

SCIENTIFIC RECONSTRUCTION OF THE PALACE OF AMENHOTEP III AT MALQATA

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In 2016,¹ Peter Lacovara was looking for someone to correct the existing drawings of the Palace of Amenhotep III at Malqata with the most up to date information. Responding to his call, I embarked upon the exciting project to produce an exterior aerial view of the palace along with an interior view of the columned hall “H”. To achieve this, I engaged the skills of digital reconstruction expert Paul François² in order to carry out a review of the digital reconstruction technologies now available that could be used to create the most up to date and sophisticated archaeological reconstruction of the structure. I launched the new “Projet palais pharaonique 3D” in 2021 and built on preliminary work I carried out in 2017 with Paul François. The project improved upon those early efforts and moved the reconstruction work much further forwards.

The 3D software we selected gave us an optimal working and testing platform, and let us figure out the best viewpoints to be used as graphical illustrations.³ The immersive environment helped us test and validate or invalidate our architectural and decorative assumptions, made where direct archaeological evidence was lacking. The software produced different renderings of the structure as we manipulated the color tones and adjusted the atmosphere in and around the monument. We could choose if it was shown during the day or at night, and if the interior views included artificial lighting.

The software’s most powerful facility was undoubtedly its ability to produce virtual animations of the reconstructed monument. These allowed us to bring the palace back to life for the viewers by setting the architectural elements in motion. It is important, however, to emphasize that this advanced computing power did not consign the fundamental principles of archaeological reconstruction to the background. Documentary research and the cross-referencing of different archeological data sets continued to form the foundations of the undertaking.

This cooperative effort with Paul François resulted in the first virtual reconstruction of the central columned hall “H” of the King’s Palace at Malqata. I then focused my efforts on reconstructing the throne room “I” and its royal baldachin canopy, and continued to improve the initial reconstruction effort with further analysis of the relevant documentation.

The process was broken down into several steps. The first was to reconstruct the columned hall and the throne room it leads to in three dimensions. To achieve that, I first had to gather together all the existing documentation that related to that part of the palace. The archaeological surveys that were undertaken in the early 20th century provided a precise ground plan showing the layout of the walls as

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- 1 I gratefully acknowledge Alain Guilleux, Françoise Laroche-Traunecker and Shinichi Nishimoto for kindly providing illustrations and the rights to reproduce them here.
 - 2 LS2N (UMR6004) and AMO (EA4276) at Nantes, today at the Laboratoire d’Archéologie Médiévale et Moderne en Méditerranée.
 - 3 Karelin, Klimenko and Klimenko (2016).



Fig. 1. Remains of the foundations of the columned hall leading to the throne room.
(photo: Franck Monnier)

well as the location of the doors opening onto the adjacent rooms (**fig. 1**). Remains of circular limestone column bases showed that the two rooms were hypostyle halls incorporating two rows of columns. The column shafts were made of wood and were probably painted red as was generally the case during that era in that context.⁴ A wooden fragment and two lotus-shaped decorative elements discovered by the Tytus expedition helped us to resolve the issue regarding the original form of the capitals, as is discussed below (**fig. 2 a-b**).⁵

We also decided to raise the roof of the central aisle in order to better position the clerestories that provide openings for daylight illumination.⁶ Decorative fragments of the side spans of the roofs found by the Japanese team from Waseda University allowed us to reconstruct its overall decorative form (**fig. 2 c-d**).⁷ The space was divided into three long aisles or bays. For the roof covering the central aisle, the evidence

4 Kemp (2012), pp. 189-190.

5 « ... capitals of wood accurately carved in low relief and painted to represent the half blown lotos, must have presented a magnificent effect » (Tytus (1903), p. 18 and fig. 13).

6 These clerestories could have been situated in the lateral walls as well. This point is still uncertain.

7 Nishimoto (1990) and Nishimoto (1991).

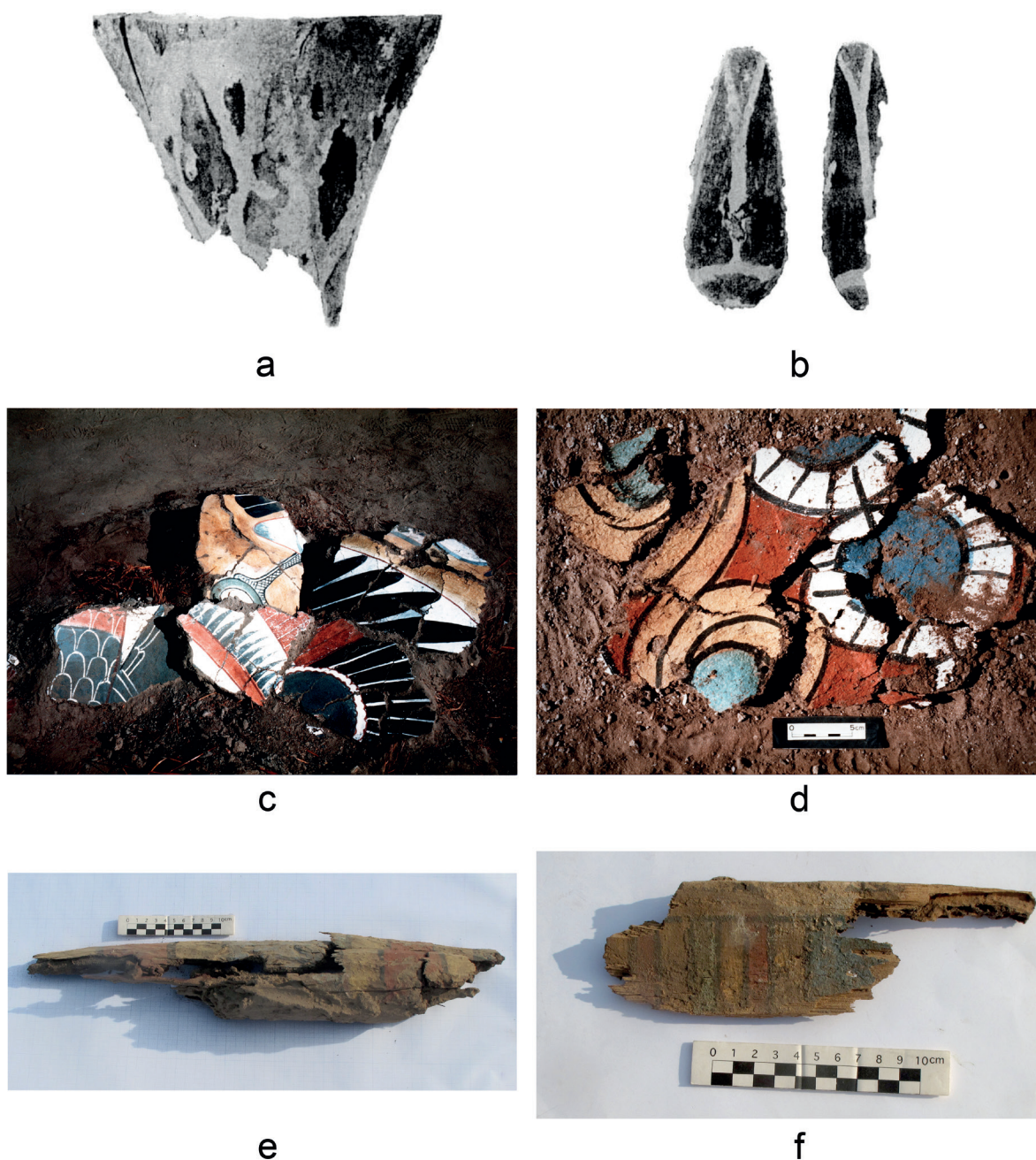


Fig. 2. Decoration fragments found in the palace at Malqata.

a-b: Wooden fragment of a column and lotus-shaped decorative elements (Tytus (1903), p. 20 and fig. 13).

c-d: Scroll pattern and fragments of the painted Nekhbet figure found in room H (courtesy of Shinichi Nishimoto, Waseda University).

e-f: Fragment of a painted wooden column and a painted cornice found in the throne room (© Peter Lacovara).

collected by the Tytus and Metropolitan expeditions indicated that it was decorated with a succession of winged vultures.⁸ Some fragments later uncovered by the Japanese mission confirmed this assertion and allowed a fuller restoration (**fig. 2c**).⁹

We do not know exactly what the decorative themes on the side walls of the columned hall might have been. The houses and palaces of Tell el-Amarna¹⁰ do show that the decoration of the time was typically related to their surrounding environments, including themes such as gardens and ponds, and that they celebrated the activities that took place there including dancing, music playing, and the hosting of banquets. The paintings found in contemporary tombs also offered examples of typical scenes, most notably those suitable for decorating the single lower registers of the wall scenes. The surviving evidence of these scenes is, however, nowhere near adequate to allow a definitive restoration. Tytus noted that the king was represented on the south wall as sitting on his throne and surrounded by captives.¹¹ Unfortunately, nothing remains of that image, but the gorgeous representation in tomb TT226, reproduced and restored in color by Nina de Garis Davies, can give some idea of what it may have looked like, even if Tytus described it as being like a caricature¹² (**fig. 5**). Ornamental designs, such as rows of swags or a frieze, probably surmounted the wall scenes by running along the topmost registers.



Fig. 3. Floor pattern found near the central court (Cairo Museum, photo: Franck Monnier).

The paintings that covered the floors have been better preserved and were partially uncovered by the earlier expeditions to the site. The pieces confirmed the postulated similarity with the buildings at Tell el-Amarna (**fig. 3**). The floor symbolized a garden through which visitors could walk from one end of the room to the other. Reed and papyrus thickets provided an environment in which various

8 Tytus (1903), p. 20.

9 Nishimoto (1990) and Nishimoto (1991).

10 Kemp (2012), pp. 142, 169-176.

11 Tytus (1903), p. 21. This mention of the “south wall” is ambiguous since the walls are located either in the southeast or in the southwest. There was not enough space on the southeast wall separating the columned hall from the throne room, so it was probably the southwestern wall.

12 Tytus (1903), p. 21.



Fig. 4. 3D reconstruction of the columned hall “H” leading to the throne room (Franck Monnier).

bird species flourished, including aquatic avian species like ducks. As in the palaces of Tell el-Amarna, foreign prisoners were represented with their arms tied behind their backs in order to express Egyptian domination over their neighbors. These were probably also painted on the floor in front of the baldachins so that the visitors and the king himself could symbolically trample the pharaoh’s enemies underfoot, all the way up to the foot of the canopy containing the throne. Similar fragments have been uncovered from other rooms in the complex. Tytus claimed to have seen fragments with representations of a pool in the central columned hall, so it is likely that its central aisle was painted that way.¹³

The architecture of the throne room was reconstructed using some of the same assumptions we made for the columned hall. In the first instance, my reconstruction efforts were focused on the supporting platform of the throne and its canopy. The throne had been partially preserved while the

¹³ Tytus (1903), pl. I.

Fig. 6 (opposite). Amenhotep III enthroned beneath a canopy. Facsimile painting of an offering scene from the TT 226 tomb at Sheikh Abd el-Qurna (Nina de Garis Davies, Metropolitan Museum of Art).



Fig. 5. Remains of the base of the royal baldachin in the throne room "I".
(photo: Franck Monnier)

appropriate type of canopy was represented many times on the walls of contemporary tombs. Some painted fragments were found in situ (**fig. 2-e-f**). The base was brickwork covered with a white painted plaster and measured approximately 3 meters long by 2.60 meters wide. Its surviving height did not exceed 22 centimeters. Based on the available graphical evidence, it was crowned with a cavetto cornice. The short ramp decorated with bound prisoners allowed access to the top of the throne platform.¹⁴ The surviving iconographic documentation from tomb and temple representations allowed me to reconstruct the overall form of the superstructure, which was a richly decorated baldachin. The throne at this particular location was not unique in the palace and it was not possible for me to determine which particular representation I should associate with this example and how it might have been differentiated from the others, all of which may have been more or less different.¹⁵ It is likely that none of these painted scenes rigorously represents a particular model. Artistic license and symbolic contingencies always took precedence over realism, which was not the principal concern of the Egyptian artists. I did note that the wooden columns were shown arranged on both sides of the throne in pairs, but in varying numbers. Most known representations only displayed two of the columns, one at the front and one at the back of

¹⁴ There could be no more than two here because of its small size.

¹⁵ Differences can be seen even in one single tomb, for example Kheruef's tomb where the decoration of the base varies from one wall to another, as well as the type of throne (*OIP* 102, pl. 24-26, 48-53).



the side represented.¹⁶ During the reign of Amenhotep III, however, all of the examples show at least two pairs of supports. Does this necessarily indicate a nested structure? The representation in tomb TT226 reproduced by Nina de Garis Davies is the most complex depiction that has come down to us. Although two-dimensional, it gives good indications of how to represent such a kiosk in a three-dimensions (**fig. 6**). The two innermost pairs of columns stand on bases located at the same level, along the edge of a central platform. The outermost pair of bases rests on a lower level. Other contemporary canopy paintings of the New Kingdom represent all of the column bases on the same horizontal plane.¹⁷ It is most likely that this double-level arrangement reflects a nested structure incorporating two canopies. Other evidence from the period supports this interpretation.

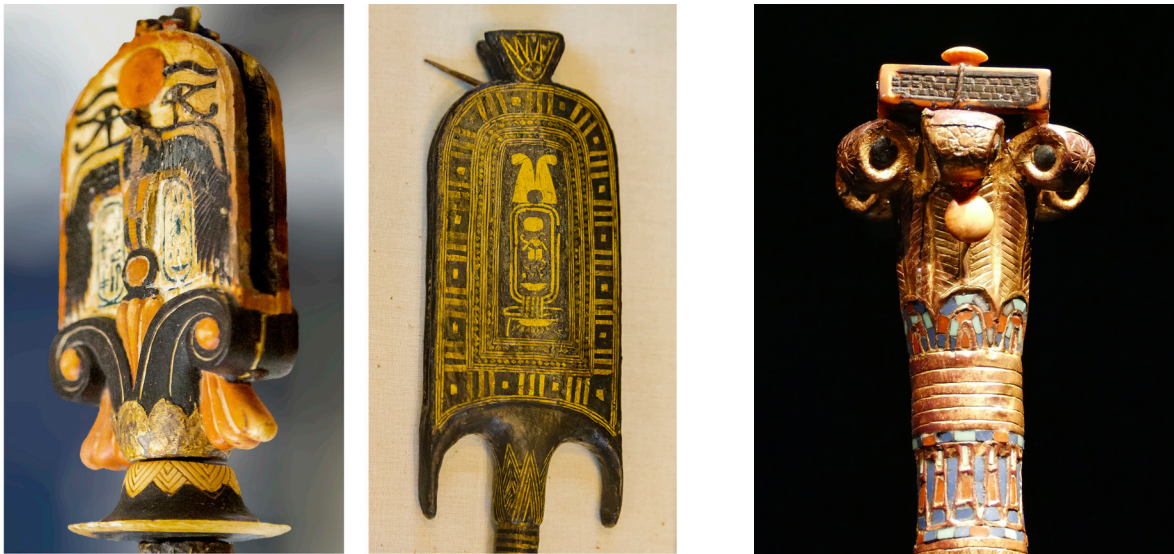


Fig. 7. Objects found in the tomb of Tutankhamun.

Left and middle: Fans (JE 62003 and JE 62006, Cairo Museum. Photos: Alain Guilleux).

Right: Palm-shaped ebony pen holder (JE 62094, Cairo Museum. Photo: Franck Monnier).

It was also important to consider how the baldachin was decorated. Many wooden models discovered at Tell el-Amarna¹⁸ as well as contemporary paintings show bunches of grapes made of painted wood or perhaps faience hung all around the wooden roofs of canopies (**fig. 6**). Where single rows of grape clusters are drawn, only two pairs of columns are shown, but when two rows of grape clusters are drawn then three pairs of columns are depicted. I conclude that the depictions with only two pairs of columns represent a single canopy with one roof, while three pairs represent a nested canopy with two roofs. This suggests that a double nested shrine is represented in tomb TT226, while the other paintings show a single canopy with a single roof. Two pairs of columns thus reveals, to a certain extent, a partial perspective effect. On the basis of this conclusion, I decided that it was appropriate to illustrate the

¹⁶ For references, see Yoshifumi (2014).

¹⁷ See also: LD III, bl. 77; Prisse D'Avennes (1878), II, pl. Sculpture 8; Davies (1941), pl. XXIX.

¹⁸ Kemp (2012), p. 57; Petrie (1894), pl. XIX.

most elaborate of these structures, since this throne room occupied a central place in the palace. The relatively large floor area occupied by the platform supported this conclusion very well. The modeling of a simple four-columned single roof structure in this space produced a disharmonious impression, with so much empty space around it that the throne seemed to be lost. After testing that initial case, I definitively rejected that hypothesis. The opportunity was then available to produce an unprecedented and innovative reconstruction of a pharaonic throne with its baldachin of a type that would have been among the most sophisticated and widely documented of Amenhotep III's reign. The painting made by Nina de Garis Davies was, therefore, invaluable, since it could be exploited to facilitate a more realistic rendering of the original form and its painted details.

The decorative details of the canopy that are most questionable are the composition of the capitals that took on many different forms during the New Kingdom.¹⁹ During the reign of Amenhotep III they were typically inverted-campaniform papyrus capitals, or clustered lotus capitals, both opened or closed, as well as liliiform capitals.²⁰ There was no difficulty with the reconstruction of capitals shaped like papyrus or lotus plants since there are many examples of such decoration in architectural contexts and on furniture. The difficulty lies in reconstructing the liliiform capitals, of which no sample carved in the round has survived from the New Kingdom.²¹ The association of the Egyptian motif with the lily flower is generally accepted.²² Some doubts have been expressed about this identification and other proposals have been put forward, for example by Gustave Jéquier who thought it was an Iris flower,²³ and Helene J. Kantor who thought it was just a "completely artificial and abstract motive".²⁴ For our part, having no reason to call into question the identification with a lily,²⁵ we used that as a basis for reconstructing the capitals, by convention and for convenience, and we will continue to designate this motif as a "lily flower". This lily flower was one of the principal symbols of Egyptian royalty and unity.²⁶ Along with the papyrus, it embodied the bipartite nature of the Egyptian state, where the lily stood for Upper Egypt and the papyrus for Lower Egypt. The unification of the two Lands was traditionally represented by the Sema-Tawy motif, in which Seth and Horus linked the two plants together around the Nilotic artery.²⁷ In Egyptian iconography the lily was consistently represented by two petals arranged symmetrically on both sides of the pistil.

At first sight, a three-dimensional design for the liliiform capitals seems evident, since some contemporary objects carved in the round resemble the classic two-dimensional painted form. These include, for example, a fan (JE 62003, Cairo Museum, **fig. 7-left**), and a polisher (JE 62095, Cairo Museum), both of which come from the tomb of Tutankhamun. In both cases, the lily flower is similar in every respect to the designs drawn, painted, or engraved throughout the New Kingdom. It should be noted, however,

19 Yoshifumi (2016), pp. 108-111. See also Yoshifumi (2014).

20 Yoshifumi (2016), pp. 108.

21 Yoshifumi (2016), pp. 108-111.

22 Borchardt (1897), pp. 18-24 (and especially p. 20).

23 Jéquier (1924), pp. 263-264. It did not really persuade Egyptologists (Haneborg-Lühr (1992), pp. 131-132; Arnold (1999), p. 298; Phillips (2002), pp. 15-16).

24 Kantor (1945), p. 111.

25 The research carried out by Alexandra Nibbi on this subject seems to be convincing (Nibbi (1991) et Nibbi (1995)). Nibbi states that the plant is a liliaceous of a *gagea reticulata* type.

26 Nibbi (1991).

27 Förster (1997), pp. 32-53.

that each of these lilies supports a flat decorated element intended to be seen from the front or rear only. There is some level of doubt, therefore, that the carvings in the round are applied in a conventional manner. These doubts are reinforced by the existence of another fan from the same tomb that does not represent a lily, but a papyrus (**fig. 7-middle**). Instead of the perfectly bell-shaped form of the well-known campaniform papyrus capitals, it is somewhat flattened. Although still carved in the round, this deformation produces curves that recall the pictorial pattern rather than the architectural models. It would appear then that there were hybrid sculptural conventions specific to that type of object, which combined the flat graphical representation with the sculpture in the round. The end result more closely resembles a type of high relief, where the forms on the adjacent two faces support each other visually. For this reason, reconstructing the three-dimensional liliform capitals with reference to these models does not appear to be the most logical option.

The flowers of the liliaceae family have six tepals²⁸ of identical colors.²⁹ It is likely that the Egyptian artists faithfully represented this characteristic, just as they knew how to represent the distinctive features of other plants and animals. Many decorative scenes incorporating the lily motif adorned the walls in the city of Tell el-Amarna. A repeated pattern of lilies with two symmetrical tepals was among them.³⁰ Petrie reproduced a particularly interesting one with a floral pattern carved in the round. This was intended to be attached to another element, probably a column shaft representing the stem, and it is important to note here that it has six tepals.

The temples dating to the Greco-Roman period include columns with extremely elaborate decorated capitals. They are categorized as composite capitals as they associate several different floral motifs.³¹ Many of them reproduce the lily pattern, with fine volutes, giving a great elegance to the whole composition. These decorations with volutes are mostly arranged on several levels, with a geometric composition that could be described as fractal.³² One upper level of a campaniform capital has eight lily tepals³³ (an eight-lobed capital), the next level has 16, then the next 32, and so on. Others have only four tepals on the upper level³⁴ (a four-lobed capital). The second level has 8, then the next 16, and so on. In these cases, it is impossible to deduce how many tepals the original floral pattern was intended to have. Two sculpted models of campaniform capitals now in display in the Cairo Museum³⁵ and the University of Strasbourg (**fig. 8**) incorporate six lily tepals in a classic papyriform style, emerging from a cluster of papyrus leaves. The example in the University of Strasbourg collection (n° 1388) may provide a good indication of what a typical liliform capital of the New Kingdom would have looked like, particularly if the form is imagined with the upper campaniform portion removed. This hypothesis is supported by two other objects. The first is the decorative element discovered by Flinders Petrie at Tell el-Amarna, already mentioned above. The second is another of the artifacts found in Tutankhamun's tomb - a palm-shaped ebony pen holder (JE 62094, Cairo Museum, **fig. 7-right**). The latter has the general appearance of a palm-shaped column, however, the details of the capital have been varied since the extremities of the

28 Tepal is either a petal or a sepal when both are identical.

29 Angiosperm Phylogeny Website: <http://www.mobot.org/MOBOT/Research/APWeb/orders/lilialesweb.htm#Lilium>.

30 Petrie (1894), pl. XVIII (398).

31 Jéquier (1924), pp. 242-274; Haneborg-Lühr (1992).

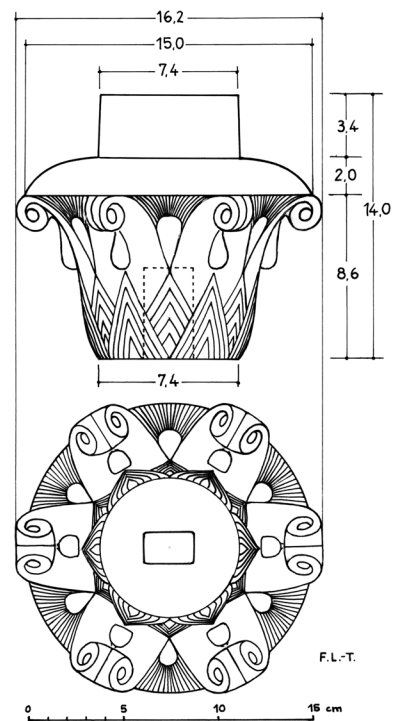
32 That is, each level exactly reproduces the decorative elements of the upper level, but on a smaller scale.

33 Jéquier (1924), pp. 271-274.

34 Jéquier (1924), pp. 257-271.

35 Tomoum (2005), pl. 84a, JE 39557.

Fig. 8. Capital model of the University of Strasbourg (Collection of Strasbourg, n° 1388, courtesy of Françoise Laroche-Traunecker).



vegetation on its upper part do not resemble the ends of palms, but rather the liliform volutes of the Ptolemaic Period. In addition, their number does not follow the standard for palmiform capitals since there should be eight or nine lobes,³⁶ while here there are only six.³⁷ Another important point is that pendant date clusters at the base of the palm leaves are stylized in the manner of sepals,³⁸ a floral feature found nowhere else in the palmiform style. It is, therefore, possible that the artisan who created this fine decoration played a symbolic game, and was engaging in a stylistic exercise combining two usually incompatible shapes: the palmiform and the liliform.

It is important to note the existence of the composite campaniform example UC 28720 from the Ptolemaic era, preserved at University College, London. This one does not bear six but only four tepals.³⁹ At first sight it would appear to confirm that the reconstruction attempted by Dieter Arnold a few decades ago, of a liliform capital, was valid.⁴⁰ Known examples of such campaniform capitals are extremely rare, however, there is a model with six tepals located in the kiosk of Nectanebo I at Philae⁴¹ and a fragment of another such capital was discovered at Gabbari (3rd century BC).⁴²

36 Jéquier (1924), pp. 196-201; Arnold (1999), pp. 297-299. See also Phillips (2002).

37 The author was able to examine the artefact during an exhibition.

38 Arnold (1999), p. 293.

39 Trope *et al.* (2005), p. 162.

40 Arnold (1997).

41 Pischikova (2002), fig. 11.

42 Pichot and Boussac (2014), pp. 176-177, fig. 9.

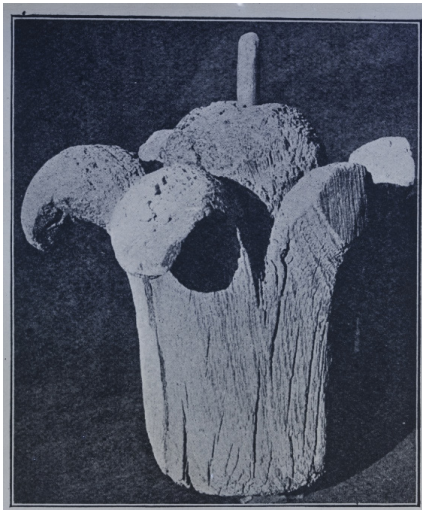


Fig. 9. Wooden capital from tomb 279 (Garstang (1907), fig. 139).

Tomb TT223 of Karakhamun (26th dynasty) seems to have included at least one lilyform capital, but unfortunately only the base has been preserved, offering no information that could be useful in this analysis.⁴³ A Greco-Roman lamp support reproduces the lilyform pattern, but this time with five tepals.⁴⁴ Last, but not least, is an exceptional wooden model in the round of a capital, discovered at the beginning of the 20th century (**fig. 9**). It was published by John Garstang in 1907, but he mistakenly identifying it as a palmiform capital or a lotiform capital.⁴⁵ As far as I know, only an old photograph of this object survives, so it seems that nobody ever recognized what the original shape of it was until now. It is undoubtedly a representation of a lilyform capital, with six flowers, and was designed for some kind of canopy. It came from TT279 which dates to the Saïte Period. This piece convinced me to reproduce the capitals of the baldachin according to that shape.



Fig. 10. Wooden duck-head found in room G (Tytus (1903), p. 14 (fig. 4)).

This wooden example and other many representations of lily flowers show that the central part symbolizing the pistil was typically ovoid. This way of filling the space also provided a support for the upper elements forming the “floral bouquet” .

43 Pischikova (2008), pp. 191-192. See also Pischikova (2002).

44 Pichot and Boussac (2014), p. 178.

45 Garstang (1907), p. 141, fig. 139.

Some of these bouquets were very elaborate, and some were even decorated with animal heads. One canopy from the time of Amenhotep III was shown decorated with liliform capitals topped with pairs of duck heads. Decorating capitals with animal heads was, in fact, a fairly common practice. The goat, the falcon, and the lion are attested in other cases.⁴⁶ The excavations at Malqata actually uncovered one of these duck heads in room G, not far from the throne room (**fig. 10**).⁴⁷ This was an extremely valuable clue that allowed me to propose a reconstruction of the capital with a degree of confidence. It is very likely that these heads were shown in pairs on the murals so as not to hide the central lotus cluster capital motif, but in reality, there had to be at least three when the capitals were created in the round. I have estimated that this was the most likely number used, for reasons of balance and composition (**fig. 11**).

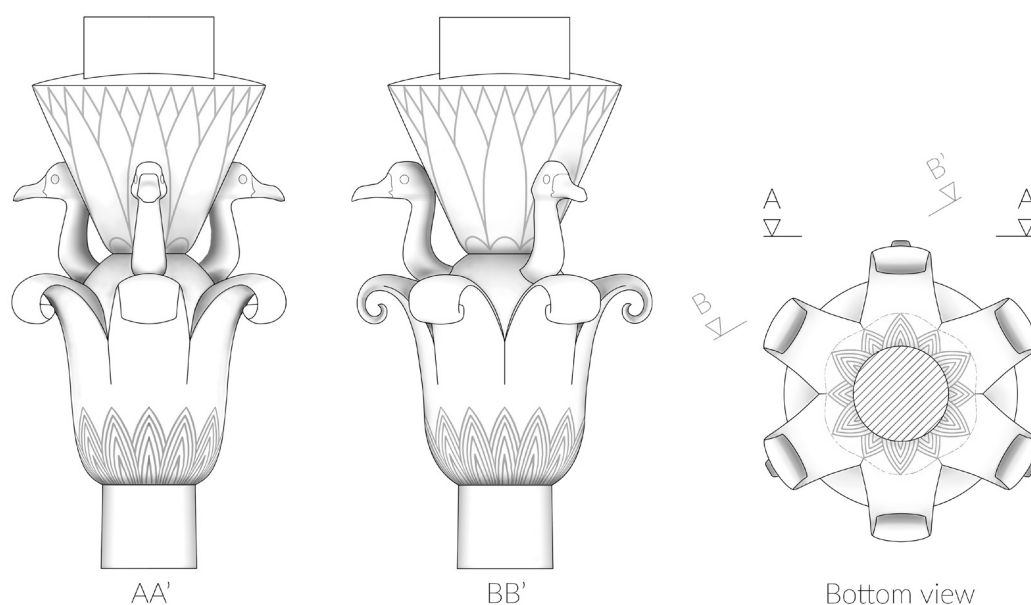


Fig. 11. Reconstruction of the lily capital with duck heads.
(Franck Monnier)

A fragment of a painted wooden column shaft was discovered near the brick platform and shows that some of the columns were painted with alternating blue, green, and red bands, interspersed with thinner yellow bands (**fig. 2e**).

This evidence is in agreement with the known, colored, two-dimensional representations. It seems that in this case the canopy was not covered with gold like the throne, but was only painted in yellow. In the reconstruction, I crowned the shafts supporting the inner canopy with liliform and lotus capitals, and the shafts supporting the outer canopy with papyriform capitals. This respects the arrangement seen on the attested representations of royal canopies and provides an additional symbolic link evoking the bipartite Two Lands theme. The pharaoh was the guarantor who ensured the union and balance of the

46 Prisse d'Avennes (1878), pl. 19-20.

47 Tytus (1903), p. 14 (fig. 4).

Fig. 12. Reconstruction of the royal baldachin of Amenhotep III.
(Franck Monnier)



two regions of Egypt. Alongside such symbolic considerations, the canopies functioned as sunshades when used outdoors, and within an architectural setting they could be draped with fine linen to act as mosquito netting, or decorated with opaque fabric to ensure that the occupant was hidden, as the occasion would require.



Fig. 13. Aerial view reconstruction of the palace of Malqata, looking to the east.
(Franck Monnier)

This research outlined above and the associated computer modeling work eventually resulted in the first scientific reconstruction of a pharaonic throne adorned with its richly decorated baldachin (**fig. 12**). While the possibility remains that this model is not identical to the one that actually stood in the throne room “I” at Malqata, it is certainly an example of the type of canopy under which a king of the New Kingdom such as Amenhotep III would have sat. With regards to the columned hall and the palace as a whole (**fig. 13**), well-argued hypotheses such as those posited above can be used to help illustrate and provide authentic animated simulations of such structures.

Rebuilding this entire monument in such digital detail, with increased realism and accuracy, would, however, require hundreds of hours of additional work. If that is to happen, then the work could eventually turn towards simulating the surrounding local environment, including the huge lake and the vegetation around it. It is to be hoped that this project will be able to proceed and do justice to this building, one of the most majestic and well-documented pharaonic palaces.

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