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Analytical study of the first royal Egyptian heart-scarab, attributed to a Seventeenth Dynasty king, Sobekemsaf

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SUMMARY Analytical examination of the heart-scarab (EA7876) belonging to a King Sobekemsaf has produced new evidence on its production. The heart-scarab, with its unusual inscription containing incomplete hieroglyphs, was acquired from Henry Salt's collection and entered the British Museum in 1835. It was allegedly found inside the coffin of King Nubkheperre Intef and has been linked to King Sekhemre Shedtawy Sobekemsaf whose tomb at Thebes was sacked, as evidenced by the robbers' confessions recorded in the Abbott and Amherst papyri (*c.*1110 BC).

The heart-scarab was examined and analysed by optical microscopy, X-radiography, X-ray fluorescence spectrometry, scanning electron microscopy with energy dispersive X-ray spectrometry, Raman spectroscopy, Fourier transform infrared spectroscopy and gas chromatography-mass spectrometry to determine the materials and techniques used in its production. The results are compared with those for other objects in the British Museum belonging to King Nubkheperre Intef in order to understand any possible chronological and material link with the scarab; these are a finger-ring (EA57698), bearing the prenomen of King Nubkheperre and spacer-bars from a bracelet (EA57699 and EA57700), belonging to his wife, Queen Sobekemsaf, both dated with more certainty to the Seventeenth Dynasty. All were found to have been made of unrefined alluvial gold with copper added to lower the melting temperature for hard soldering of the components. The craftsmen of these three items used a similar repertoire of manufacturing techniques: sheet and wire components, sharp chisel cuts to mark details and chasing for the inscriptions. There is no evidence for casting of any of the gold components. The finding of the use of a mixture of *Pistacia* resin and a coniferous resin from the Pinaceae family as a fill for a hollow gold item has not previously been reported.

Comparison of the inscriptions on these gold items does not suggest that the connection between King Sobekemsaf (with no prenomen) and King Nubkheperre Intef was sufficiently close for them to have shared the same goldsmith, but the results of the technical studies indicate that in the Second Intermediate Period (*c.*1800–1550 BC), at a time known for a lack of luxury resources, the Theban region still retained a strong goldsmithing tradition.

Introduction

Second Intermediate Period gold objects in the British Museum

A green jasper scarab set in a gold plinth (EA7876: Figure 1) entered the British Museum (BM) collection from Sotheby's sale of Henry Salt's third collection in June–July 1835 [1; p. 396, No. 5].[1] Although scarabs are among the most characteristic and well-known items from ancient Egypt, the BM scarab belongs to a distinctive type: the 'heart-scarab' [2]. The base of this scarab is inscribed with a verse of spell 30B of the Book of the Dead [3; pp. 209, 212, 226], while the name of the person for whom the scarab was intended is inscribed at the end of the formula along the sides of its plinth, "Made for the Osiris king Sobekemsaf, justified" [4; pp. 22–23, No. 211]. Although heart-scarabs are rare before the New Kingdom (*c.*1550 BC), they have been found in a few late Middle Kingdom (*c.*1700 BC) burials [5, 6], and the BM example represents the first recorded for a royal figure [2; p. 73]. Unfortunately, the name of the king is written without prenomen so that it is currently uncertain to which King Sobekemsaf it might have belonged; a recent summary is provided by Vandersleyen [7; pp. 117–118]. There are,

Figure 1. Heart-scarab (EA7876): (a) green jasper set in a gold mount; and (b) the inscription on the base of the mount. Length: 3.8 cm

Figure 2. Gold finger-ring with lapis lazuli scarab (EA57698). Diameter of stone: 2.6 cm

Figure 3. The inscription on the underside of scarab ring EA57698. The scale bar shows 1 mm divisions. The inset is a drawing of the inscription

however, only two kings of that name for whom secure evidence exists: Sekhemre Shedtawy Sobekemsaf [8; pp. 173–175] and Sekhemre Wadjkhau Sobekemsaf [8; pp. 175–178], both from the Second Intermediate Period (*c.*1800–1550 BC) [9; p. 5 and Table 2], and thought to have reigned in the (late) Thirteenth [10], Sixteenth [11; p. 276], or Seventeenth Dynasty [12; pp. 237–242, 268–269]. Although there is some mystery surrounding the circumstances of the scarab's discovery, the repeated mention of the Theban necropolis as its findspot in the sale description can be considered reliable [13; p. 167, No. 209].[2]

The scarab bears one of the earliest versions of spell 30B of the Book of the Dead, whose 'archetype' was inscribed on a fragment of wood, presumably a coffin [14; p. 71, Figure 116], found by de Morgan in one of the tombs of royal princesses at Dahshur and datable to the late Middle Kingdom (*c.*1850 BC). The hieroglyphic signs in the scarab inscription are distinctive in chronological and topographical terms: birds and snakes are reproduced in a truncated form, missing part of their body, while the other animal or human figures are represented complete. The custom of composing inscriptions with incomplete hieroglyphs began at approximately the end of the reign of Amenemhat III (*c.*1820 BC) in the Fayum area of northern Egypt, extending to other regions of Egypt by the end of the Second Intermediate Period and declined into incoherent reproduction around the later Seventeenth Dynasty (*c.*1550 BC), mainly in southern Egypt [15].

The incomplete hieroglyphs and the spell for protection of the heart confirm the dating of the inscribed royal name to the Second Intermediate Period. However, the time span covered by the modern definition of the Second Intermediate Period is more than 300 years and it represents a transitional phase [16; pp. 14–21]. The archaeological and textual evidence for this period is scant and does not produce a coherent historical picture. Many questions about the scarab remain to be answered: the findspot; the identity of its owner; its link with other kings of the period (notably with Nubkheperre Intef); and the quality of its manufacture, which is unexpected for this period when there was an apparent loss of expertise in fine metalwork [17, 18].

Among a small collection of objects donated to the BM by Dyson Perrins (1864–1958) is an unprovenanced lapis scarab set in a shallow gold tray, which acts as a ring bezel (1924,1215.1: EA57698), and is inscribed with the name

Figure 4. A pair of bracelet spacer-bars decorated with cats (EA57699 and EA57700). Longest dimension: 3 cm

Intef, Figures 2 and 3. Two reasons suggest that the owner of this ring may be identified as the king Nubkheperre Intef of the Seventeenth Dynasty [1; pp. 394–395]. First, there are two gold bracelet spacers decorated with cats (1924,1215.2: EA57699 and 1924,1215.3: EA57700) that were also part of the Dyson Perrins donation, Figure 4. These are inscribed to King Nubkheperre Intef and his queen Sobekemsaf (Figure 5) and, since they came from the same collection as the ring, may share a similar provenance and be linked [19; pp. 342–343, 12; p. 233, No. 5]. Second, the spelling of the name on the ring, ʾIn-i-it-f, which can be rendered more precisely as Inyotef, might identify its owner with King Nubkheperre, who usually spelled his name with an infix 'i' [19; p. 25]. A stela from Edfu recounting the restoration of the tomb of Queen Sobekemsaf [20; p. 203], and other evidence of this queen at the site, have led scholars to suppose that these two objects came from her tomb at Edfu [8; p. 283, No. 19], although there is currently no evidence to support this assertion.

History and attribution of the heart-scarab

In 1836, a report by Giovanni d'Athanasi, who had sold part of Henry Salt's collection to the BM in the summer of 1835, provided further information on the scarab. D'Athanasi, referring to the discovery of the burial of King Nubkheperre Intef (Seventeenth Dynasty) at Dra Abu el-Naga in the northernmost part of the Theban necropolis [21], mentions that the heart-scarab came from his mummy [13; pp. xi–xiii]. Although this attribution has been accepted by many scholars, it is not without difficulties.

Heart-scarabs were not transferable from one person to another. They were intended to restrain the heart of the owner from witnessing against them during judgement in the afterlife and because of this there is a strong link between the object and the owner. Such a function is known from archaeological evidence, for instance the burial of Neferkeuet in the early Eighteenth Dynasty (*c.*1500 BC) [22], and from textual evidence [23]. Although there is considerable evidence for the circulation of goods and the inclusion of heirlooms in burials of the Second Intermediate Period [16; p. 58], the presence of this heart-scarab in a burial other than that of a king named Sobekemsaf would be curious and suspicious.

Figure 5. Inscription on the undersides of the bracelet spacer-bars illustrated in Figure 4: (a) inscription on EA57699; and (b) inscription on EA57700

Table 1. Distribution of evidence for kings named Sobekemsaf from western Thebes

Object	Location	Reference
Sekhemre Shedtawy Sobekemsaf		
Base of a statuette	Dra Abu el-Naga (Thebes west)	[1; p. 393, No. 3]
Stela of a private individual	Dra Abu el-Naga (Thebes west)	[1; p. 393, No. 4]
Stela of a private individual	Thebes west	[1; p. 393, No. 5]
Tomb recorded by the 'inspection papyri'	Thebes west	[1; p. 393, Nos 9–11]
Lintel (?)	Thebes west	[1; p. 393, No. 7]
Sekhemre Wadjkhau Sobekemsaf		
Block	Deir el-Bahri (Thebes west)	[1; p. 396, No. 10]
Sobekemsaf with no prenomen		
Heart-scarab	Thebes west	
Canopic box	Thebes	[31; pp. 60–65, 32; pp. 37–47, 118, 152–153, Plates 14–16]
Door jamb	Farshut Road (Thebes west)	[27; pp. 50–51]

It is worth remembering the common practice of nineteenth-century dealers of combining items from different burials in a fictitious ensemble in order to excite the interest of purchasers. At approximately the same time as the discovery of the coffin of Nubkheperre Intef, a canopic box belonging to a king called Sobekemsaf (with no prenomen) appeared at Thebes and a few years later was sold to the National Museum of Antiquities in Leiden [24, 19; pp. 319–320] by an Italian dealer called Piccinini who operated mainly at Thebes. The canopic box and the scarab share a great many features: the owner's name, a lack of a prenomen, the same incomplete hieroglyph system and the same provenance, Thebes. The simplest conclusion would be that both objects belonged to the same king, called Sobekemsaf. It is suggested, therefore, that in the early nineteenth century the tombs of King Nubkheperre Intef and an unspecified king called Sobekemsaf could have been discovered at almost the same time. A note by Auguste Mariette alludes to such a possibility: "At Drah-abou-neggah, I recognized the location of seven royal tombs that are those of kings Ra-noub-Kheper-Entef and Sevek-em-saf, dug to the west of the plain in the sides of a hill; the tomb of the first of these kings is a hemi-speos, and the façade is ornamented with two obelisks",[3] suggesting the discovery of a tomb belonging to a King Sobekemsaf after that of King Nubkheperre [25; p. 28]. Puzzlingly, Mariette does not give any details about the tomb of Sobekemsaf, which has led many to question whether he actually found it [26].[4] Intriguingly, a door jamb has been found recently at 'gebel Antef' at Thebes bearing an inscription that clearly refers to King Nubkheperre Intef as the son of a king called Sobekemsaf [27; pp. 50–51], raising the possibility of a shared tomb. In this context, two other kings of the late Second Intermediate Period (Seventeenth Dynasty) who were also buried at Dra Abu el-Naga – Sekhemre Wepmaat Intef [1; pp. 393–394] and Sekhemre Heruhirmaat Intef [1; p. 395] – shared the same tomb, as indicated in a sketch by Gardner Wilkinson [16; pp. 70–72]. Hence, the scarab and canopic box have usually been considered to belong together, variously attributed by scholars over the years to either Sekhemre Shedtawy Sobekemsaf [28, 29; pp. 139–140] or Sekhemre Wadjkhau Sobekemsaf [1; pp. 169–171, 8; p. 175, 12; pp. 268–269].

The Amherst-Leopold II papyrus and Abbott papyrus, reporting inspections carried out in the Theban necropolis following robberies in the late Ramesside period, refer to extensive and destructive looting of the tomb of King Sekhemre Shedtawy Sobekemsaf: "we [the robbers] opened their outer coffins and their inner coffins in which they lay ... The noble mummy of the king was all covered with gold and silver inside and outside with inlays of all kinds of precious stones. We appropriated the gold which we found ... We set fire to their inner coffins. We stole their outfit which we found with them" [30; pp. 37, 48–49]. The gold scarab and wooden canopic box would have hardly survived this looting and fire, which suggests that an association with Sekhemre Shedtawy Sobekemsaf is unlikely, while an attribution of the scarab to Sekhemre Wadjkhau Sobekemsaf, as proposed by Kim Ryholt [1; p. 396], is possible, although there is no firm evidence that he was buried at Thebes since the only evidence is a fragmentary block from Deir el-Bahri [1; p. 396, 26; pp. 136–137]. Table 1 shows the distribution of mentions of different kings named Sobekemsaf from western Thebes [1, 27, 31, 32].

Since neither the written nor the archaeological sources can confirm the identity of the scarab's owner it would be safest to consider the scarab (and the canopic box) to be associated with an as-yet unidentified King Sobekemsaf of the Second Intermediate Period.

Technical descriptions

Heart-scarab (EA7876)

This human-headed green scarab weighs 17.1 g and measures 3.8 × 2.5 cm, Figure 1. It is set into a cloison on top of a sheet gold box or plinth that was confirmed to be hollow by X-radiography. The stone of the scarab was identified as green jasper (an opaque microcrystalline quartz) by Raman spectroscopy. The base, sides and top of the box forming the hollow plinth are made of three sheets of gold, soldered together and apparently filled with a translucent brown material that prevents the stone from falling into the hollow box. A sample of this adhesive filler, extracted from the side of the setting after removing the upper layers to minimize the risk of contamination from the mummy, was identified by Fourier transform infrared (FTIR) spectroscopy and gas chromatography-mass spectrometry (GC-MS) as a mixture of *Pistacia* resin and a coniferous resin from the Pinaceae family [33]. Although these tree resins have previously been identified in

Table 2. Semi-quantitative analysis of the gold alloys

Region of analysis	wt%			Analytical method
	Au	Ag	Cu	
Heart-scarab 7876				
Top plate of plinth	86.2	12.6	1.2	XRF
Corrugated strip around scarab	86.1	12.6	1.3	XRF
Side wall of plinth	86.5	11.5	2.0	SEM-EDX
Base plate of plinth	86.8	12.3	0.9	XRF
Leg – front left	86.1	12.6	1.3	XRF
Leg – back right	85.4	13.1	1.5	SEM-EDX
Leg – back left	87.5	11.3	1.2	SEM-EDX
Ring 57698				
Hoop	85.0	14.0	1.0	XRF
Bezel plate	83.0	16.0	1.0	XRF
Coiled wire	84.0	15.0	1.0	XRF
Leg – left	91.3	7.6	1.1	SEM-EDX
Leg – right (including hard solder)	85.2	10.0	4.8	SEM-EDX
Collar	87.0	11.3	1.7	SEM-EDX
Bracelet spacer 57699				
Base plate	81.7	17.0	1.3	XRF
End plate	81.1	16.8	2.1	XRF
Top plate	80.5	17.0	2.5	XRF
Cat – body 1	88.0	11.0	1.0	XRF
Cat – body 2	88.7	10.3	1.0	XRF
Cat – body 3	88.9	10.1	1.0	XRF
Cat – tail	82.4	16.3	1.3	XRF
Cat – front leg	85.6	13.3	1.1	XRF
Bracelet spacer 57700				
Base plate	81.1	17.4	1.5	XRF
End plate	81.3	17.0	1.7	XRF
Top plate	79.1	17.5	3.4	XRF
Cat – body 1	87.8	11.0	1.2	XRF
Cat – body 2	87.5	11.2	1.3	XRF
Cat – body 3	86.6	11.8	1.6	XRF
Cat – tail	84.4	13.4	2.2	XRF
Cat – front leg	85.6	12.7	1.7	XRF

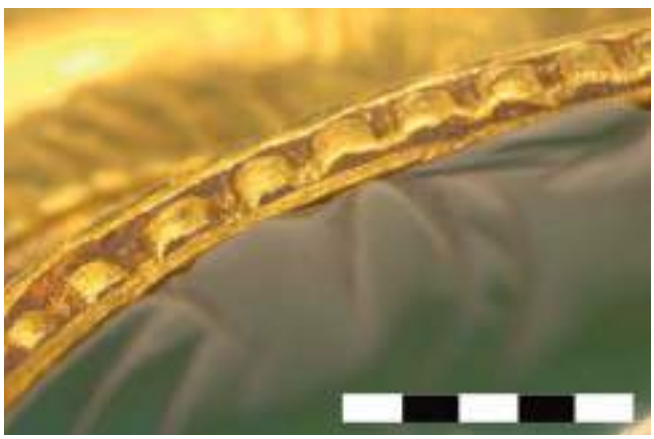

Figure 6. Detail of imitation of beaded wire or granulation around the stone of the heart-scarab. The scale bar shows 1 mm divisions

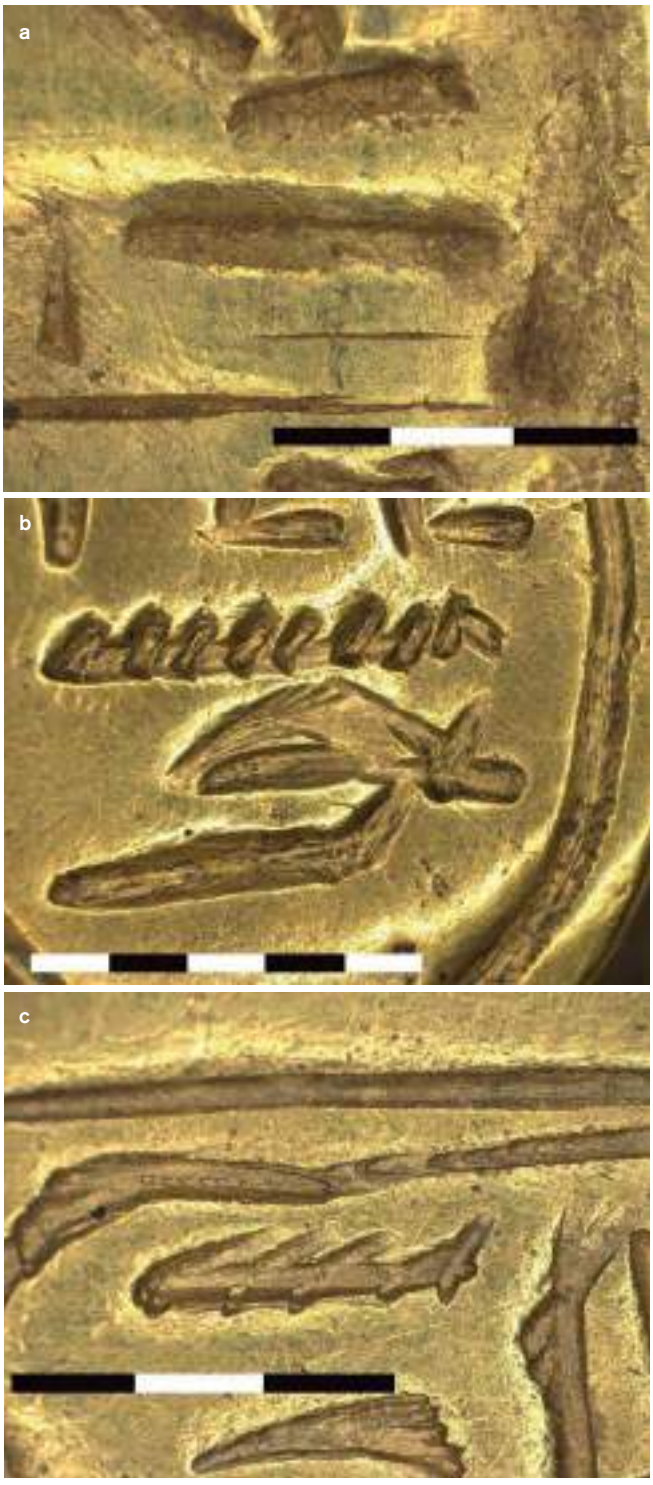

Figure 7. Comparison of the different styles of inscribing the same hieroglyph (the 'n' sign) on the three objects: (a) on the underside of the heart-scarab; (b) on the finger-ring; and (c) on one of the bracelet spacers. The scale bars show 1 mm divisions

many ancient Egyptian contexts, ranging from uses in mummification to incense and varnish, analytical evidence for their use as a filler in goldwork has hitherto been scarce [34; pp. 7–8, 35, 36].

The cloison surrounding the scarab has a double wall enclosing a corrugated strip of gold that imitates a beaded wire border, Figure 6. The beetle's legs were individually cut from sheet gold and sharply incised to represent hairs. They were soldered to the top sheet of the plinth before its sides were added.

Hieroglyphs around the plinth, and in five horizontal rows across its underside, show marks with the characteristic soft profile of chasing executed with a blunt tool, causing indentation of the sheet gold around each symbol, Figure 1. Some marks may have been punched using a tool with a wedge-shaped tip, Figure 7a. Straight lines dividing the inscription appear to have been scraped with several sweeps of a sharp pointed tool. A comparison of details of the toolmarks of the hieroglyphs on this and the other items demonstrates that the three pieces must have been inscribed by different hands, Figure 7.

Gold finger-ring (EA57698)

The finger-ring has a diameter of 2.6 cm, a thickness of 1.2 cm and weighs 7.2 g; it is set with a blue scarab with details of the insect's head outlined, Figure 2. The identity of the mineral was confirmed by Raman spectroscopy as lazurite $[Na,Ca]_4[AlSiO_4]_3[SO_4SCl]$, indicating that the stone is lapis lazuli. The back of the gold setting is inscribed with the name Intef, with no surrounding cartouche, Figures 2 and 3. Three holes are drilled at each side of the scarab and another runs through its body from end to end. The legs of the scarab are made of six gold strips joined by hard soldering to the inside rim of the gold setting. Two legs show traces of inscribed markings, indicating hairs, but these have largely been overlaid by hard solder. The tops of the legs slot into the holes in the side of the scarab holding it in the manner of a claw setting. At either end of the setting is soldered an undecorated gold collar through which the ring shank – a gold rod of hammered wire – is threaded. The wire of the shank at the head end of the scarab runs through the perforation of the body and is coiled around the other side of the shank to form a decorative mechanical join. The wire of the shank at the tail end of the scarab is threaded across the setting, under the scarab body, and is coiled to matching effect around the shank at the head end. The hieroglyphs are chased into the gold with marks that indicate the use of a blunt tool, producing feathered lines around the curves, Figures 3 and 7b. These toolmarks are overlaid by sharp scratching, which is likely to relate to later cleaning out of the inscription.

Pair of bracelet spacer-bars decorated with cats (EA57699 and EA57700)

These gold spacer-bars are 3 cm long, 1.8 cm wide and 1.2 cm high, and weigh 19.2 and 19.1 g respectively, Figure 4. Each consists of an open-sided shallow box formed around 12 gold tubes through which strings for the bracelet were threaded. The tubes are each formed of a single sheet of gold crudely rolled into a cylinder with a longitudinal seam. The box is formed of a top plate on which three cats lie, an inscribed base plate, deeply chased, and two separate sheets along the shortest sides. The three cats that are soldered onto the top of each box are each made up of seven solid rod/wire components, worked to shape and hard soldered together. The body and head are one piece with details of the eyes, nose and mouth worked into the gold. The ears were made separately and soldered onto the heads. The four legs and tail were formed of wire and details of the front paws and striped tail were cut into the metal, Figure 4.

Gold analysis

Surface depletion of copper and, to a lesser extent, silver from gold alloys causes surface enrichment in gold. This depletion may result either from 'pickling' by the goldsmith during manufacture or from corrosion of less noble metals, particularly copper, during burial. As this well-known phenomenon affects the results of surface X-ray fluorescence (XRF) analysis and, to an even greater extent, energy dispersive X-ray analysis carried out in a scanning electron microscope (SEM-EDX) [37, 38], the surface alloy analyses reported in Table 2 may not accurately reflect the core metal composition and these results should therefore be considered semi-quantitative.

The concentrations of silver (10–18 wt% Ag) found for the alloys in these objects are typical of naturally occurring, unrefined alluvial gold, as might be expected at this period [39].[5] The silver results (*c.*17 wt%) for the components of both boxes in the bracelet spacers are consistent, suggesting that these sheets were cut from the same piece, whereas the components of the cats show a wider variation in composition, which may reflect the use of different pieces of rod or wire.

The copper content of naturally occurring alluvial gold is typically below 2 wt% [40, 41], but the copper concentrations detected for some components of these artefacts are higher (Table 2), suggesting intentional addition of copper. The addition of copper to gold in Egypt in the early Eighteenth Dynasty has been cited by Schorsch [42]. Copper, presumably added to lower the melting temperature of gold for a hard solder, was identified by analysis in jewellery from the so-called Qurneh queen's burial at Thebes [43]. In the case of the ring examined here, the solder on the scarab's legs is visible under magnification and the compositional difference is clear, Table 2. The box constructions of the heart-scarab and the bracelet spacers also show visible soldered joins and this may account for some elevation of copper levels near the joins.

The presence of several platinum group element inclusions confirms that the metal used in the manufacture of both the heart-scarab and the finger-ring contained alluvial gold [44–46]. Normalized SEM-EDX analysis detected 37 wt% ruthenium, 32 wt% osmium and 31 wt% iridium for the inclusion on the gold setting of the finger-ring, and 12 wt% ruthenium, 48 wt% osmium and 40 wt% iridium for an inclusion in the sheet gold of the heart-scarab. Although white metal inclusions were seen on the bracelet spacers these were not accessible for analysis due to the geometry of the instrument. It seems likely, however, that they are of a similar type and indicate that this gold probably also derived from alluvial sources.

Conclusions

Analysis has established that all the items examined are made of unrefined alluvial gold with copper sometimes added to lower the melting temperature for hard soldering of the components. The craftsmen of these items used a similar repertoire of manufacturing techniques: sheet and wire components; sharp chisel cuts to mark details on the cats and scarabs; and chasing, with perhaps some punching, for inscriptions. There is no evidence for any of the components of these pieces having been cast. The finding of a mixture of *Pistacia* and Pinaceae

(*Cedrus* genus or *Pinus* genus) resins as a filler and adhesive for a hollow gold item has not previously been reported. This may be because it has not been sought analytically outside the context of mummification, but it is not surprising that it could have served both purposes. The carved stones used for the scarabs – green jasper and lapis lazuli – were relatively common at this period in Egypt. While jasper could have been sourced locally, lapis lazuli was a precious trade item from Afghanistan [47; pp. 29–30, 39–40].

The use of incomplete hieroglyphs on the heart-scarab but not on the ring and spacers could be explained by their different functions, as the latter were intended for use in daily life rather than in funerary practice. However, the dissimilarity in the style and execution of the hieroglyphic inscriptions indicates that they were not executed by the same hand, Figure 7. A close connection between King Sobekemsaf (with no prenomen) and King Nubkheperre Intef might have been established had it been evident from the toolmarks that the same goldsmith chased the personalized inscriptions on the different pieces. The association between the ring and spacers arose from their presence in the same collection but does not prove that they were found together. In conclusion, a link between King Sobekemsaf (with no prenomen) and King Nubkheperre Intef, or their burial assemblages, although evocative, is not supported on the basis of the technical study of these items. What is clear from the results, however, is that in the Second Intermediate Period, at a time known for a lack of resources, the Theban region still retained the traditional repertoire of goldsmithing knowledge and expertise.

Experimental appendix

Gold analysis

Elemental analysis of the surface of the gold was carried out by XRF using a Brucker Artax spectrometer with a molybdenum X-ray tube operated at 50 kV and 800 μA, with a 0.65 mm collimator. Small components were analysed using EDX in a Hitachi S-3700N variable pressure SEM, set to an accelerating voltage of 20 kV and a chamber pressure of 30 Pa. The semi-quantitative results of these surface analyses were calculated using three of the British Museum's in-house set of gold alloy standards: SB12 (90 wt% Au, 5 wt% Ag, 5 wt% Cu); SB39 (50 wt% Au, 30 wt% Ag, 20 wt% Cu); and SB8A (70.98 wt% Au, 24.07 wt% Ag, 4.95 wt% Cu).

X-radiography

Images were produced using a Siefert DS1 X-ray tube operating at 100 kV with an exposure of 5 mA for four minutes.

Raman spectroscopy

Identification of the stones of the two scarabs was carried out *in situ* using a Jobin Yvon LabRam Infinity spectrometer with a green (532 nm) laser with maximum power of 1.8 mW at the sample, a liquid nitrogen cooled CCD detector and an Olympus microscope system. Spectra were collected for 5–20 seconds, with at least five scans used to produce each spectrum.

Identification of material inside the heart-scarab

A powdered sample was analysed by FTIR spectroscopy in transmission mode on a Nicolet 6700 with a Continuum IR microscope. Further analysis was carried out by GC-MS: the sample was extracted in dichloromethane, derivatized in bis(trimethylsilyl)trifluoroacetamide with 1% trimethylchlorosilane and analysed on a HP5-MS column in an Agilent Technologies 890N Network GC system with an Agilent 5973 Network mass selective detector [33].

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Notes

1. See [1] for complete bibliography. Ryholt assumes the scarab belongs to King Sekhemre Wadjkhau Sobekemsaf.
2. "A Scarabeus of jasper, in the form of a 'cartouche', set in gold and mounted on a gold base, round which are hieroglyphics, and on the bottom are five lines of hieroglyphics, 1¼ in. long … Thebes, £16. 10s. This unique and very curious relic was taken from the breast of a male mummy found at Thebes."
3. "J'ai reconnu à Drah-abou-neggah l'emplacement de sept tombes royales qui sont: celles des rois Ra-noub-Kheper-Entef et Sevek-em-saf, creusées à l'ouest de la plaine, dans les flancs d'une colline; la tombe du premier de ces rois est un hémi-spéos, et la façade était ornée de deux obélisques."
4. It is probable that when Mariette discovered Nubkheperre Intef's tomb he remembered the story of a golden scarab bearing the name of a King Sobekemsaf associated with the discovery of the coffin of King Intef from d'Athanasi's account, but it is also possible that Mariette had found a tomb belonging to a king named Sobekemsaf.
5. A larger set of gold analyses will be presented in a forthcoming publication: PICS 5995 CNRS 'Analytical study of Bronze Age Egyptian gold jewellery'.