senebtysy excavated at Lisht. The other objects are one gold ingot from the treasure of Tod analysed by Z. I. Hassan (70507 in Bisson de la Roque 1950, 52–5); one *hes*-vase amulet in the collection of the Museum of Fine Arts in Boston (26.379) from Bersha (Hatchfield & Newman 1991); one shell pendant in the Fitzwilliam Museum collection (E.GA.302a.1947) with the cartouche of Senusret I (Ogden 2000, 164); and several objects in the collection of the Ashmolean Museum (Gale & Stos-Gale 1981, Oxalid) including beads from tomb 299 excavated at ElKab and several objects excavated at Abydos found in tombs E 30 and E 166 (Garstang 1901), the burial of Nakht (Davies 1917), and tomb 416 (Kemp & Merrillees 1980, 109–60).

The range of alloys employed in the Middle Kingdom and in the New Kingdom is similar. The data obtained in this volume and contained in the mentioned publications cover closely the same area in Figures 11.31 and 11.33. However, the number of objects made entirely or partially from gold alloys containing more than 30 wt% Ag, that is, made from pale gold, is higher in the Middle Kingdom than in

the New Kingdom. The New Kingdom productions plotted in Figure 11.31 cluster in an area corresponding to silver contents under *c.* 25 wt% (yellow gold) whilst the Middle Kingdom productions plotted in Figure 11.33 are evenly distributed in relation to the silver contents (from yellow to whitish gold). Based on the high amounts of silver observed for the Middle Kingdom objects and the heavy wear of the Qurna girdle, it is possible to suggest that this girdle (at least the wallet and barrel beads strung in the girdle, which contain more than 50 wt% Ag) was made before the woman's lifetime, perhaps at the beginning of the Second Intermediate Period, when pale gold might still be in fashion and available.

Concerning the child's jewellery, in Figure 11.34 are plotted, chronologically, all the tiny gold beads studied by different authors in several chapters of this volume with those contained in the Qurna child's necklace. It is noticeable that the majority of the tiny beads analysed contain less than 20 wt% Ag, which is expected for the manufacturing technology employed, based on the production of gold sheet. Only those dated to the Second Intermediate Period and the New Kingdom contain higher silver contents, with the exception of the whitish beads from string UC18092 (shown in Fig. 11.11), found in undisturbed tomb 7923 at Qau and dated to the early First Intermediate Period (further discussion is provided in Chapter 7.4).

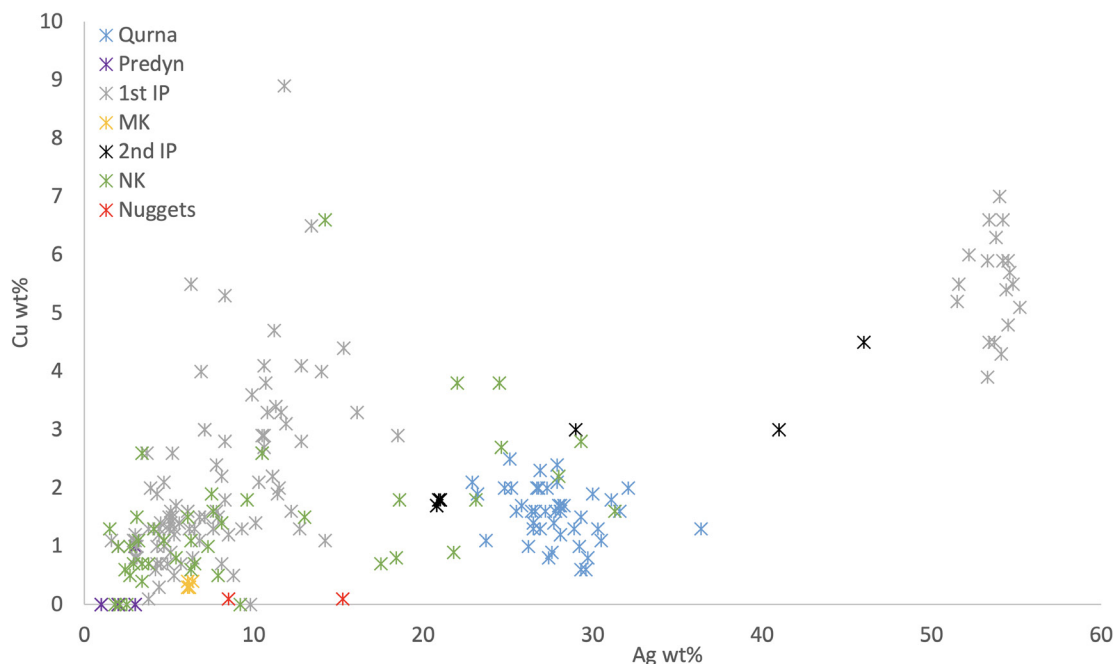


Figure 11.34. Silver versus copper contents obtained for all the tiny beads studied in different chapters of this volume plotted by period and the gold nuggets from ElKab and Meroë.

The small number of Middle Kingdom tiny beads analysed makes it impossible to reach conclusions on the high silver contents observed for the few beads dated to the Second Intermediate Period that were analysed. Nevertheless, it is possible to state that the tiny beads contained in the Qurna child's necklace were not a 'fresh' production made in a single batch for this necklace and that they are made from alloys that are compositionally closer to those produced in the Second Intermediate Period and New Kingdom to make this type of beads.

Final remarks

From the technological point of view, the gold jewellery excavated at Qurna can be separated into two groups: one corresponding to the adult's jewellery and the other to the child's jewellery. However, the adult's jewellery does not constitute a homogeneous group.

The adult woman was buried with a collar containing four strings of ring beads. The ring beads show the tool marks expected for the technique regularly employed in Egypt in the production of small ring beads. The clasp, using sets of beads soldered together and a pin passing through gold loops soldered to the cup-shaped components, is also a typical Egyptian fastening system of that period. The beads outer surfaces were finished and the rings finely soldered, revealing the work of skilled goldsmiths. The solder alloys contain higher copper contents than the parts to be soldered. These alloys were employed regularly for hard soldering processes in Egypt until the New Kingdom, when alloys also containing higher amounts of silver seem to start to be used. Among the objects that were studied in this volume, only the four gold armlets that the woman was wearing contain such thin joins, which potentially indicates that the same goldsmith(s) (or workshop?) made them.

Similar to the collar and the armlets, the pair of ribbed penannular earrings are quite 'fresh' and made with high purity gold alloys, regularly employed in Egypt. Although of a particular type, the woman's earrings are a typical Egyptian construction. Egyptian ribbed penannular earrings are regularly made by soldering four hollow tubes (in general rounded or triangular) at their bases using a solder alloy containing higher copper contents than the parts to be soldered, and the tubes are closed by soldering gold sheets. However, the quite thick joints of the Qurna ribbed penannular earrings suggest that these were not made by the same goldsmith(s) who potentially made the collar and the armlets. As such, several different goldsmiths could have made all of them in the same workshop.

In contrast, the woman's pale yellow greenish girdle, a string of wallet and barrel beads made using an Egyptian technology, has marks of intense use-wear as if it had been extensively worn over a long period, perhaps by several persons in succession. When the high amounts of silver observed for the Middle Kingdom objects are considered, based on the high wear and high silver content (> 50 wt%) of the Qurna girdle, it is possible to suggest that this item (or the strung wallet and barrel beads) was made before the woman's lifetime, perhaps at the beginning of (or even before?) the Second Intermediate Period. It is interesting to notice that objects from the tomb of the three foreigner wives of Thutmes III also contain quite high silver contents, but their level of wear was not reported.

Might the girdle be a 'family' item used on particular occasions?

As mentioned by Patch (2005), girdles are one of the few jewellery items that were exclusively worn by women, of various social positions, in the New Kingdom. While no comment on the colour and wear is provided, it is interesting to consider burial A1, Pit 1, Courtyard CC 41 at Asasif (Lythgoe et al. 1917), dated to a period close to Qurna and which contained a group of jewellery items as remarkable as the group excavated at Qurna, including a 'whitish' girdle. The state of use-wear of this girdle is unknown, but interestingly acacia seed-shaped beads are well represented in Middle Kingdom productions, when whitish gold was appreciated. Both girdles are whitish, contain barrel beads as spacers and were found in rich female burials. This tends to support the proposition that the girdle was a 'family' item, possibly for protection in particular events or during particular periods of the women's life. However, intense use-wear might also result from unavailability during a particular period of materials or specific artisans leading to the use of an ancient girdle or restringing of ancient beads, despite wear marks of some of the barrel beads in the Qurna girdle indicate that the beads were extensively worn in this (type of) mounting. The presence in the girdle of a heavily worn wallet bead may simply be the result of a repair, consisting of replacing the lost or damaged bead by a wallet bead from an old string, but it must be taken into account that in an original mounting the strung beads undergo wear depending on their position in the string.

It is difficult to provide further discussion on this question without the study of other objects dated to 17th–early 18th Dynasties. However, some objects dated to this period studied in this volume have also shown marks of intense use-wear. These include two strings excavated at Qau and Badari, which contain worn barrel beads and Kamose's components of an

armband bearing the name of Ahmose. These objects are made from gold alloys containing high silver contents. In contrast with the Qurna jewellery, which is made from typical Egyptian gold alloys and contain PGE inclusion of expected alloys, Kamose's armband contains PGE inclusions of different alloys (see Chapter 9.4). This might indicate that the gold was imported (obtained by recycling?) or that perhaps the two lions were originally part of a (non-Egyptian?) jewellery item and were reused to make the armband.

Among the gold items excavated at Qurna, the ribbed penannular earrings are perhaps the most interesting pieces. Indeed, the group of jewellery excavated by A. M. Lansing at Asasif mentioned above, which is as remarkable as the Qurna group, shows that other burials dated to 17th–early 18th Dynasties contained outstanding jewellery. The jewellery excavated at Thebes includes many penannular earrings, some of them of a type that is as atypical as the Qurna type. Among them, we can mention those decorated with four ropes of incised lines found in burial B5 in Courtyard CC 41, Pit 3 excavated at Thebes, and the two pairs in gold and lapis lazuli worn by the woman buried in Pit 1 tomb 74 at Mandara. It is worth noting that in some way the rows of lapis lazuli beads in those from Mandara evoke the beaded tubes of the earrings from Qurna and that the beaded tubes of those from Qurna evoke the parallel lines that often decorate the ends of spiral and ribbed penannular earrings with round tubes. The woman buried at Mandara was also wearing a string of gold and blue faience beads, two silver rings and three scarabs and a cowroid in gold mounts. Interestingly, all those Theban burials seem to contain quite regularly perforated scarabs, many inscribed with scrolls, which were tied, such as the one found with the Qurna woman, on the women's left hand. The presence of those scarabs together with collars and gold penannular earrings were also observed in tombs excavated at Tell el-Ajjul. The study of these scarabs might provide in the future additional information on the woman buried at Qurna.

Even though a connection between the Qurna penannular earrings and Asiatic earrings is therefore quite tempting, and although imported jewellery could somehow have reached Thebes in that period, the techniques employed in the production of the Qurna jewellery are the traditional Egyptian ones, suggesting that Egyptian goldsmiths might have been inspired by imported jewellery. This does not mean that the possibility of a Sudanese origin should be dismissed. The jewellery-making techniques employed in Sudan in the 2nd millennium BC are currently not clearly established and the presence of PGE inclusions cannot be used to separate 'Egyptian' from 'Nubian' productions.

In contrast, the child buried at Qurna was wearing very different jewellery items that in a certain way form a homogeneous group. The technological study of the so-called earrings suggests that they were probably gold components from pieces spoiled during production (or repair?) or come from damaged or 'out of fashion' pieces that have been set aside to be melted down and recycled. They are technologically and in shape similar to suspension rings and their diameter corresponds to those used to hang, for example, the pectoral from Middle Kingdom tomb 124 excavated at Riqqa (see Fig. 11.13), although they can also be components of a hinged jewel. Their alloys correspond to the composition of Egyptian objects dated to the Second Intermediate Period and the New Kingdom.

The child's necklace is a string of tiny gold beads of different shapes and dimensions, made using the regular Egyptian technique (but which is used in many other regions). They are of ring and tubular type made from quite varied alloys and contain the expected PGE inclusions for the Egyptian production. However, if the two sorts of gold tiny beads are regularly observed in Egyptian strings, their presence was also identified in strings excavated in Sudan. This is also the case for PGE inclusions. Although two very similar and quite fresh tubular beads are contained in the necklace, many of the beads show wear marks indicating reuse of beads from ancient strings. The practice of reuse of common beads (separators) has been revealed for several Egyptian strings studied in this volume. If the single gold piece excavated at Kerma dated to 1600 BC that has been so far analysed (bracelet 20.1671, Museum of Fine Arts in Boston; Gânsicke & Newman 2000; Reisner 1923b, 283, pl. 44) matches in composition the tiny beads contained in the child's necklace, there is no reason to suggest a non Egyptian origin for the child's jewellery. Indeed, these alloys were observed for Second Intermediate Period and New Kingdom objects studied in this volume.

In brief, the jewellery-making techniques and the alloys employed in the manufacture of the Qurna jewellery were found regularly in other Egyptian productions studied in this volume or published by other authors. All the objects excavated at Qurna contain PGE inclusions like the gold used for jewellery making at that period in Egypt. This tends to confirm an Egyptian origin of the Qurna objects, but a Nubian origin cannot be ruled out without detailed study of Nubian jewellery. Therefore, the woman buried at Qurna was wearing a remarkable array of jewellery, as remarkable as a few others excavated at Thebes, made by very skilled goldsmiths in the Egyptian tradition, but which we are currently unable to distinguish from a possible (analogous?) Nubian tradition. The

group includes a girdle that seems likely to have been made before the woman's lifetime, but the rest of the jewellery was probably her own jewellery, made not long before her death. The reuse of beads to make the child's necklace and the use of jewellery components, perhaps from suspension or hinge systems, as ear ornaments form a 'logical' group. All the gold parts of the child's jewellery could thus represent the reuse for burial of ancient or damaged pieces (either in possession of the family or available at a local goldsmith's workshop, in the place where the child died) perhaps because the child was still too young to have his or her own jewellery.

All in all, when discussed in its broader context, the Qurna assemblage encapsulates many of the subjects cross-cutting this volume, and it will no doubt continue to raise questions and inspire further research on the art of goldsmithing in Egypt.

Notes

1. Ostrich eggshell beads were excavated in many Egyptian and Sudanese sites (e.g. Leclant & Clerc 1988, 1998). See string 062402 dated to 2000–1500 BC (probable) and Second Intermediate Period string 941.23.9 from Abydos, both in the collection of Royal Ontario Museum of Archaeology, Toronto.
2. The black and white photograph 5A_543 (in the archive of the Department of Egyptian art of the Metropolitan Museum of Art (in Lilyquist 2020) shows that some of the rings are whitish and the others are dark grey, which might be associated to the use of gold containing different amounts of silver. Some of the rings seem to form sets (soldered together?).
3. Data published for strings EA14693 and 16.10.314 by Tate et al. (2009). The closing pin of EA14693 has a different composition, it contains 4.6 wt% Ag and 1.3 wt% Cu.
4. The 1251 gold rings that had decorated one of Sathathorinet's wig (16.1.25–26-related in the Metropolitan Museum of Art) are made in two diameters, 0.9 cm and 0.45 cm, but they are all tubular undecorated (based on these diameters estimated height: c. 1.2 cm and c. 0.4 cm, respectively).
5. A detail of one of the suspension rings of pectoral 5966 is also visible under SEM in Figure 8.16, in Chapter 8.3, where the whole group of jewellery from tomb 124 is presented and discussed (by L. Troalen, M. F. Guerra, M. Maitland, M. Ponting and C. Price).
6. On jewellery dismounting, see Chapter 5.
7. Other jewels contain small gold loops. Although more recent, dated to the Middle Assyrian period (1400–1200 BC), the crescent-shaped earrings from tombs 125 (Parrot 1937, pl. XX-2) and 128 excavated at Mari (Nicolini 2010, nos.70–71) contain in the suspension system small gold loops soldered together.
8. The rigid bracelet with a udjat eye and the ornamental bracelet with a turquoise bead and decorated with filigree and granulation patterns found on Tutankhamun's

forearms are hinged pieces with ribbed tubes (Edwards 1976, nos. 12 and 13).

9. Based on the presence of particular pieces in the tomb (axe, dagger and arrowheads), Carter identified the pair as a soldier and his wife. However, the relation between the two individuals is undocumented, and further research into 18th Dynasty burial goods is needed to determine whether the presence of weaponry indicates occupation during life or ritual associations.
10. Petrie (1891, 23, pl. 26 no. 18) found lions' heads in green paste 'for forming the ends of a collar' with coffin 7 in the tomb of Maket excavated at Lahun.
11. The four steatite and two carnelian seal-amulets are shown in Miniaci (2011, pl.4d).
12. Singer (2013, 2015) reassesses this hoard containing ingots and fragmented jewellery in gold and silver in the light of other similar Bronze Age hoards found in Eastern Mediterranean sites. Other authors (e.g. Thompson 2003) discuss this type of hoard.
13. One gold plain torc with incised end is contained in the Syro-Egyptian treasure in the collection of the Beirut Museum (Chéhab 1937) containing a pectoral bearing the name of Amenemhat III.

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Ancient Egyptian gold

This book aims to provide a new level of synthesis in the study of gold jewellery made in Egypt between 3500 BC and 1000 BC, integrating the distinct approaches of archaeology, materials science and Egyptology. Following accessible introductions to the art and use of gold in Ancient Egypt, and to current advances in technical analyses, the volume presents detailed results on the manufacturing technology and elemental composition of some 136 objects in the collections of six European museums, with discussion of the findings in historical and cultural contexts. The questions generated by the jewellery buried with a woman and a child at Qurna (Thebes) led to investigation of assemblages and individual artefacts from later and earlier periods in varied social contexts, from the rural environment of Qau and Badari, to sites connected with urban or royal centres, such as Riqqa, Haraga and Lahun. A final discussion of the Qurna group provides an agenda for future research.

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