Tim Karberg

The Old Stonemasons' Rightful Habit

Mason's marks and their semiotics at the Great Enclosure of Musawwarat es Sufra[1]

Wer baute das siebentorige Theben?
In den Büchern stehen die Namen von Königen.
Haben die Könige die Felsbrocken herbeigeschleppt?
Und das mehrmals zerstörte Babylon,
Wer baute es so viele Male auf? In welchen Häusern
Des goldstrahlenden Lima wohnten die Bauleute?
Wohin gingen an dem Abend, wo die chinesische Mauer fertig war,
Die Maurer? Das große Rom
Ist voll von Triumphbögen. Wer errichtete sie? […]

Bertold Brecht: Fragen eines lesenden Arbeiters[2]

1. Introduction

The stonemason's marks corpus of Musawwarat's Sufra is among the richest and most complex non-textmarking systems in the Nile Valley cultures. 5918 individual signs occur on the walls of the so-called Great Enclosure alone. These characters can be divided into 81 different groups of graphically and, most probably, also functionally similar characters (fig. 1). An analysis of this encoding system enables numerous new insights into various questions concerning the building history of the Great Enclosure. These are in detail problems of construction technology, the construction organization,[3] as well as the integration of Musawwarat es Sufra's buildings into the Meroitic as well as supra-regional architectural history.[4]

Fritz Hintze, whose memory is honoured with the lecture this paper is based upon, can be considered a kind of founding father for the works presented here in several respects. Although he himself did not conduct research on the subject of stonemason's marks during the excavations in Musawwarat es Sufra, indeed he worked on the assembly marks,[5] a closely related group of material.[6] Additionally, beyond field research in Musawwarat es Sufra, he also did pioneering work in a completely different field being of special importance for the thesis this paper is based on – in fact, he was one of the first to recognize the importance of what we would call "big data" today for archaeological research. As early as 1962, his article "Beiträge zur Clusteranalyse und zur Seriation" was published in the scientific journal of Humboldt University,[7] at a time when mathematical and information technology methods were still undiscovered countries for most of his colleagues. Today, multivariate statistical methods have become a standard methodology in archaeological sciences, without which the structuring and analysis of large data corpora would be difficult to manage – includ-

1 This article is based upon the author's PhD thesis, submitted at the University of Muenster (WWU) in 2017. The author expresses his gratitude to the supervisors of the PhD, Angelika Lohwasser and Michael Zach, as well as Claudia Naeser (supervisor at the Humboldt-University Berlin in the initial phase of the PhD project). Additionally, to Steffen Wenig for the idea to document the mason'S marks corpus of the Great Enclosure; to Karl-Heinz Priese (†), Geoff Emberling, and the Friedrich Hinkel Research Centre of the German Archaeological Institute for the provision of unpublished material; to Cornelia Kleinitz, Pawel Wolf, and Thomas Scheibner for discussions on the topic; to the German Academic Exchange Service (DAAD) for funding research activities in Sudan and Egypt; and Jana Eger for all her support.

2 Quoted after Brecht 1989

3 Karberg 2019

4 Karberg in print

5 Also sometimes called "setting out marks" (i.e. Lamon & Shipton 1939, 20 Fig. 26)

6 Hintze 1968, 674-677

7 Hintze 1962

Fig. 1: All mason's marks at the Great Enclosure of Musawwarat es Sufra, documented by the author between 2000 and 2009.

ing the processing of the largest contiguous stonemasonry corpus in the entire Nile Valley cultures, the stonemason's marks of the Great Enclosure of Musawwarat es Sufra.

In order to understand the structure and function of the stonemason's marks of Musawwarat es Sufra their character as a semiotically coded sign system as well as the etymology of the markings themselves have to be analyzed. The (general) identification of mason's marks corpora as sign system has to be defined from a theoretical background.

Semiotically, signs are mostly categorized along the immediate or indirect character of the signification process,[8] as well as the existence, complexity, and flexibility of different levels of signification.[9] The (im)mediate character of the signification is constituted by different qualities: On the basic, ontological level, a signification results from the fact that a phenomenon is evaluated by the sender as well as the receiver as coherent and relevant.[10] From a psycholinguistic background, the role of the sender often plays the major role,[11] while from the philosophical point of view in many cases the role of the receiver is investigated more prominently.[12] For Ogden and Richards, a strict structural as well as functional differentiation between three independent factors of a signification process is eminent: symbol, referent, and reference.[13] For the semiotics of mason's marks, especially the relation between referent and reference is crucial. According to Ogden and Richards, the referent is defined as a matrix of possible meanings of a sign within a specific group of communication agents. This matrix – as a complex of abstract entities – must have the potential of being related to any possible communication context of its meanings in order to be qualified as a sign.

The reference of a sign within a specific communicative context has to be distinguished sharply

8 Eco 2002, 197-199
9 Eco 2002, 236-242
10 Heidegger 1986, 78-79
11 Ogden & Richards 1974, 17-20
12 Heidegger 1986, 76-83
13 Ogden & Richards 1974, 17-19

from the referent. Within the whole complex of a signification, the reference is immanent to the individual communication process. It is also defined as an abstractum, but not as a matrix, since it refers to a specific intellectual pattern to be coded by the sender. These individual references are connected to a referent causally,[14] but connections to one referent are always possible by a (infinite) number of references, which are entangled with each other only mediately[15] without interfering with other possible entanglements with different referents.[16]

From the practical point of view, this means that different communication environments can indicate different aspects of meaning while using one and the same single sign. Therefore, it is completely acceptable to postulate different meanings of one mason's mark – as along as these different meanings are entangled with each other by a mediate relation: for example the work gang they refer to in different aspects. This idea might be of some importance for interpreting the semiotic etymology of some mason's marks, as well as the functional differentiation between mason's marks and quarry marks.

Another question of relevance for the semiotic interpretation of mason's marks is the definition of different structural levels of meaning of the whole sign system. Obviously, several mason's marks from the so called Great Enclosure of Musawwarat es Sufra show a significant degree of variability within their graphic layout, whilst it is still clear that these variants are derived from a single basic sign. Comparable variations were also observed in other mason's marks corpora from antiquity as well as the medieval period, and interpreted quite controversially by different scholars. In the 19th century, the Austrian architect Franz (von) Ržiha postulated the possibility to derive most medieval stone mason's marks used in Europe from few "mother signs" inherited from Roman stone masonry.[17] This highly debatable idea, still discussed by few scholars, is refused by most recent researchers on the subject – maybe most radically by Marc Depauw, who postulates that due to psycho-linguistic reasons variations within a sign system like mason's marks cannot be understood intuitively, and therefore postulates that mason's marks would lack any "double articulation".[18] Within this paper, this question will be analysed regarding the mason's marks corpus of Musawwarat es Sufra.

Another question of some relevance for the decoding of mason's marks is the interpretation of what is called semiotically "zero significant".[19] At the Great Enclosure of Musawwarat es Sufra, many blocks are not marked with a mason's mark at all. In many cases, like large parts of the courtyard walls, this obviously results from heavy erosion of these walls. But there are other parts of the building complex, especially the "temple 100" on top central terrace, where the surface of the worked stone blocks is well preserved, and therefore erosion cannot explain the lack of mason's marks. At the other hand, very few mason's marks are also preserved at this part of the building, therefore it can also not be the case that these walls were smoothed very carefully, and thus markings on the block surfaces would have been erased. An ideological reason for these very inhomogeneous distribution patterns seems likely.[20]

2. Variations of mason's marks: a multi-level articulation?

The question whether the mason's marks of Musawwarat es Sufra code some type of multi-level articulation is raised by the fact that a significant number of the basic markings occur with different variations. These could be interpreted as a secondary articulation level (i.e. sub-divisions of the coded work teams), or simple ludic variations of the symbols due to aesthetic reasons. In some cases, variants of a common "mother symbol" causes some difficulties concerning the differentiation between mason's marks and secondary graffiti; nevertheless, in most cases mason's marks can be identified with sufficient certainty.[21]

Indications for and against both hypotheseis can be derived from semiotic as well as topo-statistical observations. Seven examples of markings[22] from the Great Enclosure of Musawwarat es Sufra with especially significant variants may illustrate this.

2.1 Mark No. 19

The mason's mark Musawwarat es Sufra no. 19 consists of an X-shaped symbol, in some cases augmented with additional linear elements. The fact

14 Via the signification process.
15 Via the mutually shared referent itself.
16 Ogden & Richards 1974, 16-18
17 Ržiha, 1883, 37-43
18 Depauw, 2009, 207-212
19 Eco, 2002, 237
20 Karberg 2019, 81; 88 Fig. 17
21 Karberg in print
22 The numbers of the markings refer to the complete list of mason's marks from Musawwarat es Sufra as documented in Karberg 2017, 493-497 Tab. 9-1

that this symbol is widespread as a mason's mark in the Kushite world, but not in neighbouring regions like Ptolemaic and Roman Egypt, could lead to the assumption that this symbol in its specific field of usage as a mason's mark might be derived from the Meroitic character for the number "30" rather than from Latin, Greek, or Karian characters.[23] This mason's mark is documented in the Great Enclosure of Musawwarat es Sufra with 217 examples. Altogether, this sign is distributed rather homogeneously over the Great Enclosure.[24] When having a closer look at the distribution patterns of the different variants, however, some interesting inhomogeneities become visible.

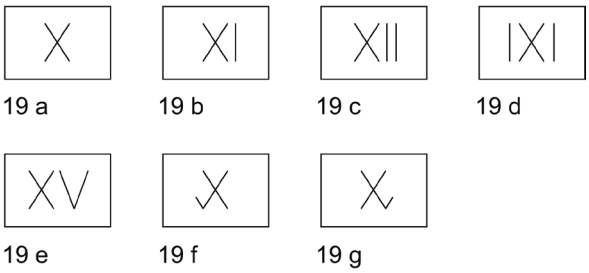


Fig. 2: All variants of mason's mark 19.

Fig. 3: Distribution patterns of mason's mark 19 in the Great Enclosure.

The mason's mark no. 19 occurs at Musawwarat es Sufra in seven different variants (fig. 2). Among the 217 evidences, the vast majority (203) consists of the symbol variants a and b (fig. 3). The other variants seem negligible (due to their small number as well as statistically insignificant distribution geometry). The major variants a and b differ significantly in their topographic distribution patters: While variant a shows four different core distribution areas with centroids at the northern temenos, the northern part of the central terrace around room 108, the western part of the central terrace (especially room 525), and the north-eastern wall of the rooms 507 and 508. Variant b shows a much more concentrated distribution pattern: The vast majority of this symbol is concentrated around room 108. Therefore, the different distribution geometry indicates structural differences, but also similarities between the variants (due to the fact that the sole distribution core of variant b coincides with at least one of these cores of variant a). The fact that variant b was derived from variant a by augmentation allows to distinguish them (and the other variants) from each other intuitively; therefore, it is highly presumable that the structural differentiation encodes also a functional one.

23 Karberg 2017, 86-88; for the (here neglected) idea of a Carian influence, cf. also Gosline 1992, 46.

24 Karberg 2019, 71; 75 Fig. 5

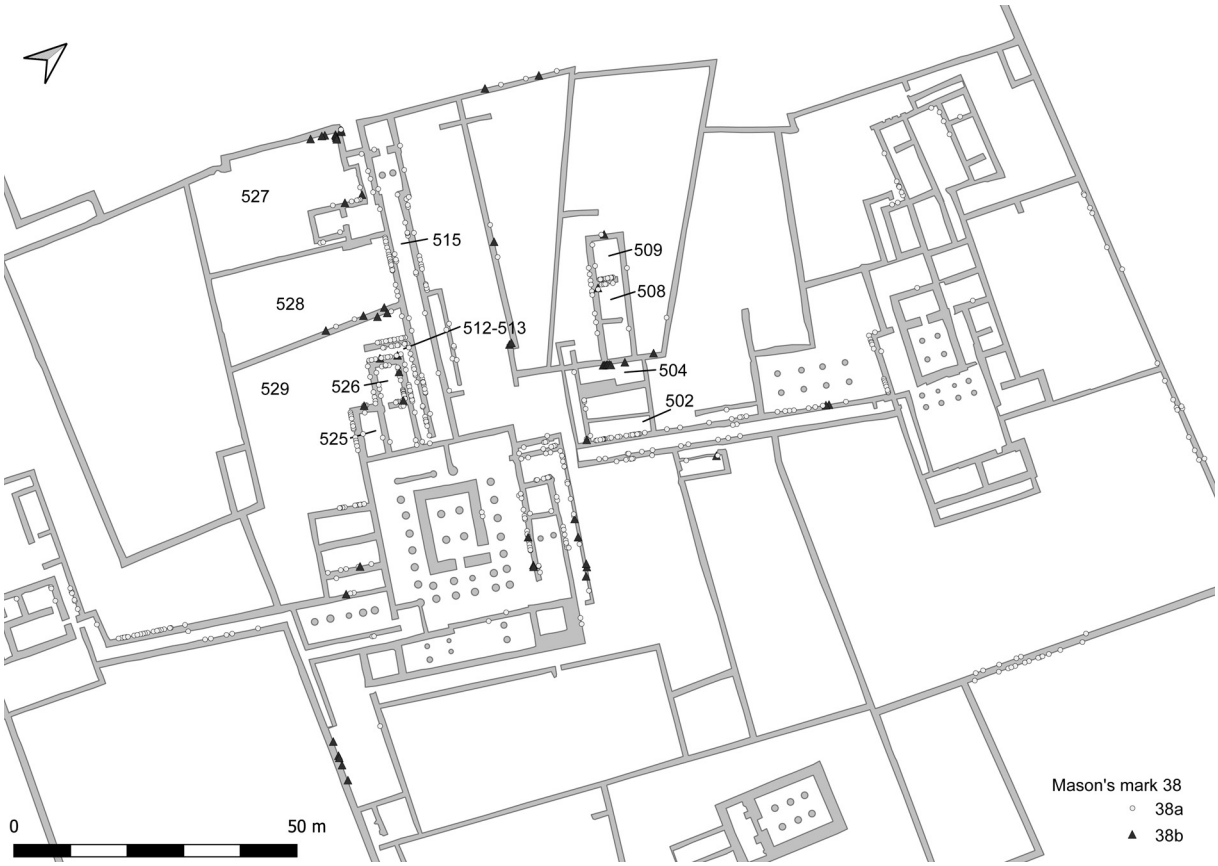


Fig. 4: Distribution patterns of mason's mark 38 in the Great Enclosure.

2.2 Mark No. 38

The mason's mark no. 38 from Musawwarat es Sufra is the most common one within this corpus: At the Great Enclosure, altogether 602 evidences of the different variants of this symbol were documented (fig. 4). The basic variant of its symbol resembles the character "N" (fig. 5). As with mason's mark no. 19, the vast majority of the markings of this group belongs to variant a (540), a much smaller, but still significant number to variant b (57), while the number of the other variants is negligible (only five evidences for all three remaining variants altogether).

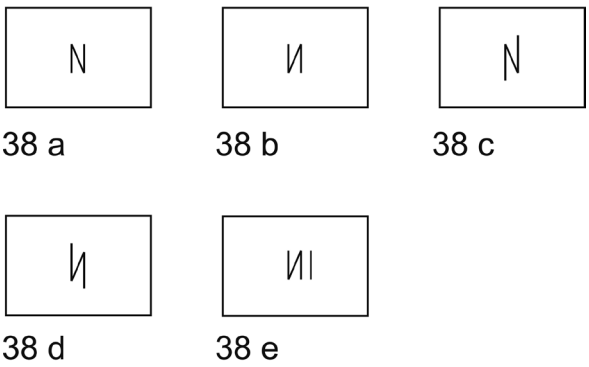


Fig. 5: All variants of mason's mark 38.

Due to the number of evidences for this mason's mark, especially for variant a areas of dense distribution are widespread within the Great Enclosure, and therefore geometric cores are less easy to identify. Nevertheless, the difference between variants a and b concerning their small-scale distribution patterns at some areas are noteworthy. At the rooms of the so called "holy wedding"[25] and the adjacent rooms, variant a shows significant concentrations at the wall between 508 and 509 (and the directly connected outer walls) as well as the eastern wall of room 502; variant b, however, is significantly concentrated in this area at the western wall of room 504. Around the building structures between the central terrace and the western chapel, variant a concentrates on the walls of the terraced rooms 525 and (especially) 526, the ramp corridor 212-213, and the outer terrace walls of the elevated corridor 515; in the same area, variant b shows two concentrations at the ground level delimitation walls of courtyard 527 and between the courtyards 528 and 529. The question whether this encodes a functional differentiation is not that easy: from the semiotic point of view, it is of some importance that both variants graphically

25 Eigner 2002

differ from each other only by inversion, which obviously is not as intuitive as an augmentation.[26] At the other hand, the different distribution patterns are not purely topographical ones: variant a is much more widespread at terrace walls (which needed more skilled work), while variant b is concentrated at the less ambitious courtyard walls.

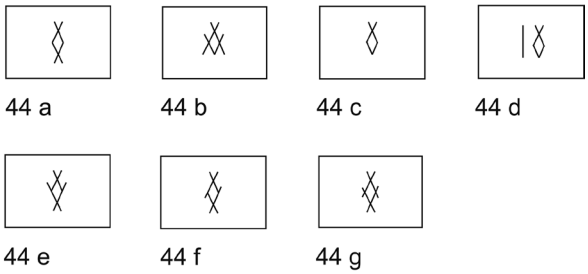


Fig. 6: All variants of mason's mark 44.

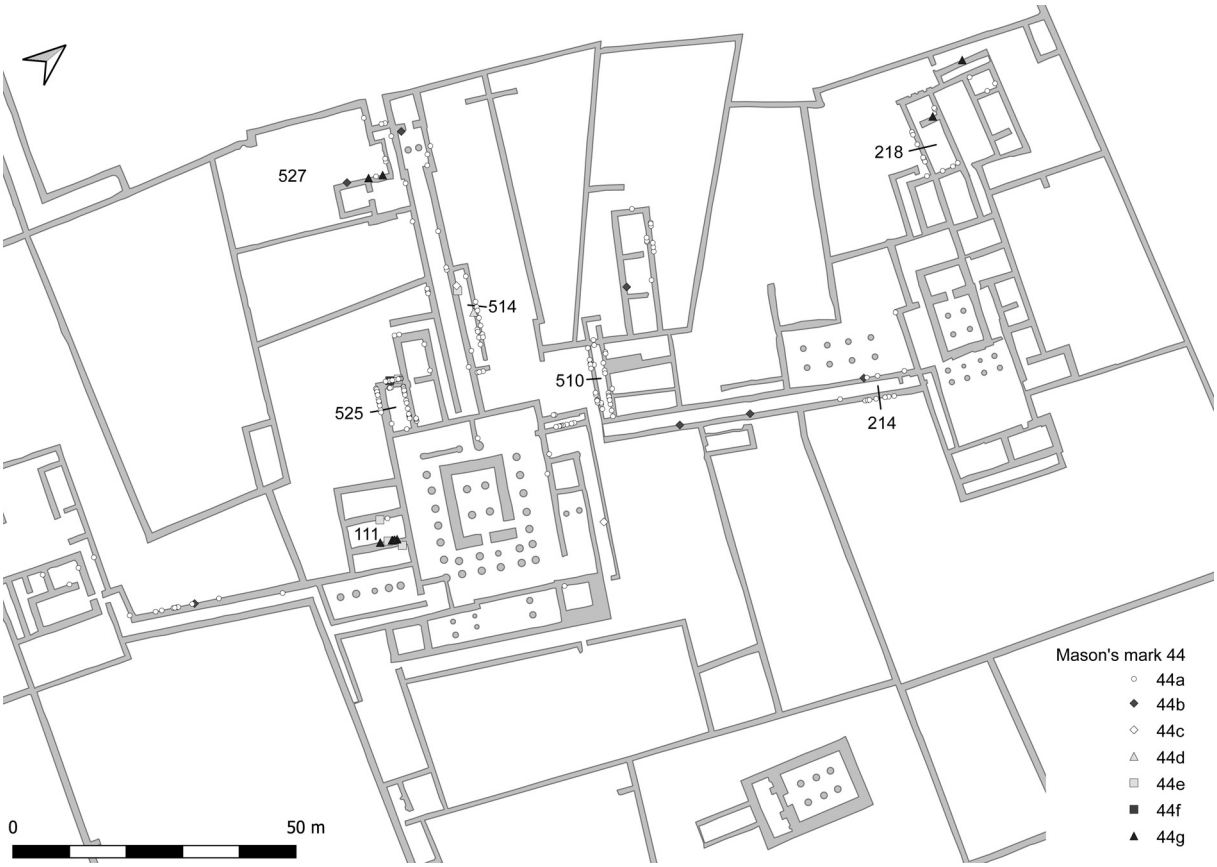


Fig. 7: Distribution patterns of mason's mark 44 in the Great Enclosure.

2.3 Mark No. 44

Mason's mark no. 44 is represented by different variants of a rhomboid geometric symbol (fig. 6). It is documented 219 times within the Great Enclosure; the vast majority of these evidences show the simple variant a. The different variants are in most cases defined by augmentations. Since many of these augmentations consist only of short overleaping strokes at the corners of the rhomboid basic symbol, it seems possible that they were just created accidentally. Even if assumed that these variants represent some specific functional articulation, it could be presumed that when using these signs it was not easy to distinguish the meaningful, intentional augmentations from simple mistakes when a tool was not used precisely and therefore a linear stroke accidentally prolonged. Nevertheless, the topographic distribution patterns of at least one of these variants shows some remarkable differences to the distribution of the main variant (fig. 7): While the major distribution cores of variant a are found in and around the terraced room 525, ramp 514, ramp 510, and, to some smaller extent, at corridor 214 and room 218, the two concentration cores of variant g are found at two completely different places: the terraced room 111 and the north-eastern corner of courtyard 527. Despite this specific difference of the distribution

26 Especially when it has to be considered that blocks were incorporated upside down into a wall, as often observed for the mason's marks of Musawwarat es Sufra.

patterns, it is hard to imagine that the variants of mason's mark no. 44 represent a multi-level articulation, since mistaken understanding due to unprecise craftsmanship would have been a realistic issue.

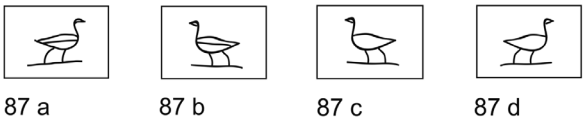


Fig. 8: All variants of mason's mark 87.

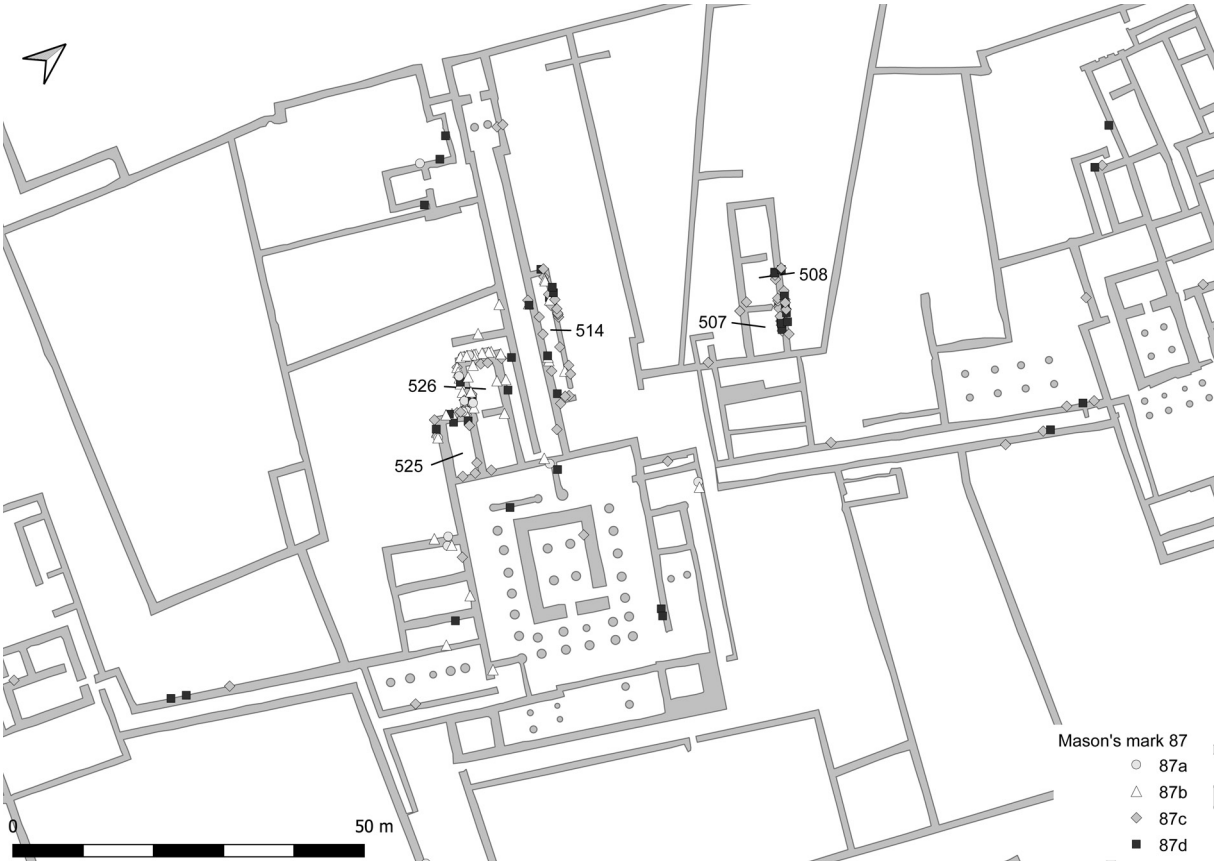


Fig. 9: Distribution patterns of mason's mark 87 in the Great Enclosure.

2.4 Mark No. 87

Mason's mark no. 87 consists of a bird-shaped symbol. Its variants consist of the depiction or non-depiction of a wing, as well as the orientation of the sign on the block (fig. 8). It seems possible to derive the symbol from the Egyptian writing system (in this case the hieroglyph /s3/) as well as the Meroitic script (where a similar character represents the letter /k/). There are some other evidences for the use of this symbol as a mason's mark in the Meroitic culture (i.e. at pyramid Beg. N9), but also some similar graffiti inside the quarries of Gebel al Silsile.[27] As shown by Mark Depauw for the masons's marks of the Deir el Barsha,[28] simple mirroring of a symbol is not intuitive enough for a multi-level articulation; nevertheless, the representation of a wing could be.

This assumption coincides with the different topographical distribution patterns (fig. 9). The densest geometric centroid core of the distribution of variants a and b are found around room 526, especially its western wall. Within this room, also some evidences for variants c and d are found, but much less, and tendentially concentrated at its eastern wall. Around the directly adjacent room 525, significantly more evidences for variants c and d, and less for a and b are found. Another distribution core of variant c and d is ramp 514, where only few examples of variant b are found. The most significant difference concerning the distribution patterns is found at the northern wall of the rooms 507 and 508 of the so called "Holy Wedding", which is another major distribution core of variants c and d, while not one evidence for variants a and b is found here.

Therefore, it can be assumed that the variants a and b as well as variants c and d form two groups: The mirroring of the symbol has no distinct meaning, but

27 Preisigke, Spiegelberg, & Legrain, 1915, Pl. IV-72
28 Depauw 2009

can be interpreted as some kind of ludic variation of the symbol; the augmentation of the wing, however, can most probably be connected with some kind of differentiated functional articulation.

2.5 Mark No. 89

Mason's mark no. 89, in general, represents some kind of bough, grain stroke, or (most probably) palm leaf. It occurs in different graphic variants (fig. 10), documented altogether 69 times inside the Great Enclosure of Musawwarat es Sufra. Variant b, upright on the block and with parallel leafs, is documented 16 times, while variant c with conical leafs, often touching the block edge, and placed horizontally on the block, occurs 38 times. All other variants occur three times maximum. Nevertheless, they can be grouped around the most numerous variants b and c (fig. 11): All variants with parallel leafs comparable to variant b, as well as the variants with conical leafs like variant c show similar distribution patterns each. While variant b and its group show a rather homogeneous distribution pattern over larger parts of the Great Enclosure, variant c and its group shows two very dense distribution cores at the southwestern wall of ramp 510 and the outer (terrace) walls at the southwestern corner of room 525.

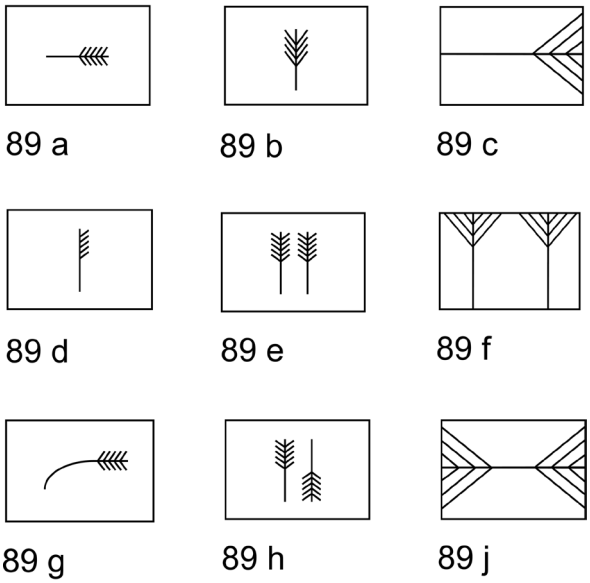


Fig. 10: All variants of mason's mark 89.

This distinct difference concerning their distribution patterns indicates that variants b and c encode different functional articulations, while the other variants within their particular "groups" might be just ludic variations.

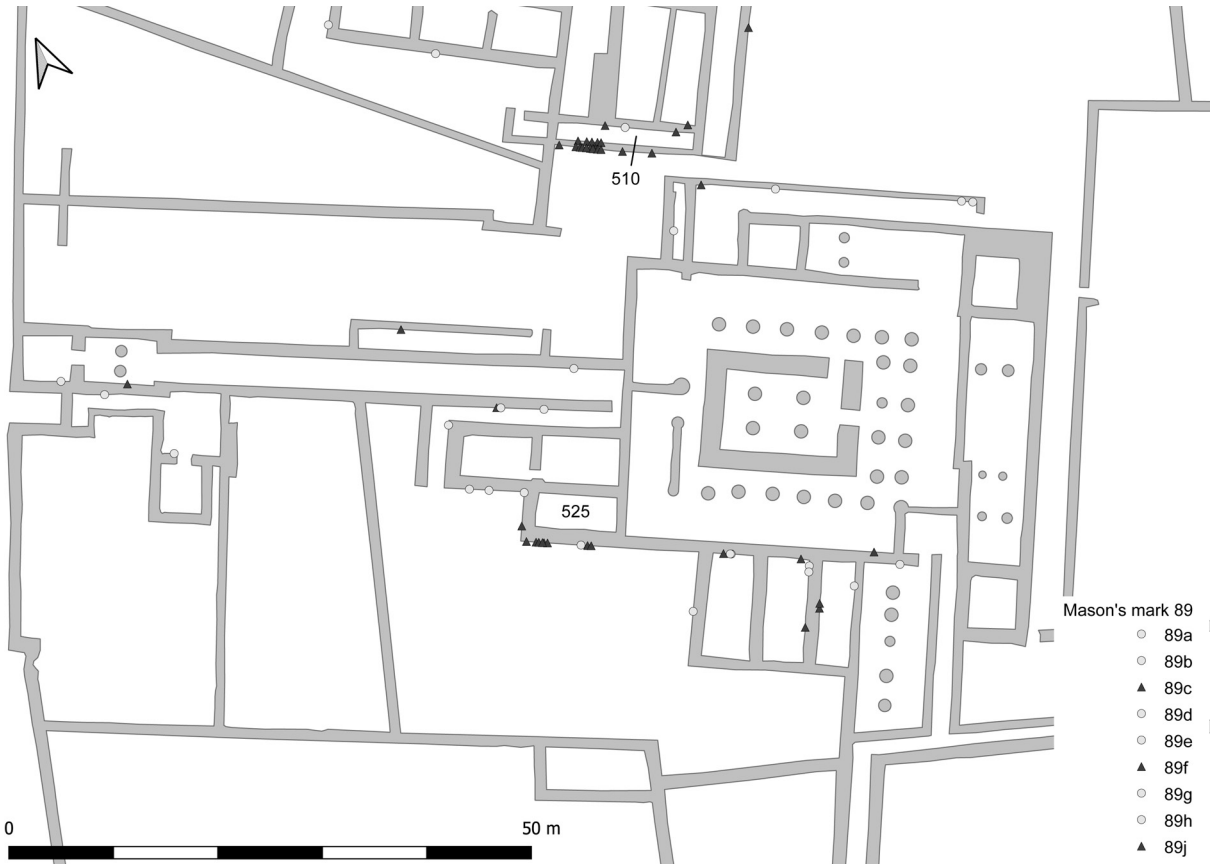


Fig. 11: Distribution patterns of mason's mark 89 in the Great Enclosure.

2.6 Mark No. 92

Mason's mark no. 92 consists of a curved geometric figure, maybe the very abstract depiction of a flower (fig. 12). Its different variants show mirroring (especially of the curve under the "flower"), as well as some augmentations. The graphically most significant augmentation is a round turn inside the centre of the "flower" instead of a sharp edge. The mason's mark occurs, altogether, 170 times at the walls of the Great Enclosure. Only the three variants a, c, and f occur in significant numbers (fig. 13): A with 53 evidences, c with 90, and f with 14. All other variants occur only one up to five times. Variant c is concentrated especially along the southern outer wall of the elevated corridor 515 within the courtyard 528 and ramp 522-523, and at the southern wall of the rooms of the "Holy Wedding" near the edge between rooms 508 and 509. Variant a is distributed more homogeneously within the Great Enclosure. Variant f shows some kind of distribution core at the outer terrace wall of room 112, but due to the small number of evidences for this variant this could also be coincidental (as the slight concentration of evidences for all three variants at the foot of ramp 110).

Despite the rather concentrated distribution cores of variant c not observed for the other variants, it seem rather improbable that this indicates a differentiation within the functional meaning, since the mirroring of the "base curve" is rather unintuitive, and the turn instead of a sharp edge within the "flower" can also occur accidentally when drawing the symbol too fast, which bears the danger of mistaken understandings.

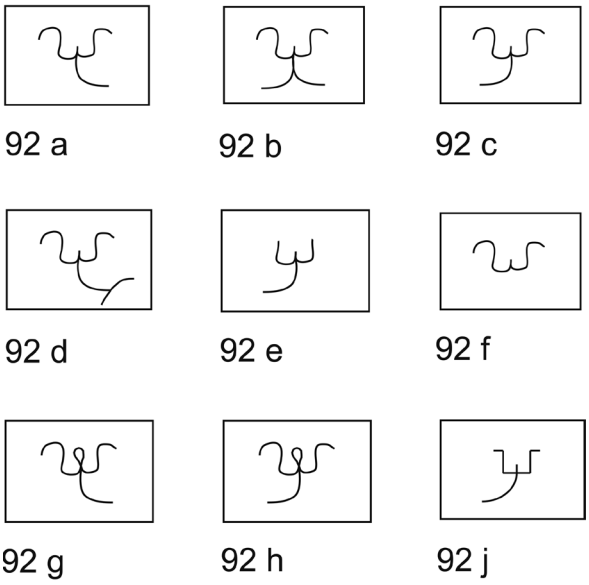


Fig. 12: All variants of mason's mark 92.

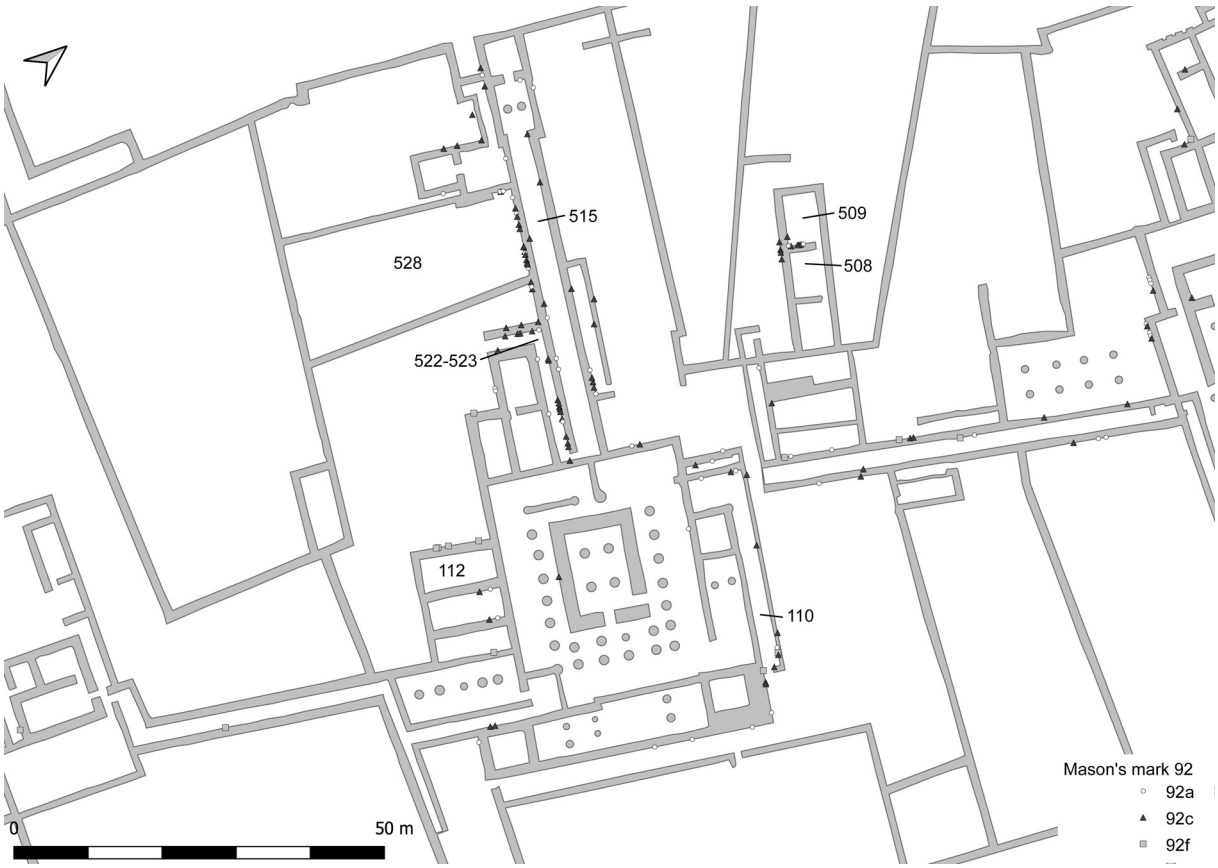


Fig. 13: Distribution patterns of mason's mark 92 in the Great Enclosure.

3. Conclusions

3.1 Mason's marks or quarry marks? The role of the markings in the construction site organisation at the Great Enclosure

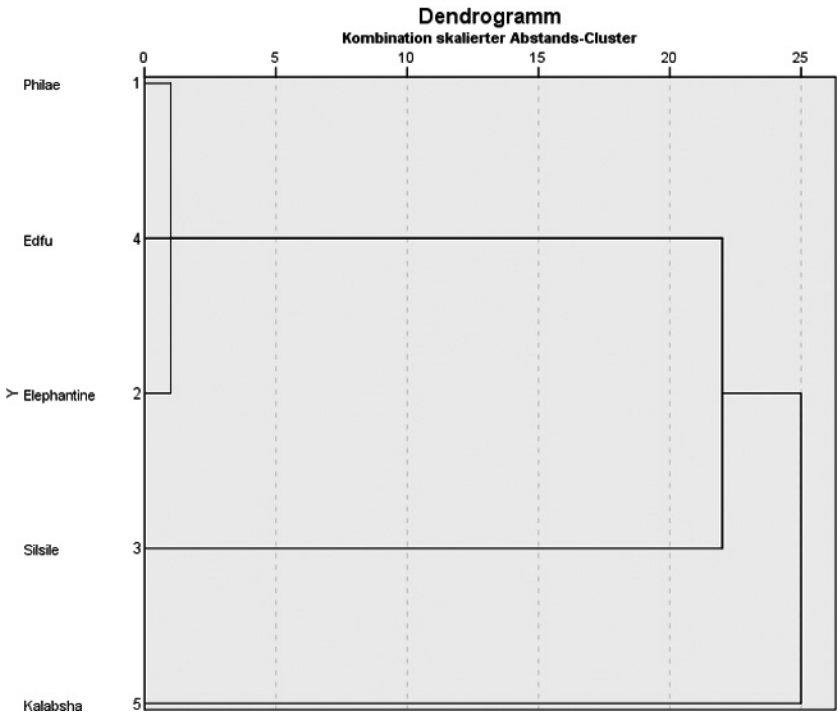
In many works on architectural marking systems in antiquity their character as quarry marks is postulated, and a differentiation between ancient quarry marks and "real mason's marks" from the European medieval period assumed.[29] Especially for buildings in Upper Egypt of the Ptolemaic and Roman period, contemporary to the Meroitic culture, Horst Jaritz argues vehemently for a strict differentiation of quarry marks and "real mason's marks", and the identification of the Late Period Upper Egyptian marking systems with the former.[30] Subsequently, Jaritz postulates the possibility to strictly differentiate the "quarry marks" corpora of several buildings in Upper Egypt (i.e. the terraces of the temple of Chnum and Satet at Elephantine Island and the temples of Philae), as well as the assignment of these corpora to different quarries: The temples of Philae to the quarries of Kertassi, and the terraces at Elephantine Island to the quarries of Gebel Silsile.[31]

This is contradicted by the fact that the distribution patterns of some rather frequent marks between the corpora of Philae and Elephantine Island cannot be differentiated clearly,[32] and a general analysis of different corpora of Upper Egyptian marking corpora shows significant similarities between the terraces of Elephantine Island and Philae (tab. 1 & 2).[33] Additionally, Jaritz' assumption that a connection between the quarries of Kertassi and the temples of Philae can also be reconstructed from epigraphical record[34] seems to over-interpret one single inscription, dating to the 3rd century AD and therefore long after the construction of the parts of the temples of Philae in question.[35]

Cluster affiliation

Case	4 Clusters	3 Clusters	2 Clusters
Philae	1	1	1
Elephantine	2	1	1
Silsile	3	2	1
Edfu	1	1	1
Kalabsha	4	3	2

Tab. 1: Cluster analysis (median centred) of several mason's marks corpora in Upper Egypt I: Cluster affiliation (using IBM SPSS Statistics 25).



Tab. 2: Cluster analysis (median centred) of several mason's marks corpora in Upper Egypt II: Dendrogram of scaled distance clusters (using IBM SPSS Statistics 25).

Applying these debates on the specific situation at Musawwarat es Sufra, an interpretation of the mason's marks corpus of the Great Enclosure as "quarry marks" seems even more improbable due to several reasons. Most importantly, inside the identified sandstone quarries of the building material of the Great Enclosure no comparable markings were documented. The few symbols found there

29 I.e. Richter, 1885, 32; Jaritz 1980, 85-94

30 Jaritz 1980, 85. Subsequently, several authors followed his point of view: Gosline 1992, 44; Golvin 1992, 80-81; Fauerbach 2018, 213-214

31 Jaritz 1980, 85; 87

32 Especially the mark "+" as well as several other markings occur at the terraces of Elephantine Island and at (contemporary) building parts at Philae Island as well (Karberg 2017, 416-418).

33 Cf. also Karberg in print, tab. 2.

34 Jaritz 1980, 87

35 Karberg in print, Fn. 21

differ in shape and structure significantly from the mason's marks, and most probably have to be identified as secondary graffiti,[36] while tool traces on the worked surfaces are plenty (and therefore the lack of mason's marks cannot be due to erosion).[37] Additionally, the remains of working spaces inside the quarries indicate many small-scale work units of similar size,[38] which does not coincide with the inhomogeneous numerical patterns of the different mason's marks at the Great Enclosure. Another indication is the topographical distribution pattern of the different mason's marks, which often show remarkably dense clusters (cf. fig. 2, 4, 6, 8, and 12). These distribution patterns indicate an offspring of similar mason's marks not directly at the sites of wall construction, but in close distance. An offspring as far away as the quarries should have resulted in much more homogeneous distribution patterns of most mason's marks, especially when payloads of working stones had to be transported in small charges (i.e. by donkey), and not in larger quantities via ship as to be assumed for the Nile valley. Another factor is the marking of spolia with (new) mason's marks during re-use, which can be observed at the walls of the Great Enclosure several times. In some of these cases, more than one mason's mark was used on one block. This indicates that the marking of the (already quarried, but obviously re-dressed) block was done during this working step, not already in the quarry.

In Musawwarat es Sufra, the vast majority of mason's marks was applied at the already smoothed surface of the blocks, intended to form the obverse side after being integrated into a wall. The comparably bad quality and softness of the local sandstone makes it rather improbable that the smoothing of the blocks was already done inside the quarry – the danger that the stone blocks would have been damaged during the transport from the quarry to the construction site would have been evident. Instead, it has to be assumed that the dressing of the blocks inside the quarry was only done roughly, and a werkzoll remained on the block as transport protection. If the blocks were finally dressed not directly at the wall construction site, but at workshops in their close vicinity, this would have demerged the construction process, and it would result in concentrated distribution patterns of mason's marks as they can be observed at the walls of the Great Enclosure. Therefore, at least for Musawwarat es Sufra (and most probably also for other contemporary mason's marks corpora) an identification as "real mason's marks" (and not quarry marks) seems appropriate.

3.2 Implications on building techniques

The construction technique of the majority of the walls of the Great Enclosure of Musawwarat es Sufra is subject to controversial debate. In 2014, Pawel Wolf assumed that – similar to building techniques used in Ptolemaic and Roman Egypt – most walls of the Great Enclosure were erected with significant bossages, which were smoothed after the erection of the wall.[39]

Concerning the mason's marks, this construction method seems rather doubtful. If the walls of the Great Enclosure would have been smoothed after their erection as Pawel Wolf suggested, the obvious fact that a significant number of mason's marks is preserved on the walls can only be explained by several highly speculative assumptions. It could be assumed that the mason's marks were incised much deeper during the initial dressing of the stones, and the markings still visible today are only what is left over after smoothening the walls. This assumption has to be rejected because nowhere in the Great Enclosure (including the few walls with remaining bossages and mason's marks) deeply incised mason's marks were documented; the homogeneous depth and stroke characteristics of most mason's marks cannot be explained by purely coincidental remains. Another hypothetical explanation would be the assumption that the mason's marks were drawn onto the blocks after the erection of the walls. This has to be rejected due to the fact that many mason's marks are found upside down or cut by sawing works during the construction process. The third assumption is the idea that not only the repeatedly marked, but all blocks with preserved mason's marks are spolia from earlier construction phases. This idea is contradicted by the fact that spolia within the walls of the Great Enclosure are often easily recognisable by the fact that their surfaces and edges are eroded in a different way than the other blocks at the same wall. This is especially evident at the inner walls of some rooms of the central terrace: At several of these walls, mason's marks were documented in trenches inside the terrace filling material. The local sandstone of Musawwarat es Sufra shows an almost white colour when cut freshly from the quarry; exposed to the sunlight, it developes a brownish, relatively hard patina. The fact that the inner walls of the

36 Personal observation; cf. also Becker 2000, 70.
37 Becker 2000, 62-69
38 Becker 2000, 64
39 Wolf 2014, 370

central terrace in most cases still show their initial, quarry-fresh whitish surface proves that these walls were covered with terrace filling quickly after their erection and not exposed to the sunlight for a longer period. If the blocks with mason's marks within these walls would have been re-used spolia from earlier building phases, these blocks would necessarily have been significantly more patinated than the rest of the blocks, which is not the case.

Since all these assumptions explaining the preservation of mason's marks within the hypothesis of the bossage construction as standard building technique in the Great Enclosure have to be rejected, the only remaining conclusion can be that the idea of the bossage construction method is wrong. An alternative hypothesis would be the idea that the obverse of the blocks was smoothed in advance (at the beforementioned workshops close to the wall construction sites), and the uniform inclination angle of most of the walls was achieved by using some kind of ruler. In this case, only the side edges of the single blocks and – after the completion of a whole row of blocks – their upper edge would have been treated with a stone saw after during the wall construction phase itself.

3.3 What did they mean?

Besides the mason's marks implications on construction organization and techniques, the main and central question is their meaning. The graphic variants and their distribution patterns imply some kind of functional multi-level articulation, and a use during an intermediate work phase between the cutting of the blocks in the quarry and their implementation into the wall at the construction site. Nevertheless, it remains unclear whether the multi-level articulation was structurally necessary, and whether the type of information encoded was of the same relevance as the marking per se. The only marginal and non-intuitive graphic variation of some of the mason's marks variants, but especially the inhomogeneous numbers of the different variants might indicate an informational relevance below the general marking in principle. Similar small-scale variants were also observed in other mason's marks corpora, i.e. at Persepolis – here, the variation were interpreted as different "handwritings" of single stonemasons working for the same work gang.[40] For Musawwarat es Sufra, the fact that in most cases one variant of mason's marks is overwhelmingly dominant in numbers over the others might indicate that only the "mother sign" was estimated as canonical, while the variants represent single individuals within a workshop or phyle wishing some degree of individual representation. In such a case, the multi-level articulation would not follow on linear concept of canonical definition of meaning, but anyway encode different socio-economical structures within the working organization.

Another aspect is the question whether the mason's marks had a practical (administrative) or some kind of ideological meaning. Authors like Horst Jaritz imply an administrative function within the building (or quarrying) accounting,[41] while Maria Nilsson during her work on markings inside the quarries of Gebel Silsile as well as temple buildings assumes some kind of (folk) religious connotation of the signs, which was intended to "stabilize" the block magically.[42] At Musawwarat es Sufra, the fact that the whole amount of mason's marks shows a remarkable blending of completely different types of signs (derivations from the Greek or Latin alphabets as well as the different Egyptian and/or Meroitic scripts; pictographic symbols connected to stone masonry like architectural elements and tools; and religious symbols – cf. tab. 3) indicate that most of the signs were arbitrarily derived from completely different character sets. At the other hand, the fact that some kind of "semiotic etymology" of mason's marks like the palm leaf might (widespread i.e. in religious and funeral inscriptions inside the quarry of Gebel Silsile)[43] indicate that at least for some of the stonemason's workshops a (folk) religious tradition had some significance when choosing their particular symbol, even it was used within the general marking system by a superordinate authority for accounting purposes.

Within a pre-modern conception of the world, some kind of magic stabilisation of a block as well as a whole building might have been a part of the quality of the work as the craftsmanship itself.

40 Nylander 1974, 219

41 Jaritz 1980, 87

42 Nilsson, 2012-13

43 Preisigke, Spiegelberg & Legrain 1915

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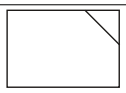
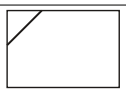
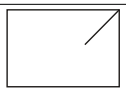
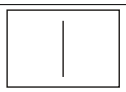
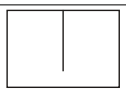
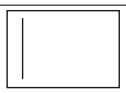
1a		184
1b		69
1c		3
2a		418
2b		4
2c		104
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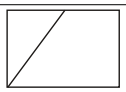
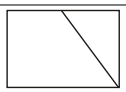
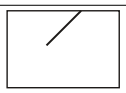
3a		6
3b		1
4a		2
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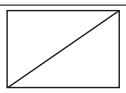
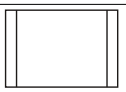
6a		59
8a		20
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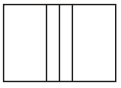
13b		3

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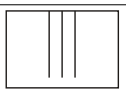
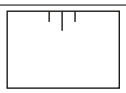
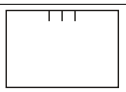
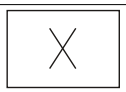
13c		3
15a		10
15b		7
19a		134
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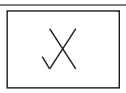
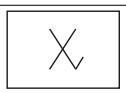
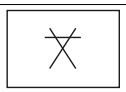
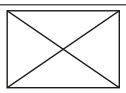
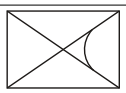
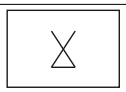
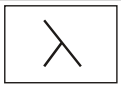
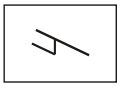
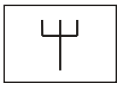
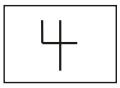
19f		1
19g		2
20a		5
21a		21
21b		7
22a		4
23a		15
24a		2
25a		2
26a		2
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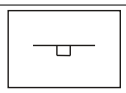
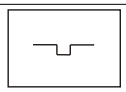
27a		20
27b		1
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36a		3
36b		88
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36d		4
37a		44
37b		20
38a		540
38b		57

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39b		1
39c		5
39d		2
40a		3
41a		3
41b		4
42a		3
43a		1
43b		2
43c		2
44a		194
44b		7
44c		2
44d		1
44e		5

Tab. 3a: The complete mason's marks corpus of the Great Enclosure of Musawwarat es Sufra (cf. also (Karberg in print, Tab. 1).

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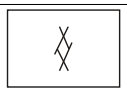
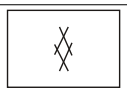
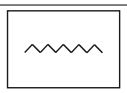
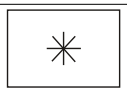
44f		1
44g		9
45a		4
47a		5
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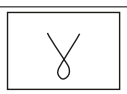
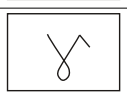
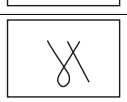
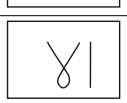
51a		22
51b		2
51c		108
51d		9
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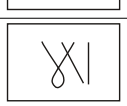
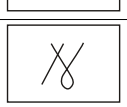
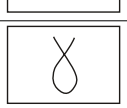
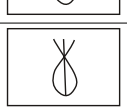
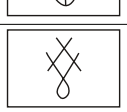
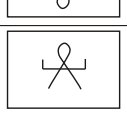
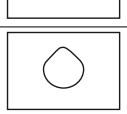
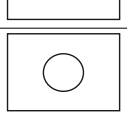
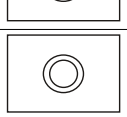
51f		1
51g		3
51j		16
51k		2
52a		31
53a		7
54a		15
54b		249
54c		2

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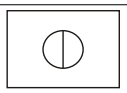
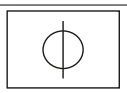
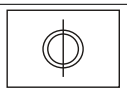
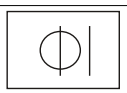
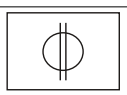
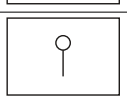
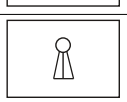
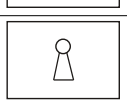
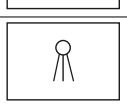
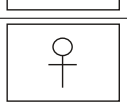
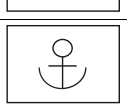
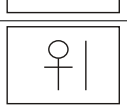
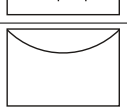
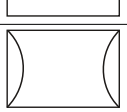
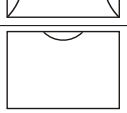
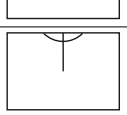
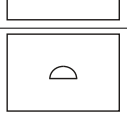
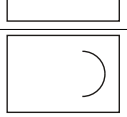
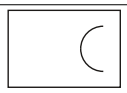
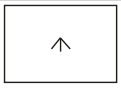
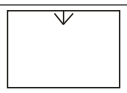
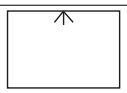
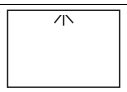
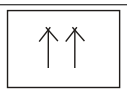
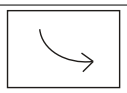
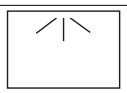
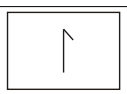
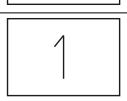
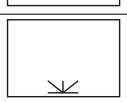
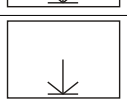
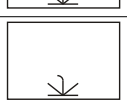
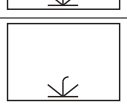
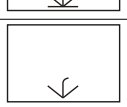
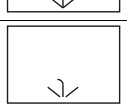
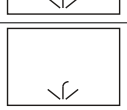
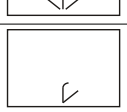
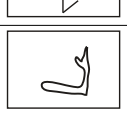
55a		2
55b		43
55c		2
55d		1
56a		3
57a		4
58a		55
58b		7
58c		11
59a		199
59b		27
59c		3
60a		10
60b		1
61a		24
61b		5
62a		2
64a		12

No.	Sketch	Quantity
64b		2
64c		5
64d		2
64e		1
65a		169
65b		2
65c		15
65d		5
65e		1
65f		1
66a		46
66b		4
66c		7
66d		1
67a		87
67b		22
67c		1
68a		4
70a		22

No.	Sketch	Quantity
70b		30
73a		10
74a		2
74b		3
75a		21
75b		1
76a		8
77a		4
78a		3
78b		4
78c		2
79a		2
79b		20
79c		12
79d		37
79e		6
79f		5
79g		2
79h		1

Tab. 3b: The complete mason's marks corpus of the Great Enclosure of Musawwarat es Sufra (cf. also (Karberg in print, Tab. 1).

No.	Sketch	Quantity
79j		3
79k		5
79l		12
79m		27
79n		2
79o		1
79p		4
80a		17
80b		5
81a		56
81b		2
82a		2
82b		6
84a		8
84b		4
84c		10
84d		2
86a		65
86b		15

No.	Sketch	Quantity
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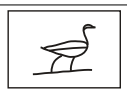
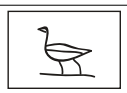
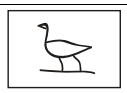
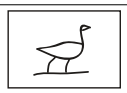
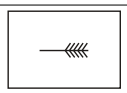
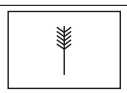
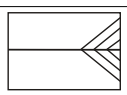
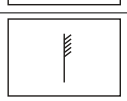
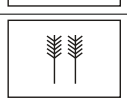
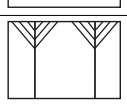
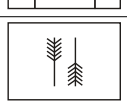
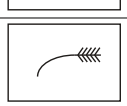
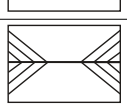
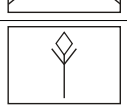
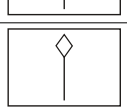
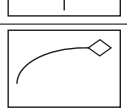
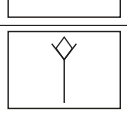
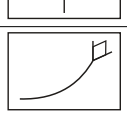
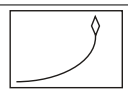
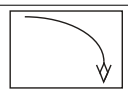
87a		17
87b		52
87c		71
87d		42
89a		3
89b		16
89c		38
89d		3
89e		1
89f		3
89g		1
89h		1
89j		3
90a		8
90b		52
90c		6
90d		10
90e		5

No.	Sketch	Quantity
90f		18
90h		3
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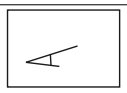
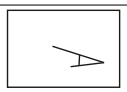
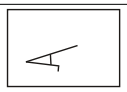
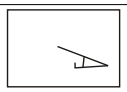
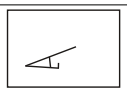
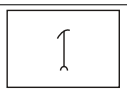
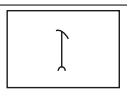
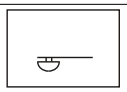
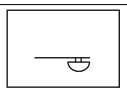
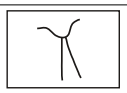
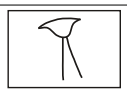
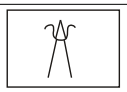
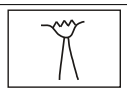
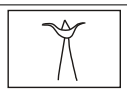
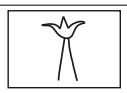
90k		5
90l		1
90m		3
90n		18
91a		12
91b		3
91c		45
91d		1
91e		5
91f		1
92a		53
92b		5
92c		90
92d		1
92e		1
92f		14

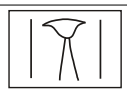
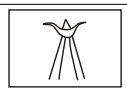
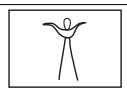
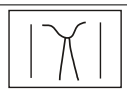
No.	Sketch	Quantity
92g		5
92h		1
93a		1
93b		1
93c		1
93d		1
93e		2
96a		1
96b		1
96c		1
96d		2
96e		1
98a		102
98b		384
98c		7
98d		1
99a		63
99b		67
99c		1

Tab. 3c: The complete mason's marks corpus of the Great Enclosure of Musawwarat es Sufra (cf. also (Karberg in print, Tab. 1).

No.	Sketch	Quantity
100a		13
100b		1
100c		13
100d		4
100e		1

No.	Sketch	Quantity
101a		3
101b		7
102a		1
102b		4
103a		15

No.	Sketch	Quantity
103b		18
103c		46
103d		9
103e		4
103f		1

No.	Sketch	Quantity
103g		1
103h		2
103k		2
103l		1

Tab. 3d: The complete mason's marks corpus of the Great Enclosure of Musawwarat es Sufra (cf. also (Karberg in print, Tab. 1).

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Zusammenfassung

Dieser Artikel stellt einige Aspekte der Untersuchungen zu den Steinmetzzeichen aus Musawwarat es Sufra vor, die der Autor im Rahmen seiner Dissertation vornahm. Neben grundlegenden semiotischen Überlegungen zum Zeichencharakter dieses nichtsprachlichen Markierungssystems wird der Frage nachgegangen, ob es sich bei den vorliegenden Steinmetzzeichen um ein in mehreren Ebenen bedeutungsdifferenzierendes Zeichensystem handelt (was bejaht wird), und ob alle differenzierbaren Bedeutungsebenen dasselbe Maß an informations- und kommunikationstechnischer Relevanz und besitzen (was verneint wird).

Darüber hinaus wird auf Schlussfolgerungen eingegangen, die aus den beobachteten Steinmetzzeichen bezüglich Bauorganisation und -technik zu ziehen sind. Die Idee, bei den Steinmetzzeichen von Musawwarat es Sufra handele es sich um Steinbruchmarken (und nicht um „echte“ Steinmetzzeichen) wird zurückgewiesen, und in diesem Zusammenhang darauf hingewiesen, dass auch für vergleichbare Steinmetzzeichen-Coprora vor allem aus Oberägypten bestimmte Beobachtungen widerspruchsfreier erklärbar sind, wenn die von verschiedenen Autorinnen und Autoren vertretene Idee von reinen Steinbruchmarken einer kritischen Neubewertung unterzogen wird.

Auch bezüglich der in der Großen Anlage angewandten Bautechnik erlauben die Steinmetzzeichen Rückschlüsse: Die Idee, der Neigungswinkel der Wände der Großen Anlage bzw. die Glättung ihrer Schauseiten sei erst nach Abschluss der Maurerarbeiten durch Abarbeitung von Bossen erfolgt, erweist sich als nicht mit den beobachteten Eigenschaften und Verteilungsmustern der Steinmetzzeichen kompatibel.

Die Frage, ob die Steinmetzzeichen von Musawwarat es Sufra eher eine technisch-administrative oder eher eine magisch-ideologische Funktion besessen haben könnten, wird dahingehend beantwortet, dass beide Konzepte in vormodernen Weltvorstellungen nicht notwendigerweise einen Widerspruch zu einander dargestellt haben müssen, und dass der Zeichenvorrat, auf den zur Herausbildung des Steinmetzzeichen-Corpus von Musawwarat es Sufra zurück gegriffen wurde, auch bei bestimmten Zeichen eine Weitertradierung magischer und/oder ideologischer Bedeutungsebenen (neben anderen) ermöglichen konnte.

Fig. 1: All mason's marks at the Great Enclosure of Musawwarat es Sufra, documented by the author between 2000 and 2009.

ing the processing of the largest contiguous stonemasonry corpus in the entire Nile Valley cultures, the stonemason's marks of the Great Enclosure of Musawwarat es Sufra.

In order to understand the structure and function of the stonemason's marks of Musawwarat es Sufra their character as a semiotically coded sign system as well as the etymology of the markings themselves have to be analyzed. The (general) identification of mason's marks corpora as sign system has to be defined from a theoretical background.

Semiotically, signs are mostly categorized along the immediate or indirect character of the signification process,[8] as well as the existence, complexity, and flexibility of different levels of signification.[9] The (im)mediate character of the signification is constituted by different qualities: On the basic, ontological level, a signification results from the fact that a phenomenon is evaluated by the sender as well as the receiver as coherent and relevant.[10] From a psycholinguistic background, the role of the sender often plays the major role,[11] while from the philosophical point of view in many cases the role of the receiver is investigated more prominently.[12] For Ogden and Richards, a strict structural as well as functional differentiation between three independent factors of a signification process is eminent: symbol, referent, and reference.[13] For the semiotics of mason's marks, especially the relation between referent and reference is crucial. According to Ogden and Richards, the referent is defined as a matrix of possible meanings of a sign within a specific group of communication agents. This matrix – as a complex of abstract entities – must have the potential of being related to any possible communication context of its meanings in order to be qualified as a sign.

The reference of a sign within a specific communicative context has to be distinguished sharply

8 Eco 2002, 197-199
9 Eco 2002, 236-242
10 Heidegger 1986, 78-79
11 Ogden & Richards 1974, 17-20
12 Heidegger 1986, 76-83
13 Ogden & Richards 1974, 17-19

from the referent. Within the whole complex of a signification, the reference is immanent to the individual communication process. It is also defined as an abstractum, but not as a matrix, since it refers to a specific intellectual pattern to be coded by the sender. These individual references are connected to a referent causally,[14] but connections to one referent are always possible by a (infinite) number of references, which are entangled with each other only mediately[15] without interfering with other possible entanglements with different referents.[16]

From the practical point of view, this means that different communication environments can indicate different aspects of meaning while using one and the same single sign. Therefore, it is completely acceptable to postulate different meanings of one mason's mark – as along as these different meanings are entangled with each other by a mediate relation: for example the work gang they refer to in different aspects. This idea might be of some importance for interpreting the semiotic etymology of some mason's marks, as well as the functional differentiation between mason's marks and quarry marks.

Another question of relevance for the semiotic interpretation of mason's marks is the definition of different structural levels of meaning of the whole sign system. Obviously, several mason's marks from the so called Great Enclosure of Musawwarat es Sufra show a significant degree of variability within their graphic layout, whilst it is still clear that these variants are derived from a single basic sign. Comparable variations were also observed in other mason's marks corpora from antiquity as well as the medieval period, and interpreted quite controversially by different scholars. In the 19th century, the Austrian architect Franz (von) Ržiha postulated the possibility to derive most medieval stone mason's marks used in Europe from few "mother signs" inherited from Roman stone masonry.[17] This highly debatable idea, still discussed by few scholars, is refused by most recent researchers on the subject – maybe most radically by Marc Depauw, who postulates that due to psycho-linguistic reasons variations within a sign system like mason's marks cannot be understood intuitively, and therefore postulates that mason's marks would lack any "double articulation".[18] Within this paper, this question will be analysed regarding the mason's marks corpus of Musawwarat es Sufra.

Another question of some relevance for the decoding of mason's marks is the interpretation of what is called semiotically "zero significant".[19] At the Great Enclosure of Musawwarat es Sufra, many blocks are not marked with a mason's mark at all. In many cases, like large parts of the courtyard walls, this obviously results from heavy erosion of these walls. But there are other parts of the building complex, especially the "temple 100" on top central terrace, where the surface of the worked stone blocks is well preserved, and therefore erosion cannot explain the lack of mason's marks. At the other hand, very few mason's marks are also preserved at this part of the building, therefore it can also not be the case that these walls were smoothed very carefully, and thus markings on the block surfaces would have been erased. An ideological reason for these very inhomogeneous distribution patterns seems likely.[20]

2. Variations of mason's marks: a multi-level articulation?

The question whether the mason's marks of Musawwarat es Sufra code some type of multi-level articulation is raised by the fact that a significant number of the basic markings occur with different variations. These could be interpreted as a secondary articulation level (i.e. sub-divisions of the coded work teams), or simple ludic variations of the symbols due to aesthetic reasons. In some cases, variants of a common "mother symbol" causes some difficulties concerning the differentiation between mason's marks and secondary graffiti; nevertheless, in most cases mason's marks can be identified with sufficient certainty.[21]

Indications for and against both hypotheseis can be derived from semiotic as well as topo-statistical observations. Seven examples of markings[22] from the Great Enclosure of Musawwarat es Sufra with especially significant variants may illustrate this.

2.1 Mark No. 19

The mason's mark Musawwarat es Sufra no. 19 consists of an X-shaped symbol, in some cases augmented with additional linear elements. The fact

14 Via the signification process.
15 Via the mutually shared referent itself.
16 Ogden & Richards 1974, 16-18
17 Ržiha, 1883, 37-43
18 Depauw, 2009, 207-212
19 Eco, 2002, 237
20 Karberg 2019, 81; 88 Fig. 17
21 Karberg in print
22 The numbers of the markings refer to the complete list of mason's marks from Musawwarat es Sufra as documented in Karberg 2017, 493-497 Tab. 9-1

that this symbol is widespread as a mason's mark in the Kushite world, but not in neighbouring regions like Ptolemaic and Roman Egypt, could lead to the assumption that this symbol in its specific field of usage as a mason's mark might be derived from the Meroitic character for the number "30" rather than from Latin, Greek, or Karian characters.[23] This mason's mark is documented in the Great Enclosure of Musawwarat es Sufra with 217 examples. Altogether, this sign is distributed rather homogeneously over the Great Enclosure.[24] When having a closer look at the distribution patterns of the different variants, however, some interesting inhomogeneities become visible.

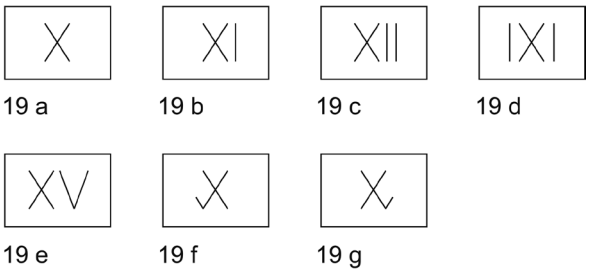


Fig. 2: All variants of mason's mark 19.

Fig. 3: Distribution patterns of mason's mark 19 in the Great Enclosure.

The mason's mark no. 19 occurs at Musawwarat es Sufra in seven different variants (fig. 2). Among the 217 evidences, the vast majority (203) consists of the symbol variants a and b (fig. 3). The other variants seem negligible (due to their small number as well as statistically insignificant distribution geometry). The major variants a and b differ significantly in their topographic distribution patters: While variant a shows four different core distribution areas with centroids at the northern temenos, the northern part of the central terrace around room 108, the western part of the central terrace (especially room 525), and the north-eastern wall of the rooms 507 and 508. Variant b shows a much more concentrated distribution pattern: The vast majority of this symbol is concentrated around room 108. Therefore, the different distribution geometry indicates structural differences, but also similarities between the variants (due to the fact that the sole distribution core of variant b coincides with at least one of these cores of variant a). The fact that variant b was derived from variant a by augmentation allows to distinguish them (and the other variants) from each other intuitively; therefore, it is highly presumable that the structural differentiation encodes also a functional one.

23 Karberg 2017, 86-88; for the (here neglected) idea of a Carian influence, cf. also Gosline 1992, 46.

24 Karberg 2019, 71; 75 Fig. 5

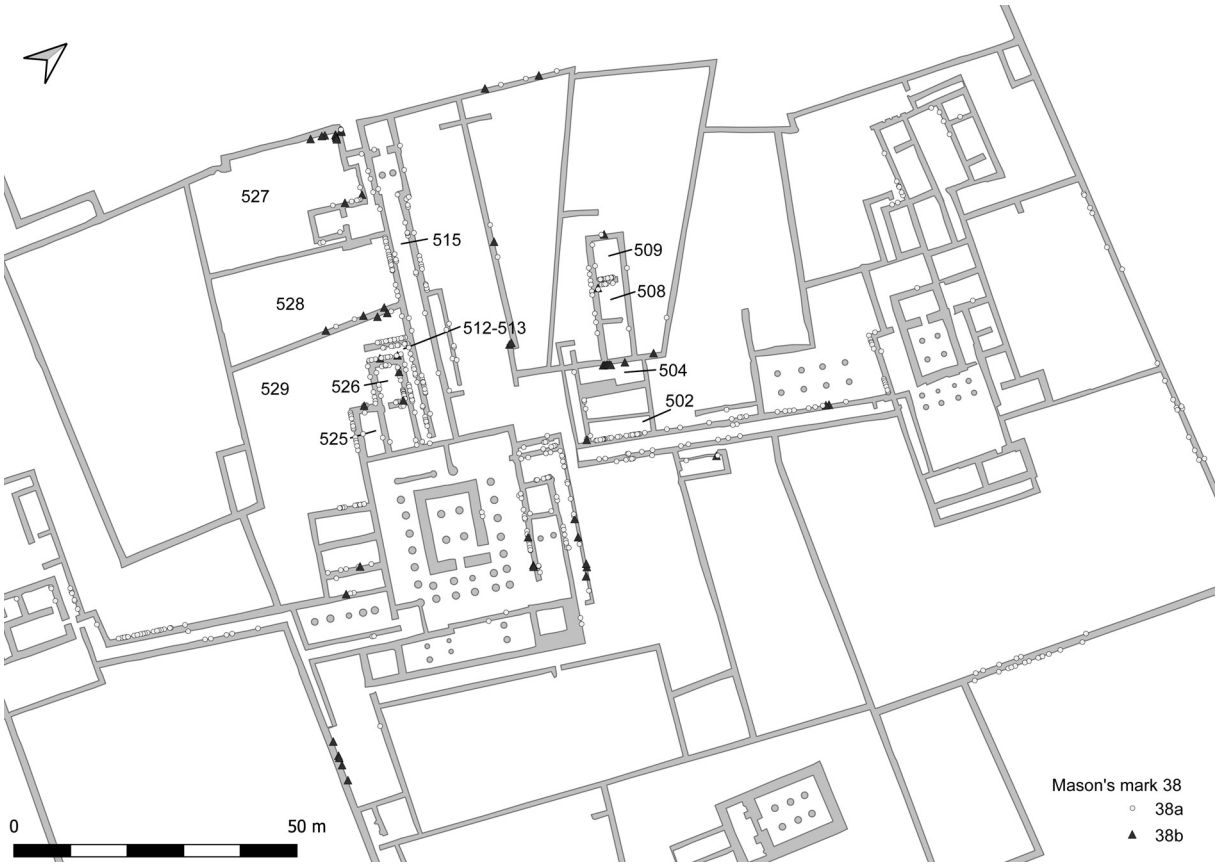


Fig. 4: Distribution patterns of mason's mark 38 in the Great Enclosure.

2.2 Mark No. 38

The mason's mark no. 38 from Musawwarat es Sufra is the most common one within this corpus: At the Great Enclosure, altogether 602 evidences of the different variants of this symbol were documented (fig. 4). The basic variant of its symbol resembles the character "N" (fig. 5). As with mason's mark no. 19, the vast majority of the markings of this group belongs to variant a (540), a much smaller, but still significant number to variant b (57), while the number of the other variants is negligible (only five evidences for all three remaining variants altogether).

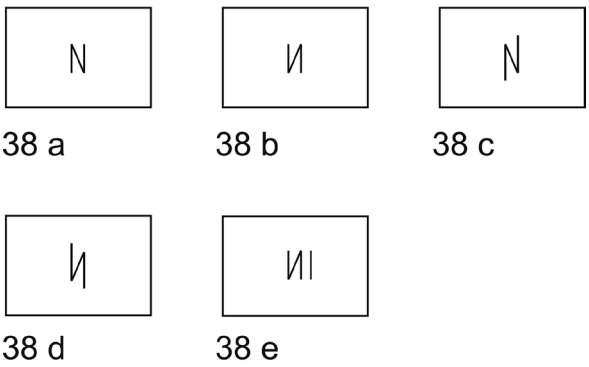


Fig. 5: All variants of mason's mark 38.

Due to the number of evidences for this mason's mark, especially for variant a areas of dense distribution are widespread within the Great Enclosure, and therefore geometric cores are less easy to identify. Nevertheless, the difference between variants a and b concerning their small-scale distribution patterns at some areas are noteworthy. At the rooms of the so called "holy wedding"[25] and the adjacent rooms, variant a shows significant concentrations at the wall between 508 and 509 (and the directly connected outer walls) as well as the eastern wall of room 502; variant b, however, is significantly concentrated in this area at the western wall of room 504. Around the building structures between the central terrace and the western chapel, variant a concentrates on the walls of the terraced rooms 525 and (especially) 526, the ramp corridor 212-213, and the outer terrace walls of the elevated corridor 515; in the same area, variant b shows two concentrations at the ground level delimitation walls of courtyard 527 and between the courtyards 528 and 529. The question whether this encodes a functional differentiation is not that easy: from the semiotic point of view, it is of some importance that both variants graphically

25 Eigner 2002

differ from each other only by inversion, which obviously is not as intuitive as an augmentation.[26] At the other hand, the different distribution patterns are not purely topographical ones: variant a is much more widespread at terrace walls (which needed more skilled work), while variant b is concentrated at the less ambitious courtyard walls.

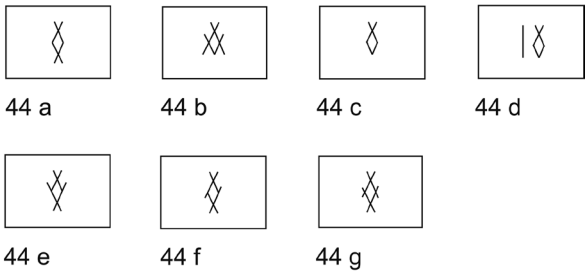


Fig. 6: All variants of mason's mark 44.

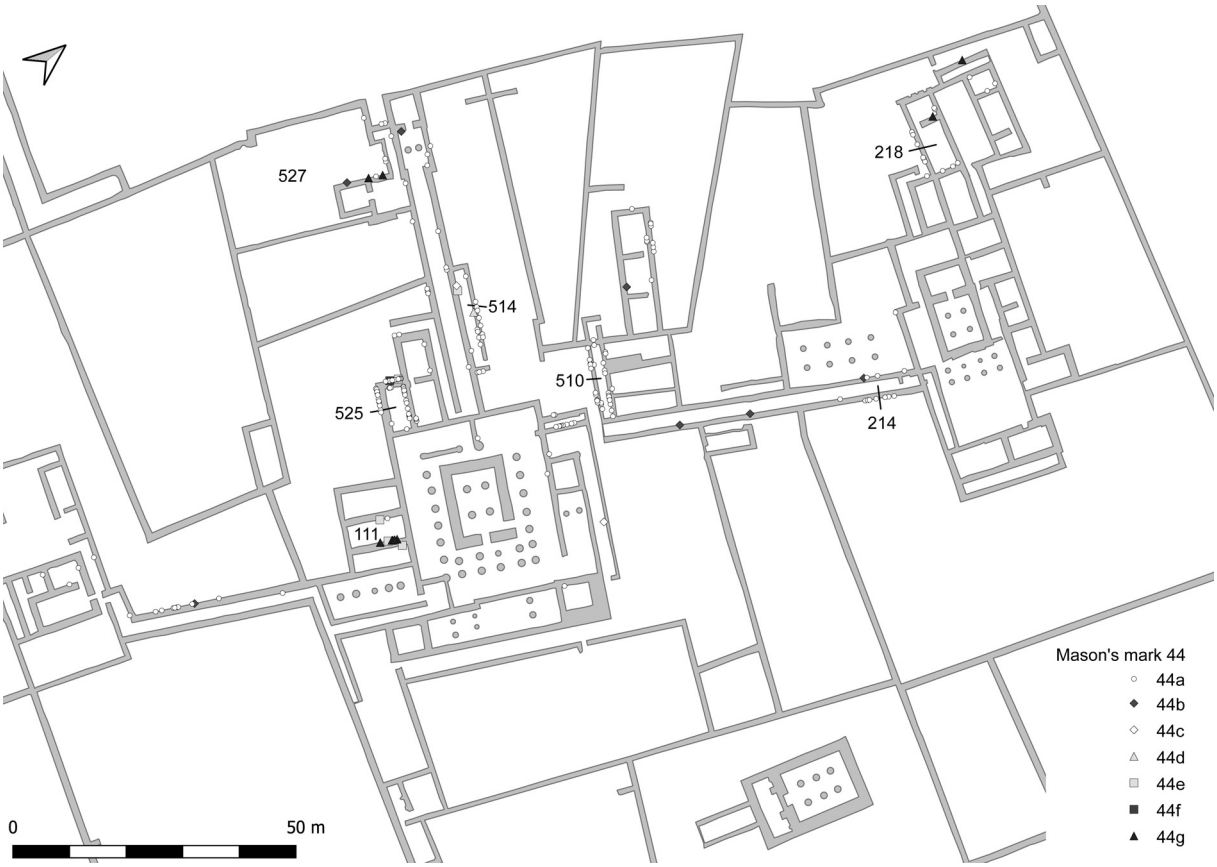


Fig. 7: Distribution patterns of mason's mark 44 in the Great Enclosure.

2.3 Mark No. 44

Mason's mark no. 44 is represented by different variants of a rhomboid geometric symbol (fig. 6). It is documented 219 times within the Great Enclosure; the vast majority of these evidences show the simple variant a. The different variants are in most cases defined by augmentations. Since many of these augmentations consist only of short overleaping strokes at the corners of the rhomboid basic symbol, it seems possible that they were just created accidentally. Even if assumed that these variants represent some specific functional articulation, it could be presumed that when using these signs it was not easy to distinguish the meaningful, intentional augmentations from simple mistakes when a tool was not used precisely and therefore a linear stroke accidentally prolonged. Nevertheless, the topographic distribution patterns of at least one of these variants shows some remarkable differences to the distribution of the main variant (fig. 7): While the major distribution cores of variant a are found in and around the terraced room 525, ramp 514, ramp 510, and, to some smaller extent, at corridor 214 and room 218, the two concentration cores of variant g are found at two completely different places: the terraced room 111 and the north-eastern corner of courtyard 527. Despite this specific difference of the distribution

26 Especially when it has to be considered that blocks were incorporated upside down into a wall, as often observed for the mason's marks of Musawwarat es Sufra.

patterns, it is hard to imagine that the variants of mason's mark no. 44 represent a multi-level articulation, since mistaken understanding due to unprecise craftsmanship would have been a realistic issue.

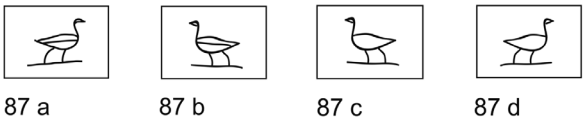


Fig. 8: All variants of mason's mark 87.

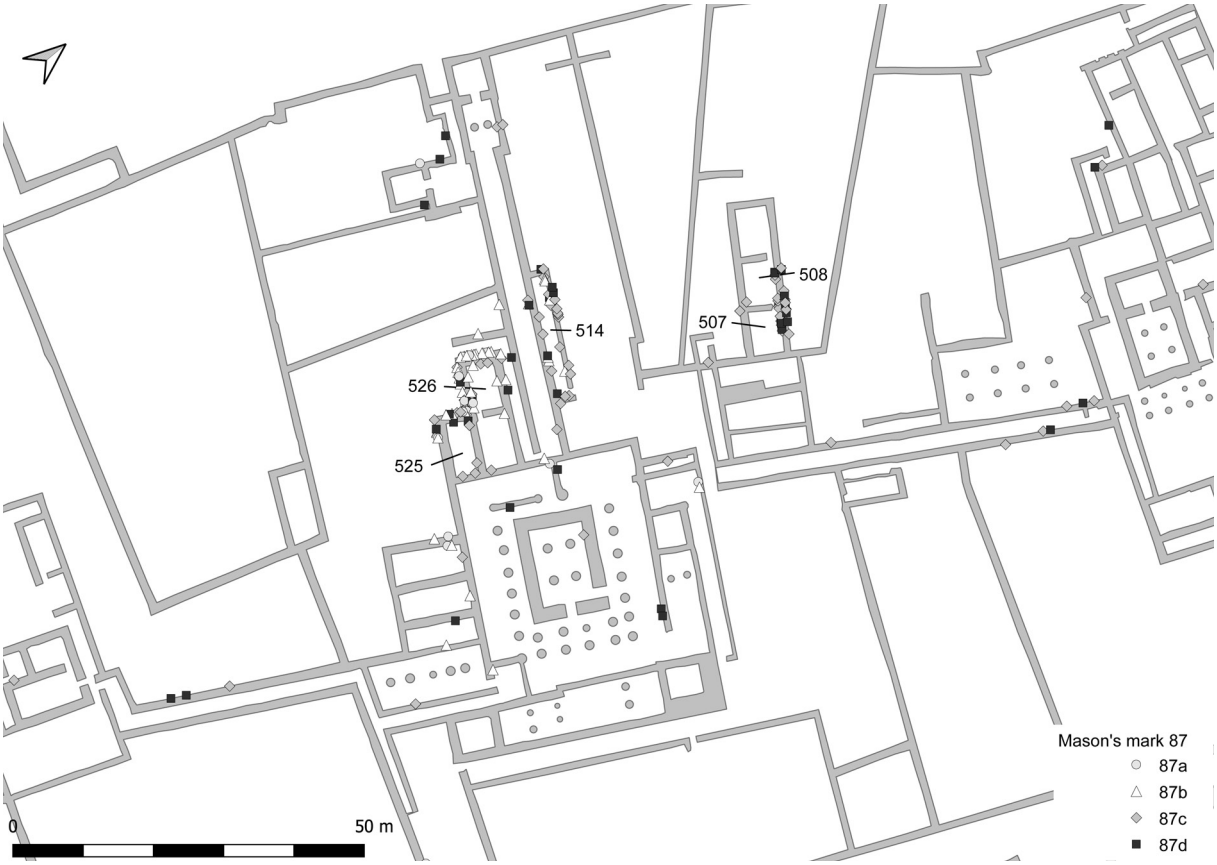


Fig. 9: Distribution patterns of mason's mark 87 in the Great Enclosure.

2.4 Mark No. 87

Mason's mark no. 87 consists of a bird-shaped symbol. Its variants consist of the depiction or non-depiction of a wing, as well as the orientation of the sign on the block (fig. 8). It seems possible to derive the symbol from the Egyptian writing system (in this case the hieroglyph /s3/) as well as the Meroitic script (where a similar character represents the letter /k/). There are some other evidences for the use of this symbol as a mason's mark in the Meroitic culture (i.e. at pyramid Beg. N9), but also some similar graffiti inside the quarries of Gebel al Silsile.[27] As shown by Mark Depauw for the masons's marks of the Deir el Barsha,[28] simple mirroring of a symbol is not intuitive enough for a multi-level articulation; nevertheless, the representation of a wing could be.

This assumption coincides with the different topographical distribution patterns (fig. 9). The densest geometric centroid core of the distribution of variants a and b are found around room 526, especially its western wall. Within this room, also some evidences for variants c and d are found, but much less, and tendentially concentrated at its eastern wall. Around the directly adjacent room 525, significantly more evidences for variants c and d, and less for a and b are found. Another distribution core of variant c and d is ramp 514, where only few examples of variant b are found. The most significant difference concerning the distribution patterns is found at the northern wall of the rooms 507 and 508 of the so called "Holy Wedding", which is another major distribution core of variants c and d, while not one evidence for variants a and b is found here.

Therefore, it can be assumed that the variants a and b as well as variants c and d form two groups: The mirroring of the symbol has no distinct meaning, but

27 Preisigke, Spiegelberg, & Legrain, 1915, Pl. IV-72
28 Depauw 2009

3. Conclusions

3.1 Mason's marks or quarry marks? The role of the markings in the construction site organisation at the Great Enclosure

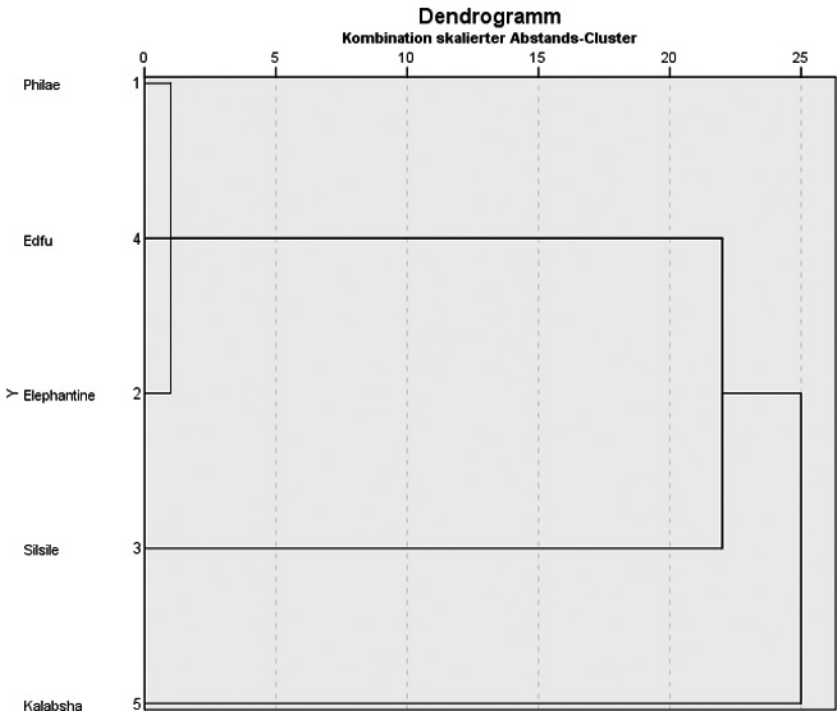
In many works on architectural marking systems in antiquity their character as quarry marks is postulated, and a differentiation between ancient quarry marks and "real mason's marks" from the European medieval period assumed.[29] Especially for buildings in Upper Egypt of the Ptolemaic and Roman period, contemporary to the Meroitic culture, Horst Jaritz argues vehemently for a strict differentiation of quarry marks and "real mason's marks", and the identification of the Late Period Upper Egyptian marking systems with the former.[30] Subsequently, Jaritz postulates the possibility to strictly differentiate the "quarry marks" corpora of several buildings in Upper Egypt (i.e. the terraces of the temple of Chnum and Satet at Elephantine Island and the temples of Philae), as well as the assignment of these corpora to different quarries: The temples of Philae to the quarries of Kertassi, and the terraces at Elephantine Island to the quarries of Gebel Silsile.[31]

This is contradicted by the fact that the distribution patterns of some rather frequent marks between the corpora of Philae and Elephantine Island cannot be differentiated clearly,[32] and a general analysis of different corpora of Upper Egyptian marking corpora shows significant similarities between the terraces of Elephantine Island and Philae (tab. 1 & 2).[33] Additionally, Jaritz' assumption that a connection between the quarries of Kertassi and the temples of Philae can also be reconstructed from epigraphical record[34] seems to over-interpret one single inscription, dating to the 3rd century AD and therefore long after the construction of the parts of the temples of Philae in question.[35]

Cluster affiliation

Case	4 Clusters	3 Clusters	2 Clusters
Philae	1	1	1
Elephantine	2	1	1
Silsile	3	2	1
Edfu	1	1	1
Kalabsha	4	3	2

Tab. 1: Cluster analysis (median centred) of several mason's marks corpora in Upper Egypt I: Cluster affiliation (using IBM SPSS Statistics 25).



Tab. 2: Cluster analysis (median centred) of several mason's marks corpora in Upper Egypt II: Dendrogram of scaled distance clusters (using IBM SPSS Statistics 25).

Applying these debates on the specific situation at Musawwarat es Sufra, an interpretation of the mason's marks corpus of the Great Enclosure as "quarry marks" seems even more improbable due to several reasons. Most importantly, inside the identified sandstone quarries of the building material of the Great Enclosure no comparable markings were documented. The few symbols found there

29 I.e. Richter, 1885, 32; Jaritz 1980, 85-94

30 Jaritz 1980, 85. Subsequently, several authors followed his point of view: Gosline 1992, 44; Golvin 1992, 80-81; Fauerbach 2018, 213-214

31 Jaritz 1980, 85; 87

32 Especially the mark "+" as well as several other markings occur at the terraces of Elephantine Island and at (contemporary) building parts at Philae Island as well (Karberg 2017, 416-418).

33 Cf. also Karberg in print, tab. 2.

34 Jaritz 1980, 87

35 Karberg in print, Fn. 21

differ in shape and structure significantly from the mason's marks, and most probably have to be identified as secondary graffiti,[36] while tool traces on the worked surfaces are plenty (and therefore the lack of mason's marks cannot be due to erosion).[37] Additionally, the remains of working spaces inside the quarries indicate many small-scale work units of similar size,[38] which does not coincide with the inhomogeneous numerical patterns of the different mason's marks at the Great Enclosure. Another indication is the topographical distribution pattern of the different mason's marks, which often show remarkably dense clusters (cf. fig. 2, 4, 6, 8, and 12). These distribution patterns indicate an offspring of similar mason's marks not directly at the sites of wall construction, but in close distance. An offspring as far away as the quarries should have resulted in much more homogeneous distribution patterns of most mason's marks, especially when payloads of working stones had to be transported in small charges (i.e. by donkey), and not in larger quantities via ship as to be assumed for the Nile valley. Another factor is the marking of spolia with (new) mason's marks during re-use, which can be observed at the walls of the Great Enclosure several times. In some of these cases, more than one mason's mark was used on one block. This indicates that the marking of the (already quarried, but obviously re-dressed) block was done during this working step, not already in the quarry.

In Musawwarat es Sufra, the vast majority of mason's marks was applied at the already smoothed surface of the blocks, intended to form the obverse side after being integrated into a wall. The comparably bad quality and softness of the local sandstone makes it rather improbable that the smoothing of the blocks was already done inside the quarry – the danger that the stone blocks would have been damaged during the transport from the quarry to the construction site would have been evident. Instead, it has to be assumed that the dressing of the blocks inside the quarry was only done roughly, and a werkzoll remained on the block as transport protection. If the blocks were finally dressed not directly at the wall construction site, but at workshops in their close vicinity, this would have demerged the construction process, and it would result in concentrated distribution patterns of mason's marks as they can be observed at the walls of the Great Enclosure. Therefore, at least for Musawwarat es Sufra (and most probably also for other contemporary mason's marks corpora) an identification as "real mason's marks" (and not quarry marks) seems appropriate.

3.2 Implications on building techniques

The construction technique of the majority of the walls of the Great Enclosure of Musawwarat es Sufra is subject to controversial debate. In 2014, Pawel Wolf assumed that – similar to building techniques used in Ptolemaic and Roman Egypt – most walls of the Great Enclosure were erected with significant bossages, which were smoothed after the erection of the wall.[39]

Concerning the mason's marks, this construction method seems rather doubtful. If the walls of the Great Enclosure would have been smoothed after their erection as Pawel Wolf suggested, the obvious fact that a significant number of mason's marks is preserved on the walls can only be explained by several highly speculative assumptions. It could be assumed that the mason's marks were incised much deeper during the initial dressing of the stones, and the markings still visible today are only what is left over after smoothening the walls. This assumption has to be rejected because nowhere in the Great Enclosure (including the few walls with remaining bossages and mason's marks) deeply incised mason's marks were documented; the homogeneous depth and stroke characteristics of most mason's marks cannot be explained by purely coincidental remains. Another hypothetical explanation would be the assumption that the mason's marks were drawn onto the blocks after the erection of the walls. This has to be rejected due to the fact that many mason's marks are found upside down or cut by sawing works during the construction process. The third assumption is the idea that not only the repeatedly marked, but all blocks with preserved mason's marks are spolia from earlier construction phases. This idea is contradicted by the fact that spolia within the walls of the Great Enclosure are often easily recognisable by the fact that their surfaces and edges are eroded in a different way than the other blocks at the same wall. This is especially evident at the inner walls of some rooms of the central terrace: At several of these walls, mason's marks were documented in trenches inside the terrace filling material. The local sandstone of Musawwarat es Sufra shows an almost white colour when cut freshly from the quarry; exposed to the sunlight, it developes a brownish, relatively hard patina. The fact that the inner walls of the

36 Personal observation; cf. also Becker 2000, 70.
37 Becker 2000, 62-69
38 Becker 2000, 64
39 Wolf 2014, 370

central terrace in most cases still show their initial, quarry-fresh whitish surface proves that these walls were covered with terrace filling quickly after their erection and not exposed to the sunlight for a longer period. If the blocks with mason's marks within these walls would have been re-used spolia from earlier building phases, these blocks would necessarily have been significantly more patinated than the rest of the blocks, which is not the case.

Since all these assumptions explaining the preservation of mason's marks within the hypothesis of the bossage construction as standard building technique in the Great Enclosure have to be rejected, the only remaining conclusion can be that the idea of the bossage construction method is wrong. An alternative hypothesis would be the idea that the obverse of the blocks was smoothed in advance (at the beforementioned workshops close to the wall construction sites), and the uniform inclination angle of most of the walls was achieved by using some kind of ruler. In this case, only the side edges of the single blocks and – after the completion of a whole row of blocks – their upper edge would have been treated with a stone saw after during the wall construction phase itself.

3.3 What did they mean?

Besides the mason's marks implications on construction organization and techniques, the main and central question is their meaning. The graphic variants and their distribution patterns imply some kind of functional multi-level articulation, and a use during an intermediate work phase between the cutting of the blocks in the quarry and their implementation into the wall at the construction site. Nevertheless, it remains unclear whether the multi-level articulation was structurally necessary, and whether the type of information encoded was of the same relevance as the marking per se. The only marginal and non-intuitive graphic variation of some of the mason's marks variants, but especially the inhomogeneous numbers of the different variants might indicate an informational relevance below the general marking in principle. Similar small-scale variants were also observed in other mason's marks corpora, i.e. at Persepolis – here, the variation were interpreted as different "handwritings" of single stonemasons working for the same work gang.[40] For Musawwarat es Sufra, the fact that in most cases one variant of mason's marks is overwhelmingly dominant in numbers over the others might indicate that only the "mother sign" was estimated as canonical, while the variants represent single individuals within a workshop or phyle wishing some degree of individual representation. In such a case, the multi-level articulation would not follow on linear concept of canonical definition of meaning, but anyway encode different socio-economical structures within the working organization.

Another aspect is the question whether the mason's marks had a practical (administrative) or some kind of ideological meaning. Authors like Horst Jaritz imply an administrative function within the building (or quarrying) accounting,[41] while Maria Nilsson during her work on markings inside the quarries of Gebel Silsile as well as temple buildings assumes some kind of (folk) religious connotation of the signs, which was intended to "stabilize" the block magically.[42] At Musawwarat es Sufra, the fact that the whole amount of mason's marks shows a remarkable blending of completely different types of signs (derivations from the Greek or Latin alphabets as well as the different Egyptian and/or Meroitic scripts; pictographic symbols connected to stone masonry like architectural elements and tools; and religious symbols – cf. tab. 3) indicate that most of the signs were arbitrarily derived from completely different character sets. At the other hand, the fact that some kind of "semiotic etymology" of mason's marks like the palm leaf might (widespread i.e. in religious and funeral inscriptions inside the quarry of Gebel Silsile)[43] indicate that at least for some of the stonemason's workshops a (folk) religious tradition had some significance when choosing their particular symbol, even it was used within the general marking system by a superordinate authority for accounting purposes.

Within a pre-modern conception of the world, some kind of magic stabilisation of a block as well as a whole building might have been a part of the quality of the work as the craftsmanship itself.

40 Nylander 1974, 219

41 Jaritz 1980, 87

42 Nilsson, 2012-13

43 Preisigke, Spiegelberg & Legrain 1915

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Zusammenfassung

Dieser Artikel stellt einige Aspekte der Untersuchungen zu den Steinmetzzeichen aus Musawwarat es Sufra vor, die der Autor im Rahmen seiner Dissertation vornahm. Neben grundlegenden semiotischen Überlegungen zum Zeichencharakter dieses nichtsprachlichen Markierungssystems wird der Frage nachgegangen, ob es sich bei den vorliegenden Steinmetzzeichen um ein in mehreren Ebenen bedeutungsdifferenzierendes Zeichensystem handelt (was bejaht wird), und ob alle differenzierbaren Bedeutungsebenen dasselbe Maß an informations- und kommunikationstechnischer Relevanz und besitzen (was verneint wird).

Darüber hinaus wird auf Schlussfolgerungen eingegangen, die aus den beobachteten Steinmetzzeichen bezüglich Bauorganisation und -technik zu ziehen sind. Die Idee, bei den Steinmetzzeichen von Musawwarat es Sufra handele es sich um Steinbruchmarken (und nicht um „echte“ Steinmetzzeichen) wird zurückgewiesen, und in diesem Zusammenhang darauf hingewiesen, dass auch für vergleichbare Steinmetzzeichen-Coprora vor allem aus Oberägypten bestimmte Beobachtungen widerspruchsfreier erklärbar sind, wenn die von verschiedenen Autorinnen und Autoren vertretene Idee von reinen Steinbruchmarken einer kritischen Neubewertung unterzogen wird.

Auch bezüglich der in der Großen Anlage angewandten Bautechnik erlauben die Steinmetzzeichen Rückschlüsse: Die Idee, der Neigungswinkel der Wände der Großen Anlage bzw. die Glättung ihrer Schauseiten sei erst nach Abschluss der Maurerarbeiten durch Abarbeitung von Bossen erfolgt, erweist sich als nicht mit den beobachteten Eigenschaften und Verteilungsmustern der Steinmetzzeichen kompatibel.

Die Frage, ob die Steinmetzzeichen von Musawwarat es Sufra eher eine technisch-administrative oder eher eine magisch-ideologische Funktion besessen haben könnten, wird dahingehend beantwortet, dass beide Konzepte in vormodernen Weltvorstellungen nicht notwendigerweise einen Widerspruch zu einander dargestellt haben müssen, und dass der Zeichenvorrat, auf den zur Herausbildung des Steinmetzzeichen-Corpus von Musawwarat es Sufra zurück gegriffen wurde, auch bei bestimmten Zeichen eine Weitertradierung magischer und/oder ideologischer Bedeutungsebenen (neben anderen) ermöglichen konnte.