

Economy and Status of the Metallurgist According to Babylonian Texts of the 1st millennium BC

Francis JOANNÈS

Abstract: In Mesopotamia during the 6th century BC, the social status of metalworkers (ironsmiths, bronzesmiths and goldsmiths) varied considerably. Often, they were part of the permanent temple staff and were paid in the form of maintenance rations or, less commonly, silver. The technologies used were not particularly sophisticated, and skills were passed on within the family. However, we must take into account the fact that almost all of our sources come from temples.

Keywords: Neo-Babylonian, metallurgy, blacksmith, bronze smith, goldsmith, temples, craftsmanship.

Résumé : En Mésopotamie, au VI^e siècle avant J.-C., le statut social des métallurgistes (forgerons, bronziers et orfèvres) est loin d'être uniforme. Ils font souvent partie du personnel permanent des temples et sont rémunérés sous forme de rations d'entretien ou, plus rarement, d'argent. Les technologies utilisées ne sont pas particulièrement sophistiquées et c'est au sein de la famille que se transmettent les compétences. Cependant, il faut tenir compte du fait que presque toutes nos sources proviennent des temples.

Mots clés : néo-babylonien, métallurgie, forgeron, bronzier, orfèvre, temples, artisanat.

This presentation of the activities and status of metalworking craftsmen in Babylonia during the 1st millennium BC is the result of a collaborative research. It was carried out within the framework of a Franco-Austrian research project on the material culture (*Material Culture of Babylonia in the 1st millennium BCE*), which ran from 2018 to 2022, and for which I was assisted, as far as metal is concerned, by M. Djabellaoui and B. Gombert, doctoral students at Paris 1 – Panthéon-Sorbonne University. In particular, B. Gombert (2018) provided a substantial amount of data, collected as part of his doctoral thesis on the army and military structure in Babylonia during the Neo-Babylonian (626–539 BC) and Achaemenid (539–330 BC) periods.

The aim of this paper, therefore, is to draw on the wealth of data provided by Babylonian cuneiform tablets on metalworking, especially during the so-called long 6th century BC, in order to present some information on the activities and status of metalworkers in this period. Several studies⁽¹⁾ have already been carried out

on this corpus, but they are not very well known, either because they have been published within the rather narrow field of Assyriological literature, or because a part of them have remained unpublished. On the neo-babylonian metallurgy in general, see especially: Zawadzki 1985; Joannès, 1993; Jursa, 2010; Kleber, 2016; on the metallurgy in Sippar: Zawadzki, 1991; Joannès, 1992; Bongenaar, 1997; Jursa and Zawadzki, 2001; on the metallurgy in Uruk: Beaulieu, 2003; Payne, 2007; on the metallurgy of weapons: Gombert, 2018.

The two main sources for our subject are the cuneiform archives of the temple of the Babylonian Sun god, Šamaš, in the city of Sippar, known by the Sumerian name of Ebabbar 'the Shining House', and the cuneiform archives of the temple of the famous goddess Ištar, in the city of Uruk, called Eanna 'the House of Heaven'. The study of these archives, which consist mainly of administrative and accounting documents, has made it possible to reconstruct the prosopography of metalworkers between 650 and 500 BC (Zawadzki, 1985; 1991; Bongenaar, 1997; Payne, 2007) or to evaluate the use of certain metals (Joannès, 1992; 1993; Beaulieu, 2003; Kleber 2016; Gomb-

1. The bibliographical abbreviations used here are those of the *Chicago Assyrian Dictionary* (CAD), volume 20 (U and W), p. VII–XXIX (= Roth, 2010).

ert, 2018). Many comments on the socio-professional environment of metalworkers can also be found in the large synthesis edited by M. Jursa and published in 2010.

In Babylonia, craftsmen working with metal can be divided into three distinct categories, corresponding to three different designations expressed in Akkadian by the terms *nappāḥ parzilli* ('iron smith'), *nappāḥ siparri* ('bronze smith'), and *kutimmu* ('goldsmith', which replaced an earlier designation *nappāḥ ḥurāši* 'smith for gold'). For convenience, I will use the terms 'iron-smith', 'bronzesmith' and 'goldsmith' to refer to these craftsmen, although I am aware that these global equivalents are not exact translations. The Akkadian word *nappāḥu* 'the smith' is related to both the homonymous object *nappaḥu*, denoting the leather bellows used by the smith in the furnace, and the verb *napāḥu*, meaning 'to blow, to light (the fire)'; this akkadian name of profession is also often written, according to the rule of cuneiform writing, by an ideogram (i.e. a sign with the value of a whole word), which is of Sumerian origin and is read SIMUG to designate the smith. But this same ideogram can also have the value DE₂ which means 'to melt'. The sumerian smith is therefore the person who melts metal while using the heat of fire.

During the first millennium BC, and more specifically in the 6th century BC, the craftsman who worked with gold was no longer a smith for gold (*nappāḥ ḥurāši*) but a goldsmith (KU₃-DIM₂: The person who works (DIM₂) the precious metal (KU₃), which in Akkadian became *kutimmu*), and the *nappāḥu* themselves were thus divided into only two categories: bronze smiths and ironsmiths. Each category was usually impermeable to the other. Prosopography confirms that, with very few exceptions, a bronze smith never worked with iron, and vice versa.

However, some boundaries are not entirely clear and a certain degree of overlap remains, not between bronze and iron, but between bronze and precious metals: some bronze smiths are recorded as working silver or refining precious metals. However, this is never the case for ironsmiths. So there exist differences not only in vocabulary (ironsmith, bronze smith, goldsmith), but also in practice: those who worked bronze could also work silver, but not iron.

Finally, there were also social distinctions that cut across all three categories: some craftsmen were independent or even members of what might be called the Babylonian urban elite. This membership of the social elite is reflected in their civil status by the mention of an ancestor's name used as a family name, after the father's name: 'PN₁, son of PN₂, descendant of PN₃'. In contrast, other craftsmen were members of the temple's dependent-class: they were legally free (not slaves), but the temple administration exercised a kind of legal authority over them. They are called *širku*, 'those who are vowed (to the divinity)', which is generally translated as 'oblates'. While, as might be expected, the number of rich peoples among the independent craftsmen was higher among goldsmiths

than among ironsmiths, there were goldsmith oblates among the temple staff, which is more unexpected.

As was said earlier, the textual corpus documenting the activities of smiths during the 6th century BC comes overwhelmingly from the archives of two great temples of Babylonia. It is therefore in institutional archives, rather than private ones, that we will find most of the information concerning the metallurgical activities.

It is true that in the non-institutional field we find an ancestor's name linked to metalworking (*nappāḥu*), which is borne by at least one Babylonian family during the 6th century BC: its members are known as the 'descendants of the Smith' in Babylon, but a study of their archives (Baker, 2004) has shown that metallurgy was completely outside the professional field of these people. The people documented by this group of texts should therefore be considered equivalent to the Smith, Fabre, Lefebvre, Schmied and Schmitt of our contemporary European societies.

To return to the temples, they were not only places of worship, but also important economic entities, providing for their own needs, whether for worship or for the management of their agricultural estates or flocks. They therefore needed a specialised workforce capable of making and repairing the jewellery that adorned the statues of the gods, the worship equipment used to prepare and present offerings, as well as tools of all kinds and sometimes even weapons.

According to A. Bongenaar (1997, p. 355–356), although the metalworkers were organised in small groups, probably corresponding to individual workshops, the temple of the god Šamaš in the city of Sippar seems to have established an administrative structure in which a *nappāḥu* called Bēl-uballiṭ acted as a link between the temple administration and the individual metalworkers. This Bēl-uballiṭ was therefore the person to whom the temple entrusted the responsibility of transferring the raw material to the craftsmen: generally gold, and at least once iron, but not bronze: the bronze smiths had their own allocation structure.

All in all, the system seems to have been poorly structured and very much based on individual relationships between the temple and the craftsmen. Only in the case of the goldsmiths was there any sort of regulation, and even then only because the goldsmiths worked on objects that came into contact with the divine statues and therefore had to enter inside the holy area of the temple.

One last point should be emphasized: despite its wealth (several hundred texts documenting metallurgical activities), temple documentation reveals only a part of the chain of operations. In other words, the extraction and processing of raw ore took place outside Babylonia. The Babylonian temples mention only metal in the form of ingots to be worked, or scrap metal. Similarly, very little is said about the technology used to work the metal, so this must be often deduced. However, there is enough data to allow us to attempt an overview based on three types of metallurgy: 1) iron, 2) bronze, 3) precious metals.

THE IRON SMITHS (*NAPPĀḤ PARZILLI*)

Social and professional status

The records of the temples at Sippar and Uruk tell us that the ironsmiths working for the temple were initially, at the beginning of the period covered by the temple archives, at the end of the 7th century, few in number, usually a group of two or three in each of these temples. From the middle of the 6th century their number increased to six or seven ironsmiths. The social status of these ironsmiths was not very high: most of the *nappāḥ parzilli* in the temple of Uruk were oblates. They also owed certain obligations to the temple, such as taking part in the major digging or construction work. They were remunerated by food rations in kind, except in the case of one file from Uruk dating from 591 to 587 (years 15-18 of Nebukadnezzar's reign), where the temple used outside ironsmiths against payment of a salary in money.⁽²⁾ This file is linked to the obligation of the temple of Ištar to provide labour for major royal works (digging canals or building large edifices) and it also shows that, in addition to the temple staff, there were 'freelance' metalworkers, i.e. private craftsmen who worked on their own account, in the city or countryside, with whom the temple occasionally concluded work contracts under certain circumstances. The same system can be found in Sippar, where, according to S. Zawadzki, the temple of the god Šamaš sometimes employed ironsmiths on a casual basis, as and when required.⁽³⁾

Place of work

Ironsmiths' workshops are never mentioned in temple archives. However, we do know that these craftsmen used charcoal for their furnaces and that they were able to produce it themselves (see below BM 75517). Their mastery of the charcoal-making technique meant that they may also have been responsible for supplying the temple with charcoal for another purpose like the sacred offerings.

BM 75517 (Bongenaar 1997, p. 360–361, pl. 6.)

Adarru, the smith (and) oblate of Šamaš, spoke to Bēl-uballiṭ, the Temple Administrator of Sippar, as follows: "I will give 6 ½ *mašīḫu* (= about 234 litres) of charcoal (*bulū*) monthly to Ebabbar as (my) work assignment". Bēl-uballiṭ, the temple administrator of Sippar, heard him and decided: "6 ½ *mašīḫu* will be delivered to the storehouse (of Ebabbar) as the obliga-

tion of Adarru". Adarru said the following: "There will be no other obligation upon me".

(Written) in the presence of Bēl-uballiṭ, the temple administrator of Sippar. (3 witnesses and the scribe).

Sippar, 26-xi of year 1 of Cambyses, king of Babylon, king of the Lands (02/26/528 BC)

From the first day of the month Addaru, (this allocation of charcoal) will be his duty.

Adarru is known as an ironsmith. This ironsmith undertook to supply the temple with charcoal every month, in addition to the charcoal needed for his own metalwork. As noted by A. Bongenaar, the product to be delivered according to the contract, *bulū*,⁽⁴⁾ is quite often attested in combination with the smiths. In CT 55, 202, silver is given to Bunene-ibni, the ironsmith, for "two *kor* (= 360 l.) of *bulū*-charcoal", and in CT 55, 250, Arad-Gula, the ironsmith, also received silver for (the production of) *bulū*-charcoal.

Activities

According to E. Payne (2007, p. 287), 75% of the Uruk texts mentioning the *nappāḥ parzilli* record the delivery of raw or worked raw material to a ironsmith or the delivery of iron tools to the temple by the ironsmith. The iron 'raw material' was supplied in the form of ingots (*kušru*) or plates known as 'turtles' (*šeleppūtu*):

CT 55 222

5 iron bars, 1 iron ingot (*šeleppūtu*); total: 57 ½ minas of iron (28.75 kg) were taken from the *bīt miḫši*-workshop to the storehouse

14-xii of year 20 of Kandalānu (month 03 or 04/628 BC)

P. R. S. Moorey (1994, p. 291) mentions also fish-shaped plates at Khorsabad in Assyria (8th Century BC). Broken pieces of iron tools and iron scraps (*hušē*) are also sometimes found.

The objects produced by the ironsmiths fall into four main categories:

- blades (knives) and cutting tools (axes);
- iron rings (for prisoners) and metal parts for closing doors (bars, rings);
- tools for livestock farming (shearing scissors, branding irons);
- agricultural tools such as hoes, spades and pickaxes. Ploughshares were also made of iron. We can also find fasteners (nails, pegs) and sickles, which were generally very light in weight.

Examples of ironsmith's work: the *marru* spades:

4. Bongenaar 1997, p. 361: "G. van Driel suggested the translation 'charcoal' for *bulū*, which may have been measured in *kors*, but more importantly, charcoal is an absolute necessity for melting scrap metal (Joannès, 1993, p. 102). Burning wood does not produce enough heat."

2. Cf. the study by E. Payne, in Jursa, 2010, p. 688–694.

3. Zawadzki, 1991, p. 37: "Silver is mentioned as payment for finished objects only in a few texts. In these texts the term *idū* is used, which denotes payment to hired men. (...) On the ground of documents available so far, we can conclude that the Ebabbar temple in Sippar employed smiths only occasionally."

Oberhuber Florenz 1960 no. 1

13 minas 10 shekels [= 6.5 kg] of iron, work completed, the weight of 9 iron *marru* spades:⁵ that is what Nabû-lē'i delivered to the warehouse

15-iv of year 8 of Nabonidus, king of Babylon (07/24/548 BC)

YOS 6 81

[x] iron spades brought by [.....]a, Ištar-šum-ēreš and Šamaš-zēr-ibni are in the hands of Nanaia-karābi, son of Ina-šilli-Nanaia. 2 broken iron *marru* spades to be reattached (the blade to the handle): the iron *marru* spades were given to the ironsmith, and (another) iron *marru* spade was given to the Treasury.

Received (from) Ištar-zēr-ibni, son of Šamaš-zēr-ibni.

15-vii of year [o] of Nabonidus, king of Babylon (september or october, between 556 and 539 BC)

The main task of the ironsmiths was therefore the production of agricultural tools and their repair. This means that the pattern of use of metal agricultural implements was the same for iron in the first millennium as it was for bronze in the early second millennium BC: agricultural implements were the property of the temple. The temple distributed them to the workers according to the work they had to do, then took them back and had them repaired if necessary. We can assume that the smiths had real practical know-how, but this was limited to hammering and shaping iron, which did not make them high-level craftsmen. This fact has already been noted by Moorey (1994, p. 281, quoting Curtis, 1979, p. 381) for the Neo-Assyrian period: "Neo-Assyrian smiths did not know how to manipulate in the most effective ways the operations in which iron attains the greatest strength".⁶

Moreover, the *nappāḥ parzilli* usually worked on non-cultic objects, which unmistakably belonged to the profane sphere of the temple. It is evident that in Mesopotamia, the fabrication of cultic objects from iron was virtually non-existent, with the exception of certain ceremonial weapons that were part of the equipment of divine statues; in CT 55 235, they are said to be made of iron. But they may contain also elements of gold and silver as in YOS 24 51:

CT 55 235: (payment in silver for work completed by the *nappāḥ parzilli* Arad-Gula on the weapons of the goddess Annunītu in Sippar)

3 shekels of silver for the iron dagger of the Annunītu's quiver (and) 2 shekels of silver for 60 arrowheads. In all, 5 shekels of silver were paid into the hands of Arad-Gula the ironsmith. 22-x-of year 11 of Nabonid, king of Babylon (01/21/544 BC)

YOS 24, 51 ll. 12-16 (Inventory of cult objects from the Temple of Ištar in Uruk, no date)

(...) two iron daggers with silver and gold (ornaments), one iron throwing-stick with silver and gold (ornaments), four *mēṭu*-maces of iron and gold, two silver *tuḥullu*?, one iron sickle (...)

Among the objects made by ironsmiths, we find finally weights for weighing, which can be considered an elaborate handicraft. However, the form of these iron weights, which weighed 1 mina (= 500 g.) and its subdivisions into shekels, is not known, unlike the bronze weights, and they may have been produced in specialised workshops outside the Temple.

In conclusion, the temples employed ironsmiths, who were primarily drawn from their permanent dependent labour force, the oblates. When necessary, the services of independent ironsmiths were used, a sign that this craft was also present in the rest of society.

Oblate ironsmiths are not part of the temple's 'high-tech workforce'. They have a certain amount of know-how, which can be defined as the mastery of the furnace and its supplies, as well as simple technical skills such as hammering and shaping certain tools. However, it should be noted that they are neither steelworkers nor manufacturers of high-performance weapons. The primary function of these individuals is the maintenance and restoration of the fundamental tools required by the temple for its agricultural operations.

THE BRONZESMITHS (*NAPPĀḤ SIPPARI*)

Social and occupational status

In 6th-century Babylonia, bronze metallurgy is a much more experienced craft than iron metallurgy, with some 18 centuries of tradition, three times longer than that for iron. The bronzesmiths were also more closely involved in the cultic life of the temple and were more skilled in a wider range of techniques than the ironsmiths: in particular, they practised copper-tin alloying, metal casting, object shaping and probably damascening.

While the *nappāḥ parzilli* worked on agricultural tools, the *nappāḥ sipparri* worked on cult objects. They could work with raw metal: bronze, silver, tin, or make repairs to extant bronze objects. They mainly made pots and vessels of various shapes and sizes, but were also involved in casting and testing. A *nappāḥ sipparri* could therefore be called upon to make silver bowls, implying that it was technical skill rather than the type of metal that counted. Some evidence suggests that the *nappāḥ sipparri* knew how to mould objects with the lost-wax casting technic. Finally, some *nappāḥ sipparri* also knew how to assay silver and gold (by melting and removing impurities). The boundary between the *nappāḥ sipparri* and the goldsmiths was therefore permeable, especially as the lat-

5. 1 *marru*-spade = 730 g. on average

6. Moorey, 1994. The same author points out that there are no studies of Neo-Babylonian data.

ter tended to specialise in working with gold, often leaving silver to their colleagues in bronze.

Activities: objects produced

The bronzesmiths produced and repaired bronze and silver objects⁽⁷⁾ mainly for cultic purposes. Among the objects supplied by the bronzesmiths we find:

- cultic vessels for preparing and serving food offerings: incense burners (*nignakku*), bowls and vessels (*makkasu*, *sūtu* and *kirru*), basins for ablutions (*ša mē qātē*), cooking pots (*mušahhīnu*);

- musical instruments, like kettledrums and part of a harps (*balaggu*);

- weapons: spears (*azmarū*), arrowheads;
- parts of doors and parts of carts (mainly the wheels), such as a cart for the ‘house of the brewers’ (*attaru ša bīt sirāšē*). Bronze plates or strips, decorated or not, could be applied to wooden supports: this was the case for monumental doors and ceremonial chariots.

- measuring vessels like a bronze *sūtu* capacity-measure⁽⁸⁾ or bronze lion weights.⁽⁹⁾

Technical aspects

Among the objects cited, we can distinguish between bronze objects made in moulds (spearheads, arrowheads, grids), sheets or plates modelled upon a shape, then riveted or brazed to form vessels (bowls, pots, cauldron-*mušahhīnu*), and more elaborate objects, probably made by lost-wax casting, such as bronze weights in the shape of a lion, examples of which have been found in Assyria.

To produce the objects ordered, the *nappāh siparri* had at his disposal either ready-made bronze in the form of *kušru*-ingots,⁽¹⁰⁾ or copper and tin, or even bronze and tin which he mixed himself, according to a standard ratio which had been known for several centuries: in the 2nd millennium BC the ratio between tin and copper was 1 to 6 (Joannès, 1993, p. 104, §9). In the Neo-babylonian documentation (6th century BC), however, it seems that tin was not only used to make an alloy, but also sometimes to strengthen an existing bronze, or to make a solder between bronze elements.

Bronze and tin at Sippar during the reign of Nabonidus (556-539 BC):

Nbn 471 (tin/bronze ratio: 1 to 8 $\frac{2}{3}$)

$\frac{1}{2}$ talent 5 minas 20 shekels of bronze (= 17.6 kg); 4 minas and 5 shekels of tin (2.04 kg) from the (temple)store, on the occasion of the entry of the sheep (?) to the Bunene temple were given to Libluṭ and to Iqūpu, the bronze workers.

6-xi-of year 10 of Nabonidus, King of Babylon (02/15/545 BC)

Nbn 924 (tin/bronze ratio: : 1 to 5)

10 minas of bronze (= 5 kg) and 2 minas of tin (= 1 kg), the first part of $\frac{1}{2}$ talent and 5 minas of bronze (= 17.5 kg) for the plates(?) of the bronze cauldron (used to prepare the *tabnitu*-offerings), were given to Libluṭ, the bronzemaker, 23-x of year 15 of Nabonidus, king of Babylon (01/08/540 BC).

The problem is that we have no evidence of any technical handbook in cuneiform describing the art of bronze metallurgy during this period. The approach favoured by the temple administration in its written archives was a purely arithmetical one, taking into account the numerical standards for the production of an alloy or the loss that occurred in the refining and alloying process and was considered acceptable, and then comparing the weight of the raw metal supplied with the weight of the object produced. It is therefore by reference to the type of object produced that we can suggest the use of a particular technique, with a degree of uncertainty of course. However, if we compare the type of work carried out by the ironsmiths with that of the bronzers, it seems clear that the latter's technical baggage was superior and that the range of their creations was wider.

THE GOLDSMITHS (*KUTIMMU*)

As E. Payne writes (2007, p. 203): “The goldsmiths were responsible, first, for fashioning and maintaining the jewelry and other gold objects that ornamented the cultic statuary of the temple. They were also responsible for cleaning jewelry. Second, the goldsmith, together with the bronze smiths were responsible for smelting gold and silver and assaying gold.”

Social status

Goldsmiths had a special status among the staff of temple craftsmen: some of them were part of the staff authorised to enter the sacred space of the temple where the statues of the deities resided, the so-called ‘entrants’ (*ērib bīti*). In this capacity, goldsmiths had a specialised function in texts from the 3rd and 2nd centuries BC, which was called “the prebend of goldsmith and entrant into the room of secrecy”: *isiq kutimmūtu u ērib bīt pirištūtu* (Doty, 1977, p. 126).

But this function did not exist before the Hellenistic period. Prior to that time, goldsmiths were scattered

7. Nbn 159 (making of *makkasu*-bowl of the temple of the Lady of Sippar); CT 55 284 (making a plate for the *šālām bīti* ritual)

8. YOS 24 66.

9. Weighing 10 minas (5 kg), 5 minas (2.5 kg), 3 minas (1.5 kg), 2 minas (1 kg); 1 mina (0.5 kg), etc.

10. Cf. TCL 12 112: “2 talents 14 minas of bronze (= 67 kg) in 10 ingots-*kušru*, to work, were given to Bazuzu the bronze smith (...) 21-x of year 15 of Nabonidus, king of Babylon” (01/06/540 BC).

throughout the strata of the babylonian society, some were prominent, others were simple oblates, i.e. they were dependent of the temple and belonged to what could be called the group of its specialised workers.

Independent goldsmiths, i.e. those who were not oblates, generally worked in workshops of one or two people, but were much more subject to the control and supervision of the temple administration than were the bronzesmiths or the ironsmiths. They have rights, such as a form of exclusivity in the service of the temple (i.e. the temple gives them priority), but they have also duties: the raw materials supplied to them by the temple may only be used for orders from the sanctuary, and these always take priority.

E. Payne has observed a change in the relationship between the temple of the goddess Ištar at Uruk and its goldsmiths: until about 600 BC, the responsibility for working the gold was more or less evenly distributed among all known goldsmiths. Then this responsibility was reduced to two individuals, working as a team, who were responsible for almost all the gold worked.⁽¹¹⁾

Goldsmiths' activities.

Kutimmu worked mainly with gold and silver, but could also combine them with precious or semi-precious stones. As we have seen, some precious metal forms can be worked by *nappāḥ siparri*. So what was the specific contribution of the goldsmith *kutimmu*? According to S. Zawadzki (1991, p. 45), in Sippar they worked only with gold, while silver remained in the hands of bronzesmiths.

The *kutimmu* were first and foremost experts in judging the purity of metal: they knew how to carry out a precision weighing operation and how to purify gold and silver by removing impurities. They were sent by the temple outside to buy gold, and they knew how to assess its quality and set its price.

In the protocol for judging the purity of gold, the precious metal is first refined by passing it through a furnace, which removes most of the impurities. This is followed by an operation known as *pīdānu* (var. *pādunu*), which is currently recorded from twelve references.⁽¹²⁾ This word has been interpreted as meaning 'to test' and would therefore imply the use of a touchstone.

Refining gold by firing and *pīdānu* assay:

Nbn 489

(Regarding) 2 minas 2 shekels (= 1,016.26 g) of gold, which were put into the furnace: on this 10 ½ shekels (= 87.46 g)

of gold disappeared during the firing, and 1 mina and 51 ½ shekels of red gold (= 928.8 g) came out of the furnace. And 1 mina and 8 ½ shekels (= 570.6 g) of red gold, on the gold that was bought for silver, (given) from the workshop.

In all, 3 minas of red gold (= 1,500 g), which were sent to Babylon by Marduk-šum-ušur, son of Bēlšunu, Šamaš-erība, son of Balīḫu, and Bēl-uballit, the metallurgist, for the sceptre of Anunnītu.

In the presence of Bēl-ahhe-eriba, *qipu* of the Ebabbar (and) Mušēzib-Marduk, priest of Sippar
2-i of year 11 of Nabonidus, king of Babylon (04/10/545 BC)

To obtain 180 shekels of 'red' gold, 68 ½ shekels of red gold already available in the goldsmith's workshop were added to the 111 ½ shekels of gold resulting from the refining of 122 shekels that had been put into the furnace. The refining loss was 10 ½ shekels, or 8.6%.

YOS 6, 121⁽¹³⁾

5 minas of gold, (weight) of 5 plates, a royal donation, which were placed in the furnace: in the first firing, 45 shekels of gold disappeared; the gold was reduced to 4 minas 15 shekels; at the second time through the furnace, 32 shekels of gold disappeared during the firing; the gold was reduced to 3 minas 43 shekels;

To be checked (*ana pīdāni*) by the silversmiths Bēl-ibni and Širiktū.

(Weighed) with weights of 2 minas and 1 mina, in bronze, ½ mina, 10 shekels, (and) a unit of 5 shekels in iron,
15-ii of year 8 of Nabonidus, king of Babylon (05/26/548 BC)

The first loss is 15 %, the second 12.5 %. The total loss is 25 % of the initial weight: the gold has lost about ¼ of its initial weight.

EPHE No. 609 (Kandalanu's reign 648-626 BC)

1 mina and 56 shekels of gold (= 966.5 g) to be verified (*ana pīdāni*) are at the disposal of [PN].

20 minas and 10 shekels of silver (= 10.083 kg) for [(.....)] the silver fermenting vat (placed before) the god [DN] were put at the disposal of Nabû-zêr-ibni, the *nappāḥ siparri*; (the vat) was placed in the bronze balance, and it was weighed (with a weight of) 10 minas of bronze (and a weight of) 10 minas of polished stone (*galala*).

If we follow K. Kleber (Kleber, 2016, p. 131–132), this term, used in Akkadian from the 6th century onwards, can be related to the Arabic root *ḥfn* meaning 'to test, probe, try, examine', from which the Arabic term for touchstone (*fatīn*), is derived.

11. Payne, 2007, p. 228: "This shared responsibility added a layer of accountability and protected both the craftsmen and the temple from theft or the accusation of theft. For the next fifty years, two pairs of individuals—a pair of fathers and a pair of sons from each family—are responsible for nearly three-quarters of the total gold worked during this period."

12. BM 63883 (= Bertin, 1883, no. 1431); EPHE 609 (= Durand, 1982, p. 34 and pl. 115); CT 55 294; GC 2 39, 277, 372; Nbn 394, 431; UCP 9 43; YOS 6 54, 112, 121.

13. See the study of this text in Joannes, 1987.

Goldsmith activities: production

The *kutimmu* mastered the techniques of sophisticated goldsmithing in order to produce the jewellery (*šukuttu*) that adorned the statues of the gods and was beyond the reach of the *nappāḥ siparri*. Again, however, there is no textual information about the way they practised goldsmithing, the tools they used or the equipment they had in their workshops. The texts tell us what they make, not how they make it. We need to be able to compare the names of jewels and parts of jewels given in the texts with what has been found in archaeological finds from this period in Mesopotamia, and to draw up an exhaustive list of the types of objects made from precious metal in order to know what techniques were used.

The divine patronage

Finally, it is worth mentioning an interesting phenomenon: the activities of temple metalworkers were linked to the patronage of the Mesopotamian god of technology and knowledge, Ea. When it came to the making of divine statues and cult artefacts in general, Mesopotamian scholars likened human craftsmen to a series of gods who personified the art being created. For example, the well-known *Sun Tablet of Sippar* (Woods, 2004) recounts the making of the cult statue of the god Šamaš in Sippar:

“To the fashioning of that image his (= the priest Nabû-nadin-šumi) attention was directed and so, by the skill of Ea, by the craft of Ninildu, Kusibanda, Ninkurra (and) Ninzadim, with reddish gold (and) lustrous lapis-lazuli, he properly prepared the image of Šamaš, the great lord” (Woods, 2004, p. 85–86, col. iv ll. 12–21).

These are the patron gods of craftsmen: Kusibanda god of the goldwork, Ninildu, the god of carpentry, Ninkurra, a sculptor goddess, Ninzadim, a lapidary god, to whom we can add Ninagal, the divine smith, specialized in the work of copper, bronze and silverwork.

We find, then the god Kusibanda being the ‘holy protector’ of the goldsmiths as Ninagal is the one for the bronzers. But there seems to be no place for the ironsmiths, both because these equivalences were established

at an early date, i.e. before the widespread use of iron, and because in the 1st millennium iron was not one of the noble raw materials used in worship.

CONCLUSION

What can we conclude from this brief review of the status and activities of craftsmen in Mesopotamia during the Neo-Babylonian period, based on textual documentation and in the specific context of temple archives?

Firstly, all categories of metalworkers taken together were more diverse in status than might be expected. The majority of goldsmiths, for example, were undoubtedly members of the upper classes, but there were also oblates among them who were dependent of the temples.

Secondly, metalworkers were part of the permanent staff of the temples. Whether for religious or utilitarian purposes, the temples used these craftsmen and paid them either in maintenance rations or, more rarely, in wages. By specialising some of their oblates in these activities, the temples also ensured the stability of this workforce.

The technologies used were not necessarily very sophisticated: goldsmiths and bronzesmiths seem to have mastered a number of technical aspects of their craft, but this is probably not the case for ironsmiths, who made and repaired tools with relatively simple shapes. In all cases, skills were passed on within the family. The prosopography of the craftsmen of Sippar and Uruk reveals many cases of metalworkers passing the trade from father to son.

We must therefore take into account the nature of the sources, almost all of which come from the temples: the data produced at the same time by the royal palace should be studied to see whether, in the field of weapons in particular, the palace employed ironsmiths with more sophisticated techniques than their temple counterparts. Excavations at Khorsabad and Nineveh have yielded pieces of military equipment made of iron, testifying to its importance to the Neo-Assyrian kings, and the same was undoubtedly true of the Neo-Babylonian royal arsenals. Clearly, there are still many avenues to explore in this area.

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Francis JOANNÈS

Université Paris 1 – Panthéon-Sorbonne
UMR 7041 ArScAn - HASAE, Nanterre
francis.joannes@gmail.com