Glazed Brick Decoration in the Ancient Near East

Proceedings of a Workshop at the 11th International Congress of the Archaeology of the Ancient Near East (Munich) in April 2018

edited by

Anja Fügert and Helen Gries

Vorderasiatisches Museum
Staatliche Museen zu Berlin

ARC HAE O PR ESS

Glazed Brick Decoration in the Ancient Near East

Proceedings of a Workshop at the 11th International Congress of the Archaeology of the Ancient Near East (Munich) in April 2018

For the Vorderasiatisches Museum – Staatliche Museen zu Berlin

edited by

Anja Fügert and Helen Gries

Vorderasiatisches Museum
Staatliche Museen zu Berlin

Archaeopress Archaeology

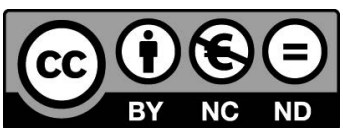
Archaeopress Publishing Ltd
Summertown Pavilion
18-24 Middle Way
Summertown
Oxford OX2 7LG

www.archaeopress.com

ISBN 978-1-78969-605-9
ISBN 978-1-78969-606-6 (e-Pdf)

Publication management Staatliche Museen zu Berlin: Sigrid Wollmeiner, Marika Mäder

Cover image: VA Ass 2299 © Staatliche Museen zu Berlin – Vorderasiatisches Museum, photo: Olaf M. Teßmer



This book is available direct from Archaeopress or from our website www.archaeopress.com

Contents

Foreword and Acknowledgements

Over the last decade a number of excavations have supplied new evidence from glazed bricks that once decorated the facades of the Ancient Near East's public buildings during the Iron Age. Significant progress has further been achieved from revived work on glazed bricks excavated more than a century ago which today are kept in various museum collections worldwide. Although the latest summarising works on Ancient Near Eastern glazed architectural decor published several decades ago by Reade (1970), Nunn (1988), and Moorey (1994) still hold and by no means have lost their validity, in the meantime considerable insight into the subject has been gained. Over the last years issues pertaining to polychromy in antiquity have gradually moved into the spotlight of scholarly attention, especially with regard to architecture, statues, reliefs etc. The Ancient Near East's glazed brick decor has certainly much to contribute to this discussion.

The workshop 'Glazed Brick Decoration in the Ancient Near East' held in Munich at the 11th International Congress of the Archaeology of the Ancient Near East (ICAANE) in 2018 aimed at establishing a network for researchers working on glazed bricks, in order to enhance the exchange of information and experience on scientific methods of analysis, appropriate conservation measures, optical imaging, and visualisation techniques. Focus was laid on the development of glazing technologies from the early Neo-Assyrian time onwards. The brick manufacturing processes, the use and variety of fitters' marks, epigraphic and figural stamp impressions, and other auxiliary marks were discussed. The workshop fixed a point of departure only, as the discussion on this topic is set to continue at the 12th ICAANE in Bologna in a workshop called 'Decorated Bricks of the Achaemenid Period and their Forerunners' organised by Julien Cuny (Musée du Louvre, Paris) and Emad Matin (University of Bologna, Department of Cultural Heritage).

We thank all the lecturers and participants at the workshop for their valuable contributions and hope to close in a little more on the knowledge gap with this publication. All papers in this volume have been peer-reviewed. We would like to thank the reviewers for their swift and constructive assessments as well as May-Sarah Zeßin for her help in the editing work and Paul Larsen for conscientious proofreading. Furthermore, we are indebted to Sigrid Wollmeiner and Marika Mäder from the publications department of the *Staatliche Museen zu Berlin* for their support. Our thanks also go out to Archaeopress Publishing Ltd, especially David Davison for their constructive and supportive cooperation.

Anja Fügert and Helen Gries

Chapter 1: 'I had baked bricks glazed in lapis lazuli color'[1] – A Brief History of Glazed Bricks in the Ancient Near East

Anja Fügert and Helen Gries

Abstract: This contribution is an updated introduction to the glazed bricks in the Ancient Near East. It traces the development of this building decoration from the 2nd half of the 2nd millennium BC to the Seleucid Era (3rd and 2nd century BC) and shows the regional differences.

Keywords: Building Decoration; Polychromy; Glazed Bricks; Glazed Tiles; Iron Age; Elam; Assyria; Babylonia; Achaemenid; Seleucid

1 The development and manufacture of glazed architectural decoration[2]

Intentionally produced glass vessels are attested from the 16th century BC onwards and the technique of applying glaze to clay objects is known since the 14th century BC. The advent of glaze technologies had a profound impact on Ancient Near Eastern material culture.[3] In architectural contexts in Mesopotamia (Syria and Iraq) and Elam (Iran), vitreous materials were used to adorn architectural facades as well as interior features, such as wall plaques, knobs, and door bolts. The technology was also used for portable objects like vessels, seals, and beads. Although the ingredients of vitreous materials like glass and glaze, which consisted of sand or quartz pebbles, plant ash as flux and lime were easily accessible, the application of glaze to clay objects was challenging for craftsmen, since clay and glaze have diverging coefficients of thermal expansion and contraction.[4] The majority of the earliest glazed clay objects bore only a single translucent or monochrome glaze, mostly a light blue or green colour, due to the added copper oxide colourants.[5] It was during the course of the 1st millennium BC only that the colour range of the glazes on bricks increased significantly through the addition of other metal oxides.[6] The technique of glazing bricks made it possible to decorate walls with brilliant and waterproof surfaces, and thus became suited for exterior facades exposed to the weather. Mesopotamia and Elam were forerunners in the development and use of this technique. In neighbouring Egypt the technique of glazing clay surfaces did not become established until the introduction of the lead-glazed pottery in the 1st century BC.[7]

In looking at the development of Ancient Near Eastern glazed brick production, we can identify two different brick types. One with a coarser clay body was used across the Near East, whereas a second type, made of a finer siliceous material, was developed in Elam in the 12th century BC. These bricks are particularly distinctive in the Middle and Neo-Elamite and Achaemenid Periods. In Mesopotamia inscriptions from the Middle Assyrian kings of the second half of the 2nd millennium BC attest to the invention of glazed bricks with clay bodies. In his inscriptions from Nineveh, King Tiglath-Pileser I (*c.* 1114–1076 BC) boasted about the building works at the palace: 'I raised its walls and towers ... with a facade of bricks glazed [the colour of] obsidian, lapis lazuli, *pappardilû*-stone, [and] *parūtu*-alabaster.'[8] In the material record, however, glazed bricks are not attested in Assyria earlier than the 9th century BC.

2 The invention of vitreous building decoration in Elam

As from the Middle Elamite Period (*c.* 1500–1100 BC), various vitreous materials consisting of glass, glazes on clay, and siliceous bodies were used in Elam in a local manifestation as architectural decor. This type of building decoration remained characteristic of Elamite architecture until the end of the Neo-Elamite Period (*c.* 1000–520 BC).[9]

[1] Thus the Assyrian king Ashurnasirpal II (883–859 BC) as he praised himself in his description of his palace (Grayson 1987: A.0.101.30, 32); translation after CAD A1: 162, s.v. *agurru*.

[2] This contribution has been published in slightly modified form in the exhibition catalogue 'A Wonder to Behold: Craftsmanship and the Creation of Babylon's Ishtar Gate' (2019) of the Institute for the Study of the Ancient World at New York University (Fügert and Gries 2019). We thank the curators of the exhibition A. Amrhein, C. Fitzgerald and E. Knott for their constructive remarks.

[3] Barag 1970; Moorey 1994: 196–202; Schmidt 2019: 9–10.

[4] Paynter and Tite 2001: 243; Tite *et al.* 2008: 189–190; Caubet 2012: 157.

[5] The colours of glass objects from this time already had a wider range including an opaque red, white, yellow, and blue-green; see Tite *et al.* 2008: 188.

[6] For the possible colourants and their sources, see Schmidt 2019: 139–141 with further references.

[7] Paynter and Tite 2001: 240, 242 fig. 13.1; Tite *et al.* 2008.

[8] Trans. after Grayson 1987: 54, A.0.87.10, ll. 65–66.

[9] For the Elamite architectural decorations, see Daucé 2018, with further references.

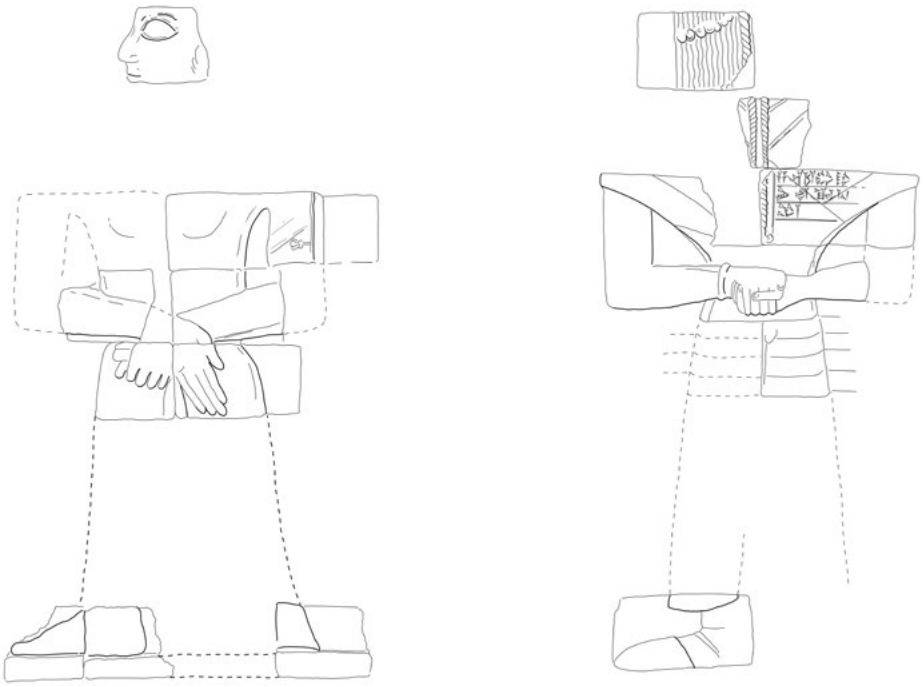


Figure 1. Glazed brick facade from Susa (Iran) probably showing the Elamite king Shilhak-Inshushinak and his wife (drawing by Anja Fügert, after Amiet 1976: figs. 3 and 22).

Particularly numerous were the glazed objects unearthed at Choga Zanbil, a 14th century city newly built as a religious centre and residence of the Elamite kings, located 40 km southeast of Susa. The variety of decoration and simultaneously used techniques and materials at this site is outstanding, as polychrome glass tubes, knobbed plaques, figurative nails and protomes as well as glazed bricks – all of them either with a siliceous or clay body – , and large animal figures made of glazed ceramics and used as door guards have been found.[10]

One focal point in the development of bricks in high-relief can be observed for the second half of the 2nd millennium BC in Elam. In contrast to the older relief bricks from the Kassite Period in Mesopotamia, the Elamite counterparts could also be glazed and consisting of siliceous bodies. The earliest known glazed brick facade comes from Susa and dates to the 12th century BC. It is probably the Elamite king Shilhak-Inshushinak (*c.* 1150–1120 BC) and his wife who are depicted (Figure 1).[11] Besides these outstanding moulded siliceous bricks, there are also mono- and polychrome clay bricks without relief.

3 Tracing glazed bricks in Assyria and Western Iran

By contrast to Elam, only glazed mudbricks were used in Assyria and Babylonia before the Achaemenid Period. The archaeological records attest to highly diverse brick formats as well as figurative repertoires for the 9th to the 7th century BC in Assyria. Glazed bricks decorated facades, crenellations, and doorways of palaces and temples, as well as city gates and other structures like altars and podia.[12] Unfortunately, the glazed surfaces of most Assyrian bricks are in a worse state of preservation than the later glazed bricks from the Neo-Babylonian, Achaemenid, and Seleucid periods. Corrosion processes and the subsequent fading of the glazed surface, if not the flaking of the glaze, can be observed on most objects from this early period. Additionally, lines that were probably originally black now often appear whitish to the naked eye, due to the corrosion of their surface.[13]

In the early Neo-Assyrian Period (9th century BC), decorative glazed bricks appeared in different formats. The so-called wall tiles are glazed on their square sides but not on their edges, as is the case for the glazed bricks of the 'normal' format. The oldest known glazed tiles date to the reign of Tukulti-Ninurta II (890–884 BC). Their average size is about 65 by 45 cm, and their depictions are very carefully executed and

[10] Ghirshman 1966: 18, 37, 73–76, pls. 17–19, 33–35, 52, 97, 98; Heim 1989: 51, 82–86, 102, 168–170, 177; Daucé 2018: 573–576, with further references.

[11] Amiet 1976; Nunn 1988: 166, pl. 120; Heim 1992: 125, fig. 13.

[12] Moorey 1994: 316–317.

[13] For examples of this phenomenon, see in this volume Lehmann and Tallis: figs. 7, 8; Fügert and Gries: figs. 10, 17; Thomas: fig. 2.

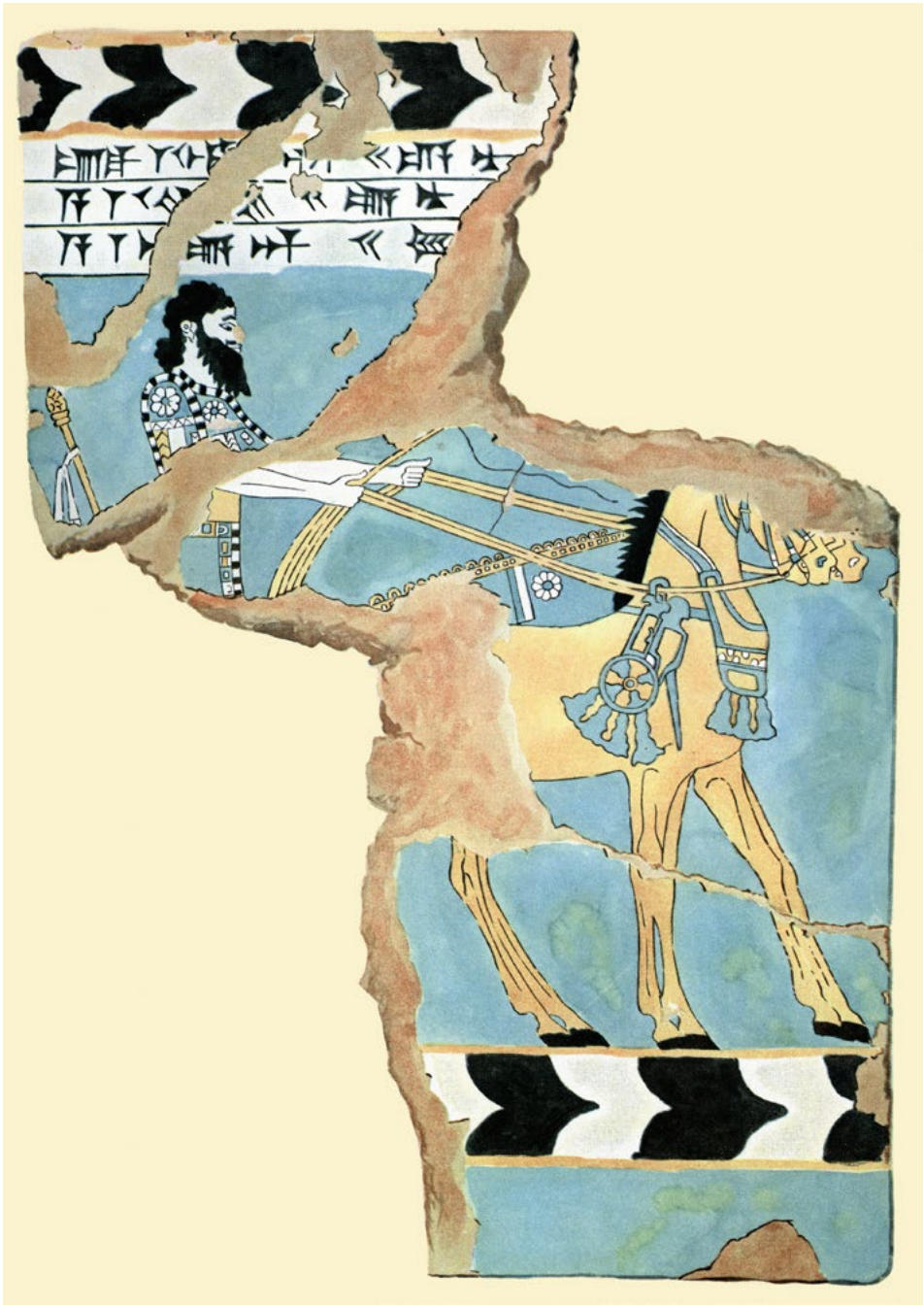


Figure 2. Tile from Ashur (Iraq) of Tukulti-Ninurta II, drawing by Walter Andrae (© Archive Deutsche Orient-Gesellschaft).

detailed (Figure 2). Most of these tiles exhibit complete motifs and could thus stand alone.[14] Whether the tiles were part of the wall bond is not known, since none was found *in situ*. Glazed tiles can be found throughout the Neo-Assyrian Period in Assyria proper and further east beyond the Zagros Mountains. Outside the Assyrian heartland in West Iran (e.g. Qalaichi, Rabat Tepe, Ziwiye, Hasanlu, Tepe Shinawe) and the Autonomous Region of Kurdistan, Iraq (Satu Qala), the motifs of glazed architectural elements and bricks partly resemble Assyrian motifs and partly show distinctly local traits.[15] The latest examples of glazed tiles dating to the second half of the 7th century BC originate in Nimrud and depict a military campaign against Egypt. By contrast to the older period, these compositions were now created by assembling several tiles.[16]

[14] Andrae 1923: 12–14, pls. 7–9; Reade 1970: 211; Reade 1979: 20–21; Nunn 1988: 165–170; Fügert and Gries in this volume.

[15] A comprehensive work on the glazed tiles and bricks from West Iran and Kurdistan is not yet available; for Ziwiye and Hasanlu, see Moorey 1994: 314; Qalaichi: Hassanzadeh 2006; Hassanzadeh and Mollasalehi 2011; 2017; Rabat Tepe: Afifi and Heidari 2010; Reade and Finkel 2014; Salimi, Ebrahimipour and Sorkhabi 2019; Satu Qala: Van Soldt *et al.* 2013: 202, 212–213, figs. 4, 5, 13; for a more general summary see Reade and Finkel 2014; Hassanzadeh and Curtis 2018; Gries and Fügert 2019.

[16] The Assyrian king Esarhaddon commanded three military expeditions against Egypt in the years 674, 671, and 669 BC. He died during the last campaign. Which of the three campaigns is depicted

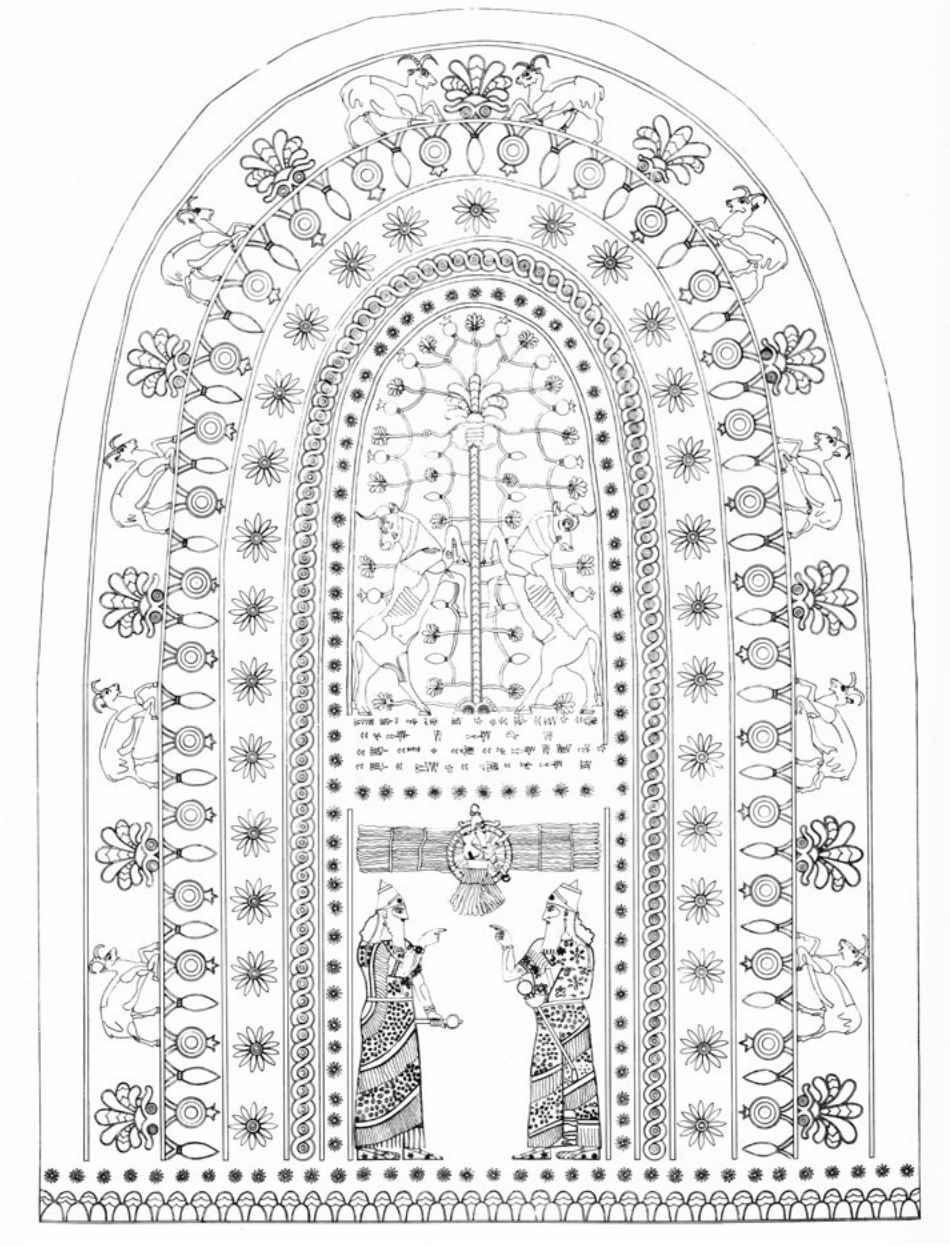


Figure 3. Brick panel of Shalmaneser III from Fort Shalmaneser (courtyard T) at Nimrud (Iraq), Iraq Museum (drawing by Julian Reade, 1963).

From Ashurnasirpal II onward, we observe decoration with glazed bricks of the 'standard' format (approximately 30–35 cm in side length and 9–13 cm in height). They were used to embellish monumental buildings and gateways and comprise not only ornamental patterns[17] but also complex figurative depictions and narrative scenes. Entire wall panels showing narrative scenes were assembled from hundreds of glazed bricks. Fitters' marks were a crucial means by which such complex scenes could be assembled.[18] The motifs of the glazed bricks that were used to adorn gateways and wall crenellations are often more ornamental in character, presenting either floral or geometric elements or different kinds of patterned borders.

The impressive panel from Fort Shalmaneser in Nimrud (Figure 3 and Thomas in this volume: Figure 7) dates to the reign of Shalmaneser III (858–824 BC). The more than three hundred bricks belonging to this panel, which could be fully reassembled after the excavation

cannot be determined; see Nadali 2006; Lehmann and Tallis in this volume.

[17] Campbell Thompson and Hutchinson 1931: 83, pls. 28–32.

[18] Zeßin 2019 with further references.

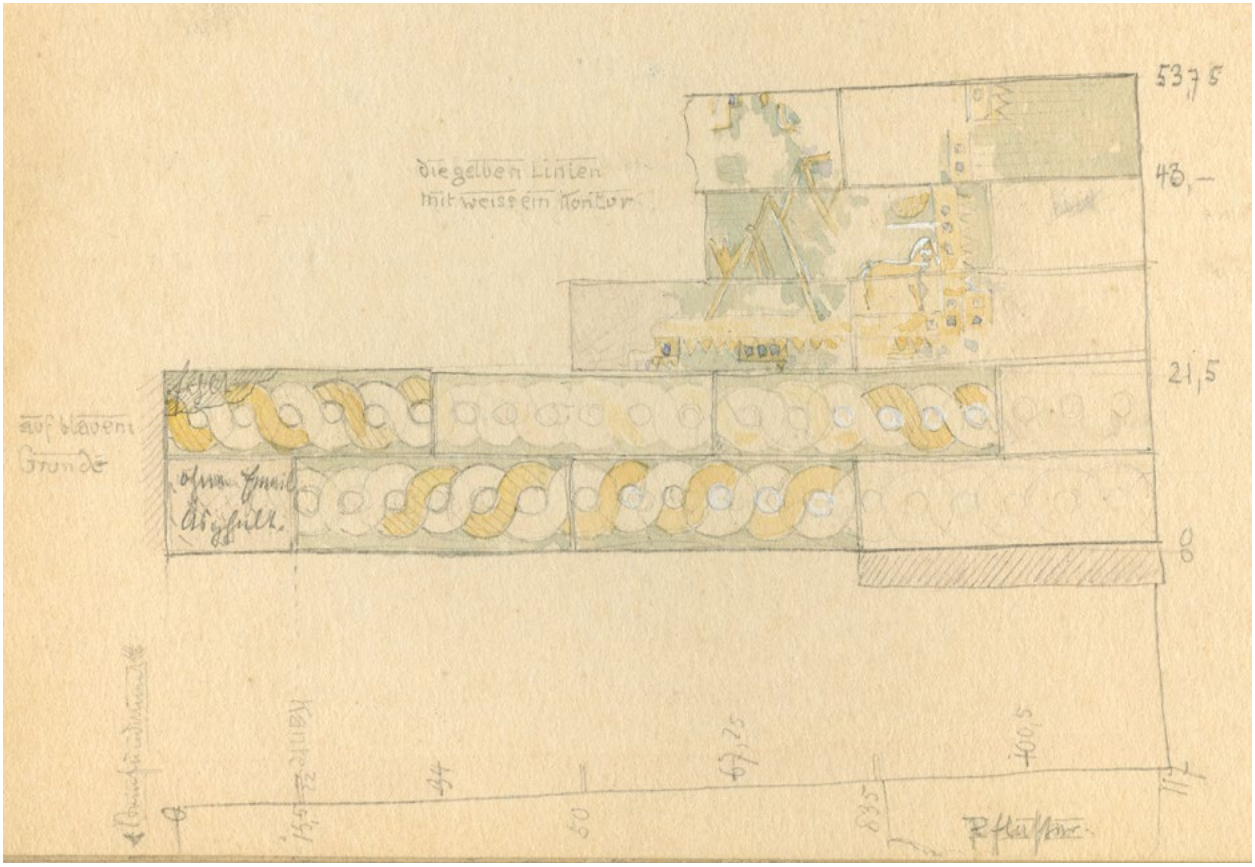


Figure 4. Sketch of north-western face of facade 16 of the Ashur Temple at Ashur (Iraq) by Ernst Herzfeld, 1909 (© Archive Deutsche Orient-Gesellschaft).

and are now part of the exhibition of the Iraq Museum in Baghdad, give an impression of its former glory, although most of its colours are much faded. The panel was originally situated above the horizontal lintel of an outer doorway behind the throne-room suite. It measures over 4 m in height and nearly 3 m in width at its base. In a central arch, two kings face each other while praying and holding a mace in their left hands as the winged sun hovers above them. Above this scene is a stylized tree flanked by rampant bulls, below which appears a four-line cuneiform inscription. These images are framed by a band of arcaded buds, and within the outermost framing band wild goats kneel in front of small palmettes. The base of the panel is formed by a row of scale-shaped mountains and a row of small rosettes. The excavators of the British School expedition and Julian E. Reade, who reconstructed the panel, observed fitters' marks on the surfaces of most of the bricks.[19]

The Temple of Ashur at Ashur is an exceptional example of a temple decoration with glazed bricks, since eighteen facades were found *in situ*. They were located at the entrances to the main building and also embellished various podia in the large forecourt of the sanctuary. The south-eastern facade of the temple was easily visible to a large audience from the forecourt and richly decorated with glazed depictions. Most of the panoramas facing the forecourt either narrate the military campaigns of the Assyrian army in great detail (Figure 4) or depict scenes of the royal court. Other fragments prove that gods and religious scenes also decorated the temple's walls. Noticeable are similarities between the broad thematic range of glazed depictions and the Assyrian palace reliefs.[20]

In Dur-Sharrukin (modern Khorsabad), the new imperial capital founded by Sargon II (721–705 BC) 16 km north of Nineveh, in several locations within the city, including the palace, the temples, important portals, and even a bridge, glazed brick decor was used.[21] The excavators found many fragments of glazed bricks bearing ornamental patterns and inscriptions that celebrate the greatness of Sargon's empire.[22] The precise original location of most of these fragments is unfortunately unknown, but it seems that they might

[19] For the panel from Fort Shalmaneser, see Reade 1963.

[20] For further references, see Fügert and Gries in this volume.
[21] See, e.g., Loud and Altman 1938: 42, pl. 12.
[22] Reade 1995: 227, 232.

Figure 5. Town Gate 3 at Khorsabad (Iraq) with stone colossi and glazed brick archivolt during excavations under Victor Place (photograph by Gabriel Tranchand, 1853).

have formed smaller panels or bands that were set into the walls of the buildings on the citadel.

The glazed-brick archway that was found intact at one of Dur-Sharrukin's gates is renowned (Figure 5). The drawings of this archway, whose bricks were lost in the Tigris River during their transport to Paris, showed winged genii, each holding a bucket and cone, alternating with encircled rosettes and framed with bands of much smaller rosettes (Thomas in this volume: Figure 3a). Numerous glazed-brick fragments hint at the existence of other gates and temple entrances decorated in a similar manner. The placement of purifying winged genii at liminal and possibly threatened areas, such as gates and entrances to sacred places, served the protection of the city and its monumental buildings.[23] Several flat panels with rounded tops can be reconstructed from brick fragments found within the premises of Sargon's palace. These panels are comparable, even though larger, to the complete one found at Fort Shalmaneser.[24]

Several courtyard facades, found within the Palace Temple complex of Sargon II as well as at the Nabu Temple located to the southeast of the palace, were furnished with podia bearing glazed-brick decor.[25] In the Palace Temple, these podia flanked the entrances to the shrines of Sin (Figure 6), Shamash, and Ningal. In the Nabu Temple, a pair of podia was found in the forecourt and another in the central court at the entrance leading to the cella. Best preserved were the abutting podia located in front of the shrine of the moon-god Sin. Each side of all these entrances to the different shrines was decorated with mirrored motifs: the Assyrian king, a striding lion and bull (Figure 7), a bird of prey, a fig tree, a plow, and another man holding a spear. The two human figures are placed on either side of the podia, the other elements on the faces. Most scholars agree that these motifs, which glorify Sargon and his kingship, form the oldest evidence of rebus writing in Assyria.[26] This kind of rebus writing is also attested for

[23] Reade 1995: 228.
[24] Thomas 2016: 205–207, No. 211; Thomas in this volume.
[25] For the description of characteristics and the archaeological contexts of the several podia, see Loud and Altman 1938, 41–42; for the glazed bricks currently in the Oriental Institute Museum Chicago, see Whyte *et al.* 2004.
[26] Reade and Finkel 1996; Roaf and Zgoll 2001.

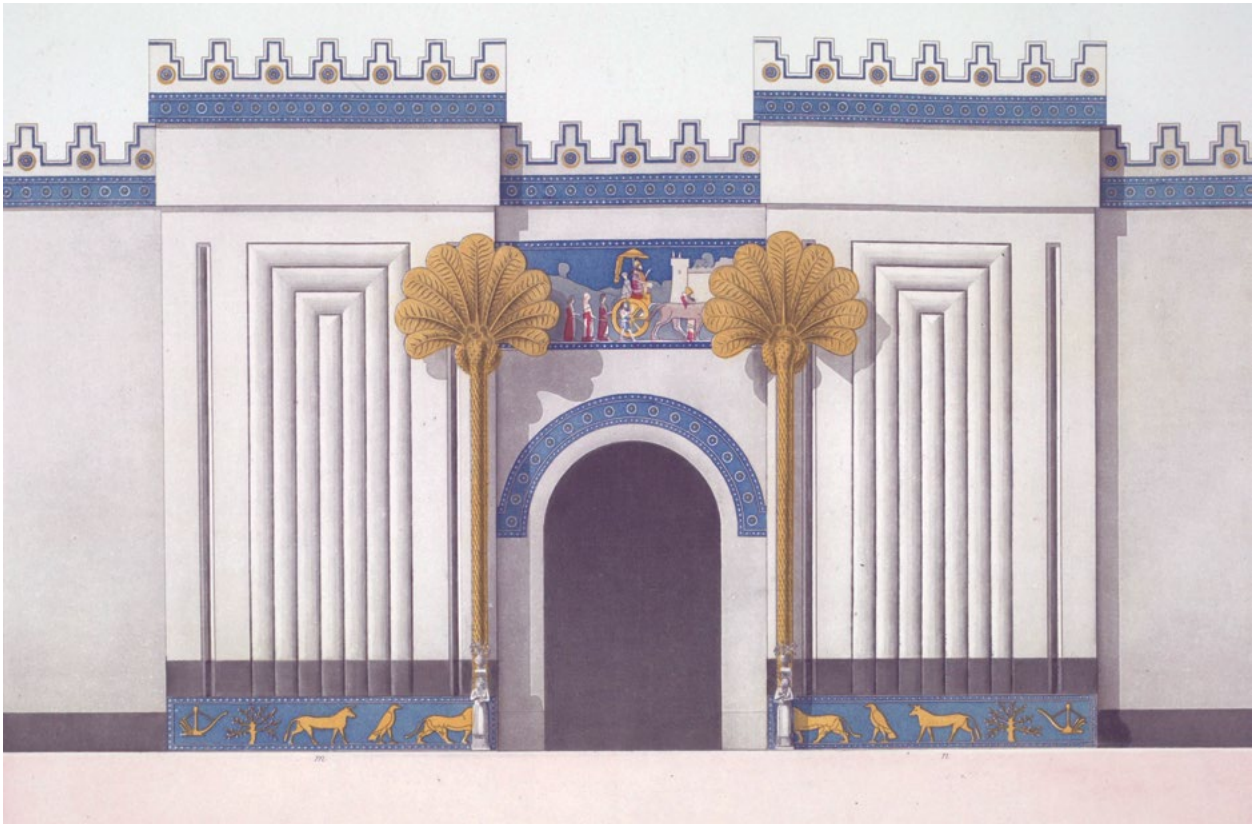


Figure 6. Reconstruction of glazed podia at the entrance of the Sin Temple in the Palace Temple complex of Sargon II at Khorsabad (Iraq) (etching by René Henri Digeon and Antoine René Digeon after Félix Thomas, 1867).

Sargon's successors and can be found on other types of objects, as well. Glazed bricks from Nineveh that might have belonged to a similar podium were convincingly assigned to Sargon's grandson Esarhaddon.[27]

The use of glazed bricks in Assyria extends beyond architecture to freestanding installations like altars or pedestals. At Khorsabad remnants of a free-standing square altar (?) were found in the central court of the Nabu Temple. Although the glaze on the bricks was poorly preserved, the faces of the altar might have shown some of the same emblematic elements as the podia. Traces of another structure adorned with glazed bricks were found in a courtyard in the Palace Temple.[28] In the western provinces of Assyria, further altars decorated with glazed bricks were found. For example, the altar found at Tell Halaf was constructed with glazed bricks in various special shapes and decorated with rosettes, scales, and rhombs, as well as the omnipresent guilloche motif (Figure 8).[29]

In the later Neo-Assyrian Period, most probably starting with Esarhaddon's reign (680–669 BC), the first glazed high-relief bricks began to be used in Assyria. Fragments of those were found in Nineveh. Their decor resembles the motifs found on the podia in front of the temple shrines at Khorsabad.[30] Again, to the west, glazed high-relief bricks were possibly recognised at Carchemish, where they originally embellished the upper part of the facade of the temple of the storm god.[31]

4 The Golden Age of glazed bricks under Nebuchadnezzar II

The earliest attested evidence for glazed bricks in Southern Mesopotamia can be attributed to the Assyrian king Ashurbanipal (669–631 / 627 BC), who decorated the ziggurat in Nippur with them.[32] However, the most spectacular glazed wall decorations from the region are known from Babylon: the Ishtar Gate, the Processional Way, and the Throne Room Facade with its friezes of striding lions and palm trees are among the most famous monuments of the Ancient Near East. Although the site of Babylon is inseparably connected with these decorations, all of them are witnesses for the building mania of one man only: the Late Babylonian

[27] Nadali 2008: 95–99.
[28] Loud and Altman 1938: 42, pl. 22C.
[29] Langenegger, Müller and Naumann 1950: 71–78, colour pls. I–III; Cholidis, Dubiel and Martin 2010, 345, fig. XV.6.
[30] Nadali 2008.
[31] Woolley 1952: 169, frontispiece.
[32] Clayden and Schneider 2015.

Figure 7. Reconstructed glazed bricks from left podium of the Sin Temple at Khorsabad (Iraq) (A11810; courtesy of the Oriental Institute, Chicago).

Figure 8. Reconstructed glazed facade of an altar found at Tell Halaf (Syria) (© Vorderasiatisches Museum, SMB, photo: Olaf M. Teßmer).

king Nebuchadnezzar II (604–562 BC). It is therefore possible that the idea of glazed building decoration in this region was adopted from Assyria or neighbouring Elam.

As opposed to the Assyrian glazes, the Babylonian examples are characterised by their brilliant colouring. The deep blue tint, obtained using cobalt oxide as colouring agent, is considered as particularly distinctive for Late Babylonian glazes. Cobalt oxide, which might have been imported from Anatolia or Egypt, was for the first time added to glazes during the Late Babylonian Period.[33]

[33] Cobalt has been used as a colourant of glass since the 2nd century BC. Cobalt ores are rare in the Eastern Mediterranean and Mesopotamia, and sources are known from Egypt only

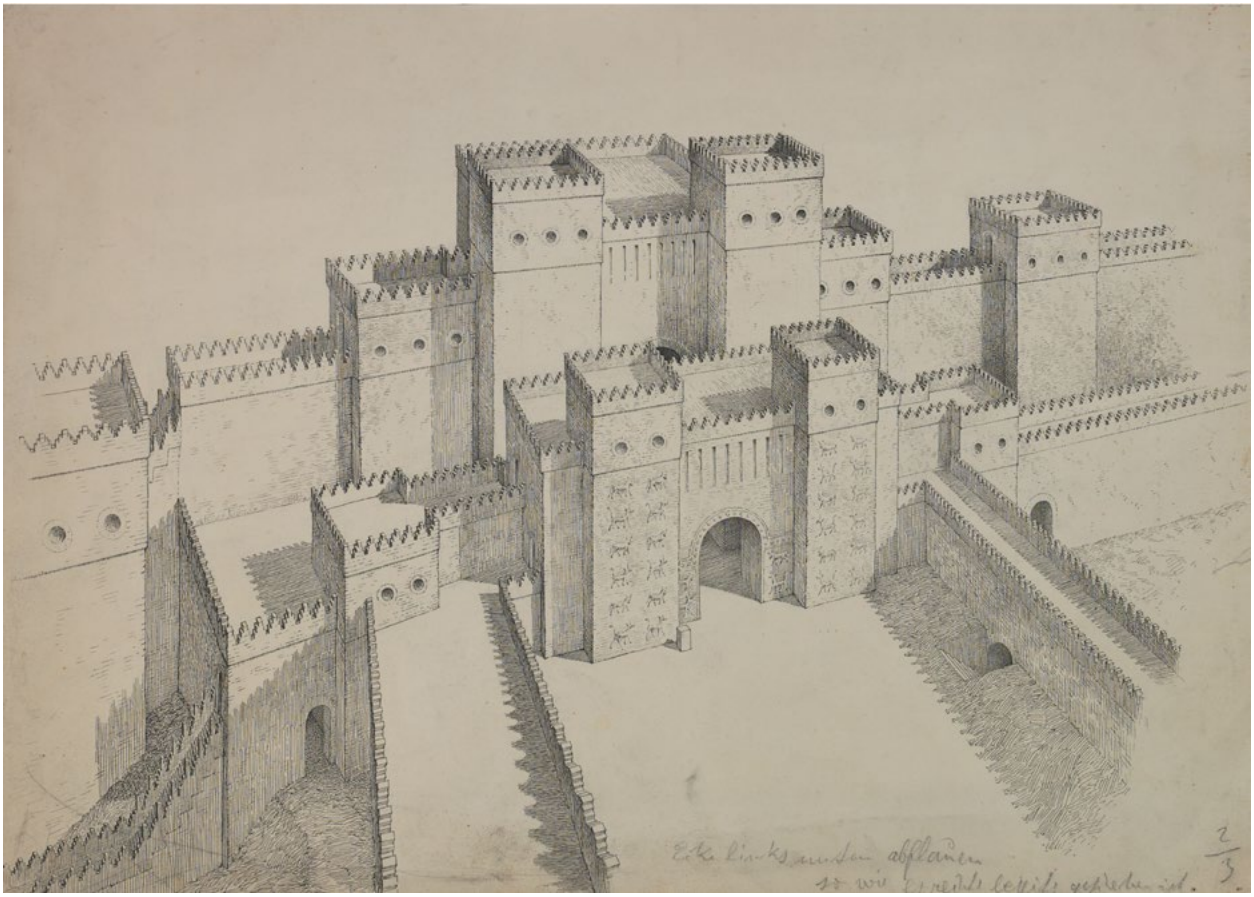


Figure 9. Last building stage of the Ishtar Gate at Babylon (Iraq) drawing by Alfred Bollacher, 1918 (© Archive Deutsche Orient-Gesellschaft, photo: Olaf M. Teßmer).

The Ishtar Gate complex with its three constructional phases reveals the available technical possibilities and how craftsmen played with them. Each time the gate was rebuilt, the street level was raised by several metres. In all three phases the gate was decorated with the same motifs: bulls and snake-dragons (*mušḫuššu*). In the first and earliest phase moulded unglazed bricks in high-relief were used. In the second phase the gate was erected using glazed but flat (!) bricks. Only the third and last phase consisted of glazed bricks in high-relief, but none of these bricks were found *in situ* any more. The Ishtar Gate, which can be admired today at the *Pergamon Museum* in Berlin, is a reconstruction using small brick fragments and mostly modern bricks. The Processional Way with its striding lions is contemporary with the last building stage of the Ishtar Gate (Figure 9). Although it is unknown why Nebuchadnezzar II had the Ishtar Gate redesigned three times, [34] it almost stands to reason that the visibility of the motifs increased noticeably – first by the use of colour and second by relief.

From Nebuchadnezzar II's inscriptions, we know also that the crenellations of the Northern Palace (*Hauptburg*) as well as the temple on the top of the ziggurat were clad in lapis-lazuli-blue glazed bricks.[35] However, in the area of the ziggurat, no trace of glazed bricks from this building was found. Several scholars have suggested that the glazed brick fragments observed in the brick dump at the Homera mound of Babylon might have been brought there during Alexander the Great's reign or later.[36] It was repeatedly assumed that the Ancient Near Eastern temple towers, the ziggurats, were colourfully decorated. These presumptions probably go back to a text passage by Herodotus[37]

(Schmidt 2019: 139–140). Further cobalt sources are suspected in Anatolia (Caubet 2012: 159; Henderson 2013: 74). However, the origin of the cobalt used for the Late Babylonian bricks is unknown.

[34] For the construction and reconstruction of the Ishtar gate, see Koldewey 1918; Marzahn 1995; Pedersén 2018, with further references; Pedersén in this volume.

[35] For the inscriptions, see Pedersén in this volume.

[36] It is unclear when the ziggurat was removed; see Wetzel, Schmidt, and Mallwitz 1957: 2; Schmid 1995: 93–94; Pedersén in this volume.

[37] He describes the walls of the city of Ecbatana as follows: 'The battlements of the first circle are white, of the second black, of the third circle purple, of the fourth blue, and of the fifth orange: thus the battlements of five circles are painted with colours; and the battlements of the last two circles are coated, the one with silver and the other with gold.' Herodotus, *Histories* 1.98, trans. Godley 1920.

Figure 10. Pastel drawing of the throne room facade at the South Palace in Babylon (Iraq) drawing by Elisabeth Andrae (© Vorderasiatisches Museum, SMB, photo: Olaf M. Teßmer).

and are unconfirmed. However, some archaeological hints provide information on the earlier decoration of ziggurats with glazed materials across the Ancient Near East. The earliest evidence is known from Choga Zanbil, where the ziggurat was decorated with both glazed bricks and knobs (see above). In Mesopotamia the decoration of ziggurats with glazed bricks could only be verified at Nippur, Ur, and Borsippa, but it is possible that in the 1st millennium BC more ziggurats had been decorated with these shiny materials.[38]

Other glazed bricks were also found in the North Palace and the South Palace of Babylon. In the main court of the South Palace, the southern wall leading to the throne room was elaborately decorated with glazed bricks. The facade depicted striding lions and stylized floral ornaments applied to flat bricks (Figure 10).[39] The decoration of the Throne Room Facade with its lions made of glazed bricks in high-relief is probably contemporary with the latest phase of the Ishtar Gate.

The glossiness of the glazed bricks at the Throne Room Facade, the Ishtar Gate, and the Processional Way were not isolated phenomena, but may rather be understood as part of a larger dynamic tradition of architectural decoration. For example, in the city of Borsippa, about 20 km southwest of Babylon, fragments of glazed relief bricks were also found. These belonged to bull and dragon figures and thus show the same motifs found at the Ishtar Gate. Due to the numerous surface finds of such bricks in Babylon and the proximity of both sites, one could assume that these had been relocated to Borsippa. This, however, can be excluded, because the ones at Borsippa differ slightly from those at Babylon as they originate from different moulds. These glazed bricks from Borsippa can most likely be attributed to Nebuchadnezzar II, who claims to have also decorated buildings there with glazed bricks.[40] Glazed bricks are also known from the Nabu Temple at Borsippa, but these probably date to the Achaemenid or even the Seleucid Period.[41]

[38] Nunn 1988: 235–237, with further references; for Nippur, see Clayden and Schneider 2015.

[39] Koldewey 1931: 84–91, pls. 37–38; Marzahn 1995: 32; Pedersén in this volume.

[40] In the East India House Inscription (BM 129397), he describes that he adorned the entrance of the cella, the way to the temple, and the top of the ziggurat with glazed bricks; see Langdon 1912: 128–129 (Nebukadnezar no. 15).

[41] The reconstruction of the animal figures from Borsippa extends back to Kaniuth 2013; for further references, see there. Since the glazed bricks in Borsippa all come from more recent contexts, the dating to the reign of Nebuchadnezzar II is not certain; see Kaniuth 2018.

5 Glazed brick decoration during the Achaemenid Period

Darius I (522–486 BC), king of the Achaemenid Empire, singles out the Babylonians in his famous, trilingual inscription (the so-called *Foundation Charter of the Palace*) as 'the men who wrought the baked brick, those were Babylonians.'[42] The text also mentions people from abroad who had brought all kinds of rare and highly valued building materials as well as foreign workers, whose special skills had been used to build and embellish his palace in Susa.

Glazed brickwork was still an important element of the royal architecture of the Achaemenid kings, and glazed bricks were found in the principal sites of this period – in Susa, Persepolis, and Babylon. That the Achaemenid builders aimed to decorate their monumental buildings partly in the tradition of the preceding Elamite and Mesopotamian empires becomes particularly perceptible with the residence of King Darius I in Susa, where decorative brickwork was the most prominent feature. Achaemenid kings utilized both siliceous and clay bricks that were either glazed, with or without relief, or unglazed with relief. It is estimated that more than 100,000 decorative bricks, covering a surface of approximately 2500 to 3000 m^2, were used to adorn the facades of the more than a few courtyards in the royal residence.[43]

The highly detailed motifs depicted include processions of the royal archers – the so-called immortals (Figure 11) – and servants, striding lions, and a variety of mythological creatures, such as winged bulls, sphinxes, and griffin-lions. Bands with geometrical and interwoven floral patterns and rosettes framed the friezes and ornamented flights of stairs. Cuneiform inscriptions were executed in glazed brickwork as well. The chromatic spectrum of the Susa reliefs consists of light and dark blue, turquoise and green, yellow and orange, brown and black, and white. Mixing different metal oxides resulted in a range of hues between these colours. In order to minimise the thickness of the facing joins, the artisans at Susa gave most bricks a special wedge-like shape.[44] The art of decorating royal residences with glazed brickwork is attested from the reign of Darius I to that of Artaxerxes II (404–358 BC).[45]

An astonishing find was made recently in Tol-e Ajori, a site near Persepolis, one of the capitals of the Persian Empire in southern Iran. There the remains of a gate were discovered that was decorated with glazed bricks also showing bulls and dragons very similar to the ones found at Babylon.[46] The gate had not been built before 539 BC[47], conventionally understood as the end of the Neo-Babylonian Empire, and thus the discovery in Tol-e Ajori raises many questions, including that of a late dating of the most recent construction stage of the Ishtar Gate within or even after the reign of Nebuchadnezzar II. In any case, it also proves that Neo-Babylonian art had a strong influence on the succeeding Achaemenid rulers.[48]

Figure 11. Royal archer of Darius I at Susa (Iran) (© Vorderasiatisches Museum, SMB, photo detail: Olaf M. Teßmer).

[42] Trans. after Kent 1950: 144, DSf §3k, 49–55.
[43] Daucé 2018.
[44] Razmjou 2004: 384–385, fig. 3; Daucé 2013: 307, figs. 328–330.
[45] Razmjou 2004: 385–386.
[46] For the preliminary results of the excavation at Tol-e Ajori, see Askari Chaverdi, Callieri, and Matin 2016.
[47] Askari Chaverdi, Callieri, and Matin 2016: 223, 226.
[48] For the interrelationships between Late Babylonian and Achaemenid art and the possible late date of the last construction stage of the Ishtar Gate, see Kaniuth 2018.

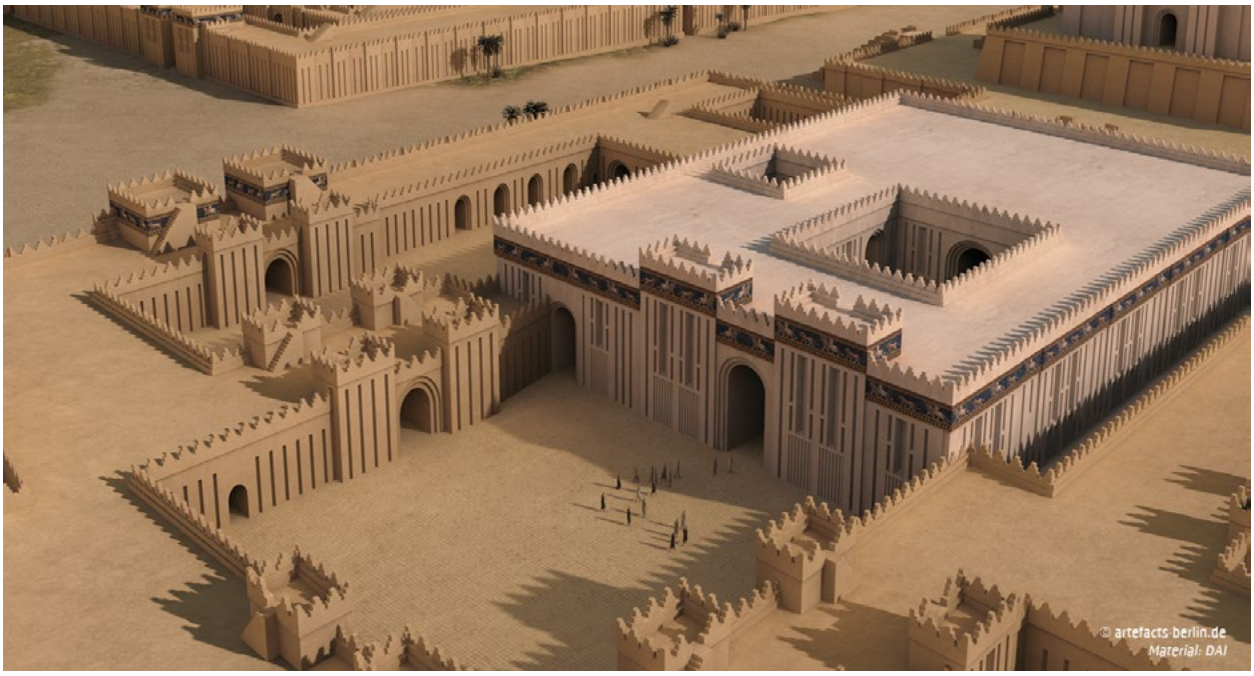


Figure 12. Reconstruction of the Anu-Antum Temple at Uruk (Iraq) (© artefacts-berlin.de; Material: German Archaeological Institute).

6 Seleucid Era: A revival?

During the Seleucid Period (302–129 BC), the southern Mesopotamian city of Uruk was an important religious centre. Two enormous temple complexes, the Bit Resh with its adjoining ziggurat and the Irigal, revived the older Babylonian architectural tradition with respect to both plan and decor. Both sacred complexes were decorated with glazed bricks bearing ornamental and figural motifs as well as inscriptions.

The excavators of the Anu-Antum Temple in the centre of the Bit Resh complex, erected in 202 BC under Anu-uballit Kephalon, the head of the temple administration, found fragments of glazed bricks at the foot of the temple's exterior walls. With these fragments, they postulated the existence of a glazed brick frieze below the roof edge, consisting of yellow lions and winged white lion-griffins striding right and left, and several framing ornamental bands.[49] Further fragments belonging to a similar frieze were also found at the contemporaneous Irigal sanctuary. The main cella of Irigal was decorated with deep-blue glazed bricks and an Aramaic inscription in white glaze. Positioning the frieze on the entablature was clearly an inspiration from the *peripteros* in Greek religious architecture, though the iconography and the chosen manufacture technique remained within the Ancient Near Eastern tradition (Figure 12).[50]

7 Future outlook for research on glazed bricks

There are still hosts of yet unanswered questions about the production, installation, conservation, and preservation of glazed bricks. Furthermore, numerous glazed bricks from excavations in the 19th and early 20th centuries, still today, remain unpublished. Higher standards in documenting excavation contexts may lead to drawing far-reaching conclusions and rethinking theses which until recently have been taken for granted. In addition, new and more easily accessible probing methods as well as new imaging technologies may result to new insights and headways on other questions. This workshop on the glazed brick decoration of the Ancient Near East therefore marks a starting point only for coming research on this complex but often neglected group of objects.

Further interdisciplinary exchange of information and experience about scientific analysis methods, appropriate conservation measures, and optical imaging and visualisation techniques are urgently needed. We therefore trust the ongoing and renewed studies of long-established findings as well as the abundant flow of new evidence pertaining to glazed bricks will finally move these objects back into their erstwhile splendour as an epitome of the Ancient Near East's architectural decoration from the 2nd millennium BC onward.

[49] Kose 1998: 162.
[50] Kose 2013.

Authors

Dr Anja Fügert
Deutsches Archäologisches Institut
Podbielskiallee 69–71
14195 Berlin
Germany
anja.fuegert@dainst.de

Dr Helen Gries
Vorderasiatisches Museum Berlin
Geschwister-Scholl-Straße 6
10117 Berlin
Germany
h.gries@smb.spk-berlin.de

References

Afifi, R. and R. Heidari 2010. Reflections on glazed bricks from Rabat Tepe II, Iran, in A. Kosyan, A. Petrosyan and Y. Grekyan (eds) Urartu and its Neighbours: Festschrift N. Harutyunyan. *ARAMAZD: Armenian Journal of Near Eastern Studies* 5 (2): 152–187.

Amiet, P. 1976. Disjecta membra aelamica: le décor architectural en briques émaillées a Suse. *Arts Asiatiques* 32: 13–28.

Andrae, W. 1923. *Farbige Keramik aus Assur und ihre Vorstufen in altassyrischen Wandmalereien*. Berlin: Scarabeus.

Askari Chaverdi, A., P. Callieri and E. Matin 2016. Tol-e Ajori: A monumental gate of the Early Achaemenian Period in the Persepolis area. The 2014 excavation season of the Iranian-Italian project 'From Palace to Town,' with an appendix by Gian Pietro Basello, 'A Fragment of Another Inscribed Glazed Brick from Tol-e Ajori'. *Archäologische Mitteilungen aus Iran und Turan* 46: 223–254.

Barag, D. 1970. Mesopotamian Core-Formed Glass Vessels (1500–500 B.C.), in A.L. Oppenheim (ed.), *Glass and glassmaking in ancient Mesopotamia: An edition of the cuneiform texts which contain instructions for glassmakers with a catalogue of surviving objects*. (The Corning Museum of Glass Monographs 3): 131–199. Corning, NY: Corning Museum of Glass.

CAD 1956–2010. *The Assyrian Dictionary of the Oriental Institute of the University of Chicago*, A.L. Oppenheim and E. Reiner (eds), Chicago: Oriental Institute.

Campbell Thompson, R. and R.W. Hutchinson 1931. The Site of the Palace of Ashurnasirpal at Nineveh, Excavated in 1929–30 on Behalf of the British Museum. *Annals of Archaeology and Anthropology* 18: 79–112.

Caubet, A. 2012. A Matter of Strategy, Taste or Choice? Glazed Clay versus Siliceous Faience, in M. Gruber, Sh. Aḥituv, G. Lehmann and Z. Talshir (eds) *All the Wisdom of the East: Studies in Near Eastern Archaeology and History in Honor of Eliezer D. Oren* (Orbis Biblicus et Orientalis 255): 157–167. Göttingen: Vandenhoeck & Ruprecht; Fribourg: Academic Press.

Cholidis, N., U. Dubiel and L. Martin 2010. Zusammenfassung, in N. Cholidis and L. Martin (eds), *Tell Halaf. Im Krieg zerstörte Denkmäler und ihre Restaurierung* (Tell Halaf V): 337–363. Berlin, New York: De Gruyter.

Clayden, T. and B. Schneider 2015. Assurbanipal and the Ziggurat at Nippur. *Kaskal* 12: 349–382.

Daucé, N. 2013. The Ornamental Bricks, in J. Perrot (ed.) *The Palace of Darius at Susa: The Great Royal Residence of Achaemenid Persia*: 305–320. London: I.B. Tauris.

Daucé, N. 2018. The industry of vitreous materials in Elam, in J. Álvarez-Mon, G.P. Basello and Y. Wicks (eds) *The Elamite World:* 568–584. Abingdon and New York: Routledge.

Finkel, I. and J.E. Reade 1996. Assyrian hieroglyphs. *Zeitschrift für Assyriologie und Vorderasiatische Archäologie* 86: 244–268.

Fügert, A. and H. Gries 2019. 'The men who wrought the baked brick, those were Babylonians': A brief history of molded and glazed bricks, in A. Amrhein, C. Fitzgerald and E. Knott (eds) *A Wonder to Behold: Craftsmanship and the Creation of Babylon's Ishtar Gate*: 41–53. Princeton: Princeton University Press.

Ghirshman, R. 1966. *Tchoga Zanbil, vol. I: La Ziggurat* (Mémoires de la Délégation Archéologique en Iran XXXIX). Paris: Geuthner.

Grayson, A.K. 1987. *Assyrian Rulers of the Early First Millennia BC (to 1115 BC)* (The Royal Inscriptions of Mesopotamia, Assyrian Periods 1). Toronto: University of Toronto Press.

Gries, H. and A. Fügert 2019. The glazed brick façades from Ashur in the *Vorderasiatisches Museum* Berlin in context of the north-western Iranian glazed bricks, in Y. Hassanzadeh, A.A. Vahdati and Z. Karimi (eds) *Proceedings of the international Conference on the Iron Age in Western Iran and the Neighbouring Regions*: 258–272. Teheran and Sanandaj: Research Institute of Cultural Heritage and Tourism, National Museum of Iran, Kurdistan Province ICHHTO.

Hassanzadeh, Y. 2006. The glazed bricks from Bukan (Iran): New insights into Mannaean art. *Antiquity* 80: 307.

Hassanzadeh, Y. and J. Curtis 2018. Western Iran in the Iron Age, in G. Brereton (ed.) *I am Ashurbanipal, King of the World, King of Assyria*: 166–179. New York: Thames and Hudson; London, England: in collaboration with the British Museum.

Hassanzadeh, Y. and H. Mollasalehi 2011. New evidence for Mannean art: An assessment of three glazed tiles from Qalaichi (Izirtu), in J. Álvarez-Mon and M.B. Garrison (eds) *Elam and Persia*: 407–417. Winona Lake, IN: Eisenbrauns.

Hassanzadeh, Y. and H. Mollasalehi 2017. *An Archaeological Exploration of the Mannaean Site of*

Qalaichi on the Basis of Analyses of Glazed Bricks from the National Museum of Iran and other Collections (in Persian). Teheran: National Museum of Iran.

Heim, S. 1989. Glazed Architectural Elements from Elam and Related Materials from Luristan. Unpublished PhD dissertation, New York University.

Heim, S. 1992. Royal and religious structures and their decoration, in P. Harper, J. Aruz and F. Tallon (eds) *The Royal City of Susa: Ancient Near Eastern Treasures in the Louvre*: 123–127. New York: Metropolitan Museum of Art.

Henderson, J. 2013. *Ancient Glass: An Interdisciplinary Exploration*. Cambridge: Cambridge University Press.

Herodotus. *Histories*, translation by A.D. Godley 1920. Cambridge: Harvard University Press.

Kaniuth, K. 2013. Spätbabylonische Glasurziegelreliefs aus Borsippa. *Mitteilungen der Deutschen Orient-Gesellschaft* 145: 53–82.

Kaniuth, K. 2018. The transition from Neo-Babylonian to Achaemenid glazed brick decoration, in K. Kaniuth, D. Lau and D. Wicke (eds) *Übergangszeiten: Altorientalische Studien für Reinhard Dittmann anlässlich seines 65. Geburtstag*: 343–360. Münster: Zaphon.

Kent, R.G. 1950. *Old Persian: Grammar, Texts, Lexicon*. New Haven: American Oriental Society.

Koldewey, R. 1918. *Das Ischtar-Tor in Babylon: nach den Ausgrabungen durch die Deutsche Orient-Gesellschaft* (Wissenschaftliche Veröffentlichungen der Deutschen Orient-Gesellschaft 32). Leipzig: Hinrichs.

Koldewey R. 1931. *Die Königsburgen von Babylon. 1. Teil. Die Südburg* (Wissenschaftliche Veröffentlichungen der Deutschen Orient-Gesellschaft 54). Leipzig: Heinrichs.

Kose, A. 1998. *Uruk: Architektur, Vol. 4: Von der Seleukiden- bis zur Sasanidenzeit (mit einem Beitrag von Hans-Georg Bartel)*. Mainz: Philipp von Zabern.

Kose, A. 2013. Das seleukidische Resch-Heiligtum, in N. Crüsemann, M. van Ess, M. Hilgert and B. Salje (eds) *Uruk: 5000 Jahre Megacity*: 333–339. Petersberg: Michael Imhof Verlag.

Langdon, S. 1912. *Die neubabylonischen Königsinschriften* (Vorderasiatische Bibliothek 4). Leipzig: Hinrichs.

Langenegger F., K. Müller and R. Naumann 1950. *Tell Halaf, vol. 2: Die Bauwerke*. Berlin: De Gruyter.

Loud, G. and C.B. Altman 1938. *Khorsabad II, The Citadel and the Town* (Oriental Institute Publication 40). Chicago: The University of Chicago Press.

Marzahn, J. 1995. *The Ishtar Gate: The Processional Way, The New Year Festival of Babylon.* Mainz: Philipp von Zabern.

Moorey, P.R.S. (1994) 1999. *Ancient Mesopotamian Materials and Industries: The Archaeological Evidence.* Oxford: Clarendon Press. Reprint, Winona Lake, IN: Eisenbrauns.

Nadali, D. 2006. Esarhaddon's glazed bricks from Nimrud: The Egyptian campaign depicted. *Iraq* 68: 109–119.

Nadali, D. 2008. Assyrian high-relief bricks from Nineveh and the fragments of a royal name. *Iraq* 70: 87–104.

Nunn, A. 1988. *Die Wandmalerei und der glasierte Wandschmuck im Alten Orient* (Handbuch der Orientalistik, 7. Abt., 1/2, Lfg. 6). Leiden: Brill.

Paynter, S. and M. Tite 2001. The Evolution of Glazing Technologies in the Ancient Near East and Egypt, in A.J. Shortland (ed.) *The Social Context of Technological Change: Egypt and the Near East, 1650–1150 BC*: 239–254. Oxford: Oxbow Books.

Pedersén, O. 2018. The Ishtar Gate area in Babylon: From old documents to new interpretations in a digital model. *Zeitschrift für Orient-Archäologie* 11: 160–178.

Razmjou, S. 2004. Glasierte Ziegel der achämenidischen Periode, in D. Stöllner (ed.) *Persiens Antike Pracht: Bergbau–Handwerk–Archäologie*: 382–393. Bochum: Deutsches Bergbau-Museum.

Reade, J.E. 1963. A glazed-brick panel from Nimrud. *Iraq* 25: 38–47.

Reade, J.E. 1970. The Design and Decoration of Neo-Assyrian Public Buildings. Unpublished PhD dissertation, University of Cambridge.

Reade, J.E. 1979. Assyrian architectural decoration: Techniques and subject-matter. *Baghdader Mitteilungen* 10: 17–49.

Reade, J.E. 1995. The Khorsabad glazed bricks and their symbolism, in A. Caubet (ed.) *Khorsabad, le palais de Sargon II, roi d'Assyrie: actes du colloque organisé au Musée du Louvre par le Service Culturel les 21 et 22 janvier 1994 sous la direction d'Annie Caubet:* 225–251. Paris: La Documentation Française.

Reade, J.E. and I. Finkel 2014. Between Carchemish and Pasargadae: Recent Iranian Discoveries at Rabat, in S. Gaspa, A. Greco, D. Morandi Bonacossi, S. Ponchia and R. Rollinger (eds) *From Source to History: Studies on Ancient Near Eastern Worlds and Beyond*: 581–596, 806–810. Münster: Ugarit-Verlag.

Roaf, M. and A. Zgoll 2001. Assyrian Astroglyphs: Lord Aberdeen's Black Stone and the Prisms of Esarhaddon. *Zeitschrift für Assyriologie und Vorderasiatische Archäologie* 91 (2): 264–295.

Salimi, S., S. Ebrahimipour and O. Sorkhabi 2019. Some Mannean glazed bricks from the Little Zab river basin, Northwestern Iran. *ARAMAZD: Armenian Journal of Near Eastern Studies* 13 (1): 101–110.

Schmid, H. 1995. *Der Tempelturm Etemenanki in Babylon* (Baghdader Forschungen 17). Mainz: Philipp von Zabern.

Schmidt, K. 2019. *Glass and Glass Production in the Near East during the Iron Age. Evidence from objects, texts and chemical analysis*. Oxford: Archaeopress.

Thomas, A. 2016. Fragments de briques à glaçure polychrome provenant du décor mural du palais du roi Sargon II, in A. Thomas (ed.) *L´histoire commence en Mésopotamie*: 205–207. Lens: Musée du Louvre-Lens/Gand/Snoeck.

Tite, M.S., A.J. Shortland, B. McCarthy and S. Paynter 2008. Production of glazed pottery and brickwork

in the Near East, in M. Tite and A.J. Shortland (eds) *Production Technology of Faience and Related Early Vitreous Materials* (Oxford University School of Archaeology Monograph 72): 187–198. Oxford: Oxford University School of Archaeology.

Van Soldt, W.H., C. Pappi, A. Wossink, C.W. Hess and K.M. Ahmed 2013. Satu Qala: A Preliminary Report on the Seasons 2010–2011. *Anatolica* 39: 197–239.

Wetzel, F., E.F. Schmidt and A. Mallwitz 1957. *Das Babylon der Spätzeit* (Wissenschaftliche Veröffentlichungen der Deutschen Orient-Gesellschaft 62). Berlin: Gebr. Mann.

Whyte, A., V. Muros and S. Barack 2004. "Brick by Brick": piecing together an 8th century BC façade from Iraq. *AIC Objects Specialty Group Postprints* 11: 172–189.

Woolley, C.L. 1952. *Carchemish: report on the excavations at Djerabis (Jerablus) on behalf of the British Museum. Part III, The excavations in the Inner Town*. London: Trustees of the British Museum.

Zeßin, M. 2019. Reading between the lines: Fitters' marks in the Ancient Near East, in A. Amrhein, C. Fitzgerald and E. Knott (eds) *A Wonder to Behold: Craftsmanship and the Creation of Babylon's Ishtar Gate*: 81–89. Princeton: Princeton University Press.

Chapter 2: Scientific Research on the Iron Age Glazes from Iran and Iraq: Past and Future

Parviz Holakooei

Abstract: This paper provides an overview of the scientific works published on the Iron Age (IA) glazed materials from Iran and Iraq. Scientific studies performed from the 1960s onwards are reviewed, and past and current approaches in studying early Mesopotamian vitreous materials are reviewed. The chemical composition of glazes' matrix, opacifiers and inclusions in the IA glazes found in Iran and Iraq are presented and discussed.

Keywords: Iron Age; Iran; Iraq; Glaze Technology; Pyrotechnology; Opacifier

1 Introduction

Early glaze production in Mesopotamia is reported from various archaeological sites over a fairly large geographical area, covering northern and southern parts of today's Iran and Iraq (Figure 1). Mesopotamian glaze industry is known to begin in the Late Bronze Age at Nuzi,[1] Tell Brak,[2] Tall-e Rimah[3] and Tell Taya[4] in the north, and at Failaka,[5] Nippur,[6] Tchogha Zanbil, Tall-i Malyan, Larsa, and Tello[7] in the south. Iron Age (IA) glaze production seems to have appeared first at Hasanlu in Iran[8] and flourished during the Neo-Assyrian Period[9] in Northern Iraq. Subsequently, parallel to the Neo-Elamite glaze production in the south, the 7th and 8th centuries BC glazes occurring at Qalaichi,[10] Tepe Rabat[11] and Ziwiye[12] reveal a significant demand for glazed objects in the northern lands of Mesopotamia. The Neo-Babylonian glazed objects at Babylon[13] and Borsippa[14] and the somewhat later Achaemenid glazed materials at Toll-e Ajori,[15] Susa,[16] Babylon,[17] and Persepolis[18] in Southern Iran and Iraq seem to mark the expiry of this industry towards the middle of the 1st millennium BC.

The IA in Mesopotamia coincides with important advances in pyrotechnology of which developments in the glaze production are of major archaeological significance. Shifting from copper to iron production not only influenced metallurgical processes, but also considerably impacted glazing technologies. As evidence, various colours and opacifiers were introduced to the glaze industry, and a variety of glazed materials was employed as tableware, architectural decorations, and decorative and ritual objects. All these achievements to some extent seem to have occurred in light of new advances in other pyrotechnological industries, such as metallurgy and glass-making. Although the relationship between early glazes and glass production in Bronze Age Mesopotamia has been discussed,[19] the available information on the influence of the IA pyrotechnology on glaze production in the Near East yet remains scanty.

2 Previous studies

The fact is that our knowledge about the developments achieved in the IA glaze industry is confined to a limited number of published scientific articles,[20] two edited volumes[21] and a catalogue[22] aiming to draw an integrated picture of early glazing technologies. Although scholarly studies on early Mesopotamian glazed objects had already cropped up in the mid-19th century,[23] including also scientific attempts to reproduce them,[24] it wasn't before the mid-1960s that the first systematic studies on early Mesopotamian glazes were carried out,[25] which culminated in the 1980s. With the development of new methods of analysing ancient artefacts, scientific studies on early Mesopotamian glazed materials have gained more attention in recent years (Figure 2).

[1] Kirk 2009; Shortland *et al.* 2008; Shortland *et al.* 2018; Vandiver 1982, 1983.
[2] Henderson 1997.
[3] Pollard and Moorey 1982.
[4] Bimson 1973
[5] Pollard and Højlund 1983.
[6] Hedges 1976.
[7] Caubet 2007.
[8] Stapleton 2011.
[9] Freestone 1991.
[10] Hassanzadeh and Mollasalehi 2011.
[11] Holakooei *et al.* 2017a.
[12] Barnett 1956.
[13] Matson 1986.
[14] Kaniuth 2013; Holakooei *et al.* 2017b.
[15] Askari Chaverdi *et al.* 2013.
[16] Holakooei 2013.
[17] Haerinck 1973.
[18] Holakooei *et al.* 2017a.
[19] Paynter 2009.
[20] See Holakooei 2014 and references therein.
[21] Bimson and Freestone 1987; Tite and Shortland 2008.
[22] Caubet 2007.
[23] Bigot 1913; Brongniart 1844: 89; Layard 1853: 140.
[24] Moore 1948.
[25] Schulz 1965.

Figure 1. Various archaeological sites in Iran and Iraq with evidence of early glaze production. The archaeological sites not marked in *italic* have received insufficient scientific attention.

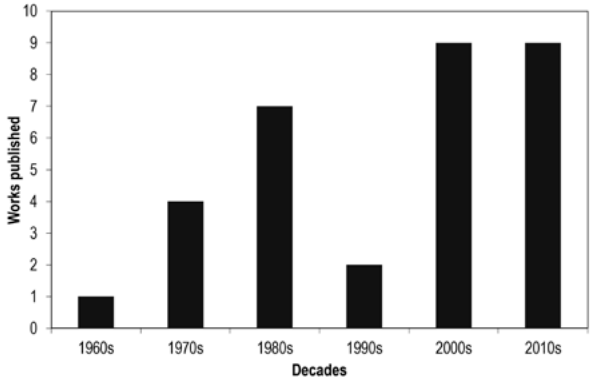


Figure 2. Scientific works published on early glazed materials from Iran and Iraq.

Over the past 50 years, more than 30 studies involved several analytical methods to technologically characterise around 600 occurrences of early Mesopotamian glazes (Figure 3). They comprise X-ray fluorescence spectrometry (XRF), X-ray diffractometry (XRD), optical emission spectrometry (OES), atomic absorption spectroscopy (AAS), different methods of isotope analysis, micro-Raman spectroscopy (μ-Raman), inductively coupled plasma (ICP) coupled with spectroscopic techniques, scanning electron microscopy (SEM) coupled with energy dispersive X-ray spectrometry (EDS) or wavelength dispersive X-ray spectroscopy (WDS), and electron microprobe analysis (EMPA). The diversity of the scientific methods implemented over the last decades has resulted to the implementation of several analytical approaches for a better understanding of early glaze technology in Mesopotamia (Figure 3). However, these studies have sometimes failed to create a dynamic contextualisation of the scientific data for sustaining the archaeological discussion. This has been due mostly to the nature of analytical methods on the one hand and the highly weathered conditions of the glazes on the other. As demonstrated in Figure 3, most of the scientific data available on the IA glazes from Iran and Iraq were obtained from XRF measurements performed on unprepared, weathered glaze surfaces in air, which leads to a considerable loss of the data's quality and the failure to measure low atomic weight elements. This led to a series of scientific studies aiming at characterising the glazes qualitatively or semi-quantitatively on the basis of some of their composing elements, mainly the colouring agents and the opacifiers. In fact, the proportion of glazes analysed with quantitative elemental analysis such as ICP-based methods, EMPA, OES, and AAS is still trivial (about 20% of all analysed

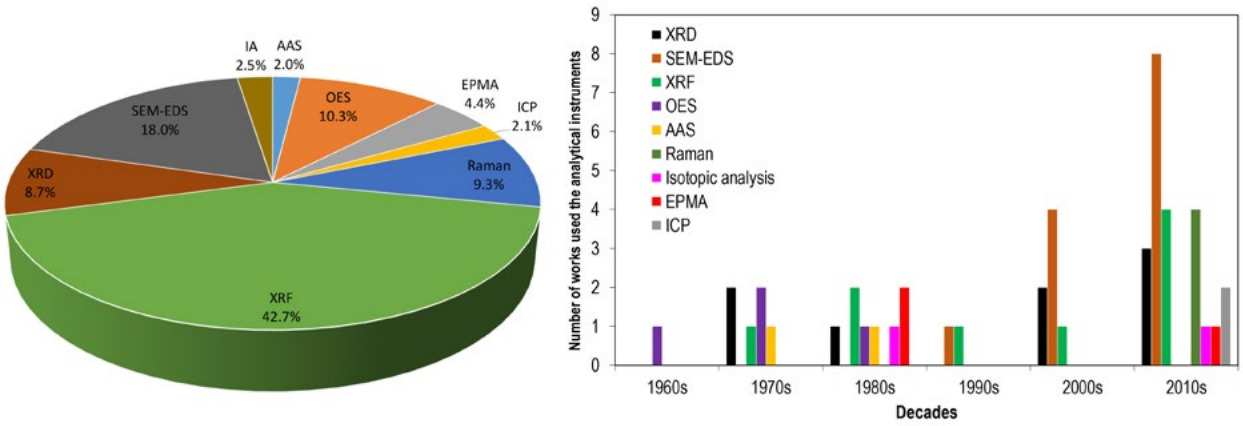


Figure 3. Analytical studies performed on early glazes from Iran and Iraq as from the 1960s.

glazes) (Figure 3). As shown in Figure 3, from the 1990s onwards, the use of SEM-EDS for providing (semi-) quantitative compositional data from IA glazes from Iran and Iraq has increased progressively. SEM-EDS provides reasonably quantitative data from glazes and opacifiers, so that about 20% of the compositional data of IA glazes have been obtained using this method.

On the other hand, there is an informational void regarding the formation of opacifiers. This may owe to the limited number of appropriate scientific methods capable of determining these opacifiers. The identification of Early Mesopotamian glaze opacifiers relies for the most on the glazes' elemental compositions, which are established through qualitative, semi-quantitative, and quantitative elemental analyses, such as XRF, EMPA, ICP-based methods, AAS, OES and SEM-EDS. The opacifiers of only less than 20% of the IA Mesopotamian glazes have been systematically identified using analytical tools, such as XRD and μ-Raman capable of determining the mineralogical composition of the crystalline components embedded inside the glazes (Figure 3). The fact is that the chemical composition of the glaze matrix itself containing the opacifiers is crucial for the formation of the latter. As recent scientific studies have shown, more than one opacifier may be contained in an IA Mesopotamian glaze (see also section '3.2.1 Opacifiers').[26]

3 Chemistry of the Iron Age glazes from Iran and Iraq

3.1 Glaze's matrix

3.1.1 Source of alkalis

Most early Mesopotamian glazes are severely weathered, so that quantitative data on the glaze matrix are often less reported (Figure 3). The analytical data published on the IA glazes point to the fact that they are almost exclusively alkali-lime glazes (Figure 4), representing variable Na_2O contents between 12 to 20 wt% and lower than 2 wt% from PbO. However, Pb-based opacifiers (see '3.2.1 Opacifiers') include variable Pb amounts into the alkali-lime glazes (Figure 4). Subtracting the amount of PbO needed for satisfying the Sb content in the Pb-bearing opacifier (i.e. lead antimonate, $Pb_2Sb_2O_7$), the variable amount of PbO from 2.5 to 12.5 wt% classifies these glazes as low lead-alkali to lead-alkali glazes.[27] The occurrence of Pb in the antimony-opacified glazes may also be linked to the Sb source of the opacifiers used in the glazes (for further details, see '3.2.1 Opacifiers').

On the other hand, according to the MgO *vs.* K_2O bivariate plot presented in Figure 5, the source of alkali in the entire set of glazes analysed so far is almost certainly plant ash. As discussed by Tite *et al.* (2006), apart from Na_2O plant ash introduces variable amounts of K_2O and MgO, to the glaze. Although the bivariate plot of Figure 5 is mostly used for describing the source of alkali in ancient glass objects,[28] it can be used for roughly explaining the source of alkalis in the ancient glaze, despite the fact that the chemical composition of an archaeological glaze may be influenced by both the body on which it is applied and the emitted waste gases from the fuel inside the kiln. In any case, it can be argued that the higher than 1.5 wt% K_2O and lower than 3.5 wt% MgO values for the Hasanlu and Achaemenid Susa glazes are consistent with low MgO and K_2O plant ash glass from the west of the Euphrates, and that on the other hand, the higher than 3.5 wt% MgO and K_2O values in a group of IA glazes from Iran and Iraq (mainly Babylon and Borsippa) are connected to the fact that their origins are in the vitreous materials from the eastern lands of the Euphrates.[29] The different source of alkalis in the IA glazes from Iran and Iraq is also reflected in the composition of the opacifiers embedded

[26] Holakooei *et al.* 2017a.

[27] Tite 2011.

[28] Sayre and Smith 1961.

[29] Freestone 2006.

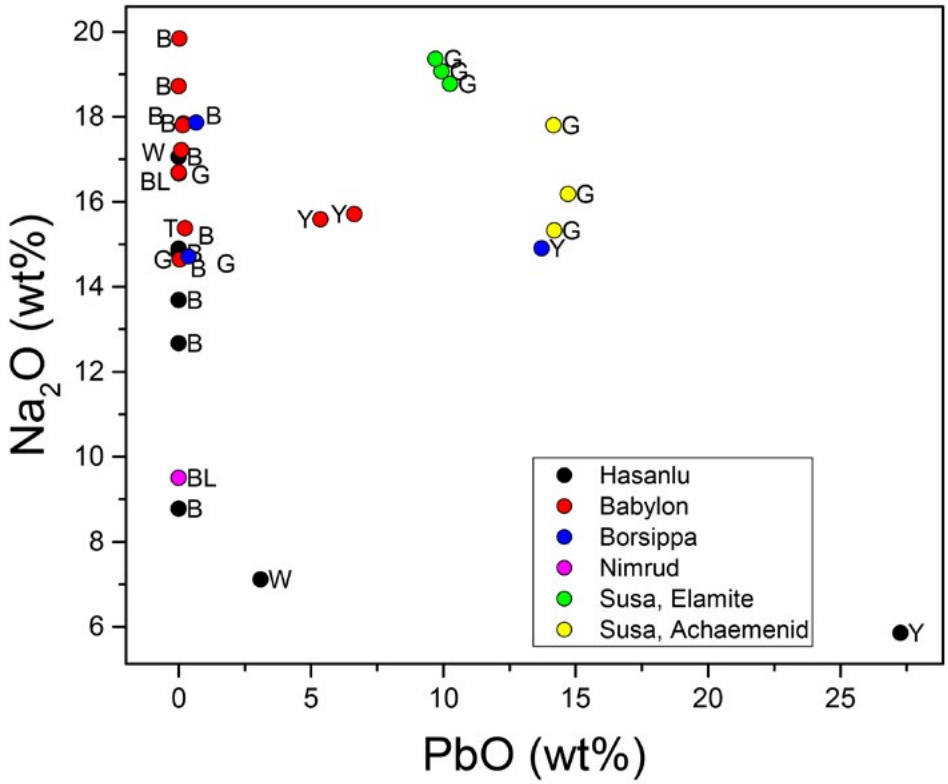


Figure 4. PbO *vs.* Na_2O within the IA glazes analysed from Iran and Iraq. Legend: Y, W, B, BL and G stand for yellow, white, blue, black, and green glazes, respectively (data from Freestone 1991; Holakooei 2013, 2014; Kaniuth 2013; Matson 1986; Stapleton 2011). (All the compositional data have been obtained through SEM-EDS, except for the data furnished by Matson and Stapleton that have been determined with EMPA).

inside the glazes (for further details, see '3.2.1.1 White opacifiers').

3.1.2 Colouring agents

Colouring agents of the Mesopotamian IA glazes are linked to Fe and Cu and various proportions of both. Although the use of cobalt in the Babylonian and Achaemenid glazes from the Late IA has been reported,[30] the blue-greenish colour was also achieved through variable amounts of Fe and Cu. Black colour has been linked either to Fe-Mn or Fe compounds.[31] The black (e.g. the Achaemenid black glazes) to dark brown colour glazes (e.g. the Elamite brown glazes) were usually used as separating glazes, in order to avoid blending between adjoining glazes before and after firing (Figure 6). The dark coloured relief glazes contain high quartz contents that enhance the softening point of the glazes.[32] Other colours like yellow and white are in fact opacified glazes which are discussed in '3.2.1 Opacifiers'. Orange glazes have been achieved by mixing red haematite and a yellow opacifier.[33]

3.1.3 Isotopic studies and issues of provenance

Isotope studies on early Mesopotamian glaze objects are scant. Brill (1986) published an attempt in this regard on only three glazes from Babylon. He contextualised the $^{208}Pb/^{206}Pb$ *vs.* $^{207}Pb/^{206}Pb$ of these three samples within a group of *c.* 40 glass and glaze samples from Mesopotamia and Iran and argued that the lead isotope signature of the Babylonian glazes is closer to Southern Mesopotamian lead ores than ones in the north. A recently published study sheds further light on this issue. Rodler *et al.* (2019) employed copper and lead isotope studies and concluded that the ores from the Pontic area and the Taurus Mountains in Turkey are possible sources for metal oxides used as colorants in the Babylonian glazes.

3.2 Inclusions

Inclusions in Mesopotamian glazes comprise different types of materials that either may have been added to the glazes or have formed as post-production inclusions. Opacifiers are shown to have been added to the glaze batch or to have been formed during firing, while metallurgical relicts are from those important inclusions testifying to the influence of

[30] Holakooei 2013.
[31] Freestone 1991; Holakooei 2013; Holakooei *et al.* 2017b.
[32] Holakooei 2013; 2014.
[33] Holakooei 2013.

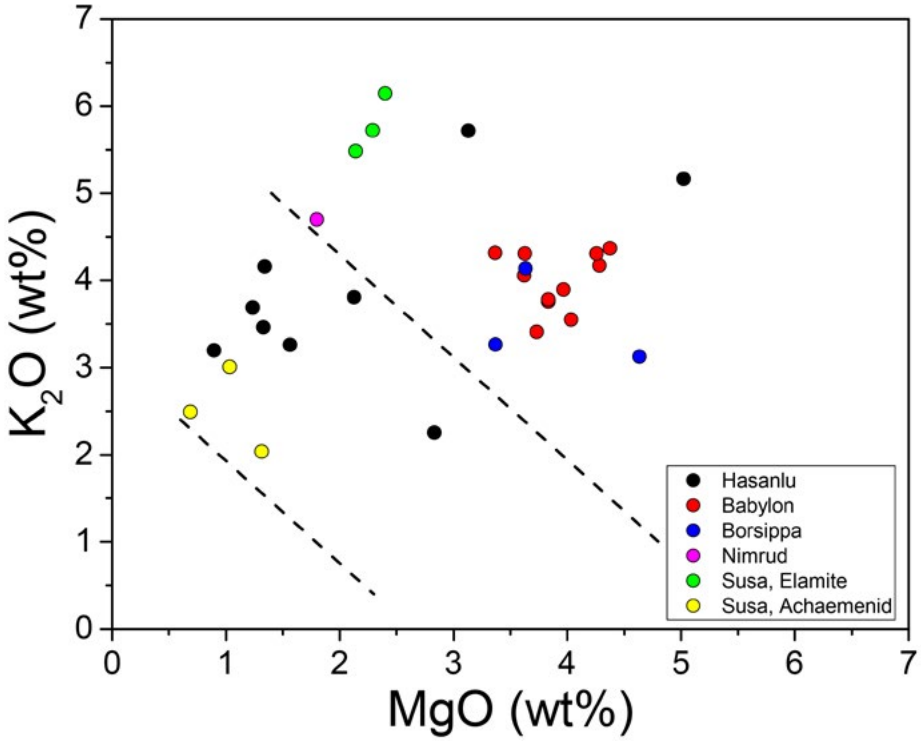


Figure 5. MgO *vs.* K_2O on the compositional data of the IA glaze from Iran and Iraq (data from Freestone 1991; Holakooei 2013, 2014; Kaniuth 2013; Matson 1986; Stapleton 2011). (All the compositional data have been obtained through SEM-EDS except for the data furnished by Matson and Stapleton that have been determined with EMPA).

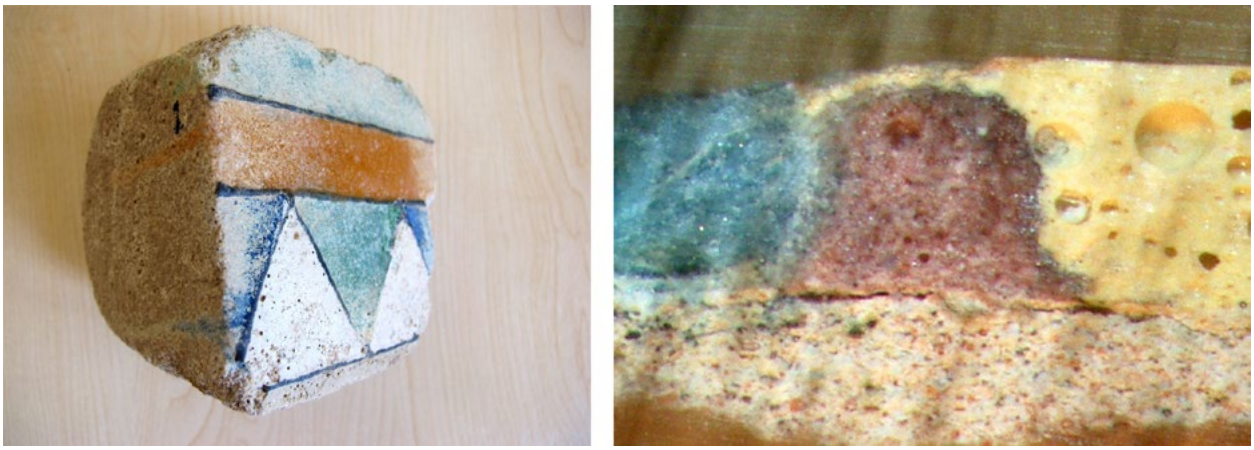


Figure 6. (*left*) The dropping blue and orange glazes on the lateral wall of an Achaemenid glazed brick from Susa show that the Achaemenid brick-makers were aware of mixing glazes. The black relief glaze could prevent the glazes from blending. (*right*) Section of an Elamite glazed brick from Susa evidences the role of a brown relief glaze in separating turquoise and yellow glazes.

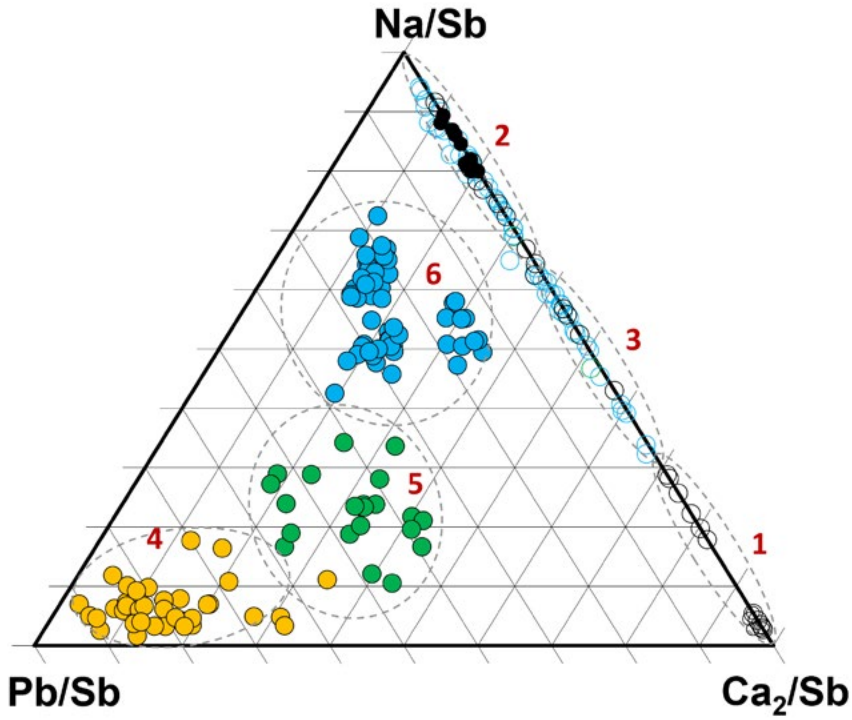


Figure 7. Ternary diagram based on the EDS micro-analyses of various opacifiers in the glazes from Tepe Rabat, Persepolis, Nimrud, and Hasanlu (yellow circles: yellow opacifiers from Tepe Rabat, Persepolis, and Hasanlu; void turquoise circles: opacifiers in turquoise glaze from Tepe Rabat; filled turquoise circles: opacifiers in turquoise glaze from Persepolis; black void circles: white opacifiers in white glazes from Nimrud and Tepe Rabat; black filled circles: white opacifiers in white glazes from Persepolis; green filled circles: opacifiers in green glazes from Persepolis; green void circles: opacifiers in green glazes from Tepe Rabat.
Data from Holakooei *et al.* (2017a, 2017b).

other pyrotechnological industries. Some inclusions, nevertheless, are deterioration products formed by environments linked to burial contexts.

3.2.1 Opacifiers

The systematic study of early opacifiers started with the pioneering contribution of Turner and Rooksby (1959) who scientifically evidenced the use of antimony-based opacifiers in ancient glass. Accordingly, a comparative study on the opacifiers occurring in various glazes from Tepe Rabat, Persepolis, Nimrud, Hasanlu, and Borsippa revealed the presence of antimony-based white and yellow opacifiers (Figures 7 and 8). While the white opacifier is reported to be either calcium antimonite ($CaSb_2O_6$) or sodium antimonate ($NaSbO_3$), lead antimonate ($Pb_2Sb_2O_7$) has been reported to be the cause for yellow opacification. It has been shown that an opacifier or a mixture of opacifiers may occur in a single glaze.[34]

3.2.1.1 White opacifiers

While a large group of white opacifiers occurring in the glazes from Hasanlu, Nimrud, and Borsippa consists of calcium antimonate (group 1 in Figure 7; spectrum 1 in Figure 8), the main white opacifier in the glazes from Persepolis and Tepe Rabat turned out to be sodium antimonate (group 2 in Figure 7; spectrum 2 in Figure 8). It is interesting to mention that some glazes from the above archaeological sites have been opacified with both calcium and sodium antimonate (group 3 in Figure 7; spectrum 3 in Figure 8).

It has been argued that calcium antimonate is crystallised in the alkali-lime glassy matrix of a glaze and the opacification is achieved as a result of separating calcium antimonate crystals in the glaze at the expense of consuming the glaze's calcium content.[35] Antimony could be added to the alkali-lime glaze batch in the form of antimony sulphide (i.e. stibnite, Sb_2S_3) or metallic antimony, since evidence for metallic

[34] Holakooei 2013, 2014; Holakooei *et al.* 2017a, 2017b.

[35] Lahlil *et al.* 2010.

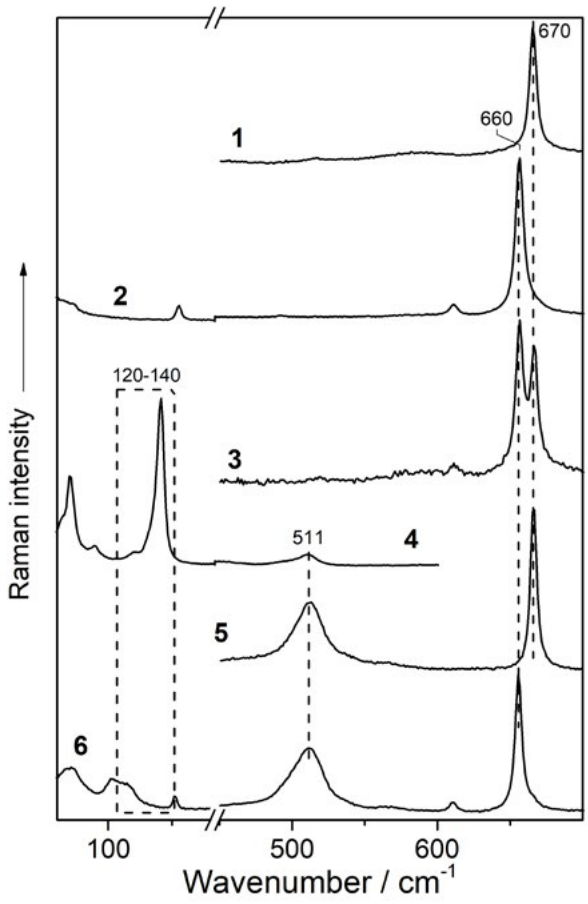


Figure 8. The Raman spectra from the groups of opacifiers highlighted in Figure 7. Each spectrum corresponds to the same group name in Figure 7 (The Raman bands at 660 and 670 cm^{-1} correspond to the strongest Raman bands from sodium antimonate (Frost and Bahfenne 2010) and calcium antimonate (Ricciardi *et al.* 2009), respectively. Note the stronger Raman band at 511 cm^{-1} when the Sb:Pb ratio is higher than 1. The Sb:Pb ratio ≤1 gives a higher Raman intensity at the Raman bands from 120 to 140 cm^{-1} (Rosi *et al.* 2009). Data from Holakooei *et al.* (2017a, 2017b).

antimony has been reported from some archaeological sites in Mesopotamia, including Hasanlu, Tello, Tell Leilan, and Assur.[36] Similarly, sodium antimonate has been suggested to be precipitated in glazes with low Ca content.[37] The scattered single crystals of calcium antimonate (Figure 9, *top left*) and sodium antimonate (Figure 4b in Holakooei *et al.* 2017b) strengthen this idea. Thus, it may be argued that the occurrence of sodium and calcium antimonate in a glaze is not a technological choice but that it depends on the glaze's Ca and Na content. Stapleton (2011), however, contends that calcium antimonate crystals in the glass objects from Hasanlu had been made in a step prior to their addition to the glass batch. Large calcium antimonate chunks in a white glaze from Nimrud (Figure 9, *top right*) might support this idea. It should however be emphasised that the calcium antimonate identified in ancient Mesopotamian glazes (i.e. $CaSb_2O_6$) has a different composition with respect to the calcium antimonate reported for ancient glass (i.e. $Ca_2Sb_2O_7$). This may be explained by the higher temperature and longer heating time necessary for making glass.[38]

A discussion around the source of alkalis may arise from the study of antimony-based opacifiers. Since the Ca and Na content of the ancient Mesopotamian glazes is mostly connected with the alkali source of the glazes on the one hand and on the other, the formation of sodium and calcium antimonate is linked to the Na and Ca of the glazes, it may be suggested that the source of alkalis in the glazes from Tepe Rabat and Persepolis is different from those evidenced at Nimrud, Borsippa, and Hasanlu. In other words, whereas the source of alkalis in the glazes from Nimrud, Hasanlu, and Borsippa is plant ash containing higher Ca levels, the alkali content in the glazes from Tepe Rabat and Persepolis is poor in Ca and probably supplied from a different source with lower Ca content (compare Figures 7 and 8). Due to the severe weathering of the glazes from Persepolis and Tepe Rabat, it is however hard to obtain quantitative data, by which the alkali source can be inferred from the glaze composition.

3.2.1.2 Yellow opacifiers

Lead antimonate has been reported as the common yellow opacifier in ancient Mesopotamian glazes.[39] The chemical composition of the yellow opacifier has often been stated to be $Pb_2Sb_2O_7$, comparable with the composition of mineral bindheimite. The Pb:Sb at% ratio in most of the yellow opacified Mesopotamian glazes is close to 1, which testifies to the occurrence of $Pb_2Sb_2O_7$ (group 4 in Figure 7). Raman studies on these opacifiers also support the use of this opacifier in the yellow opacified glazes (spectrum 4 in Figure 8). However, sometimes the Pb:Sb at% ratio in the glazes drops below 1, thus showing higher Sb contents in the composition of the opacifier (groups 5 and 6 in Figure 7; spectra 5 and 6 in Figure 8). Lead antimonate has been reported to occur simultaneously either with calcium antimonate (group 5 in Figure 7; spectrum 5 in Figure 8) or with sodium antimonate (group 6 in Figure 7; spectrum 6 in Figure 8) within the IA Mesopotamian glazes.

It has been debated that lead antimonate could have been prepared separately from an alkali-lime glaze and then added to the glaze batch to create a yellow

[36] Moorey 1994: 242.
[37] Jung and Hauptmann 2004; Tite and Shortland 2004.
[38] Lahlil *et al.* 2010.
[39] Caubet and Kaczmarczyk 1998; Fitz 1982; Hedges and Moorey 1975.

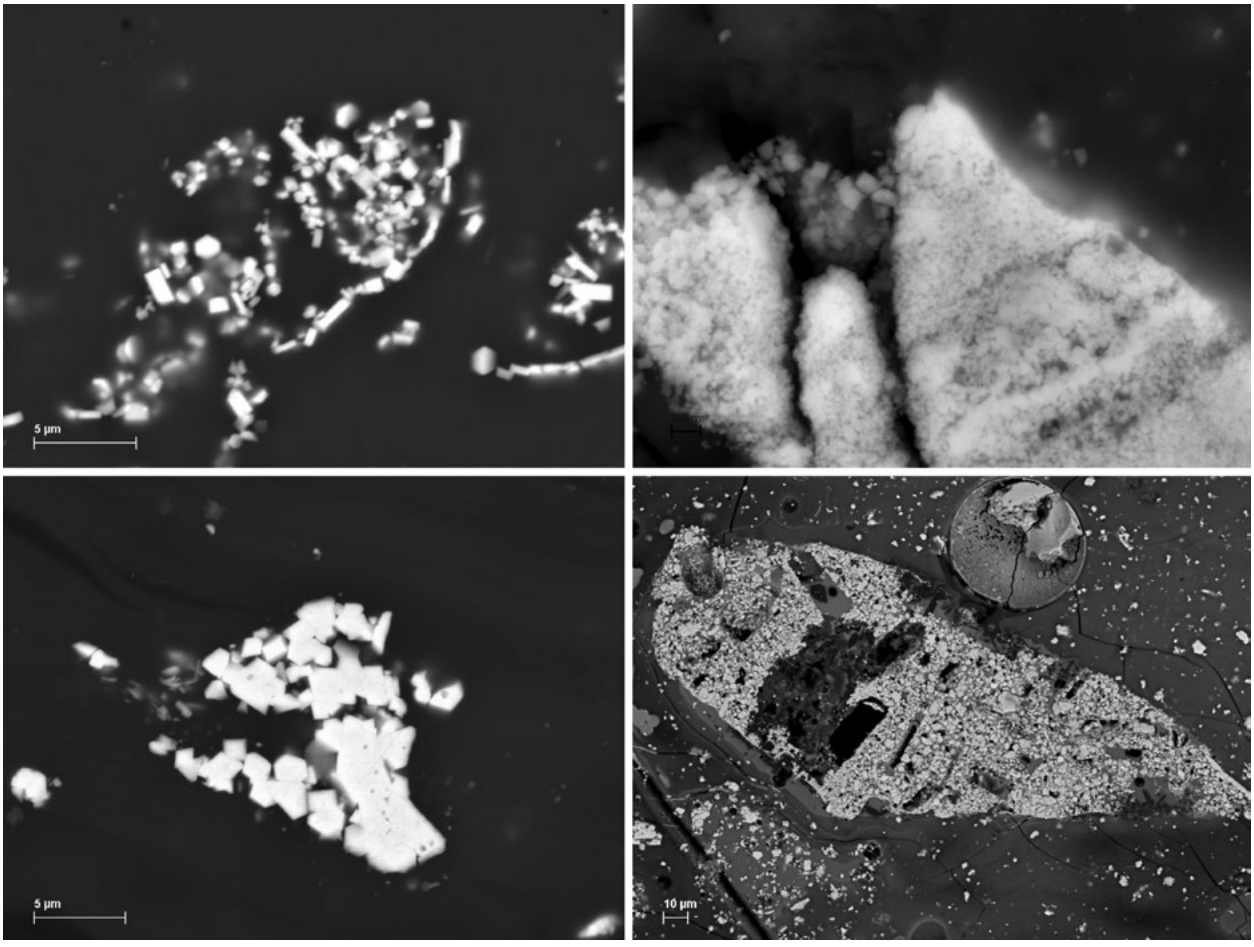


Figure 9. (*top left*) Scattered crystals of calcium antimonate in a white glaze from Nimrud (Metropolitan Museum of Art, accession number 54.117.32) and (*top right*) a chunk of calcium antimonate in a green glaze from Nimrud (Metropolitan Museum of Art, accession number 57.27.25) together with (*bottom left*) scattered crystals of lead antimonate in a yellow glaze from Hasanlu (Metropolitan Museum of Art, accession number 61.100.85), and (*bottom right*) a chunk of lead antimonate in a yellow glaze from Borsippa (Metropolitan Museum of Art, accession number 86.11.412). The SEM micrographs have been obtained from polished and graphite-coated samples under low vacuum using a Zeiss Sigma HD field emission scanning electron microscope at 20 kV).

opacified colour.[40] Large chunks of lead antimony in the yellow opacified glazes support this idea (Figure 9, *bottom right*). Contrary to this suggestion, Stapleton (2011) suggests that the yellow lead antimonate in the vitreous materials from Hasanlu were made by blending plant ash, quartz sand, feldspar, lead ore, and an antimony-bearing material in one and the same step. Dispersed scattered crystals of lead antimonate in the IA glazes from Hasanlu are in favour of this claim (Figure 9, *bottom left*).

Glazes with both lead antimonate and calcium/sodium antimonate (groups 5 and 6 in Figure 7) may indicate that antimony (or stibnite) had been added to the batch of the lead antimonate in excess amounts needed for satisfying the Pb content of the glaze for producing $Pb_2Sb_2O_7$. The excess antimony could then be precipitated in the glaze in the form of sodium or calcium antimonate at the expense of consuming the glaze's calcium or sodium contents. The higher levels of Sb with respect to the Pb content is also evident in the Raman spectra of some Mesopotamian yellow opacifiers (see the higher intensity of the Raman band at 511 cm^{-1} in spectra 5 and 6 in Figure 8). In another possible scenario the source of Sb (e.g. stibnite) introduces some Pb to the glaze. This hypothesis is plausible, as the simultaneous occurrence of stibnite and galena, PbS, has been reported from the antimony deposits in Sardasht, near Tepe Rabat[41] and several gold deposits in North-western Iran.[42] Thus, apart from calcium/sodium antimonate, lead antimonate could also be precipitated

[40] Lahlil *et al.* 2011; Shortland 2002.

[41] Topa *et al.* 2013.

[42] Daliran 2008; Mehrabi *et al.* 1999.

in an alkali-lime glaze. The scattered lead antimonate crystals may back this claim (Figure 9, *bottom left*).

3.2.2 Metallurgical and geological relics

Although the connection of metallurgy and glass production techniques with glaze production in the Ancient Near East has been discussed,[43] little is known about the ideas borrowed from metallurgical processing and its impact on Mesopotamian glaze production. Direct analytical studies on metallurgical relics in Mesopotamian glazes are reported from Hasanlu and Nimrud. Stapleton (2011) evidences sub-micron spherical inclusions of iron-copper sulphides in black glasses from Hasanlu. The black glasses from Hasanlu are in fact coloured by the addition of copper-refining slags containing fayalite, Fe_2SiO_4, and iron-rich sulphide droplets. Stapleton (2011) concludes that although copper alloy was not the copper source for the blue transparent-translucent glasses from Hasanlu and that copper may have been supplied from common geologic minerals, copper used for colouring blue transparent glazes and blue opaque glasses from Hasanlu was derived from alloyed metals of compositions similar to the Hasanlu bronzes.

Green glazes from Nimrud and Hasanlu also represent fairly the same technological features. Holakooei *et al.* (2017b) evidence cassiterite crystals (SnO_2) in green glazes from Hasanlu and Nimrud and demonstrate that their Sn source is associated with copper. However, the source of cassiterite in the glazes from Nimrud and Hasanlu may be different (at least for the limited number of glazes analysed by Holakooei *et al.* 2017b). Cassiterite crystals in the glazes from Nimrud are associated with scarce copper prills and magnesium and iron-containing Ca-pyroxenes in a glassy matrix (Figure 10, *left* and Figure 5a in Holakooei *et al.* 2017b), thus suggesting the use of vitreous slag of a Cu-Sn alloy in the glaze. However, a green glaze from Hasanlu showed no evidence of metallurgical slags but instead from copper sulphide comparable with mineral chalcocite, Cu_2S, associated with cassiterite.[44] This is consistent with Stapleton's (2011) findings that identified copper-iron sulphides in the glasses from Hasanlu. However, it should be stressed that the copper sulphide spherical features in the glazes from Hasanlu revealed no significant iron content. Holakooei *et al.* (2017b) argue that the occurrence of chalcocite and cassiterite crystals exclude the use of bronze corrosion products, powdered bronze scales, and bronze alloy slags as colouring agents, but instead discuss that chalcocite-like spherical features associated with cassiterite might be related to the geological source from which copper was derived.

3.2.3 Post-production inclusions

Some inclusions are formed as a result of interactions between burial environments and the glazes. For example, pyromorphite ($Pb_5(PO_4)_3Cl$) and arsenian pyromorphite ($Pb_5(PO_4,AsO_4)_3Cl$) have been reported to be incorporated in the yellow glazes from Borsippa and Nimrud, respectively.[45] The formation of (arsenian) pyromorphite happens when a Pb-bearing material (e.g. a glaze opacified with lead antimonate) gets into contact with phosphates and chlorides in the soil.[46] Phosphates may originate from organisms containing phosphorus (e.g. bone) in the burial soil and produce spherical pyromorphite in a Pb-containing glaze (Figure 10, *right* and Figure 5e, f in Holakooei *et al.* 2017b). Freestone *et al.* (1985) document pyromorphite and lead hydroxyapatite concentrated in finely spaced and concentric Liesegang rings that formed on the weathered surface of a 7th century Mesopotamian lead-based glass.

4 Conclusions and future work

Despite the attempts made in characterising early Mesopotamian glazes, several matters still need to be clarified, of which the use and distribution of alkali- and lead-based glazes in various archaeological zones and the sources of alkalis used as flux in glazes are of particular importance. Also, the presence of opacifiers and the role of the surrounding glaze matrices in their formation is highly significant. The fact is that the centre of glaze production in Mesopotamia consistently alternated between the northern and southern regions during the IA. This may probably owe to the shifting concentration of the political headquarters and powerhouses in certain periods. It is not clear how these geographical changes of glaze production modified the glaze industry over the studied period. In other words, it is uncertain to which extent the glazing industry in Northern Mesopotamia owed its advances to developments achieved in the south, and *vice-versa*. Moreover, we are unable of clearly distinguishing what the local achievements were at specific locations at certain time intervals and how the local industries were influenced by advances imported from elsewhere. Further study will hence have to focus on local developments in the glazing industries in different archaeological zones of Iron Age Mesopotamia. It will also need to investigate matters concerning the technological transfer between production centres in both the south and the north, as well as the interaction between the glaze manufacturing and glass production industries and finally, the influence of metallurgical engineering on the IA glazing industry in Mesopotamia.

[43] Hauptmann *et al.* 2000; Paytner 2009.
[44] Holakooei *et al.* 2017b.
[45] Holakooei *et al.* 2017b.
[46] Rhee *et al.* 2012.

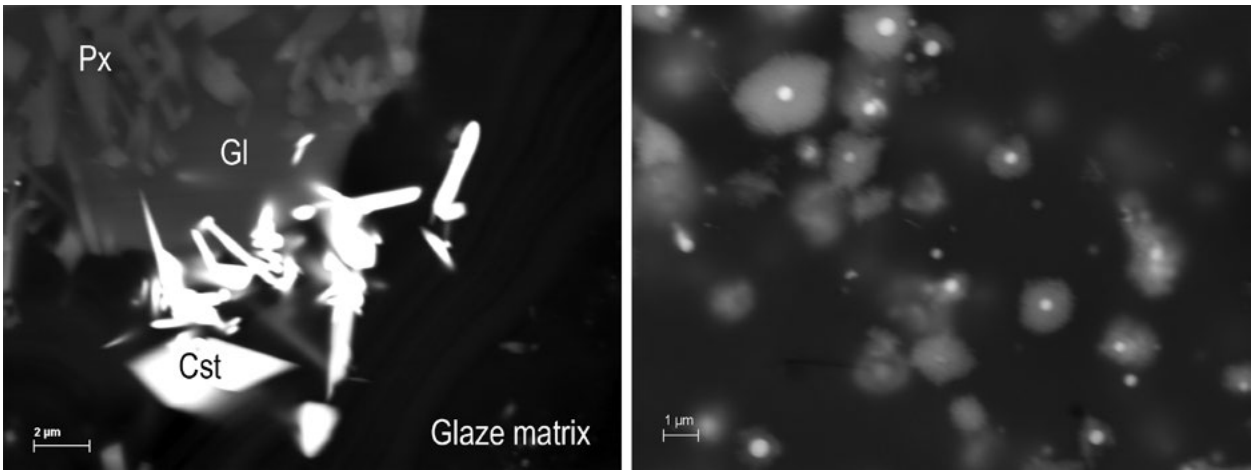


Figure 10. (*left*) Cassiterite and pyroxene crystals embedded in the glassy matrix of a crushed slag particle in a glaze from Nimrud (Metropolitan Museum of Art, accession number 54.117.34) and (*right*) pyromorphite spherical features in a yellow glaze from Nimrud (Metropolitan Museum of Art, accession number 57.27.25; Gl: glass, Px: pyroxene, Cst: cassiterite. The SEM micrographs have been obtained from polished and graphite-coated samples under low vacuum using a Zeiss Sigma HD field emission scanning electron microscope at 20 kV).

Acknowledgments

I wish to thank Maryam Ahamdi (National Museum of Iran, Tehran), Joan Aruz, Tim Healing, Jean-François de Lapèrouse, Lisa Pilosi, Federico Carò (Metropolitan Museum of Art, New York), Sebastiano Soldi (Museo Archeologico Nazionale di Firenze, Florence) and Masoud Rezaei (Parse-Pasargadae Research Foundation, World Heritage Site, Marvdasht) for their contribution. I am also grateful to Anja Fügert, Helen Gries and an anonymous reviewer for their constructive comments and suggestions.

Author

Parviz Holakooei, Ph.D.
Department of Art Conservation and Archaeometry, Art University of Isfahan, Iran
Hakim-Nezami St., P.O. Box 1744, Isfahan
Iran
parvizholakooei@gmail.com
https://orcid.org/0000-0002-7613-6081

References

Askari Chaverdi, A., P.F. Callieri and S. Gondet 2013. Tol-e Ajori, a new monumental building in Parsa. Preliminary cross interpretations from recent surveys and excavations works around Persepolis (2005-2012). *Achaemenid Research on Texts and Archaeology* 6: 1–40.

Barnett, R.D. 1956. The treasure of Ziwiye. *Iraq* 18: 111–116.

Bigot, A. 1913. Les frises du palais de Darius et leur fabrication (Ve siècle av. J.-C.). *Comptes-rendus des Séances de l'Académie des Inscriptions et Belles-Lettres* 57: 274–280.

Bimson, M. 1973. Appendix 4: Analysis of glazed material from Tell Taya. *Iraq* 35: 183–184.

Bimson, M. and I.C. Freestone 1987. *Early Vitreous Materials*. London: British Museum Publications.

Brill, R.H. 1986. Appendix: A report on lead isotope ratios in a Babylonian glaze, in W.D. Kingery (ed.) *Ceramics and Civilization II, Technology and Style*: 152–156. Columbus: American Ceramic Society.

Brongniart, A. 1844. *Traité des Arts Céramiques ou des Poteries*, Vol. 2, Paris: Béchet jeune.

Caubet, A. and A. Kaczmarczyk 1998. Les briques glaçurées du palais de Darius. *Techné* 7: 23–26.

Caubet, A. 2007. *Faïences et Matières Vitreuses de l'Orient Ancient*. Paris: Musée du Louvre.

Daliran, F. 2008. The carbonate rock-hosted epithermal gold deposit of Agdarreh, Takab geothermal field, NW Iran—hydrothermal alteration and mineralisation. *Mineralium Deposita* 43: 383–404.

Fitz, S.C. 1982. The coloured glazes of neo-Babylonian wall facings. *Ceramic Forum International: Berichte der Deutschen Keramischen Gesellschaft* 59: 179–185.

Freestone, I.C., N.D. Meeks and A.P. Middleton 1985. Retention of phosphate in buried ceramics: an electron microbeam approach. *Archaeometry* 27: 161–177.

Freestone, I.C. 1991. Technical examination of Neo-Assyrian glazed wall plaques. *Iraq* 53: 55–58.

Freestone, I.C. 2006. Glass production in Late Antiquity and the Early Islamic period: a geochemical perspective, in M. Maggetti and B. Messiga (eds) *Geomaterials in Cultural Heritage*: 201–216. London: The Geological Society.

Frost, R.L. and S. Bahfenne 2010. Raman spectroscopic study of the antimonate mineral brizziite $NaSbO_3$.

Radiation Effects & Defects in Solids: Incorporating Plasma Science & Plasma Technology 165: 206–210.

Haerinck, E. 1973. Le palais achéménide de Babylone. *Iranica Antiqua* 10: 108–132.

Hassanzadeh, Y. and H. Mollasalehi 2011. New evidence for Mannean art: An assessment of three glazed tiles from Qalaichi (Izirtu), in J. Álvarez-Mon and M.B. Garrison (eds) *Elam and Persia*: 407–417. Winona Lake, IN: Eisenbrauns.

Hauptmann, A., R. Busz, S. Klein, A. Vettel and R. Werthmann 2000. The roots of glazing techniques: copper metallurgy? *Paléorient* 26: 113–129.

Hedges, R.E.M. and P.R.S. Moorey 1975. Pre-Islamic ceramic glazes at Kish and Nineveh in Iraq. *Archaeometry* 17: 25–43.

Hedges, R.E.M. 1976. Pre-Islamic glazes in Mesopotamia—Nippur. *Archaeometry* 18: 209–211.

Henderson, J. 1997. Scientific analysis of glass and glaze from Tell Brak and its archaeological Implications, in D. Oates, J. Oates and H. McDonald (eds) *Excavations at Tell Brak, Vol 1*: 94–100. Cambridge: Macdonald Institute.

Holakooei, P. 2013. A multi-spectroscopic approach to the characterization of early glaze opacifiers: Studies on an Achaemenid glazed brick found at Susa, south-western Iran (mid-first millennium BC). *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy* 116: 49–56.

Holakooei, P. 2014. A technological study of the Elamite polychrome glazed bricks at Susa, southwestern Iran. *Archaeometry* 56: 764–783.

Holakooei, P., M. Ahmadi, L. Volpe and C. Vaccaro 2017a. Early opacifiers in the glaze industry of the first millennium BC Persia: Persepolis and Tepe Rabat. *Archaeometry* 59: 239–254.

Holakooei, P., S. Soldi, J.-F. de Lapérouse and F. Carò 2017b. Glaze composition of the Iron Age glazed ceramics from Nimrud, Hasanlu and Borsippa preserved at The Metropolitan Museum of Art. *Journal of Archaeological Science: Reports* 16: 224–232.

Jung, M. and A. Hauptmann 2004. Report on the scientific examination of a glazed brick from Susa: Colours, in T. Stöllner, R. Slotta and A. Vatandoust (eds) *Persiens Antike Pracht – Band 2*: 390–392. Bochum: Deutsches Bergbau-Museum.

Kaniuth, K. 2013. Spätbabylonische Glasurziegelreliefs aus Borsippa. *Mitteilungen der Deutschen Orient-Gesellschaft* 145: 53–82.

Kirk, S. 2009. The vitreous materials from the 2nd millennium BC city of Nuzi: Their preservation, technology and distribution. Unpublished PhD dissertation, University of Cranfield.

Lahlil, S., I. Biron, M. Cotte and J. Susini 2010. New insight on the in situ crystallization of calcium antimonate opacified glass during the Roman period. *Applied Physics A* 100: 683–692.

Lahlil, S., M. Cotte, I. Biron, J. Szlachetko, N. Menguy and J. Susini 2011. Synthesizing lead antimonate in ancient and modern opaque glass. *Journal of Analytical and Atomic Spectrometry* 26: 1040–1050.

Layard, A.H. 1853. *Discoveries Among the Ruins of Nineveh and Babylon*. New York: Harper & Brothers.

Matson, F.R. 1986. Glazed brick from Babylon – Historical setting and microprobe analyses, in W.D. Kingery (ed.) *Technology and Style* (Ceramics and Civilization II): 133–156. Columbus, Ohio: American Ceramic Society.

Mehrabi, B., B.W.D. Yardley and J.R. Cann 1999. Sediment-hosted disseminated gold mineralisation at Zarshuran, NW Iran. *Mineralium Deposita* 34: 673–696.

Moore, H. 1948. Reproductions of an ancient Babylonian glaze. *Iraq* 10: 26–33.

Moorey, P.R.S. 1994. *Ancient Mesopotamian Materials and Industries: The Archaeological Evidence*. Oxford: Clarendon Press.

Paynter, S. 2009. Links between glazes and glass in mid-2nd millennium BC Mesopotamia and Egypt, in A.J. Shortland, Th. Rehren and I.C. Freestone (eds) *From Mine to Microscope*: 93–108. Oxford: Oxbow Books.

Pollard, M. and P.R.S. Moorey 1982. Some analyses of middle Assyrian faience and related materials from Tell al-Rimah in Iraq. *Archaeometry* 24: 45–50.

Pollard, A.M. and F. Højlund 1983. High-magnesium glazed sherds from Bronze Age tells on Failaka, Kuwait. *Archaeometry* 25: 196–200.

Rhee, Y.J., S. Hillier and G.M. Gadd 2012. Lead transformation to pyromorphite by fungi. *Current Biology* 22: 237–241.

Ricciardi, P., Ph. Colomban, A. Tournié, M. Macchiarola and N. Ayed 2009. A non-invasive study of Roman age mosaic glass tesserae by means of Raman spectroscopy. *Journal of Archaeological Science* 36: 2551–2559.

Rodler, A.S., S. Klein, G. Artioli and C. Brøns 2019. Probing the provenance of archaeological glaze colorants: Polychrome faunal reliefs of the Ishtar Gate and the Processional Way of Babylon. *Archaeometry* 61: 837–855.

Rosi, F., V. Manuali, C. Miliani, B.G. Brunetti, A. Sgamellotti, T. Grygar and D. Hradil 2009. Raman scattering features of lead pyroantimonate compounds. Part I: XRD and Raman characterization of $Pb_2Sb_2O_7$ doped with tin and zinc. *Journal of Raman Spectroscopy* 40: 107–111.

Sayre, E.V. and R.W. Smith 1961. Compositional categories of ancient glass. *Science* 133: 1824–1826.

Schulz, E.M. 1965. Keramische Untersuchung babylonischer Emaillen. *Wissenschaftliche Zeitschrift der Hochschule für Architektur und Bauwesen* 12: 21–26.

Shortland, A.J. 2002. The use and origin of antimonate colorants in early Egyptian glass. *Archaeometry* 44: 517–531.

Shortland, A., K. Eremin, S. Kirk and J. Armstrong 2008. Reassessing Bronze Age manufacturing technologies

at Nuzi. *MRS Online Proceeding Library Archive* 1047: 217–231.

Shortland, A.J., S. Kirk, K. Eremin, P. Degryse and M. Walton 2018. The analysis of late Bronze Age glass from Nuzi and the question of the origin of glass-making. *Archaeometry* 60: 764–783.

Stapleton, C.P. 2011. Glass and glaze analysis and technology from Hasanlu, period IVB, in M. de Schauensee (ed.) *Peoples and Crafts in Period IVB at Hasanlu, Iran*: 87–102. Philadelphia: University of Pennsylvania Press.

Tite, M.S. and A.J. Shortland 2004. Report on the scientific examination of a glazed brick from Susa: Glazes, in T. Stöllner, R. Slotta and A. Vatandoust (eds) *Persiens Antike Pracht – Band 2*: 388–390. Bochum: Deutsches Bergbau-Museum.

Tite, M.S., A. Shortland, Y. Maniatis, D. Kavoussanaki and S.A. Harris 2006. The composition of the soda-rich and mixed alkali plant ashes used in the production of glass. *Journal of Archaeological Science* 33: 1284–1292.

Tite, M.S. and A.J. Shortland (eds) 2008. *Production Technology of Faience and Related Early Vitreous Materials*. Oxford (Oxford University School of Archaeology Monograph 72): Oxford University School of Archaeology.

Tite, M.S. 2011. The technology of glazed Islamic ceramics using data collected by the late Alexander Kaczmarczyk. *Archaeometry* 53: 329–339.

Topa, D., E. Makovicky, H. Tajedin, H. Putz and G. Zagler 2013. Barikaite, $Pb_{10}Ag_3(Sb_8As_{11})\Sigma_{19}S_{40}$, a new member of the sartorite homologous series. *Mineralogical Magazine* 77: 3039–3046.

Turner, W.E.S. and H.P. Rooksby 1959. A study of the opalising agents in ancient glasses throughout three thousand four hundred years. *Glastechnische Berichte* 18: 17–28.

Vandiver, P.B. 1982. Mid-second millennium BC soda-lime-silicate technology at Nuzi (Iraq), in T.A. Wertime and S.E. Wertime (eds) *Early Pyrotechnology: The Evolution of the First Fire-Using Industries*: 73–92. Washington D.C.: Smithsonian Institution Press.

Vandiver, P.B. 1983. Glass technology at the mid-second Millennium BC Hurrian site of Nuzi. *Journal of Glass Studies* 25: 239–247.

Chapter 3: The Reconstruction of the Glazed Brick Facades from Ashur in the Vorderasiatisches Museum, Berlin (GlAssur Project)

Anja Fügert and Helen Gries

Abstract: In 2016 the project 'The Reconstruction of the Glazed Brick Facades from Ashur in the *Vorderasiatisches Museum*' (GlAssur Project) was launched. The aim of this case study is to reconstruct the glazed architectural decor and to trace the development of glazing practices at Ashur (Iraq) between the 9th and the 7th century BC. It is centred on issues relating to iconography, dating, contexts, and manufacture. It further focusses on the methods by which the glazed brick facades were built and how their construction was managed, and not least on their reconstruction and visualisation. This paper is intended to present a first overview over the project, to explain its challenges and methods, and also to share some of the preliminary results obtained so far.

Keywords: Ashur; Ashur Temple; Glazed Bricks; Neo-Assyrian; Temple Decoration

1 Introduction

More than 3000 glazed bricks and glazed brick fragments from Ashur (Iraq) are currently kept at the *Vorderasiatisches Museum* in Berlin. The present project is called 'The Reconstruction of the Glazed Brick Facades from Ashur in the *Vorderasiatisches Museum*' (GlAssur Project), and its object is the scientific investigation of these yet unpublished artefacts.[1] Most of the glazed bricks were found within the temple complex dedicated to Ashur, ancient Assyria's most supreme sanctuary. They date to the reigns of Tiglath-Pileser III, Sargon II, and Sennacherib who ruled between the 8th and the 7th century BC. Another, yet smaller group of fragments have been dated to the early 9th century BC. The glazed bricks were unearthed in Ashur (Qal'at Sherqat) during the excavations directed by the architect Walter Andrae under the auspices of the *Deutsche Orient-Gesellschaft* (German Oriental Society) between 1903 and 1914.

This paper focusses on the glazed brick facades from the Ashur Temple of which most were found still *in situ*. In a brief introduction the city's glazed brick corpus is discussed, as well as the find spots inside the Ashur Temple and the excavation documentation itself. This is then followed by a description of the procedures and documentation methods of the GlAssur Project and the implications of the first findings concerning the brick marks, the inscriptions, as well as their making. Subsequently, a preliminary reconstruction of two of the temple facades (BF 0 and 13) is presented more in detail.

2 The bricks at the *Vorderasiatisches Museum*, Berlin

All of the more than 3000 glazed bricks and glazed brick fragments from Ashur, now part of the collection of the *Vorderasiatisches Museum* in Berlin, were recovered during the excavations of the *Deutsche Orient-Gesellschaft* in Ashur (1903–1914). They were packed in crates and later shipped to Germany (Figure 1). The first bricks reached Berlin via Istanbul in 1908,[2] whereas the second and larger lot was attributed to the Berlin collection in a second division of finds in 1914. At the outbreak of WWI this shipment was suspended in Lisbon, and it wasn't before extensive negotiations with the Portuguese authorities that it eventually attained Berlin in 1926.[3]

Because of their poor state of preservation, the glazed bricks from Ashur were kept in the museum's storerooms for decades. Early photographs show that at least two of the facades from the Ashur Temple had been put on display in the newly opened *Vorderasiatisches Museum* in the 1930s (Figure 2). However, at the museum's reopening after WWII in 1953, the facades were no longer on display. Unfortunately though, many bricks had suffered in the meantime from neglect or inadequate conservation treatment, the latter of which took place probably already in the late 1920s or early 1930s. Back then, missing parts were replaced, gaps

[1] In its initial phase, the project repeatedly received generous financial support from the *Freunde der Antike auf der Museumsinsel e. V.* Since 2018 funding has been assured by the *Deutsche Forschungsgemeinschaft*. Our sincere and warmest thanks, therefore, go out to both bodies. We would also like to thank the director of the *Vorderasiatisches Museum*, Professor Barbara Helwing, our project's team members, May-Sarah Zeßin, Mathilde Schulze, Benjamin Scheel and Dr Fanny Alloteau, as well as our colleagues at the museum, Dr Lutz Martin, Sonja Radujkovic, Alrun Gutow, and Olaf M. Teßmer.

[2] For the first division of finds and the negotiations with the Ottoman Empire, see Crüsemann 2001: 192–197.

[3] For the second division of finds, see Crüsemann 2001: 197–204, and especially Cholidis 2014 with further references.

Figure 1. Transport of finds from Ashur on a raft (© Staatsbibliothek zu Berlin, Nachl. Andrae 246, Bl. 15).

Figure 2. Reconstructed facade on display at the *Vorderasiatisches Museum* in 1933 exhibition (© Vorderasiatisches Museum, SMB, unknown photographer).

filled in, edges and surfaces smoothened with layers of either gypsum or cement, the latter in deplorably generous amounts. Irreversible damages were thus inflicted especially to the so-called fitters' marks on the bricks' upper sides. In 2003 one section (BF 0) was presented to the public in a temporary exhibition at the *Pergamon Museum* called *'Wiedererstehendes Assur. 100 Jahre deutsche Ausgrabungen in Assyrien'*.[4]

Nonetheless, the rediscovery of old excavation sketches in 2010 was a most lucky event and subsequently an important prerequisite of the implementation of the project (see below). This happenstance, along with the fact that today almost all of the dismantled and collected bricks from the facades are present in Berlin (as confirmed by a first survey of the museum collection) led for the first time to prospects of launching a scientific investigation programme on the glazed bricks. This opportunity came closer when during renovation work at the *Pergamon Museum,* all bricks from Ashur were moved to another storeroom with subsequent conservation treatment from 2014 to 2016.[5] Since the glazes had partly loosened and hence required both cleansing and consolidation measures, it was only after this effort that research on the collection could begin.

[4] Marzahn 2003: 195, fig. 5b.
[5] Unpublished research report PMU VE 6-423-01 (2017).

A small number of glazed tile fragments are dated to the early 9th century BC and are therefore among the earliest known glazed architectural ornaments from Mesopotamia.[6] Most are from the Temple of Anu-Adad.[7] These fragments belong to a distinctive artefact group known as the so-called *Ziegelorthostaten*. As opposed to the glazed bricks, these tiles are glazed on their broad sides but not along their edges. Their average size varies around 65 × 45 cm, and their depictions reveal a very careful execution with much detail and thin black contouring lines.[8] Most of the tiles show entire motifs and were thus apt to be displayed on their own. It is uncertain whether or not they had been part of integrated brickwork. Some bear glazed inscriptions by Tukulti-Ninurta II (*c.* 890–884 BC) (see Figure 2 in Fügert and Gries 'A Brief History' in this volume). Today most such glazed tiles from Ashur are kept at the British Museum.[9] Glazed tiles dating to the Iron Age are known from throughout Assyria and Western Iran.[10] The latest representatives originate from Nimrud and relate to a military campaign in Egypt. By contrast to the earlier ones, these scenes are composed of several tiles.[11]

More than 600 of the approximately 3,000 bricks and brick fragments belong to the 18 facades found *in situ* at the Ashur Temple (see below). Most are complete (approx. 30 × 30 × 10 cm) and they always display laterally glazed edges. Half bricks were almost exclusively used for facade corners. In addition, hundreds of fragments can no longer be attributed to any particular facade. Most were found at the Ashur Temple where they had once been part of the sanctuary's architectural decor. Isolated glazed bricks were moreover found throughout the rest of the city's ruins, but fall short of scattering in noteworthy concentrations. Numerous brick fragments reveal small figurative motifs that originally belonged to larger narrative scenes. The corpus further includes various decorative patterns and geometric ribbons (such as guilloches and chevrons).

3 The Temple of Ashur at Ashur

3.1 A short overview

The supreme god Ashur was the namesake for both the city and the surrounding country. His temple was hence the largest and most important temple of the Assyrian Empire. It had been built on a rock promontory overlooking the Tigris at the city's north-eastern end, next to other public buildings. The excavations of the temple were carried out under the direction of Walter Andrae between 1903 and1905 and between 1909 and 1912.[12]

The oldest finds from the temple area date back to the transition between the Early Dynastic Period and the beginning of the Akkadian Period.[13] Remains of a monumental mudbrick building from the end of the 3rd or beginning of the 2nd millennium BC have been confirmed, although they are sparse. This massive construction has been safely identified as the temple dedicated to Ashur as from the reign of Erišum I (*c.* 1974–1935 BC). In the late 19th or early 18th century BC, the Old Assyrian king Šamšī-Adad I (*c.* 1744–1712 BC) built an entirely new and much larger temple complex that consisted of a main building and a forecourt bounded by annex buildings. By the time of Šamšī-Adad I, the complex covered an area of about 100 × 220 m. Its basic plan remained unaltered for more than 1,000 years. After a fire in the 13th century BC, the Middle Assyrian ruler Shalmaneser I (*c.* 1269–1241 BC) had the complex fully rebuilt whilst heading the earlier plan. The Neo-Assyrian king Sennacherib (704–681 BC) was consequently the first king to substantially modify the sanctuary's layout through the addition of an eastern annex (the so-called *Ostanbau*).[14]

When in the second half of the 2nd millennium BC Assyria accessed the rank of a major power, the responsibilities of the supreme god Ashur likewise expanded over the well-being of the country's newly added territories. The divinity now played a crucial role in the ideological representation of the Assyrian king as well as his state. The Assyrian king thus evolved to the god's earthly representative and, consequently also to his high priest.[15] The Assyrian king had now become accountable for his military campaigns by his obligation to submit so-called *Royal Reports to the god Ashur* in his temple.[16] Even when in the later Neo-Assyrian Period Ashur no longer functioned as the principal place of abode for the Assyrian kings, the ranking of the temple of Ashur remained unaltered, as demonstrated by the abundance of royal building activities still concentrating around its compound.[17]

At the city's sack by the Medes in 614 BC the temple suffered severely. Its systematic looting seems most likely, since no valuable portable objects or materials

[6] Nunn 1988: 160–190; Moorey 1994: 312–322.
[7] Andrae 1923: 12–13, pl. 7–8; Werner: 2016: no. 1545–1622.
[8] Reade 1970: 211; Nunn 1988: 166–170.
[9] Andrae 1923: 13–14.
[10] Moorey 1994: 314; Hassanzadeh and Mollasalehi 2011; Reade and Finkel 2014; Van Soldt *et al.* 2013: 202, 212–213, figs. 4, 5, 13; Salimi, Ebrahimipour and Sorkhabi 2019; Gries and Fügert 2019.
[11] Nadali 2006; Lehmann and Tallis (in this volume).
[12] Gries 2017: 5–7.
[13] Gries 2017: 126–129.
[14] For the architectural evolution of the temple, see Haller and Andrae 1955; Miglus 2001; Gries 2017: 126–143, and references therein.
[15] Maul 1999; Pongratz-Leisten 2015: 202–205.
[16] For the so-called *Royal Reports to the God Ashur*, see also Mayer 2013: 7–8; Pongratz-Leisten 2015: 323–334 with further references.
[17] For the architectural evolution of the Ashur Temple in the Neo-Assyrian Period, see van Driel 1969: 20–31; Menzel 1981: P2–P3; Galter 2004; Gries 2017: 121–125, 137–143, tab. 20.

have been recorded there.[18] The destruction in the late 7th century BC was followed by erosion, especially in its eastern part, but also by other disturbances from the area's later occupation. However a sanctuary consecrated to Ashur was still in place in the Parthian Period.[19] Particularly in the areas marked by later occupation only the foundations of the earlier building stages have been preserved.[20]

3.2 The glazed brick decor of the Ashur Temple

Altogether eighteen glazed brick facades were found *in situ* at the Ashur Temple (Figure 3). They were recorded in various parts of the building and belong to different building levels. Such chronological differences are also reflected by the inscribed bricks. The bricks furthermore reveal slight divergences in dimensions, motifs, and manufacturing methods. For the time being the facades seem to link up with building projects referred to in inscriptions by Tiglath-Pileser III (744–727 BC) and Sargon II (721–705 BC). The youngest glazed facades located at the later added eastern annex date either to Sennacherib (704–681 BC) or one of his successors (see below).

Sixteen facades were counted in the great forecourt of the Ashur Temple in front of the main building, thus adorning various platforms as well as the sanctuary's main entrance (BF 0–15). The temple's southwest front revealed particularly lavish decorations with glazed depictions which were easily noticeable to the greater public in the temple's forecourt. Most of the depicted panoramas facing the forecourt narrate in great detail military campaigns of the Assyrian army, or else depict scenes with numerous royal courtiers (Table 1).

The stratigraphy inside the forecourt is highly complex, because some of the platforms date back to the Middle Assyrian Period, receiving later veneers made of glazed bricks. In addition, the documentation for this area is less informative than for elsewhere, and no detailed plan is available. The facades in the forecourt have survived in better conditions than the one (BF 16) in the south-western courtyard, because the level of the court had been raised, probably during the reign of Sennacherib, which led to the partial covering of the glazed brick facades. [21]

Surprisingly, some of the glazed bricks were incorrectly placed within the facades in the last construction phase before their later overbuilding. Some bricks of the facades BF 1 and BF 12 disclose inscriptions by Tiglath-Pileser III that specify their purpose for the gate of the Adad Temple.[22] Their recovery at the Ashur Temple may therefore suggest a secondary use here. Another facade (BF 0) was identified by Ernst Weidner as a depiction of Sargon II's 8th campaign in 714 BC (see below).[23] It is one of the aims of our project to shed further light on the issues of dating of the facades.

Although poorly preserved, another glazed brick facade was found *in situ* (BF 16) at one of the gate's in the southwest projections towards the main building of the sanctuary court. A military camp is still identifiable on the few surviving glazed remains (see Figure 4 in Fügert and Gries 'A Brief History' in this volume),[24] thus also backing that also this facade may have displayed depictions of military activities (Table 1). Several glazed bricks reveal an inscription by Tiglath-Pileser III, which designates them as part of the 'platform of the temple of (the god) Ashur'.[25] Many single glazed bricks and glazed brick fragments were further found in the southwest court. These belonged likewise to large narrative scenes with military contents, including a representation of a siege machine.[26]

Numerous fragments of glazed bricks from the area of the southwest courtyard originally composed to form large rosettes (Figure 4).[27] They once probably had a knob in the centre with an inscription by Sargon II. Since no remains of the rosettes were found *in situ*, they had probably been arranged in a frieze along the walls' upper parts. The combination of glazed bricks and knobs has so far been documented in this form at the Ashur Temple only.[28] A section of such a rosette frieze is now on display in room 12 at the *Vorderasiatisches Museum* in Berlin.

The framing projections around the entrances of Sennacherib's eastern annex were also decorated with glazed bricks (BF 17). Their preservation is nonetheless poor, since only few brick courses were found in their original disposition on one side of the gate. Contrary to the rest, these bricks are for the most trapezoid rather than rectangular (Figure 5). They have no inscriptions, but the archaeological context excludes that their glazed decorations predate the reign of Sennacherib. Despite the preservation of only a fraction of the depicted image, it too seems to represent a battle scene.[29]

[18] Gries 2017: 144, diagram 2.
[19] For the Achaemenid and Parthian (Arsakid) sanctuary, see Andrae and Lenzen 1933: 73–88; Hauser 2011: 138–142.
[20] Gries 2017: 143–145, pl. 8.
[21] Gries 2017: 50–54.
[22] For the inscription, see Tadmor and Yamada 2011: Tiglath-pileser III 59; for a description and depiction of the representation, see Gries 2017: 108, pl. 202, 203b, c, 212.
[23] Weidner 1926; Gries 2017: 106–108, 112–113, pl. 202, 203a, 210, 211.
[24] Gries 2017: 113–114, pl. 218.
[25] Tadmor and Yamada 2011: Tiglath-pileser III 58.
[26] Haller and Andrae 1955: 63–64; Gries 2017: 114.
[27] Nunn 2006: 58; Gries 2017: 115, 139.
[28] Rosette friezes assembled from glazed bricks without knobs are also known from Nimrud (see for example BM. 140443a–d) and date to the reign of Shalmaneser III (858–824 BC). A high number of similar glazed bricks were found in the recent excavations in Tell Nebi Yunus / Nineveh (pers. comm.: Prof P. A. Miglus, Heidelberg).
[29] Gries 2017: 114–115, pl. 209.

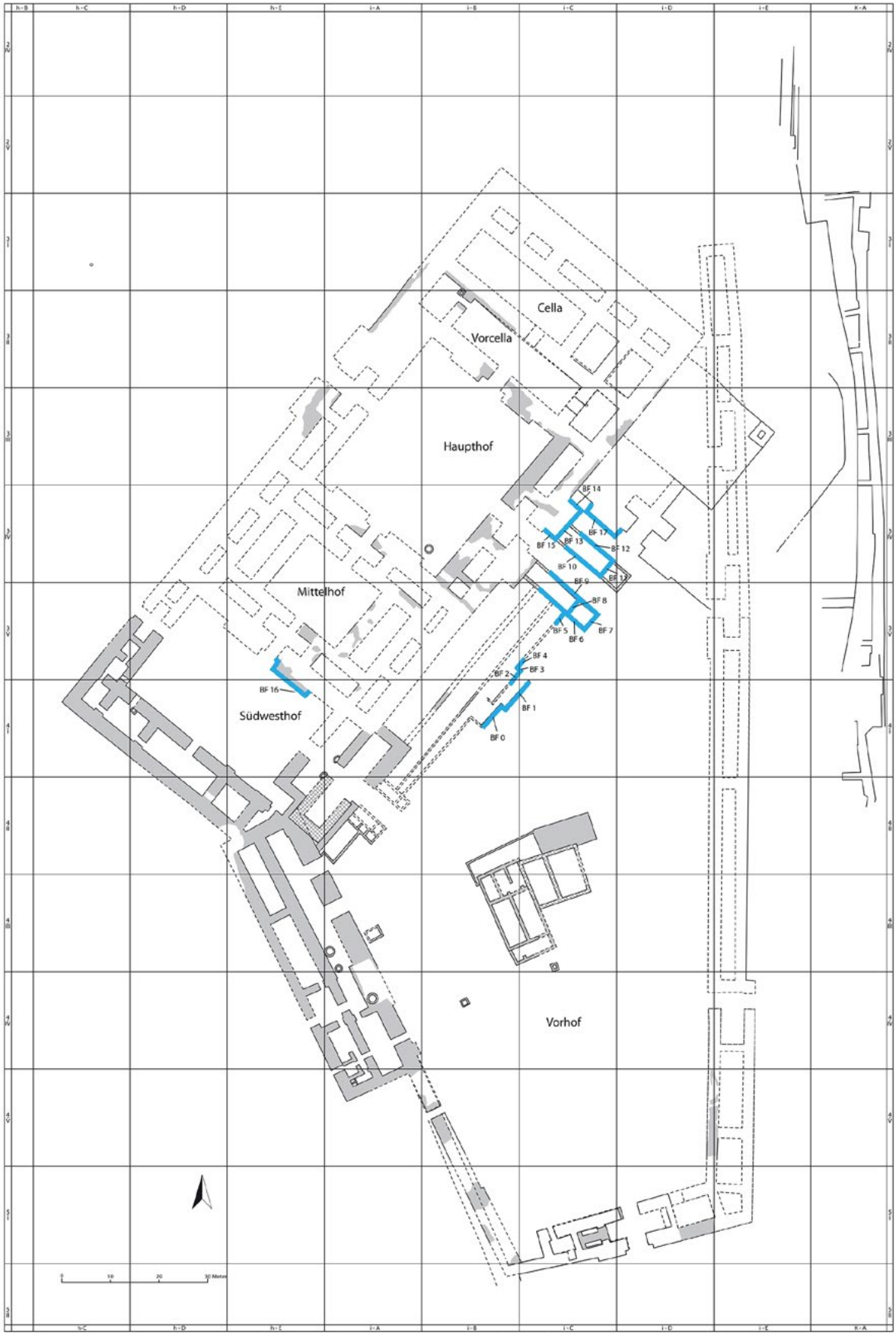


Figure 3. Plan of the Ashur Temple highlighting in blue the location of the glazed brick facades (drawing: Manfred Lerchl / Helen Gries).

Table 1. Table listing the facades found *in situ*, their contents, inscriptions and locations

BF-No. & orig. denomination	Content	Inscription	Location
0 (M)	Military campaign across the Zagros Mountains (Sargon II's 8th campaign)	Glazed inscription by Sargon II	Forecourt, podium
1 (MR)	Military campaign against ?, destruction of 3 or 4 cities	Stamped brick inscription by Tiglath-Pileser III	Forecourt, podium
2 (MV)	Uppermost frieze: ? Lowermost frieze: Military campaign against ?, destruction of city	/	Forecourt, podium
3 (MV)	Uppermost frieze: ?, Individuals walking towards the right Lowermost frieze: ?	/	Forecourt, podium
4 (R)	Uppermost frieze: ? Lowermost frieze: ?	/	Forecourt
5 (R)	Uppermost frieze: Chariot scene, military camp Lowermost frieze: Military campaign against ?, battle scene	/	Forecourt
6 (A)	Uppermost frieze: ? Lowermost frieze: (left part) Military camp, (right part subdivided into two friezes) upper: Chariot scene lower: Assyrian officials walking right, other individuals walking left towards the officials (tribute scene?)	Glazed inscription by ?	Ramp
7 (B)	Uppermost frieze: Individuals walking right Lowermost frieze: Military campaign against ?, Assyrian officials walking right	/	Ramp
8 (B)	Uppermost frieze: Poor state of preservation Lowermost frieze: Military campaign against ?, destruction of city	/	Ramp
9 (C)	Individuals walking right, city	/	Ramp
10 (D)	?	/	Ramp
11 (E)	Uppermost frieze: - Lowermost frieze: Military campaign against ?, animals	Glazed inscription by ?	Ramp
12 (F)	Uppermost frieze: Military campaign against ?, battle scene Lowermost frieze: Military campaign against ?, destruction of cities	Stamped brick inscription by Tiglath-Pileser III	Ramp
13 (G)	Siege or sack of city, deportation and subjugation scene	/	Gate tower
14	?	/	Gate tower
15	?	/	Gate tower
16	Lowermost frieze: Military camp, Assyrian officials and Assyrian king performing subjugation; further motifs reconstructed from bricks found nearby: siege (including siege machine) and sack of city	Brick inscription by Tiglath-Pileser III	SW-court
17 (S)	Uppermost frieze: - Lowermost frieze: Military campaign against ?, probably battle scene	/	Eastern annex, gate

3.3 The original documentation

Next to hundreds of glazed brick fragments recovered in the Ashur Temple, 18 glazed brick facades were found *in situ* (see above). Before their cautious dismantling by the excavators, the bricks were meticulously documented in written descriptions and pencil sketches, of which most were augmented in watercolours and captured in black-and-white and colour photographs (Figure 6). The sketches that the excavators made on site not only reveal the facades' depictions, but furthermore identify each brick with a separate number.[30] The same numbers were also transferred to the bricks themselves. The sketches reveal a number of iconographic details unperceivable in the photographs and they also provide additional information pertaining for instance to the fitters' marks and inscriptions (Figure 7). The

[30] Several ways of numbering the bricks were observed. On some facades a consecutive numbering was used. Most of the brick layers are specified through Latin numbers, and within a single layer the adequately preserved bricks are numbered individually, starting with 1.

Figure 4. Watercolour painting of reconstructed rosette motif, by C. St. (initials unknown) after a sketch by Walter Andrae (© Vorderasiatisches Museum, SMB, photo: Olaf M. Teßmer).

Figure 5. Top view of a trapezoid brick belonging to BF 17 (© Vorderasiatisches Museum, SMB, photo: GlAssur Project).

majority of the sketches were drawn by W. Andrae, whilst E. Herzfeld, and W. Bachmann are known to have made one each. For around 90 years, the sketches were considered lost, except for one, but luckily they were found in 2010.[31] They now form the most important source for the reconstruction of the glazed brick facades, as they enable us to locate the individual bricks within the larger facades.

The black-and-white photographs mainly reveal the contexts and the states of preservation, though only few iconographic details. Some facades are also documented in autochrome photographs that effectively render the brightness of the colours at the moment of their excavation (Figure 8). Autochrome photography is an early form of colour photography devised by the Lumière brothers and patented in 1903.

[31] A drawing of a facade was published in 1923 in the volume on coloured ceramics from Ashur, see Andrae 1923: pl. 6 (English translation Andrae 1925). The first reproduction of all sketches can be found in Gries 2017: pl. 210–218.

Figure 6. Team member documenting facades during the excavations (Ass.-Ph. 4910; © Vorderasiatisches Museum, SMB / Deutsche Orient-Gesellschaft, photo: Conrad Preusser, 1910).

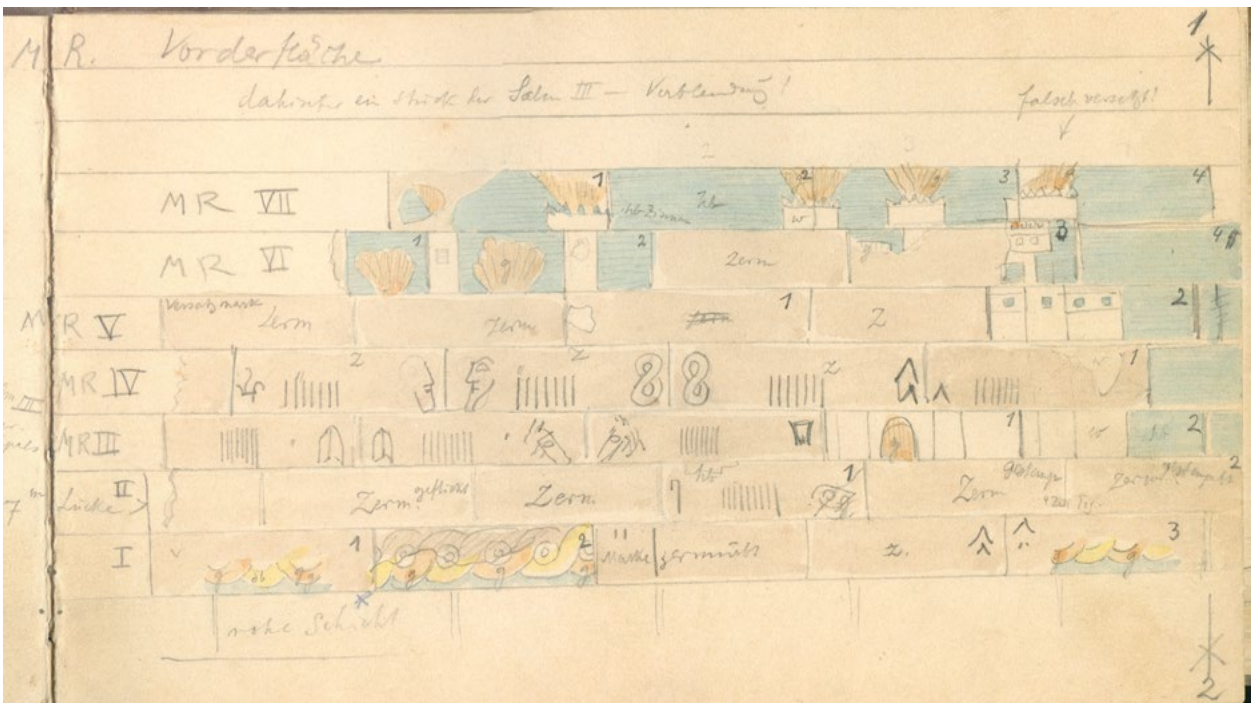


Figure 7. Sketch of facade section BF 1 (MR), by Walter Andrae (© Archive Deutsche Orient-Gesellschaft).

Figure 8. Autochrome photograph of facade BF 13 (© Vorderasiatisches Museum, SMB / Deutsche Orient-Gesellschaft, photo: Walter Andrae).

Andrae was thus one of the first archaeologists to use this technology even before its introduction to the public in 1907. The photographs have a soft, slightly blurred appearance which is typical for autochromes.[32]

However, the autochromes could not be reproduced in 1955 when the glazed brick facades were published in the final study of the Ashur Temple.[33] At that time, the excavators submitted only descriptions of the temple's rich, glazed brick decoration that were based on Andrae's extensive notes, because the excavation sketches had by then gone lost (see above). The only discoverable sketch was that of BF 0 published as a modified watercolour painting in 1923 in the volume on the coloured ceramics from Ashur (Figure 9). Until recently, this watercolour was the only thus far illustrated representation of a glazed brick facade known from Ashur.

4 The GlAssur Project

4.1 Procedures and methods of documentation

All bricks were first examined macroscopically so as to record all external features in a database. In addition to the description of the representations, we also record in detail the various markings on the bricks (see below). Digital photographs are taken of both the glazed sides as well as all the markings.

Among the tested imaging methods, checking the object surfaces under UV(A)-light proved highly instructive. This UV-Vis fluorescence imaging technique is non-destructive and is used by conservators as a diagnostic tool which further informs about former conservation treatment and coatings.[34] In the present case, however, it proved an effective imaging method for recognising and deciphering the facades' faded glaze depictions (Figure 10). We use two panels, each equipped with five UV-fluorescent tubes that cast uniform light onto the objects' surface. We thus capture the visible UV(A)-induced fluorescent features with a digital camera in order to enable work with the photographs in the next stage. Especially the glaze used for the contouring lines is highly fluorescent. Generally, the glazes fluoresce to varying degrees, the less well-preserved ones usually more than the still intact glazes. For the moment we are still unable to determine the causes behind these disparities.

As from fall 2019, the Ashur glazed bricks will also be submitted to scientific probing in the Rathgen Research Laboratory of the *Staatliche Museen zu Berlin*. The main concerns here are the bricks themselves as carriers of the glazes, their manufacture, as well as firing temperatures and the glaze compositions. The already existing randomly sampled analyses indicate that the glazed bricks had been produced using the double firing method at temperatures between 900°C

[32] Marzahn 1998; Matthes 2011: 23–27; Gutow 2013: 42, fig. 4b.
[33] Haller and Andrae 1955: 58.
[34] See for example Measday *et al.* 2017.

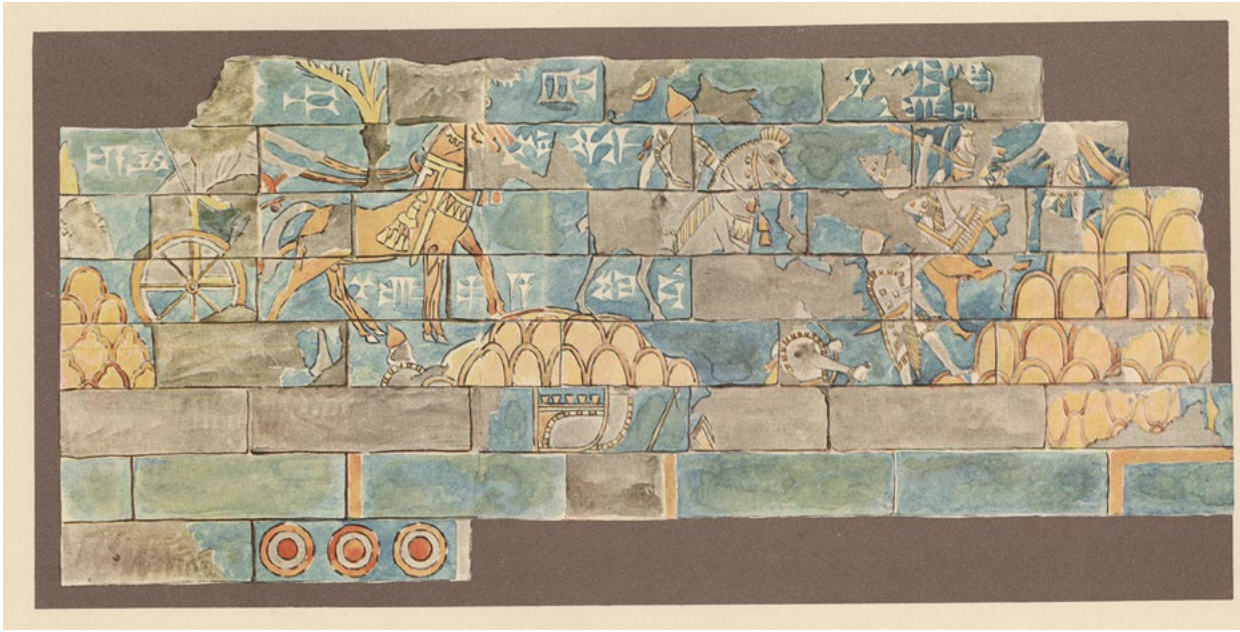


Figure 9. Published watercolour painting of facade BF 0, by Walter Andrae (© Archive Deutsche Orient-Gesellschaft).

Figure 10. Neo-Assyrian brick from Ashur Temple, seen under daylight and under UV-light (© Vorderasiatisches Museum, SMB, photos: GlAssur Project).

Table 2. Table showing processes involved producing glazed brick facades and related physical characteristics of mudbricks, by May-Sarah Zeßin.

Process	Physical indications on the brick
Brickmaking: mixture of clay and water, along with minerals and organic additives; placement of mixture into a wooden mould	Fingerprints, impressions of human hands
Setting of wet clay mixture in mould	Stamps (figurative, epigraphic), incised inscriptions, marking and/or impressions from fingers, animal paw prints
Drying in the sun	Warping and shrinking
Firing I (850–1100°C)	Preservation of colour, texture
First (temporary) assembly of facade	Underdrawings on face
Application of fitters' marks	Glazed or painted strokes, pictographs, West-Semitic letters etc.
Dismantling of facade	Work marks on non-glazed sides
Glazing of outlines	Outlines of motifs
Firing II of glazed outlines (900–1000°C)	Glaze tears on sides
Glazing of motifs	Filling of glaze into motif outlines/areas, slight mixing of glazed sections
Firing II/III of glazed motifs (up to 900–1000°C)	Glaze tears on sides
Production of mortar	Traces of mortar (e.g. bitumen, sand)
Permanent assembly of facade	Mortar residues

and 1100°C.[35] However, dependable statements will be made after further investigations.

In order to determine the mineralogical and chemical compositions of the glazes, both petrographic microscopy and scanning electron microscopy with energy dispersive X-ray spectroscopy (SEM-EDS) will be used. X-ray fluorescence spectroscopy (XRF) is also planned. Research will focus on the used colour spectrums, their composition and the determination of the various colouring agents and opacifiers. In order to create a reliable database, all represented colours of the different facades will be analysed with SEM-EDS in order to determine their elemental composition.[36]

4.2 Making glazed bricks in ancient Ashur

Mudbricks consist of clay to which chaff has been added as temper. The prepared mixture was formed into rectangular bricks of different formats (square, half etc.) by using wooden moulds of standardised dimensions (Table 2).[37] We were able to observe that on the unsmoothed undersides of many of the Ashur bricks large chunks of the clay mixture had apparently been placed inside the moulds in roughly circular motions. After their shaping, the bricks were taken out of their moulds and left to dry in the sun. They were then exposed to first firing. After the drying and the firing processes the bricks were assembled to provisional panels so as to receive the motif outlines in fine, either red or black brush strokes. These underdrawings whose brush strokes considerably vary in both width and accuracy, are still observable on some bricks. After this the bricks were again dismantled, and it was probably at this point that the fitters' marks were applied in order to facilitate the final assembly of the finished bricks. We observe a great number of fitters' marks on the bricks' top surfaces. The vast majority of these fitters' marks, which quite often unfortunately have been impaired by the work of the early restorers, are executed in a white, whitish-beige or sometimes yellowish glaze. Only very rarely do other colours occur.[38] For the glazing process, the bricks were handled one by one and positioned with the decorated surface facing up, as revealed by the presence of so-called glaze-tears. After the firing process they could thus be easily assembled according to the fitters' marks.

[35] Unpublished research report VAM 5.10 (2004).

[36] REM-EDX is currently the standard method for analyses on glasses and glazes, so that the comparability with other test results is generally quite good, see Shortland 2012: 179–182; Holakooei in this volume: 17–18.

[37] See Moorey 1994: 302–306 and Sauvage 1998: chap. 1 for a general overview on brick making in the Ancient Near East.

[38] This observation contrasts with the ones made by Reade 1963: 39 who reassembled a large glazed arched brick panel decorating a doorway above the lintel in Fort Shalmaneser in Nimrud. There different glaze colours were used to differentiate between several sets of bricks forming the panel.

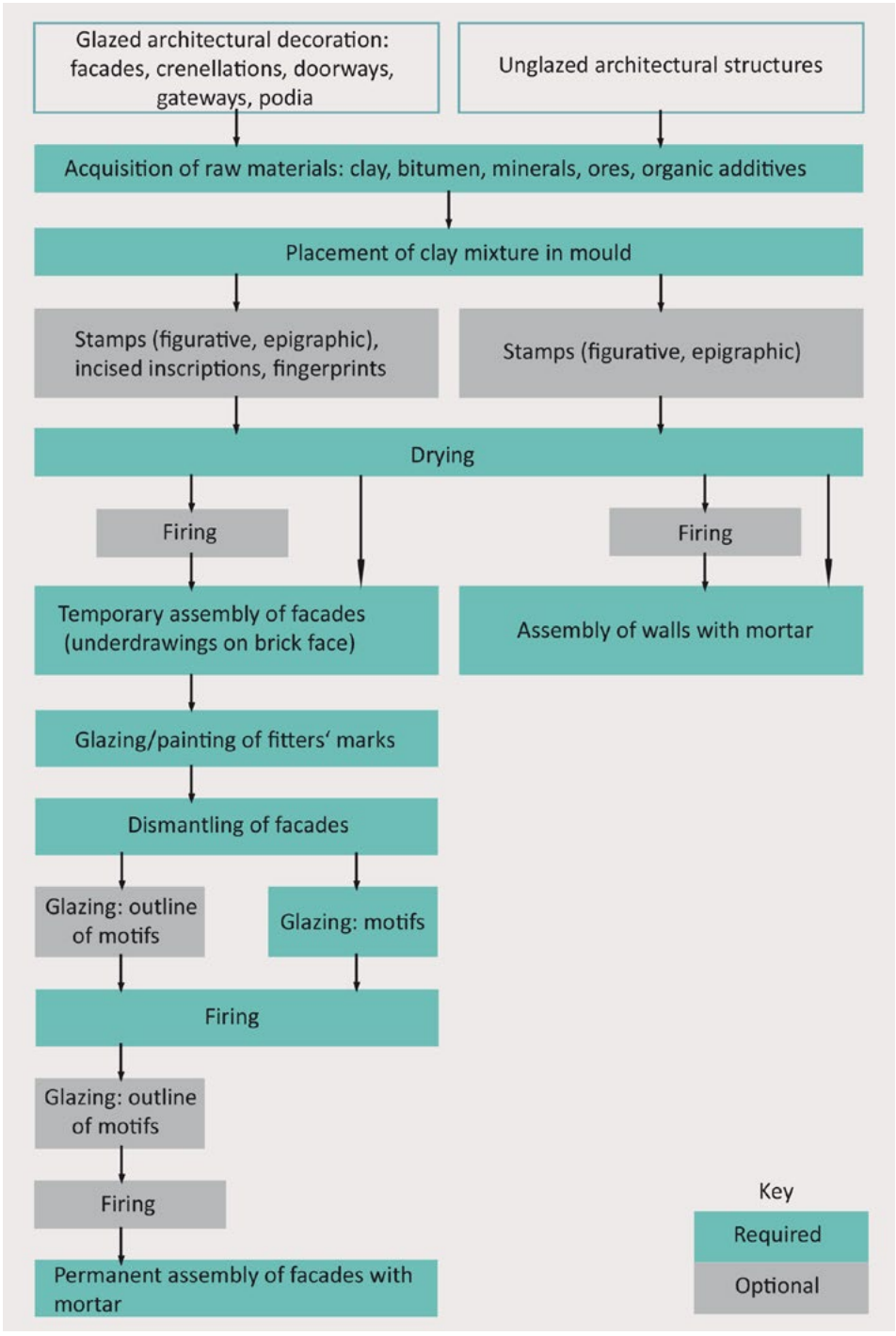


Figure 11. Diagram displaying the *chaîne opératoire* for creating glazed and unglazed architectural brick structures, by May-Sarah Zeßin.

4.3 Marks and inscriptions

We pay particular attention to the various marks on the bricks (fitters' marks, stamp and finger impressions, stamped or written inscriptions etc.), as they may furnish important information on the production of the bricks themselves and the way their assembly had been organised through different stages of the production process (Figure 11). In addition to the glazed fitters' marks, we can sometimes observe stamped figurative impressions, stamped or written inscriptions, as well as scratches or curved strokes executed with fingers in different recurring shapes and sizes on the brick surfaces prior to their firing. The semantics of the stamped figurative marks and finger strokes yet remain to be fully understood and deciphered.[39] The

[39] For a more general overview on figurative stamp impressions and

Figure 12. Sketch of facade BF 0, by Walter Andrae (© Archive Deutsche Orient-Gesellschaft).

function of the different markings on the bricks is being investigated by May-Sarah Zeßin as part of her dissertation project.[40] We hope that we will be able to make further statements on the use and function of the unglazed marks in future.

The usual disposition of the fitters' marks on the Ashur bricks consists of one to nine vertical strokes (depending on the original height of the depictions) in the middle of the upper surface, close to the glazed front and two figurative marks at its lateral sides. The highest course of the frieze was usually represented by one stroke on each brick. The vertical strokes thus served to indicate the sequential position of the brick course. In facades consisting of two image friezes, the number of vertical strokes in each frieze could reach nine. The two lateral figurative signs had matching counterparts at the adjoining bricks of the same course. Their execution differs according to which facade they belong to. They range from small and delicate strokes and signs to rough and large marks covering most of the brick's top surface. Andrae himself had already documented the fitters' marks in his sketches, though not systematically (see Figure 7).[41]

4.4 Observations on the facades BF 0 and BF 13 and some preliminary findings

In the following paragraphs two of the 18 facades from the Ashur Temple are discussed in detail and the results obtained thus far presented. In the original documentation Andrae labelled the facades with letters (from A to at least G) and with short abbreviations like MV (for *Mittelvorsprung*) or R (for *Rücksprung*). In the later publication on the Ashur temple the glazed brick facades then appear with separately attributed numbers.[42] For the present study the procedure and the research potential of the facades BF 0 and BF 13 were assessed. This comprised their almost complete processing and full representation in preliminary drawings (montages bringing together the new digital drawings of all bricks belonging to one facade). In order to test our methods and the documentation of the results as comprehensively as possible, two facades in highly contrasting states of preservation and in differing documentations were selected. Facade BF 0 (M) is best preserved and was already published by Andrae as a watercolour in 1923 (see Figure 9). The aim of the investigations into this facade was to assess the gained insight from an in-depth analysis. Facade BF 13 (G), on the other hand, was documented to a cursory degree only, so that much less information was available.

4.4.1 Facade BF 0 (M)

Facade BF 0 was located at the lower podium west of the central ramp (*Mittelrampe*) in the forecourt and at the southeast front of the main building (see Figure 3). It was preserved at a height above *c.* 1.10 m and a length of *c.* 2.10–2.15 m. Its north-eastern end had been destroyed, and its original length was therefore unknown. It had once probably continued towards the central ramp and certainly been higher. The glazed corner of two adjoining sides at the south-western

impressions made with fingers and hands see Sauvage 1998: 40–47. For the figurative stamp impressions on the bricks from Babylon, see the monograph by Sass and Marzahn 2010.

[40] A first insight into the fitters' marks system so far observed at Ashur can be found in Zeßin 2019.

[41] See Gries 2017: pl. 212a (BF 1), 213a (BF 2), 214 a and b (BF 4 and BF 5), 215a (BF 6). Some of the fitters' marks observed on the bricks of facade BF 12 were also documented in a sketch by Andrae.

[42] Haller and Andrae 1955: 56–62; Gries 2017: 106, fn. 731.

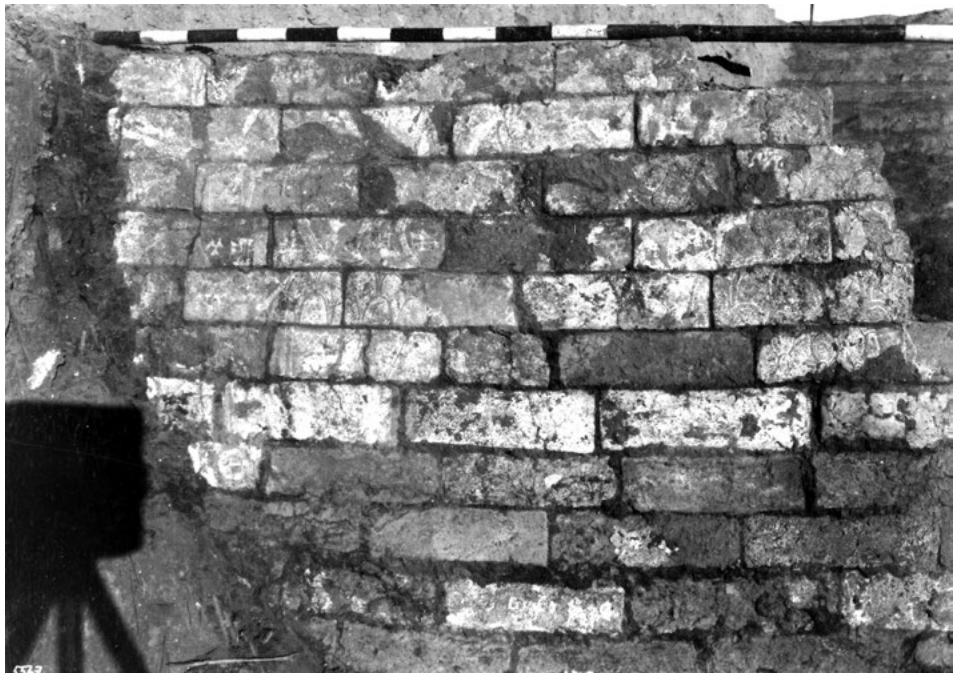


Figure 13. Photograph of facade BF 0 (Ass.-Ph. 5567; © Vorderasiatisches Museum, SMB / Deutsche Orient-Gesellschaft, photo: Conrad Preusser, 1911).

extremity reveals that the facade had continued in a north-westerly direction.

Contrasting to the other drawings in the sketchbooks, this sketch was recorded in one of the so-called notebooks on the Ashur Temple (*Notizbuch 19*). Since *Notizbuch 19* formed the basis for the 1955 publication of the Ashur temple by A. Haller and W. Andrae, the drawing was probably the only one available at that time. The published watercolour painting by Andrae differs only by minor details from his original sketch (Figure 12) made on the site and showing only a cropped section of the facade. A black-and-white photograph taken during the uncovering of the facade exists (Figure 13) but unfortunately no autochrome documentation.[43]

Owing to the relatively well-preserved brightness of its colours (present state preservation), facade BF 0 stands out from the rest of the facades found *in situ*. Due to its glaze inscription, we are informed that the panorama dates to Sargon II and that it depicts his famous 8th campaign in the Mannaean regions south of Lake Urmia, before continuing into the territories of Assyria's archenemy Urartu.[44] In fact, this is one of the only two depictions known thus far of this campaign against Assyria's rival in the northeast.

The inscription in the preserved upper four brick courses is composed as a first-person narrative of the king himself. It mentions the difficulties Sargon's troops had faced while crossing the Zagros Mountains in the area of Zamua, which probably refers to the Kullar valley[45] and its mountains Nikippa und Upâ while further characterising a mount Simirria as difficult to access. The lines 15, 18 ff. of Sargon's famous *Royal Report to the god Ashur* during his 8th campaign relate to the same episode, though embellished with much more detail (Figure 16).[46]

The re-assessed glazed panel unveils three mountains (Figure 14) consisting of two tall ones on either side of the facade and a lower one in the middle. The panel's inscription also mentions three mountains, Nikippa, Upa, and Simirria. Weidner read the glazed brick panel according to the mountains' order of appearance

[43] For the archaeological context and a description of facade BF 0, see Gries 2017: 106–108, pl. 202, 203a, 210, 211 with further references.

[44] For issues concerning the date of this facade, see Gries 2017: 112–113.

[45] Line 11 of Sargon's II *Royal Report to the God Ashur* mentions Sargon's entry in the region of the Lullubaeans and their country called Zamua.

[46] l. 15: '*I passed between the land of Nikappa and the land of Upa, high mountains covered with impenetrable trees, whose interiors are labyrinthine and whose passes are frightful*' and *l. 18–23: 'The mountain, Simirriu, the highest peak of the mountains which lunges up like the point of a spear, raising its head above the mountains, the dwelling of the mistress of the gods, whose summit leans up to heaven, whose root reaches down in the midst of the underworld, and (where) like the backbone of a fish, there is no going side by side, its ascent on all sides is difficult, on whose sides gullies and mountain ravines are deeply cut and the act of looking at it is shrouded in terror, unfit for the ascent of chariots or for horses to show their mettle, its access was too difficult for foot soldiers, through the understanding and wide knowledge which Ea and the mistress of the gods decreed for me, they enabled me (lit. opened my knees) to destroy the land of my enemy.'* (transl. after Melville in Strawn *et al.* in Chavalas 2006: 337).

Figure 14. Draft reconstruction of bricks in facade BF 0 under daylight and UV-light, detail (© Vorderasiatisches Museum, SMB, photos / drawings: GlAssur Project).

on the panel as well as in Sargon's II famous *Royal Report to the god Ashur*.[47] Interestingly, the scales of the mountains appear in different shapes, although they undeniably are part of the same panel and certainly date to the same building phase.[48] A war chariot drawn by two horses and carrying at least two men is shown between the mountains Nikippa and Upa at the left of the facade's preserved part. In front of it and above the central mountain formation appears an Assyrian soldier on horseback. As recognisable by his three-tiered headdress, the Assyrian king himself is shown mounted on a horse in the left part. The fact that the king is depicted on horseback whilst leading a military campaign is relatively unique, as we know of only few representations of the riding Neo-Assyrian king, and if so, then predominately in hunting contexts.[49] The

[47] See Weidner 1926: 4; Mayer 2013: 63, fig. 1 and caption is following him in this aspect which combines the position of the inscription and the depiction of the mountains.

[48] Andrae's original sketch as well as the watercolour published in 1923 are misleading concerning the depiction of the left mountain formation, which – as proved by recent examination of the bricks imagery – in fact consists entirely of mountain scales curving slightly inwards at their tops.

[49] Magen 1986: 29.

king's horse, led by the reins by another soldier, ascends the left steep flank of the right mountain formation. At least two soldiers walk behind the king. In the lower part of the facade we see an Assyrian soldier climbing the central mountains. Approximately one quarter of a chariot wheel can be recognised in the upper right corner, so the scene most probably continued to the right. Although the depiction of the panel was known already from Andrae's published watercolour, the thorough autopsy of the glazed bricks themselves revealed a number of yet unknown details.

Many of the fitters' marks on facade BF 0 have been preserved. They had been applied very delicately, presumably by one and the same person. They follow the scheme most often observed on the glazed bricks from Ashur (see above). Since the bricks of the highest preserved brick course bear fitters' marks with three strokes in the central part of the surface, it may be that the original facade had been at least two courses higher than the state it was found in. There is therefore sufficient space to add another chariot to the upper right part of the depicted scene.

The fact that facade BF 0 had undergone later alterations is clearly discernible from several pictorial inconsistencies along the upper and lower parts of its glazed motif. In the central lower part we see for instance a single brick showing a section of a royal throne in an upside-down position. Even though the number of fitters' mark strokes matches with the brick course, the motif is located in the wrong place.[50] It may originally have belonged to the southwest-facing part of the podium, of which only a small part is preserved but which also once had glazed depiction.

4.4.2 Facade BF 13 (G)

Facade BF 13 decorated about 8 m of the south-eastern front of the northeast projection at the forecourt's entrance to the main building of the Ashur Temple (Figure 15). The facade's northern half (approx. 4.5 m) still displayed a maximum height of nine brick courses, even though the southern part's preservation was much poorer. Andrae documented facade BF 13 with a very rough pencil sketch (Figure 16), two autochrome photographs, and one black-and-white photograph. The sketch contains less details than the other watercolours and the colour information is completely missing. In addition, the drawing is not true to scale in some parts. Some bricks are much too long or too narrow.

It is noteworthy that the general state of the facade's preservation was much poorer than facade BF 0. Andrae himself decided not to keep all its bricks. There is no reason to believe that facade G had been altered at some later stage, as seen with facade M, since all the bricks were found at their exact original positions.

The facade had originally been composed of at least two friezes placed one upon the other and with framing guilloche-patterned brick courses. Only the lowermost brick course in the upper frieze has been preserved, as it reveals the lower legs and feet of several individuals walking towards the right. The left-hand side of the lower frieze displays a strongly fortified city with an oversized arched gate, several towers, and triangular merlons topping its battlement walls. This part of the facade is largely missing on Andrae's sketch, but on the autochrome photograph large bright patches of glaze belonging to this motif are discernible (Figure 8). In his description of the facade he also mentions the city. To the left a number of Assyrian soldiers, all moving right, are leading away a group of three women and most probably four children as deportees. The women are wearing long, fringed garments, whilst three of the children are walking in front of them, and one following behind. Another beardless Assyrian in a long, square-patterned garment is facing the small group of deportees. At least three officials are walking behind him to the right, and in front of them one recognises a kneeling person. In conjunction with a deportation scene this attitude would usually suggest *proskynesis* before the king. However, in Andrae's sketch the figure standing in front of the kneeling one seems to be oriented in the same direction, thus looking outwards. By taking a closer look at the brick depicting the figure's feet it becomes evident that Andraes' sketch is misleading and that the person is facing the kneeling person the way one would expect it to (Figure 17). In conclusion, the lower frieze of facade G shows a deportation of some high ranking families as well as a *proskynesis* before the standing Assyrian king. Comparable depictions are known e.g. from the murals in the provincial palace at Til Barsip,[51] the Balawat gates,[52] the black obelisk,[53] but also from palace reliefs.[54]

Because the facade falls short of revealing any inscribed bricks, its dating relies exclusively on observations of iconography. Next to the fitters' marks the only recorded markings were variously shaped finger strokes on the bricks' smoothed bottom sides. None of these markings were documented by Walter Andrae.

[50] For the moment we prefer not to go as far as Fridman, who suggested a different dating for this brick and the whole facade (Fridman 1969). The brick actually shares most other characteristics with the other bricks safely attributed to this facade. They include the state of preservation of the glazed surface as well as the style of the preserved fitters' marks, which is very distinctive for this facade.

[51] See Thomas 2019: 94–95.

[52] See for example Schachner 2007: pl. 10, 13.

[53] See for example Orthmann 1975: fig. 207, the two uppermost registers of the obelisk.

[54] See for example Orthmann 1975: fig. 216; see Gries 2017: 111, fn. 762 for more general literature concerning subjugation scenes in Assyrian art.

Figure 15. Photograph of BF 16 (Ass.-Ph. 5076; © Vorderasiatisches Museum, SMB / Deutsche Orient-Gesellschaft, photo: Conrad Preusser, 1910).

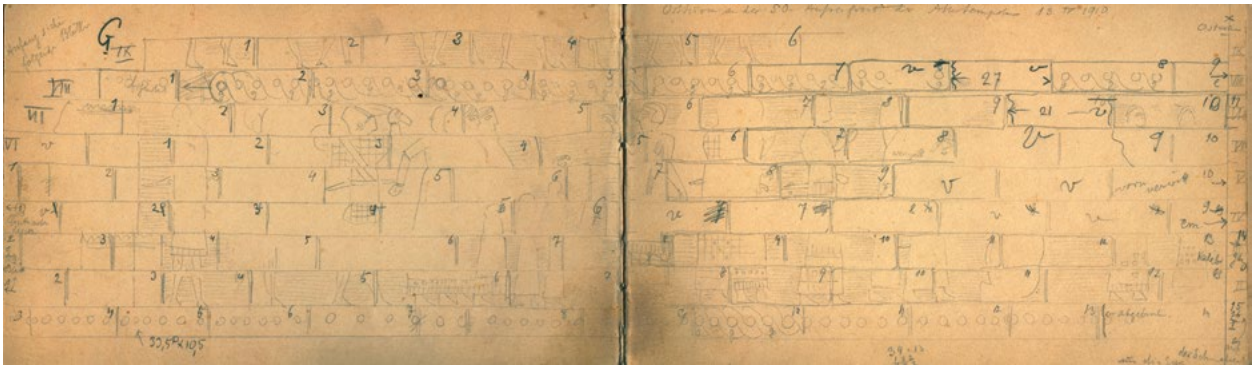


Figure 16. Sketch of facade BF 13, by Walter Andrae (© Archive Deutsche Orient-Gesellschaft).

4.5 Aims of the Project and Synthesis

With the sketches now available we are able to reconstruct the glazed brick facades of the Ashur Temple and thus to investigate its pictorial programme. So reconstructing and analysing the iconography of Assyria's main sanctuary will be the chief aim of the project. It strikes that most of the displayed scenes documented by the excavators centre on the military triumphs of the Assyrian king (see Table 1). This may at first seem surprising, but considering the changes in Assyrian state ideology from the mid-second millennium BC onwards, this impression is lessened. In fact, the basic mission of the Assyrian king was not only to ensure the well-being of his subjects, to warrant the country's prosperity, or to care for the temples, but moreover to stand up to the duty of expanding Assyria's borders by conquering surrounding territories and peoples (*māta ruppušu* = *to enlarge the country*). Owing to the utmost significance of this divine mandate entrusted upon the king by the supreme god Ashur inside the very premises of his own sanctuary, the temple itself had now become the compulsory location for putting on display the king's military achievements and efforts to maintain the cosmic world order and its unfolding in the conquered territories. The glazed brick facades formed the visual component of this display. Others included the so-called *Royal Reports to the gods*, which were placed in the temple itself and the triumphal processions leading to the temple after

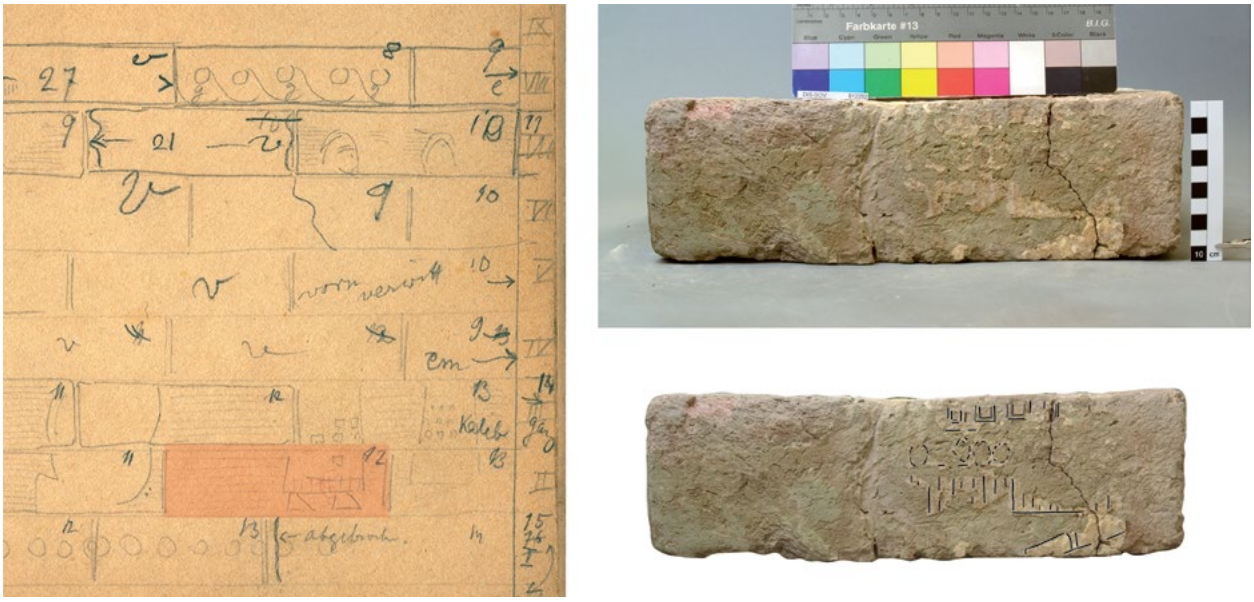


Figure 17. Sketch of facade BF 13, detail, by Walter Andrae (© Archive Deutsche Orient-Gesellschaft). Photographs of glazed brick showing depiction of feet (© Vorderasiatisches Museum, SMB, photos: GlAssur Project).

successful campaigns. The kings reported about their exploits in warfare, destruction, slaughter, and cruelty, just as they did in the *Royal Reports to the god Ashur* and the annals that gave detailed, yet biased accounts on their military campaigns.

Analyses on the remaining preserved bricks and brick fragments, which have not been attributed to the documented facades but yet once decorated other parts of the temple, will contribute to the effort of reconstructing not only the appearance of the most important Assyrian sanctuary, but also its impact on the minds of its contemporaries. Some fragments also reveal that gods as well as religious scenes were put on display on the temple walls. We hence definitely expect to learn significantly more about the decoration in Neo-Assyrian sacral architecture.

In addition to the analysis of the iconography, the project will address issues pertaining to dating and find contexts. Furthermore, matters concerning manufacture and building organisation, as well as the original construction of the glazed brick facades and later modifications will be studied. The large number of fitters' marks and preserved stamped impressions will provide new insight into the planning and execution of these large-scale construction projects at the decorated temple facades and gates. Scientific analyses will provide information on the glazes' compositions and will likewise complement the investigation with inquiries into the development of glazing technologies between the 9th and the 7th century BC. These analyses are further planned to explore matters of colour and face the challenges of preservation and weathering. Digital reconstructions leading subsequently to visualisations of parts of the temples' exterior constitutes another fundamental component of this study. Visualising not only the results from research but also the remaining uncertainties will help us to better understand the role of Assyria's foremost sanctuary.

Authors

Dr Anja Fügert
Deutsches Archäologisches Institut
Podbielskiallee 69–71
14195 Berlin
Germany
anja.fuegert@dainst.de

Dr Helen Gries
Vorderasiatisches Museum Berlin
Geschwister-Scholl-Straße 6
10117 Berlin
Germany
h.gries@smb.spk-berlin.de

References

Andrae, W. 1923. *Farbige Keramik aus Assur und ihre Vorstufen in altassyrischen Wandmalereien*. Berlin: Scarabeus.

Andrae, W. and H. Lenzen 1933. *Die Partherstadt Assur* (Wissenschaftliche Veröffentlichung der Deutschen Orient-Gesellschaft 57). Leipzig: J.C. Hinrichs.

Chavalas M.W. (ed.) 2006. *The Ancient Near East. Historical Sources in Translation.* Malden, MA, Oxford, Victoria: Blackwell.

Cholidis, N. 2014. Abgegeben an Portugal für Assur-Funde, Ein Kapitel deutsch-portugiesischer Museumsgeschichte (1914–1927), in P. Winter and J. Grabowski (eds) *Zum Kriegsdienst einberufen. Die Königlichen Museen zu Berlin und der Erste Weltkrieg*: 133–159. Köln: Böhlau.

Crüsemann, N. 2001. *Vom Zweistromland zum Kupfergraben. Vorgeschichte und Entstehungsjahre der Vorderasiatischen Abteilung der Berliner Museen vor fach- und kulturpolitischen Hintergründen* (Jahrbuch der Berliner Museen Beiheft 42). Berlin: Gebr. Mann.

Fügert, A. and H. Gries 2019. 'The men who wrought the baked brick, those were Babylonians': A brief history of molded and glazed bricks, in A. Amrhein, C. Fitzgerald and E. Knott (eds) *A Wonder to Behold: Craftsmanship and the Creation of Babylon's Ishtar Gate*: 41–53. Princeton: Princeton University Press.

Fridman, A. 1969. Sargon II or Tiglath-Pileser III? *Revue d'Assyriologie et d'Archéologie orientale* 63: 172–175.

Galter, H.D. 2004. Geschichte als Bauwerk: Der Aššur-tempel und das assyrische Geschichtsbewusstsein, in G. Frame (ed.) *From the upper Sea to the lower Sea. Studies on the History of Assyria and Babylonia in Honour of A. K. Grayson* (Publications de l'Institut historique et archéologique néerlandais de Stamboul = Uitgaven van het Nederlands Instituut voor het Nabije Oosten te Leiden 101): 117–135. Leiden: Nederlands Instituut voor het Nabije Oosten.

Gries, H. 2017. *Der Assur-Tempel in Assur: Das assyrische Hauptheiligtum im Wandel der Zeit* (Wissenschaftliche Veröffentlichung der Deutschen Orient-Gesellschaft 149). Wiesbaden: Harrassowitz.

Gries, H. and A. Fügert 2019. The glazed brick façades from Ashur in the *Vorderasiatisches Museum* Berlin in context of the North-Western Iranian glazed bricks, in Y. Hassanzadeh, A.A. Vahdati and Z. Karimi (eds) *Proceedings of the International Conference on the Iron Age in Western Iran and the Neighbouring Regions*: 258–272. Teheran and Sanandaj: Research Institute of Cultural Heritage and Tourism, National Museum of Iran, Kurdistan Province ICHHTO.

Gutow, A. 2013. Eine genutzte Chance. Das Fotoarchiv des Vorderasiatischen Museums im Neuaufbau. *Antike Welt* 6: 41–45.

Haller, A. and W. Andrae 1955. *Die Heiligtümer des Gottes Assur und der Sin-Šamaš-Tempel in Assur* (Wissenschaftliche Veröffentlichung der Deutschen Orient-Gesellschaft 67). Berlin: Gebr. Mann.

Hassanzadeh, Y. and H. Mollasalehi 2011. New evidence for Mannean art: An assessment of three glazed tiles from Qalaichi (Izirtu), in J. Álvarez-Mon and M.B. Garrison (eds) *Elam and Persia*: 407–417. Winona Lake, IN: Eisenbrauns.

Hauser, S. 2011. Assur und sein Umland in der Arsakidenzeit, in J. Renger (ed.) *Assur – Gott, Stadt und Land* (Colloquien der Deutschen Orient-Gesellschaft 5): 115–148. Wiesbaden: Harrassowitz.

Magen, U. 1986. *Assyrische Königsdarstellungen – Aspekte der Herrschaft. Eine Typologie* (Baghdader Forschungen 9). Mainz: Philipp von Zabern.

Marzahn, J. 1998. Farbe in Assur. Frühe Farbdiapositive in der Archäologie (1909–1910). *Mitteilungen der Deutschen Orient-Gesellschaft* 130: 223–239.

Marzahn, J. 2003. Der »virtuelle Tempel« aus Assur. Forschungsergebnisse in musealer Gestaltung – eine Vision, in J. Marzahn and B. Salje (eds) *Wiedererstehendes Assur. 100 Jahre deutsche Ausgrabung in Assyrien*: 192–202. Mainz: Philipp von Zabern.

Matthes, O. 2011. Zur Vorgeschichte der Ausgrabungen in Assur 1898–1903/1905. *Mitteilungen der Deutschen Orient-Gesellschaft* 129: 9–27.

Maul, S.M. 1999. Der assyrische König – Hüter der Weltordnung, in K. Watanabe (ed.) *Priests and Officials in the Ancient Near East*: 201–214. Heidelberg: Winter.

Mayer, W. 2013. *Assyrien und Urartu I. Der Achte Feldzug Sargons II. im Jahr 714 v. Chr.* (Alter Orient und Altes Testament 395.1). Münster: Ugarit-Verlag.

Measday, D., C. Walker and B. Pemberton 2017, A summary of ultra-violet fluorescent materials relevant to Conservation, viewed 17 October 2019, https://aiccm.org.au/national-news/summary-ultra-violet-fluorescent-materials-relevant-conservation (last accessed 10.01.2019).

Menzel, B. 1981. *Assyrische Tempel* (Studia Pohl 10). Rome: Biblical Institute Press.

Miglus, P.A. 2001. Der Aššur-Tempel des Königs Šamši-Adad I. und die mesopotamische Sakralarchitektur seiner Zeit, in J.-W. Meyer, M. Novák and A. Pruß (eds) *Beiträge zur Vorderasiatischen Archäologie. Festschrift W. Orthmann*: 322–331. Frankfurt am Main: Archäologisches Institut.

Moorey, P.R.S. 1994. *Ancient Mesopotamian Materials and Industries: The Archaeological Evidence*. Oxford: Clarendon Press.

Nadali, D. 2006. Esarhaddon's glazed bricks from Nimrud: The Egyptian campaign depicted. *Iraq* 68: 109–119.

Nunn, A. 1988. *Die Wandmalerei und der glasierte Wandschmuck im Alten Orient* (Handbuch der Orientalistik, 7. Abt., 1/2, Lfg. 6). Leiden: Brill.

Nunn, A. 2006. *Knaufplatten und Knäufe aus Assur* (Wissenschaftliche Veröffentlichung der Deutschen Orient-Gesellschaft 112). Saarwellingen: Saarländische Druckerei und Verlag.

Orthmann, W. (ed.) 1975. *Der Alte Orient* (Propyläen Kunstgeschichte 14). Berlin: Propyläen-Verlag.

Pongratz-Leisten, B. 2015. *Religion and ideology in Assyria* (Studies in Ancient Near Eastern Records 6). Berlin, Boston: De Gruyter.

Reade, J.E. 1970. The Design and Decoration of Neo-Assyrian Public Buildings. Unpublished PhD dissertation, University of Cambridge.

Reade, J.E. and I. Finkel 2014. Between Carchemish and Pasargadae: Recent Iranian discoveries at Rabat, in S. Gaspa, A. Greco, D.M. Bonacossi, S. Ponchia and R. Rollinger (eds) *From Source to History: Studies on Ancient Near Eastern Worlds and Beyond*: 581–596, 806–810. Münster: Ugarit-Verlag.

Salimi, S., S. Ebrahimipour and O. Sorkhabi 2019. Some Mannaean glazed bricks from the little Zab River's basin, Northwestern Iran. *Aramazd: Armenian Journal of Near Eastern Studies* 13.1: 101–110.

Sass, B. and J. Marzahn 2010. *Aramaic and figural stamp impressions on bricks of the sixth century B.C. from Babylon* (Wissenschaftliche Veröffentlichungen der Deutschen Orient-Gesellschaft 127). Wiesbaden: Harrassowitz.

Sauvage, M. 1998. *La brique et sa mise en oeuvre en Mésopotamie. Des origines à l'époque achéménide*. Paris: Éditions Recherche sur les Civilisations.

Schachner, A. 2007. *Bilder eines Weltreichs. Kunst- und Kulturgeschichtliche Untersuchungen zu den Verzierungen eines Tores aus Balawat (Imgur-Enlil) aus der Zeit von Salmanassar III. König von Assyrien* (Subartu XX). Turnhout: Brepols.

Shortland, A. 2012. *Lapis Lazuli from the Kiln. Glass and Glassmaking in the Late Bronze Age.* Leuven: Leuven University Press.

Strawn, B.A., S.C. Melville, K. Greenwood, S. Noegel 2006. Neo-Assyrian and Syro-Palestinian texts II, in M.W. Chavalas (ed.) *The Ancient Near East. Historical Sources in Translation*: 331–381. Malden, MA, Oxford, Victoria: Blackwell.

Tadmor, H. and S. Yamada 2011. *The royal inscriptions of Tiglath-pileser III (744–727 BC) and Shalmaneser V (726–722 BC), Kings of Assyria* (Royal Inscriptions of the Neo-Assyrian Period 1). Winona Lake, IN: Eisenbrauns.

Thomas, A. 2019. *Les peintures murales du palais de Tell Ahmar. Les couleurs de l'empire assyrien*. Paris: Musée du Louvre.

Van Driel, G. 1969. *The Cult of Aššur*. Assen: Brill.

Van Soldt, W.H., C. Pappi, A. Wossink, C.W. Hess and K.M. Ahmed 2013. Satu Qala: A preliminary report on the seasons 2010–2011. *Anatolica* 39: 197–239.

Weidner, E.F. 1926. Assyrische Emailgemälde vom achten Feldzuge Sargons II. *Archiv für Orientforschung* 3: 1–6.

Werner, P. 2016. *Der Anu-Adad-Tempel in Assur* (Wissenschaftliche Veröffentlichung der Deutschen Orient-Gesellschaft 145). Wiesbaden: Harrassowitz.

Zeßin, M. 2019. Reading between the lines: Fitters' marks in the Ancient Near East, in A. Amrhein, C. Fitzgerald and E. Knott (eds) *A Wonder to Behold: Craftsmanship and the Creation of Babylon's Ishtar Gate*: 81–89. Princeton: Princeton University Press.

Chapter 4:
Glazed Bricks by the Dozens:
A Khorsabad Jigsaw Reassembled at the Louvre

Ariane Thomas

Abstract: Excavators of Khorsabad (Iraq) reportedly found a large quantity of glazed bricks, unfortunately very damaged and often spread around the site. Thus only a few bricks arrived in Paris as individual study samples, mostly kept in store. Recent study of these Assyrian bricks in the Musée du Louvre has led to the reconstruction, if quite hypothetical, of a monumental panel. This paper will present that project along with the ongoing results of an associated research programme.

Keywords: Glazed Bricks; Khorsabad; Assyria; Louvre

1 Introduction

In addition to coloured stone reliefs, painted murals and shimmering fabrics and furnishings, thousands of glazed[1] bricks contributed to the polychrome 'magnificence'[2] of Assyrian architecture. These glazed bricks were rediscovered in large quantities at various places on the site of Khorsabad (Iraq), the ancient city of Dûr-Sharrukin, founded in the late 8th century BC to be its capital by king Sargon II (721–705 BC). Thus they must have played a major role in architectural decoration. However, the ones sent from Khorsabad to the Louvre in the mid-19th century were often lost, seriously damaged or separated from those with which they originally constituted a whole. Hence they were long viewed as the remnants of unsolvable jigsaw puzzles. A few of them were displayed individually, while the rest were placed in store. Putting them together is clearly no simple task, but a detailed study has resulted in a reassembly employing most of them. It also provided the opportunity to launch a project on glazed bricks, which is already underway.[3]

2 The modern history of the glazed bricks found at Khorsabad

A brief examination of the archives of the excavators of Khorsabad, and of the museums holding their discoveries, has shed further light on the glazed bricks found there, notably the ones now in the Louvre.

2.1 Discovery of Khorsabad's glazed bricks

The bricks are covered with a vitrified siliceous glaze on the side that would ultimately be seen. This glaze made a brick more visible once it had been detached from its original set that had crumbled to the ground.[4] Early scholars were struck by these bricks,[5] and the number of bricks still visible today on the ground at Khorsabad indicates the extent of their original quantity.

2.1.1 Paul-Emile Botta (1843–1845): A great number of scattered(?) bricks

On 20 March 1843, the French consul at Mosul, Paul-Emile Botta, began the first excavations in the history of Mesopotamian archaeology at Khorsabad. The dig continued, with a few interruptions, until June 1845. Although Botta primarily described the stone reliefs, he also mentioned the profusion of glazed bricks found 'in very great number' at various places on the site (Figure 1). '[I]n the earth are found numerous fragments of a thick plaster of a beautiful azure-blue colour'.[6] But Botta regretted that they were too scattered and incomplete to be put together: 'Unfortunately, I could find only fragments; which sufficed, for that matter, to offer an idea of this kind of decoration'.[7]

[1] See Nunn 1988: 142–159, on the often erroneous terminology that has led to various labels such as *Emaille* (enamelled), *Fayence* (faience) and *Glasur* (glazed).

[2] 'Magnificence' is the term used by Loud (1936: 93) to describe the effect of these '*glazed tableaus*'.

[3] This author is grateful for the support she received from many quarters, notably the Louvre's decorative-arts assembly workshop and restorer Anne Liégey. Warm thanks also go to Anne Bouquillon and Thomas Calligaro, as well as to Christel Doublet, Ann Bourges and Patrice Lehuédé, at the *Centre de Recherche et de Restauration des Musées de France* (C2RMF) for their invaluable help.

[4] This point is stressed in Eugène Flandin's account lamenting the difficulties encountered by early travellers (published in the great *Revue des Deux Mondes*): 'Nothing of the city of Semiramus, nothing of the city of Ninus – yet the keen if anxious traveller continued to seek, spurred by the corner of a cuneiform tablet or a fragment of a glazed brick' (Flandin 1845: 1082).

[5] The Abbé de Beauchamp – investigating sites and even making a few exploratory probes at Hillah where people had told him of a chamber wall on which 'there was a cow made of varnished bricks and the image of the sun and the moon' – came across 'a brick on which there was a lion and on others a half moon in relief' (Beauchamp 1790, quoted in Scheil 1913: 11–12, and Parrot 1946: 20). Beauchamp reportedly brought back 'a fragment of a glazed brick with a white rosette against a grey ground' (Longpérier 1854: 47; whereabouts unknown today) from 'Babylon', which perhaps means Hillah, located in the immediate vicinity.

[6] Mohl 1845: 22–23.

[7] Botta 1849–1850: V, 171.

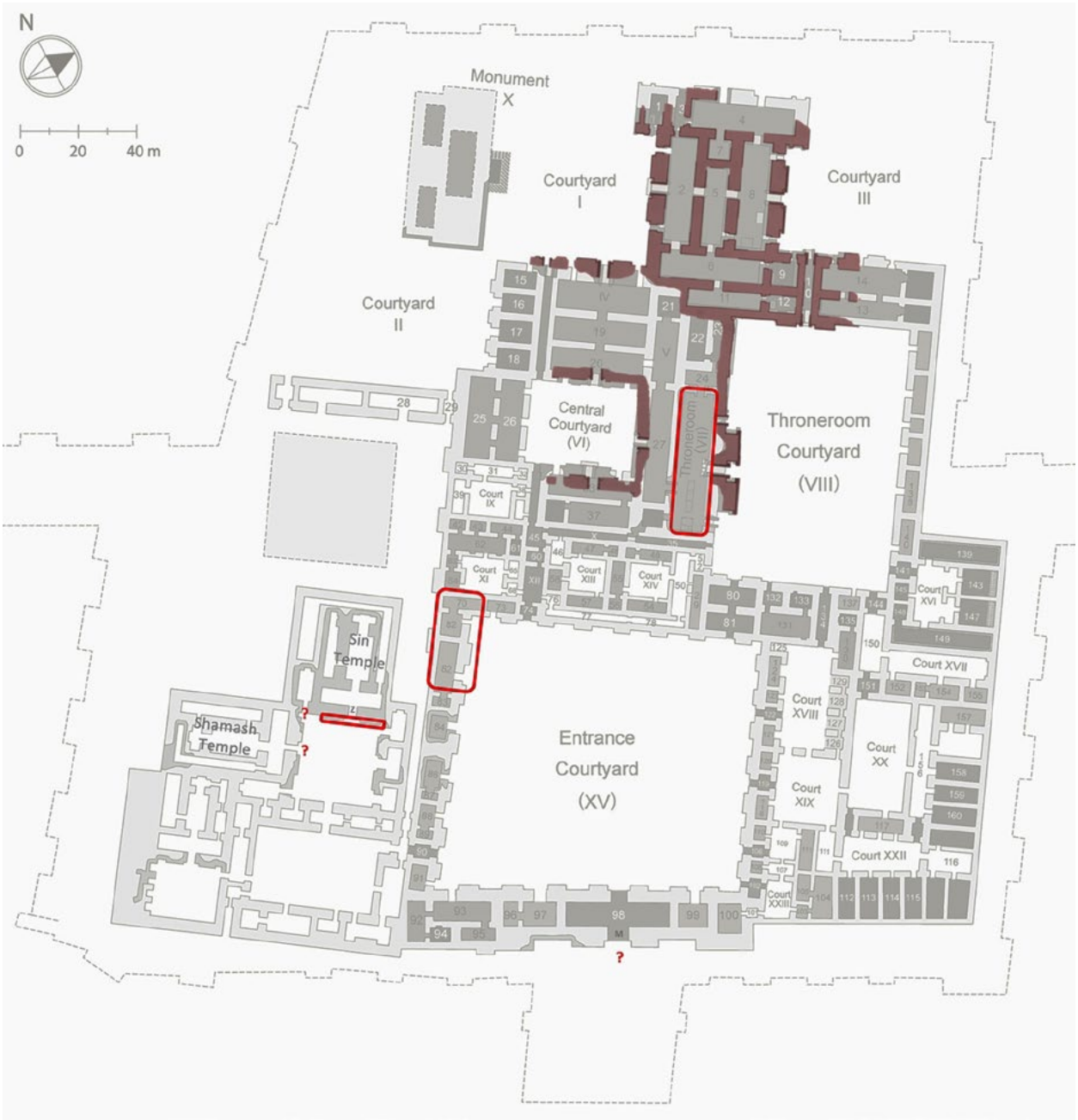


Figure 1. Layout of the Royal Palace at Khorsabad. Botta's excavations appear in brown, while hypothetical and confirmed locations of glazed bricks are marked in red (plan based on Kertai 2015: pl. 11).

Eugène Flandin, the artist who accompanied Botta to Khorsabad, created two watercolour plates showing thirty glazed bricks, including five sets of two contiguous bricks (Figure 2).[8] Based on currently known archives, it is unfortunately impossible to say whether the bricks found by Botta were completely scattered or had fallen in a more coherent way (with regard to the original arrangement) than it appeared.

2.1.2 Victor Place (1852–1854): Glazed bricks in a few specific locations

Nearly ten years later, Botta's successor as French consul in Mosul, Victor Place, resumed digging at Khorsabad between January 1852 and January 1854. He also came across many glazed bricks, whose locations he specified (Figure 1). According to Place, rooms 82 and 70 of the royal palace were 'completely filled with glazed bricks, some of them whole, others in pieces...in a jumble'.[9] Because he thought they were 'intended for

[8] Botta 1849–1850: II, pls. 155–156.

[9] Place 1867–1870: I, 89.

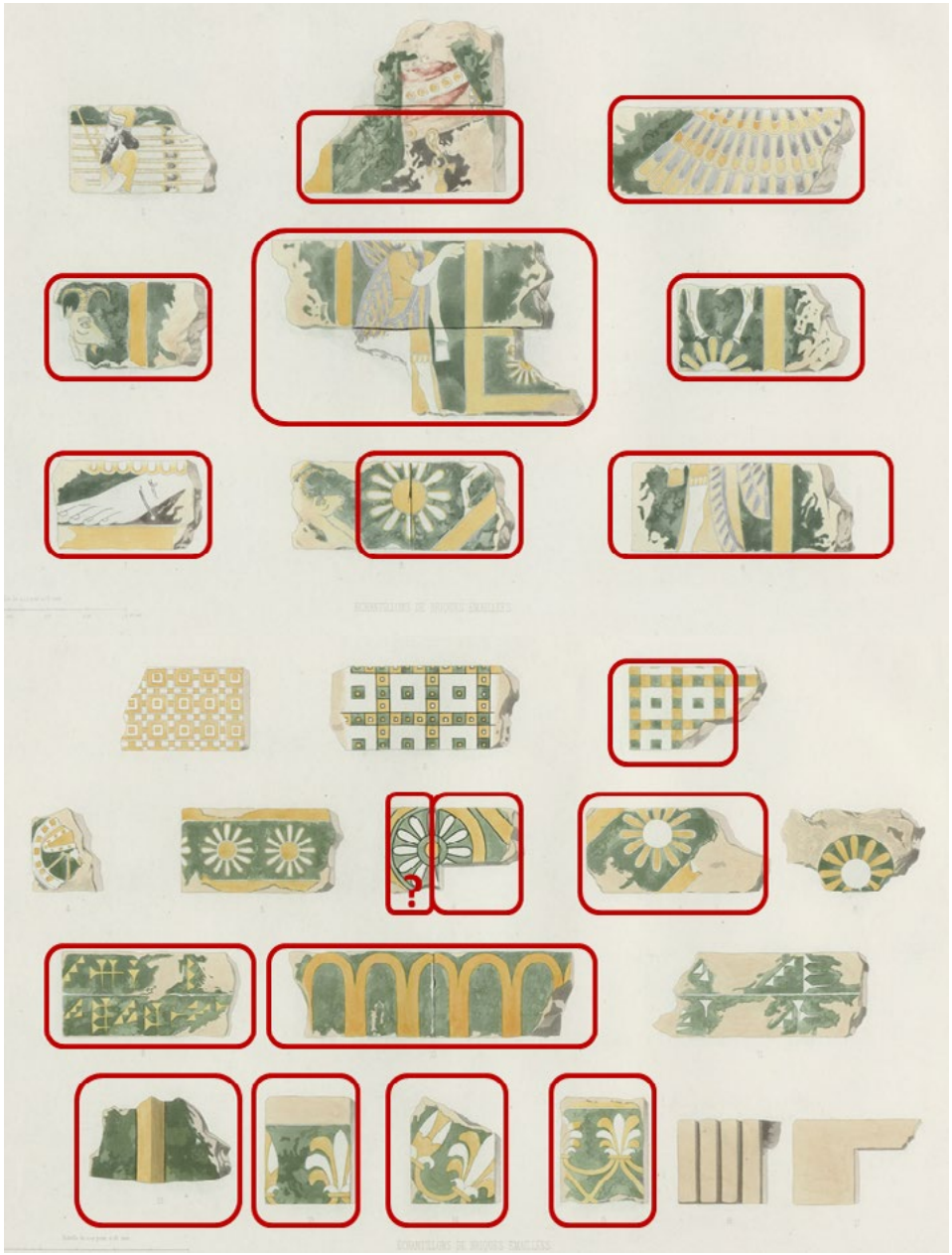


Figure 2. Plates of glazed bricks found at Khorsabad by Botta, drawn by Flandin. Those bricks now in the Louvre are circled in red
(after Botta 1849–1850: II, pls. 155–156; © New York Public Library).

use in future construction or . . . the refuse of completed construction', he named this place the 'glazed-brick warehouse'. However, the jumble in which he found them suggests that they might have fallen from high above and/or come from highly disturbed spots.

But Place also found glazed bricks *in situ* – and, moreover, some complete ensembles. The discovery shed fresh light on this type of decoration, prompting Place to state that 'it was Khorsabad which enlightened us about this important aspect of Assyrian construction'.[10] At the southern edge of the city, he uncovered a complete arc of glazed bricks gracing the archway of gate 3 in the outer wall. Drawings and watercolours of it by Félix Thomas survived (Figure 3a),[11] as does a painting exhibited by Thomas in the Salon of 1863,[12] plus roughly fifteen photographs by Gabriel Tranchand (Figure 3b).[13] These

[10] Place 1867–1870: I, 233.

[11] Place 1867–1870: III, pls. 11–17.

[12] Thomas 2017. The Salon (named after where it took place in the '*Salon carré*', a room in the Louvre) was the official art exhibition of the *Académie des Beaux-Arts* in Paris since the 17th century. Between 1748 and 1890 it was arguably the greatest annual or biennial art event in the Western world.

[13] These photographic archives are currently conserved at the

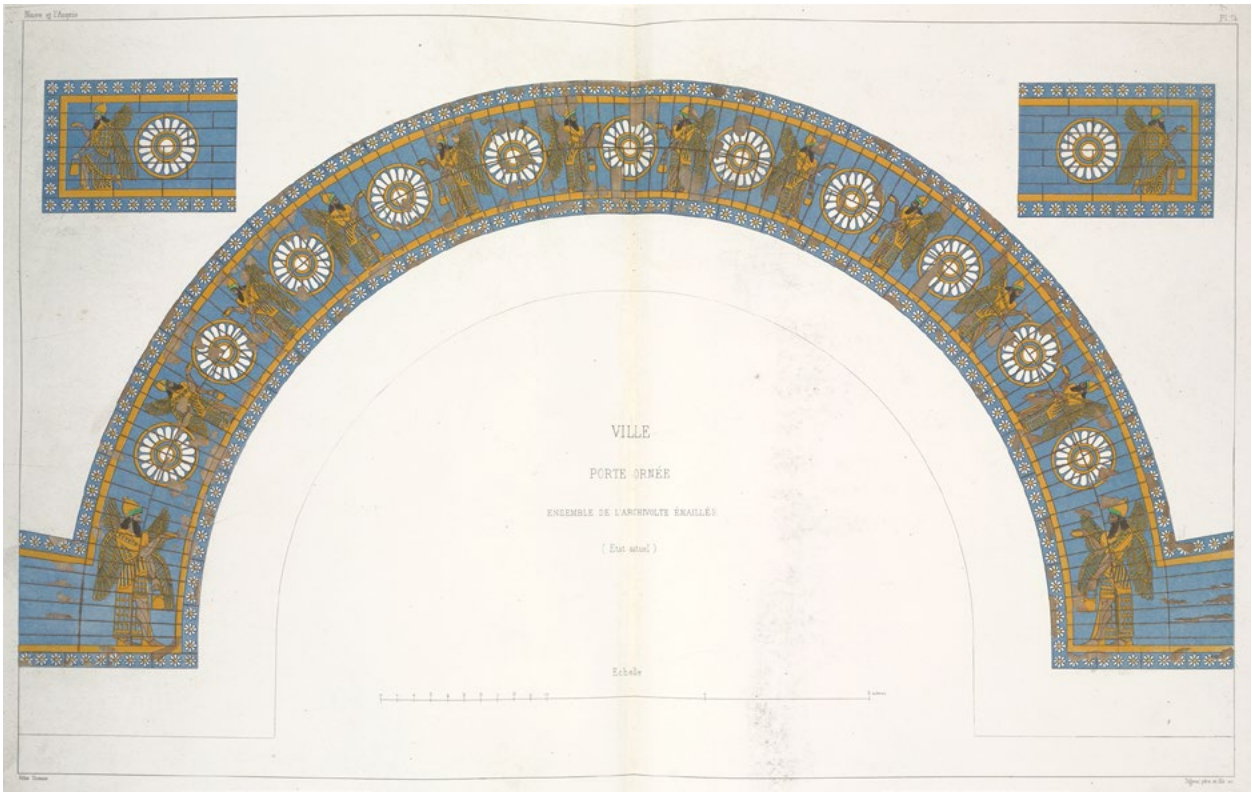


Figure 3a. Drawing of the glazed-brick decoration on gate 3 of the city of Khorsabad (Place 1867–1870: III, pl. 14; © New York Public Library).

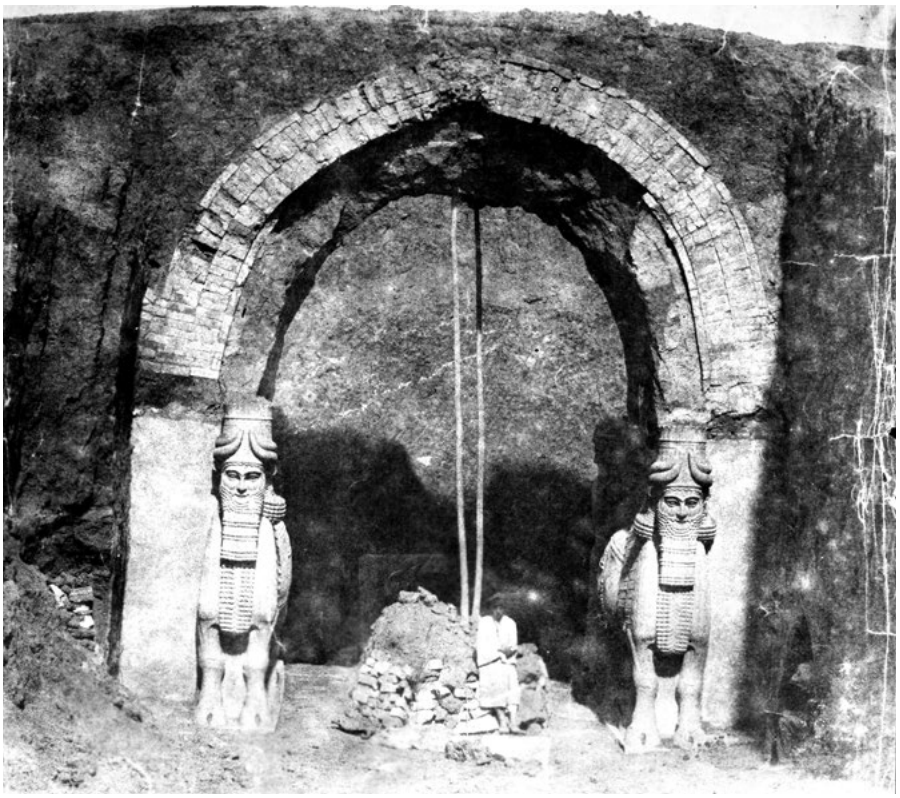


Figure 3b. Calotype by Gabriel Tranchand showing excavations of gate 3 of the city of Khorsabad, crowned by an arch of glazed bricks, *c.* 1853 (© archives, Department of Near Eastern Antiquities, Musée du Louvre).

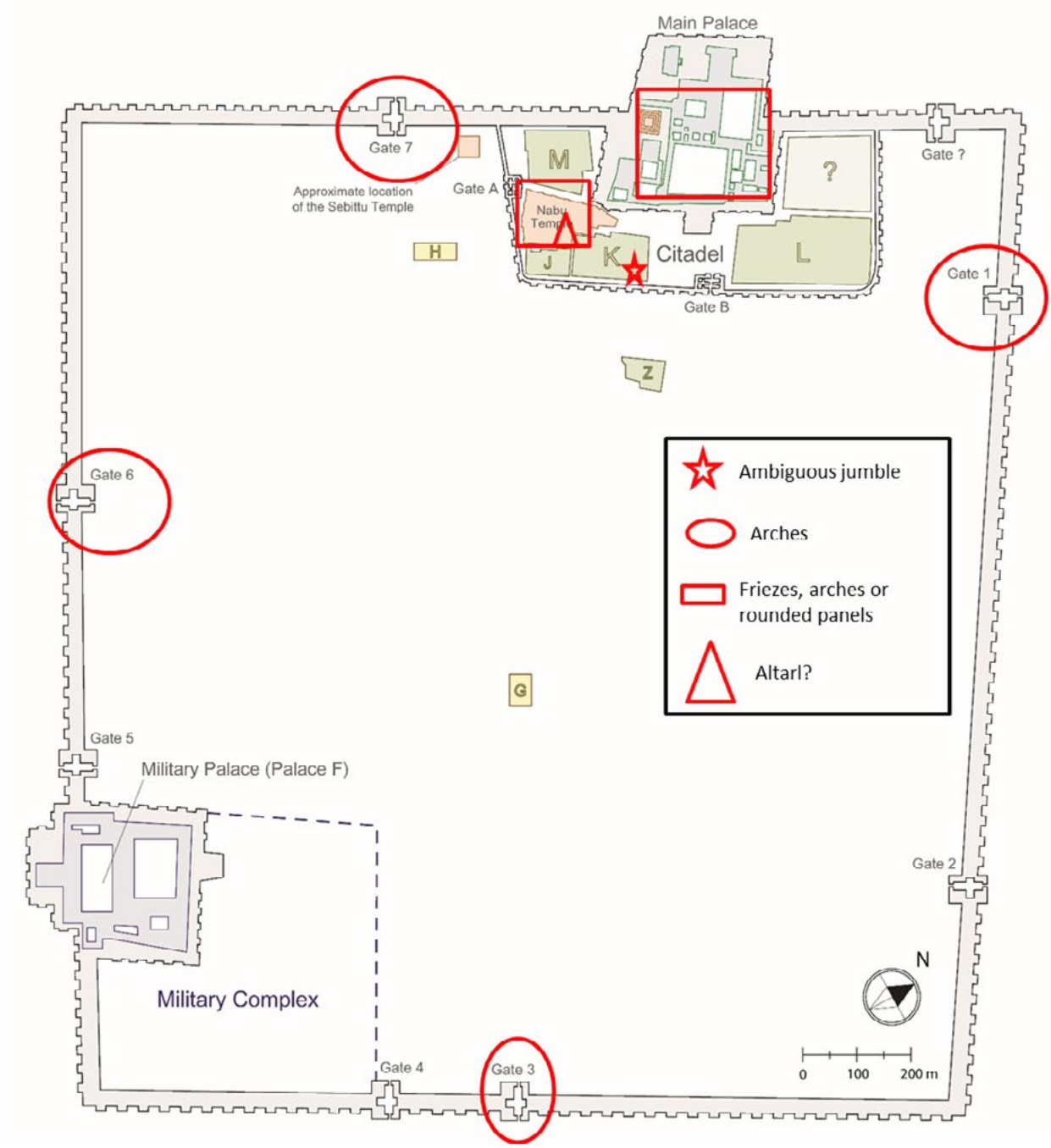


Figure 4. Plan of the city of Khorsabad, with known locations of discovery of glazed bricks marked in red (plan based on Kertai 2015: pl. 10A).

archives show that gate 3 was crowned by two rows of bricks arranged in a semi-circle above the archway, decorated with kneeling spirits and rosettes. The whole thing must have included at least 200 hundred glazed bricks. According to Place, the arch was 6.46 m high and spanned 4 m.

Place said that, along with stone bulls, he found more arches of glazed bricks adorning two other city gates, namely 1 and 6, although no known vestiges or pictures survived (Figure 4).[14] Hence still other gateways, which are furthermore decorated with a greater number of monumental bulls, may also have been graced by one

Collège de France (https://salamandre.college-de-france.fr/iconographie-search-form.html). They are calotypes, copies of which are held by the Louvre's Department of Near Eastern Antiquities. At least nine photos also show individual bricks (used as supports for various vases and other objects uncovered by Place's excavations) which may have come from this same group.

[14] Place 1867–1870: I, 181.

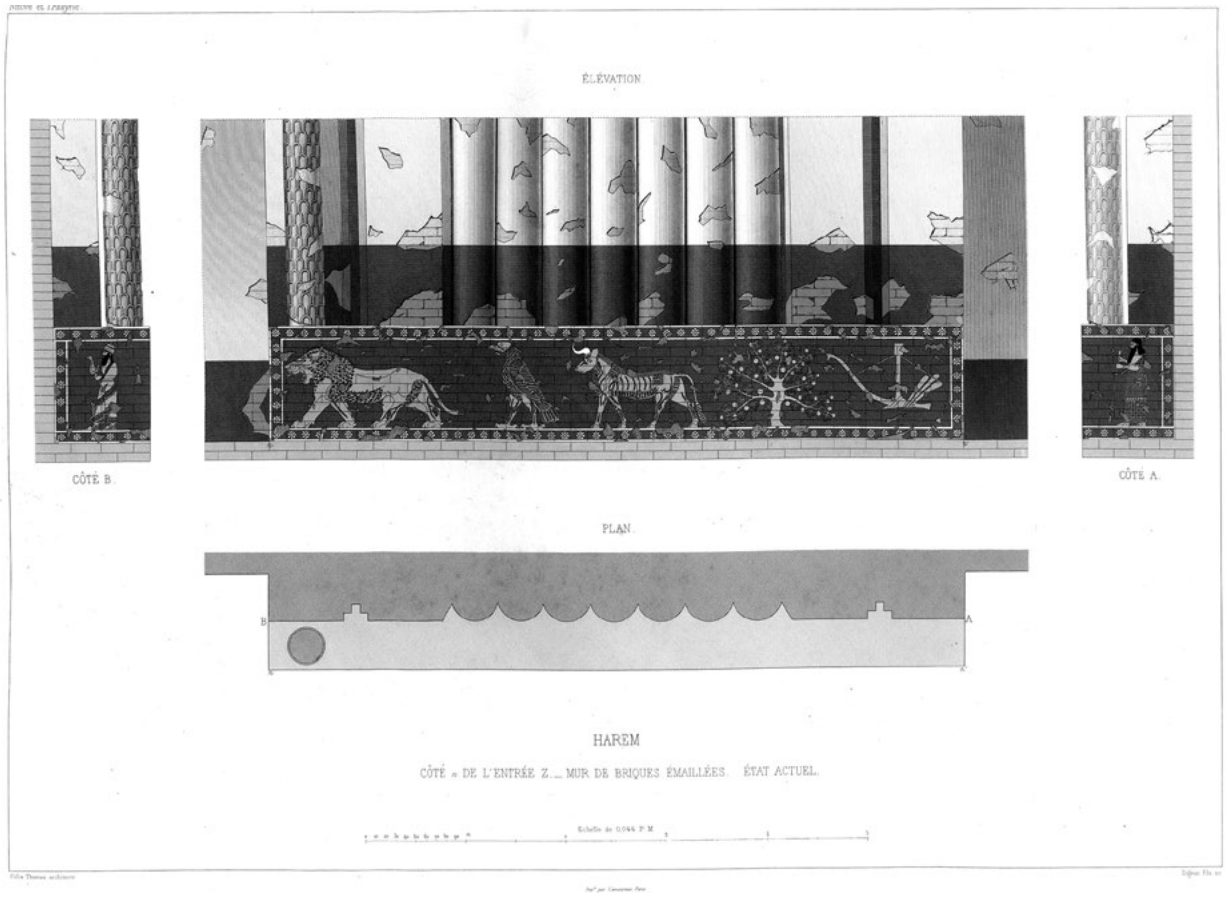


Figure 5. Decoration of the Sin temple facade in Khorsabad (Place 1867–1870: III, pl. 26; © New York Public Library).

(or several) arches of glazed bricks, such as gateway M, one of the main entrances to the royal place. Place suggested as much in his publication.[15]

At the base of the two walls flanking gate Z – what would turn out to be the entrance to the temple of the moon-god Sin, at the north end of the palace temple zone (not what Place called a 'harem')[16] – Place uncovered a long frieze of glazed bricks in courtyard XXVII (Figure 5).[17] This 12-course frieze of bricks measured 1.12 m high. Each side was 7 m long, for a total of 14 m in addition to the gateway. On each side, converging toward the entrance, were a lion, an eagle and a bull, with a fig tree and a plough; around the bend in the wall was the king at the head of this procession, while the rear was brought up by a dignitary (called 'the vizier' by Place). The whole thing was framed by a frieze of rosettes against a blue ground.

On the same wall, to the left of the monumental gateway, another entrance led to room 166, which turned out to be dedicated to Adad. According to Place, the alcove in this room was 'surmounted by an arch of glazed bricks, abundant debris of which was found in the rubble'.[18]

Also in courtyard XXVII, flanking gate Z" (the entrance to the temple of Shamash), Place noted an archway decorated with glazed bricks, many fragments of which filled the space between the two walls.[19]

Unfortunately, the sets of glazed bricks that Place collected for the Louvre vanished beneath the waves when the ship carrying them sank in the Shatt al-Arab in 1855. The archway of gate 3 was forever lost, never to take its place in the Louvre as a masterpiece documenting the colours of Assyrian architecture, whose place in the hierarchy of the arts was hotly debated at that time.

2.1.3 The Oriental Institute (1929–1935): Glazed bricks in context

A little less than a century after the French excavations, a team from the University of Chicago's Oriental

[15] Place 1867–1870: III, pls. 20–21. This reconstruction is highly fanciful, since nothing above the ruined bulls was conserved when the gate was discovered.
[16] Place 1867–1870: III, pl. 24.
[17] Place 1867–1870: III, pls. 23–31.
[18] Place 1867–1870: I, 128.
[19] Place 1867–1870: I, 126–127.

Institute (led by Edward Chiera, Henry Frankfort and Gordon Loud) uncovered the friezes of the Sin temple,[20] as well as glazed bricks at the entrance to the Shamash temple and the Ningal temple.[21] In the Nabu temple, they found bricks from a frieze or panel, as well as an altar or offering slab 150 cm square.[22] The excavators also described bricks decorating the bridge that connected the palace to the Nabu temple,[23] in vestibule K15 of Residence K[24] and in the city itself.[25] Along the city wall they also found 'many fragments of glazed bricks, with the usual rosette pattern, but none in position'.[26] Finally, they returned to Chicago with vestiges of glazed bricks from the throne room of the royal palace of Khorsabad.[27] Based on their size, these fragments of white cuneiform characters, of a human foot and of the remains of the fringe of a garment, probably belonged to a panel or a frieze, rather than an arch, for which the figures would have been smaller.

2.2 The provenance of the Louvre's bricks

The Louvre now holds 68 bricks from Khorsabad. Of those, 58 bear an inventory number assigned during the Second French Empire,[28] characterised by the prefix N (referring to the Musée Napoléon), from N 8079 to N 8138.[29] Eight other bricks have more recent numbers, from AO 29708 to AO 29715,[30] attributed in 1989 on the supposition that they were bricks surviving from Place's excavations.[31] Finally, two fragmentary bricks, bearing no visible number, were discovered in storage in June 2018.[32] Since these inventory numbers – not to mention those that have been effaced or never assigned – make no distinction between bricks found by Botta and those found by Place (even as certain late comments raised doubts about whether the bricks came not just from Khorsabad but also from Maltai),[33] it seemed essential to cross-check successive numbers with more or less precise descriptions, beginning with the ones published as early as 1849 by Adrien de Longpérier, the first curator of these antiquities.[34] The resulting concordance is given here in a chart of all the bricks in the Louvre (Table 1).

It can therefore be established that 58 of the Louvre's bricks were published by Longpérier prior to Place's explorations, and thus were certainly discovered by Botta. Only two bricks, unpublished prior to Longpérier in 1854 (Table 1, nos. 17–18), might have come from Place's digs; he had already made several shipments, including one of 19 chests of objects and archives from his excavations, which arrived in Paris in August 1853.[35] In contrast, at least two of the eight bricks thought in 1989 to have been found by Place (AO 29710 and AO 29712; Table 1, nos. 47b and 63) were published by Botta among the rare items selected for the only two plates illustrating such bricks (Figure 2).[36] Thus not all the bricks inventoried later could have come from Place's excavations, although that was probably the case of five others (AO 29708, AO 29709, AO 29711, AO 29713 and AO 29714; Table 1, nos. 59, 60, 62, 64–65). The 1989 supposition might therefore only be half wrong. If we add another brick inventoried at that time, AO 29715, even though it bears no image (Table 1, no. 66), plus the two bricks discovered in June 2018 (Table 1, nos. 67–68), we arrive at a total of eight bricks apparently shipped by Place.

In the end, apart from the uncertain provenance of a few of the Louvre's bricks, we can be certain that the majority came from Botta, hence from Khorsabad, the only site he worked on – unlike Place, who also explored surrounding areas. The bricks most probably come from the royal palace, which was Botta's main area of focus.

3 Toward a hypothetical reconstruction

Regarding Assyrian glazed bricks, as early as 1888 Joachim Menant wrote that 'we learn little from the few fragments preserved in our display cases. Only a large ensemble would enable us to appreciate them'.[37] Yet despite Julian Reade's 1995 suggestion that these bricks

[20] Loud 1936: 89–108.
[21] Loud 1936: 82–83, 110–114, figs. 92, 115, 116.
[22] Loud and Altman 1938: pl. 22C.
[23] Loud and Altman 1938: 42, pl. 12D
[24] Loud and Altman 1938: 42.
[25] Archives, Oriental Institute, excavation journal for 9 and 10 March 1930.
[26] Loud 1936: 3.
[27] Oriental Institute of Chicago, inv. A11796, A11797, A11799, A11807.
[28] They follow the Napoleon III inventory of crown furniture and furnishings, submitted on 8 April 1861 (the description of Assyrian artefacts begins at number 2855). See Table 1, nos. 1–58. These bricks also have another, roughly contemporary, inventory number, although not marked on them: Nap 2913 to Nap 2973 inclusive.
[29] These numbers succeeded the ones already attributed to other antiquities in the museum (after having had temporary numbers with the prefix LP, for Longpérier, the curator who categorised and inventoried them).
[30] See Table 1, nos. 59–66.
[31] Pillet 1963: 51.
[32] A temporary number was assigned to one brick (SH086937–1; Table 1, no. 67) in the hope of identifying it. Although seriously damaged, it appears to show a goat. The other brick is devoid of any representation, or at least none survives (SH086937–2).
[33] According to Pottier 1917: 144, these bricks come not just from Botta's dig but also from Maltai, based on information gathered by Maurice Pillet from the Place expedition files. However, some of Pottier's comments may be legitimately questioned, given that his catalogue contains a certain number of errors and inaccuracies – not to mention the fact that he failed to find several bricks fully extant today.
[34] Longpérier 1849a: 33–35.
[35] Although almost all of Place's discoveries were lost in the shipwreck, a few objects had been shipped earlier, between January 1852 and May 1853.
[36] Botta 1849–1850: II, pls. 155, 8a, 156, 7, corresponding to bricks AO 29710 and AO 29712 (even though, compared to its watercolour, it has lost part of its motif). One of these two bricks might be N 8127, of which no marked vestige has been found, especially since it corresponds to the description of 'another [brick] with white rosette on yellow ground' (Longpérier 1849b: 34).
[37] Menant 1888: 137.

Table 1: Glazed bricks from Khorsabad in the Louvre

No. in table	Inventory number	Museum	Dimensions in cm			Category	Re-assembled	References /comments
			Height	Length	Depth			
0	?	Lost				Central motif	No	Botta 1849–1850: II, pl. 155, 2a (brick contiguous to N 8079)
1	N 8079 (= Nap 2913) LP 2520	Louvre	11	24	18	Central motif	Yes	Botta 1849–1850: II, pl. 155, 2b; Longpérier 1849b: 33, no. 42-A; Longpérier 1854: no. 48; Pottier 1917; 1924: no. 199 (brick contiguous to N 8078; king's image deliberately defaced)
2	N 8080 (= Nap 2914)	Louvre	12.5	19.5	13	Central motif	Yes	Botta 1849–1850: II, pl. 155, 7; Longpérier 1849b: 33, no. 42-B; Longpérier 1854: no. 49; Perrot and Chipiez 1884: XV; Pottier 1917; 1924: no. 200; Department of Near Eastern Antiquities ex. cat. 1979: no. 254; Albenda 1986: 263; Caubet 2007: 88, no. 21
3	N 8081 (= Nap 2915)	Louvre	11.5	34	16–17	Border band	Yes	Botta 1849–1850: II, pl. 155, 5a; Longpérier 1849b: 33, no. 42-C; Longpérier 1854: nos. 50–53 (50); Pottier 1917; 1924: no. 198 (brick contiguous to N 8083b)
4	N 8082 (= Nap 2916)	Louvre	11	18	11	Border band	Yes	Botta 1849–1850: II, pl. 155, 5b (flower subsequently deteriorated); Longpérier 1849b: 33, no. 42-C; Longpérier 1854: nos. 50–53 (51)
5	N 8083 (= Nap 2917)	Louvre	11	17	10	Border band	Yes	Botta 1849–1850: II, pl. 155, 9; Longpérier 1849b: 33, no. 42-C; Longpérier 1854: nos. 50–53 (52)
6	N 8083b (= Nap 2918)	Louvre	10.5	15–16	6.5–9.8	Border band	Yes	Longpérier 1849b: 33, no. 42-C; Longpérier 1854: nos. 50–53 (53) (Brick contiguous to N 8081)
7	N 8084 (= Nap 2919)	Louvre	11.5	29.5	16	Central motif	Yes	Botta 1849–1850: II, pl. 155, 3; Longpérier 1849b: 33, no. 42-D; Longpérier 1854: no. 54; Pottier 1917; 1924: no. 201
7b	?	Lost					No	Longpérier 1849b: 33, no. 42-E
7c	N 8085 (= Nap 2920)	Lost					No	Longpérier 1849b: no. 42-F; Longpérier 1854: no. 55
8	N 8086 (= Nap 2921)	Louvre	10.5	16	9.5	Border band	Yes	Botta 1849–1850: II, pl. 155, 4; Longpérier 1849b: 35, no. 42-G; Longpérier 1854: no. 56
9	N 8087 (= Nap 2922)	Louvre	11	23.5–25	15.5–16	Border band	Yes	Botta 1849–1850: II, pl. 155, 6; Longpérier 1849b: 35, no. 42-H; Longpérier 1854: no. 57
10	N 8088 (= Nap 2923)	Louvre	11.5	11 to 12	16 to 16.5	Border band	Yes	Botta 1849–1850: II, pl. 155, 8b; Longpérier 1849b: no. 42-H; Longpérier 1854: no. 58
11	N 8089 (= Nap 2924)	Louvre	11	11.7–17.5	9–11	Inscription	No	Longpérier 1849b: no. 42-I; Longpérier 1854: no. 59; Pottier 1917; 1924: no. 202; Albenda 1986: 113; Frame 2020: 244–246 (brick contiguous to N 8090 [?])
12	N 8090 (= Nap 2925)	Louvre	9	19	16.5	Inscription	No	Longpérier 1849b: no. 42-J; Longpérier 1854: no. 60; Albenda 1986: 113; Frame 2020: 244–246 (brick contiguous to N 8089 [?])
13	N 8091 (= Nap 2926)	Louvre	9.5	32.5	16	Inscription	Yes	Longpérier 1849b: no. 42-K; Longpérier 1854: nos. 61–67 (61); Frame 2020: 244–246 (brick contiguous to N 8096)
14	N 8092 (= Nap 2927)	Louvre	9.5	32.5	16	Inscription	Yes	Longpérier 1849b: no. 42-K; Longpérier 1854: nos. 61–67 (62); Frame 2020 : 244–246

No. in table	Inventory number	Museum	Dimensions in cm			Category	Re-assembled	References /comments
			Height	Length	Depth			
15	N 8093 (= Nap 2928)	Louvre	9.5	32.5	15	Inscription	Yes	Botta 1849–1850: II, pl. 156, 9(?); Longpérier 1849b: no. 42-K; Longpérier 1854: nos. 61–67 (63)
16	N 8094 (= Nap 2929)	Louvre	9.5	20.5	16	Inscription	Yes	Longpérier 1849b: no. 42-K; Longpérier 1854: nos. 61–67 (64); Caubet and Pierrat-Bonnefois 2005: 106, ill. 283; Frame 2020: 244–246
17	N 8095 (= Nap 2930)	Louvre	9.5	33	16	Inscription	Yes	Longpérier 1854: nos. 61–67 (65); Frame 2020: 244–246
18	N 8096 (= Nap 2931)	Louvre	9.5	17	9	Inscription	Yes	Longpérier 1854: nos. 61–67 (66); Caubet and Pierrat-Bonnefois 2005: 106, no. 284; Frame 2020: 244–246 (brick contiguous to N 8091)
19	N 8097 (= Nap 2932)	Louvre	9	15.5	11	Inscription	Yes	Longpérier 1849b: no. 42K; Longpérier 1854: nos. 61–67 (67); Frame 2020: 244–246 (loss of some decoration after 1850)
20	N 8098 (= Nap 2933)	Louvre	10	12.5	6–7		No	Longpérier 1849b: 35, no. 42-L; Longpérier 1854: no. 68; Pottier 1917; 1924: no. 197; Caubet 2007: 86, no. 18
21	N 8099 (= Nap 2934)	Louvre	9	12.5	10–12	Border band	No	Botta 1849–1850: II, pl. 156, 12; Longpérier 1849b: 35, no. 42-M; Longpérier 1854: no. 69; Pottier 1917; 1924: no. 197; Caubet 2007: no. 19
21b	N 8100 (= Nap 2935)	Lost(?)				Base	No	Longpérier 1849b: 35, no. 42-N; Longpérier 1854: nos. 70–77 (= 70)
22	N 8101 (= Nap 2936)	Louvre	9.5	32.5	16	Base	Yes	Longpérier 1849b : 35, no. 42-N; Longpérier 1854: nos. 70–77 (= 71)
23	N 8102 (= Nap 2937)	Louvre	10.5	24.5–25.5	15.5	Base	Yes	Botta 1849–1850: II, pl. 156, 10a(?); Longpérier 1849b: 35, no. 42-N; Longpérier 1854: nos. 70–77 (= 72)
24	N 8103 (= Nap 2938)	Louvre	10.5	33	16	Base	Yes	Longpérier 1849b: 35, no. 42-N; Longpérier 1854: nos. 70–77 (= 73); Pottier 1917; 1924: no. 195
25	N 8104 (= Nap 2939)	Louvre	10.5	14.5–15	9–10	Base	Yes	Longpérier 1849b: 35, no. 42-N; Longpérier 1854: nos. 70–77 (= 74); Pottier 1917; 1924: no. 195
26	N 8105 (= Nap 2940)	Louvre	10.5	33–33.5	16	Base	Yes	Longpérier 1849b: 35, no. 42-N; Longpérier 1854: nos. 70–77 (= 75); Pottier 1917; 1924: no. 195
27	N 8106 (= Nap 2941)	Louvre	10.5	33–33.5	16	Base	Yes	Longpérier 1849b: 35, no. 42-N; Longpérier 1854: nos. 70–77 (= 76); Pottier 1917; 1924: no. 195
28	N 8107 (= Nap 2942)	Louvre	10.5	21	10	Base	Yes	Longpérier 1849b: 35, no. 42-N; Longpérier 1854: nos. 70–77 (= 77)
29	N 8108 (= Nap 2943)	Louvre	11.5	16–18	9	Border band	Yes	Botta 1849–1850: II, pl. 156, 15 (highly deteriorated since); Longpérier 1849b: 35, no. 42-O; Longpérier 1854: nos. 78–88 (= 78); Albenda 1986: pl. 151; Caubet 2007: 88, no. 20
30	N 8109 (= Nap 2944)	Louvre	11	15–16	10	Border band	Yes	Longpérier 1849b: 35, no. 42-O; Longpérier 1854: nos. 78–88 (= 79); Pottier 1917; 1924: no. 197
31	N 8110 (= Nap 2945)	Louvre	11.5	15	17	Border band	Yes	Botta 1849–1850: II, pl. 156, 13 (highly deteriorated since); Longpérier 1849b: 35, no. 42-O; Longpérier 1854: nos. 78–88 (= 80)

No. in table	Inventory number	Museum	Dimensions in cm			Category	Re-assembled	References /comments
			Height	Length	Depth			
32	N 8111 (= Nap 2946)	Louvre	11	13.5–14	3.5–4	Central motif	Yes	Longpérier 1849b: 35, no. 42-O; Longpérier 1854: nos. 78–88 (= 81)
33	N 8112 (= Nap 2947)	Louvre	11	20.5	14–15	Border band	Yes	Botta 1849–1850: II, pl. 156, 14 (highly deteriorated since); Longpérier 1849b: 35, no. 42-O; Longpérier 1854: nos. 78–88 (= 82)
34	N 8113 (= Nap 2948)	Louvre	11	15.5	11	Border band	Yes	Longpérier 1849b: 35, no. 42-O; Longpérier 1854: nos. 78–88 (= 83)
35	N 8114 (= Nap 2949)	Louvre	10.5	12	8.5	Central motif	Yes	Longpérier 1849b: 35, no. 42-O; Longpérier 1854: nos. 78–88 (= 84)
36	N 8115 (= Nap 2950)	Louvre	11	16	12.5	Border band	Yes	Longpérier 1849b: 35, no. 42-O; Longpérier 1854: nos. 78–88 (= 85)
37	N 8116 (= Nap 2951)	Louvre	11–12	23	14–15	Border band	Yes	Longpérier 1849b: 35, no. 42-O; Longpérier 1854: nos. 78–88 (= 86)
38	N 8117 (= Nap 2952)	Louvre	10.5	12	11	Border band	Yes	Longpérier 1849b: 35, no. 42-O; Longpérier 1854: nos. 78–88 (= 87)
39	N 8118 (= Nap 2953)	Louvre	10.5	14–15	10.5–11	Border band	Yes	Longpérier 1849b: 35, no. 42-O; Longpérier 1854: nos. 78–88 (= 88); Pottier 1917; 1924: no. 196
40	N 8119 (= Nap 2954)	Louvre	10.5–11	15.5–16	14.5–15	Border band	Yes	Longpérier 1849b: 35, no. 42-P; Longpérier 1854: no. 89
41	N 8120 (= Nap 2955)	Louvre	9.5–10	32	20	Border band	Yes	Longpérier 1849b: 35, no. 42-Q; Longpérier 1854: no. 90; Pottier 1917; 1924: no. 196 (brick contiguous to N 8125)
42	N 8121 (= Nap 2956)	Louvre	11	13.5	16–17	Border band	Yes	Longpérier 1849b: 35, no. 42-Q; Longpérier 1854: no. 91; Pottier 1917; 1924: no. 196
43	N 8122 (= Nap 2957)	Louvre	9.5	13.5	8.5	Border band	Yes	Botta 1849–1850: II, pl. 156, 6b; Longpérier 1849b: 35, no. 42-R; Longpérier 1854: nos. 92–96 (= 92); Pottier 1917; 1924: no. 196
44	N 8123 (= Nap 2958)	Louvre	10	14	16	Border band	Yes	Botta 1849–1850: II, pl. 156, 6a (but placed the wrong way); Longpérier 1849b: 35, no. 42-R; Longpérier 1854: nos. 92–96 (= 93); Pottier 1917; 1924: no. 196
45	N 8124 (= Nap 2959)	Louvre	11.5	33	16.5	Border band	Yes	Longpérier 1849b: 35, no. 42-R; Longpérier 1854: nos. 92–96 (= 94)
46	N 8125 (= Nap 2960)	Louvre	9.5	20.5	15.5	Border band	Yes	Longpérier 1849b: 35, no. 42-R; Longpérier 1854: nos. 92–96 (= 95) (brick contiguous to N 8120)
47	N 8126 (= Nap 2961)	Louvre	12	20	15.5–16	Border band	Yes	Longpérier 1849b: 35, no. 42-R; Longpérier 1854: nos. 92–96 (= 96)
47b	N 8127 (= Nap 2962)	Lost = AO 29710(?)					No	Longpérier 1849b: 35, no. 42-S; Longpérier 1854: no. 97
48	N 8128 (= Nap 2963)	Louvre	9.5–10	13–14	13.5–14	Central motif	Yes	Longpérier 1849b: 35, no. 42-T; Longpérier 1854: nos. 98–107 (= 98)
49	N 8129 (= Nap 2964)	Louvre	10	11	15.5	Central motif	Yes	Botta 1849–1850: II, pl. 156, 3 (highly deteriorated since – loss at right and colours [?]); Longpérier 1849b: 35, no. 42-T; Longpérier 1854: nos. 98–107 (= 99)
50	N 8130 (= Nap 2965)	Louvre	9.5	12.5	15.5	Central motif	Yes	Longpérier 1849b: 35, no. 42-T; Longpérier 1854: nos. 98–107 (= 100)
51	N 8131 (= Nap 2966)	Louvre	9.5	9	12.5–13	Central motif	Yes	Longpérier 1849b: 35, no. 42-T; Longpérier 1854: nos. 98–107 (= 101)

No. in table	Inventory number	Museum	Dimensions in cm			Category	Re-assembled	References /comments
			Height	Length	Depth			
52	N 8132 (= Nap 2967)	Louvre	12	10.5–12	11	Central motif	No	Botta 1849–1850: II, pl. 156, 1(?) (piece subsequently lost); Longpérier 1849b: 35, no. 42-T; Longpérier 1854: nos. 98–107 (= 102)
53	N 8133 (= Nap 2968)	Louvre	8.5–10	10	7	Central motif	No	Longpérier 1849b: 35, no. 42-T; Longpérier 1854: nos. 98–107 (= 103)
54	N 8134 (= Nap 2969)	Louvre	9	15–16	15	Central motif	Yes	Longpérier 1849b: 35, no. 42-T; Longpérier 1854: nos. 98–107 (= 104)
55	N 8135 (= Nap 2970)	Louvre	9.5	23–24	12.5–13	Central motif	Yes	Longpérier 1849b: 35, no. 42-T; Longpérier 1854: nos. 98–107 (= 105); Pottier 1917; 1924: no. 197; Caubet and Pierrat-Bonnefois 2005: 106, no. 285
56	N 8136 (= Nap 2971)	Louvre	10	11.4–13	9	Central motif	Yes	Longpérier 1849b: 35, no. 42-T; Longpérier 1854: nos. 98–107 (= 106)
57	N 8137 (= Nap 2972)	Louvre	10	12.5	9.5	Central motif	Yes	Longpérier 1849b: 35, no. 42-T; Longpérier 1854: nos. 98–107 (= 107)
58	N 8138 (= Nap 2973)	Louvre	10	14	13–13.5	Central motif	Yes	Longpérier 1849b: 35, no. 42-U; Longpérier 1854: no. 108; Pottier 1917; 1924: no. 197
59	AO 29708	Louvre	9.5	16	13	Central motif	Yes	
60	AO 29709	Louvre	9	10	7.5	Central motif	Yes	
61	AO 29710 = N 8127 ?	Louvre	11	32	16.5	Border band	Yes	Botta 1849–1850: II, pl. 156, 7; Longpérier 1849b: 33, no. 42-S(?); Longpérier 1854: no. 97
62	AO 29711	Louvre	10	8	7	Central motif	No	
63	AO 29712	Louvre	11.5	8	8	Border band	Yes	Botta 1849–1850: II, pl. 155, 8a (deteriorated – loss of fragment of goat)
64	AO 29713	Louvre	7	6	7	Central motif	Yes	
65	AO 29714	Louvre	9	5	9	Central motif	No	
66	AO 29715	Louvre	8	14	12	Decoration not preserved	Yes	
67	SH086937–1	Louvre	8.2	7.5	5.5	Border band (?) Fragment of a goat (?)	No	
68	SH086937–2	Louvre	8.5	12	6	Decoration not preserved	No	

belong to one or several nearly identical panels with rounded tops,[38] it was only in 2015 that this author – charged with curating an exhibition[39] – was able to attempt to reassemble the Khorsabad bricks in the Louvre.

3.1 Typologies and coherence of the Louvre's collection

First the sizes, patterns and colours of these bricks were categorised, along with their marks and any other aspect that might help to determine whether or not they might be pieced together, for it was not certain that they could all fit into the same puzzle.

3.1.1 Shape

With the exception of one square brick that apparently never reached the Louvre – roughly 30 cm square, seen in Tranchand's calotypes (Figure 6)[40] – all the glazed bricks from Khorsabad currently in the Louvre are

[38] Reade 1995: 229–230.

[39] *L'histoire commence en Mésopotamie*, exhibition held at the Louvre–Lens from 2 November 2016 to 30 January 2017, curated by Ariane Thomas.

[40] The Oriental Institute in Chicago holds a square glazed brick that apparently comes from the throne room of the royal palace in Khorsabad (Table 2, no. 28).

Figure 6. Calotype by Gabriel Tranchand showing a square glazed brick used as a base for various objects, *c.* 1853 (© archives, Department of Near Eastern Antiquities, Musée du Louvre).

rectangular in shape.[41] But some of the very partial ones might have originally been square. In fact, the only complete panel of glazed bricks recovered to date features an alternation of square and rectangular bricks, to help it bond to the wall it once adorned (Figure 7).[42] One of the Louvre's bricks stands out from the others by being a corner brick (N 8099), glazed on two adjacent sides rather than solely on one. Except for this brick, the decoration on all the others is applied to just one of the long edges.

3.1.2 Dimensions

Based on the best preserved examples (Table 1, nos. 3, 7, 13–15, 17, 22, 24, 26–27, 41, 45, 55 and 61) these rectangular bricks were, on average, some 15 cm deep and roughly 10 cm high. They display a certain number of differences,[43] some of which seem insignificant, while others suggest that the bricks were not all part of one panel, but rather of several distinct – if iconographically similar – panels.

3.1.3 Designs

Analysis of the Louvre's bricks, as well as those merely published by Botta and Place, reveals twelve major categories of design: winged spirits (Table 1, nos. 3–6); what should be identified as the lower part of a winged disc (Table 1, no. 7); goats (Table 1, nos. 8–10); vestiges of cuneiform inscriptions coloured white or yellow (Table 1, nos. 11–19); a wavy chequered pattern (Table 1, no. 20); the above-mentioned, turquoise-blue corner brick (Table 1, no. 21); what former catalogues described as an ovolo pattern but will be interpreted here as mountains (Table 1, nos. 22–28); various floral patterns (Table 1, nos. 29–40, 64), including large open blossoms alternating with buds that must be lotuses (Table 1, nos. 30, 31, 33, 34, 36, 39–40); palmettes linked by intertwining, stylised tendrils (Table 1, nos. 29, 32, 35, 37, 38 and 64); and various types of rosettes (Table 1, nos. 41–47, 61, 63). There is also the head and foot of a figure interpreted to be a king of Assyria (Table 1, nos. 0–2) and, finally, several kinds of garments (Table 1, nos. 48–60, 65), not to mention lone motifs that are still poorly understood (Table 1, no. 62). Several bricks that display variations on certain patterns (in terms of colour and size) have been broken down into sub-categories here.

Some goats are shown standing, hooves close together, upon a rosette with white centre and twelve yellow petals (Table 1, no. 9), while others are kneeling, flanking either side of a rosette with yellow centre and twelve white petals.[44]

[41] Reade 1963: 38–39.
[42] Reade 1963.
[43] One brick (N 8080) is 12.5 cm high while another (N 8097) is 3.5 cm shorter.
[44] Botta 1849–1850: II, pl. 155, 8a, 8b. The left-hand brick (8a) corresponds to brick AO 29712, now seriously deteriorated, having almost entirely lost its figure of a yellow goat; the right-hand brick (8b) is inventoried under number N 8088 (Table 1, nos. 10 and 63).

Bricks with 'chequered borders'[45] must depict garment fabrics. Despite the disparate deterioration of bricks of similar origin,[46] three variants can be distinguished, based on the appearance and/or colours of the chequers, as well as their border. A first group features white squares with a yellow square in the middle; this white square is surrounded by sixteen small blue and yellow squares (Table 1, nos. 48, 49, 54, 56–58). Three of these bricks include a border pattern of yellow dots alternating with yellow squares with blank centres (Table 1, nos. 48, 56 and 58). A second group is characterised by white squares with a blue square in the centre, surrounded by sixteen little squares with, in their centres, an even smaller square in alternating colours of blue and yellow (Table 1, nos. 50, 51, 55 and 57).[47] A third type entails a chequered fabric of squares formed by a solid yellow line, in which is set a solid yellow square; a network of smaller yellow squares also appears on the outer edge of the larger squares, the whole thing being strictly aligned in an orthogonal pattern (Table 1, nos. 52 and perhaps also 53 and 65).

Floral patterns include at least five sub-types of rosette. The first group, featuring yellow centres and twelve white petals (Table 1, nos. 10, 45, 47 and 63) was perhaps alternated with the second, symmetrically contrasting group with white centres and twelve yellow petals (Table 1, nos. 9 and 61 [?]).[48] A third group is characterised by yellow petals externally ringed by a yellow circle (Table 1, no. 14). This third type may have alternated with the fourth, symmetrically contrasting, group of white petals externally ringed by a double band of white and yellow (contiguous bricks N 8125 and N 8120, and N 8106; Table 1, nos. 46, 41, 27).[49] Two other bricks also seem to belong to this fourth group (Table 1, nos. 43 and 44); perhaps because they are better preserved, they show a black line ringing not only an outer yellow circle but also an inner, slender turquoise-blue circle ringing roughly twelve white petals, also outlined in black, against a background that is now green. These petals radiate from a yellow centre ringed by turquoise blue, the whole thing outlined in black. Only one other brick from group four retains traces of black outlines (Table 1, no. 41). The fifth group features rosettes with nine white petals – wider and shorter than the other groups – around a yellow centre, but no ring (Table 1, nos. 4 and 42).

[45] Longpérier 1854: 46, nos. 98–107 ('à bordures quadrillées').
[46] This deterioration has effaced certain outlines and altered originally identical colours.
[47] Botta 1849–1850: II, pl. 156, 2.
[48] Brick AO 29710 also has twelve yellow petals, but the centre appears to be green while the ground is black, which might simply be the result of deterioration specific to this brick, as discussed below.
[49] It is possible that the third group also had a double yellow-and-white ring, but the surviving brick is too worn to be certain.

3.1.4 Colours

Apart from a few exceptions (N 8098, N 8099 and N 8080 in particular), which may therefore originate from a different tableau, the Khorsabad bricks are in a poor state of conservation, whether now at the Louvre or at the Oriental Institute in Chicago. In many cases, the glazing has almost completely disappeared, leaving only a dull ghost of the decoration. So hasty judgments should not be made based on what is visible to the naked eye – which is the point of another study currently underway. Nevertheless, at least four or five colours can be discerned: orange-yellow, white, black and grey-blue-green/brown, to which should be added red, based on Flandin's watercolour of the king's tiara (Figure 2).

3.1.5 Joins and other reference points

18 of the Louvre's bricks were contiguous, forming six pairs: AO 29712[50] and N 8088, rosette and goat; N 8116 and N 8117, palmette; N 8096, N 8091 and N 8099, inscription; N 8081 and N 8083b, spirit; N 8136 and N 8128, garment; N 8125 and N 8120, rosette. To these could be added a row of five bricks depicting mountains (N 8102, N 8105, N 8103, N 8101 and N 8107), in a repetitive pattern that makes their juxtaposition possible, though not certain.

Other bricks served as reference points for the overall composition because they showed several patterns in combination. For example, one brick has a winged spirit separated by a vertical yellow stripe from a rosette, itself flanked by yellow borders above and below (N 8082). Another has a rosette separated from a fragment of a cuneiform inscription by a vertical stripe (N 8092). Others combine mountains with a vertical yellow stripe and a circular pattern (a hint of which can be seen on the right of N 8106), or else the mountains have a thick, horizontal yellow border that defines itself as the top of that pattern (N 8104). Two bricks show, respectively, a spirit and rosette (N 8081 and N 8120) between two vertical stripes that indicate the width of those borders. One brick with a pattern flanked by two horizontal stripes indicates the height (N 8121). Other bricks have a curve that situates them at the top of the panel, in the arch (AO 28710, N 8126, N 8122 and N 8127).

3.1.6 Marks

At least six bricks have clearly visible fitters' marks that must have been used to assemble the panel, as attested on other, similar Assyrian decoration.[51] In addition to conserved, discernible marks such as crosses, circles and up to ten vertical lines, there are also hard-to-

[50] This brick today shows just a rosette, whereas it also had a goat at the time it was depicted on Flandin's watercolour (Botta 1849–1850: II, pl. 155, 8a).
[51] Reade 1963: 39–40.

distinguish motifs perhaps comparable to the beardless heads observed at Fort Shalmaneser.[52] These marks were painted in white on the inner face of the long side of the bricks.[53] Seventeen other bricks bear less legible traces of what might be such marks (N 8080, N 8083, N 8091, N 8092, N 8095, N 8096, N 8103, N 8109, N 8111, N 8113, N 8114, N 8115, N 8118, N 8120, N 8123, N 8135, N 8136). In contrast, seven bricks (N 8101, N 8125, N 8129, N 8130, N 8132, N 8137, AO 29708) show what seem to be simple drips of glaze. Although originally designed to guide installation of the panel, these fitters' marks have not, unfortunately, aided this attempt at modern reassembly, especially since the bricks with the clearest marks are not the few contiguous ones.[54]

3.2 Reconstructing a coherent whole

This reassembly, despite its purely hypothetical nature, has been done with bricks that are sufficiently similar to go together even though they may originate from different tableaus.

3.2.1 What kind of decorative feature?

The numerous glazed bricks uncovered in Assyria in the past two hundred years have made it possible to understand where and how they originally appeared.

Brief review:

While the exact original placement of many surviving bricks remains unknown, what we know of glazed Assyrian bricks (Table 2) reveals at least five categories of decorative feature:

– Round arches on the gates of cities and temples are attested by Place's discoveries at Khorsabad (city gates 3 [Figure 3], 1, 6 and 7; room 166, the Adad temple; gate Z of the Sin temple), and were perhaps also found on passageways within the palace, as discussed below.
– Panels with rounded tops,[55] which must have been placed above lower decoration, as seen in another mural showing one such panel that was 13 m high, crowning long friezes that were already 7 m high (Figure 8).[56] This rare evidence of decoration some 20 m high was discovered in the private residence (K) of a Khorsabad dignitary. The mural might be a less costly version of decoration that could entail various supports and techniques when done in the royal palace (whose throne room contained vestiges of glazed bricks and painted murals certainly combined with reliefs). The only complete, preserved example of one of these panels of glazed bricks is on display at the Baghdad Museum (Figure 7); it was found in ruins at Fort Shalmaneser, in a passage leading from a room behind the throne room to courtyard T.[57]
– Long, low friezes sometimes adorned the bases of outer walls. Place uncovered this type of decoration flanking the entrances to temples in Khorsabad. And at Nimrud, even though they seem to have attracted less attention, contemporary English excavations similarly found glazed bricks – if apparently less well preserved – at the foot of the walls flanking the entrance to the temple of Ishtar Sharrat Niphi, based on what we see in the foreground of a watercolour drawing by Frederick Charles Cooper (Figure 9).[58] This entrance was moreover adorned with monumental stone lions, whereas the one to the Sin temple was guarded by relatively modest statues of deities. This suggests that friezes of glazed bricks could be found flanking other richly decorated entrances, including the palace of Khorsabad.
– Altars or large podiums covered with glazed bricks have been found in the middle of the sacred precinct of the Nabu temple at Khorsabad (Figure 10),[59] as well as in the temple of Ashur at Assur.[60] The podiums were decorated with long compositions perhaps similar to the friezes just described.
– Buildings were crowned by merlons. Several still lie on the ground at Khorsabad.

These arches, rounded panels, podiums and merlons correspond relatively well with the few allusions to such decorations found in Assyrian texts. King Tiglath-Pileser I thus mentioned facades of glazed bricks on the walls and towers of his palace,[61] which might correspond to wall friezes, while Ashurnasirpal II claimed to have placed glazed-brick decorations above gateways, where rounded panels or arches of glazed bricks must have been set. These latter are, in fact, mentioned by Sennacherib[62] and Esarhaddon,[63] who compared them to rainbows.

– The Louvre's bricks: perhaps a rounded panel

Most of the motifs found on the Louvre's bricks are similar to known examples of rounded panels, whether glazed or painted. Given that certain motifs would not

[52] Reade 1963: 39.
[53] The same is true of the Khorsabad bricks in Chicago, and of the Assur bricks now in Berlin. Apparently they do not include marks made in the clay itself, as is the case of other, unglazed bricks (Loud and Altman 1938: pl. 65, no. 270).
[54] We thank May-Sarah Zeßin (Vorderasiatisches Museum) for her advice on this topic.
[55] This rounded shape is also found notably on the stone stelae set up by Assyrian kings.
[56] Loud and Altman 1938: 66, pls. 43, 88–89.
[57] Reade 1963.
[58] Now in the British Museum, inv. 2007,6024.149.
[59] Loud and Altman 1938: 42, 61, pl. 22C–F.
[60] Andrae 1925: 21–23, figs. 4–5, pl. 6; Gries 2017: 105–115, pls. 202–218. A glazed brick shrine associated with the Late-Babylonian regime was found at the top of the ziggurat at Ur (see British Museum, inv. BM 116981).
[61] Grayson 1991: 54–55, A.0.78.10.1, pls. 66–67.
[62] Grayson and Novotny 2014: 44, 60, 71, 86, 94.
[63] Leichty 2011: 24, 34, 40.

Table 2: Assyrian glazed bricks

No.	Provenance	Type	Category	Period	References	Museum / inventory (and/ or excavation) no.[1]
Ashur						
1	Temple of the god Ashur, podiums in front of the main facade and in the southwest court	Frieze / podium	Bricks	Tiglath Pileser III (744–727 BC) and Sargon II (721–705 BC)	Andrae 1925: 21–23, figs. 4–5, pl. 6; Gries 2017: 105–115, pls. 202–218 ; Frame 2020: 303–304	Berlin, Vorderasiatisches Museum
2	Temple of Anu and Adad, near the east corner of the Adad ziggurat (west tower of the temple), below Shalmaneser III's brick facings		Orthostats (8 fragments)		Andrae 1925: 28–29, pl. 9 a–h	Berlin, Vorderasiatisches Museum, Ass 10756 Ass 7081, Ass 7126c, Ass 6764a
3			Orthostats (3)		Andrae 1925: 25–26, 28, pls. 7–8	London, British Museum, BM 115705 = Ass 7433; 115706 = Ass 7434; 115708 = Ass 7408
4			Orthostat		Andrae 1925: 28	Ass 7211
5	Interior of the northwest sector of the city wall, in the lower part of the wall	Frieze	Orthostat	8th century BC (?)	Andrae 1925: 29–31, fig. 7, pl. 10	Berlin, Vorderasiatisches Museum, VA Ass 897 = Ass 9987
6	Private residence		Orthostat		Andrae 1925: 28	Ass 8019
7	Private residence south of the Nabu temple		Orthostat		Andrae 1925: 28–29, fig. 6	London, British Museum, BM 115707 = Ass 13560
Nimrud						
8	Fort Shalmaneser, courtyard T	Rounded panel	Bricks (roughly 300)	Shalmaneser III (858–824 BC)	Reade 1963	Bagdad, National Museum of Iraq
9	Southeast corner of the wall, southeast courtyard		Bricks (12)	Esarhaddon (680–669 BC)	Layard 1853: II, 6–7, pls. 53–54 nos 7–9, 12–14; Nadali 2006	London, British Museum, BM 92183 =N2066; N 1036; N2067
10	Northwest Palace		Orthostat(?)	Ashurnarsirpal II (875–850 BC) (?)	Layard 1853: II, 7, pl. 55 no 6; Albenda 2005: pl. 35; Aruz *et al.* 2014: 66	London, British Museum, BM 90859
			Brick		Layard 1853: I, 8, pl. 84	
			Bricks	9th century BC (?)	Albenda 1991: 45; Grayson 1991: RIM.A.0.101.115.4; Reade 1995: figs. 3, 4	London, British Museum, N 1999 = BM 92181, N 2000–2002, N 2003 = BM 92182, N 2004–2007, N 2009–2011, N 2012 = BM 124607; N 2013 = BM 92184; N 2015–2016, N2017 = BM 92175, BM 92188 = N2018, N 2019–2026, N 2029, N 2031, N 2032; N 2034; BM 1983,0101.388; BM 90757 = 1848,1104.44; BM 1983,0101.387
11	Southeast Palace		Brick		Smith 1875: 79, pl. 80	London, British Museum, BM 92190 = DT 454
12	Temple of Ishtar Kidmuri(?)		Wall-plaque with knob	9th century BC		London, British Museum, BM 131660; Paris, Musée du Louvre, AO 2670
13	Temple of Ishtar Sharrat Niphi, entrance	Frieze	Bricks		From a watercolour (British Museum BM, 2007,6024.149)	
14	Nimrud		Bricks			London, British Museum, BM 140443a, b and d; BM 1848,1104.62; BM 1848,1104.59
15			Bricks (7)	9th century BC	Albenda 2005: 104, pl. 36.	New York, Metropolitan Museum of Art, 54.117.31a–c; 57.27.24a–b; 57.27.25–26; 57.27.28; 58.31.58; 58.31.59

[1] When no information is available, this column is left blank.

No.	Provenance	Type	Category	Period	References	Museum / inventory (and/ or excavation) no.[1]
Khorsabad						
16	Gate 3 (city wall)	Arch	Bricks	Sargon II (721–705 BC)	Place 1867–1870: I, 233–234; III, pls. 11, 14–17	Lost (shipwreck of 1855)
17	Gate 1 (city wall)	Arch	Bricks	Sargon II	Place 1867–1870: I, 181	
18	Gate 6 (city wall)	Arch	Bricks	Sargon II	Place 1867–1870: I, 181	
19	Gate 7 (city wall)	Arch	Bricks	Sargon II	Loud and Altman 1938: 3, fig. 3	
20	Frieze of the Harem/ Temple of Sin, gate Z (walls n and m)	Frieze	Bricks	Sargon II	Place 1867–1870: I, 115–120, 125–126; III, pls. 26–31; Loud and Altman 1938: 66, pls. 43, 88–89; Frame 2020: 246–250	Oriental Institute of Chicago, A11810.147–150, 156–158, 163
21	Room 166/Temple of Adad	Arch	Bricks	Sargon II	Place 1867–1870: I, 128; III, pl. 25	
22	Entrance to the Temple of Shamash, gate Z"	Arch	Bricks	Sargon II	Place 1867–1870: I, 126–127; Frame 2020: 246–250	
23	Entrance to the Temple de Shamash	Frieze	Bricks	Sargon II	Loud and Altman 1938: 82–83, fig. 92; Frame 2020: 246–250	
24	Temple of Nabu	Frieze or panel(?)	Bricks	Sargon II	Loud and Altman 1938: pl. 17-D-E; Frame 2020: 246–250	
25	Temple of Nabu	Podium	Bricks	Sargon II	Loud and Altman 1938: 42, 61, pl. 22 C-F	
26		Merlons	Merlon	Sargon II	Place 1867–1870: III, pl. 21, 24(?)	
27	Royal Palace, 'brick warehouse'			Sargon II	Place 1867–1870: I, 89	
28	Royal Palace(?)	Rounded panel(s)	Bricks	Sargon II		Paris, Musée du Louvre (see Table 1)
28'	Royal Palace, throne room		Bricks	Sargon II		Oriental Institute of Chicago, DS 5; A11796 (DS 312), A11797 (DS 310), A11798 (DS 321), A11799 (DS 309), A11807 (DS 88)
29	Residence K, vestibule K15 (hiding place[?])		Bricks	Sargon II	Loud and Altman 1938: 42	
30	Bridge between Palace and Temple of Nabu		Bricks	Sargon II	Loud and Altman 1938: 42, pl. 12D	
31	Palace F, trench M		Bricks	Sargon II		Oriental Institute of Chicago (DS 86, DS 87, DS 88, DS 89)
32	City		Bricks	Sargon II	Oriental Institute of Chicago excavation journal, 9 and 10 March 1930	
Nineveh						
33	To the southeast of the Temple of Nabu, between it and the Temple of Ishtar – perhaps from the Temple of Ishtar(?)		Bricks including some with high relief	9th century BC (?)	Campbell Thompson and Hutchinson 1931: 80, 82–83, pls. XXXIX, XXVIII, XXXXII; Hedges and Moorey 1975; Tomabechi 1986: 52; Reade 2000: 409, 416; Matthiae 2002: 579; Nadali 2008: 110, fn. 9	London, British Museum
34	Kuyunjik		Bricks	Ashurnasirpal II (883–859 BC) (?)		London, British Museum, SM.2235; BM 1929,1012.213; 1929,1012.206; 1855,1205.455; 1930,0508.210; 1930,0508.213; 1930,0508.214; 1930,0508.216; 1930,0508.217
35	Nebi Yunus		Brick			London, British Museum, BM 122095 = 1881,0204.7

No.	Provenance	Type	Category	Period	References	Museum / inventory (and/ or excavation) no.[1]
Others						
36	Khorsabad(?) or Nimrud(?)		Bricks	Sargon II		London, British Museum, BM 92192; BM 108831 = 1914,0214,57
37	Sherif Khan		Brick	Ashurbanipal (668–627 BC)		London, British Museum, BM 122094; BM 1855,1205.249
38	Arban		Bricks	9th century BC	Layard 1867: 122–123; Freestone 1991: 55; Albenda 1991: 46, 51, pl. IIIb	London, British Museum, WA 91689
39	Bashiqa (Tell Billah)			9th century BC	Freestone 1991: 55	London, British Museum, WA N 2037, N 2038
40	Northern Iraq		Brick	9th century BC		London, British Museum, BM 92180
41	Tell Satu Qala (Kurdistan)		Orthostats (2)		Van Soldt *et al.* 2013: 233–234, figs. 4–5	SQ 10–6; SQ 10–10+
42			Merlon		Van Soldt *et al.* 2013: 233–234, fig. 13	SQ 1047.303
43	Samsat		Bricks		Özgüc 2009: 53–54, pl. 125f	

be found elsewhere,[64] only a rounded panel seemed liable to yield a coherent whole for the majority of these bricks.

As a plausible hypothesis, this author therefore assembled a rounded panel 330 cm wide (ten aligned bricks) by 525 cm high (some 50 courses of bricks). Such a panel would have originally required roughly five hundred bricks, whereas the Louvre holds just 68 bricks from Khorsabad, of which only 58 were incorporated into this whole, with some adjustments. Furthermore, several bricks featured patterns that might also have been found on an arch, a low wall frieze or a podium.[65] Based on the angle of the curve of a yellow band clearly seen on four of the Louvre's bricks (AO 29710, N 8088, N 8122 and N 8126), the approximate width of the panel moreover corresponded to the width of several passages in the palace at Khorsabad. In addition, a brick with the head of the king (N 8079) shows signs of deliberate damage: the face seems to be have been meticulously scratched out, which must have been clearer when it was first uncovered, according to Flandin's watercolour.[66] This suggests that the design was sufficiently reachable to have been defaced – perhaps part of a frieze rather than a high, rounded panel. Nevertheless the brick might have fallen before, perhaps when the Assyrian Empire collapsed.[67]

3.2.2 A possible overall composition

Starting from the hypothesis of a tall rounded panel, the Louvre's bricks were set in position based on comparable decorative schemes. As far as we know, rounded panels were characterised by a greater standardisation of motifs than the long friezes, where narrative scenes might unfold. Despite the somewhat unconventional handling of certain motifs,[68] and even though it is earlier and comes from a different site, the exceptional panel found at Fort Shalmaneser was of great assistance (Figure 7). Also of use were paintings found in Khorsabad, especially one in Residence K featuring a similar rounded panel (Figure 8). The complementarity between paintings and glazed bricks seems particularly strong, not only in terms of motifs and their compositional arrangement, but also in terms of the type and positioning of the decoration. Stone reliefs and decorative metalwork, moreover, also served as points of comparison. In addition, use was made of the principles of reverse symmetry and alternation (notably of colours), well known in Assyria, when pairing motifs – whose colours might alternate – often around a different motif.

Comparisons, compositional principles and clues gleaned from the Louvre's bricks prompted this author

[64] Notably in the central zone, as discussed below.

[65] The combination of rosettes and curved bands is well attested on arches (Figure 3). Moreover, the inscriptions, intertwined tendrils, winged disc, royal figures and even the mountains might have belonged to a horizontal frieze, judging by examples found in the temple precincts at Khorsabad and Assur, even though no decoration of this type has been found *in situ* in a palace, unfortunately (Table 2).

[66] Botta 1849–1850: II, pl. 155, 2b. There the brick appears to be better preserved.

[67] In contrast, depictions of the king on the stone reliefs, which were certainly reachable, were not defaced. Botta 1849–1850: I, pls. 12, 14; II, pl. 105.

[68] Reade 1963: 48. This author is grateful to Julian Reade for his valuable help.

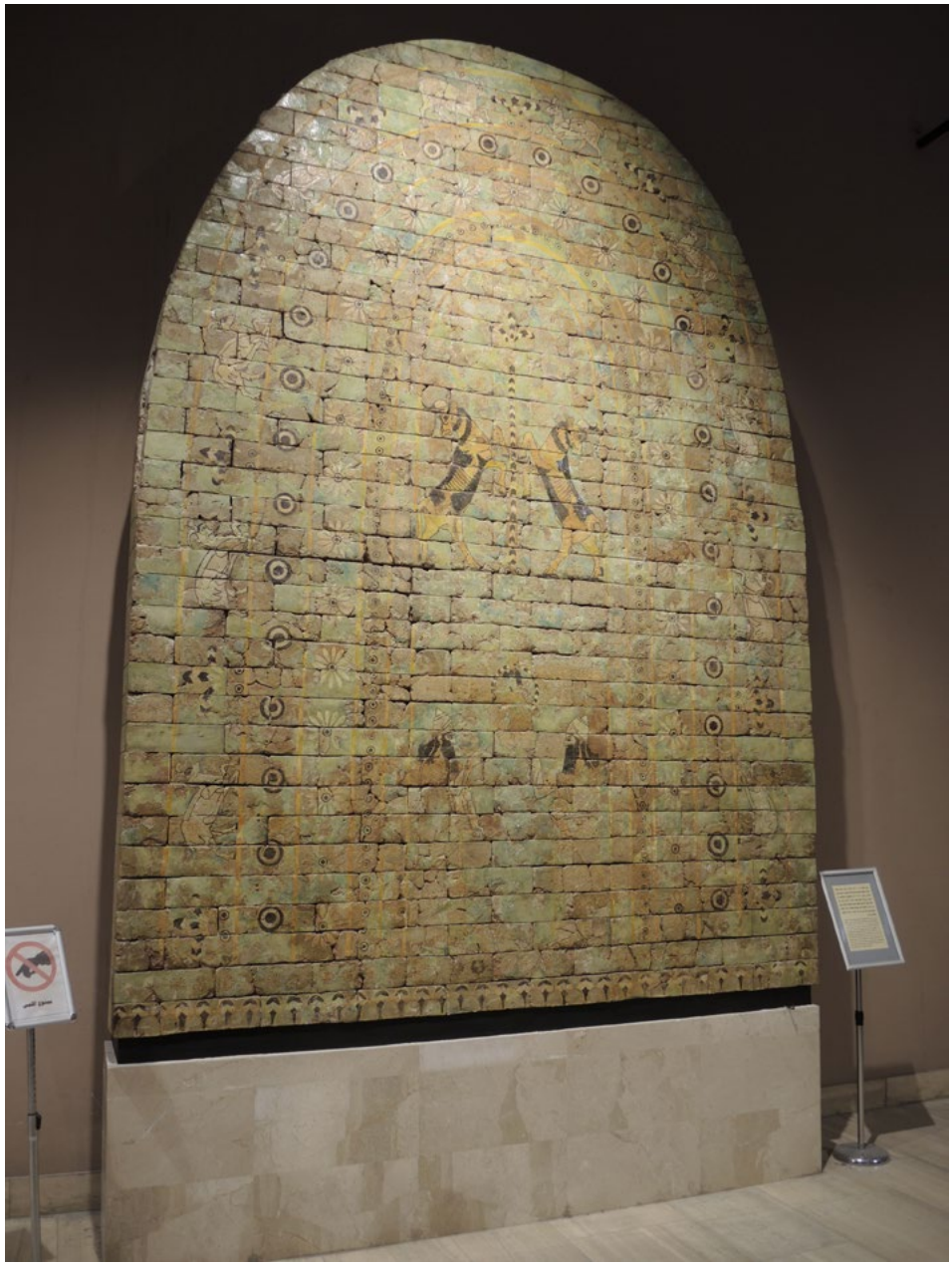


Figure 7. Rounded panel of glazed bricks found at Fort Shalmaneser, reassembled in the National Museum of Iraq in Baghdad (© A. Thomas 2019).

to allocate some ten motifs to three distinct zones – the base, the borders and the centre (Figure 11).

1. The base is formed of two rows of yellow arches on a blue/green background, which must represent mountains, as on various friezes from Assur (Table 2, no. 1).[69] Several apparently contiguous bricks form a row below the one in which must have sat a brick combining these arches with a horizontal yellow stripe (N 8104) that separates this zone from the rest of the composition. A wide base, rather than a podium, was reconstructed for the central figures because one of the mountain-patterned bricks (N 8106) has a vertical yellow stripe and the edge of a large rosette set in a circle, of a type that could apparently only fit on the outer part of the panel. Depending on the actual number of decorative borders on the panel to which these mountain-pattern bricks originally belonged, those bricks might have formed a narrower base, underpinning just the central motif.
2. The central zone was bordered by four decorative bands, all separated from one another by an

[69] Gries 2017: 105–115, pls. 202–218.

Figure 8. Restoration of wall painting found in Room 12 of Residence K in Khorsabad (© Loud and Altman 1938: pl. 89).

orange-yellow vertical stripe that is 3.8 cm wide on average. The number of borders, although uncertain, seems plausible compared to the four decorative bands at Fort Shalmaneser (Figure 7).

– Since one brick combined the mountain pattern with a vertical yellow stripe and a fragmentary rosette of the fourth type (N 8106), it was decided to place it at the outer edge of the panel. Another brick (N 8120) features the same type of rosette – whose upper petals and white inner circle can be seen – between two vertical stripes, as well as the positioned hint of the yellow ring of another rosette. This suggests an outer

Figure 9. Glazed bricks (circled in red) in the foreground of the entrance to the Temple of Ishtar Sharrat Niphi at Nimrud; watercolour by F.C. Cooper *c.* 1850, British Museum, inv. 2007,6024.149.

decorative band between two vertical yellow stripes against a presumably blue ground, bearing a series of rosettes with a yellow centre ringed by turquoise blue, outlined in black, and a dozen white petals also outlined in black, the whole enclosed in a double ring (inner ring of turquoise blue, thicker outer ring of yellow). Five bricks are assigned to this decorative band, two on the right and three on the left of the panel (from right to left, starting from the bottom: N 8106, N 8122, N 8123, N 8120 and N 8125).

– Based on what remains visible on the seven bricks assigned to it, another decorative border features a garland of alternating flowers and stylised lotus buds, visibly yellow and white. The flowers with their rounded petals are very similar to the palmettes in the central motif.[70] Nothing authorises the exact positioning of this band; it was simply situated in relation to the two subsequent borders, which were positioned thanks to the clues found on the conserved bricks.
– Another band of alternating rosettes and goats has been reconstructed from seven bricks (N 8124, N 8126, N 8088, AO 29712, N 8087, N 8086 and SH 086937–1). Some goats are yellow (N 8086 and SH 086937-1), as on the Fort Shalmaneser panel (Figure 7), whereas others are white,

Figure 10. Square podium of glazed bricks in the central courtyard of the Nabu temple at Khorsabad (© Loud and Altman 1938: pl. 22-E).

[70] They appear to be a variation of the pointed flowers seen, for example, on the painting in Residence K (Figure 8), on the borders of the paintings at Tell Ahmar (Thomas 2019: 40, 55, 70, 139) and in the hands of the spirits in the stone reliefs of Khorsabad.

either kneeling (N 8088) or upright (N 8087). The kneeling goats – one leg bent forward, the other back – must have been in facing pairs separated by a rosette of the first type, based on two contiguous bricks also seen on Flandin's watercolour (AO 29712 and N 8088, Figure 2),[71] which clearly shows that the goat on the left was yellow while the one on the right was white. Other goats stand upright; their hind- and forelegs, joined as though the goats had only two limbs, rest on a rosette of the second type, according to the only surviving brick to depict this motif (N 8087). The goat on that brick is white, whereas another brick bears the head of a yellow upright goat (N 8086). In addition to the colour of the bodies, the position of the heads of the upright goats might have alternated, sometimes facing left, sometimes right. But only one brick shows the head, which happens to be turned to the right. These two types of goat, kneeling and upright, have been combined here on the same decorative band, alternating with rosettes of the first and second types, that is to say yellow centre with twelve white petals (N 8088, N 8124, N 8126 and AO 29712) or, conversely, white centre with twelve yellow petals (N 8087). This arrangement, although not solidly confirmed, makes it possible to concentrate the few surviving bricks in the same decorative band. Two other distinct borders, perhaps from different panels, might nevertheless have existed: one of alternating yellow and white kneeling goats, facing a rosette of the first type; and another of a series of yellow and white upright goats standing on a rosette of the second type. If just one of these were to be retained in the panel, only the series of kneeling goats and rosettes of the first type could be attached to the last decorative band. For in fact one brick (N 8126) shows a rosette of the first type and crenellated borders that may correspond to the wings of the spirits like those placed in the adjoining band.

– That last band shows two-winged spirits holding a situla in one hand and lifting a pine cone in the other. Dressed in a long garment that is half open to show another, shorter one revealing a forward-striding leg, the spirits have mid-length hair, long beards and wear horned tiaras (N 8030, N 8081, N 8083b and N 8082). One of these bricks (N 8082) has a vertical yellow stripe to the right of the spirit and the tip of a band of rosettes framed by two horizontal yellow stripes. This suggests that the decorative band of winged spirits was indeed the one adjacent to the central motif of a rounded panel. Yet another brick (N 8092) shows a rosette of the third type – that is say, yellow petals ringed by a yellow circle – with a similar vertical yellow stripe and, further to the right, the tip of a cuneiform inscription that must have extended laterally. This type of rosette was therefore also placed in the band next to the central motif. Rosettes and spirits might come from two distinct bands on different panels, if not from a single border as proposed here.[72] Given the dearth of surviving bricks, we cannot know the position of the spirits in the curve that crowns the panel. Based on the drawing – perhaps not entirely reliable – of the painting in Residence K (Figure 8), the spirits might curve along the arch until they are nearly horizontal at the top (Figure 15). This approach would explain the edges of what would then be wings on brick N 8126, as already mentioned. But this position might seem awkward,[73] so the spirits might have been arranged to always appear standing (Figure 11), as on the drawings – equally unreliable – of the arch of gate 3 (Figure 3).

3. It is proposed that the central area, framed by the decorative bands, should be rounded at the top and subdivided into four main zones, that is from bottom to top, a pair of standing figures, a winged disk, an inscription and a sacred tree:

– At the bottom, just above the mountains, one standing figure faces its opposite, as seen on the Fort Shalmaneser panel (Figure 7). Given the base of his headdress (N 8079), which formed the truncated conical tiara seen in Flandin's watercolour (Figure 2), this might be King Sargon II. It would seem that he wears black sandals with a yellow strap (N 8080) as well as a long, chequered garment (N 8131 and N 8135) ending in a long fringe (N 8130) and covered by a half-length cloak or mantle. This fabric of the second type is found again on a brick showing the bust of a figure at the spot where this garment – which must have been a kind of robe – appears beneath the mantle crossed on the chest. This latter garment appears to be made of the same type of fabric as the first group (N 8134, N 8137, N 8138, N 8129, N 8136 and N 8128[?]), which also ends in a long fringe. It is a kind of cloak, shorter than the robe underneath, whose hypothetical reconstruction is partly inspired by stone reliefs at Khorsabad showing Sargon II dressed in a similar fashion.[74] Those reliefs display several

[71] Botta 1849–1850: II, pl. 155, 8a, 8b.

[72] As hypothetical as this reconstruction may be, it should be noted that this type of rosette ringed by a circle might have been a smaller reprise of the ones placed here on the outermost border, thereby lending an apparent coherence to the whole.

[73] Personal observation made by Julian Reade.

[74] Botta 1849–1850: II, 12, 14 (Musée du Louvre, AO 19873), 81; II, pls. 101, 105. On those examples, however, even though the gown beneath is similar in length and chequered pattern, the cloak is decorated with rosettes, or else the gown and cloak are decorated with chequers and rosettes. Botta 1849–1850: II, pl. 101.

variations including a shorter cloak,[75] like the one proposed here for the figure on the right.

One brick shows the yellow pommel of the sword that the king on the left wore by his side (N 8138),[76] on which rests what must be his right hand, given the rosette-adorned bracelet. For lack of surviving bricks, the position of his other arm remains unknown. Based on comparison with the Fort Shalmaneser panel (Figure 7), this reconstruction shows his left arm raised, and similarly depicts the king on the right in reverse symmetry (right arm raised, left hand holding a sceptre). The head of the first king (N 8079), although highly damaged and even defaced, shows that he had a beard, wore cross-shaped earrings and a truncated conical tiara – originally red, according to Flandin's watercolour – from the back of which fell ribbons still visible today.

– Above the king, this reconstruction sets a winged disc, based on a brick showing its tail (N 8084). Placing a god (probably Ashur or Ninurta[77]) in the centre of this disc is pure conjecture, yet is analogous to the Fort Shalmaneser panel (Figure 7), to various reliefs and to what must have been a god above a winged disc seen in Flandin's watercolour (Figure 2).
– Higher up, the reconstruction places a horizontal band featuring a series of rosettes of the fifth type (N 8082 and N 8121), that is to say with yellow centre and nine rather wide, white petals. One of these bricks also contains a vertical stripe, revealing that the band must have been horizontal rather than a border ringing the central motif.
– Above that band, an Assyrian cuneiform inscription – in yellow characters on a blue-green ground – must have occupied four courses, according to Lionel Marti, who has attempted to reconstruct it despite lacunae. A plausible series of seven bricks (N 8092, contiguous bricks N 8096 and N 8091, N 8097, N 8093, N 8095 and N 8094), arranged from top to bottom and left to right, partially forms a standard passage of the Sargon legend. It was probably addressed to the gods, because it was placed too high to be read. It says: 'Palace of [Sargon, governor of Enlil, p]riest-*neshakku* of Ashur, powerful king, [king of all, king of the land of Assur, king of four regions, favoured [by the great gods...], the one who deported the land of Amattu ... who struck Ursa with ..., of the land of Urartu and ... [led to his suicide..., who brought down the] land of the [distant] Med[es, the one who massacred the people of] Harhar, the one who sub[jected]...'[78] The cuneiform signs were set upon a horizontal white line and each brick had two lines of writing.
– To crown the central area, this reconstruction proposes the motif of a sacred tree, ringed by a yellow line that is narrower (0.8 cm) than the other stripes separating motifs, based on the Fort Shalmaneser panel (Figure 7). On the other hand, the reconstruction does not include the upright goats flanking the tree – which is always framed by figures in all known examples – since no surviving brick indicates them. Although placement of the tree remains uncertain, its reconstructed appearance is based on several stone reliefs; it has a large, stylised central trunk from which spring a geometric lattice of branches leading to palmettes, the whole rimmed by a yellow line defining it as an arched panel within an arched panel (N 8117, N 8116, AO 29713, N 8111 and N 8108). The trunk is crowned by a palmette larger than the others (N 8114). In total, six surviving bricks are related to this symbol of fertility and prosperity, sometimes called the 'tree of life'.

Overall, this panel might symbolise the stability of the universe, upheld by the king stationed between the heavenly and earthly spheres.[79]

3.2.3 More puzzles than one

Based on the sizes of the bricks and motifs, as well as on the motifs themselves and their colours, it would appear that the great majority of the Louvre's bricks belonged to one and the same panel. However, several bricks had to be excluded and several allowances made, demonstrating that several panels, at the very least, were involved.

– A few allowances

The goal was to propose an overall reconstruction permitting display of all the bricks liable to be part of a plausible – if hypothetical – composition, the better to understand their original use and to grasp the monumentality of Assyrian decoration. That is why a maximum number of bricks, which would have otherwise remained in store, were incorporated, even though some of them must have been part of a different whole.

[75] Botta 1849–1850: II, pl. 113.
[76] Even this combination of the overgarment and sword pommel does not guarantee that this figure is the king – although the combination was *not* found on the 'vizier' in the friezes of the Sin temple – since other dignitaries are shown wearing a sword elsewhere. See, for example, Thomas 2019: 60.
[77] Reade 1995: 231–232. The sun-god Shamash is another possibility, according to Reade, who mentions the syncretism then emerging.
[78] This author is most grateful to Lionel Marti.
[79] Reade 1995: 231.

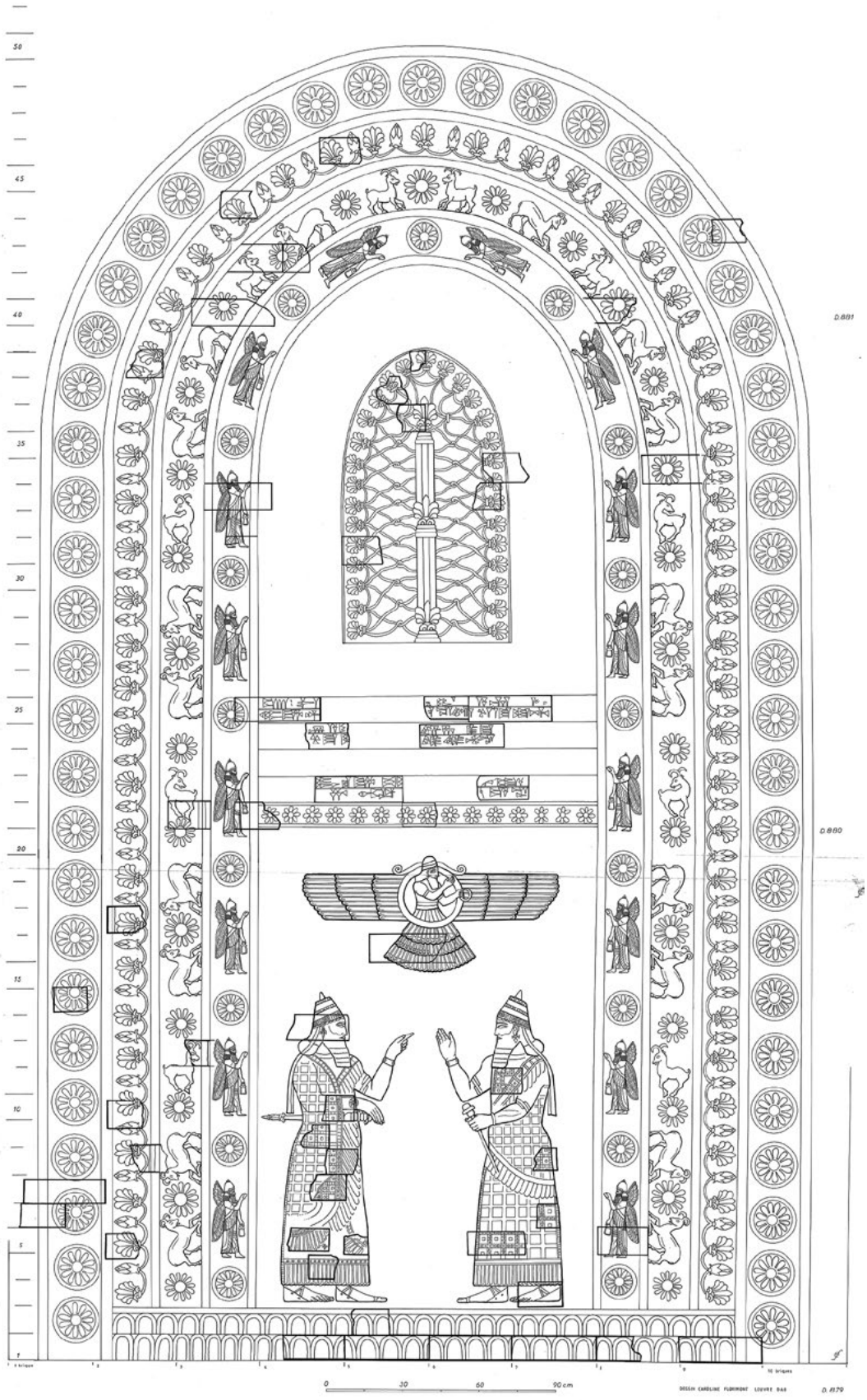


Figure 11. Drawing of the reassembled panel (© Musée du Louvre, C. Florimont).

Although highly similar, some bricks must have belonged to different rounded panels or else to other types of decoration. Variations have been noted in the size of the bricks, notably in terms of height, with a divergence of up to 4 cm (Table 1). A difference in scale, although slight, can also be noted in motifs that would otherwise function together. Thus the king's head (N 8079) seems too small with respect to what would otherwise have been his foot (N 8080). Because the foot originally associated with the face of this royal figure must nevertheless have been very similar, these two bricks were reassembled together, a decision made all the easier in so far as the difference in proportion is relatively minor and the foot and face are fairly distant; furthermore, decoration is not rigorously accurate in general.

In addition, one brick with a rosette (N 8124) was included in this hypothetical reconstruction even though it contained another motif that didn't fit and that is hard to grasp in its current condition, namely a circle – or what remains of it – that is today pale grey but was perhaps originally blue.[80] Its field contains a yellow dot.

Another brick (AO 28708) shows what must be the fringe of a garment and also a kind of cross and a border that might connect it to the third type of fabric. But that type has found no place in the hypothetical reconstruction proposed here, where other clues prompted inclusion of the first and second types. Since this brick, primarily showing fringe, could fit at the bottom of the king's garment, which necessarily had some, it was incorporated into the panel, as was another brick depicting similar fringe (AO 29709). These two bricks with fringe for a different type of garment must nevertheless have belonged to some other panel. They are furthermore thought to come from Place's excavations and not, like the others, from Botta's.

Doubts remain as to whether other bricks truly belonged to this reconstruction. Given that coherent groups were formed largely on the basis of the typology of motifs, the most severely deteriorated bricks were the trickiest to interpret and assemble. It was therefore particularly difficult to place, with confidence, a brick too damaged to be certain of its motif and colours (N 8131).[81]

Finally, one brick has a rosette of the fourth type bordered on the right by a curved yellow stripe (N 8122). It was therefore placed in the outermost decorative band of the panel. But this brick is incomplete on its right side, which would have been the panel's outer edge. It may or may not have been cut away at an angle to mark the arch, as on the Fort Shalmaneser panel.[82] That example shows that the final decorative band is separated from the actual edge of the panel by a blue-green zone (Figure 7), suggesting that another angle-cut brick, immediately to the right of the surviving brick, might have rimmed the panel (Figure 15).

– Unused bricks

Several bricks could not be incorporated into the reconstructed whole, however hypothetical.

Two bricks with cuneiform writing in white framed by horizontal yellow stripes (N 8089 and N 8090) found no place in an inscription in yellow characters; inserting a second inscription into the panel did not seem very coherent.[83]

Except for the above-mentioned bricks with fringe, bricks showing the third type of fabric were excluded from this reconstruction (N 8132, N 8133 and AO 29714).[84] This fabric is nevertheless remarkably similar to the one worn by the king on the painted walls of the Assyrian palace at Tell Ahmar.[85]

One corner brick (N 8099) must have belonged to a different type of glazed decoration, either the corner of a frieze or podium. Like archways, rounded panels appear to have been set into the walls, flush with the surface.

One brick with a chequered motif (N 8098) could not be fitted into the panel, nor could a brick with a relatively enigmatic motif – perhaps part of a jewel, garment or chariot (AO 29711). In that case it would have been a small-scale motif for the miniature scenes better known on horizontal friezes.[86] The same is true of two bricks depicted in Flandin's watercolours as a bust of a god and a wheel of a chariot,[87] and perhaps for a now lost brick described by Longpérier as showing a horse's head with bridle (N 8085). Considering the relative repetitiveness of standard motifs on arches and rounded panels, the bricks with more complex or miniature motifs (AO 29711 and N 8098) must have

[80] This idea is based on early observations conducted with the team at the *Centre de Recherche et de Restauration des Musées de France* (C2RMF).

[81] If understood correctly, this brick shows a motif comparable to the ones seen on Flandin's watercolours. Botta 1849–1850: II, pl. 156, 2.

[82] Reade 1963: 39.

[83] The same is true of a brick seen in Flandin's watercolours. Botta 1849–1850: II, pl. 156, 11.

[84] A brick drawn by Flandin is also part of this group. Botta 1849–1850: II, pl. 156, 1.

[85] Thomas 2019: 84. 108, 149, 160, 162, nos. 29, 55. Musée du Louvre, AO 25067 N.

[86] For example, a mere three courses of bricks from the podium of the Ashur temple in Assur (Table 2, no. 1) might contain the motif of a figure that would require, in contrast, roughly ten courses of bricks on a high rounded panel like the one from Nimrud (Table 2, no. 8; Figure 7) and on this hypothetical reconstruction from Khorsabad.

[87] Botta 1849–1850: II, pl. 155, 1, 4.

Figure 12. Relief perhaps showing the Assyrian city of Arbela, with rectangular and arched doorways outlined in black; Nineveh, North Palace of Ashurbanipal; Musée du Louvre, inv. AO 19914 (© 2012 RMN-Grand Palais (musée du Louvre) / Franck Raux).

belonged to more varied, narrative compositions[88] found on friezes and podiums. Finally, bricks no longer extant but depicted by Flandin must have been from an entirely different model and would thus have no place in a rounded panel.[89]

In total, eight bricks were not included in the reassembly, nor were five of the 30 depicted by Flandin.

3.2.4 Possible location(s) of such decoration(s)

To date, glazed bricks have been found at gates 1, 3, 6 and 7 of Khorsabad. Others decorated the entrances to the temples of Sin, Adad, Shamash, Ningal and Nabu, as well as a bridge between the Nabu temple and the royal palace, plus Residence K. Finally, still others come from the palace, the brick warehouse (room 82), the throne room and other unspecified spots (Figure 4). They involve arches, friezes, rounded panels and altars or podia as well as vague piles of scattered bricks about which we know nothing of how or where they were originally displayed.

Whatever the nature and type of decorative feature they embodied, glazed bricks seem to have been mostly, if not exclusively, employed outdoors, as Place had already suggested.[90] Indeed, the difficult and certainly costly technique of glazing had the advantage of waterproofing the bricks' vitrified decoration.

Because they predominantly derive from Botta's excavations, the Louvre's Khorsabad bricks must come from the north-western royal palace, where he

[88] Or else they may have symbolically expressed the name of the king, as at the entrance to the Sin temple in Khorsabad. Nadali 2008: 98, 99.

[89] Botta 1849–1850: II, pl. 156, 16–17.

[90] Place 1867–1870: II, 84, 86 (the wrist of a figure?). And yet Place found stray fragments of yellowish glaze inside the rooms; his suggestion also runs counter to the theory of indoor glazed brickwork proposed by the Chicago excavators (Loud and Altman 1938: 49). See also Nadali 2006: 109–110.

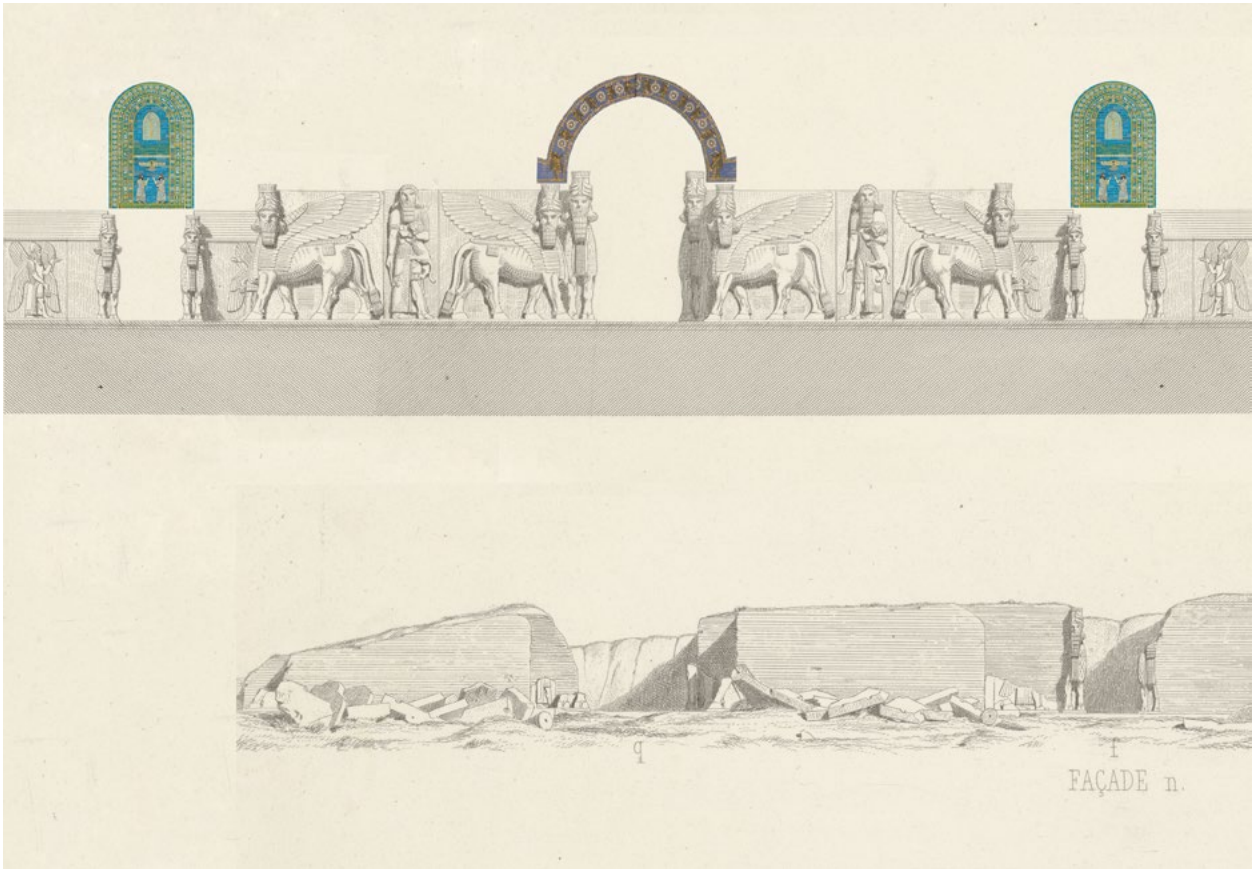


Figure 13. Hypothetical reconstruction of the glazed-brick decoration on the facade of the throne room in the Royal Palace at Khorsabad (after Botta 1849–1850: I, pl. 7; Place 1867–1870: III, pl. 14, and Figure 15 here; © New York Public Library).

focused his exploration, before the Place and Chicago teams dug up Sargon II's vast palatial complex more extensively. Starting from the theory that these bricks decorated exterior areas, Botta might have found them somewhere in the excavated parts of the main courtyard VIII (façade n), courtyard III (façade N), courtyard I (façade L) or small courtyard VI (façade m). However, some of the bricks conserved in Chicago apparently come from the throne room (Table 2, no. 28), which would potentially imply glazed decoration in indoor areas – or at least the most important zones, which would thus be the most highly decorated ones. But maybe these bricks only adorned the (outer side?) of the entranceway from the main courtyard. One of them shows the foot of a figure – perhaps the king – which suggests that there was either a horizontal frieze somewhere on the wall or a rounded panel that could have been placed above the reliefs or the doors. Like the University of Chicago team, which uncovered arched doorways as well as others capped by a wood lintel,[91] Julian Reade has stressed the coexistence of round and rectangular openings in the same facade,[92] as notably seen on a relief from Nineveh now in the Louvre (Figure 12).[93] If we adopt this idea for the facade with three passageways leading from the main courtyard to the throne room, a rounded panel of glazed bricks might have been placed above each side door – with rectangular frame – flanking the main central passage, itself perhaps featuring a rounded arch adorned with glazed bricks (Figure 13). In fact, several bricks with borders – particularly those with a curve – may well have decorated arches as well as rounded panels. These motifs were perhaps all the more similar because they echoed one another, notably in these three passageways between the main courtyard and the throne room in Khorsabad. Rounded panels might also have adorned lintel-topped doorways,[94] whether or not they were paired with arched passageways decorated with glazed bricks, or else set into the wall above a frieze, like the painted decoration found in Residence K (Figure 8).

[91] Loud and Altman 1938: 24–25.

[92] Paper delivered by Julian Reade at the *65th Rencontre Assyriologique Internationale*, 10 July 2019 (forthcoming).

[93] Although the relief dates from the reign of Sargon's great-grandson, Ashurbanipal, it must reflect what could be seen at Khorsabad.

[94] The size of the panel might then have been related to the size of the doorway in question.

All this remains hypothetical. We do not know the precise provenance of the Louvre's bricks, found scattered with no obvious logic apparent to the excavators. In fact, many of these decorative features were probably in more or less chaotic jumbles, a disorder all the greater for bricks originally set high (at least 6 or 7 m for the lower sections of over-door decorations such as the one between the throne room and the main courtyard, given the height of the bulls).[95] Ultimately, many of the bricks employed in this hypothetical reconstruction of a rounded panel may well have been part of a narrative frieze or arch. Nor can we exclude the possibility that glazed bricks could have been reused in later construction, like other components of buildings at Khorsabad and other Assyrian sites.[96]

3.3 Exhibiting the jigsaw

As part of a temporary exhibition at the Louvre–Lens,[97] this coherent assembly of most of the Louvre's Khorsabad bricks was put on show. Thanks to support from management and staff at both the Louvre in Paris and the Louvre in Lens, this author was able to devise a panel[98] specifically designed to produce an overall effect evoking the polychrome monumentality of Assyrian glazed brick decoration. This possibility immediately raised several issues.

The Louvre's bricks fortunately displayed various motifs that could belong to different parts of a hypothetical panel. Yet in the end just 58 bricks were incorporated into a panel that would have originally employed some five hundred.[99] So how could the idea of a whole be conveyed to museum-goers when most of it was missing?

In the past, other damaged, incomplete ensembles were substantially restored and completed with modern additions. When bricks from the Ishtar gate in Babylon arrived at Berlin's *Vorderasiatisches Museum* in the 1920s, a large quantity of modern bricks was manufactured to supplement original bricks and fragments. Although it often goes unnoticed, nearly 80% of the reconstructed gate is composed of modern bricks made in Berlin. More recently, in 1990, the Louvre adopted a different approach for the pillar of Gudea.[100] Bricks made in France copied the shape of original bricks, employing ancient techniques but with a different clay and without any inscriptions. Whether or not the modernity of the bricks made to complete a monument is underscored, these two examples represented one possible approach to the Khorsabad bricks. But it was not adopted. No new brick was made. Nor was any decoration restored on or reincorporated into the original bricks, even though it would have been easy to complete motifs well-documented elsewhere.

Instead, the overall composition was recreated through a drawing, one that initially served as a tool. Unlike the bricks conserved in Berlin, Baghdad and Chicago (Table 2, nos. 1, 8 and 20) – namely, the only sets of glazed bricks that were not already scattered when discovered and could thus be reassembled with confidence – no overall plan of the Louvre's bricks existed, for good reason. The reconstruction ultimately placed on display was thus the product of successive revisions of a large design whose cut-out motifs were recomposed as the process proceeded. The final drawing, which reassembled the whole panel without (re)creating it, was done in black lines on a lightly tinted background in order not to overshadow the original bricks in their deteriorated condition. That motive, as well as uncertainty concerning the original polychromy, led to the rejection of the idea of a large-scale coloured drawing. On the other hand, a small-scale colour test (Figure 15) was placed alongside the reassembled panel during the exhibition; it was furthermore printed on a glossy surface to imitate the original glaze. The large drawing done on the scale of the surviving bricks stood nearly 6 m high. Cut-outs were made to fit the shapes and positions of the original bricks (Figure 14).[101]

Apart from the inscription in the centre, the composition of such a panel is characterised by almost perfect pairing of motifs on both sides of a central vertical axis, so it would have been possible to double the number of bricks visually by, for example, inserting a mirror-image photo of surviving bricks opposite their respective positions. Similarly, bricks not in the Louvre but seen in Flandin's watercolours could have been reproduced to fill out the whole, notably those contiguous with a Louvre brick, such as one showing the head of the king, whose red royal headgear is seen on the upper brick drawn by Flandin (Figure 2). However,

[95] One of the two bulls presented in profile with head turned (Oriental Institute Museum, Chicago, inv. AOIM A7369) is 495.3 cm high, and this pair flanked an even taller pair of bulls, based on the size of the hooves found on the spot by Botta and Flandin (Figure 13). This passage was one of the largest found – 360 cm wide. Loud and Altman 1938: 25.

[96] Nadali 2008: 87.

[97] See fn. 39.

[98] The bricks, and notably their glazes, are extremely fragile, having been relatively poorly fired and then subjected to the vagaries of long burial before being placed in storerooms. In order to assemble them, an accurate description of their condition was drawn up prior to consolidating whatever could be, all the while striving to intervene as little as possible on bricks otherwise untouched by modern handling. The consolidation work was carried out by restorer Anne Liégey in 2016 in anticipation of their display at the *L'histoire commence en Mésopotamie* exhibition held at the Louvre-Lens.

[99] This figure is based on the observation that an arch of glazed bricks contained roughly two hundred bricks (according to photographs taken by the Place expedition) and that a smaller rounded panel (Figure 7) required at least three hundred.

[100] Thomas 2016: 192–193.

[101] Given their extreme fragility, and despite made-to-measure mounts, the bricks were placed at a safe distance from the public.

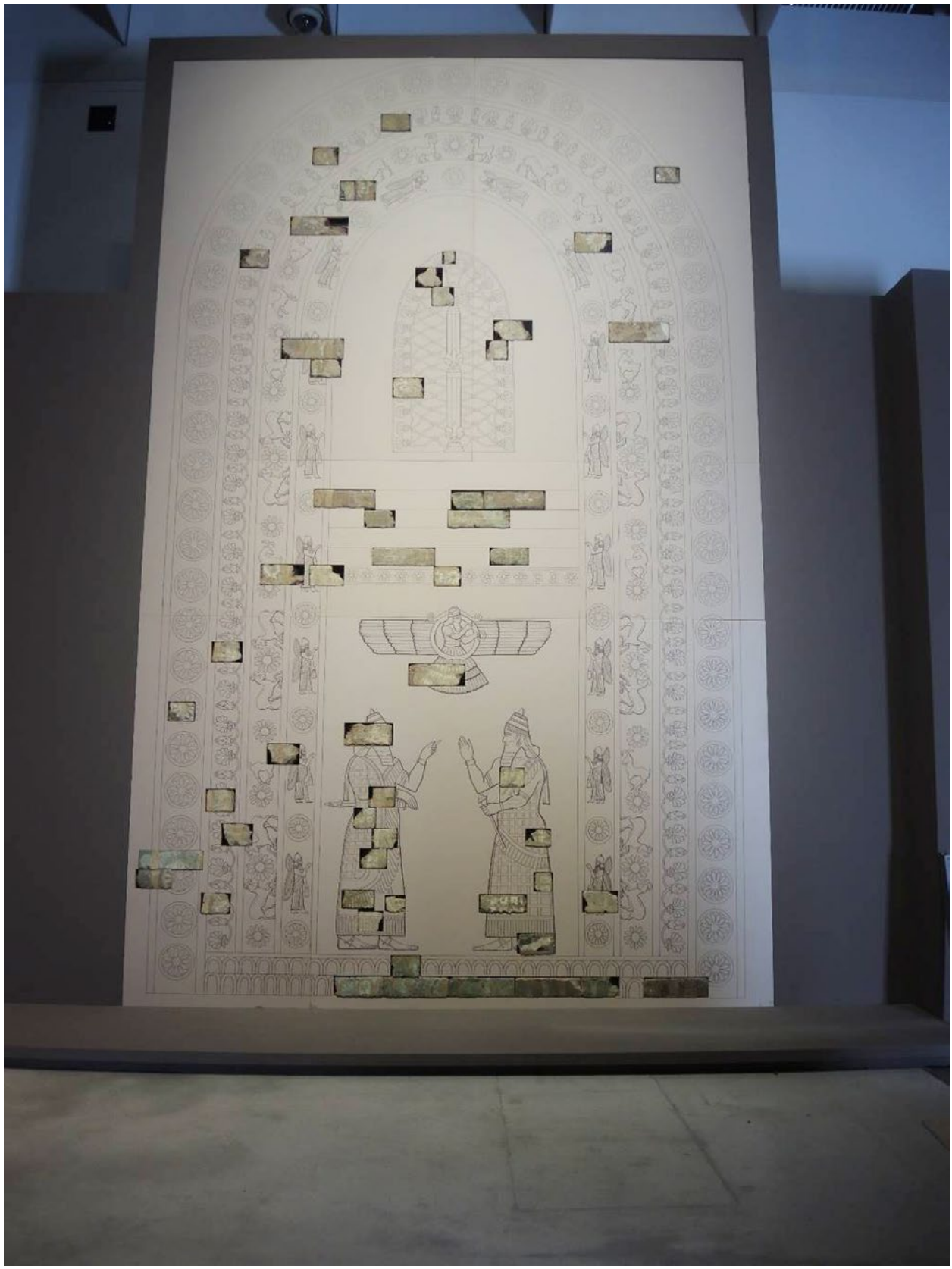


Figure 14. The hypothetical panel as reassembled and exhibited at the Louvre-Lens (© A. Thomas 2016).

Figure 15. A proposed polychrome reconstruction of the reassembled panel
(© Musée du Louvre, C. Florimont).

neither of these two options was ultimately adopted.[102] A full-scale mock-up showed that the original bricks, as few and as damaged as they are, created an overall impact that adequately conveyed the brilliant colours and monumentality of this kind of decoration. There is now a plan to install the panel permanently in what is known as the *Cour Khorsabad* of the Musée du Louvre.

4 An ongoing project: Research into the manufacture and original appearance of the bricks

A study is currently underway thanks to the help of Anne Bouquillon, Ann Bourges, Thomas Calligaro and Christel Doublet of the *Centre de Recherche et de Restauration des Musées de France* (C2RMF). Launched by this author, the project is being carried out in collaboration with Helen Gries and Anja Fügert, who are pursuing an ambitious programme on the glazed bricks from Assur (Table 2, no. 1).[103] The idea is to gain a better understanding of the making of such bricks and their original polychromy, which is crucial to a reconstruction of the overall impact of these decorative features. Another goal is to better resituate the Khorsabad bricks in their overall decorative setting and in the history of a technique spanning the plain of Mesopotamia and the plateau of Iran.[104]

4.1 The manufacture of glazed bricks

The bricks were first made as such, moulded in frames of standard dimensions used for the panel, arch or frieze to be designed. The side that would take the decoration might be shaved to make it smoother so that nothing would protrude beyond the overall panel.[105]

The exact composition of the bricks awaits analysis, but as Botta already commented, the clay was coarsely refined. Most of the time one can see the imprint in the clay of the plant-based additive when it decomposed during firing; the Louvre bricks even retain a few traces of this (Figure 16), suggesting that they might have been baked at relatively low temperatures.[106]

Once moulded, the bricks may have been simply left to dry in the sun before being decorated, which would have saved fuel and time for these decorative features

Figure 16. Brick with traces of plant-based additive (© A. Thomas 2019).

apparently produced in series, if not hurriedly. Whether or not the bricks were given a theoretical preliminary firing, might an underlayer have sometimes been applied before the drawing that preceded the decorative glaze? In this regard, Botta noted that 'the painted surface seems to have been smoothed by a thin layer of clay on which was added a layer of lime or plaster'.[107] Indeed, the C2RMF's still-incomplete investigations have notably revealed local concentrations of calcium and silicon between clay and glaze, without yet explaining their origin (lime water as a ground over the clay? or interstitial crystals between clay and glaze?).

The underdrawings then had to be drawn in detail, to serve as a guide for the application of the glaze that covered it. At this stage, the bricks must have been set flat, in the same arrangement they would later be laid. The designs were probably drawn free-hand, based on the rough rectilinearity of the yellow stripes and of several motifs. Whereas the bricks from the Fort Shalmaneser panel were drawn in black lines,[108] the motifs on the Louvre's bricks seem to have been drawn in white. Several white drips have also been noted along the sides adjoining the glazed surface – the drawing apparently dripped when the bricks were on the ground facing skyward.

[102] On the other hand, it would be potentially possible to include in this reconstruction the bricks from the Khorsabad palace now in the Oriental Institute Museum in Chicago.
[103] Fügert and Gries 2019: 46.
[104] The re-examination would thereby cover not only Assyrian bricks, but also Elamite, Mannaean, Babylonian and Persian bricks. An initial meeting was organised at the 11th International Congress of the Archaeology of the Ancient Near East (ICAANE) in Munich in April 2018 by Helen Gries and Anja Fügert.
[105] Reade 1963: 388.
[106] Some plants particularly rich in silica might also be conserved, but we have no idea of whether that could be the case here. More probably, the density of the substance of the brick protected the plant matter at the core of the clay.
[107] Botta 1849–1850: V, 171.
[108] Reade 1963: 39. Other Assyrian bricks have retained traces of probable drawing. See Reade 1995, fig. 4f, centre; British Museum BM 1983, 0101.387; and Table 2, no. 10.

Figure 17. Brick with fitters' marks. Department of Near Eastern Antiquities, Musée du Louvre, inv. N 8079 (© C. Marquaire 2016).

Figure 18. Brick retaining bitumen and imprint of plant-based matting, AO 29715 (© A. Thomas 2019)

The bricks were then painted, one by one, with corresponding coloured glazes.[109] Although no trace of change is found on the Louvre's bricks, other bricks display changes between the drawn motif and the glaze applied on top of it.[110] According to early results from the C2RMF, the glaze seems to be very alkaline, largely composed of sodium (over 10%) with lesser amounts of potassium and calcium (less than 5%).

The above-mentioned fitters' marks, made with the same white pigment used for the underdrawing, were apparently placed on a side not visible once the work was installed (Figure 17), either right when the bricks were arranged, prior to application of the drawing and the coloured glaze, or else later, when the bricks were removed.

After each brick was drawn, given a fitters' mark and glazed with colour, it had to be fired. These days, the glaze has often vanished,[111] given the vagaries of time and the conservation of the bricks, but perhaps also due to the difficulty of achieving compatibility between the differing materials (clay-rich mud and alkaline glaze). Analysis of the Khorsabad bricks in Chicago has revealed bubbles in the glaze that might indicate overly rapid firing, or inadequate mixing or insufficient fluidity in the glaze prior to firing.[112] Since Khorsabad was built in a short time and some reliefs were never completed, the decorations of glazed bricks – or at least some of them – may also have been hastily or poorly finished.

Once fired, the bricks had to be set in place. Their underside is slightly concave, probably to take the reed-and-bitumen mortar – sometimes still visible (Figure 18) – that held them together, while producing the smallest possible gap between each course of bricks where the motif extended continuously from one to another.

These bricks therefore called for a series of specialists at each stage: brick-makers, draughtsmen[113] and/or glaze painters, suitable workers responsible for the complex firing of the bricks, and architects and labourers to install these decorations in the buildings. Those involved must have been all the more specialised in so far as these glazed brick decorations were produced in multiple, relatively stereotyped series, providing them with enough work for this to become their sole occupation. It is not known whether or not these artisans worked exclusively at Khorsabad.

4.2 Polychromy and the original appearance of glazed bricks

Botta stated that the visible colours were 'white, black, red, olive green, azure blue, grey and various shades of yellow',[114] but only the precise composition of the colours and potential shades used for Khorsabad's glazed bricks provides a better grasp of the original appearance of these decorative features.

[109] Reade 1963: 39.
[110] Reade 1963: 39–40.
[111] That explains references to painted rather than glazed bricks, since several completely lost their glaze and appeared mat.
[112] Whyte *et al.* 2004: fig. 8.
[113] And perhaps also scribes for the cuneiform inscriptions – or at least for the models supplied to the draughtsmen. The characters were written on lines, perhaps designed to guide the person in charge of inscriptions, less skilled in draughtsmanship than the one who did the drawing.
[114] Botta 1849–1850: V, 171.

4.2.1 Conservation and degradation of colours

Orange-yellow is generally well conserved, apparently with little variation, as are white and black. In contrast, blue and green seem badly deteriorated, and raise the question of the alteration of colours over time, perhaps misrepresenting the original polychromy. Although these decorative glazed bricks were consistently given a blue ground,[115] that hue has altered to various shades ranging from grey to green and brown. The question is whether the uneven evolution of the original polychromy is solely the product of irregular deterioration of the same colour depending on the vagary of each brick or whether it reflects an initial variety of blue-green shades (whether entailing different pigments or various mixtures of those pigments). This unevenness, whether linked solely to the deterioration of the colours or to their original chemistry, was conveyed on the trial polychrome reconstruction of the panel here (Figure 15).

Identical motifs of the same size differ only in colour. Thus the mountains appear green (N 8105) or blue (N 8107). As soon as the bricks arrived at the Louvre, Longpérier noted the heterogeneity of blue, green or black backgrounds for the same motifs – suggesting that the colours had already deteriorated when they were discovered. They may have nevertheless continued to evolve since that time – today we no longer perceive certain colours described by Longpérier nearly 170 years ago (assuming he was reliable).[116] Similarly, today we see very little blue whereas the excavators described many bricks as 'a beautiful azure blue'.[117] The bricks seen in Flandin's watercolours also differ somewhat from the corresponding bricks now in the Louvre. But perhaps these watercolours are not to be overly trusted when a brick looks green whereas in fact it is turquoise blue (N 8099).

4.2.2 Composition of colours

Excavators, notably Place, were interested in the chemical composition of colours right when the bricks were discovered. Having found raw lumps of red[118] and blue[119] pigment in a corner of room 99 of the palace annexe, he decided to use them when reproducing on paper the frieze of glazed bricks at the entrance to the Sin temple, in order to 'give that work the hue which best matches the original'.[120] But 'whereas the red, which was not needed, mixed well, the blue totally resisted'. Upon analysis, it proved to be 'composed of ground, coloured glass, designed solely for glazers, hence unusable as a wash' and of 'powdered lapis-lazuli probably mixed with an oily substance' (unlike the copper oxide mixed with a little lead, identified elsewhere by Layard), whereas the red was an iron oxide called sanguine (red chalk). These early analyses apparently also identified the yellow as a lead antimonate with a certain percentage of tin, and white as a tin oxide, the black perhaps being animal black, whereas the green 'could be obtained by blending yellow and blue, for example ochre and copper oxide'.[121] But nothing more is known of these analyses, the archives of which have not been found. Given the lack of confirmed clues of earthenware and glazing workshops at Khorsabad, Annie Caubet has dismissed the suggestion that they might be 'raw materials to be refired and cast'.[122]

The 19th-century analyses, and others conducted some fifteen years ago on four bricks,[123] partially agree with early results from the ongoing study at the C2RMF. Since nine micro-samples collected in 2015[124] proved too small and were drawn from areas too degraded, in 2018 new samples were taken from other bricks, which were also analysed by X-ray fluorescent spectrometry mapping (XRF).[125] Despite the general deterioration of the glaze, which makes identification of materials and characterisation of techniques difficult, it has already been established that:

– The yellow is composed of lead antimonate, as revealed by the original analyses, with variations in content of lead oxide[126] and iron oxide ranging from 1% to 6%, liable to produce shades of orange-yellow.
– The white seems to be composed of calcium antimonate, as are the white glazes of the bricks from the Sin temple, some of which have been analysed in Chicago.[127]
– The black glaze used for outlining, where it has survived, seems to be a vitrified microcrystalline substance containing neither chrome nor manganese,

[115] As suggested, for example, by Reade 1963: 40.
[116] For instance, Longpérier (1849b: nos. 42-O, 42-P; 1854: nos. 78–88, 89) described 'yellow and pale blue palmettes on a black ground' for one item and 'yellow and white [palmettes] on a black ground' for another, whereas little or no difference can be distinguished on the corresponding bricks (Table 1, nos. 29–40).
[117] See notably Mohl 1845: 22–23.
[118] Musée du Louvre, inv. SH090310(?).
[119] Musée du Louvre, inv. AO 27924–27926 and AO 29539–29549. They long remained a 'glazing substance' (Pottier 1917: 147). Block AO 29541 is apparently 'Egyptian blue' (Caubet 2007: 90, no. 24).
[120] Place 1867–1870: II, 251–252, quoted by Perrot and Chipiez 1884: II, 705–706. See a colour reproduction in Place 1867–1870: III, pls. 27–31 (frieze of Sin temple), 14–17 (arch of gate 3).
[121] Perrot and Chipiez 1884: II, 706.
[122] Caubet 2007: 90.
[123] Caubet 2007: 86–88, nos. 18–21 (N 8080, N 8089, N 8099 and N 8108).
[124] AO 29710 (three samples from the yellow stripe, the centre of the flower and the ground); N 8083b (yellow border); N 8105 (two samples of yellow on the border and the ground); N 8108 (ground); N 8126 (ground).
[125] N 8094, N 8096, N 8105, N 8123.
[126] Caubet 2007: 86–88.
[127] Whyte *et al.* 2004: 178. Observations made via scanning electron microscopy with energy dispersive spectrometry indicate, as at the Louvre, that blue was made of copper oxide and manganese and yellow from lead antimonate, whereas black was composed of manganese and iron.

unlike the bricks from the Sin temple analysed in Chicago. It appears to cover the white line which is all that survives on the bricks that have lost almost all their glaze.

– Turquoise blue seems to be systematically composed of copper oxide (producing a blue-green shade), always combined with more or less iron and probably a little manganese (which should somewhat darken the blue). In some cases, microcrystals of lead antimonate perhaps yield a greener shade.

– The other blues require further analysis. The coexistence of several blues is nevertheless well established, notably on one brick (N 8123), analysis of which reveals quite different proportions of copper and antimony in two blues still distinguishable by the naked eye, although one appears greener.

– Red remains unanalysed, being attested so far only by Botta's account and Flandin's watercolour. It would be all the more interesting in so far as red glaze is particularly difficult to master.

These results do not differ significantly from a study carried out in 1991 on Assyrian glazed bricks dating from the 9th century BC and originating from three sites (Nimrud, Ba'shiqa and Arban), reflecting standardised production based on a long-term technological tradition within a uniform geological area. Obtained from bricks older than the ones from Khorsabad, the results of that study are very similar, if not identical, to the ones we have begun to assemble here.[128]

A more recent study focused on 18 glazed bricks, dating from the 9th to the 6th century BC, from the Assyrian site of Nimrud, the Babylonian site of Borsippa and the site of Hasanlu on the Iranian plateau.[129] The main opacifier for white glaze was calcium antimonate, sometimes combined with sodium antimonate, as at Nimrud. Yellow was basically lead antimonate. Casserite combined with an alloy of copper and tin was found in the green glaze from Nimrud, prompting the authors to propose a link between metalworking and glaze-making, the latter employing foundry slag.

The corpus of surviving Assyrian bricks is relatively small given the quantity that must have originally existed. Systematic analysis of coherent, contemporary corpuses such as those of Khorsabad and Assur, the better to compare them, will enhance our understanding of the original hues and the very technique of glazed brickwork,[130] in order to learn who may have contributed to it and how this technique was both part of an existing tradition and related to its famous successors: Babylonian and Persian bricks.[131]

4.2.3 Reconstructing the original appearance – the issue of the blue background

The few mentions of glazed bricks in Assyrian texts compare their colours to gleaming gemstones – black is like obsidian, yellow like *pappardilû* stone, white like alabaster and blue like lapis-lazuli. Together they form a rainbow.[132] Observed differences between colours, notably in the backgrounds, raised the question of whether the reconstruction should favour a dominant lapis-lazuli blue as described by Assyrian kings, or a lighter turquoise blue as seen on one remarkably conserved brick (N 8099 and the cheques on N 8135), or other variants ranging today from blue/green (N 8101, for example) to grey/brown in the most deteriorated examples where the colour of the brick itself seems to emerge (the highly effaced N 8088, for example). It was ultimately decided to reflect this heterogeneity of colours – particularly in the ground – in the polychrome reconstruction of the panel (Figure 15).

The heterogeneity of blue and green hues constituting the main ground of the glazed decoration does not seem explicable solely by random deterioration of pigments nor by the fact that the relevant bricks come from different tableaus. It might of course result from mixing 'bottom of the barrel' glazes, or else from a deliberate determination to vary a single colour through differences in the composition or preparation of a glaze. One brick (N 8108) seems to have been given a preliminary background, that is to say a vitrified slip between the body of the brick and the glaze, perhaps designed to produce a particular shade or intensity. The motif here is the sacred tree, set off by a thin strip, thus all the more receptive to a background of its own shade.[133] A cross-section of a brick with a rosette (N 8126) also suggests that some substance might have been laid on the brick before the glaze. The Chicago team, moreover, has already identified several layers of white underglaze that may have been used to adjust the tone of the final blue glaze.[134]

More generally, as slight as they may be, were the differences in the composition or proportions of

[128] Freestone 1991: 58. More specifically, and despite the deterioration of the bricks, black is composed of manganese and a little iron, white from antimony and calcium, and yellow from lead antimony. In contrast, green (or turquoise) is a combination of powdered copper and calcium antimony. The glaze seems to be composed of silica, soda, lime, potassium and magnesium.

[129] Holakooei *et al.* 2017.

[130] This will notably entail analysing the bodies of bricks and the lumps of pigment found at Khorsabad, and standardising pigment analysis for all the bricks in the Louvre.

[131] The later Babylonian bricks have drawn more attention and are better known today (see notably Fitz 1982 and Matson 1986 – black is composed of iron, blue of copper and cobalt). A study of Persian glazed bricks found at Susa is currently being planned at the Louvre.

[132] Grayson 1991: 289; Leichty 2011: 24, 34, 40, 117; Grayson and Novotny 2014: 36, 44, 60, 71, 86, 94.

[133] This might explain the now-grey background of bricks linked to the sacred-tree motif.

[134] Whyte *et al.* 2004: fig. 9.

pigments on certain bricks[135] originally intended to yield different shades? Early results from examination of the Assyrian bricks preserved today suggest that the production of Assyrian glazed bricks was relatively standardised and well controlled, if not sophisticated. Differences might stem more from a wish to vary the polychromy than from individual artisans' recipes. The badly deteriorated condition of the bricks today means that further analyses of this question are required.

4.3 A few final considerations

Glazed bricks were an important feature of Assyrian architectural decoration. Their colours and patterns reflected those used on other supports, the whole thing repeating themes glorifying the king and the gods, framed by ornamental motifs both symbolic and decorative in nature, whether floral, geometric or animal. The brilliance and colours of these bricks perhaps evoked the lavishness of the semi-precious stones to which kings compared them.

4.3.1 The role of glazed bricks in the overall decorative setting

On the basis of surviving Assyrian bricks, this kind of decoration was widely used in the Assyrian Empire. Multiple works were produced in a fairly standard way, adorning city gateways, temple entrances and palace zones, yet also private residences and urban structures such as the Nabu bridge at Khorsabad. Glazed bricks have been found in the major Assyrian royal cities of Assur, Nimrud, Khorsabad and Nineveh, not forgetting sites of lesser importance, such as Sherif Khan, Tell Arba, Tell Billah and Tell Satu Qala (Table 2). Although it may be due to the random nature of discoveries, more glazed bricks are found in areas toward Babylon and Iran – where this decorative technique was already well developed before the Assyrian era – than in the western provinces of the Assyrian Empire.

Assyrian walls must thus have been decorated with as many, if not more, panels, friezes and arches of glazed bricks as stone reliefs. The lack of surviving paintings, furnishings and textiles distorts our vision, long focused on the reliefs. As at Babylon a little more than a century after Khorsabad, numerous glazed bricks must have echoed the rest of the decorative scheme in other techniques and supports, the whole producing a carpeted yet shimmering effect, at least in the most highly decorated places. One might wonder what criteria determined the choice of a given technique in so far as horizontal friezes, borders and large rounded panels also existed in stone and in paint (unlike arches, specifically of glazed brick).

[135] Depending on whether or not there is calcium antimonate in the white, manganese in the black, and on distinct blends and proportions for yellow and blue.

4.3.2 Potentially symbolic and decorative motifs and colours

Similar imagery can be found in glazed brickwork, carved reliefs, paintings, metallic facings and so on. For example, the same themes, styles and even details of fabrics[136] and foliage[137] are seen everywhere. A large range of floral motifs – dominated by rosettes – and of animals probably alluded to the prosperity of the Assyrian kingdom. Goats were also associated with the idea of fertility, and recalled nearby mountain regions where Assyrian kings went on campaign.

Apart from a few variations, there was in fact an overall decorative system based on a stylistic and iconographic programme that was repeated throughout the kingdom, in all media. Some writers have stressed the potential symbolism of colours,[138] notably blue, which simultaneously warded off evil and imitated lapis-lazuli, highly regarded due to its great cost.[139] The shimmer of glazed bricks, meanwhile, may have evoked *melammu,* the divine aura.

4.3.3 The tradition and heritage of a widely developed technique

The first stirrings of glazed-brick architectural decoration seem to be bricks painted on one edge, notably attested at Mari in the early 2nd millennium BC.[140] But the earliest known glazed bricks date to the second half of the 2nd millennium BC and were found in Elam starting in the reign of Untash-Napirisha around 1340 BC and in Mesopotamia at Nuzi, level II.[141]

Monumental glazed-brick exterior decoration occasionally appeared during the reigns of Adad-Nirari (1307–1275 BC), Ashur-resh-ishi (1133–1116 BC) and above all Tiglath-Pileser I (1114–1076 BC),[142] and were developed on a wider scale starting in the reign of Ashurnasirpal II (883–859 BC).[143] Cuneiform texts generally refer to glazed bricks as *agurru (sa)* NA_4N, combined with the name of a stone that represented a colour – blue (*agurri uqnî*), yellow (*a.pappardilli*), red

[136] See, for example, Loud 1936: 60, fig. 70.

[137] See, for example, Botta 1849–1850: II, pl. 114; also Loud and Altman 1938: pl. 91.

[138] But the blue and red palmettes in the paintings at Tell Ahmar and Khorsabad (Thomas 2019: 41, 80, 71) are yellow and white, for example, on the Louvre's Khorsabad bricks.

[139] Nunn 1988.

[140] Sauvage 1994: 40. Sauvage suggests that the Mari reference indicates a painted, not glazed, brick (ARM XIII, 139), recalling that bricks 'painted on the edge usually in black, sometimes in red, or red and black' were found in the palace of Zimri-Lim (Parrot 1958: 10–11).

[141] Starr 1939: 412. Astrid Nunn pointed out that the basic colours were initially blue-green, that yellow was used at Isin in the 14th century BC, and that the palette only grew to include red, yellow-orange and perhaps pink, at Assur and Susa in the 2nd – or at latest, 1st – millennium BC. Nunn 1988: 142–159.

[142] Grayson 1991: 54–55, A.0.78.10, ll. 66–67.

[143] Grayson 1991: 289–290, A.0.101.30, ll. 30–32; Reade (1963: 47, fn. 26) suggests a link between moulded brick decoration attested simultaneously in the Middle Elamite and Kassite kingdoms.

(*a.surri*) or white (*a.paruti*).[144] As Sylvie Lackenbacher has revealed, a rare passage in a text by Ashurnasirpal II refers to the making of glazed bricks: 'I have had bricks baked with blue'.[145]

Other kings, while not mentioning them in surviving texts, left us glazed bricks inscribed with their name.[146] When it comes to Sargon II, examples come from Khorsabad – some of which, now in the Louvre, are the subject of this article – and the Ehursaggalkurkurra temple of Ashur in Assur (today in Berlin). Other written references mention glazed-brick decoration liable to have been commissioned by Sargon beyond Assyria's main cities, such as Harhar in Iran, renamed Kar-Sarrukin after it was conquered.[147]

Sargon II's successors – son Sennacherib[148] and grandson Esarhaddon[149]– were more voluble. It was apparently during the reign of the latter that glazed bricks in relief, rather than flat,[150] first appeared at Nineveh, perhaps under the influence of Babylonian and Elamite relief decoration, known by the 2nd millennium BC.

Assyrian demand – which was certainly massive, given the amount of glazed-brick decoration that spread throughout the empire – must have paralleled the rise of teams specialised in this technology. Those teams, notably the glaze-painters, perhaps travelled to various sites, yet when faced with demand they also probably trained others. We know little of these specialised artisans (how they operated, how they were trained, where they came from), but some of them may have worked at Babylon after the fall of the Assyrian Empire. The technique continued to develop on Mesopotamian and Persian buildings up to the modern era.

5 Conclusion

'It is certain that, beneath the sky and sun of Nineveh, the glazed archivolts of the gates of Khorsabad assumed tones other than those which reconstructions, however skilful they may be, try to bring back to life', noted Joachim Menant in 1888.[151] Félicien de Saulcy had suggested as much as early as 1847, pointing out that 'modern Persia is covered in mosques and palaces where glazed tiles play a major role, especially the role of wonderful effect'.[152] We must think of the still-visible and often-restored glazed-brick decorations in modern Persia in order to imagine the sparkling, colourful impact produced by Assyrian glazed bricks. Like gemstones, they occupied a key place in the overall decoration. More than 170 years after they arrived at the Louvre, almost all the glazed bricks from Khorsabad have now been re-assembled in a large and plausible, if hypothetical, panel. It displays the monumentality and polychromy of this type of decoration, allowing us to exclaim that, by evoking 'these gigantic palaces...all gleaming with the sparkle of multicoloured ceramics, what a world is reborn for us on these banks of the Tigris where the sun today bakes sterile hillocks!'[153] It is hoped that this project, along with exhibition of the panel in 2016, will have helped to rekindle studies into glazed bricks as part of an international dynamic of research that, in the near future, will surely shed further light on this decorative feature.[154]

Author

Dr Ariane Thomas
Département des Antiquités orientales
Musée du Louvre
Porte Mollien
75058 Paris cedex 01
France
ariane.thomas@louvre.fr

References

Albenda, P. 1986. *The Palace of Sargon, King of Assyria: Monumental Wall Reliefs at Dur-Sharrukin, from Original Drawings Made at the Time of their Discovery in 1843–44 by Botta and Flandin.* Paris: Éditions Recherche sur les Civilisations.

Albenda, P. 1991. Decorated Assyrian knob-plates in the British Museum. *Iraq* 53: 43–53.

Albenda, P. 2005. *Ornamental Wall Painting in the Art of the Assyrian Empire* (Cuneiform Monographs 28). Leiden and Boston: Brill.

Andrae, W. 1925. *Coloured Ceramics from Ashur and Earlier Ancient Assyrian Wall Paintings.* London: K. Paul, Trench, Trubner & Co.

Aruz, J., S.B. Graff and Y. Rakic (eds) 2014. *Assyria to Iberia at the Dawn of the Classical Age.* Exhibition held at the Metropolitan Museum of Art, New York, September 2014–January 2015 [Exhibition catalogue]. New Haven: Yale University Press.

Beauchamp, J. de. 1790. Mémoires sur les Antiquités babyloniennes qui se trouvent aux environs de Bagdad par M. de Beauchamp, vicaire général de

144 Lackenbacher 1982: 86; Moorey 1985: 171.
145 Lackenbacher 1982: 86.
146 Grayson 1991: 184–185, A.0.100.15; Grayson 1996: 157, A.0.102.100 (nos 1, 6 and 11), 168, A.0.102.112 and 169, A.0.102.114; Tadmor and Yamada 2011: 159, no. 1007.
147 Fuchs and Parpola 2001: no. 94.
148 Grayson and Novotny 2014: 44, 60, 71, 86, 94.
149 Leichty 2011: 24, 34, 40.
150 Reade 2005: 381; Nadali 2008.
151 Menant 1888: 137.
152 Saulcy 1847: 459.
153 Toudouze 1906: 280.
154 In addition to a workshop in April 2018, a temporary exhibition titled *A Wonder to Behold: Craftsmanship and the Creation of Babylon's Ishtar's Gate* was held at the Institute for the Study of the Ancient World (ISAW) in New York from November 2019 until May 2020. A further encounter is scheduled for the upcoming 12th ICAANE in Bologna in April 2021.

Babylone et Correspondant de l'Académie des Sciences. *Journal des Savants* December 1790: 797–806.

Botta, P.-E. 1849–1850. *Monument de Ninive, découvert et décrit par M. P. E. Botta, mesuré et dessiné par M. E. Flandin*. 5 vols. Paris: Gide & J. Baudry/Imprimerie Nationale.

Campbell Thompson, R. and R.W. Hutchinson 1931. The site of the Palace of Ashurnasirpal at Nineveh, excavated in 1929–30 on Behalf of the British Museum. *Annals of Archaeology and Anthropology* 18: 79–112.

Caubet, A. and G. Pierrat-Bonnefois (eds) 2005. *Faïence de l'Antiquité, de l'Egypte à l'Iran.* Exhibition held at the Musée du Louvre, Paris, June–September 2005 [Exhibition catalogue]. Paris: Musée du Louvre Éditions.

Caubet, A. (ed.) 2007. *Faïences et matières vitreuses de l'Orient ancien. Etude physico-chimique et catalogue des œuvres des Antiquités orientales.* Paris: Musée du Louvre Éditions/Snoeck.

Department of Near Eastern Antiquities, Musée du Louvre 1979. *De Sumer à Babylone: collections du Musée du Louvre*. Travelling exhibition at the Musée Depsiau-Wlérick, Mont-de-Marsan, October 1979–January 1980 [Exhibition catalogue]. Mont-de-Marsan: Musée Despiau-Wlerick.

Fitz, S.C. 1982. The coloured glazes of neo-Babylonian wall facings. *Ceramic Forum International: Berichte der Deutschen Keramischen Gesellschaft* 59: 179–185.

Flandin, E. 1845. Voyage archéologique à Ninive. *Revue des Deux Mondes* June 1845: 1081–1106.

Frame, G. 2020. *The Royal Inscriptions of Sargon II, King of Assyria (721–705 BC)* (The Royal Inscriptions of the Neo-Assyrian Period 2). Toronto: University of Toronto Press.

Freestone, I.C. 1991. Technical Examination of Neo-Assyrian Glazed Wall Plaques. *Iraq* 53: 55–58.

Fuchs, A. and S. Parpola 2001. *The Correspondence of Sargon II, part III, Letters from Babylonia and the Eastern Provinces* (State Archives of Assyria 15). Helsinki: Helsinki University Press.

Fügert, A. and H. Gries 2019. 'The Men who wrought the baked brick, those were Babylonians': A brief history of molded glazed bricks, in A. Amrhein, C. Fitzgerald and E. Knott (eds) *A Wonder to Behold: Craftsmanship and the Creation of Babylon's Ishtar Gate:* 41–53. Princeton: Princeton University Press.

Grayson, A.K. 1991. *Assyrian Rulers of the Early First Millennium BC (1184–859 BC), I* (The Royal Inscriptions of Mesopotamia, Assyrian Periods 2). Toronto: University of Toronto Press.

Grayson, A.K. 1996. *Assyrian Rulers of the Early First Millennium BC (858–745 BC), II* (The Royal Inscriptions of Mesopotamia, Assyrian Periods 3). Toronto: University of Toronto Press.

Grayson, A.K. and J. Novotny 2014. *The Royal Inscriptions of Sennacherib, King of Assyria (704–681 BC),* part 2 (The Royal Inscriptions of the Neo-Assyrian Period 3). Toronto: University of Toronto Press.

Gries, H. 2017. *Der Assur-Tempel in Assur: Das assyrische Hauptheiligtum im Wandel der Zeit* (Wissenschaftliche Veröffentlichung der Deutschen Orient-Gesellschaft 149). Wiesbaden: Harrassowitz.

Hedges, R.E.M. and P.R.S. Moorey 1975. Pre-Islamic ceramic glazes at Kish and Nineveh in Iraq. *Archaeometry* 17: 25–43.

Holakooei, P., S. Soldi, J.-F. Lapérouse and F. Carò 2017. Glaze composition of the Iron Age glazed ceramics from Nimrud, Hasanlu and Borsippa preserved at the Metropolitan Museum of Art. *Journal of Archaeological Science: Reports* 16: 224–232.

Kertai, D. 2015. *The Architecture of Late Assyrian Royal Palaces*. Oxford: Oxford University Press.

Lackenbacher, S. 1982. *Le roi bâtisseur: Les récits de construction assyriens des origines à Tiglath-Phalasar III.* Paris: Éditions Recherches sur les Civilisations.

Layard, A.H. 1853. *A Second Series of the Monuments of Nineveh*. London: John Murray.

Layard, A.H. 1867. *Nineveh and Babylon: A narrative of a second expedition to Assyria, during the years 1849, 1850, and 1851* [abridged version of *Nineveh and Babylon* (1853)]. London: John Murray.

Leichty, E. 2011. *The Royal Inscriptions of Esarhaddon, King of Assyria (680–669 BC)* (The Royal Inscriptions of The Neo-Assyrian Period 4). Winona Lake (IN): Eisenbrauns.

Longpérier, A. de. 1849a. *Notice des monuments exposés dans la galerie d'antiquités assyriennes au Louvre* [1st edition]. Paris: Imprimerie de Vinchon.

Longpérier, A. de. 1849b. *Notice des monuments exposés dans la galerie d'antiquités assyriennes au Louvre* [2nd edition]. Paris: Imprimerie de Vinchon.

Longpérier, A. de. 1854. *Notice des antiquités assyriennes, babyloniennes, perses, hébraïques, exposées dans les galeries du musée du Louvre* [3rd edition]. Paris: Imprimerie de Vinchon.

Loud, G. 1936. *Khorsabad I, Excavations in the Palace and at a City Gate* (Oriental Institute Publication 38). Chicago: The University of Chicago Press.

Loud, G. and C.B. Altman 1938. *Khorsabad II, The Citadel and the Town* (Oriental Institute Publication 40). Chicago: The University of Chicago Press.

Matthiae, P. 2002. La magnificenza sconosciuta di Ninive. Note sullo sviluppo urbano prima di Sennacherib, in *Rend. Mor. Acc. Lincei s.* IX,XIII/4: 543–587.

Matson, F.R. 1986. Glazed brick from Babylon – Historical setting and microprobe analyses, in W.D. Kingery (ed.) *Technology and Style* (Ceramics and Civilization II): 133–156. Columbus, Ohio: American Ceramic Society.

Menant, J. 1888. *Ninive et Babylone*. Paris: Hachette/Bibliothèque des Merveilles.

Mohl, M.J. 1845. *Lettres de M. Botta sur ses découvertes à Khorsabad près de Ninive, publiées par M. J. Mohl, membre de l'Institut*. Paris: Imprimerie Royale.

Moorey, P.R.S. 1985. *Materials and Manufacture in Ancient Mesopotamia: The Evidence of Archaeology and Art Metals and Metalwork, Glazed Materials and Glass.* Oxford: British Archaeological Reports.

Nadali, D. 2006. Esarhaddon's glazed bricks from Nimrud: The Egyptian campaign depicted. *Iraq* 68: 109–119.

Nadali, D. 2008. Assyrian high-relief bricks from Nineveh and the fragments of a royal name. *Iraq* 70: 87–104.

Nunn, A. 1988. *Die Wandmalerei und der glasierte Wandschmuck im Alten Orient* (Handbuch der Orientalistik, 7. Abt., 1/2, Lfg. 6). Leiden: Brill.

Özgüc, N. 2009. *Samsat (Ciltli): Sümeysat, Samosata, Kumaha, Hahha, Hahhum.* Istanbul: Türk Tarih Kurumu Yayınları.

Parrot, A. 1946. *Archéologie mésopotamienne, les étapes*. Paris: Albin Michel.

Parrot, A. 1958. *Mission archéologique de Mari, vol. II, Le Palais*. Paris: Geuthner.

Perrot, G. and C. Chipiez 1884. *Histoire de l'art dans l'Antiquité: Égypte, Assyrie, Perse, Asie mineure, Grèce, Etrurie, Rome, Tome II: Chaldée, Assyrie.* Paris: Hachette et Cie.

Pillet, M. 1963. *Victor Place, un pionnier de l'assyriologue*. (*Cahiers de la Société asiatique* XVI). Paris: Imprimerie Nationale.

Place, V. 1867–1870. *Ninive et l'Assyrie*. Paris: Imprimerie Impériale.

Pottier, E. 1917. *Catalogue des Antiquités Assyriennes.* Paris: Musées Nationaux/Musée du Louvre.

Pottier, E. 1924. *Catalogue des Antiquités Assyriennes.* Paris: Musées Nationaux/Musée du Louvre.

Reade, J.E. 1963. A glazed-brick panel from Nimrud. *Iraq* 25: 38–47.

Reade, J.E. 1995. The Khorsabad glazed bricks and their symbolism, in A. Caubet (ed.) *Khorsabad, le palais de Sargon II, roi d'Assyrie: actes du colloque organisé au Musée du Louvre par le Service Culturel les 21 et 22 janvier 1994 sous la direction d'Annie Caubet:* 225–251. Paris: La Documentation Française.

Reade, J.E. 2000. Ninive (Nineveh), in E. Ebeling and E.F. Weidner (eds) *Nab-Nuzi* (Reallexikon der Assyriologie und Vorderasiatischen Archäologie 9): 388–433. Berlin [u.a]: de Gruyter.

Reade, J.E. 2005. The Ishtar Temple at Nineveh. *Iraq* 67/1: 347–390.

Saulcy, F. 1847. Le musée assyrien du Louvre. *Revue des deux mondes* 20: 447–467.

Sauvage, M. 1994. Note sur les briques émaillées d'ARM XIII 139. *Nouvelles Archéologiques Brèves et Utilitaires* 2: 40.

Scheil, V. 1913. Documents relatifs à l'histoire de l'assyriologie. *Revue d'Assyriologie et d'archéologie orientale* 10/3: 185–193.

Smith, G., 1875. *Assyrian Discoveries; an account of explorations and discoveries on the site of Nineveh, during 1873 and 1874.* London: Sampson Low, Marston, Low and Searle.

Starr, R.F.S. 1939. *Nuzi*. Cambridge (MA): Harvard University Press.

Tadmor, H. and S. Yamada 2011. *The Royal Inscriptions of Tiglath-Pileser III (744–727 BC) and Shalmaneser V (726–722 BC), Kings of Assyria* (The Royal Inscriptions of The Neo-Assyrian Period 1). Winona Lake (IN): Eisenbrauns.

Tomabechi, Y. 1986. Wall Paintings from the Northwest Palace at Nimrud. *Archiv für Orientforschung* 33 : 43–54.

Thomas, A. (ed.) 2016. *L'histoire commence en Mésopotamie.* Exhibition at the Musée du Louvre-Lens, Lens, November 2016–January 2017 [Exhibition catalogue]. Lens: Musée du Louvre-Lens/Gand/Snoeck.

Thomas, A. 2017. The Visit by the Pasha of Mosul to the Excavations at Khorsabad, Formerly Nineveh, in J.-L. Martinez and J. Trey (eds) *From one Louvre to another: opening a museum for everyone. Exhibition at the Louvre-Abu Dhabi, Abu Dhabi, December 2017–April 2018 [Exhibition catalogue]*: 344–345. Paris: Editions Xavier Barral.

Thomas, A. 2019. *Les peintures de Tell Ahmar: Les couleurs de l'empire assyrien*. Paris/Dijon: Éditions Faton/Musée du Louvre.

Toudouze, G. 1906. Notes céramiques II: La céramique émaillée chez les peuples antiques. *Le Musée*: 280.

Van Soldt, W.H., C. Pappi, A. Wossink, C.W. Hess, and K.M. Ahmed 2013. Satu Qala: A preliminary report on the seasons 2010–2011. *Anatolica* 39: 197–239.

Whyte, A., V. Muros and S. Barack 2004. "Brick by brick": piecing together an 8th-century BC façade from Iraq. *AIC Objects Specialty Group Postprints* 11: 172–189.

Chapter 5:
Glazed Tiles from Nimrud and the Visual Narrative of Esarhaddon's Egyptian Campaign

Manuela Lehmann and Nigel Tallis

Abstract: In 2016, the authors undertook the first fully comprehensive study[1] of a group of polychrome glazed tile fragments discovered at Nimrud in December 1849, during the second excavation campaign in Assyria of Austen Henry Layard (1817–1894).

While Layard's work at Nimrud (the ancient Assyrian capital of Kalhu) is now most closely associated with excavations at the North-West Palace, this material was from the vicinity of what would later become known as Fort Shalmaneser. The tiles most probably date from the refurbishment of this area by Esarhaddon in the 7th century BC, and almost uniquely for Assyrian art the decoration of the tiles clearly depict scenes in Egypt. Despite the fact that the nature and basic narrative content of the tile fragments was recognised as unusual and significant even at the time of discovery, and have since attracted much attention among scholars, no detailed description or study in combination with complete drawings to scale and colour photography of all known fragments had ever been produced or published.

During the course of our work a number of hitherto unknown pieces were located, and for the first time many crucial new joins were identified. This substantially transforms our understanding of this material, further reinforcing its unrecognised importance in the development of Assyrian art – both as a record of cultural exchange in a key moment of close Assyrio-Egyptian interaction and in the use of glazed tile for monumental narrative schemes otherwise known mainly in stone.

Keywords: Glazed Tiles; Til Tuba; Assyrian Reliefs; Egyptian Reliefs; Tower Houses

1 Introduction and context

During his second and final expedition to Nimrud, between September 1849 to May 1851, Austen Henry Layard discovered a significant group of fragments of glazed ceramic tiles. The original quantity of tiles as well as the exact circumstances of discovery are unclear, and only vague and tantalising anecdotal descriptions by Layard remain as a record.[2] Thirteen fragments belonging to this series of glazed tiles were recovered and subsequently sent to the British Museum. Layard describes ten of them and eleven were published from coloured drawings by Frederic Charles Cooper, the artist employed by the British Museum accompanying Layard at this time.[3]

The tiles can be dated without difficulty to the 7th century BC due to diagnostic features within the scenes.[4] These show a military campaign by the Assyrians against Egypt, most likely under king Esarhaddon (680–669 BC), as he is known to have refurbished the area of Fort Shalmaneser for his own use.[5] The scenes on the tiles have been discussed in a number of studies of Assyrian art, as they are rare polychrome examples of the type of battle scenes so typically employed in Assyrian stone bas-reliefs, and of comparable narrative scenes in wall painting and glazed work.[6]

The general location of the discovery is given by Layard as the 'Tel of Athur', which corresponds to the two large mounds with several peaks, now known as the Tulul al-Azar, at the south-east corner of the defences.[7] The larger, easternmost, mound – sprawling some 100 x 80 m overall and rising 20 m above the level of the plain[8] – was initially thought by Max Mallowan to be a large defensive tower (the 'corner tower').[9] This was examined by David Oates in 1962 – in the penultimate

[1] Lehmann, Tallis *et al.* 2019.

[2] Layard states that he collected only '*a few fragments*' of the tiles discovered, see Layard 1853a: 165–166; Layard 1867: 52–55 as well as his journal entry of December 3rd 1849, now in the British Library, Ref. ADD. MS 39096.

[3] Published drawings, Layard 1853b: pl. 53–54; Original drawings in Original Drawings Series (Or. Dr.) II, pls XXXV, XXXVI) at the British Museum.

[4] For example, styles of Assyrian helmets and body armour, shields and dress. See Nadali 2006: 110, citing Albenda 1982: 12; see also Nunn 1988: 183.

[5] Nadali 2006: 110.

[6] Andrae 1923: 13; Unger 1932: pl. 38; Reade 1979b: 95; Albenda 1982: 226; Nunn 1988: 183; Albenda 1997: 226.

[7] 'Tel of Athur', Layard 1853: 165; also 'Tulul Yazar' by Hormuzd Rassam, Gadd 1936: 92; 'Tel Yazar', Jones 1852 etc. For the physical relationship of the mounds with Fort Shalmaneser see Lehmann, Tallis *et al.* 2019: fig. 1b (Jones 1852 – relationship not entirely correct); the contour map from the survey of M.L. and Anne-Tinne Friis, Mallowan 1958: pl. XIV (facing p. 107); latter modified and updated in Mallowan 1966: II, fig. 301.

[8] Oates 1959: 98.

[9] Oates 1963: 7.

Figure 1. Map of Fort Shalmaneser with suggested findspots of the tiles (after Mallowan 1966, Pl. VIII).

season of the British School of Archaeology in Iraq's (BSAI) excavations at Nimrud – revealing the throne room of Shalmaneser III and its related royal apartments. In BSAI's final season in 1963, the slightly smaller – but 5 m taller[10] – westernmost mound was excavated under the direction of Jeffrey Orchard, the results conclusively demonstrating the impressive scale of Esarhaddon's work in this area (Figure 1).[11]

The exact findspot of the tiles is unknown, but as noted by David Oates, *'We were particularly fortunate on this site, since it was virtually untouched in the nineteenth century; only a few pits and tunnels on and near the corner tower* [sic] *bear witness to brief soundings by Layard and Rassam...'*[12]. These traces of prior workings provide some clues for the findspot, if not for the original location of the tiles. Suggestions have included either the south-east corner of the inner south-east courtyard of Fort Shalmaneser, outside the throne room[13] or from courtyard T where the tiles are thought to have adorned an outer façade.[14] Reade also noted the vicinity of room T25 as one possibility.[15] Another might be that the findspot

[10] Oates 1959: 98.
[11] Mallowan 1966: 468.
[12] Oates 1959: 99; Reade also records that some stray glazed bricks from the collapsed panel of Shalmaneser III in Courtyard T were '*discovered from the fill of a nineteenth-century trench on top of the mound.*' Reade 1963: 38.
[13] Observing that an old trench had cut into the south wall of the 'throne room', David Oates suggested (Oates 1959: 99, fn. 1) that Layard's glazed tiles had been found in Courtyard S 6 and that they might originally have decorated the west façade of the 'corner tower' (for which see above) or the royal suite nearby; Nunn 1988: 183, citing Oates 1959: 111, fn. 20; Postgate and Reade 1976–1980: 317; Nadali 2006: 109.
[14] Nadali 2006: 109, citing Postgate and Reade 1976–80: 317; Oates and Oates 2001: 183–184.
[15] *Layard found them built into a pavement, whose whereabouts is*

Figure 2. Photograph showing the western slope of the westernmost mound of Tulul al-Azar in 1963 (photo courtesy Jocelyn Orchard/British Institute for the Study of Iraq).

corresponds to Esarhaddon's extensive reworking of the south-east postern entrance of Fort Shalmaneser[16] and to a building on the high terrace above it (Figure 1).[17] The significance of Layard's revision (in 1867) of the description in his original publication of the tiles is difficult to assess, but he took the opportunity to amend their findspot from *'Remains of walls and a pavement of baked bricks were, however, discovered* ***in the lower part of the platform',*** to: *'Remains of walls and a pavement of baked bricks were, however, discovered* ***at the foot of the high mound*** (our emphasis)."[18]

It is possible that Layard's revised reference to the 'high mound' was intended to refer to the noticeably taller westernmost mound. It is, of course, now impossible to be sure – even the contemporary records of the excavation can be confused and apparently contradictory – but what was likely one of Layard's trenches was still clearly visible in the western slope of this mound in 1963, where it appeared as a large shallow cleft, running from near the summit of the mound and *'terminating at the foot of the slope in a slight ridge formed by Layard's spoil heap'* (Figure 2).[19]

Layard's brief published account describes the tiles as found reused face-down in a pavement.[20] His journal for December 3rd 1849 providing some further detail:

> *'...the workmen had come upon a flooring of brick – and a* drain *beneath. Some of the bricks were painted with figures, horses, chariots – none entire – but some valuable fragments extracted. The painted side turned downward and the bricks evidently brought from elsewhere such as were found with inscriptions belong* [sic] *to the builder of the centre palace. [...].'*[21]

Whether Layard was correct, and the tiles had been re-used, or whether they had collapsed from a nearby wall, the tiles originally probably decorated a façade of a building or might have fallen from an upper storey. In contrast to decorated Neo-Babylonian bricks, which were glazed at the lateral edges, here the complete upper face of the tile was glazed, showing that these tiles were attached vertically at the face of a wall – probably with mud-plaster as possibly still preserved on the reverse of some tiles.[22]

The most comprehensive prior study of the tiles was undertaken by Nadali in 2006, which has a detailed discussion of the fragments known at that time, although he worked only from Cooper's drawings.[23]

unknown, though part of one similar tile was found in 1962 in the fill of the south doorway of T 25.', Reade 1970: 127. However, this fragment does not appear to be in the 1962 or 1963 Room Register or Field Catalogue.

[16] Nadali 2006: 109; Nunn 1988: 182.

[17] A more detailed discussion about the exact findspot is given elsewhere, see Lehmann, Tallis *et al.* 2019: 3–5.

[18] Layard 1853a: 165; Layard 1867: 55.

[19] J.J. Orchard, *Report to the Directorate General of Antiquities on the Progress of the Season's Work*, 7th March 1963 (reference courtesy Jocelyn Orchard).

[20] Layard 1953a: 165.

[21] British Library, Ref. ADD. MS 39096.

[22] This corresponds to Reade's 'type a' of glazed bricks, glazed on the face instead of the edge, see Reade 1979d: 19. Therefore the glazed objects are here called tiles and not bricks. Preserved mud plaster in Lehmann, Tallis *et al.* 2019: fig. 2l.

[23] Nadali 2006: 116.

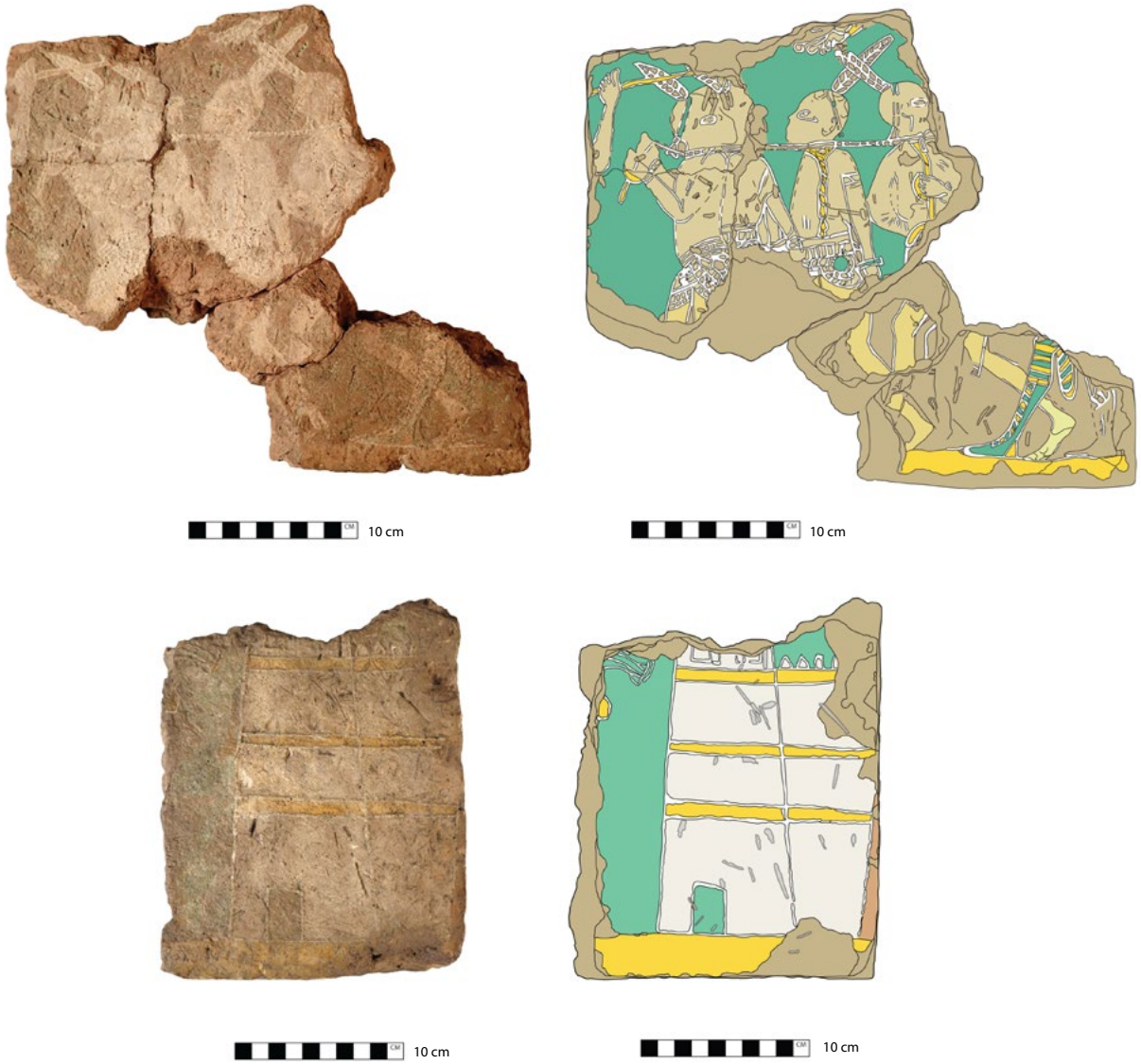


Figure 3a–b. Photos and drawings of tiles N1036 + N2069a above and N2067 below (authors/Manuela Lehmann; Photos courtesy Trustees of the British Museum).

A recent study of all remaining fragments by the authors, including several previously unknown pieces located in the course of the study, led to new joins, and, for the first time, enabled a full set of comprehensive drawings to scale as well as a complete series of photographs of the glazed tiles to be made (Figure 3).[24] The previously unknown fragments, found in miscellaneous boxes in two storerooms, unrecognised and unregistered since their arrival in the British Museum in 1850, produced new joins which yielded at least one substantially complete tile (N2069e, Figure 4). Despite Layard's journal stating that no tiles were complete, the packing list for shipping the tiles to Basra describes them as packed in two small crates – numbered XL and XLI – and suggests that perhaps some complete, or near-complete, tiles were at some point recognised, recovered and included in the shipment. After a case with *'painted bricks, ornaments &c chiefly from centre building in SE corner of quadrangle (Nimroud)'* we have: *'*[Case] *XL painted bricks with figures and some entire from SE corner of quadrangle* [and clearly not from the so-called centre building] – *found used as flooring. XLI d[itt] o d[itt]o'*.[25]

2 Description of the tiles

As a detailed description of the tiles has already been published by the authors elsewhere,[26] we will only

[24] Lehmann, Tallis *et al.* 2019.

[25] Or just possibly merely meaning that some figures were entire. Layard in letter to Ellis, 13th May 1850, BL Add MS 38942:29.

[26] Lehmann, Tallis *et al.* 2019.

Table 1. List of all surviving fragments and a short description

Frag.	Inventory No. British Museum	Layard's no.	Short description	Drawn by Cooper
1	ME 92183	Layard no. 9	Assyrian soldier stabbing	pl. 53 (partly)
2	N1036+N2069a	Layard no. 1+2	Libyan prisoners and Assyrian soldier	pl. 54
3	N2025	-	Standing Libyan soldier?	pl. 54
4	N2027	-	Small scale Assyrian soldiers' feet	-
5	N2067	Layard no. 10	Egyptian tower house	pl. 53
6	N2069b	-	Part of an Egyptian tower house	-
7	N2069c	-	Assyrian chariot (reins/draught pole?)	-
8	N2069d	Layard no. 7	Fortress and Assyrian soldiers	pl. 53
9	N2069e	Layard no. 8+3	Horses (chariot team?) and dead Libyan underneath	pl. 53+54 (partly)
10	N2069f	Layard no. 6	Fish, possible Assyrian royal chariot and floating Egyptian corpse	pl. 53
11	N2069g	Layard no. 4 (?)	Cavalryman on horse?	pl. 54
12	N2069h	Layard no. 5 (?)	Chariot and horse	pl. 54
13	N2069i	-	Corner with register border	-

Figure 4. Photograph of N2069e showing the current state of preservation – a near-complete glazed tile assembled from previously known fragments and a linking piece, newly-identified and previously unpublished. Outer edges marked (authors; Photo Courtesy Trustees of the British Museum).

provide a short general summary here (Table 1). The remaining fragments belonging to this evidently highly complex narrative composition show a battle scene with Assyrian infantry, horsemen and chariots as well as groups of prisoners in an identifiably Egyptian landscape – with tower houses – as well as a river with floating Egyptian dead. The prisoners can be identified as Libyans, an integral and important part of the Egyptian army in the Third Intermediate Period.[27] In addition, an Assyrian royal chariot can be identified (N2069f) based on the design of horse-crest, and possibly an overthrown Egyptian chariot (N2069e), which, by comparison with a similar scene in the Til-Tuba reliefs, might have represented a royal vehicle. Some examples are shown in Figures 3, 4 and 5.[28]

Only a few examples of the figures shown in these scenes are preserved to their full height. Where they are, they indicate a full figure height of between 22.5 cm and 23.3 cm. The tiles used for the composition were of at least two different formats. The larger, more frequently used format, is not preserved to full original height, but the maximum preserved height of fragment N2069e is 40.6 cm, showing that the original height must have been at least approximately 53 cm (Figure 4). The maximum width of the tiles is preserved in two examples which give widths of 32.6 cm and 32.8 cm. All the fragments have a thickness of between 9 cm and

[27] Spalinger 1981.
[28] For a complete overview of all fragments see Lehmann, Tallis *et al.* 2019.

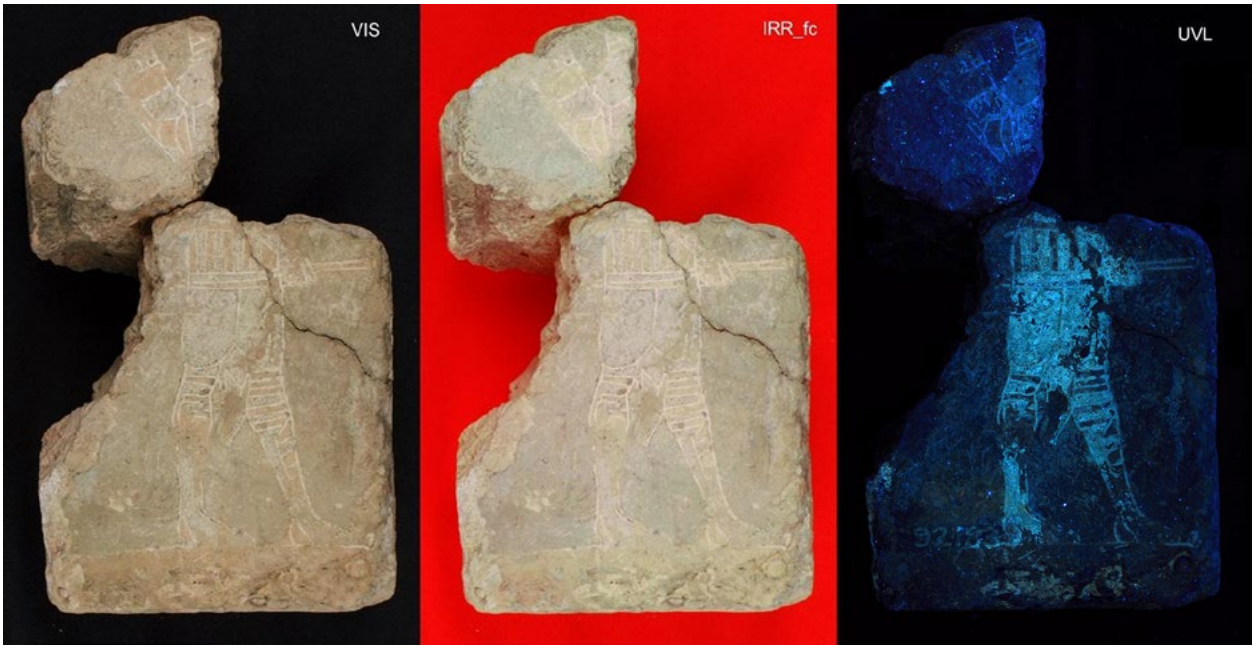


Figure 5. Multispectral images of ME 92183 from left to right a) visible reflected, b) false colour infrared reflected, c) ultraviolet induced visible luminescence (Lucia Pereira-Pardo; Photos Courtesy Trustees of the British Museum).

10 cm. A second, smaller, format of tile is attested by fragment ME 92183 (Figure 5), with a measurement of >23.4 × 14.0 cm and this was probably intended to fill a specific space in the composition – for example close to a window or door.

While no fitters' marks or other aids for assembling the completed scene can now be identified on the tiles with absolute certainty, on three lateral edges there are traces of what appears to be trickled glaze that are highly suggestive of such marks.[29] N2069e shows two yellow vertical lines next to each other, while the background is coloured green, and N2069f shows a whitish glaze that might have been two similar parallel lines, while the background here is a light yellow. Also, on the lower edge of N2069e, there are two greenish areas – the one on the left looks like a vertical line, while the sign on the right resembles a bent stroke.

3 The Visual Narrative of the Tiles and Analysis

The closest, indeed only, exact parallel in Assyrian art for such a complex military scene as shown by the glazed tiles is the representation of the battle of Til Tuba of *c.* 653 BC from Sennacherib's South-West Palace at Nineveh[30], dating to the reign of Ashurbanipal. This narrative depiction of battle in the field also used the techniques apparent on the tiles of multiple registers, sometimes with floating ground lines, and figures to different scales with different directions of movement. Nothing like this is known otherwise from the surviving corpus of Assyrian glazed tile representations.

As noted above, the tiles can be attributed to Esarhaddon on style and provenance, showing that the Til Tuba battle scenes are not unique in their scope and complexity, and had a forerunner in the arts of Esarhaddon, making this the earliest truly sophisticated narrative depiction of battle in Assyrian art now known. Many of the scenes attested on the tiles can be paralleled with scenes on the Til Tuba reliefs – as the authors have already shown in detail elsewhere.[31]

In addition, with our new interpretation of the tile images, based on close observation of the originals, it can now be proven, as suspected for these tiles as well as for the Til Tuba reliefs[32] that specific examples of Egyptian art must have been a direct inspiration and influence for these Assyrian compositions, rather than a repertoire of more generalised Egyptian influences. This can be seen stylistically, for example, in the execution of long limbs with an overcrossing of extremities of humans and horses alike. The clearest specific influence is in the depiction of a group of bound prisoners, which appears to be a direct copy of prisoners shown in battle scenes

[29] Lehmann, Tallis *et al.* 2019: 45–47, figs. 2i–k; For fitters' marks on glazed bricks from Nimrud see Curtis 2008, 61–64, figs. 8i–j; for marks indicating both the course of bricks and position within the course in a 9th century glazed composition at Nimrud, see Reade 1963: 39.

[30] Barnett *et al.* 1998.

[31] Lehmann, Tallis *et al.* 2019: 26–36.

[32] Finkel and Reade 1996: 246; Kaelin 1999; Feldman 2004: 144–145, 148; Thomason 2004: 160; Watanabe 2004: 107; Nadali 2006: 115.

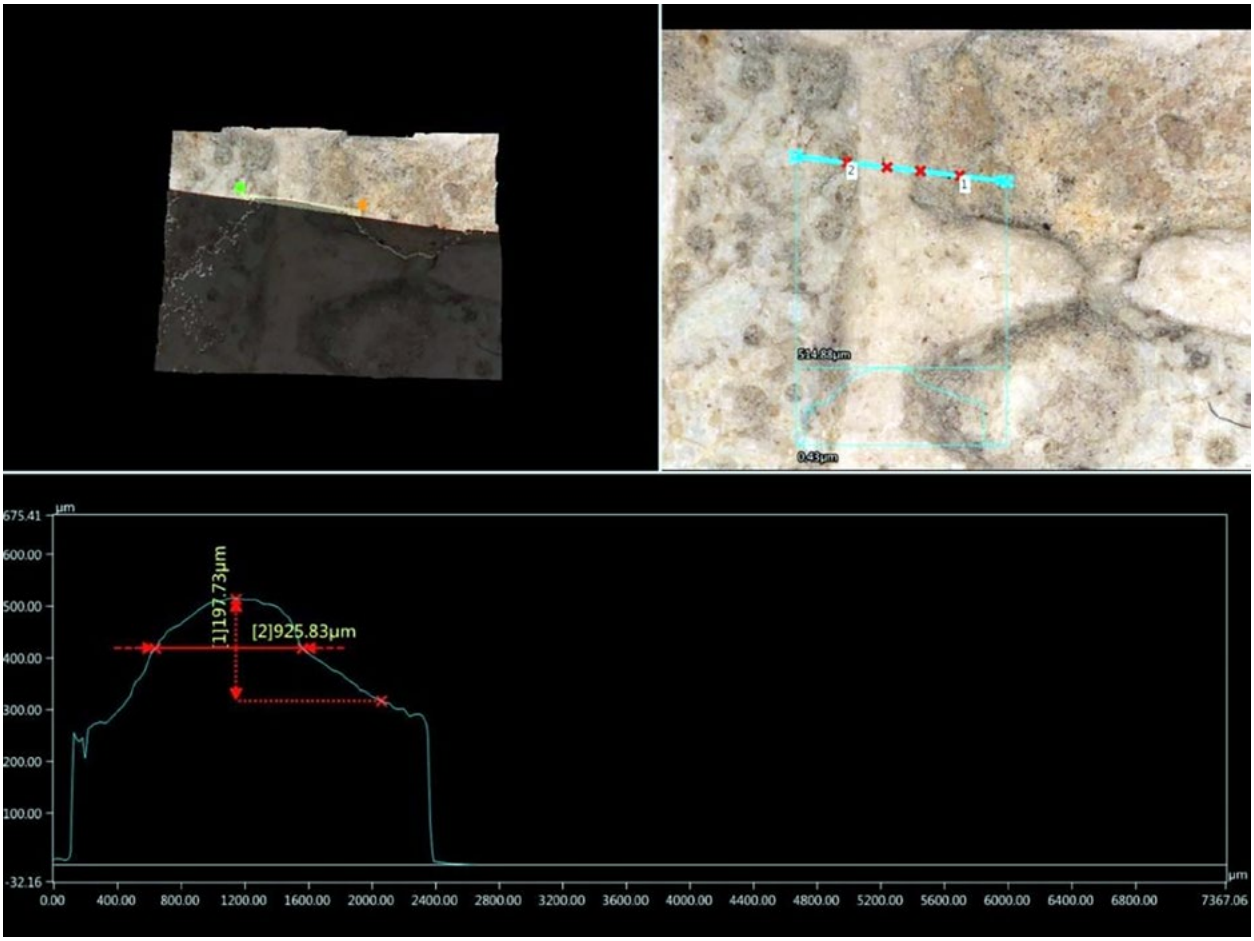


Figure 6. a) Digital 3D model of an area of the soldier's leg in ME 92183 showing the white outline, b) line measured, c) profilometry (Lucia Pereira-Pardo).

of Egyptian art – with the best parallels found in several Ramesside military campaigns as represented in extant temple relief decoration in Thebes, Abydos and Abu Simbel.[33]

The conservation and consolidation of the fragments is described in full elsewhere, but only a few of the glazed tiles have been cleaned so far and further work includes the examination of colours, surfaces and manufacturing techniques on the remaining fragments once their conservation treatment is completed. Doing so, we hope to broaden our knowledge about the materials and techniques employed in the glazing, as additional colours have been observed on some of the tiles still awaiting laser cleaning, such as pink and purple in N2069h.[34]

Cleaning and conservation of the tiles was a great assistance in several areas. It enabled a better comparison and understanding of the smaller details within the scenes depicted, for example, and for determining the sequence of steps in manufacture of narrative Neo-Assyrian glazed brickwork. The foundation for the glazed decoration, the tiles themselves, are made of fired coarse clay which is brownish to light pink in colour. The original outer edges of the tiles partly show traces of cutting or trimming of the wet clay.[35] Bricks or tiles in the Neo-Assyrian Period were generally made of clay and heavily mixed with vegetable matter, possibly to prevent shrinkage and cracking during the firing process. Freestone analysed the composition of glazes from Neo-Assyrian sites and concluded[36] that the firing temperature of the glazed brickwork was between 850 and 900°C, although some of the clay bodies were also rich in calcium oxide (CaO) which would make the bricks quite stable at temperatures up to 1050°C.

Therefore, the clay tiles seemed to be prepared first as units, their surface was corrected and smoothed

[33] Shaw 1996: 260–261 with further literature; Kaelin 1999: 79–80.

[34] The authors would like to thank Duygu Camurcuoglu, Loretta Hogan, Madeline Hagerman, Lucia Pereira-Pardo and Pingfang Wang from the Department of Conservation at the British Museum.

[35] See Lehmann, Tallis *et al.* 2019: fig. 2c.

[36] Freestone 1991: 55.

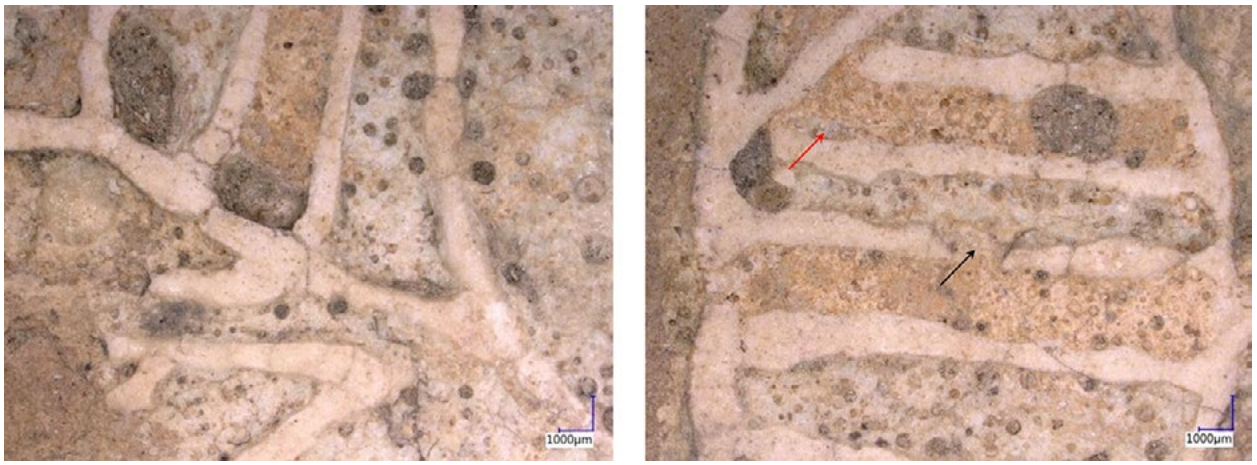


Figure 7. Micro-photographs of ME 92183 showing details of the white paste applied on top of the coloured glazes as an outline for the figures. Note a) the different thickness of the lines and the overlap in some areas (20x) and b) the presence of coloured glass in the areas where the white outline is lost (indicated with arrows), informing about the manufacturing sequence (Lucia Pereira-Pardo).

and then they were fired to burn out the temper. Next, the design was drawn in black with an easily fusible material (Reade mentions that black lines have survived in some cases where the glaze had gone[37]), presumably with all the tiles laid out for the full composition to be worked on and the main design was painted onto the tiles, applying coloured glaze. The tiles would have been – either individually or in sections – removed for a second firing process. Finally, a white paste of molten quartz was applied to highlight the outlines of the figures and then likely fired a third time at low temperature. More analysis in other collections would help better to understand the manufacturing process.[38]

The outlines of the figures are executed in narrow lines of thin white paste, closing off smaller coloured fields between them (Figures 6, 7). Many of the outlines are incredibly fine and show a high degree of craftsmanship that stands in stark contrast to the apparently coarse material and manufacture of the tiles (compare for example Figures 3, 4, 6 and 7).

Microscopic photography and analysis of the glaze was undertaken by Lucia Pereira-Pardo.[39] The elemental analysis of the white outline sample G9 revealed that the composition is mostly silicon (> 90 %), with traces of calcium, as well as sodium and potassium. In this case, no traces of any typical white opacifier (i.e. antimony or tin) were detected. The Raman analysis detected the presence of quartz, with a characteristic band at 465 cm^{-1}. These results suggest that a frit made of coarsely ground quartz was molten and applied as a paste along the outlines of the figures.

It was assumed that this white paste might have been applied first to draw the figures and isolate areas that were planned to be glazed with different colours. However, the microscopic observation of areas where the white outline is lost, revealed the presence of coloured glaze underneath (black arrow in Figure 7), indicating that coloured glaze was applied first and then the outline was applied on top to define the figures, add details and provide a certain three-dimensionality. In addition, the coloured areas overlap in some areas (red arrow in Figure 7) confirming that the white outline was not used to keep them separated. The white outlines therefore were applied on top of the coloured glaze, as a last step to highlight the figures.

The cleaning of the tiles' glazed surface also made possible a detailed technical examination of the glaze, so the colours, materials and manufacturing techniques could be investigated by means of macroscopic and microscopic observation, multispectral imaging and spectroscopic analysis. The examination of the glazed surfaces showed that, even though large areas of the glaze have deteriorated, there is still clear evidence of colour on most tiles such as white in the outlines and tower houses, green in backgrounds and garments and several hues of yellow in the band forming the ground, skin tones of people (prisoners and Assyrians alike), horses and many small details. Thus, the entire range of figures was represented using very few colours and this is reminiscent of the restricted palette employed in wall painting decoration of Assyrian palaces, as for

[37] Moorey 1994: 320.
[38] Few other examples with similar results are published in Tite *et al.* 2008.
[39] For further detail see Lehmann, Tallis *et al.* 2019.

Figure 8. Tile N2067 with partly better-preserved areas of glaze showing a smooth surface and fewer bubbles. Compare with Figure 3b for location (Manuela Lehmann).

example at Til Barsip[40] which uses mainly three colours: red and blue for the filling and black for the outlines. Green and yellow have likewise been used as main colours on glazed bricks at Khorsabad.[41]

Comparison with the description of the colours of these glazed tiles made by other authors in the past raises questions about the terminology used or a possible recent discolouration through decay. For instance, Layard uses the terms blue and green[42] and Cooper[43] also distinguishes sometimes between the darker olive green used for the background and a lighter green for the horses and clothing. These colours cannot be observed on the tiles as they are now: there is only one tone of green and no blue at all.[44] One possibility is that all the green on the tiles was once blue and it has decayed to green, or that in some instances there was both blue and green originally and the blue has now decayed to green. An example of a glazed brick with a blue background is known from Nineveh, demonstrating that such colour was certainly used.[45]

The surface of the glaze often shows many spherical cavities of up to 5 mm diameter, perhaps due to the formation of bubbles during the firing process, which would indicate an excessive firing temperature or the use of a glaze that was not ideally suitable. However, some of the better-preserved parts of the glaze on fragment N2067 show that the glaze was in general very smooth at the surface (Figure 8). This suggests that the top layer of the glaze has probably deteriorated, hence the presence of bubbles, but originally it might have looked flat and smooth at the surface with bubbles underneath the surface and not visible. Other authors have also related the presence of these cavities in Neo-Assyrian glazing to the deterioration of the surface.[46]

The ultraviolet induced visible luminescence image (UVL) highlights the presence of glaze, as some luminescence can be seen in the green glaze and white outlines of the bottom fragment (Figure 5c). Other authors have also managed to enhance the glazed areas by using UV radiation.[47] The yellow-orange areas do not fluoresce, likely due to the severe deterioration of the yellow-orange glaze. However, the possibility of having some residues of old conservation treatments in the lower fragment that enhances the luminescence cannot be completely discarded, although it is unlikely as a brighter luminescence would be expected. The glaze in the top fragment shows a weaker luminescence, perhaps due to a poorer condition or the presence of remnants of dirt, as the laser cleaning was not done extensively on the whole surface but only selectively to improve the reading of the scenes.

The absence of black in the British Museum's glazed tiles is intriguing, as this is the typical colour employed to represent hair in polychrome work, but the hair of the archer on ME 92183 shows a beige glaze (Figure 5) and the Libyan prisoners on N1036+N2069a a whitish to beige tint (Figure 3a). Traces of a black powdery material appears to be present though, and a sample was taken and analysed to investigate whether it could be the remains of a black glaze. However, this sample does not seem to correspond to a colourant, but to residues of the dark gypsum crust ingrained in the highly porous surface, as suggested by a characteristic Raman band at 1007 cm^{-1}. Possible explanations for this lack of black colour are that any black glaze was applied as an additional layer and so was especially susceptible to loss, or that the glaze was initially darker but has discoloured or simply that the hair was an insignificant detail and left plain. A closer investigation of the glaze in the 'hair' of the figures is planned.

Further research on other collections would be invaluable for a deeper understanding of the process of manufacture and decoration of Neo-Assyrian brickwork.

[40] Thureau-Dangin and Dunand 1936.
[41] Botta 1949–1950: pl. 155. It has also been noted on painted reliefs at Khorsabad by Layard, see Reade 1979a: 18.
[42] Layard 1853a: 164–167; Layard 1867: 52–55.
[43] Layard 1853b: pl. 53–54.
[44] Compare Layard's descriptions and Cooper's drawings with the new photos and drawings in Lehmann, Tallis *et al.* 2019. The description of colours was copied from Layard and Cooper in all relevant articles, see Nadali 2006: 116.
[45] Mallowan 1966: 407.
[46] Bartel 2000: 93.
[47] Gries and Fügert 2017: 43.

Authors

Dr Manuela Lehmann
Department of Ancient Egypt and Sudan, The British Museum
Amara West Project Curator
United Kingdom
manuela.lehmann@gmail.com

Dr Nigel Tallis
The British Museum
Curator Emeritus
United Kingdom
ntallis@me.com

References

Albenda, P. 1982. Observations on Egyptians in Assyrian art. *Bulletin of Egyptological Seminar* 4: 5–23.

Albenda, P. 1997. Assyrian wall reliefs: A compositional study, in H. Waetzoldt and H. Hauptmann (eds) *Assyrien im Wandel der Zeiten, XXXIXe Rencontre Assyriologique Internationale, Heidelberg 6.–10. Juli 1992 (Heidelberger Studien zum Alten Orient 6)*: 223–226. Heidelberg: Heidelberger Orientverlag.

Andrae, W. 1923. *Farbige Keramik aus Assur und ihre Vorstufen in altassyrischen Wandmalereien*. Berlin: Scarabeus.

Barnett, R.D., E. Bleibtreu and G. Turner 1998. *Sculptures from the Southwest Palace of Sennacherib at Nineveh*. London: British Museum Press.

Bartel, H.-G. 2000. Mikroanalytische Untersuchungen von Glasuren aus Assur in Mesopotamien aus den Beständen des Vorderasiatischen Museums der Staatlichen Museen Preußischer Kulturbesitz zu Berlin. *Berliner Beiträge zur Archäometrie* 17: 45–103. Berlin.

Botta, P.-E. 1849–1850. *Monument de Ninive, découvert et décrit par M. P. E. Botta, mesuré et dessiné par M. E. Flandin*. Paris: Gide & J. Baudry/Imprimerie Nationale.

Curtis, J.E. 2008. The British Museum excavations at Nimrud in 1989, in J.E. Curtis, H. Mc Call, D. Collon and L. al-Gailani-Werr (eds) *New Light on Nimrud: Proceedings of the Nimrud Conference 11th–13th March 2002*: 57–64. London: British Institute for the Study of Iraq, in association with the British Museum.

Feldman, M.H. 2004. Nineveh to Thebes and back: Art and politics between Assyria and Egypt in the seventh century BCE. *Iraq* 66: 141–150.

Finkel, I.L. and J.E. Reade 1996. Assyrian hieroglyphs. *Zeitschrift für Assyriologie und Vorderasiatische Archäologie* 86: 244–268.

Freestone, I.C. 1991. Technical Examination of Neo-Assyrian Glazed Wall Plaques. *Iraq* 53: 55–58.

Gadd, C.J., 1936. *The Stones of Assyria. The Surviving Remains of Assyrian Sculpture, their Recovery and their Original Position.* London: Chatto & Windus.

Gries, H. and A. Fügert 2017. Die Rekonstruktion der glasierten Ziegelfassaden aus Assur. Ein erster Bericht zum Projekt Glassur. *Antike Welt* 3: 41–43. Darmstadt: WBG.

Jones, F. 1852. *Maps of Mesopotamia, Vestiges of Assyria, 2, Nimrud & Selamiyeh*. London.

Kaelin, O. 1999. *Ein assyrisches Bildexperiment nach ägyptischem Vorbild. Zur Planung und Ausführung der 'Schlacht am Ulai' (Alter Orient und Altes Testament 266)*. Münster: Ugarit-Verlag.

Layard, A.H. 1853a. *Discoveries in the Ruins of Nineveh and Babylon, with Travels in Armenia, Kurdistan and the Desert: Being the Result of a Second Expedition Undertaken for the Trustees of the British Museum.* New York: Putnam and Co.

Layard, A.H. 1853b. *A Second Series of the Monuments of Nineveh*. London: Murray.

Layard, A.H. 1867. *Nineveh and Babylon: A narrative of a second expedition to Assyria, during the years 1849, 1850, and 1851* [abridged version of *Nineveh and Babylon* (1853)]. London: John Murray.

Lehmann, M. and N. Tallis, with D. Camurcuoglou and L. Pereira-Pardo 2019. Esarhaddon in Egypt: An Assyrian-Egyptian battle scene on glazed tiles from Nimrud: *British Museum Studies in Ancient Egypt and Sudan* 25: 1–100.

Mallowan, M.E.L. 1958. The excavations at Nimrud (Kalhu), 1957. *Iraq* 20: 101–108.

Mallowan, M.E.L., 1966. *Nimrud and Its Remains*. 3 Vols. London: Collins.

Moorey, P.R.S. 1994. *Ancient Mesopotamian Materials and Industries: The Archaeological Evidence*. Oxford: Clarendon Press.

Nadali, D. 2006. Esarhaddon's glazed bricks from Nimrud: The Egyptian campaign depicted. *Iraq* 68: 109–119.

Nunn, A. 1988. *Die Wandmalerei und der glasierte Wandschmuck im Alten Orient* (Handbuch der Orientalistik, 7. Abt., 1/2, Lfg. 6). Leiden: Brill.

Oates, D. 1959. Fort Shalmaneser – An interim report. *Iraq* 21: 98–129.

Oates, D. 1963. The excavations at Nimrud (Kalḫu), 1962. *Iraq* 25: 6–37.

Oates. D. and J. Oates 2001. *Nimrud – An Assyrian Imperial City Revealed.* London: British School of Archaeology in Iraq.

Postgate, J.N. and J.E. Reade 1976-1980. Kalḫu, in E. Ebeling and E.F. Weidner (eds) *Ia... - Kizzuwatna* (Reallexikon der Assyriologie und Vorderasiatischen Archäologie 5): 303–323. Berlin [u.a]: de Gruyter.

Reade, J.E. 1963. A glazed-brick panel from Nimrud. *Iraq* 25: 38–47.

Reade, J.E. 1979a. Assyrian architectural decoration: Techniques and subject-matter. *Baghdader Mitteilungen* 10: 17–49.

Reade, J.E. 1979b. Narrative composition in Assyrian sculpture. *Baghdader Mitteilungen* 10: 52–110.

Reade, J.E. 1979c. Ideology and propaganda in Assyrian art, in M.T. Larsen (ed.) *Power and Propaganda: A Symposium on Ancient Empires* (Mesopotamia 7): 329–343. Copenhagen: Akademisk Forlag.

Reade, J.E. 1979d. *Early Etched Beads and the Indus-Mesopotamian Trade* (British Museum Occasional Papers 2). London: British Museum Press.

Shaw, I. 1996. Battle in Ancient Egypt: The triumph of Horus or the cutting edge of the temple economy, in A. Lloyd (ed.) *Battle in Antiquity:* 239–269. London: Duckworth in association with the Classical Press of Wales.

Spalinger, A.J. 1981. Notes on the military in Egypt during the XXVth dynasty. *Journal of the Society for the Study of Egyptian Antiquities* 11: 37–58.

Thomason, A.K. 2004. From Sennacherib's bronzes to Taharqa's feet: Conceptions of the material world at Nineveh. *Iraq* 66: 151–162.

Thureau-Dangin, F. and M. Dunand 1936. *Til Barsib. Album* (Bibliotèque archéologique et historique 23). Paris: Geuthner.

Thureau-Dangin, F. and M. Dunand 1936. *Til Barsib. Texte* (Bibliotèque archéologique et historique 23). Paris: Geuthner.

Tite, M.S., A.J. Shortland, B. McCarthy and S. Paynter 2008. Production of glazed pottery and brickwork in the Near East, in M.S. Tite and A.J. Shortland (eds) *Production Technology of Faience and Related Early Vitreous Materials* (Oxford University School of Archaeology Monograph 72): 187–198. Oxford: Oxford University School of Archaeology.

Unger, E. 1932. Äthiopier in assyrischer Darstellung, in E. Ebeling and B. Meissner (eds) *A - Bepašte* (Reallexikon der Assyriologie 1): 310–311. Berlin/ Leipzig: de Gruyter.

Watanabe, C.E. 2004. The 'Continuous Style' in the narrative scheme of Assurbanipal's reliefs. *Iraq* 66: 103–114.

Chapter 6: The Glazed Bricks that Ornamented Babylon – A Short Overview

Olof Pedersén

Abstract: This paper presents a preliminary assessment of the famous glazed brick decorations from both the Berlin Babylon Project and other research. It discusses the basic glazed brick types at Babylon as well as the main buildings they once ornamented. Special attention is given to the Ishtar Gate, the Processional Way, and the Throne Room Facade, with regard to both the originals and the reconstructions.

Keywords: Babylon; Glazed Bricks; Ishtar Gate; Processional Way; Throne Room Facade

1 Introduction[1]

One of the main reasons for choosing Babylon for the large-scale German excavations that were carried out between 1899 and 1917 by Robert Koldewey on behalf of the *Deutsche Orient-Gesellschaft* (DOG) and the *Königliche Museen zu Berlin* (KMB, later *Staatliche Museen zu Berlin*, SMB) was the large number of beautifully coloured glazed brick fragments, partly displaying relief ornaments, which were noticed during a reconnaissance trip in late 1897 and early 1898.[2] Most date to the reign of Nebuchadnezzar II (604–562 BC).

A cooperative approach within the preparatory Babylon-Project of the *Vorderasiatisches Museum Berlin* (VAM, part of SMB, previously *Vorderasiatische Abteilung*, VA), the *Freie Universität Berlin*, and the DOG has opened new opportunities to examine the documentary evidence gathered by the excavations. Within this framework preliminary studies including the digitisation of the excavation documentation have led to the enabling of a larger Babylon project covering the study and publication of a series of yet insufficiently and even unpublished aspects. It consists of the recording of the find spots of all registered items in a digital excavation inventory. At the same time attempts have been made to identify the artefacts in the VAM Babylon collection with the ones documented during the German excavations. However, due to the high demand for the glazed brick fragments used in the museum's large-scale reconstruction and for this matter, great loss of excavation numbers, it nevertheless has to be acknowledged that this undertaking has so far proved the least successful for this find group.

The appealing appearance of the glazed bricks has in fact represented an incitement for several reconstructions already in the past. The first copy of the Ishtar Gate, at least regarding its main gate building with glazed bricks displaying bull and dragon reliefs, may have been relocated to the Persepolis area (Tol-e Ajori) as early as shortly after Cyrus' conquest of Babylon in 539 BC.[3] Another, yet far more famous, full-scale model of the front gate with its bull and dragon reliefs and a section of the Processional Way exhibiting lion reliefs, combining both ancient and modern elements from 1930 can today be admired in the VAM in Berlin.[4] A half size copy of the front gate using modern materials was constructed in 1958–1959 in Babylon itself at some distance from the Processional Way. In this case the scale of the decorative elements was smaller than in the original. In the palace area of Babylon itself, parts of the walls along the Processional Way were re-erected above the old foundations in the 1980s, though this time without the ornaments. In the following, my own digital model will be used to describe various levels.

The main brick decoration in Babylon displaying glazes and reliefs will be discussed with indications to type, find spot, and number of excavated objects in order to obtain an overview of the fragmentary but yet wealthy excavated material and its original use in the ancient buildings. This is followed by a discussion of the buildings decorated with such decorations and their modern reconstructions.

2 The decorative bricks

2.1 Main sources of glazed brick decorations in Babylon

While most of the known glazed clay brick remains in Babylon were discovered during the German excavations, some had also been found earlier on, during British and French, and a large number during

[1] The following institutions are kindly thanked for support, use of material, and permissions: Vorderasiatisches Museum Berlin (VAM); Freie Universität Berlin; Deutsche Orient-Gesellschaft (DOG); World Monuments Fund (WMF); State Board of Antiquities and Heritage Iraq (SBAH); Deutsches Archäologisches Institut, Orient-Abteilung (DAI); Uppsala University.

[2] Koldewey 1990: 37.

[3] Chaverdi, Callieri and Matin 2016; Kaniuth 2018.

[4] Marzahn 1992; Marzahn 2008a; Marzahn 2008b.

the later Iraqi excavations. Some finds further included glazed quartz bricks.

More than half of the registered find objects from the German excavations in Babylon consisted of glazed brick fragments. The main areas with such finds are the Ishtar Gate (*Ischtar Tor*),[5] the Processional Way (*Prozessionsstraße*) north of the gate along the walls of the North Palace (*Hauptburg*),[6] and parts of the South Palace (*Südburg*).[7]

Large walls of baked unglazed brick with relief decorations are still standing *in situ* at the Ishtar Gate site. Baked brick fragments with glazed, although flat colour decorations, have been found in large numbers, but only two corresponding small wall sections were excavated *in situ* at the Ishtar Gate. Baked glazed brick fragments with coloured relief decorations were also attested in large amounts, though none preserved *in situ*. Glazed quartz bricks with coloured decorations are attested in limited numbers, all fragmentary and none *in situ*. Ornaments representing bulls and dragons were observed on the Ishtar Gate, whilst lion depiction are reported along the Processional Way north of the gate and from the South Palace. The figures are referred to as animals, even though the dragon (*mušḫuššu*) composes of limbs from different animals. All had protective functions and were associated with different deities.

According to the published excavation results from the South Palace, walls of the gate between the east courtyard (*Osthof*) and the middle courtyard (*Mittelhof*) were decorated with glazed lions of which only few remains have been preserved.[8] The gate between the middle and the main courtyard (*Haupthof*) reportedly also revealed glazed lions whose remains were said to have been inside the ruins in the middle courtyard.[9] Though this has been impossible to verify, there were more locations inside the palace with glazed bricks, as seen further below.

Royal inscriptions by Nebuchadnezzar II referred to constructions in Babylon with blue glazed bricks. The top (*rēšu*) of the Etemenanki ziggurat was said to be covered with glossy baked bricks the colour of lapis lazuli (*ina agurri uqnî elleti*).[10]

The Ishtar Gate, was made of shiny lapis-lazuli-coloured, baked bricks (*ina agurri uqnî elleti*) while decorated with fine-looking bulls (*rīmu*) and dragons (*mušḫuššu*).[11] The doorjambs (*sippu*) of this and other city gates were flanked by standing copper bulls and dragons. A large broken limestone block, Bab 18465, found inside the gate led to its identification and is discussed below. The North Palace (*Hauptburg*) had battlements (*kilīlu*) of lapis-lazuli (*uqnû*), i.e. probably lapis-lazuli-coloured, baked bricks.[12]

Several tens of thousands of fragments were found in the area of the Ishtar Gate and the section of the Processional Way further north. Numerous fragments were also excavated in the South Palace. Not one single glazed brick fragment was registered within the ziggurat area, even though some possibly from there were found in the brick dump at the Homera mound where bricks from the ziggurat had apparently been stocked during the time of Alexander or later.[13] It is interesting to compare the still relatively high-standing ziggurat at Borsippa, where a large number of blue glazed brick fragments have been found.[14]

In Babylon all glazed brick fragments with relief decorations and the great majority of the glazed brick remains with flat decorations were found scattered in few areas where brick miners had been active removing the rest of the bricks. In the museum premises in Berlin the brick fragments were first submitted to cleansing and desalting (Figure 1). They were then assembled like a large jigsaw puzzle consisting of several tens of thousands of pieces (Figure 2). For aesthetic reasons many of the flat, especially blue coloured fragments were excluded for the reconstruction process. Instead, it was decided to manufacture new bricks in Berlin.[15]

2.2 The good quality baked bricks of Nebuchadnezzar II

During the reign of Nebuchadnezzar II, the use of good quality baked bricks experienced a significant increase compared to the previous periods when buildings essentially still consisted of unbaked mudbricks. Contrary to the preceding periods, baked bricks were by now no longer exclusive to structural components within humid environments but spread through all structures of many official buildings. This especially concerned the palaces but also other buildings, and even some temples during Nebuchadnezzar's II later reign. Some of the buildings were adorned with glazed bricks, as discussed in the following.

Throughout later history, high-quality bricks were quarried to be recycled at construction sites elsewhere.

[5] Koldewey 1918.
[6] Koldewey 1932; Al-Kassar 1985; Pedersén 2018a.
[7] Koldewey 1931.
[8] Koldewey 1931: 67.
[9] Koldewey 1931: 71.
[10] Langdon 1912: 98–99 Nebukadnezar No 11, clay cylinder, 126–127 Nebukadnezar No 15, large stone tablet.
[11] Langdon 1912: 132–133 Nebukadnezar No 15, large stone tablet, 192–193 Nebukadnezar No 26, clay cylinder.
[12] Langdon 1912: 118–119 Nebukadnezar No 14, clay cylinder, 138–139 Nebukadnezar No 15, large stone tablet.
[13] Wetzel 1957: 2–3; Schmid 1995.
[14] Allinger-Csollich 2013: 16.
[15] For past studies concerning the techniques and compositions of the glazes and the bricks, see, e.g., Matson 1985; Matson 1986; Tite *et al.* 2008.

Figure 1. Ishtar Gate fragments in the 1920s, VA. Cleaning glazed bricks fragments from salts. PhBab 3701 (© Vorderasiatisches Museum, SMB).

Figure 2. Ishtar Gate fragments in the 1920s, VA. Reconstruction of glazed bricks from fragments. The working room is now the portico in front of the *Neues Museum*, Berlin. PhBab 3700 (© Vorderasiatisches Museum, SMB).

Figure 3. City wall connected with the Ishtar Gate in Babylon. The two blue markings are at the facades of the massive wall. Before excavation the terrain was 3–4 m higher than the top of the walls. Long before the launching of the excavation, all upper parts of the walls had been removed by brick miners, who even dug deeper down inside the walls leading to the formation of deep hollows inside the walls. To the left, 1980s rebuilding. October 2015.

In classical Arabic times, Babylon continued to function as a known brick quarry,[16] and until the German excavations especially houses in Hillah and the large Euphrates dam at Hindiyah still consisted of bricks from Babylon. Brick mining had in the meantime removed much of the available quality baked Nebuchadnezzar II bricks, indiscriminately of the presence of reliefs or glazes.[17] The first structures to disappear were the visible ones projecting above the surface. These were then quarried down to a couple of metres underground, where the risk of collapse was still manageable. Inside massive wall foundations the brick mining could continue several additional metres (Figure 3). During the excavations and reconstructions carried out in the 1980s many of the thus hollowed-out walls preserved by only their facings were refilled with modern bricks.

Since the brick looting was motivated by purely functional purposes, evidently little attention was given to the preservation of their glazed surfaces and ornamental reliefs. On the contrary, many tens of thousands of glazed fragments often displaying relief surfaces were found scattered in the areas of the original buildings, suggesting that they had been removed and discarded.

2.3 Baked bricks with relief decorations

All visible lower levels of the Ishtar Gate displayed bands of bulls and dragons represented in relief (Figure 4). The reliefs were found mostly *in situ* on the north and south facades as well as on all inner sides of the gate.[18] Few fragments were also found in other parts of the palace area (Figure 5).

The bulls and dragons are all 13 masonry courses tall. The most customary vertical distance between the bands is 11 layers, though it may vary between nine and 13 layers in different parts of the large gate construction. Together, this adds up to 24 bricks or about 2.0 m for each standard band of figures.[19]

In essence all the reliefs are identical, with each brick type being shaped by a specific mould. In all, 45 different relief bricks were needed to depict a bull, compared to 41 for a dragon. The rest of the gate consists of flat

[16] Janssen 1995: 137, 226.
[17] Koldewey 1990: 22–23.
[18] Koldewey 1918.
[19] Koldewey 1990: 48.

Figure 4. Unglazed baked clay bricks with reliefs. The Ishtar Gate in Babylon *in situ*. Bulls (*rīmu*) and dragons (*mušḫuššu*). Unusually good light conditions at dusk. In daylight conditions the reliefs are much less visible. The vertical distance between the feet of the animals is 2.0 m. May 2017.

Figure 5. 132 unglazed clay bricks with reliefs, all find spots are located in the centre. Most brick reliefs left *in situ* at the Ishtar Gate were never inventoried. There is a marked concentration at the Ishtar Gate, all other finds are fragments in secondary positions.

Figure 6. A flat glazed brick decoration was at the marked top. Ishtar Gate, Babylon. May 2017. Cf. Figures 7–9.

bricks without reliefs. Standard format bricks measure about 32.5 × 32.5 × 8 cm and wherever needed, half-sized bricks were also used. The reliefs were moulded not onto thin wall tiles but directly onto the sides of the masonry bricks during their fabrication. Bitumen was applied in layers as mortar with some earth on top of each layer.

The street level through the gate was raised considerably at several occasions. Each time this led to the reconstruction of the gate which was equipped with a new door adapted to the raised street level.

Under inadequate lighting conditions, the visibility of the reliefs tends to diminish. This may have encouraged the application of contrasting colours to the walls and the depicted motifs.

Scattered in different areas inside the palace area were also a few fragments of unglazed reliefs said to be from lions. Due to their scarcity and deficient concentrations in specific areas, the extent and location of the original lion reliefs remains vague.

2.4 Glazed baked brick decoration without reliefs

Small remnants of glazed brick decoration with figurative bands were found in two locations above the remains of unglazed walls with animal reliefs. One of them depicted the lower part of a bull (Figures 6–9). Both were removed by the excavators, and the one displaying the legs of the bull was reassembled in the VAM in Berlin.[20]

In the same way as all the unglazed bull reliefs, the glazed-flat bull was 13 bricks tall and composed of individual bricks. In its approximate lower half, the reconstruction in Berlin (Figure 9) consists of complete bricks removed from this section of the gate wall. The upper half of the Berlin reconstruction consists of fragments of bulls found elsewhere in the area of the Ishtar Gate. As shown below, the flat decorative frame around the animals is the same for both glazed flat animals and glazed relief animals.

[20] Koldewey 1918.

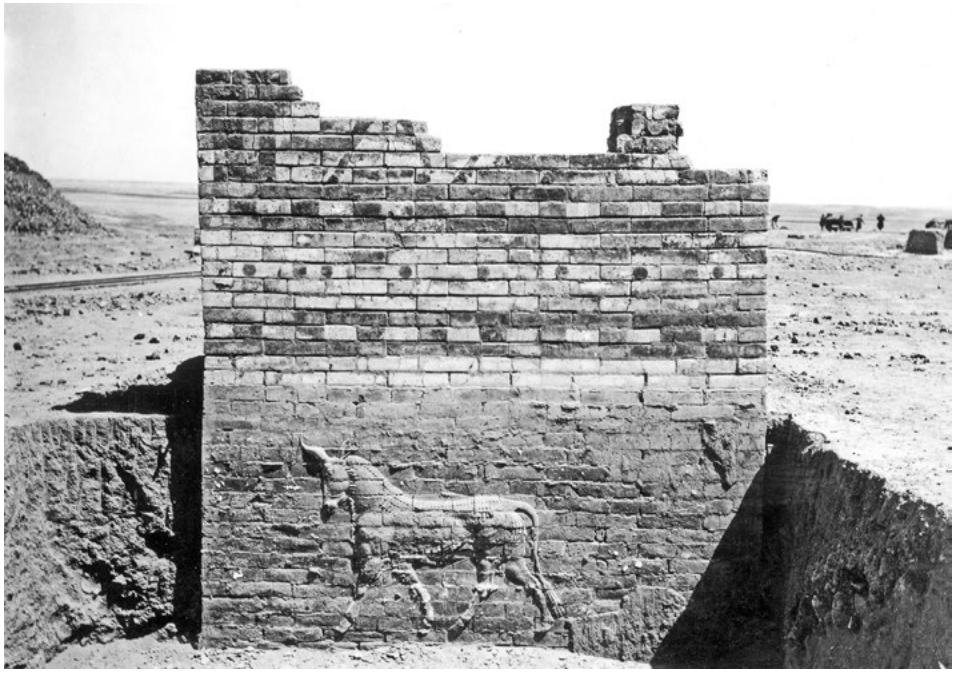


Figure 7. Flat, glazed brick decoration, Bab 20641a, with legs of a bull (*rīmu*) over unglazed bull relief. Before the excavations the terrain was about 2 m above the top of the wall remains. April 1902. PhBab 159 (©Vorderasiatisches Museum, SMB / Deutsche Orient-Gesellschaft).

The bands of bulls and dragons were arranged in an alternating order. However, the first glazed flat panel depicted a bull above an unglazed bull, which indicates that it belonged to an entirely new construction. With the raising of the street level, the upper part of the previous gate had apparently been taken down and a new one with glazed flat bricks was re-erected from the street level, beginning with a decorative band at the bottom followed by bulls and further up no longer preserved dragons.

As discussed in the following, the great majority of all glazed bricks were flat, whether decorated or not. The only difference was that the animal decoration was flat as well in a lower level of glazed bricks, and that it was in relief in an upper level.

2.5 Glazed baked brick decoration with reliefs

A later development during Nebuchadnezzar's II reign was the use of glazed reliefs. The entire background and the borders were flat as before. Only the decorative animals were rendered in relief. For the Ishtar Gate the reliefs consisted of bulls and dragons, and for the Processional Way north of the gate and the inner facade of the South Palace in front of the throne room they consisted of lions.

At the Ishtar Gate (Figure 10), the animals, the inscription, and parts of the lower decorative frieze were made of original brick fragments according to

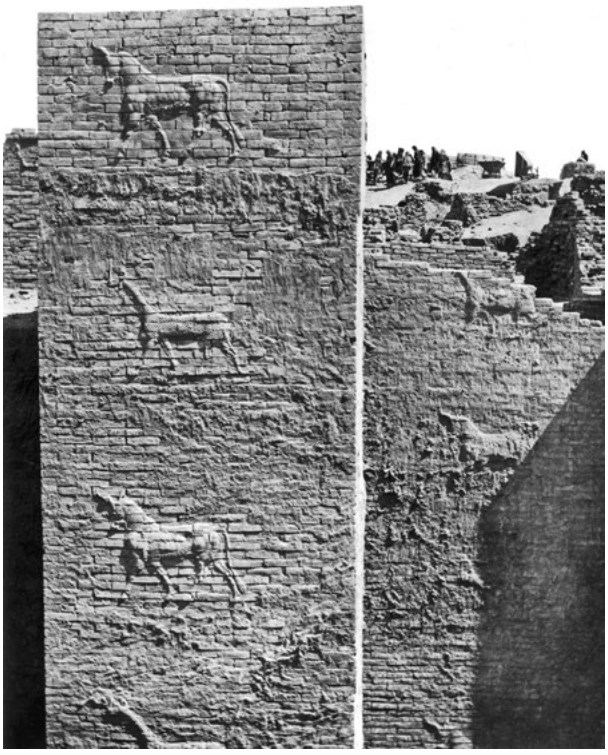


Figure 8. The unglazed reliefs below the removed flat glazed brick decoration. Bulls (*rīmu*) and dragons (*mušḫuššu*). The top bull is the same as the lower bull on Figure 7. Vertical distance between the animal feet is 2.0 m. September 1902. PhBab 197 (© Vorderasiatisches Museum, SMB / Deutsche Orient-Gesellschaft).

Figure 9. Glazed flat brick decoration in the VAM, VA Bab 1967. The lower part of the bull (*rīmu*) is from the wall, cf. Figure 7. The upper part has been assembled from different fragments. The bull is 1.1 m high (© Vorderasiatisches Museum, SMB, photo: Olaf M. Teßmer).

type. Since all bricks of one type are identical and had been made in the same mould, their correct location may apply to any of the figures.

Because no glazed relief bricks were found *in situ* and all were fragmented, the still standing lower part of the Ishtar Gate displaying unglazed relief bricks stood model for the reconstruction process. This brick-by-brick process which gradually lead to the resurrection of the structure assumed that the animals were identical, of equal size, and that they were arranged in regular intervals. Their layout and the intervals were adapted to the observations made on the lower unglazed gate. The glazed decorative flat bands at the bottom and sides of the gate panels were reconstructed according to the glazed flat brick panel discussed above (Figure 9).

The Berlin reconstruction assumes that the earlier gate had been previously demolished to give way to an entirely new gate on a higher level, this time exhibiting a decorative band and bulls as the lowermost visible animal frieze, as opposed to the dragons. Owing to this entirely new structure, the first band of glazed bull reliefs followed on a preserved level of glazed flat bulls, which itself overlay a preserved level of unglazed relief bulls, thus breaking with the otherwise observed bull – dragon alteration.

The bulls and dragons (Figures 12–13) are all 13 bricks tall, just like the unglazed and glazed flat animals. Both bulls and dragons had been executed in either brownish-yellow or white. In the Berlin reconstruction the vertical gap between the animals is 11 courses, which corresponds with the one usually observed at the unglazed lower levels. Although this distance seems quite plausible, it naturally remains conjectured. Altogether the original fragments from the bulls, the dragons, the inscription, and the lowermost decorative frieze, make out slightly less than 20%, of the reconstructed surface. The remaining 80% merely represent the architectural background and are made of modern materials (Figure 11).

The lion friezes along the reconstructed Processional Way in the VAM consist of about 45% original brick fragments, whilst more original fragments were used for the background. All lions represented in the Processional Way (Figure 14) have their tails hanging down and are 11 bricks tall. The background is either blue or cyan. The lions are either white with a brownish-yellow mane, or else, brownish-yellow with cyan mane.

At the lower southern facade (Figure 15) of the South Palace's main courtyard and in front of the throne hall, the lions are rendered in yellowish-brown, their

Figure 10. Ishtar Gate, VAM reconstruction with glazed animal reliefs. Ancient fragments fill about 20% of the surface, i.e. 26 bulls (*rīmu*), 16 dragons (*mušḫuššu*), one inscription, and part of the lowest decorative frieze. Vertical distance between animal feet is 2.0 m. Cf. Figure 11 (© Vorderasiatisches Museum, SMB, photo: Olaf M. Teßmer).

Figure 11. Ishtar Gate, the reconstructed gate at the VAM, cf. Figure 10, with all parts reconstructed with ancient fragments in black. All the remaining parts in full colour, i.e. about 80% of the surface, including all upper parts and all backgrounds are of modern bricks made in the 1920s (© Vorderasiatisches Museum, SMB, photo: Olaf M. Teßmer; black by author).

Figure 12. Ishtar Gate, glazed bull relief. VAM reconstruction. The bull and the decorative band below were assembled with ancient brick fragments, whereas the complete bricks in the background are modern. 45 relief bricks were required for each bull. The bull is 1.1 m high (© Vorderasiatisches Museum, SMB, photo: Olaf M. Teßmer).

Figure 13. Ishtar Gate, glazed dragon relief. VAM reconstruction. The dragon was assembled with ancient brick fragments, the rest with modern complete bricks. 41 relief bricks were required for each dragon. The dragon is 1.1 m high (© Vorderasiatisches Museum, SMB, photo: Olaf M. Teßmer).

Figure 14. Glazed lion relief from Processional Way north of Ishtar Gate. White lion with brown-yellow mane and hanging tail on cyan background. Excavators estimated 120 lions along the 180 m long wall facade in Babylon at the uppermost Nebuchadnezzar II street level. 24 lions are reconstructed on the walls in the VAM. 46 relief bricks were required for each lion. The lion is 0.9 m high (© Vorderasiatisches Museum, SMB, photo: Olaf M. Teßmer).

manes in brown and their tails in a raised attitude before a blue background. They are due only to their tails 12 bricks tall, slightly higher than the lions with the lowered tails. A portion of the facade displaying the trees in a stylized garden had fallen off the wall into the courtyard. Even though its composition and elevation above the floor level were successfully determined, the poor state of preservation banned any use of the bricks in the reconstruction on exhibition in the museum. It hence is a mere replica of the original. Some of the fragments from the lion depictions were cleared together with those of the garden, but most were found in rooms near other courtyards to the west, and their location below the garden yet remains unconfirmed.[21] The original lion and lower frieze fragments make up for about 15% of the facade, but as just mentioned, the main composition of the garden has been validated, despite it being a modern copy. A few original sections are exhibited next to the reconstruction in the VAM.

All glazed animal reliefs, bulls, dragons, and lions of both types had been shaped in individual brick moulds. The presence of added fitters' marks on the bricks (Figure 16) facilitated their positioning. They were frequently attested for the bricks from the garden scene outside the throne room in the South Palace but also for the lions in the Processional Way, and sometimes for the Ishtar Gate. Similarly, the fitters' marks also proved quite useful for the reconstruction.[22]

[21] Andrae 1902; Koldewey 1932.

[22] Andrae 1902.

Figure 15. South Palace, section of main courtyard wall in front of throne room from one of two mirrored VAM reconstructions. Flat glazed stylized garden with glazed lion reliefs with tails in upward position. The lions and decorative bands below are made of ancient brick fragments. The upper parts consist of modern bricks in a secured ancient design. 48 relief bricks for each lion. The lion is 1.0 m high (© Vorderasiatisches Museum, SMB, photo: Olaf M. Teßmer).

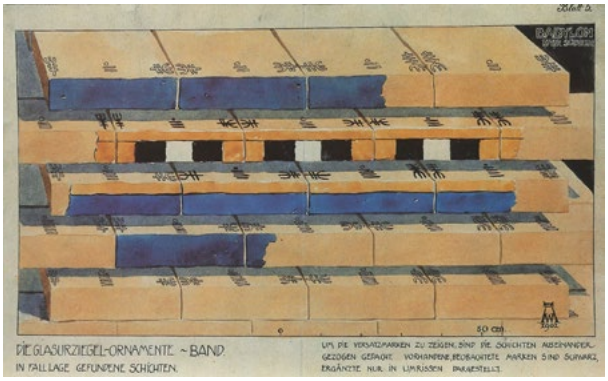


Figure 16. The fitters' mark principle shown with brick courses counted from above and signs indicating laterally abutting bricks, drawing by Walter Andrae (© Archive Deutsche Orient-Gesellschaft).

Due to their destruction, the bricks were found scattered over large areas. Some clusters according to type of decoration could nevertheless be traced (Figure 17). The fragments ascribable to the bulls and dragons revealed the highest concentrations near the Ishtar Gate. Those belonging to the stylized garden were recorded at the wall near the entrance to the throne room in the main courtyard of the South Palace. The lions with the lowered tail were found mostly around the Processional Way north of the Ishtar Gate. The lions with raised tails were documented in the South Palace, of which some at the same location as the stylised garden, but further southwest, both inside and partly even outside the palace.

A preliminary assessment of the amount of glazed bricks used in Babylon is based on the digital model, according to which they covered approximately 20,000 m^2. Together with the recorded brick size (32.5–33 cm × 32.5–33 cm × 8 cm) this would result to an estimated amount of 760,000 glazed bricks for the buildings discussed in this paper.

2.6 The decorated glazed quartz bricks

Fragments of quartz bricks with traces from glazed decorations were found in scattered locations in the palace area (Figure 18), but none of which *in situ*. A clear concentration was noted in rooms of the South Palace's southwest sector, south of what the excavators called the *Anbau* (i.e. annex). Some fragments were also found elsewhere in the palace area, but only very few in the so-called Persian building. However, the published reports only suggest that the latter originated from the Persian building but not that they were actually found there.[23]

This brick type consisting essentially of quartz sand and lime has been regarded as typical for the Achaemenid Period in concordance with the significantly important discoveries at Susa.[24] Koldewey referred to it as *Kunststein* (artificial stone). It also characterises by a *cloisonné* technique involving the creation of compartmented enamel fields (Figure 19).

The circumstance that the glazed quartz brick fragments concentrated in the south-western part of the South Palace may be an indication for a construction phase during the Achaemenid Period in this part of the palace. This has also been suggested by Gasche following an analysis of the architectural elements from this sector.[25] A so far unresolved question with the currently available evidence concerns the matching find spots of much of the quartz bricks and the glazed clay bricks with especially the lion reliefs discussed above. The extent to which this context reflects yet unknown stratigraphic disparities that the excavations have been unable to resolve after the ravages from brick quarrying remains unclear.

2.7 The use of glazed bricks in different periods

Before going on to discussing the various buildings displaying the different decorated, glazed brick types at Babylon, it may be worth recapitulating their main chronological distribution. The so far general sequence for the burnt brick types is as follows:

1. Early Nebuchadnezzar II: unglazed clay bricks with animal images in relief
2. Middle Nebuchadnezzar II: glazed clay bricks with flat animal images
3. Late Nebuchadnezzar II: glazed clay bricks with animal images in relief
4. Achaemenid: glazed quartz sand bricks

3 Buildings with decorative bricks

3.1 The Ishtar Gate

Located in Babylon's palace area, the Ishtar Gate is the city's best documented building with glazed brick decorations from a standpoint of both physical remains and written references. The evolution from an unglazed relief decoration to a flat glazed decoration and glazed relief decoration can best be grasped from the evidence from the gate.

The Ishtar Gate (Figure 20) was the main of the eight gates along the city's inner wall. The latter was built of unbaked mudbricks and consisted of two walls with some 7 m in-between. On the outside was a quay wall of

[23] Koldewey 1931: 122–124; Koldewey 1990: fig. 80.

[24] Caubet 1992; Daucé 2013; 2018.

[25] Gasche 2013.

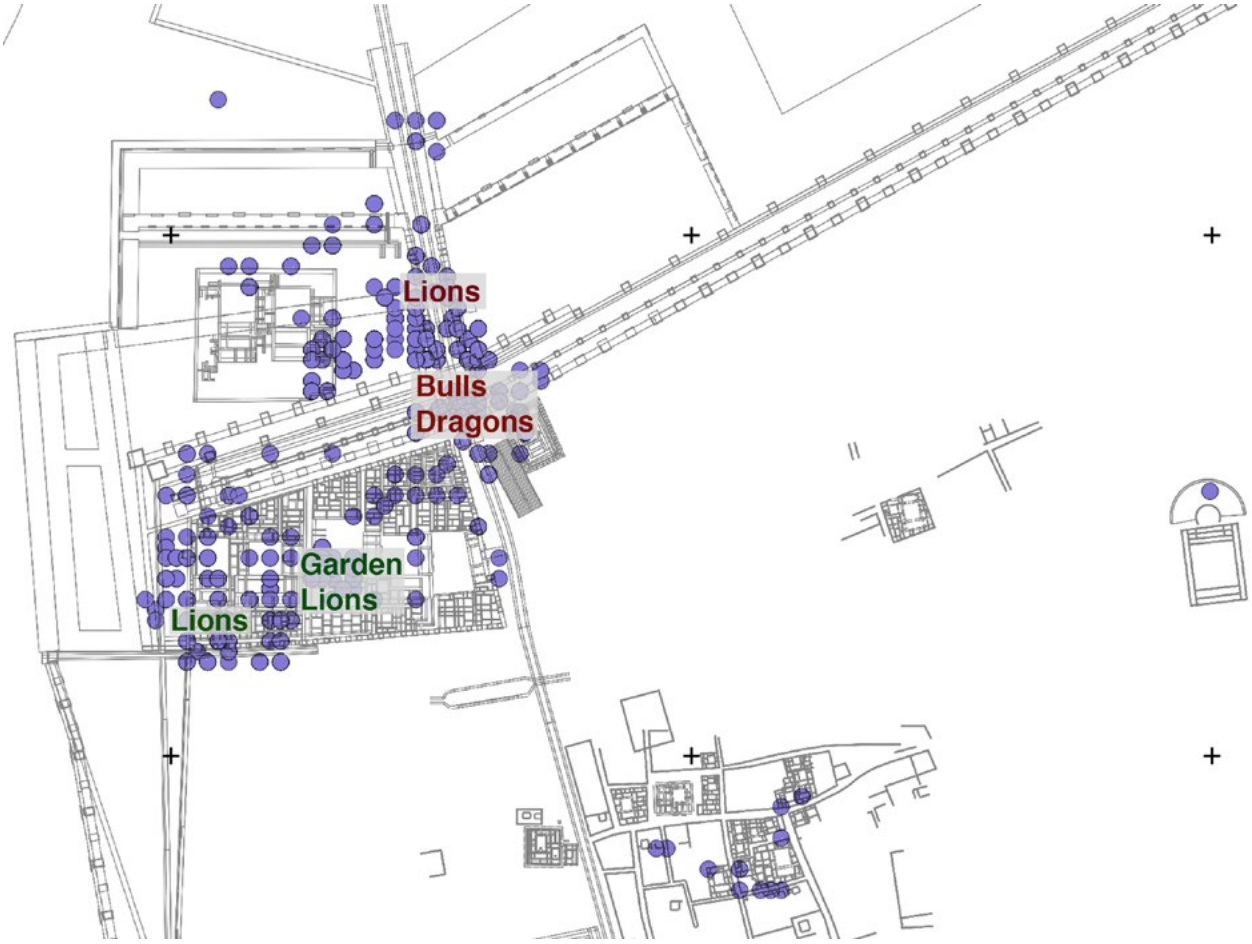


Figure 17. The 36475 glazed clay bricks with all find spots in the centre. Marked clusters appear at the Ishtar Gate, in the Processional Way to the north, and in the southern part of the South Palace, from the centre westwards.

baked bricks which resulted to a total of 40 m width for the fortification area that in addition was protected by an 80 m wide moat. The gate measured a total depth of 50 m and consisted of the front gate 13 × 28 m and the main gate 33 × 22 m with 4 m in-between. Both gate units were connected respectively to each wall. As attested in a historical text ascribed to Nebuchadnezzar II, the gate underwent several comprehensive reconstruction projects during his reign, thus referring to significant terracing work that was aimed to raise the level of the Processional Way.[26]

Level 1: Gate of blue glazed bricks with reliefs, in Nebuchadnezzar II text, +15.5 m.
Level 2: Gate of blue glazed bricks without reliefs, +13.0 m.
Level 3: Today best preserved, +11.0 m.
Level 4: Lower archaeologically attested street level, in Nebuchadnezzar II text, +7.0 m.
(Between levels 4 and 5 is a modern level for visitors, +4.0 m.)
Level 5: Lowest archaeologically attested street level, in Nebuchadnezzar II text, –2.5 m.
Level 6: Lowest possible level, in Nebuchadnezzar II text, –5.0 m.

On the assumption that the yet unexcavated sectors below the glazed wall of level 2 were ornamented with the same density of reliefs as in the cleared areas, the total number of unglazed relief animals (bulls and dragons) would add up to *c.* 450. Between level 5 and 4 there are five bands of animals, otherwise only one or two.

Today visitors to Babylon (Figure 21) can admire the best-preserved level 3 on either side of the gate over a few hundred meters. Before the excavations this level was also preserved inside the gate. Below in the middle of the modern staircase, there are platforms revealing the remains of street level 4. Though it has not survived the elevation of street level 1 with its blue gate and reliefs can nevertheless be estimated. This was at the

[26] Ismail 1985; see also Pedersén 2018a for a more detailed discussion.

Figure 18. The 685 glazed quartz bricks, all find spots in the centre. A marked concentration is visible in the southwest of the South Palace.

elevation of the lower part of the crenellations of the tower in the reconstructed South Palace. At that time, the palace too was higher up. Before the excavations, the terrain surface corresponded or was a few metres above the crenellations of the reconstruction (+15.5 m to +18 m). The visiting level inside the gate is modern but conceals two deeper levels, both dating to the time of Nebuchadnezzar II.[27]

Each street level had evidently its own gate structure and was equipped respectively with both doors and a roof cover. Whenever the street level was raised, the higher parts of the gate were taken down to the new street level or slightly above that to serve as the foundations for the new gate.[28] The minimum height of the 4.5 m wide door could be assessed above street level 5, where five lines of animals were counted before reaching street level 4. This adds up to approximately 10 m for the side wall (with or without an additional arch), which tallies quite well with the general idea on the proportions of doors in Ancient Mesopotamia. The reconstruction in Berlin, however, reveals only three lines of animals in the gate opening.

Figure 19. The only complete glazed quartz brick, Bab 9079. Height 9.0 cm. South Palace main courtyard (© Vorderasiatisches Museum, SMB, photo: Olaf M. Teßmer).

3.2 The larger Ishtar Gate area

Persistent rebuilding and enlargement activities in the palace area on increasingly higher terrain during

[27] Pedersén 2018a.
[28] Pedersén 2018b.

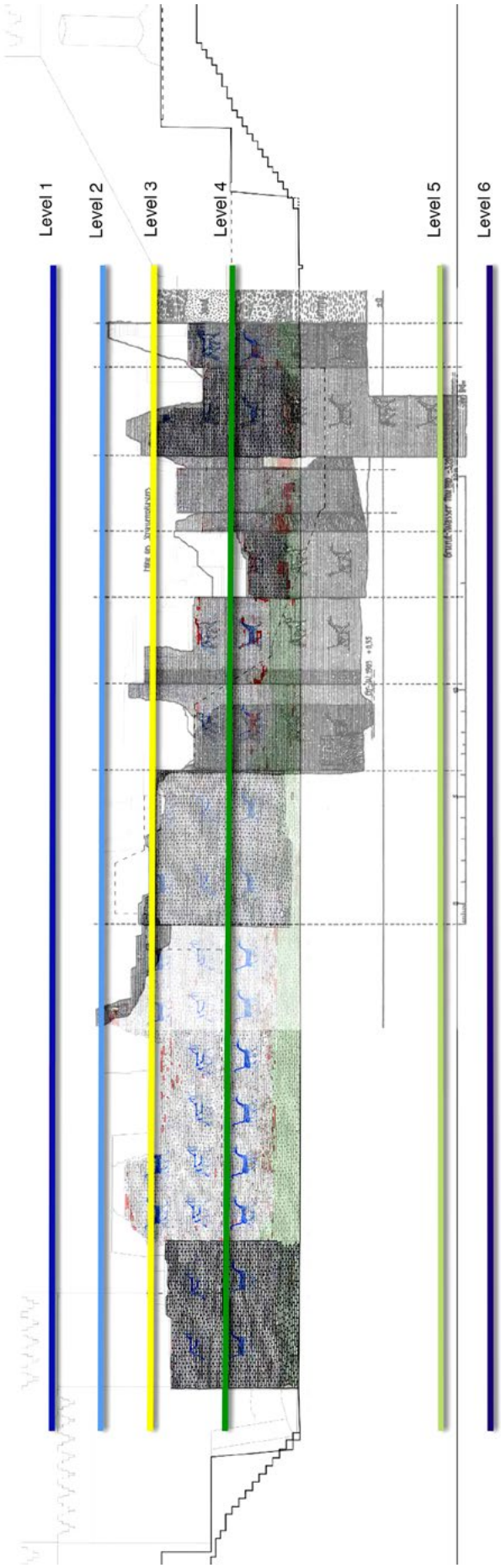


Figure 20. Ishtar Gate, looking west. The street levels are attested archaeologically or in ancient texts. Main gate, Iraqi excavation 1938, and front gate, German excavation 1902 (facade drawings by Koldewey 1932, pl. 6 and World Monuments Fund combined, with street levels added).

Figure 21. Ishtar Gate, looking south. Three Nebuchadnezzar II street levels are visible at the gate. The visiting level inside the gate is modern with two more Nebuchadnezzar II street levels below. October 2015.

the reign of Nebuchadnezzar II can be summarised to have taken place in three major steps (Figures 22–24). They are roughly datable to his early, the latter part of his middle, and late rule, or even that of his successor Nabonidus.[29]

Shortly after having accessed power, Nebuchadnezzar II (Figure 22) rebuilt the South Palace and the Ishtar Gate in baked brick, added additional baked brick quay wall fortifications outside the unbaked mudbrick city walls, and rebuilt the ziggurat. The Ishtar Gate was decorated with unglazed relief bulls and dragons. The Processional Way through the gate was probably level 5.

During the middle of his reign (Figure 23) the palace area was enlarged, the South Palace rebuilt on a higher level while expanding into the river bed. Construction activity at the North Palace was begun on an elevated level that reached into area of the former moat. The Processional Way was raised and the Ishtar Gate on level 3 rebuilt on a higher level while displaying the same type of unglazed relief bulls and dragons. This corresponds to the currently exposed level in Babylon showing the reconstructed palace walls along the street.

By the end of Nebuchadnezzar's II reign (Figure 24), the expansion of the palace area had increased. The North Palace had been completed, and the Processional Way raised on a higher level. The Ishtar Gate had again been rebuilt in glazed bricks with bull and dragon reliefs on yet a higher level. The North Gate protected the section of the Processional Way with decorations of glazed relief lions leading up to the Ishtar Gate.

The North Gate is located at a distance of 195 m from the Ishtar Gate and it was excavated by Al-Kassar in 1981. It had been built with baked Nebuchadnezzar II bricks held together by a bitumen bond at its lower parts and by a lime-gypsum mortar further up, in the same way as in Nebuchadnezzar's II North Palace. The North Gate seems to date to the end of his reign and is hence probably more or less concurrent with the palace.[30]

With the erection of the North Gate, the area of the Ishtar Gate expanded, beginning with the North Gate and continuing with the protected part of the Processional Way with the glazed relief lions, and finally the Ishtar Gate itself with glazed reliefs of bulls and dragons.

[29] For more details see Pedersén 2018a.

[30] Al-Kassar 1985; Pedersén 2018a.

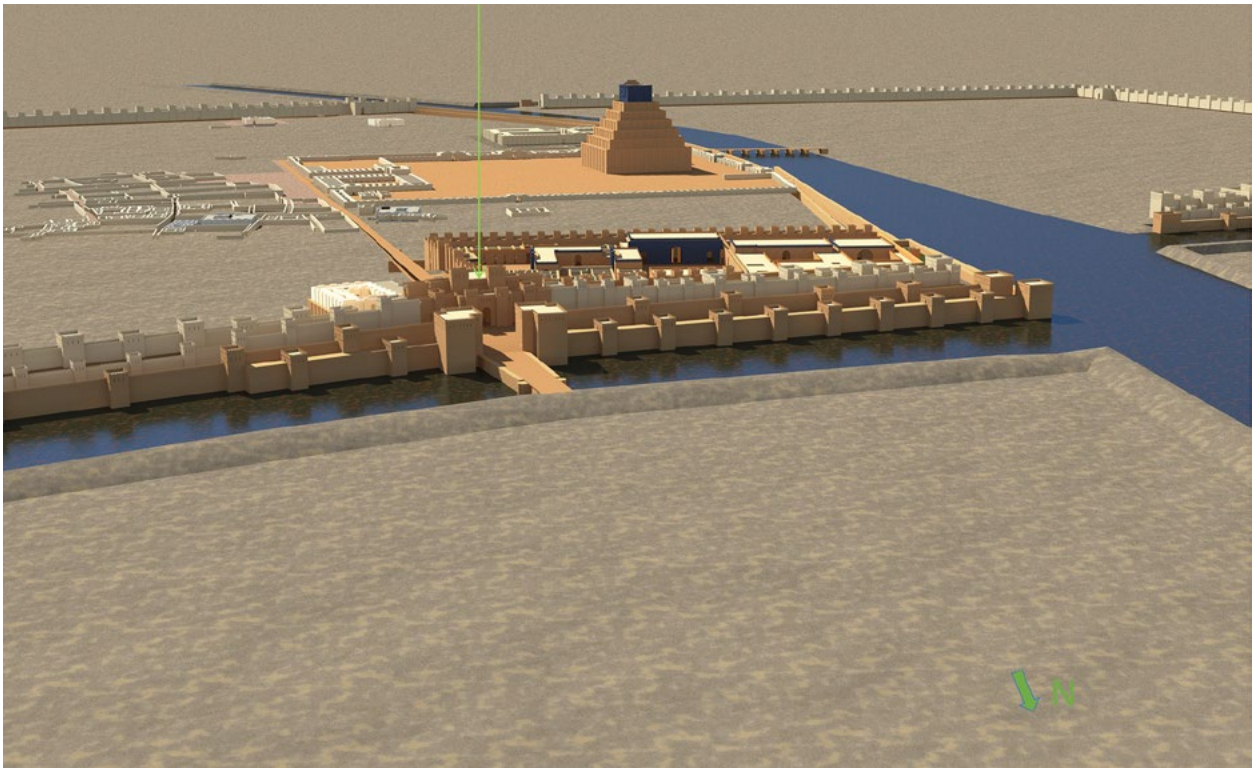


Figure 22. Babylon digital model looking south. Ishtar Gate during early reign of Nebuchadnezzar II (604–562 BC). Reliefs of unglazed bulls (*rīmu*) and dragons (*mušḫuššu*) on the gate walls. Reddish-brown walls are baked brick and whitish-grey walls are unbaked mudbrick in all model pictures.

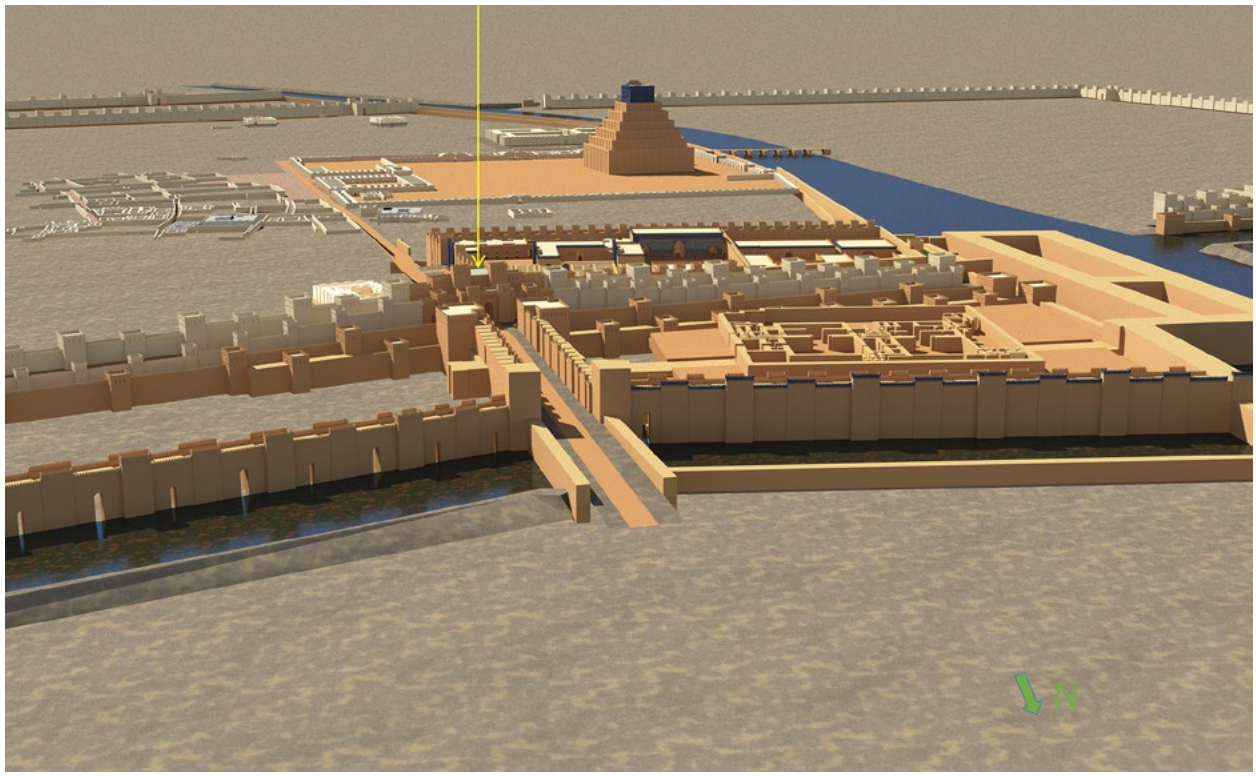


Figure 23. Babylon digital model looking south. Ishtar Gate during late middle reign of Nebuchadnezzar II and street level currently exposed in Babylon. Reliefs with unglazed bulls and dragons on the gate walls.

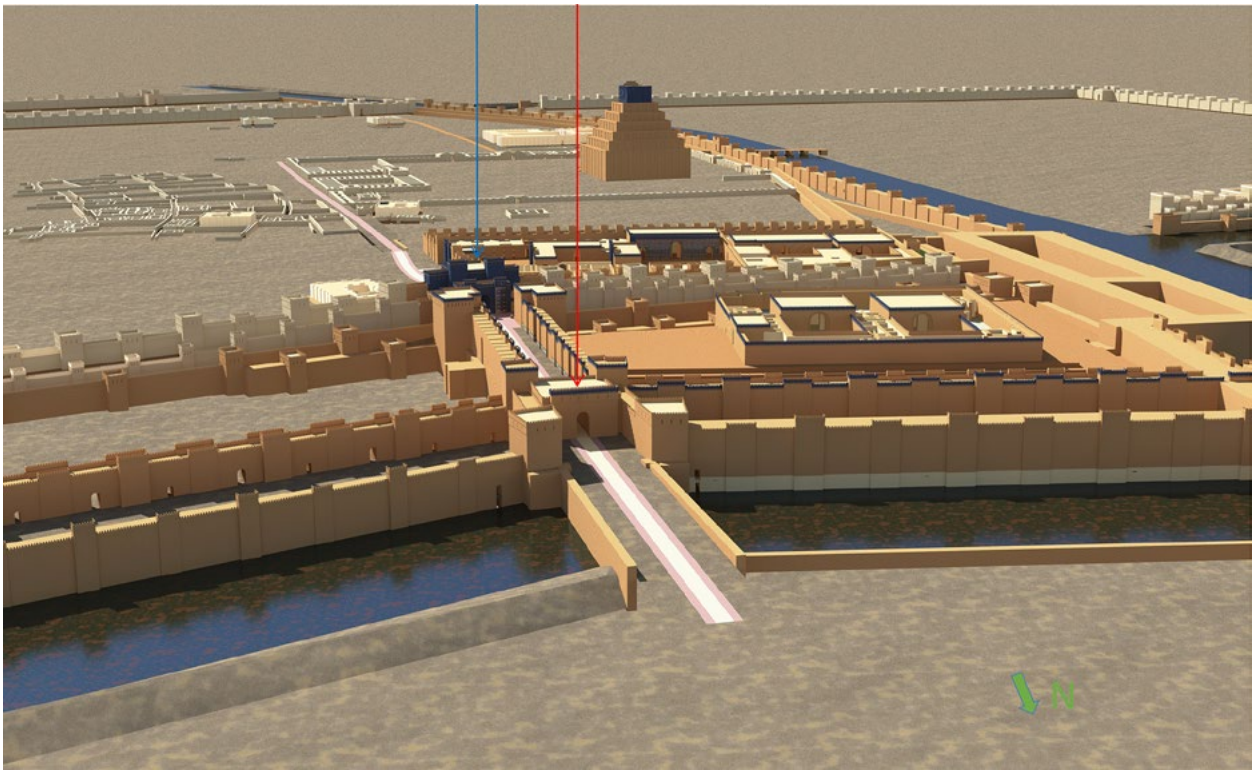


Figure 24. Babylon digital model of Ishtar Gate and North Gate, during late reign of Nebuchadnezzar II to that of Nabonidus. Glazed relief bulls and dragons on the Ishtar Gate walls as well as lions along the Processional Way in the palace area.

3.3 The Processional Way north of the Ishtar Gate with glazed brick decoration with lion reliefs

Owing to the large amount of recovered fragments between the North Gate and the Ishtar Gate, the Processional Way seems to have been decorated on an upper level with glazed bricks displaying lion reliefs. However, there was no *in situ* evidence, apart from the lower walls serving as foundations and many thousands of glazed fragments left behind by the brick miners. Contrary to the Ishtar Gate, the lower wall levels did not reveal any traces from unglazed lion reliefs. A few such fragments were reported found in different places in the palace area, but do not seem to originate from the walls there.

Within the area between both gates the 20 m wide Processional Way had been paved with large limestone slabs in the middle line, surrounded by reddish breccia stones along the sides. The walls were of baked brick, and there were no traces of plaster. According to the excavators, the glazed lion friezes once adorned the wall's lowest part, whilst its top had a glazed battlement (Figure 25). The excavators estimated that the frieze may have held up to 120 lion depictions, all striding towards those approaching the Ishtar Gate.[31]

A reconstructed section of the street with the conjectured decoration is on display in the VAM (Figure 26). Its width here is only 7 m, as opposed to the 20 m in Babylon, and in the museum its surface is level compared to the upward slant towards the Ishtar Gate at the site. The museum walls display 24 lions reconstructed from original fragments recovered from the area.[32] The reconstruction shows a possible alternation between the two different background colours, blue and cyan, and the two main colours on the lions, white and brownish-yellow, as described above.

3.4 The facade in the main courtyard of the South Palace in front of the throne room

The South Palace is the largest known building in Babylon with almost 600 rooms on the ground floor arranged around five large and 50 small courtyards. The facade of the central main courtyard (Figure 27) in front of the throne room situated on the south side of the courtyard was 53 m long and had one large, *c.* 5.8 m wide, and two more modest, 3.7 m wide, door openings leading to the throne room. The facade had an elaborate glazed brick decoration.[33] In Ancient Mesopotamia, this

[31] Koldewey 1932: 37–39; Pedersén 2018a.

[32] Marzahn 1992.

[33] Koldewey 1931: 82–91.

Figure 25. Babylon digital model of Processional Way, 20 m wide, uppermost Nebuchadnezzar II level. View from the North Gate looking south towards the Ishtar Gate. Protected room with decorations of lions on the walls next to the street in the palace area and bulls and dragons on the Ishtar Gate.

is the wall in royal palaces with the most elaborate decoration.

As stated above, the composition of the stylised garden as well as its location above the floor has been verified. The lions, however have not been safely located on the wall. The present location below the garden in the reconstruction[34] is based merely on the excavators' preference to fill the space between the garden panel and the floor with the lion motifs. The positioning of all the decorative bands on the wall is not always tenable, and alternatives may be possible.[35]

More glazed brick fragments, including remains from lion reliefs, have been found in rooms further west at the west courtyard and the annex (*Anbau*) courtyard, and even farther west outside the western wall of the palace. So far there have been no documented attempts do use them for any reconstruction. A concentration of quartz brick fragments dating to the Achaemenid Period was recorded in the rooms south of the annex courtyard, which corresponds with the area of discovery of numerous glazed clay fragments depicting e.g. lions. Although the find context points to later Achaemenid building activities within the Neo-Babylonian constructions, the German excavators failed to mention any differences pertaining to stratigraphy in this area.

Etemenanki, the ziggurat dedicated to Marduk was located at some distance away in a virtually straight line behind the king's throne room (Figure 27). According to the inscriptions of Nebuchadnezzar II referred to above, the top of the ziggurat had a facade of blue-glazed bricks. Nothing of the latter has survived within the ziggurat area, since the tower was demolished and the bricks transported to Homera hill to clear the site for a reconstruction. There is a slight possibility that a small number of glazed brick fragments reported from Homera may have belonged to the ziggurat, but since they were referred to as tiles and none has been recovered yet since, this remains conjectural.

4 The inscribed glazed bricks

The German excavators further collected residues from blue glazed bricks inscribed with white glazed cuneiform signs applied onto their surfaces. Such fragments concentrated within the Ishtar Gate area,

[34] Koldewey 1931: 84 fig. 4.
[35] See e.g. Heinrich 1984: fig. 129, 130; Hrouda 1986.

Figure 26. Processional Way in front of Ishtar Gate as reconstructed in the VAM. The street is 7 m wide instead of the original 20 m (© Vorderasiatisches Museum, SMB, photo: Olaf M. Teßmer).

but have also been attested to at other locations in the palace area. The script size is monumental as the signs cover the full height of a brick (Figure 28). Another script even covers the height of three bricks. Most of the brick remains with glazed script were found in the north-eastern part of the Ishtar Gate (Figure 29).

The highest concentration of white glazed cuneiform was recovered on the left-hand side of the northern facade of the Ishtar Gate, which roughly corresponds to the reconstructed location of the inscription on display in the Berlin museum (Figure 30). There may have been more inscriptions of this kind, as more fragments were found scattered over a larger area. Similar blue-glazed brick fragments with white cuneiform are also known from Borsippa, and for this matter, a comparative analysis may be rewarding.[36]

The German excavations registered a total of 1368 glazed brick fragments with white cuneiform. Most were used for the reconstructed inscription now on the reassembled gate, but a number of fragments have remained unaccounted for.

The original content of the inscription is unknown, but any reasonable guess would surmise that Nebuchadnezzar II is mentioned in a boastful way. The present text on the reconstructed gate is based on

[36] Allinger-Csollich 2013: 16.

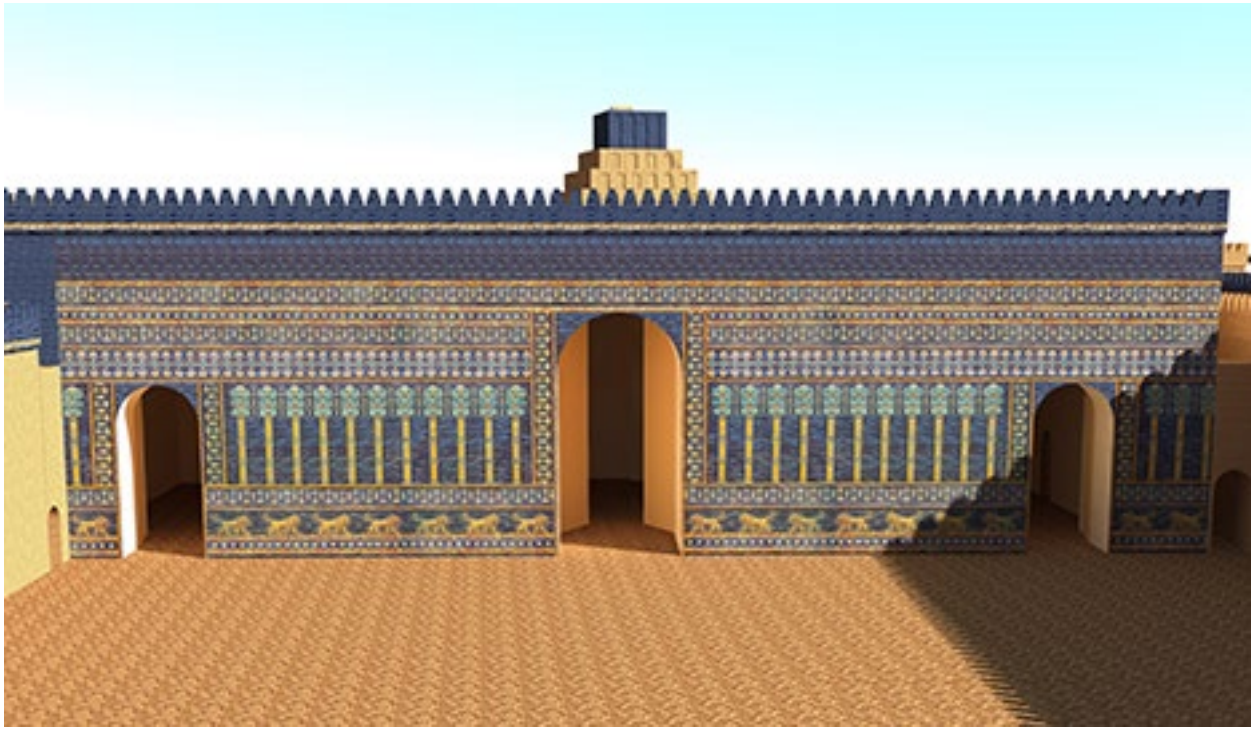


Figure 27. South Palace, main courtyard, 53 m long south wall in front of throne room. Model using VAM reconstruction of glazed flat stylised garden with glazed lion reliefs. Some 600 m behind the palace is the 90 m high ziggurat, which according to inscriptions had a glazed top.

the so-called East India House Inscription on a large stone tablet (BM 129397, 57 × 50 cm) concerning the construction of the North Palace (Figure 31). It consists of the following three sections:

Line 1–23: the East India House Inscription I 1–22, Nebuchadnezzar II with titles etc.,
Line 24–53: the East India House Inscription V 57–VI 21, building of Ishtar Gate,
Line 54–60: the East India House Inscription IV 7–13, building of New Year temple.[37]

As it stands, it cannot be an inscription for the construction of the Ishtar Gate. The last-mentioned building construction in such texts is always the one concerned and refers to the building where the inscription normally is placed. If it were an original this text would hence be the New Year temple. Accordingly, claims stating that the text displays original content can safely be set aside. The only original Ishtar Gate inscription found, Bab 18465, and which at the excavation supported the identification of the gate, was on a large limestone block (Figure 32). The broken text refers to the gate, copper bulls and dragons, and a bull(?) of limestone; in addition, in a broken passage possibly also glazed brick.[38]

Figure 28. Glazed brick with glazed cuneiform, Bab 20890. The only almost complete brick from the Ishtar Gate displaying the cuneiform sign BI. Height 7.7 cm, not used for the reconstruction of the gate in the VAM. All other brick fragments are much less well-preserved (© Vorderasiatisches Museum, SMB, photo: Olaf M. Teßmer).

An inscription with the same size of the cuneiform signs as the glazed brick inscription was placed on the west side of the Processional Way on the outer northern facade of the North Palace. The lower parts of the wall were covered with almost one-meter high limestone blocks. The complete three-line inscription was near the top on some blocks in a level on the wall. The inscription mentions Nebuchadnezzar II as builder of the limestone wall of the palace.[39] The glazed

[37] Langdon 1912: 120–141 Nebukadnezar No 15; Wallenfels 2008.
[38] Koldewey 1918: 39–41, figs. 1, 43; Koldewey 1990: fig. 28;
Langdon 1912: 190–191 Nebukadnezar No 22.
[39] Koldewey 1990: 178, fig. 110, 111.

Figure 29. 1368 glazed bricks with glazed cuneiform indicating all find spots.

brick inscription may have been something similar concerning the Ishtar Gate.

5 Discussion

After this overview of the remains of the glazed brick decoration in Babylon with the monumental remains of the Ishtar Gate, the Processional Way, and the wall in the South Palace in front of the throne room, it is time to make a final comparison with the reports of the cuneiform texts about such constructions and some comparison also with the publications of archaeological material and studies.

As already stated in the section about the sources at the beginning, the cuneiform texts refer to three main constructions with glazed brick by Nebuchadnezzar II in Babylon, i.e. the blue top of the ziggurat, the blue Ishtar Gate with bulls and dragons, and the blue battlement (*kilīlu*) of the North Palace.

As shown above, the archaeological remains only agree with the texts for the Ishtar Gate, where many blue glazed fragments as well as fragments of glazed reliefs with bulls and dragons have been found. Along the Processional Way north of Ishtar Gate on the walls of the North Palace were the long lines of blue glazed walls with a large number of glazed lions in relief. If this could be the *kilīlu* is questionable and in the reconstruction here the lions are placed below on the walls and the battlement at the top of the walls. There have hardly been found any remains of the blue glazed top of the ziggurat, only a few possible fragments on the probable place at Homera hill for the discarded bricks from the demolished ziggurat in connection with a planned reconstruction. On the other hand, the remains of glazed brick decoration in the South Palace, especially in the main courtyard on the wall in front of the throne room and rooms further west do not correspond with any known references in the cuneiform texts. It yet again emerges that the informational value of archaeology and ancient texts are quite disparate. Even a combination has probably not established everything.

A total of 102 bricks from the palace area registered during the German excavations had stamp impressions showing lions, 82 of them being from the South Palace.[40]

[40] Sass and Marzahn 2010: 96–130, 178–183, Nos. 65–113.

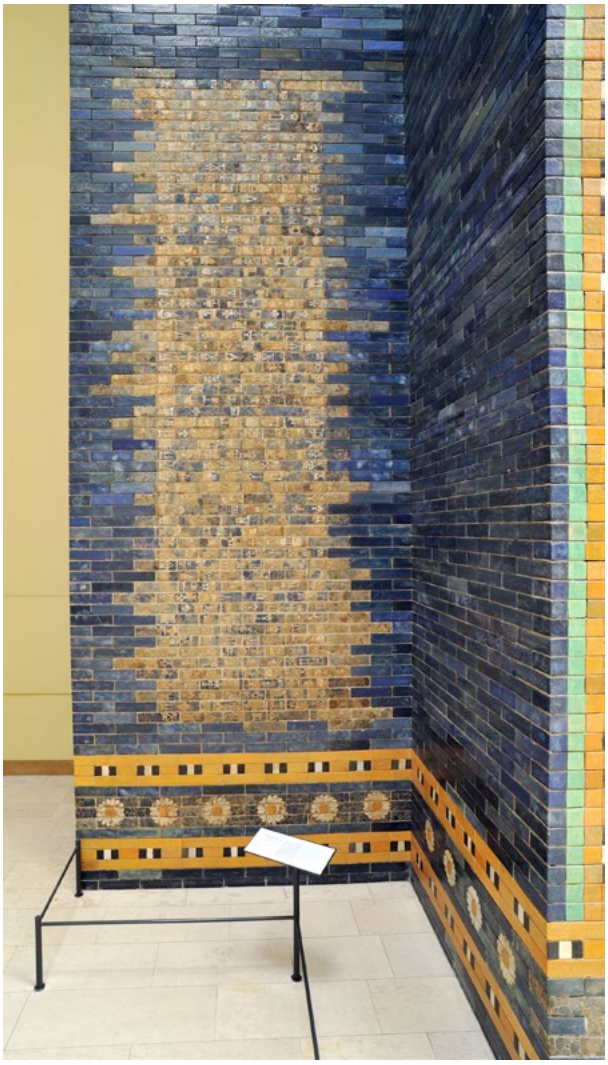


Figure 30. Ishtar Gate VAM reconstruction. Inscription with glazed cuneiform located probably at more or less the right place (© Vorderasiatisches Museum, SMB, photo: Olaf M. Teßmer).

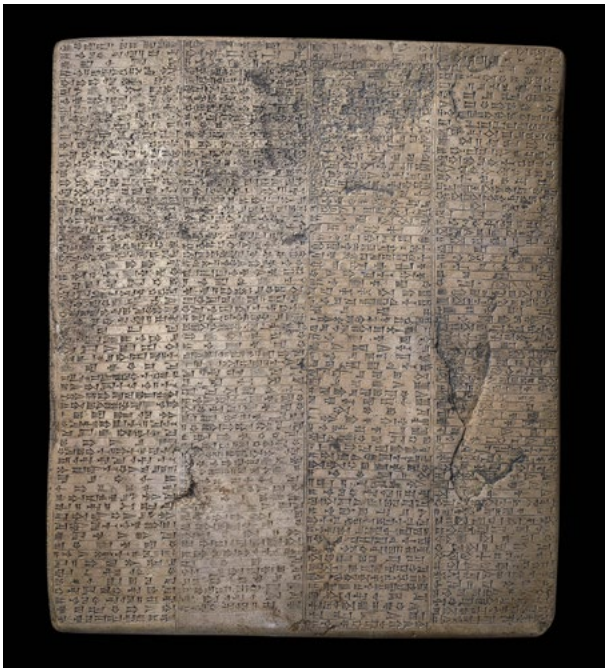


Figure 31. East India House inscription on large stone tablet, now BM 129397. Three of its passages were used to reconstruct the VAM Ishtar Gate inscription (© Trustees of the British Museum).

All the depicted lions on the bricks from the palace area had their tails pointing up, just like the glazed relief lions from the South Palace. Several of the lion-stamped bricks also had Aramaic inscriptions. Other bricks with similar Aramaic inscriptions were stamped with Neo-Babylonian royal stamps, especially ones attributed to Nebuchadnezzar II. The royal inscription stamps and the lion stamps seem to be exclusive to the Neo-Babylonian Period. In the earlier Neo-Assyrian Period, palace reliefs show lions with upward pointing tails but in round sculpture their tails are pointing down. In Babylon, the famous large stone lion, probably of Neo-Hittite date, standing in the eastern part of the North Palace near the Processional Way has a downward tail just like the lions in the Processional Way in front of the Ishtar Gate. All other lions in the palace area were of the more common type with the tail pointing up.

Babylon's tremendous development under the reign of Nebuchadnezzar II has veiled most of the remains from its earlier history that compare with the official buildings discussed here. Palaces, city gates, and ziggurats in baked brick with reliefs or glazed decorations have so far not been documented for earlier periods in Babylon. Other buildings, like temples, that to some extent can be traced to somewhat earlier phases possessed other types of decoration.

Later periods are slightly problematic, due to devastations from brick quarrying. The Neo-Babylonian Period and especially the reign of Nebuchadnezzar II produced large numbers of baked brick constructions, partly displaying reliefs, both with and without glazing. The following Achaemenid Period Persepolis saw the construction of a gate with glazed clay bricks similar to that in Babylon. We cannot affirm that any of the glazed clay bricks in Babylon date to this period. However, the glazed quartz brick constructions in Babylon have generally been dated to this period, due to similar decorative bricks in Susa. Though even later constructions in Babylon may have been decorated with glazed bricks, this remains yet to be demonstrated.

Figure 32. The only original Ishtar Gate inscription excavated inside the gate describing its construction by Nebuchadnezzar II was found on a large broken limestone block, Bab 18465, 70 cm thick. PhBab 199 (© Vorderasiatisches Museum, SMB / Deutsche Orient-Gesellschaft).

6 Conclusion

Without the reconstructions, the facades with their appealing glazed relief decorations would be no more than a heap of mixed fragments with different colours and forms. This is how they were found. The intricate work of assembling such large puzzles slowly leads to a more comprehensive understanding of an array of details. The large dimensions of such coloured brick monuments nevertheless require the addition of enormous amounts of modern materials.

The facade of the reconstructed Ishtar Gate in Berlin consists to some 80% of modern materials, whilst 20% of ancient fragments according to type. The facade in front of the throne room in the South Palace have been assembled to approximately 10% from ancient fragments. In both monuments the original parts are the animals and some decorative bands at the bottom of the reconstructions. The inscription on the Ishtar Gate also consists of ancient fragments assembled according to type, but the content of the text is not the original. The structural core inside the reconstructed facade of the Ishtar Gate consists exclusively of modern German bricks. The upper parts of the facade in front of the throne room are reconstructed according to excavated bricks but with modern bricks. A higher percentage of original fragments, about 45%, was used in the reconstruction of the lion decoration along the Processional Way. Here not only the animals and a lower decorative band consist of original fragments but also most of the flat background.

Other reconstructions may consist of modern material only. The Persepolis gate was probably constructed with Iranian bricks as a detailed copy of the original in Babylon. The reconstruction of the Ishtar Gate on display in Babylon for more than 60 years, consists of modern material only, and every digital reconstruction, including the one used to illustrate questions here, is of course just a modern attempt to understand ancient buildings.

Author

Professor Dr Olof Pedersén
Uppsala University
Department of Linguistics and Philology
Box 635
S-75126 Uppsala
Sweden
olof.pedersen@lingfil.uu.se

References

Al-Kassar, A. 1985. Views and conclusions about the excavations of the northern part of the procession street for the year 1981. *Sumer* 41, Arabic section: 137–138.

Allinger-Csollich, W. 2013. Gedanken über das Aussehen und die Funktion einer Ziqqurrat, in K. Kaniuth, A. Löhnert, J.L. Miller, A. Otto, M. Roaf and W. Sallaberger, (eds) *Tempel im Alten Orient* (Colloquien der Deutschen Orient-Gesellschaft 7): 1–18. Wiesbaden: Harrassowitz Verlag.

Andrae, W. 1902. Die glasierten Ziegel von der Südburg des Kasr. *Mitteilungen der Deutschen Orient-Gesellschaft* 13: 1–12.

Askari Chaverdi, A., P. Callieri and E. Matin 2016. Tol-e Ajori: a monumental gate of the Early Achaemenian period in the Persepolis area. The 2014 excavation season of the Iranian-Italian project 'From Palace to Town'. *Archäologische Mitteilungen aus Iran und Turan* 46: 223–254.

Caubet, A. 1992. Achaemenid brick decoration, in P.O. Harper, J. Aruz and F. Tallon (eds) *The Royal City of Susa*: 223–241. New York: The Metropolitan Museum of Art.

Daucé, N. 2013. The ornamental bricks, in J. Perrot (ed.) *The Palace of Darius at Susa: The Great Royal Residence of Achaemenid Persia*: 305–320. London: I.B. Tauris.

Daucé, N. 2018. The industry of vitreous materials in Elam, in J. Álvarez-Mon, G.P. Basello and Y. Wicks (eds) *The Elamite World:* 568–584. Abingdon and New York: Routledge.

Gasche, H. 2013. The Achaemenid Persian palaces of Babylon, in J. Perrot (ed.) *The Palace of Darius at Susa: The Great Royal Residence of Achaemenid Persia*: 436–450. London: I.B. Tauris.

Heinrich, E. 1984. *Die Paläste im alten Mesopotamien* (Denkmäler antiker Architektur 15). Berlin: De Gruyter.

Hrouda, B. 1986. Zur Thronraumfassade der Südburg in Babylon, in M. Kelly-Buccellati, P. Matthiae, M. Van Loon (eds) *Insight Through Images: Studies in Honor of Edith Porada* (Bibliotheca Mesopotamica 21): 119–127. Malibu: Undena Publications.

Ismail, B.K. 1985. New texts from the procession street. *Sumer* 41: 34–35. Arabic section 55–57.

Janssen, C. 1995. *Bābil, the City of Witchcraft and Wine* (Mesopotamian History and Environment 2, Memoirs III). Ghent: University of Ghent.

Kaniuth, K. 2018. The transition from Neo-Babylonian to Achaemenid glazed brick decoration, in K. Kaniuth, D. Lau and D. Wicke (eds) *Übergangszeiten: Altorientalische Studien für Reinhard Dittmann anlässlich seines 65. Geburtstag*: 343–360. Münster: Zaphon.

Koldewey, R. 1918. *Das Ischtar-Tor in Babylon: nach den Ausgrabungen durch die Deutsche Orient-Gesellschaft* (Wissenschaftliche Veröffentlichungen der Deutschen Orient-Gesellschaft 32). Leipzig: Hinrichs.

Koldewey, R. 1931. *Die Königsburgen von Babylon. 1. Teil. Die Südburg* (Wissenschaftliche Veröffentlichungen der Deutschen Orient-Gesellschaft 54). Leipzig: Hinrichs.

Koldewey, R. 1932. *Die Königsburgen von Babylon. 2. Teil. Die Hauptburg und der Sommerpalast Nebukadnezars im Hügel Babil*. F. Wetzel (ed.) (Wissenschaftliche Veröffentlichungen der Deutschen Orient-Gesellschaft 55). Leipzig: Hinrichs.

Koldewey, R. [5]1990. *Das wieder erstehende Babylon*. B. Hrouda (ed.). München: Beck.

Langdon, S. 1912. *Die neubabylonischen Königsinschriften* (Vorderasiatische Bibliothek 4). Leipzig: Hinrichs.

Marzahn, J. 1992. *Das Ištar-Tor von Babylon. Die Prozessionsstraße. Das babylonische Neujahrsfest*. Berlin: Staatliche Museen zu Berlin. Mainz: Philipp von Zabern.

Marzahn, J. 2008a. Von der Grabung zum Museum – Babylon wird sichtbar, in J. Marzahn and G. Schauerte (eds) *Babylon Wahrheit*: 91–98. München: Hirmer.

Marzahn, J. 2008b. Koldewey's Babylon, in I.L. Finkel and M.J. Seymour (eds) *Babylon Myth and Reality*: 46–53. London: British Museum Press.

Matson, F.R. 1985. The brickmakers of Babylon, in W.D. Kingery (ed.) *Ancient Technology to Modern Science* (Ceramics and Civilization I): 61–75. Columbus, Ohio: American Ceramic Society.

Matson, F.R. 1986. Glazed brick from Babylon – Historical setting and microprobe analyses, in W.D. Kingery (ed.) *Technology and Style* (Ceramics and Civilization II): 133–156. Columbus, Ohio: American Ceramic Society.

Pedersén, O. 2018a. The Ishtar Gate area in Babylon. From old documents to new interpretations in a digital model. *Zeitschrift für Orient-Archäologie* 11: 160–178.

Pedersén, O. 2018b. Cut it down and build it up again. Three examples of rebuilding monumental architecture in Babylon, in J. Marzahn and F. Pedde (eds) *Hauptsache Museum. Der Alte Orient im Fokus. Festschrift für Ralf-B. Wartke* (marru 6): 191–198. Münster: Zaphon.

Sass, B. and J. Marzahn 2010. *Aramaic and Figural Stamp Impressions on Bricks of the Sixth Century B.C. from Babylon* (Wissenschaftliche Veröffentlichungen der Deutschen Orient-Gesellschaft 127). Wiesbaden: Harrassowitz Verlag.

Schmid, H. 1995. *Der Tempelturm Etemenanki in Babylon* (Baghdader Forschungen 17). Mainz: Philipp von Zabern.

Tite, M.S., A.J. Shortland, B. McCarthy and S. Paynter 2008. Production of glazed pottery and brickwork in the Near East, in M.S. Tite and A.J. Shortland (eds) *Production Technology of Faience and Related Early Vitreous Materials* (Oxford University School of Archaeology Monograph 72): 187–198. Oxford: Oxford University School of Archaeology.

Wallenfels, R. 2008. A New Stone Inscription of Nebuchadnezzar II, in M. Ross (ed.) *From the Banks of the Euphrates: Studies in Honor of Alice Louise Slotsky*: 267–294. Winona Lake: Eisenbrauns.

Wetzel, F. 1957. *Das Babylon der Spätzeit* (Wissenschaftliche Veröffentlichungen der Deutschen Orient-Gesellschaft 62). Berlin: Gebr. Mann.

Digital resources

The Berlin Babylon-Project has a site in construction and planned to contain a lot of material from the German excavations:

Vorderasiatisches Museum – Staatliche Museen zu Berlin. Freie Universität Berlin. Deutsche Orient-Gesellschaft, 2019, babylon-online.org – ein digitales Findbuch, <http://babylon-online.org>.

Preliminary downloads of selective items related to Babylon can be found at:

Uppsala Universitet. Olof Pedersén, 2019, Digital Model of Babylon, <http://www.lingfil.uu.se/research/assyriology/babylon/>.