

## Production of Bronze Works in the Nabataean Kingdom

### Literary Evidence

The sole literary source on bronze working in Nabataea is Strabo's statement (Geography 16, 4, 26). Here he lists copper as well as embossed (τόρευμα) and moulded products (πλάσμα) as goods not produced in the Nabataean kingdom. The most recent events incorporated into Strabo's Geography took place around 24AD (Dueck 2000: 145-151; Engels 1999: 36-40), however it is not probable that all his information was up to date at the time of the final edition. It is not known how Strabo obtained his information for the above passage, but because earlier he mentions a visit of his friend, the philosopher Athenodoros of Tarsos, to Petra (16, 4, 21), it is generally assumed that he relied on the eyewitness report of Athenodoros for this information.

The voyage and therefore the situation described in the text may be cautiously dated between 60 and 10BC. In a more positivistic approach, Phillipson suggested that the visit took place between 30 and 25BC as a reconnaissance trip for the expedition of Aelius Gallus (RE Suppl. V Athenodoros 50).

### Copper Ore Deposits and Smelting Works in Nabataea

At first glance it may seem surprising that the Nabataeans needed to import copper because both sides of the Wādī 'Araba present some of the richest copper ore deposits in the Levant. This copper ore deposit had already been exploited during various periods since the Chalcolithic. Its three main districts are situated around Faynān, Wādī Abū Khushayba, south of Petra, and at Timnā' on the western border of the rift valley (Bender 1965; Hauptmann and Weisgerber 1987: 420).

Faynān, around 40 kilometres north of Petra, was intensively surveyed and studied by a team of the

German Mining Museum at Bochum, as well as in further surveys (Hauptmann and Weisgerber 1987; McQuitty 1998: 1). The surveyors state it is by far the largest of these mining centres according to the size of the slag heaps there. While there is in fact no evidence for mining or smelting activities in the last centuries of the first millennium BC, some of the pottery and coins found at the immense slag heaps near Khirbat Faynān, where the ore from several mines in the vicinity was smelted, hint to a production of copper from the end of the first century AD onwards (Hauptmann *et al.* 1985: 169ff.).

The second area is located about 15 kilometres south of Petra around the Wādī Abū Khushayba. There, several copper mines have been surveyed by Kind in 1964 and by Lindner during the past decades (Kind 1965; Lindner 1986), but to date a more intensive study has not taken place. The mined ore seems to have been smelted at Şabrā, where larger amounts of slag have been reported. Especially noteworthy are the slag from the fill of the temple-terrace, which provide a *terminus ante quem* for the smelting (Lindner and Zeitler 1997/98: 552). It would be interesting to know more about this mining and smelting area, especially at what exact date during the Nabataean or Roman era the exploitation was reestablished. The reported surface finds indicate frequent sites from the first century AD onwards (Kind 1965: 64; Lindner 1986: 183-188; Lindner 1992: 267). The temple, which was obviously erected after some smelting activities had begun, was dated, on the basis of its architectural details, to the first half of the first century AD (Lindner and Zeitler 1997/98: 557f). Nevertheless, until more work is done in the field one should be cautious with precise dating. A constructed road leads from the mines to Şabrā and from there to Petra. It was built to carry wheeled transport and

enters the city at the southeast, not far from the hill-ock az-Zanṭūr (Lindner 1986: 137-140, 170-183). A second road comes up the Wādī Abū Khushayba, passes Jabal Hārūn, and presumably entered the city in the southwest (Lindner 1992: 263; Hertell 2002). The construction date for both roads has not yet been determined.

At Timnā' finally, where several Nabataean and Roman sites have been excavated, there is no evidence for mining activities before the second century AD. The only exception is a foundry of the first century AD in the ruins of the Hathor temple, in which collected copper ore was stored and scrap-metal was remelted (Rothenberg 1973: 185-188). At Timnā', a large-scale production only seems to have started after the Roman annexation of Nabataea (Rothenberg 1973: 211-243; *NEAEHL* IV Timna' 1485).

**Bronze Workshops in Nabataea**

Apart from the previously mentioned foundry at Timnā', where copper was remelted and probably cast into ingots, to date we know of only one other bronze workshop in the Nabataean kingdom. It is located on the slopes north of az-Zanṭūr in the city of Petra and will be discussed below. Aside from this, near the temple of the winged lions, Hammond excavated a room in which several bronze items and a bar of lead were found (cf. Hammond 1987: 136-139, 1996: 51, 2000) but as there were

no facilities for the bronze casting proper and the context clearly belongs to the late Roman occupation of the site it will not be discussed further.

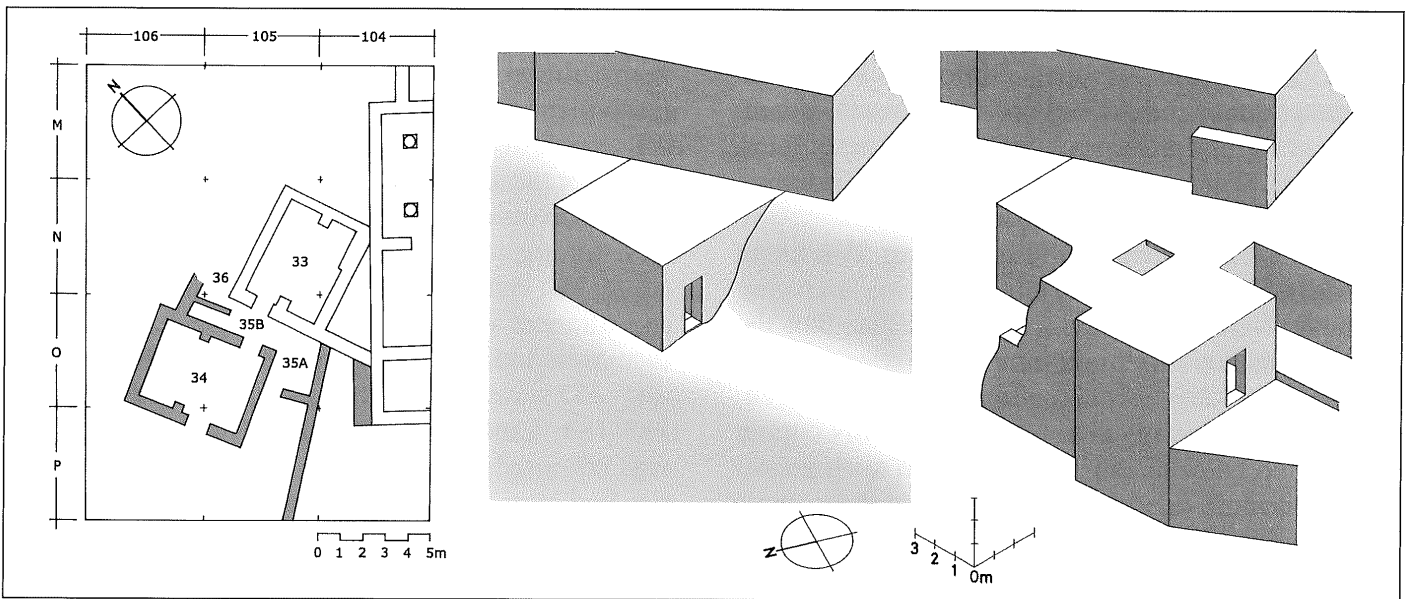
**The Workshop at az-Zanṭūr<sup>1</sup>**

The workshop at az-Zanṭūr (FIG. 1 left) is located on the northern side of the hill of the same name, which slopes down towards Petra's colonnaded Street. It was excavated in the years 1993 and 1994 by Rolf Stucky (Basel University) with funds of the Swiss-Liechtenstein Foundation for Archaeological Research Abroad (Stucky *et al.* 1994: 274-280, 1995: 299; Stucky 1996a: 26-30, 1996b: 340; Kolb *et al.* 1997: 241; Schmid 2000: 15, 32, 39).

*History of the Building*

The workshop was built into the steep slope on a small artificial terrace immediately north of the larger terrace EZ I on which a Nabataean private building stood (Stucky 1996a). Before the construction of the workshop, at the time when the house on EZ I was built (in the earliest first century AD), only a single room — probably used as a mill — occupied the otherwise untouched slope immediately to the north of EZ I (FIG. 1, middle).

The hypothetical urbanised system of the residential areas of the city at that time was described as a "petrified nomad's camp" with only the natural terraces of larger size being built up (Stucky 1992: 136ff., 1995: 197, 1996a: 49). In the area in ques-



1. Northern edge of the terrace EZ I and the slope north of it with the bronze workshop. Schematic plan with building phases and room numbers indicated. Isometric reconstructions of the building in its two phases (drawings M. Grawehr).

<sup>1</sup> The detailed study of this bronze workshop is the subject of my

ongoing PhD-project at Basel University/Switzerland.

tion this situation must have changed considerably at the time when the workshop was built (FIG. 1, right). Terraced walls alongside the earlier house and the mill were constructed, they can be traced far beyond the limits of the excavation. This way the steep slope was organized in narrow terraces and therefore the whole space between the larger terraces could be utilized and built over. The evidence for the dating of these building activities is slight. In soundings made below the floor of the workshop only a few datable shards could be recovered. They belong to phase 3a of Schmid's fineware chronology (Schmid 2000), i.e. 20-70AD.

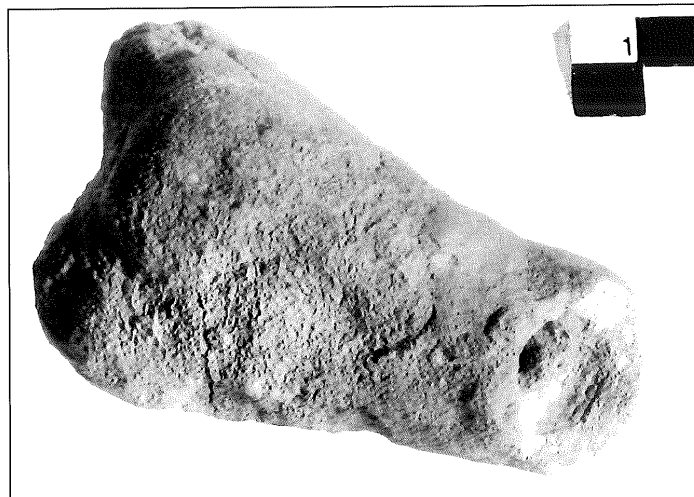
#### *Description and Destruction of the Building*

As far as the then newly erected workshop has been excavated it can be said that it consisted of five rooms (FIG. 1, left). Through a recessed door, a small corridor (35A) could be entered. This corridor led to the miniature courtyard 35B, from which one had access to the other rooms 33, 34 and to corridor 36, which extends to the limits of the excavation. The arched room 34 had its own street level access and seems to have served as a shop. It yielded next to no finds, except for a service of drinking vessels in its southeastern corner. Room 33 is the workshop proper. This is indicated by the finds that were encountered in a thick and seemingly undisturbed destruction layer, sealed by the debris of the rooms arched roof. While any indication for the cause of this destruction evades us, the dating of the event is clear. Through the evidence of the coins on the floor we arrive at a *terminus post quem* of 98AD. As there is plenty of fine ware in the destruction level, belonging to Schmid's phase 3b, but none of phase 3c, which according to him starts  $\pm 100$ AD, the destruction must have taken place at the end of the first or early in the second century AD.

#### *Finds in Room 33*

In room 33 large amounts of pottery as well as several implements and tools of a bronze worker were found. They include pieces of small portable ovens, casting and plaster moulds as well as plaster casts, which shall now be discussed in slightly more detail.

The casting mould in FIG. 2 was used for *cire perdue* casting. It was found in the stage where the wax model (around which the mould was formed) had already been melted out. In the moment of the destruction it was still awaiting its final cast-

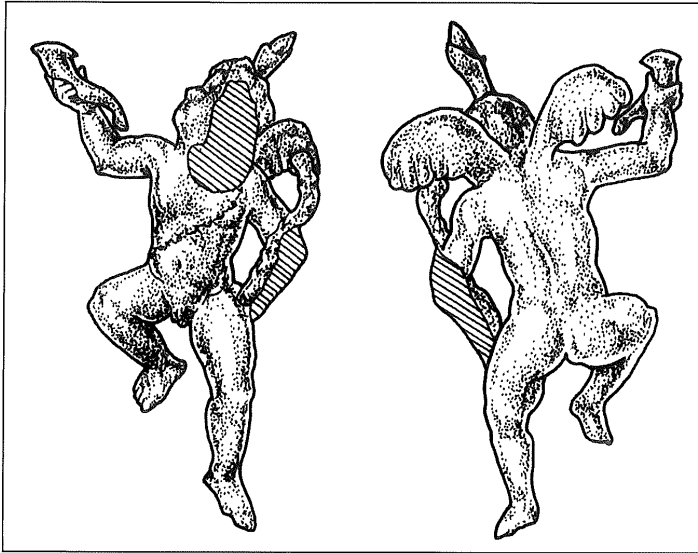


2. Casting mould found in Room 33. Length: 97mm (photo O. Jäggi).

ing in bronze. To make the hollow space inside the mould visible, the vacuum of the actual object was scanned using computerized tomography. The resulting picture is shown in FIG. 3 in which the sprue and the channels, through which the liquid bronze flowed into the extremities of the figure can be seen. The reconstruction drawing in FIG. 4 omits these features. The figure is a small chubby winged Eros with one leg raised as is common in the representations of small children. One hand is raised above the head and holds a *rhyton*, while the other arm leans on a *pedum*, attributes usually seen in the hands of Dionysos' company. On the head of the winged figure one can make out a small crown, as worn by the Egyptian Harpocrates. While



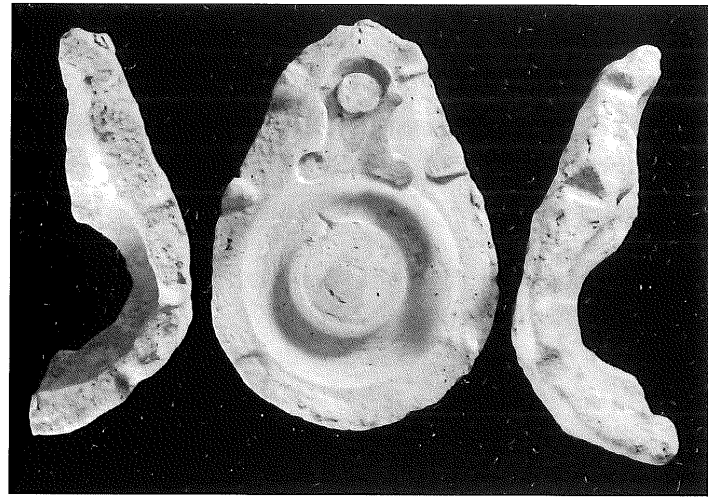
3. Three-dimensional reconstruction of the cavity inside the casting mould shown in FIG. 2 after tomographic data. Front and back view. Height of figure: ~60mm (C. Röffke).



4. Reconstructive drawing of the figure to be cast in the casting mould shown in FIG. 2, front and back view. Height of figure: ~60 mm (drawing M. Grawehr).

many small Harpocrati with wings (LIMC IV Harpokrates 444), as well as many bacchic Erotes are known (Stuveras 1969: 13f.; LIMC III Eros/Amor, Cupido 1045; Daszewski 1994), the combination of all three elements is curious. Because of the size and the posture of the figure it was probably not intended as an artifact itself. It is more likely that it was attached at its back and served as a decorative feature of an utensil. As an alternative it is tempting to envisage the Eros on the back of an animal, i.e. a panther, which then would lead to an even stronger Egyptian appearance and might explain its iconography to a certain extent (Daszewski 1994).

For the creation of the wax models the bronze worker of az-Zanṭūr disposed of plaster moulds. Plaster waste and bowls with plaster-residue confirm the production of these moulds in the workshop. They were formed after prototypes made of clay and allowed the fabrication of an identical series of objects. Many of the moulds found in the workshop were intended for the production of bronze lamps; one example of a three-piece mould is shown in FIG. 5. Objects of this kind are known from various other sites in the Eastern Mediterranean (i.e. Edgar 1903; Siebert 1973: 583-587; Barone 1994: 31-45, 77ff., 94ff.; Seif el-Din 1998). With the help of plaster moulds the wax models for simple free standing objects could be produced easily, but when it came to the casting of reliefs or high reliefs with undercutting, the bronze worker had to use a flexible material for the moulds. More flexible but less durable than plaster is wet clay. The objects that had to be created using these clay

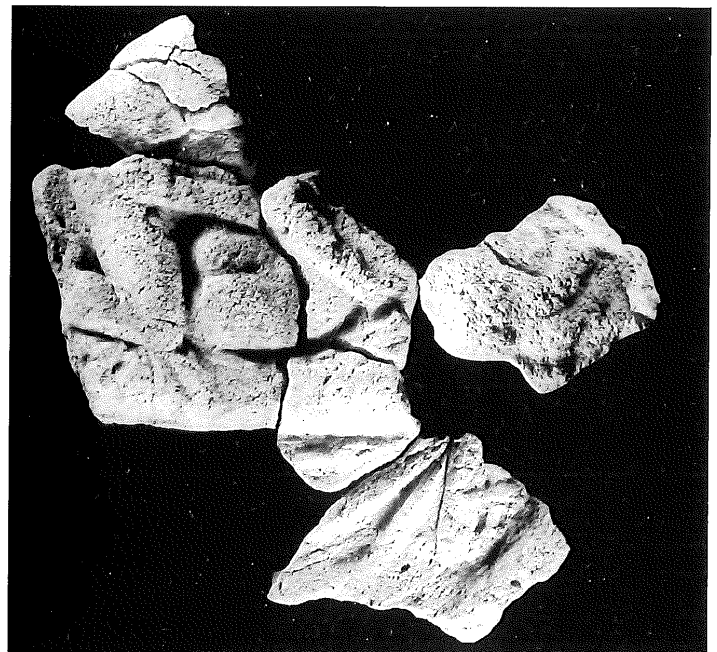


5. Plaster mould found in Room 33. Length: 155 mm (photo O. Jäggi).

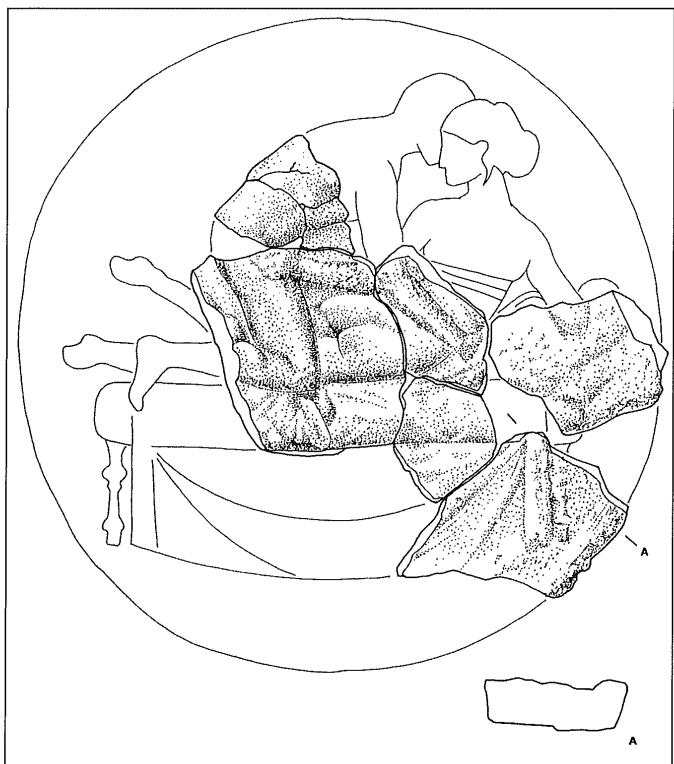
moulds were archived in the workshop with the help of plaster casts. From these casts the bronze worker could reproduce a pattern at any given time.

It is important to understand this difference in the work-process between plaster casts and plaster moulds, because they are easily confused. Plaster moulds were used for the reproduction of less complicated three-dimensional objects, while plaster casts were the appropriate tools for the production of reliefs and other objects with undercuttings.

One of the casts from az-Zanṭūr is shown in FIG. 6. The relief was recovered from a series of fragments and did not survive as a whole, but its original composition and shape can be reconstructed (FIG. 7). As the surviving fragments suggest it was taken from a mirror case or from an emblemata



6. Plaster cast found in Room 33 (photo O. Jäggi).



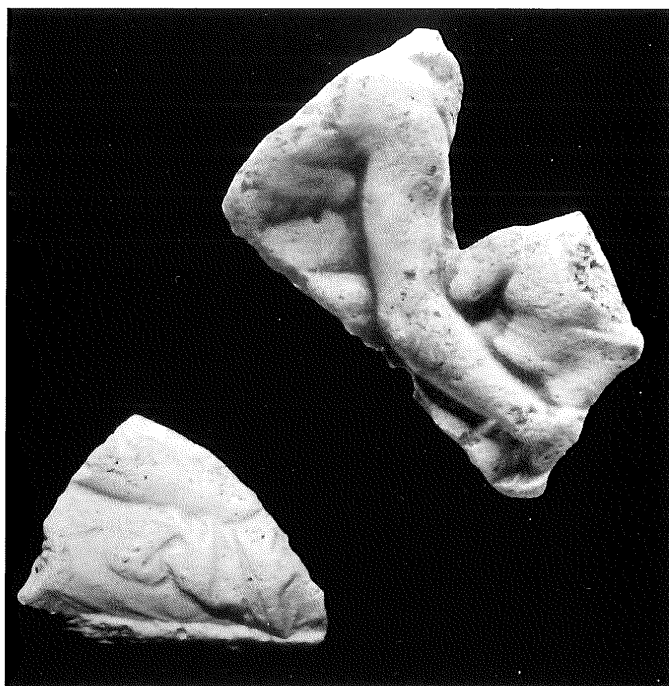
7. Reconstructive drawing of the plaster cast shown in FIG. 6. Diameter: 180mm (drawing M. Grawehr).

of a shallow bowl. The relief shows a couple on a couch. This specific iconographical scheme is also found on other vessels as Arretine sigillata or glass flasks (Lierke 1999: 76).

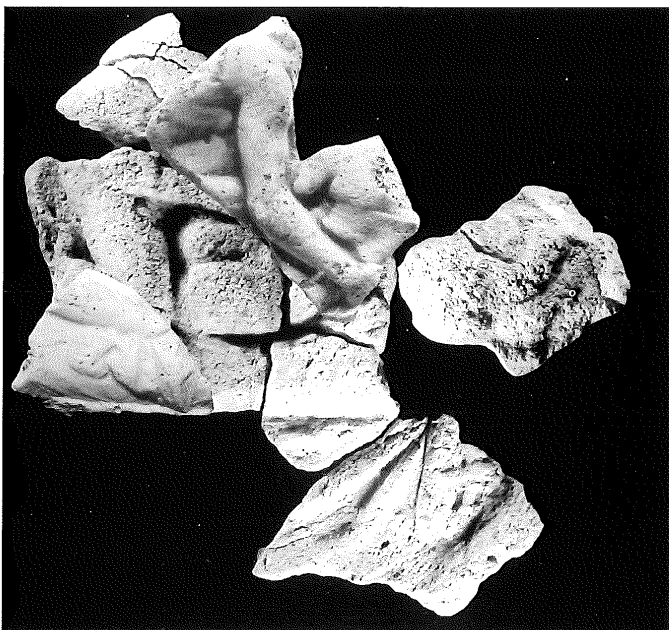
*The Egyptian Connection and Further Thoughts*

Plaster casts for the production of metalwork as they were found in the workshop at az-Zanṭūr are known through numerous other examples, but have rarely been found in their original context (cfr. Rubensohn 1911; Kurz 1954; Richter 1958; Reinsberg 1980; Burkhalter 1983/84; Vnukov *et al.* 1990). The largest known set of casts was dug up in the ruins of Memphis in Egypt over several decades at the beginning of the 20th century and found its way through the Cairo art market into various Egyptian and European museums. Two fragments (FIG. 8) of one of these casts from Memphis are today, together with many others, in the Roemer- and Pelizaeus-Museum at Hildesheim/Germany (Reinsberg 1980: 337f. no. 90, Fig. 105). They show exactly the same scene as the one from Petra described above.

Furthermore not only is the motif exactly the same but it is also identical in size. FIG. 9 shows the two Hildesheim fragments in a photomontage together with the cast from az-Zanṭūr. There is nothing to say that both casts could not originate



8. Fragments of a plaster cast in the Roemer- und Pelizaeus-Museum at Hildesheim Inv.-nos. 2958 and 2968 (photo M. Grawehr).



9. Photomontage of the casts in FIGS. 6 and 8 (M. Grawehr).

from the same mould or that they were at least taken from the same object.

As an explanation, it may be suggested that the bronze worker from az-Zanṭūr bought casts from Egypt in order to enlarge his repertoire or that he emigrated from Egypt and brought some of his casts with him. The latter hypothesis is especially tempting because it offers a variety of further possibilities. Was the bronze worker driven out of Egypt

by the economical crisis that the country suffered in the mid-first century (Bell 1938; Braunert 1964: 153-164; but see Link 1993) or was he attracted only by an especially promising economical situation at Petra? Did he relocate himself solely on his own initiative or due to a favourable offer by Nabataean officials, who wanted to establish a new economic basis for the kingdom after a reduction in commercial benefits from the caravan trade (cf. Hackl *et al.* 2003: 74f.)? Is this effort of the Nabataean state also reflected in the coordinated building activities on the terraces of az-Zantūr that were described above and of which the construction of the workshop was only a small part?

Unfortunately the discussion above remains, to a large extent, speculative but in some respects more substantiated remarks can be made. First of all, at least towards the end of the first century AD, bronze production was established in Nabataea. This production is likely to have started only after the time of Strabo's writing, or after the time of his informants respectively. Secondly, because the objects made in the workshop at az-Zantūr were formed after Egyptian models, the output of bronze working from Petra does not necessarily display any local Nabataean style or iconography. Through stylistic analysis alone the bronze works made at az-Zantūr could not be distinguished from those of Egypt. On the other hand it is not likely that the reproduced motifs were meaningless to the Nabataeans. I think the foreign motifs were carefully chosen to meet the local taste, although we are rarely able to tell what their local interpretation was.

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