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"Re-Membering" Osiris: Late Period Casting Moulds and Osirian Ritual?*

GEORGES VERLY, JOHANNES AUENMÜLLER, LUC DELVAUX, FREDERIK W. RADEMAKERS**

ABSTRACT

In 1969, a unique set of Late Period bronze casting moulds was discovered at the Qubbet el-Hawa necropolis illustrating the *chaîne opératoire* of the lost-wax technique. Usually only mould fragments, if anything at all, remain in the archaeological record, but this assemblage presents complete examples representative of different phases of the production of solid-cast bronze artefacts. µCT scans of the moulds have revealed the existence of two entirely different technological approaches. The first is for the regular production of small amulets and statuettes of deities. The second is for attempts at "re-membering" Osiris figures. Previously cast and broken bronze feet are turned into the full form of an Osiris statuette by adding a body modeled in wax, and then placing the combination in a mould to cast a new image of the deity. Technologically, this particular method does not make sense, since a fusion of the newly cast body with the extant metal feet is impossible. This paper proposes a new hypothesis that seeks to explain this casting method in the context of a local ritual use.

Keywords: Late Period, Qubbet el-Hawa, casting moulds, lost-wax technique, Osirian ritual, "re-memberment", casting on, experimental archaeology, archeometallurgy.

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RÉSUMÉ

En 1969, un ensemble unique de moules de l'époque tardive a été découvert dans la nécropole de Qubbet el-Hawa, illustrant la chaîne opératoire de la technique de la cire perdue. Habituellement, il reste au mieux des fragments de moules comme seuls vestiges archéologiques, difficilement identifiables, or ce lot de moules présente des exemplaires complets représentatifs des différentes phases de la production d'artefacts en cire perdue. Les µCT-scans ont révélé l'existence de deux approches technologiques totalement différentes. La première vise à produire de petites amulettes et des statuettes de divinités. La seconde permettrait de tenter des « remembrements » de figures d'Osiris. En effet, des pieds en bronze – préalablement coulés puis cassés – ont été complétés en ajoutant et en y modelant un corps en cire pour donner une forme complète de statuette d'Osiris. Ensuite, cette figure mi-métal, mi-cire, est entourée d'un nouveau moule afin de créer un nouveau corps. D'un point de vue technique, une telle méthode constitue un non-sens, puisqu'une fusion entre le corps nouvellement coulé et les pieds en métal déjà existants n'est pas possible. Dans cet article, une nouvelle hypothèse est proposée, qui pourrait expliquer une telle technique de coulée propre à une utilisation rituelle locale.

Mots-clés : époque tardive, Qubbet el-Hawa, moules, technique de la cire perdue, rituel d'Osiris, « remembrement », méthode de sur-coulage, archéologie expérimentale, archéométallurgie.

1. THE LOST-WAX TECHNIQUE: A SHORT OVERVIEW

While the description of the lost-wax technique is simple, its application is complicated.[1] The first step is to produce a three-dimensional wax object including the gating, i.e. pouring system. The resulting assemblage is then enclosed in several layers of ceramic moulding material,[2] that each have their individual characteristics and teleology.[3] Afterwards, the resulting mould, the future receptacle for the molten metal, is dewaxed and fired in order to obtain a negative hollow inside of it in the shape of the desired artefact. After casting, the hot and liquid metal alloy solidifies during its cooling-down time. The metalworkers then break the mould and recover an almost finished artefact, which may also comprise of unwanted parts of the gating system including the main casting sprue which could be left in place to be used as a tenon for fitting the object to a base. At the end, the desired object needs to be finalised by cutting off unnecessary parts and by working and finishing its surface as required.

1 For this technique, see, e.g. Auenmüller, Verly, Rademakers 2019; Davey 2009; Fitzenreiter 2014a; Fitzenreiter 2014b; Rama 1995; Verly 2003.

2 Auenmüller, Verly, Rademakers 2019; Fitzenreiter, Willer, Auenmüller 2016b.

3 Verly, Longelin 2019, p. 25. "Teleology" can be understood as the functionalist purpose that governs each part of an artefact or the artefact itself. Thus, teleology is the technological goal that ascribes a function to each element or artefact. In order to guarantee it, the element or artefact is made in a specific way and has a particular typology.

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2. THE QUBBET EL-HAWA CASTING MOULDS

In 1969, a unique collection of casting moulds and other artisanal artefacts was discovered by a team of Egyptologists from the University of Bonn (Germany) in rock-cut tomb QH 207 of the Qubbet el-Hawa necropolis, opposite of Aswan.[4] The object assemblage was associated with the latest burial of the Late Period occupation dating to around 570–480 BCE.[5] The objects seem to represent the materials of a workshop that once operated in the region and the main produce of which were solid-cast bronze[6] statuettes of Egyptian deities. The reason for the deposition of such technological objects in a funerary context is, however, still puzzling.[7] Soon after their initial documentation on site, they were transferred to Bonn, where they are now housed at the Egyptian Museum of Bonn University. Until 2014, scholars interested in metalwork and casting were by and large unaware of their existence. In that year, however, an interdisciplinary project funded by the Fritz Thyssen Foundation began to comprehensively investigate these objects in order to gain a fuller understanding of both their archaeological context and technology.[8]

3. THE LOST-WAX TECHNIQUE AND THE QUBBET EL-HAWA MOULDS

Needless to say, the already introduced lost-wax process and its general stages are also valid for the use and technology of the casting moulds discovered at the Qubbet el-Hawa. One particular challenge for the casters is the preparation of the individual fabrics for the different layers of the moulds.[9] Indeed, the moulds could be composed of up to five layers made of three customised ceramic fabrics of different recipes.[10] Each fabric and thus each single layer is based on its own teleology, ensuring the proper and goal-oriented functioning of both the materials and technology employed. Another challenge for the metallurgists is the successful execution of the dewaxing process. The wax has to fully evacuate the casting mould to leave a negative hollow inside, which is identical in form and volume to the original wax model.

However, some of the Qubbet el-Hawa moulds still show wax remains inside, the cause of which would be incomplete dewaxing. In fact, these moulds were never used for casting. If, indeed, any mould with traces of wax still remaining inside would be used for casting, an explosion of the mould with potential hazard for the caster could be expected. The typology and functioning of the ancient dewaxing installations are not known due to the lack of

4 For this find, its context and interpretation, see Auenmüller 2017; Auenmüller 2018; Fitzenreiter, Willer, Auenmüller 2016a.

5 For a discussion of the dating of the Late Period assemblage from QH 207, including a typological assessment of the associated funerary equipment (ceramics, canopic boxes, coffins, bead nets and mummy masks) as well as C14 dates from two wax and one wood sample, see Auenmüller 2016a, pp. 40–50.

6 The term 'bronze' is used throughout the paper as a general designation for the copper alloy the metal objects are made of, mindful of this term's inaccuracy to describe their precise alloy composition, for which see Fitzenreiter, Willer, Auenmüller 2016a, pp. 71–81.

7 See Fitzenreiter 2016, pp. 146–160 for various interpretive approaches.

8 The results are published in Fitzenreiter, Willer, Auenmüller 2016a.

9 Auenmüller, Verly, Rademakers 2019.

10 Meinel, Willer 2016; Schneider 2016; cf. also Martinón-Torres, Rehren 2014; Schneider, Zimmer 1986.

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archaeological evidence.[11] Certain Qubbet el-Hawa casting moulds that are only partially filled or show randomly distributed bronze remains were initially understood as pieces illuminating aspects of a failed dewaxing process.[12] Dewaxing is typically performed in larger sets for expenditure of time and fuel efficiency. Such collective dewaxing may consequently have led to a certain percentage of incompletely dewaxed moulds. Importantly, the incomplete dewaxing of a mould is not always visible to the metalworker from the exterior. During casting, metal is successively poured into the standing-by moulds, some of which could still contain wax residues. An experienced metalworker would immediately stop the casting of such a mould upon noticing its imminent explosive reaction and move to the next one.

Returning to the technological approach represented by the Qubbet el-Hawa casting moulds, the study of the objects reveals particular habits and customs of the metallurgists and allows for the description of significant variations within the usual *chaîne opératoire*. At least two production approaches coexisted: a standard "Production A" and special "Production B" (B1, B2 and B3), the latter aiming at mending and re-joining Osiris figures through several casting-on procedures. In the following description of these approaches, the relevant Qubbet el-Hawa moulds are referred to by using their excavation inventory number. Further details about each object can be found in the full publication of the assemblage under its respective number.[13]

3.1. Production A: The Standard Method

"Production A" enables the standard manufacture of the well-known solid-cast bronze figure assemblages connected to religious rituals and votive depositions: next to a large group of moulds for casting Osiris statuettes (QH 207/38, 207/41, 207/44, 207/45 [Fig. 1], 207/50 and 207/55), there are moulds intended for casting individual representations of deities such as Harpocrates (207/42), Anubis (207/46 [Fig. 2]) or Satet (207/48), more complex group figures such as Isis with Child (207/43) and small pieces such as a heart amulet (207/47 [Fig. 3]) and platelets (207/56). The Osiris figures were produced either individually or in sets of two, three, four and five in a single casting mould. In fact, the moulds containing multiple negatives were conceived as a collection of separate objects to be cast in one mould. Among the Qubbet el-Hawa casting moulds, object QH 207/132 is the example *par excellence* for the mass production of a single type, as it was meant for casting 34 thin Osiris figures of not more than 4.50 cm length each.

11 The so-called cross-furnace attested at Kerma (Bonnet 1986; Bonnet 2004: Middle Kerma period, ca. 19th c. BCE) was used for heating a large mould surface for bronze plate casting (Rademakers et al. 2019; Verly, Rademakers 2019; Verly et al. 2020; full results: Verly et al. in preparation). The cross-furnaces at Pi-Ramesse (Pusch 1990; Pusch 1994: 19th Dynasty, ca. 1296–1186 BCE) share many characteristics and likely represent an adapted version of this technology centuries later —most probably used for the heating of large moulds and, possibly, their de-waxing. Another similar furnace type may be attested at Kom Tuman, Memphis (Krol, Vinokurov 2006: 22nd Dynasty, ca. 764 BCE), but this structure is perhaps not related to metallurgical technology at all (Sergej Ivanov, pers. comm., 2017). We put forward the hypothesis that the idea for such cross-furnace structures may have been developed from earlier de-waxing furnace types in the Nile Valley, examples of which remain unknown for now. However, casting moulds such as those from the Qubbet el-Hawa equally may have been de-waxed and heated in ovens similar to those used for pottery, or simply open fires.

12 E.g. Auenmüller 2014; Auenmüller et al. 2014.

13 Auenmüller 2016b, pp. 170–208; Fitzenreiter, Willer, Auenmüller 2016a, *passim*.

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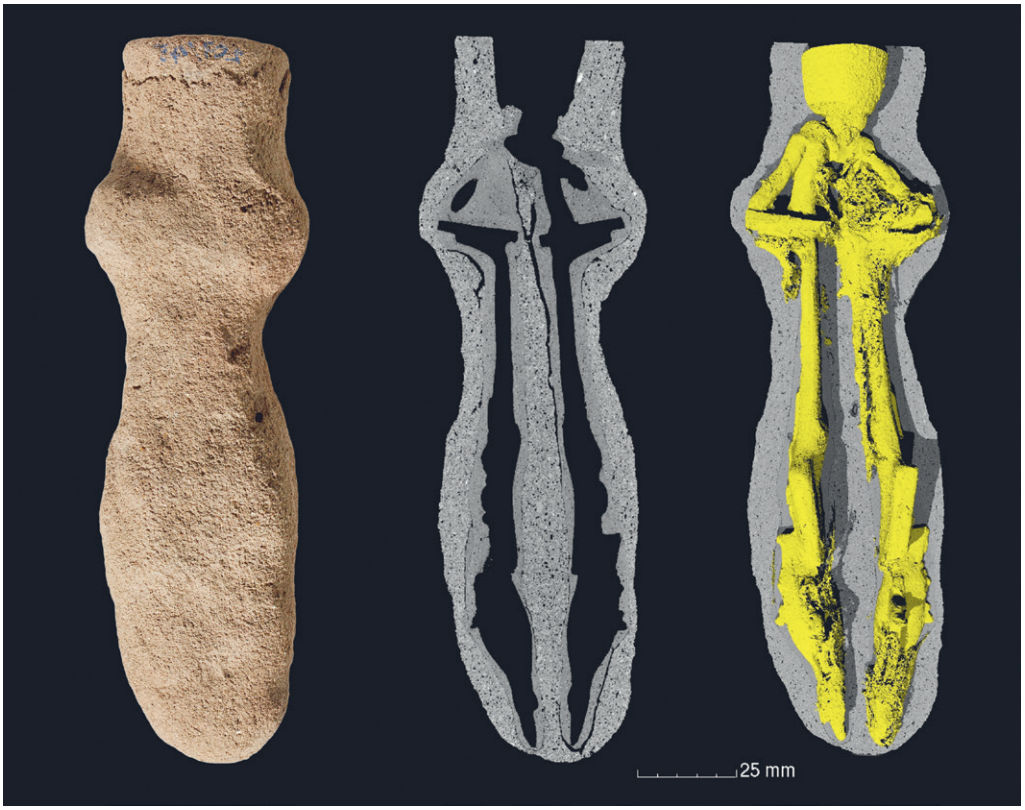

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Fig. 1. View, µCT-section and µCT 3D-reconstruction of casting mould BoS QH 207/45. The mould for casting two Osiris statuettes was never used. It is oriented in the pouring direction, the pouring cup with the gating system is above, the two Osiris figures are upside down. The inner cavity and adjoining cracks are digitally rendered with a coloured fill.

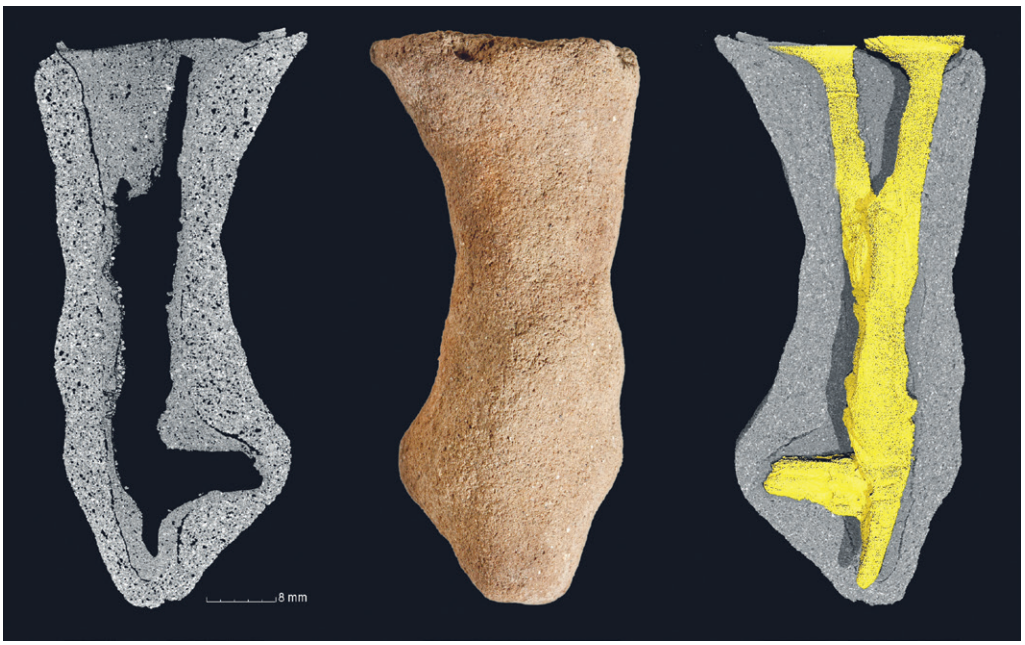

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Fig. 2. µCT-section, view and µCT 3D-reconstruction of casting mould BoS QH 207/46. The mould for casting a figure of Anubis was never used. It is oriented in the pouring direction, the pouring cup with the gating system is missing. The inner cavity is digitally rendered with a coloured fill.

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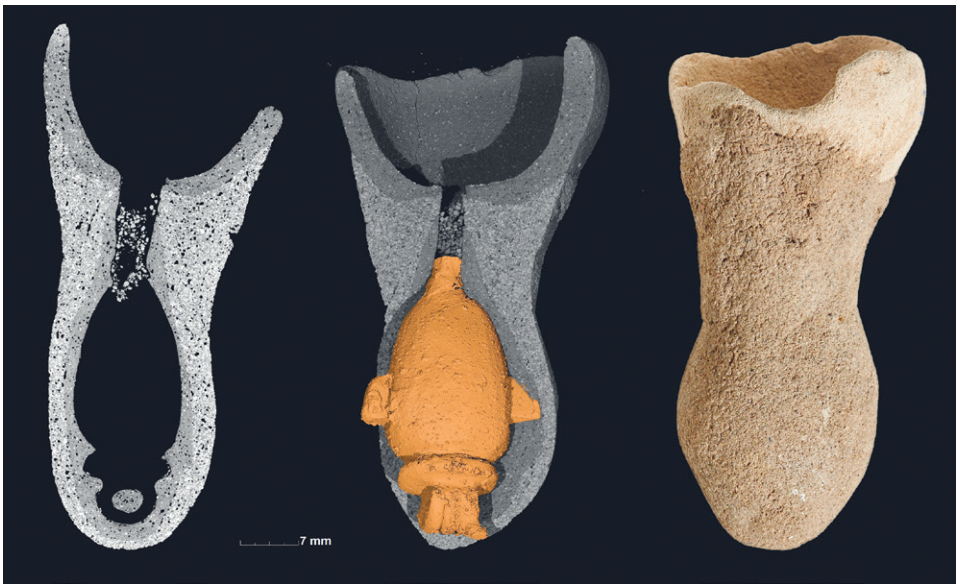

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Fig. 3. µCT-section, µCT 3D-reconstruction and view of casting mould BoS QH 207/47. The mould for casting a heart amulet was never used. It is oriented in the pouring direction. The inner cavity is digitally rendered with a coloured fill.

3.2. Production B1: The Intentional Break Method

"Production B1" is related to the creation of a particular type of "breakable" Osiris statuettes. The moulds QH 207/38, 207/39, 207/40 (Fig. 4) as well as the mould fragment 207/55 consistently contain already cast and broken bronze feet (including their tenons) that were topped with a new wax body, around which a new mould was created. In addition, there is object QH 207/32, a composite figure consisting of a bronze feet segment including its tenon topped by the body of Osiris made in wax. This piece can thus be understood as representing a preparatory step leading to the creation of the moulds that contain such composite Osiris figures. The subsequent casting had to be done not through the feet as usual, but via the top of Osiris' crown. It seems, however, that these special moulds were not yet fitted with any outer stabilizing mould layers that would have contained the necessary casting sprue and gating system. Thus, they illustrate an intermediate, unfinished stage in the creation of moulds. Nevertheless, the composite figure and these moulds reveal the idea of how bronze and wax elements were joined together in order to complete and reconstruct the Osiris figures.[14] When cast, however, —and this is an important point— no fusing between the two parts is possible. It is therefore inferred that the placing of a wax body on the upper break of the bronze feet allows to obtain two surfaces that match and fit perfectly. This seems to be one of the reasons why the metallurgists persisted in implementing this technical difficulty (see below).

Even though there are similarities between Osiris production A and B1, each one's teleology demanded a different technological approach. This functionalist perspective enables the study and interpretation of these two production technologies. The ancient metallurgists deliberately created and used two production modes for what at first sight might seem to be the same type of religious or votive artefacts.

To verify this suggested interpretation, evidence of actual mending or completion achievements have been researched. In fact, the Qubbet el-Hawa moulds do not represent a new or unique

14 Auenmüller, Verly, Rademakers 2019; Fitzenreiter, Willer, Auenmüller 2016b, pp. 136–138.

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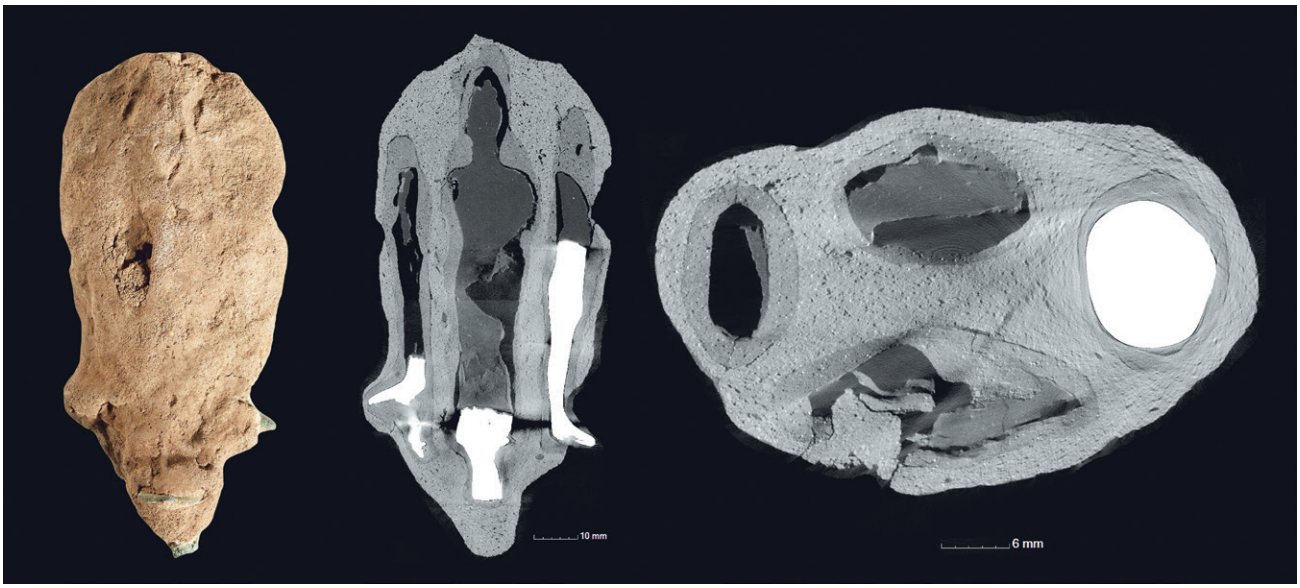

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Fig. 4. View, vertical and horizontal µCT-sections of QH 207/40. The mould was meant to reunite four bronze feet fragments of Osiris figures with new wax bodies. The bronze is represented white, the wax inside the cavities dense mid-grey. Three feet fragments (two of which are visible to the left) are broken right above the ankle, the fourth and largest one, that is also gilded, at breast height. The mould is oriented in the pouring direction, the necessary gating system would have been attached at the top.

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Fig. 5a-c. Osiris figures with breaks and additions Liebieghaus – Museum Alter Plastik, Frankfurt, inv.-no. LH1766, LH1806 and LH1879. LH1766: Osiris figure, Egypt, Late Period, bronze, H. 14 cm. LH1806: Osiris figure, Egypt, Late Period, bronze, H. 11.5 cm. LH1879: Osiris figure, Egypt, Late Period, bronze, H. 8.5 cm.

approach, since small solid-cast bronzes showing mending techniques are known, notably at the Liebieghaus – Museum Alter Plastik in Frankfurt (Main), Germany.[15] Osiris LH1766 (Fig. 5a) shows a break at knee level. LH1806 (Fig. 5b) displays a mechanical seal between the feet and the body. LH1979 (Fig. 5c) is a little out of scope for the "Production B1" approach but illustrates the technique of casting on an earlier piece (cf. below). The metallurgists wanted to add loops at the neck and feet of the figure, both of which were cast on the original figure.

15 Hofmann 1991, p. 258, cat. 129, pp. 270–271, cat. 149, pp. 275–276, cat. 157.

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3.3. Production B2: The 'Collar & Coat' Method

One further technological approach is represented by "Production B2", in which liquid metal was meant to surround existing breaks in order to cast-on new supporting and mending bronze layers, often in the form of collars (around the neck) or coats (on top of the body). This idea is represented by the mould QH 207/39, which is the main specimen for this type known from the Qubbet el-Hawa assemblage (Fig. 6).[16] The µCT-renderings reveal three Osiris figures of the above-described "Production B1" with their crowns oriented towards the not yet realised gating system. In addition, there is also one reversely oriented unique Osiris figure that represents "Production B2". The three constituent bronze elements of this Osiris —broken feet, a hollow cast body and a broken head— were coated with a wax supply system starting at the feet and running along the surface of the other fragments to create a later to be cast-on connection of the "collar & coat" type.[17] It is noteworthy that the break surfaces between the feet segment and the body do not match, indicating that both parts do not originate from the same object. Additionally, the broken head was attached to the body with a small iron rod. "Production B2" might represent another practice of a potential Osirian revival ritual (see below), in which the "collar & coat" approach was conceptualised in order to re-member the fragmented elements of an Osiris figure.

However, this approach seems even more special not only in technological terms. The role of the performer of the proposed kind of Osirian ritual is more blurred, since only a skilled metallurgist would be able to reconstitute the statuette using the lost-wax technique. The resulting figure would also not fully conform to the usual Osiris iconography anymore since it would be more or less fully covered by the cast-on coat. There are a number of bronze figures that provide evidence for the wider use of this technique.[18] Among the group of Osiris figures, two objects from the Liebieghaus – Museum Alter Plastik, Frankfurt (Main) can be mentioned. LH1876 and LH1832 both show a cast-on metal collar at their neck in order to reunite the body and the head (Fig. 7a-b).[19]

3.4. Production B3: The Connecting Method

The third technological approach is only represented by the two casting moulds QH 207/50 and 207/51 (now Cairo, JE 91899). Both have an elongated cylindrical body with a casting funnel in a slightly off-centre position on the long side. The µCT-reconstructions of QH 207/50 revealed the existence of two thin Osiris statuettes inside, whose feet (including seemingly broken tenons) and head parts are in bronze, while the area in between is filled with remains

16 In addition, the small and fragmented mould QH 207/52 could be mentioned which displays two cavities inside, one of which still contains a small bronze piece that is covered and held in place by red wax. This mould might thus also be a representative of this technological approach, in which an element of a small Osiris figure was re-modelled with wax into a complete figure and then enclosed in a mould to the be cast over. After dewaxing, the bronze piece inside would, however, possibly become loose, preventing the successful completion of a "reconstruction" cast.

17 For a more detailed description see Fitzenreiter, Willer, Auenmüller 2016a, pp. 102–111, 180–182.

18 This technique is also attested by a few bronze figures in Leiden: Raven 1992, p. 531.

19 Hofmann 1991, pp. 253–256, cat.-nos. 125–126.

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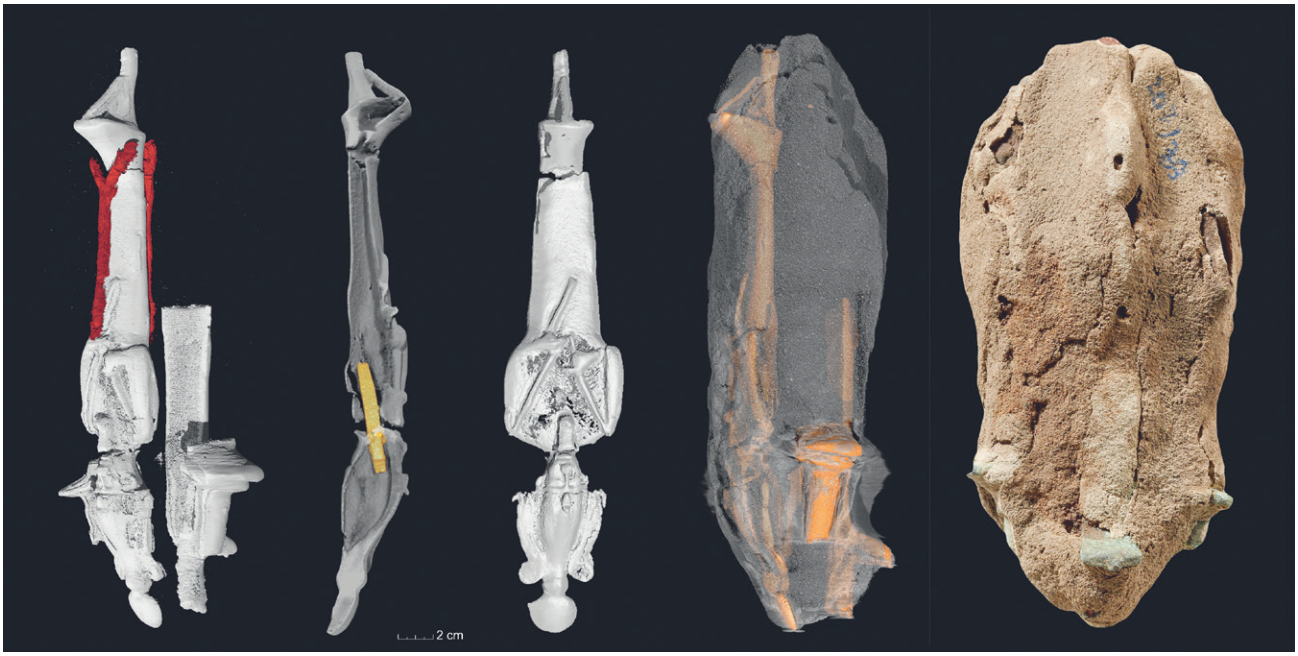

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Fig. 6. µCT 3D-reconstructions of the interior next to a view of mould QH 207/39. This mould shows three Osiris figures with bronze feet and wax body ("Production B1") and a bronze Osiris fragmented into three parts with overlying wax supply channels (in red) that were necessary to cast the collar joints ("Production B2"). The yellow element used to align the head and body before the collar joint was modelled in wax. The use of these two complex ideas demonstrates the high technological level of the ancient metallurgists.

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Fig. 7a-b. Two Osiris statuettes with cast-on collars Liebieghaus – Museum Alter Plastik, Frankfurt, inv.-no. LH1876 and LH1832. LH1876: Osiris figure, Egypt, Late Period, bronze, H. 18.8 cm; LH1832: Osiris figure, Egypt, Late to Graeco-Roman Period, bronze, H. 13.8 cm.

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of wax (Fig. 8). The funnel with its two separated inlets is directly placed over the wax areas, so as to enable the bronze to be cast in later to fill the space between the bronze parts and in this way "connect" them. The exemplary mould, which was not fully dewaxed and could not yet be used, was therefore conceptualised in order to (try to) re-cast the missing body areas of the two separate Osiris figures.

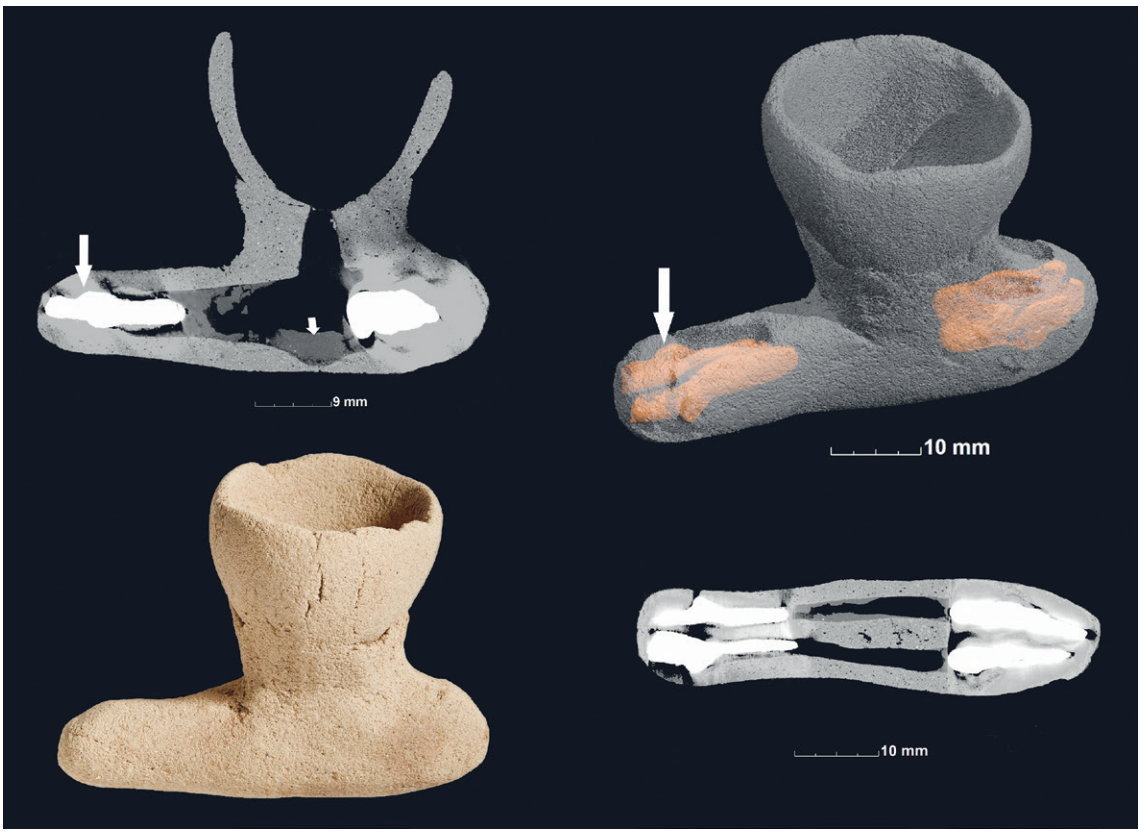

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Fig. 8. Vertical and horizontal µCT-sections, 3D-reconstruction and view of mould QH 207/50 intended to "connect" the head and feet parts of two thin Osiris figures in the centre. The long arrows indicate the bronze parts present in the left part of the mould (corresponding bronze parts are also present on the right), the short arrow highlights a larger patch of the wax remains in between them. The double outlet at the base of the funnel is directly targeted at the parallel zones between the bronze parts.

4. AN OSIRIAN RITUAL OF DIS- AND RE-MEMBERMENT?

After gaining a general technological understanding of the Qubbet el-Hawa casting moulds, a new working hypothesis has been developed. "Production A" is a technical approach that requires meticulous care in preparing mould fabrics but simplifies the production process and ensures the cleanest possible raw result. However, approaches B1, B2 and B3 are far more complicated and require additional work. This technological choice is harder to explain, particularly as techniques B1 and B2 would produce Osiris statuettes more or less similar to those made with "Production A" – provided the casting onto older bronze pieces would have worked in the first place. It must indeed be stressed that neither experiments nor archaeological research

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have demonstrated the feasibility of fusing two pieces of bronze through casting—such bonding between cold and liquid bronze is not expected indeed from a metallurgical perspective. As particularly techniques B1 and B2 are poorly explained from a purely technical point of view, the following questions can be raised: who benefits from these special technological variations and why were they conceptualised and produced?

As this method apparently has no technical advantage, would it be possible for a person outside of the workshop milieu (i.e. a non-metallurgist) but with a common usage interest (i.e. in a ritual or votive object) to expressly request the production of a "breakable Osiris" or such a deity with a "collar & coat"? Approach B1 would produce a shiny new metallic object that could —with bare hands and without the intervention of a metallurgist— have been both dismembered easily and re-membered by gluing the feet and body back together (e.g. with beeswax) by a cult officiant. The user could be a religious practitioner linked to a particular Osirian ritual taking place at the First Cataract in the period of the 25th–26th Dynasties (see below). The idea behind "Production B2" (and also B3) would be to bring Osiris back to life in making him whole again, in accordance with the Osiris myth by "re-membering" his body or fragments thereof. These special methods, however, require the intervention of a skilled metallurgist to create the necessary technological objects such as the moulds and to perform the "magical" casting process in all its steps. A cult officiant alone could not achieve this.

5. CONCEPTUALISING AN OSIRIAN RITUAL THROUGH EXPERIMENTAL ARCHAEOLOGY

In order to test the above set out hypothesis and expand the understanding of the potential casting characteristics of the moulds representing the approaches B1 and B2, an extensive experimental programme was undertaken in the context of the Egyptian and African Copper Metallurgy project (EACOM). Based on the data gathered by the initial project at Bonn in 2014–2015, this follow-up investigation focused on the experimental re-creation of the casting moulds following a strict protocol in terms of methodology and implementation. Six years of experimentation and over a hundred test moulds preceded the manufacture of moulds for Osiris figures and cat heads which form the core of the experimental programme, aimed at answering the questions presented in this paper.[20] This programme consists of two parts: the creation of moulds including the production of the different ceramic fabrics for the casting mould layers and the use of an experimental furnace for dewaxing. Each fabric has to meet a particular function and requires months of preparation following a specific recipe (which includes fermented donkey dung temper).

A particular feature of the Qubbet el-Hawa casting moulds is that they consist of up to three different fabrics assembled in five phases (cf. Tab. 1): three main layers and two additional elements such as the pouring cup and a ring layer fixing the cup to the mould. The three main layers and their particular functionality can be defined as follows:[21] The innermost one, called

20 See also Auenmüller et al. 2021 for a short overview of the experimental work.
21 Auenmüller, Verly, Rademakers 2019, pp. 149–155.

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"Definition Layer", is a thin layer directly applied to the original wax model. It defines all the surface details of the object to be cast. After drying, a thicker "Venting Layer" is applied, which provides not only some of the structural stability to the whole construction, but further aids in the release of hot casting gases through the ceramic matrix: structural air vents are absent in these moulds. The last and in general thickest and roughest layer, the "Structure Layer", ensures the overall stability of the mould and all its other elements.

Layer	Position
Layer I: "Definition Layer"	Applied directly on the wax; stops at the base of the casting sprue.
Layer II: "Venting Layer"	Applied as smooth layer on top of Layer I; terminates at the upper sprue opening (before the end of Layer I).
Element A: "Pouring Cup"	Dry-fitted on the casting sprue and on Layers I and II. The pouring cup is held in place by Element B.
Element B: "Ring"	Connects Layers I, II and Element A; forms a ring which fits between the sprue and the pouring cup.
Layer III: "Structure Layer"	Covers the whole inner layer sequence; sometimes multiple type-III layers are applied.

Table 1. The casting mould layers and elements (with some modifications after Auenmüller, Verly, Rademakers 2019, p. 150).

Examination of the Qubbet el-Hawa casting moulds representing approaches B1 and B2 not only led to the experimental casting of breakable Osiris statuettes (see below), but furthermore to a theoretical conceptualisation of the sequence of acts associated with these figures, informed by the ancient Egyptian understanding of the cyclical nature of things (Fig. 6). As far as metallurgy is concerned, cyclicity is apparent in the well-known bronze casting scene in TT 100, the tomb of the vizier Rekhmire, active under Thutmose III and Amenhotep II.[22] The type of underlying non-linear thinking represented there supports the suggestion of a specific interpretation for the special Qubbet el-Hawa casting moulds as well.

In the following, a conceptualisation of the hypothetical use of Osiris feet is detailed. First, before the cycle itself begins, a metallurgist has cast a complete Osiris (1). The time elapsed since its creation and the moment of its ritual reuse is unknown. It is conceivable that an officiant, priest or anyone else engaged in the Osirian cult (2) used an available bronze statuette. Being aware of the habit of recycling, it is possible that old or new figures may have been repurposed from their primary use to become the new medium for this ritual. The moment of dismemberment signals the start of the cycle (3). This implies the return to a metallurgist's workshop. The actions to be carried out there can only be performed by a knowledgeable person by means of fire at very high temperature. Fire management is beyond the skills of officiants and the conditions of their work environment. For cult officiants to be able to (pretend to) break an Osiris statuette with their bare hands, they need to resort to a "technical trick", as discussed below. Indeed, properly solid-cast statuettes are, in fact, unbreakable by hand.

22 Verly 2004; cf. Laboury 1997; Laboury 1998 and Tefnin 1984 for the methodological framework of "reading" pharaonic imagery according to an emic point of view with a strong emphasis on cyclicity. The scenes are not necessarily read from top to bottom and from left to right according to a chronological principle, but much more often according to a programme that makes sense for Egyptian culture: "[L]'organisation [des scènes] ne correspond à aucune disposition spatiale du sujet représenté" (Laboury 1998, p. 140).

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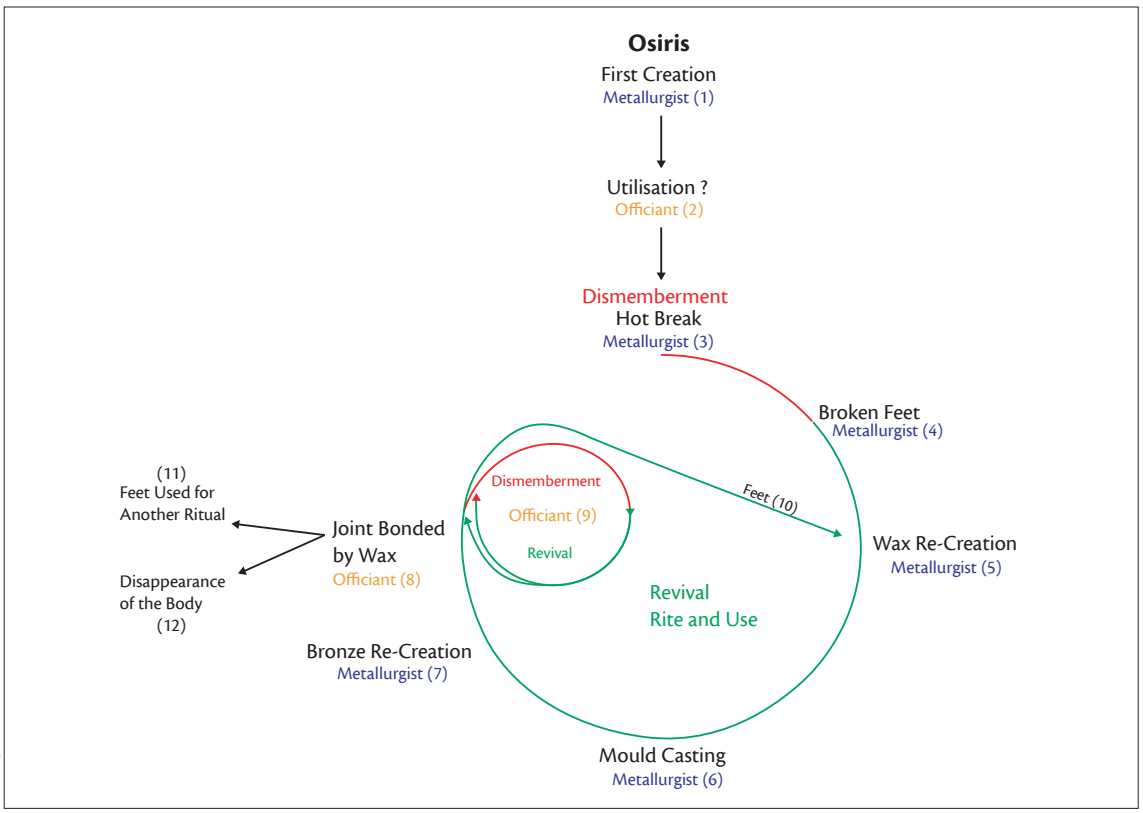

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Fig. 9. Hypothetical production and usage of bronze feet in a ritual cycle of dismemberment and revival of Osiris statuettes.

The metallurgist places the feet of the Osiris (the base of the statuette) in a fireplace (3) (Fig. 10 and Fig. 11). When the alloy is hot enough, a sharp blow creates a fracture whereby an Osiris feet fragment can be obtained (4) (Fig. 12). Hot breaking creates a slight plastic deformation of the fracture's surface, so that the two fragments do not properly re-interlock with each other anymore. Cold breaking, on the other hand, is difficult to execute without strong tools and does not offer the possibility to precisely control the location of the break while distorting the shape of the artefact. For this reason, experiments and the archaeological examples (e.g. Frankfurt Liebieghaus LH1766, Brussels E.08422) indicate the use of a hot break.

Repeated experimentation has demonstrated this, explaining the need to recreate a wax body (5) (Fig. 13) to match the unique fracture on the broken feet part, each time at a slightly different height. The wax body not only allows to complete the full form of the figure, but to perfectly match the morphologically unique contact surface of the future body to the individual break. This specific aspect may indeed have justified the entire further production process. The new Osiris (6), consisting of a bronze feet fragment and a wax body, then undergoes the usual steps of the production sequence of creating solid-cast statuettes, performed by the metallurgist. The only notable conceptual difference is that the casting was planned to be done through the top of the Osiris crown (Fig. 14), rendering the operation even more complicated. The complication lies in the fact that casting is usually done from the larger diameters to the smaller volumes. Here, the crown further increases the complexity due to the risk of cooling of the hot metal at the level of the casting sprue, entailing a casting failure.

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Fig. 10. Osiris figure Brussels RMAH E.08422 illustrates an attempt at hot breakage executed by a metallurgist. The figure has been exposed to high temperature for too long. It is deformed with its surface covered by bubbles. LH1766 (cf. Fig. 5) represents the expected result. Scale bar corresponds to 5 cm.

Fig. 11. Osiris figures Brussels RMAH E.06981N and E.06981F from Kawa. Both show hot breaks. Scale bar corresponds to 10 cm.

Fig. 12. Experimentally cast feet fragment resulting from a hot break. This break would have been executed by a metallurgist for the subsequent use of the fragment(s) by a cult officiant. Scale bar corresponds to 2 cm.

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In this conceptualisation, metallurgists act as facilitators by creating the necessary material elements for a ritual. They do not perform the ritual of an Osirian revival themselves. They only aim at creating an Osiris figure with a deliberate structural weakness: a newly cast body on top of a feet fragment, both of which are not fused but only interlocking due to the morphological match along the fracture's surface (7) (Figs 15 and 16). This structural weakness ensures the success of the officiant's act to be performed on the statuette. It is hypothesised that an officiant can then proceed to dismember the Osirian statuette, previously attached together using an organic adhesive, with their bare hands in two parts, most likely in a temple ritual context, and can give back life to the god by joining the two perfectly matching bronze pieces together (these two acts may constitute separate rituals). All this can be performed relatively quickly by a well-practiced officiant, possibly in front of a cultic audience.

© Image Egyptian Museum of the University of Bonn/Qubbet el-Hawa archive

Fig. 13. QH 207/32 (current location unknown) shows the step of recreating a complete statuette in two materials, a bronze feet fragment and a wax body. The materials (even if different) already represent a complete "re-membered" Osiris. The wax part always has to be adapted to the height of the bronze feet. The feet are the first element and determine the remaining part of the assembly.

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Fig. 14. Experimental assembly of an Osiris statuette modelled on bronze feet and put in a single mould. The feet have been deliberately cleaned to allow the contact between the metal surface with the wax to be as tight as possible. The casting sprue is placed directly on the top of the Atef crown. Scale bars correspond to 5 cm.

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Fig. 15. The figure of Osiris (cf. Figs 11–13) breaks in two during the opening of the experimental mould at the former joint of the wax and the metal. Scale bar corresponds to 5 cm.

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Fig. 16. Detail photography: no fusing occurred between the two parts in any of the experiments.

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Prior to the dismemberment, the officiant can attach the two parts together with a glue-like agent (8) (Fig. 17). Given its prominence in the whole production process and particular characteristics, beeswax is a very likely candidate. As beeswax cools, the bond becomes rigid, and the statuette can be manipulated as if it was made in one piece. By exerting some force, however, the bond between body and feet can be broken by hand: a "technical trick" enabling the officiant to do the impossible. Thanks to the wax's reversibility and quality of being easily remodelled by hand, the two pieces can be put back together for performing subsequent cyclic regeneration processes (9) (Fig. 18). It would be very easy for the officiant to break the feet, symbolically ensuring the dismemberment, then to add wax and thus reassemble the god Osiris, symbolically ensuring his revival.

This ritual practice is a working hypothesis inspired by a technological reading of the Qubbet el-Hawa moulds and an understanding of Osirian rituals. The experimental programme further adds to the conception of this process. In none of the experimental moulds did a fusing between the two parts occur, illustrating the impossibility of welding hot bronze to cold bronze by casting. On the other hand, a perfect morphological match between the feet and the body was consistently obtained (Fig. 16).

Coming back to the ritual cycle and the handling of the objects and fragments involved, different trajectories for the feet can be suggested if they are not continually used in the dismemberment-revival cycles (9). The feet part may have been sent back to the metallurgist by the officiant (10). There, they could either have been put back into a new mould and undergone the manufacturing process starting at step 5 again, to start the cycle anew with a new Osiris body. Alternatively, the magically charged feet may have been used for another purpose or they were deposited (e.g. in a temple cache) (11).[23] They could also have been recycled in a workshop to be transformed into new figures or other. In either case, the further life-history of the bodies remains unknown (12).[24]

23 For Osiris figures without feet, dating to the Late Period and beyond, see, e.g. Daressy 1905 (CG38248 [from Medinet Habu crypt], CG38255, CG38258 [Saqqara, Serapeum], CG38269 [Medinet Habu], CG38270 [Medinet Habu], CG38275 [Medinet Habu], CG38276 [Saqqara], CG38279 [Medinet Habu] and CG38422 [Medinet Habu]); Tiribilli 2018, pp. 71–72, cat. 84–86 (UC 8017, 8018A and 8020, from Koptos), p. 73, cat. 89 (unprovenanced), p. 71, cat. 96–98 (UC 8018B, 8023B and 8023C, Koptos), p. 83, cat. 109 (UC 8021, Koptos), p. 85, cat. 113–114 (UC 8027 and 8036, both unprovenanced), p. 87, cat. 116 (UC 56235, unprovenanced), p. 91, cat. 121 (UC 8026, Koptos). The Petrie Museum also houses several Osiris leg and feet fragments, see Tiribilli 2018, pp. 278–279, cat. 428–433 (all unprovenanced). Many more examples could be cited in almost every large museum collection.

24 In this context, a refuse deposit of bronze elements such as crowns, uraei, vulture heads, Isis crowns and beards from crushed plaster statuettes can be cited. It was discovered in a lower fill within the terrace of the Satet temple on Elephantine and briefly described by Jaritz 1980, p. 47. Further excavations carried out by Cornelius von Pilgrim's team led to the discovery of even more fragments of Osiris statuettes in the construction/destruction debris of the Khnum temple, including dozens of complete and broken Osiris figures. Among these are lower parts, upper parts, complete ones, socles, or just the feet. Some of them were intentionally enclosed in a thin shell of clay (Cornelius von Pilgrim, pers. comm.). A further such deposition is reported from Kom Ombo. In the 1970's, a 47 kg heavy block of corroded metal, including crowns, uraei and Osiris figures, was found there during an excavation undertaken by the Egyptian authorities (Dietrich Raue, pers. comm.).

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Fig. 17. The two parts from the experimental casting are attached together with beeswax. Scale bar corresponds to 5 cm.

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Fig. 18. Thanks to the wax, the two parts can easily be broken and joined back together by the officiant for subsequent dismembering-revival cycles. Scale bar corresponds to 5 cm.

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6. THE SIGNIFICANCE OF LOCATION AND CHRONOLOGY

At this point, some further short considerations are appropriate in order to put this hypothesis in context. It is noteworthy that the casting moulds representing this possible ritual come from a region closely linked to Osiris: the Qubbet el-Hawa is only a little downstream of Elephantine island,[25] where the priests and songstresses buried in tomb QH 207 during the Late Period performed their religious duties in the local cults of Khnum and Satet.[26] In this period, Elephantine was one of the most important religious places in the First Cataract region,[27] as it was the imaginary place where the Nile flood flowed out from the netherworld, emerging from the leg(s) or from under the sole of the feet of Osiris.[28] Elephantine thus is connected to the left Osiris leg which is the locally most significant divine relic connected with the dismemberment and revival rite.[29] Based on the hypothesis proposed here, these legs not only give back life to Osiris in the moment of the magical re-assembly of the bronze/wax statuettes. As origin of the Nile flood, they were furthermore conceptualised as significant limbs that needed to be reunited to "re-member" Egypt, giving life to the entire land and Egypt's people by providing sustenance and food.[30] In addition, the island of Biggeh is home to a leg of Osiris,[31] while Philae and its Isis temple are the place of a joint cult of the legs and the Ba of Osiris.[32]

The local importance of the feet is further highlighted by the fact that this is the body part of Osiris most frequently occurring in this special group of casting moulds. The feet seem to have been kept safe in favour of Osiris' body to use them in this special technological and ritual endeavour. In addition, there is not only one Osiris figure present in the moulds QH 207/39 and 207/40 representing Production B1 and B2, but four. This number can be understood as additional evidence for the process's intentionality and repetitiveness. Finally, the fact of using consumable materials (in this case metal) for the cult can be explained by the Khoiak rites. It is not only customary to bury clay figurines in the night of the last day of the relevant month,[33] but the fourteen "relics", which were visualised in the form of containers, can merge into a single one symbolising the myth of "re-memberment", thus showing the possibility of using different forms of artefacts to merge into one.[34]

Chronologically speaking, the production of such special Osiris statuettes —as evidenced by the Qubbet el-Hawa casting moulds— dates to 570–480 BCE, thus in the chronological range of the 26th and 27th Dynasties. Just before, particularly in the 25th Dynasty, a renewed

25 For the Qubbet el-Hawa, see, e.g. Edel 1974; Edel, Seyfried, Vieler 2008; Jiménez-Serrano, Sánchez-Léon 2019; Morenz, Höveler-Müller, el-Hawary 2011; Vischak 2015.

26 On the prosopography of the Late Period burials from QH 207 see Edel, Seyfried, Vieler 2008, pp. 1978–1979.

27 For the First Cataract area as a whole, see, e.g. the individual contributions in Raue, Seidlmayer, Speiser 2013; Zaki 2009, pp. 309–392. For several domestic contexts on Elephantine itself and associated material culture, particularly pottery, dating to the Late Saite and Persian Period, see Aston 1999, pp. 213–246; von Pilgrim 2016, pp. 11–12. The site during the Persian Period is also discussed by Rohrmoser 2014.

28 Assmann 2005, p. 361; the soles of Osiris' feet are explicitly mentioned in pMMA 35.9.21: Smith 2009, p. 144.

29 Beinlich 1984, pp. 209–213, who also stresses an etymological connection to Satet.

30 Assmann 2000; Claus 2005; Zaki 2009, pp. 224–227.

31 De Maré 2016, pp. 1–46; see now also Cauville 2021, pp. 139–151, for Osiris and Biggeh.

32 Arnold 1999, pp. 236–237; De Maré 2021, pp. 21–54; see also Cauville 2021 for Osiris and Philae.

33 Chassinat 1966–1969, p. 72.

34 Chassinat 1966–1969, p. 58.

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interest in the cult and theology of Osiris is evidenced in the whole of Egypt, but particularly at such key sites as Abydos which witnesses an increase in cultic activities together with the development of new cult ceramic forms inspired by Early Dynastic models.[35] Here, locally organised votive practices performed in the context of the Osiris festival(s) concentrated on the use of *qaab*-vessels filled with green sycamore branches and small amounts of coprolites, substances that have a strong connection to Osiris and his status as god of vegetation, regeneration and fertility.[36] Furthermore, larger unburnt clay statuettes of Osiris were ritually buried along the processional route to Umm el-Qaab and in the vicinity of the *mʿḥʿ.t*-place of re-unification and regeneration of Osiris, the ancient tomb of Djer, during the Khoiak festival.[37] After this short review, some more in-depth considerations are provided in the next section regarding the Osiris myth and the significance of the legs. In this context, it is worth noting that the conceptualisation of the relationship between Osiris's body parts and Egypt's nomes is considered to date to the early 26th Dynasty.[38]

7. THE OSIRIS MYTH: THE IMPORTANCE OF THE FEET

The foregoing technological results are intriguing and raise questions about the possible links they may have with certain elements of the Osirian myth and related rituals.[39] A central theme of Osirian mythology is the dismemberment of the god by his brother Seth, an episode known, in its narrative form, from the writings of both Plutarch (ca. 46–125 AD) and Diodorus of Sicily (1st c. BC).[40] These accounts are of course rather late and probably reflect a state of belief which is approximately contemporaneous, but the dismemberment of Osiris is already mentioned in older pharaonic religious texts, such as the Coffin Texts or the Book of the Dead, as well as in a large number of other sources from the Pharaonic period.[41]

One of the most significant cult-topographical consequences of this aspect of the myth is the dissemination of Osiris's body parts and the presence, in a whole series of towns, of parts of his body, usually called "relics".[42] One of Osiris's best known "reliquaries" is that of his holy city of Abydos, believed to contain the head of the god.[43]

Over time, the nomenclature of the towns in which Osiris's relics would have been kept has varied greatly, as has the nature of the relics themselves. In the oldest sources, the number

35 Effland et al. 2010, esp. pp. 59–60, p. 63; see also Lohwasser 2019 for the interest of 25th Dynasty kings, particularly Taharqa, in the most important Egyptian cults and places.

36 Budka 2019a; Budka 2019b.

37 Lippert 2012; Effland, Effland 2013, esp. pp. 78–89; Pamer, Effland 2015; Effland, Effland 2019, p. 46. On the *mʿḥʿ.t* of Osiris see now also Végh 2019, pp. 301–313. For a general account of the cult of Osiris at Abydos see Smith 2017, pp. 465–474.

38 Beinlich 1984, p. 270.

39 See Mojsov 2005 and Smith 2017 for overviews of Osiris and related cults, rituals and concepts, as well as Coulon 2010 for the textual and archaeological evidence, with a particular emphasis on Karnak.

40 Griffiths 1970.

41 Beinlich 1984, p. 267.

42 Beinlich 1984; Goyon 1988; Cauville 1997c, pp. 39–45; Coulon 2005; Pantalacci 1987.

43 Beinlich 1984, pp. 222–224.

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of nomes holding Osirian relics varies between 5 and 14 or 16.[44] In the Late Period, probably during the 26th Dynasty, a political and geographical concept was developed according to which each of the 42 nomes would keep one of the members of the god, which naturally led to the multiplication of identical relics. The most explicit pharaonic documents concerning this dispersion of the Osirian relics are the "Geographical List of Edfu", showing a procession of the nomes of Egypt, on the outer walls of the naos,[45] and especially the scene of the bringing of the relics of each nome in the temple of Dendera, on the walls of the central eastern chapel of the Osirian complex, located on the roof of the temple.[46]

At that time, the relics of Osiris thus multiplied but some take on more and more importance, despite any anatomical logic. Among those multiplied are the head, the spine and especially the leg or legs of the god.[47] The multiplication of this relic seems to have been developed from that of the leg associated with the town of Elephantine, at the First Cataract, from which the flood of the Nile is supposed to originate.[48]

This role of Osiris' leg is clearly evoked in the divine decrees concerning the mythical tomb of Osiris on the island of Biggeh inscribed under Hadrian, 117–138 AD,[49] but also in the Osirian chapels of the temple of Philae,[50] or in the list of the sanctuaries of Egypt in the temple of Hibis in Kharga Oasis.[51] In Hibis, the relic of the leg is kept in a reliquary which is none other than the Abydenian fetish, borrowed from the Eighth Upper-Egyptian Nome, which is supposed to contain the head of Osiris. The leg of the god is thus identified with his head and some of its representations therefore show it with a human head.[52]

This relic of the leg plays an important role in the theology of the First Nome of Upper Egypt, but it is equally present in other provinces. In the procession of Dendera, it is linked with the Nome of Elephantine but also with the Sixth, Tenth, Twentieth and Twenty-First Nomes of Upper Egypt, as well as the Third and Eighteenth Nomes of Lower Egypt.[53] To summarise, according to the various sources, a leg of Osiris as the relic of the god is mentioned in relation to eight Upper and two Lower Egyptian provinces.[54] In Thebes, the leg of Osiris is mentioned in several documents, notably through some occurrences of the "Castle of the Leg", probably a chapel dedicated to the relic of Osiris.[55] According to Marc Gabolde, the presence of the leg of Osiris at Thebes was favoured by certain peculiarities of the local geography and theology, in particular by the idea that in Karnak the flood is supposed to come out from under the

44 Chassinat 1966–1968, pp. 494–498. In the second western Osiris chapel at Dendera, also 14 relics are mentioned: Cauville 1997b, pp. 217–218.

45 Beinlich 1984, pp. 48–58; Rochemonteix, Chassinat 1897 (ed. 1984), pp. 329–344.

46 Beinlich 1984, pp. 80–207; Cauville 1988; Cauville 1997a, pp. 71–93, pl. X 35–42, X 61–68; Cauville 1997b, pp. 40–51; Cauville 1997c, pp. 33–45.

47 Chassinat 1966–1968, p. 375; Goyon 1988, p. 36; Pantalacci 1982, pp. 67–68. Beinlich 1984, pp. 314–315 gives a convenient list of the individual body parts of Osiris, their terminology and their relationship to the nomes of Egypt.

48 Assmann 2005, p. 361; Beinlich 1984, pp. 229–233.

49 Junker 1913.

50 Bénédite 1893, pp. 123–127, pl. 39–42; for Osiris at Philae see also Smith 2017, pp. 449–452.

51 Davies 1941, pl. 4,1.

52 Bénédite 1893, pp. 124–125, pl. 40.

53 Beinlich 1984, pp. 241–242, 264; Cauville 1997c, pp. 39–45.

54 Beinlich 1984, pp. 314–315; Cauville 1997c, p. 45.

55 Coulon 2005, p. 37 (cf. statue Cairo JE 36975 from the Karnak cachette).

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feet of Amun,[56] as well as in Elephantine where it comes out under the legs of Osiris. This association of the flood with the legs or feet of Osiris is indeed particularly frequent, mainly in Philae, but one finds many other mentions of it, as in the Ritual of the Khoiak Festival,[57] or in Edfu[58] or Karnak in the temple of Opet.[59]

There thus exists a complex theology of the leg of Osiris which seems to have been widespread in the Egyptian religious landscape of the Late Period. Therefore, the technological findings that were made on some bronze figures of Osiris, which multiply precisely at the time when mentions of the relics are by far the most numerous, take on a whole new meaning. Since the intentional fractures and re-joining represented by these moulds and the figurines they contain are specific to the representations of Osiris, and since they obviously do not meet any technological imperative, a ritual explanation of these particularities can be proposed.

During the manufacture of a statuette of Osiris, the act of the metallurgists recalls the two essential phases of the Osirian myth: the dismemberment (the complete statue is broken to recover its feet and sometimes its head), and the reassembly of the dispersed parts of the god's body (by re-fixing the feet with wax or other adhesive material). The statuettes of Osiris would therefore become a kind of receptacle of the myth which can be replayed indefinitely within their own anatomy. The bronze statuettes of Osiris are certainly to be appreciated in the light of ancient ritual texts, such as the Ritual of the Festival of Khoiak, well known by the texts of the Osirian chapels erected on the roof of the temple of Dendera.[60] According to these texts, the ritual prescribes the production of Osiris-Khenty-Imentiu figures which must in principle be modelled in a clay mixture mixed with barley, hence the many "corn-mummies" discovered on several sites.[61] The ritual does not mention statuettes which would be cast of metal but, within the proposed interpretation, these could be considered as *ex votos* representing, in a particular and durable material, the effigies of the deity made during the Khoiak rituals, and concentrating within their structure the two crucial aspects of the identity of the god: dismemberment and reassembly.

8. DISCUSSION

The questions posed in the following lead to a final evaluation of the presented evidence: Why did metallurgists create Osiris statuettes with such very peculiar characteristics? Do we see the material remains of experiments on technological feasibility? Or can, in fact, a connection to an Osirian ritual be established? Based on archaeometrical, technological and experimental as well as Egyptological arguments, a new hypothesis is proposed concerning a very particular technique of manufacture, namely the possible ritual employment of bronze feet during the Late Period and its possible association with a ritual connected to the revival of Osiris. This

56 Gabolde 1995; for Osiris and Karnak/Thebes, see also Coulon 2008 and Smith 2017, pp. 494–518.
57 Goyon 1965, pp. 89–156 (pLouvre I 3079, l. 41–42).
58 Cauville 1983.
59 De Wit 1968, p. 32, OPET 68.
60 Beinlich 1984; Cauville 1988; Cauville 1997a; Cauville 1997b; Cauville 1997c; Chassinat 1966–1968.
61 See for example Raven 1982; Raven 1998.

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hypothesis is one way of trying to make sense of this very particular type of casting moulds and their technology. While it may push the limits of interpretation allowed by these artefacts, this hypothesis can change the perspective on a wider range of archaeological finds, enabling other researchers to engage with this idea by testing, discussing and critiquing it.

Indeed, Osiris figures are often found with missing legs or feet.[62] The break occurs at the level of the lowest structural strength of the individual piece. The reason for that seems to be a technical one. After the hot bronze is filled into the mould, the slow cooling process starts. During this process, the bronze inside the mould shrinks a little. This shrinkage creates a certain tension between the wider feet and the even more voluminous upper part of the figure. If, furthermore, there are also casting or other manufacturing defects, the narrowest part of the lower figure, in most cases the zone below the knees down to the ankles, is weaker. In order to snap the bronze figure at this point, however, a considerable amount of force would still be necessary to successfully break the object in pieces, even if the material contains defects. In this regard, volume is an obvious factor: small and thin Osiris figures are more easily breakable than larger ones. Still, in either case, a significant expenditure of force is essential, the reason of which and rationale behind cannot be explained as undeliberate or purely random.

Bronze Osiris feet discovered in archaeological contexts and encountered within the Qubbet el-Hawa casting moulds suggest their use in at least three different, but interrelated contexts: 1) the feet alone could have been used as votive elements within a local temple, most likely on Elephantine, or 2–3) as particular components of a revival rite most likely employing the main technological approach, "Production B1", next to the two other minor and less "ritual" variants, B2 and B3. The approach B1 uses the Osiris bronze statuette as an object that is breakable and re-joinable in order to perform the essential dismemberment and revival cycle, probably during a public enactment. The ritual act can be performed several times in a row with the same statuette. For "Production B1", a metallurgist is the facilitator who provides the material object for the ritual. They create an Osiris statuette with a structural weakness, ensuring the success of the gesture when the ritualist first dismembers the Osiris figure statuette with their bare hands and brings it back to life shortly after by joining the two bronze pieces again. The officiant is the user of the metal object for the ritual.

The idea behind proposing such a practice is informed by the technological understanding of the special group of the Qubbet el-Hawa casting moulds and the autopsy of broken Osiris bronzes. The rites of dis- and re-memberment, the rebirth and revival of Osiris, would have taken place in a region that is intimately linked to the feet of the god and the natural cycle of the Nile flood, such as the First Cataract or on Elephantine itself. These two revival scenarios thus interact with each other: "Die Wiederherstellung des unversehrten Osirisleibes verlangt [...], daß das Überschwemmungswasser aus allen Gauen an einer Stelle vereinigt wird. Da jeder Tempel Ägyptens für sich einen Mikrokosmos darstellt, kann in seinem Bereich das ganze Ägypten, aber auch jeder einzelne Gau gegenwärtig sein."[63] Thus, a local re-enactment of the whole Osirian ritual together with the use of the locally most significant "relic", a foot or feet, allows the cult officiants to perform a most essential element of one of the most significant Egyptian rituals.

62 See *supra*, Fn. 23.
63 Beinlich 1994, p. 308.

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At this point, it is again necessary to strongly emphasise that this is a hypothesis that, should it prove to be true, would introduce a new and very particular Osiris ritual practice for this period. As the conceptual development of the relation (or even identity) of a nome and one (or several) particular body part(s) of Osiris seems to date to the early 26th Dynasty, one might suggest that this would also be the appropriate time during which Osirian rituals and conceptions are "played around with" on Elephantine or elsewhere in the region, by both craftspeople and cult officiants. Thus, the attempt to understand a technological anomaly concludes with a "ritualistic" explanation and the question arises on which epistemological ground the conclusion was reached and whether such an explanation is fully justified and not only an attempt at understanding and making sense of the inexplicable. It is, however, only one interpretive approach towards a group of objects that may continue to puzzle scholars in the future. Another interpretative approach in fact would be to understand the objects and their particularities from a pure technological point of view as feasibility experiments and trial pieces, as experimental objects conceptualised by the ancient casters in order to tackle and understand some technological issues arising from creating and repairing bronze figures. Finally, also in this case, their deposition in a (songstress') tomb still needs to be explained as well.

9. CONCLUSION

The technological research carried out on the bronze statuettes of Osiris and their moulds lead to particularly promising conclusions or hypotheses which shed new light on the very nature of the work of metal craftspeople in Ancient Egypt. The craftspeople, who create figures of the god and separate their components, and the officiants, who then reassemble them, re-enact the myth of the dismemberment of Osiris, the quest of Isis, and the reassembly of the god's body, being the main condition for his rebirth through their actions and gestures. Since the interest of this manufacture approach is not purely technological (in fact, it introduces "unnecessary" technical complexity), it can be proposed that a person outside the workshop milieu such as an officiant or priest requested that a "breakable Osiris" was cast. The statuette could be dismembered by bare hands, without the intervention of a metallurgist, and then seamlessly joined back together with wax. This person would be an officiant or priest performing a particular Osirian rite, most probably linked to the Khoiak ritual. Nonetheless, this whole operation procedure requires the participation of a skilled metallurgist, as the officiant alone could only deal with already broken bronze parts outside the proposed cycle. It is not possible to assess whether the cult officiant assisted during the casting or was in any other way involved in the metallurgical production chain.

As once again highlighted here, no act connected with the creation of a divine image is trivial in Pharaonic Egypt. To create such an image is to make it active and efficient, to create a connection between the reality and the conceptual and, in the case of the statuettes of Osiris, to reactivate the dynamics of one of the fundamental myths of Pharaonic Egypt.

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