7 Site Management: Cleaning and Reconstruction of the Balustrade around the Naos of Petosiris (GB 50) – Some Observations

Fig. 1: The re-erected balustrade on the eastern and southern side of the tomb of Petosiris (GB 50); 2015

7.1 The balustrade

During the field school for restorers in October 2015[1] the area around the tomb of Petosiris (GB 50) was cleaned from sand in order to reconstruct the balustrade surrounding the rear part of the tomb (fig. 1). On the southern side most of the blocks were lying almost in their original position, while on the eastern side some of the upright pillars remained standing still in situ, but all of the horizontal slabs placed on top of them were collapsed. On the western side only the blocks of the foundation for the pillars were preserved; without existent pillars and slabs the reconstruction of the western balustrade was impossible. These blocks were probably already reused in Roman times to build the stone chamber attached at the western side of the tomb of Petosiris (GB 50) because already Gustave Lefebvre did not map the balustrade on the western side, while in his plan, published in 1923/1924, the eastern row of the foundation is indicated[2].

1 A joint project between Minya University, Ministry of State for Antiquities, Lower Saxony State Museum Hanover and University of Applied Sciences and Arts Hildesheim, sponsored by the Volkswagen-Foundation.
2 Lefebvre 1923/1924, 27–28. Pl. 58, 2 (no. e). According to Gustave Lefebvre the blocks used to build the chapel “e” derived from the ceiling and the pavement of the dromos of Petosiris’ tomb, see Lefebvre 1923/1924, 28.

The foundation of the balustrade consists of local limestone blocks laid out in a U-shape around the naos, leaving an open space between them and the foundations of the temple tomb of about 110 cm (fig. 2 a–b). A new discovery in 2015, even if not unexpected, was the foundation of the balustrade in the west mentioned neither by Gustave Lefebvre in 1923/1924[3] nor by Sami Gabra and his colleagues[4]. Furthermore, Paul Perdrizet emphasised in 1941 that the balustrade was absent in the west[5].

The blocks used for the foundation are generally 100–110 cm long; shorter ones, for example in the corners, measure at least 60 cm. All of the blocks are about 30 cm thick, as selectively checked at the inner south-western corner, with a levelled surface, plane and smoothed by charring. Only the uppermost parts (3–5 cm) of the sides of the blocks are worked more carefully, below they are very roughly shaped, because they were covered by sand and hence invisible. The smoothened surface is 35 cm wide, while the raw block is actually broader (fig. 2 b and 3).

On the eastern and southern side a total of 23 pillars is preserved, three of them only as fragments[6]. The pillars are arranged in a line with an interspace of 50 cm between them[7]. Except for the first pillar in the northeast, which joins the rear of the pronaos and is adjusted to the slope of the rising masonry, the pillars measure 35 by 35 cm and are 108 cm high. The sides are smoothed vertically with a claw chisel. On top of them slabs are laid that measure 78 cm in length and 17 cm in thickness[8]. Seven of these slabs are still complete, two are broken in two pieces, and several further fragments have been found during cleaning the surroundings from sand. On seven of those slabs (six are complete and one is broken) the outline of a single foot or of a pair of feet is incised (fig. 4)[9]. They are of different sizes, and some smaller ones appear to belong to children. The toes are not always indicated; on a single foot on slab no. 5 a sandal seems to be indicated by a horizontal line incised directly below the toes. Most of the incised feet are pointing north, only two feet (slabs nos. 1 and 6) are pointing south[10] and another foot (slab no. 6) is the only one pointing west. A pair of feet on slabs nos. 4 and 7 seems to be unfinished, which is suggested by the weak and incomplete incision of the second foot.

In addition, five slabs show offering moulds (fig. 4). Similar moulds appeared also at the euthynteria of GB 51 and the tomb of Padjkam (GB 54)[11]. It is so far unclear, if those offering moulds were part of the funerary cult for Petosiris himself or if they belong to later burials that once surrounded the tomb.

Along the eastern wall of the naos of the tomb of Petosiris, eleven blocks of local limestone are left of the pavement between the naos and the balustrade. Another block of this pavement is preserved in the southeast, all of them joining the tomb with the balustrade (fig. 2 a–b). They are 100–120 cm long, 25–56 cm wide and 15 cm high[12]. The top edge of the pavement lies 5 cm lower than the top

3 Lefebvre 1923/1924, pl. 1. He discovered adjacent tombs of a later period; cf. Lembke 2015b, 211–215.
4 See Perdrizet 1941, 51–52. Pl. 18. Since several bodies were discovered alongside the western outer wall (see Perdrizet 1941, 53), it is even more astonishing that the foundations of the balustrade remained unexcavated.
5 Perdrizet 1941, 51.
6 Some of them were restored during this project, see below.
7 As also stated by Perdrizet 1941, 51.
8 18 cm according to Perdrizet 1941, 51.
9 See Perdrizet 1941, 52 interpreting them as relicts of pilgrims. For the custom of incising feet compare Takács 2005 and Gasparini 2015 with further literature.
10 Orientation of the foot on slab no. 1 might be due to restoration, as it was not discernible anymore in which way this slab was once placed, but the foot on slab no. 6 clearly points in the opposite direction from that of the other feet incised here.
11 Cf. Prell 2015a, 207; Prell 2015b, 280–281. Fig. 80.
12 As proven at the edge of the southernmost slab.

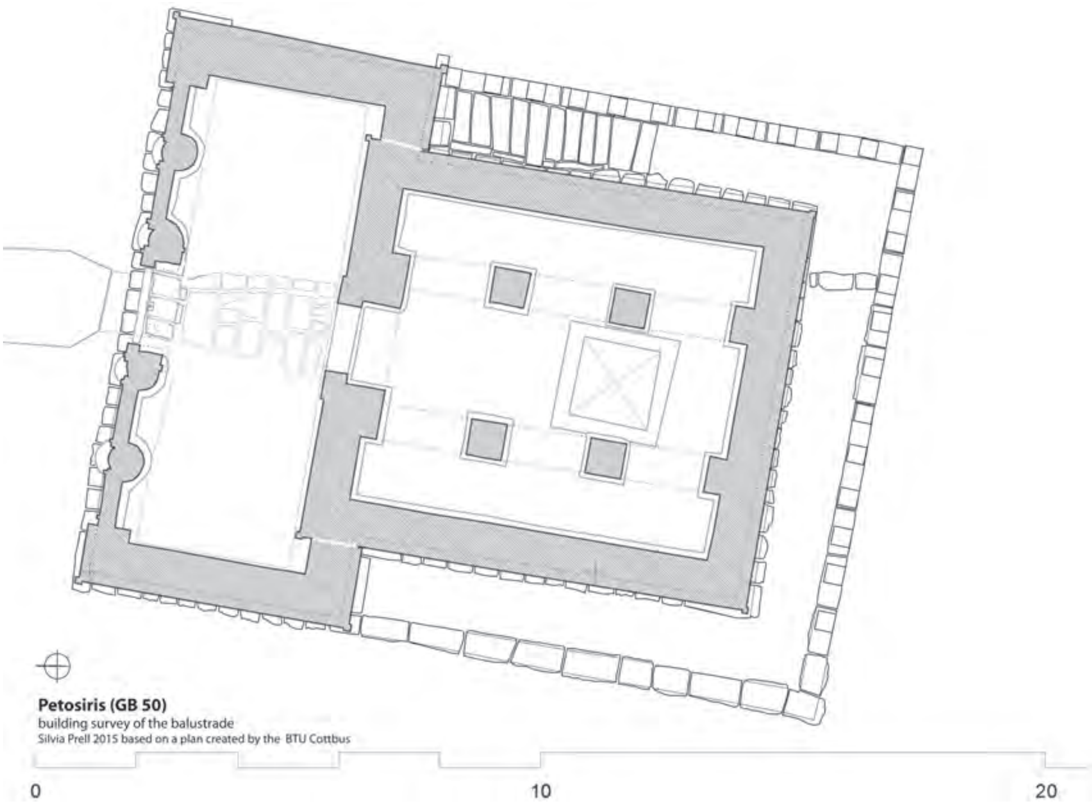

Fig. 2 a: Plan of the balustrade and its foundations; 2015

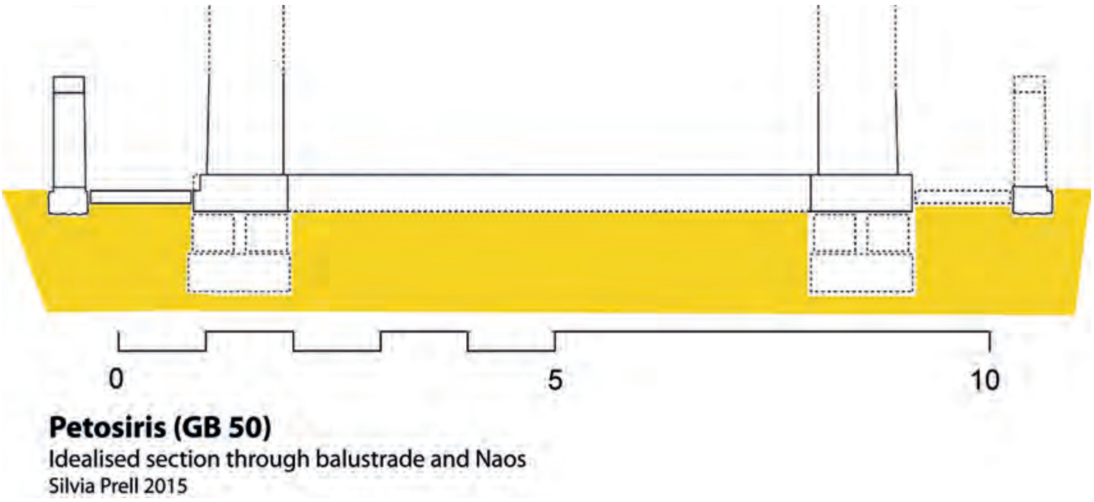

Fig. 2 b: Idealised section through balustrade and tomb building; 2015

Fig. 3: The foundation of the balustrade in the west and south; 2015

edge of the foundation blocks. The uppermost layer of the foundation of the naos, the euthynteria, however, has been chiselled off about 18 cm in certain places to match the height of the pavement (fig. 2 b and 5). Therefore, although the euthynteria seems to protrude only about 10–15 cm from the rising masonry of the tomb, it is actually wider. The length of the blocks of the euthynteria must have originally varied, because some of the blocks were not chopped off, while others protrude up to 20 cm further east below the pavement. Gaps in the pavement caused by the unevenness of the uppermost foundation layer were closed with smaller pieces or longer slabs (fig. 2 a and 5). As far as could be checked during cleaning, the western euthynteria has not been treated in the same way. The difference was probably caused by the rising masonry of the naos being built in a slightly distorted angle on top of the euthynteria, so that the latter could not be used as a point of reference for the installation of the balustrade at a consistent distance from the rising masonry.

The balustrade was probably part of the original plan, even though it was built after the construction of the tomb. The monumental measurements of the blocks and the careful workmanship with claw chisels indicate an early Ptolemaic date and are comparable to the mason's work of the tomb itself[13]. The foundation blocks of the balustrade are solidified with

13 For comparable block sizes for GB 51 and the tomb of Padjkam (GB 54) see Prell 2015b, 251 with fn. 400. Cf. Lembke – Wilkening-Aumann 2012, 178 fn. 23.

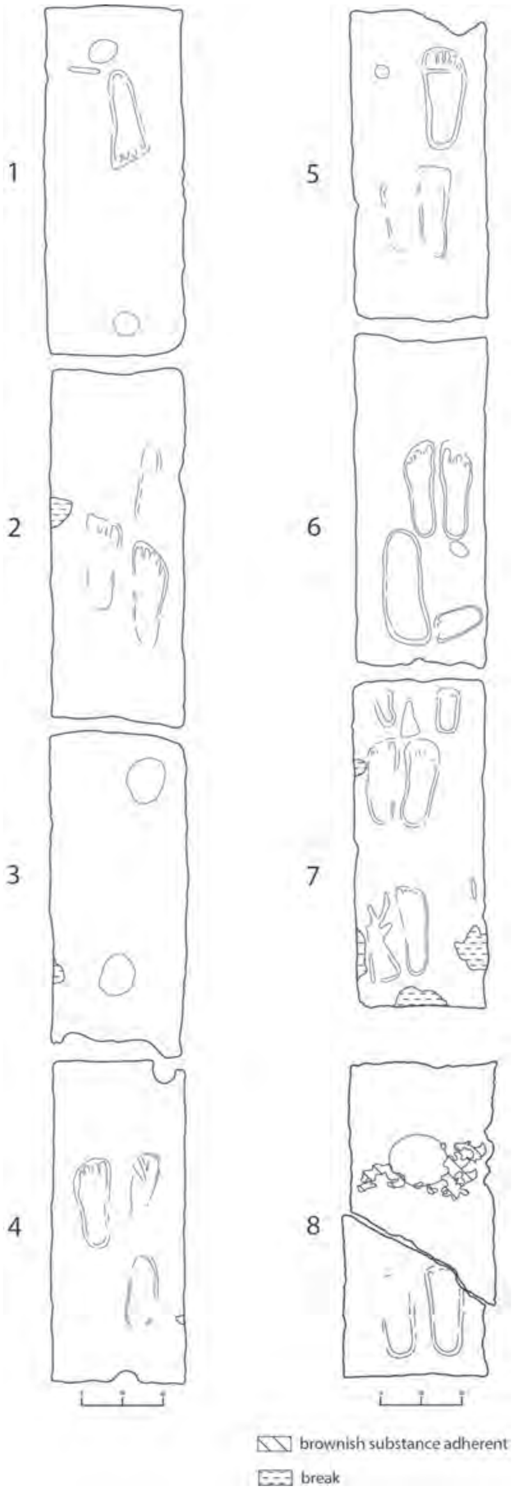

Fig. 4: The seven complete slabs and one of the broken slabs once supported by the pillars, showing incised outlines of feet and offering moulds; 2015

Fig. 5: Preserved pavement between naos and balustrade; 2015

a light grey mortar, which comes close in colour and structure to the original mortar used in the tomb of Petosiris[14].

While the euthynteria of the naos shows incised marks for the positioning of the blocks of the walls including the round bars at the corners (fig. 6)[15], the uppermost foundation layer of the pronaos – although the joints of the masonry are heavily smeared with concrete of a former restoration (possibly of Gabra's time) – bears no signs of these construction marks. Since the foundations of the balustrade also lack these characteristic marks, one gets an impression that the building of the pronaos and the balustrade occurred within a short period of time[16].

14 For a similar mortar used in GB 51 compare Prell 2015a, 191–192. Fig. 11. Alexandra Winkels is currently examining the different kinds of mortar in Egypt for her PhD thesis. For first results, see Winkels – Riedl 2015, 264–265.

15 For comparable construction marks in GB 51 and Padjkam (GB 54) see Prell 2015a, 195–202 and 2015b, 229–244.

16 Perdrizet assumes a later date for the balustrade and a connection to pilgrimage, see Perdrizet 1941, 52.

Fig. 6: Incision on top of the euthynteria indicating the future position of the round bar of the southwestern corner of the naos; 2015

The blocks of the uppermost foundation layer of the pronaos display no remains of offering moulds like at GB 51 and Padjkam (GB 54). These moulds on the slabs of the balustrade point to an adding of the balustrade maybe by Petosiris himself as an addition to the original plan as they are most likely of later date than the balustrade itself (1. errection of tomb, 2. erection of balustrade, 3. incision of moulds). In any case, they show that at this tomb offerings were placed, even if they are lesser in number compared to GB 51 and especially Padjkam (GB 54). It is nevertheless unclear if those moulds are connected to the cult of the original tomb owner, namely Petosiris, or to later burials directly surrounding it. The incised feet, though, were left most likely behind as tokens of commemoration and as a physical proof by pilgrims visiting the tomb of Petosiris (GB 50) before it was completely surrounded by later tombs since pilgrimage to the tomb is also confirmed by graffiti[17].

On the southern side, two fragmented blocks with hieroglyphic inscriptions in sunk relief were found among the scattered blocks. Most likely, they belong to the tomb of Petosiris (GB 50) and were part of the architraves once supporting the ceiling blocks. Both preserve an original edge of the block and bear traces of hieroglyphic inscriptions arranged in columns on two sides (fig. 7–9).

Along the outside of the southern wall of the tomb of Petosiris and on parts of the eastern wall of the temple tomb, the remains of a floor consisting of lime mixed with pulverised red bricks and sand was discovered (fig. 5). This floor apparently belonged to a later phase, when in the Roman period ad-

17 Lembke 2015b, 217.

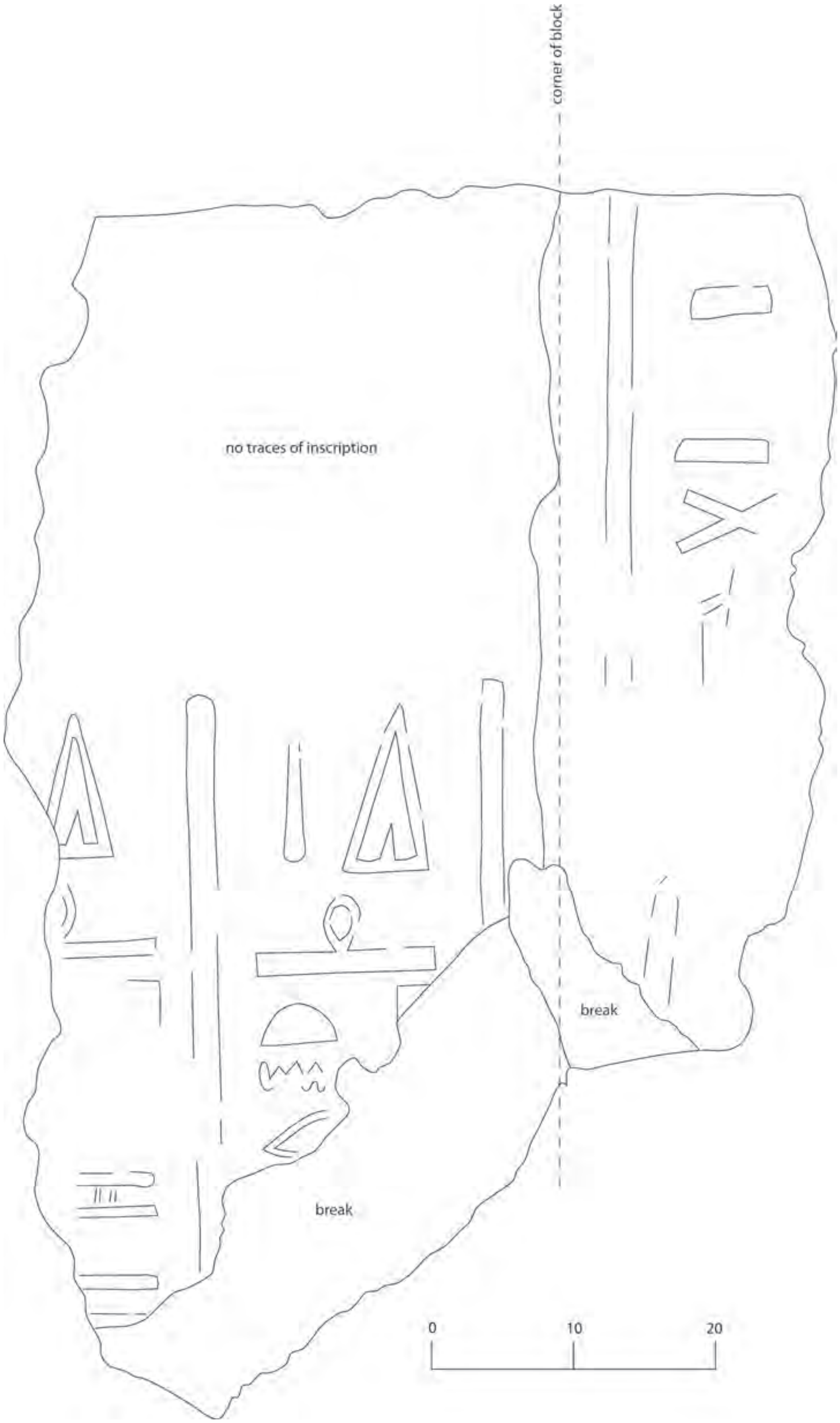

Fig. 7: Drawing of one block bearing a hieroglyphic inscription; 2015

Fig. 8: Photo of the same block bearing a hieroglyphic inscription; 2015

ditional tombs were built around the temple tomb of Petosiris (GB 50) using one of its walls as support[18].

At the bottom part of the eastern wall near the corner of the hall, graffiti in red ink of a horseman (?) facing to the right and of at least two small birds facing to the left were found (fig. 10), which had not been documented by Lefebvre nor by Gabra. Another incised depiction of a horseman (fig. 11) and traces of red paint were found on the eastern wall of the pronaos of the temple tomb of Padjkam (GB 54)[19].

No further remains of the Roman mud brick tomb houses once surrounding the tomb of Petosiris (GB 50) were uncovered during

18 Lefebvre 1923/1924, pl. 1; cf. Lembke 2015b, 211–215.

19 Prell 2015b, 248. A graffito of a horsemen is also depicted in GB 1 (M 13/SS), see Bernand 1999, 155 no. 65; Robert – Robert 1954, 185, and is already mentioned by Perdrizet 1941, 91–92. The graffito, accompanied by a nude athlete, a palm tree and traces of a Greek inscription, is located on the right side of the door providing access to the naos (cf. chap. 4.1.2 and 4.1.4, Text 2). See Prell 2015b, 222 fn. 244 for another graffito in tomb M 27 that cannot be localised anymore.

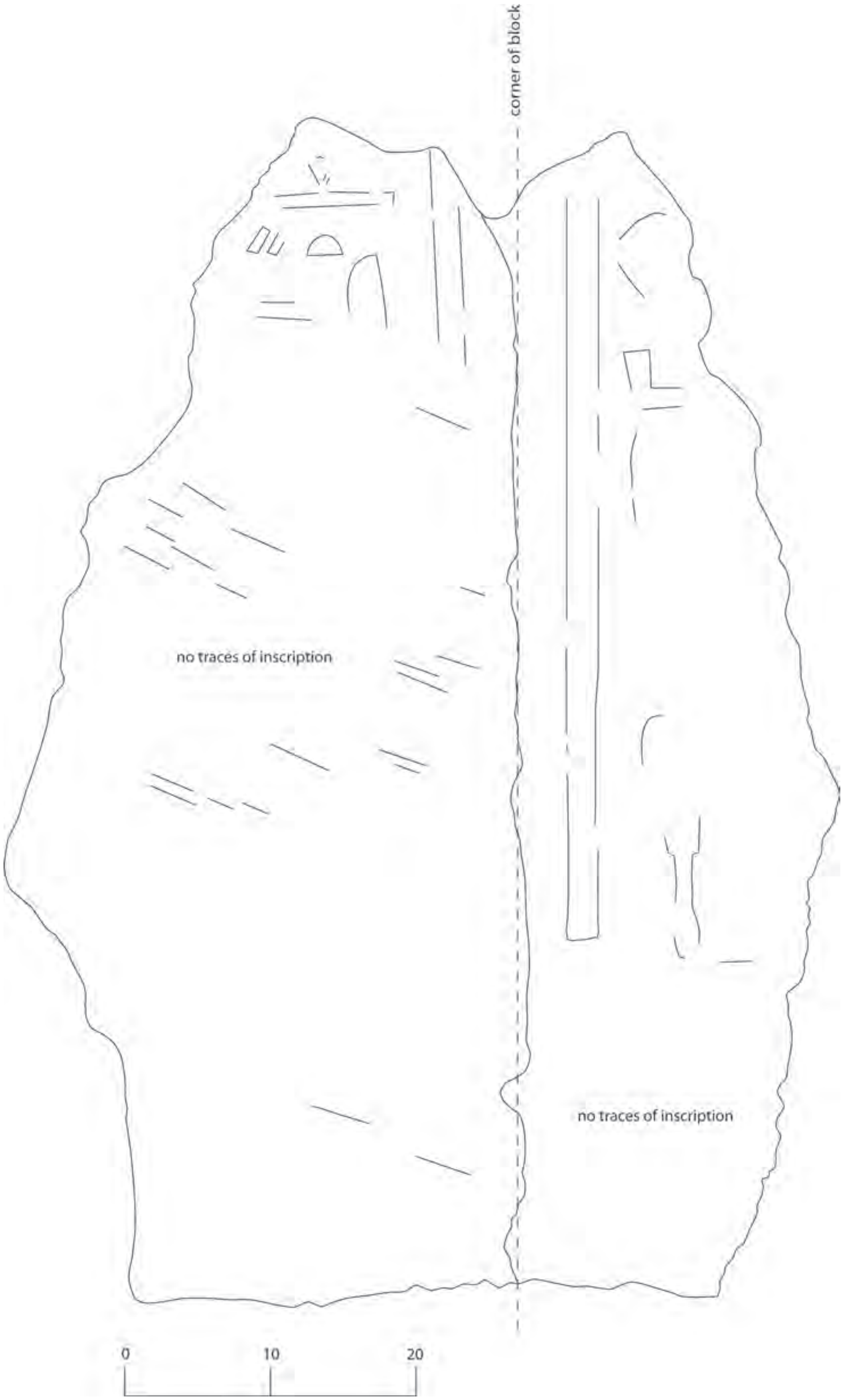

Fig. 9: Drawing of a second block bearing a hieroglyphic inscription; 2015

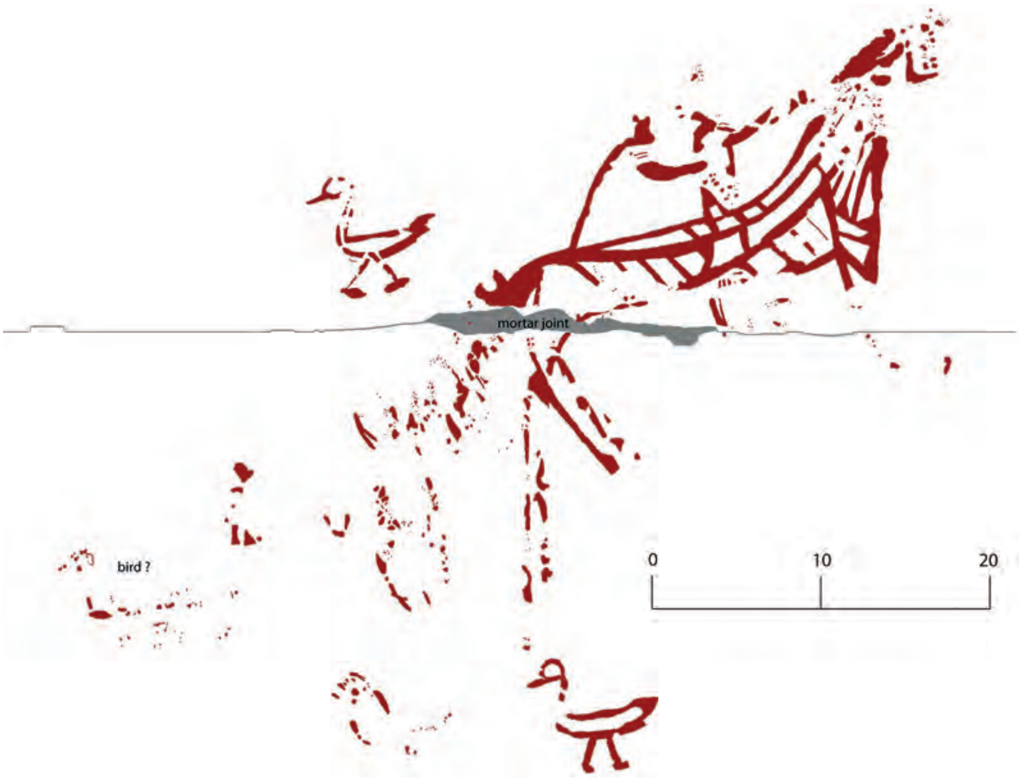

Fig. 10: Graffito depicting a horseman (?) and some birds; 2015

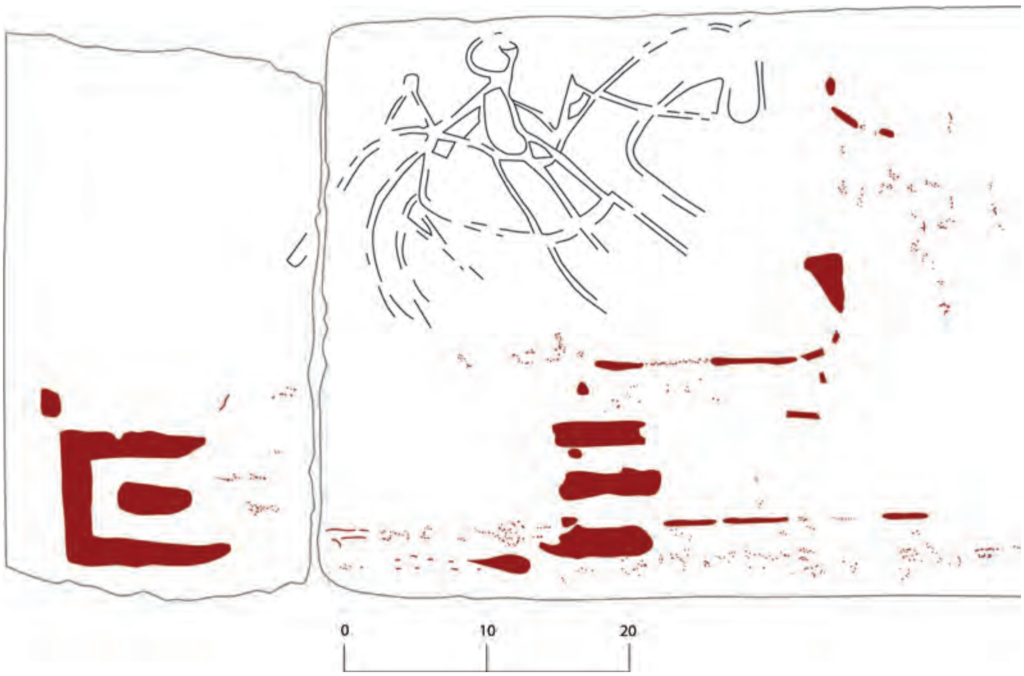

Fig. 11: Temple tomb of Padjkam (GB 54), eastern wall of the pronaos, graffito depicting a horseman; 2015

the cleaning of the area, which suggests that these structures had been completely removed during the reconstruction of the tomb in the 1920s or by Gabra[20].

7.2 Restoration of limestone blocks

The restoration of natural stone blocks can be demanding and includes a variety of challenges for the restorer, especially if dealing with historic buildings. As the quality of local limestone that was used to build the balustrade of the tomb of Petosiris (GB 50) is poor, a knowledgeable restorer well trained in dealing with stone and its construction details is required.

Since the cause of the damage to historically important buildings is often difficult to identify, it is essential to begin by carrying out a survey that provides a detailed understanding of the type of construction, present condition and construction history to ensure that all parameters necessary for the restoration work are determined correctly[21].

Before cleaning, the following criteria have to be fully understood:

- location and use of the building,
- condition of the stone remains and their characteristics,
- types and extent of surface deposits,
- condition of the joints between the stones of the wall.

The cleaning and repair of buildings is a specialised procedure that depends on the variable nature of stone and its response to the immediate environment. This means a standardized approach is often not possible.

Cleaning can be undertaken to enhance appearance by removing surface deposits, to reveal structural faults and to avoid further deterioration of the stone through reaction with pollutants, or simply to remove dirt. Cleaning stones with water until the dirt can be brushed off with soft brushes is considered the most suitable means for this kind of limestone. In addition, solvents and other chemically-based agents can be used to remove staining or tar.

Authentic stone restoration consists of superior *repair and restoration work* using authentic lime mortars and the same original stone blocks that had been used to build the building. The delicate requirements of ancient materials have to be respected, and the efforts invested by the ancients into the creation of this wonderful temple tomb in Tuna el-Gebel should be appreciated.

Lime mortar is increasingly used for stone bedding and repointing (to fill in or repair the joints between the stones). Lime mortar takes roughly five to eight times longer than concrete to set. This difficulty can be helped by using hydraulic lime mortar (which consists of slaked lime, sand and stone powder in the ratio of 1 : 1.5 : 0.5, once they have been sifted and made sure to be free of salt), which sets more quickly. This approach is particularly suited for the conservation of historically important stone buildings, where replacement of the original stone substance is not acceptable.

It is worth mentioning that lime often was used as a component of mortar for the construction of ancient buildings with sand as a joining mortar and as a filler; in some cases a percentage of gypsum or stone powder was added to it. When limestone $CaCO_3$ loses carbon dioxide CO_2 to give calcium oxide CaO, or quicklime, and by adding water to quicklime CaO, we get slaked lime which is $Ca(OH)_2$ calcium hydroxide. When slaked lime is used in the mortar and is left after construction to dry, we get calcium carbonate, $CaCO_3$, where calcium hydroxide absorbs carbon dioxide from the atmosphere, producing calcium carbonate, according to the following equations:

20 Some of the walls on the west side still existed when Gabra started to work on the site in 1931, see Gabra 1941a, pl. 1, 1. In 1934, however, they had been removed (Gabra 1941a, pl. 1, 2) and were not indicated on the map (Perdrizet 1941, pl. 18).

21 Ibrahim 2006.

$CaCO_3$ limestone	$\longrightarrow$	$CaO + CO_2$ quicklime + carbon dioxide
$CaO + H_2O$ quicklime + water	$\longrightarrow$	$Ca(OH)_2$ slaked lime
$Ca(OH)_2 + CO_2$ slaked lime + carbon dioxide	$\longrightarrow$	$CaCO_3 + H_2O$ limestone + water

In order to obtain a good lime mortar, it is mixed with water for a period of not less than 16 hours until it obtains a homogeneous consistency that is similar to cream. If it is not used right away, it should be stored in plastic bags (polyethylene) to protect it from drying out, as well as to save it from binding with atmospheric carbon dioxide, before using it in construction operations.

7.3 The restoration of the balustrade

After cleaning the area around the tomb of Petosiris (GB 50), two earlier attempts at the restorations of the balustrade could be distinguished: At first bitumen was used to glue some broken pillars along the southern side, while during a second phase the pillars along the eastern side were consolidated with a kind of concrete. It seems probable that bitumen was used during the excavation and the reconstruction of the tomb (c. 1920). However, photos of the situation in 1931 show a silty area in the south of the tomb cleaned by Gabra only in 1934[22]. Therefore, the first restorations with bitumen may have been done in the 1930s, while the concrete was used during a later period.

In 2015, another restoration of the balustrade was accomplished using the following techniques:

- Cleaning the stone surfaces by spraying limewater onto the stones until they are saturated.
- Consolidating the natural stone with approved materials. Chipped and broken areas of the stones are repaired by patching the void with mortar (fig. 12–13) that consists of lime and sand (relation 1 : 2) with some drops of Primal (emulsion of paraloid). Ground particles of the same or similar stone are added to ensure a close colour match (fig. 14). This method is suitable when no stone for replacement is available or the void is less than 25 mm deep.
- Resurfacing the exfoliated surfaces.

This project was part of a joint training program of Minya University, University of Applied Science and Arts Hildesheim and Lower Saxony State Museum Hanover to qualify students of restoration. The major aim was to advise the participants about reversible materials that are easily at hand in Egypt.

H. M. A. – K. L. – S. P.

22 Gabra 1941a, pl. 1.

Fig. 12: Cleaning the surfaces of the stones; 2015

Fig. 13: Closing gaps with the help of lime mortar; 2015

Fig. 14: Re-erection of balustrade with the help of lime mortar; 2015