Mastaba S3038 at Saqqara: a new perspective on old data

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Abstract

In 1937 Walter Bryan Emery excavated tomb S3038 at Saqqara and discovered some astonishing new construction features inside. The tomb had a stepped core over the burial chamber, which was built over with two successive platforms, accessible from the outside. The construction showed a succession of stages, defined as changes in design. The shape of the core made Emery think that this tomb was a precursor of the later step pyramids. This hypothesis did not find much support.

A re-evaluation from a construction perspective of all available data, including the unpublished field notes of the excavator, leads to different conclusions. Each successive stage was purposefully constructed to fulfil a role in the mortuary practices. In other words, the construction elements were part of a singular and preconceived design. Based on the premise of practices reflected in the construction of this unique tomb, it is also possible to reflect on the design of other tombs of the First Dynasty at Saqqara.

Keywords

First Dynasty – Saqqara – mastaba tomb – singular design – phased construction – mortuary practice

المصطبة S3038 بمنطقة سقارة: منظور جديد للبيانات القديمة

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ملخص

فى عام 1937 عثر والتر إيمرى عن المقبرة S3038 بمنطقة سقارة، واكتشف بعض المميزات المعمارية الجديدة والمذهلة داخل المقبرة. كان للمقبرة نواة بناء داخلية متدرجة فوق حجرة الدفن، والتى شيدت عليها منصتان متعاقبتان، يمكن الوصول إليهما من الخارج. أظهر البناء سلسلة متعاقبة من مراحل البناء، والتى تم التعرف عليها على أنها تغييرات فى التصميم الأصلى للمصطبة. جعل شكل نواة البناء إيمرى يعتقد أن هذه المقبرة كانت مقدمة لشكل الأهرامات الملكية التى ظهرت بعدها فى وقت لاحق. إلا أن هذه الفرضية لم تجد الكثير من الدعم.

إن إعادة التقييم لجميع البيانات المتاحة من خلال منظور البناء، بما فى ذلك الملاحظات الميدانية غير المنشورة للحفائر، من شأنها أن تؤدى إلى استنتاجات مختلفة. حيث تم بناء كل مرحلة متتالية بشكل هادف للاضطلاع بدور فى الممارسات الجنائزية. وبعبارة أخرى، كانت عناصر البناء جزءًا من التصميم المنفرد والمسبق. وبناءً على فرضية الممارسات المنعكسة فى بناء هذه المقبرة الفريدة، يمكننا أيضًا التفكير فى تأثير تصميمها على مقابر أخرى تعود لعصر الأسرة الأولى فى سقارة.

الكلمات الدالة

الأسرة الأولى – سقارة – مصطبة – التصميم الفريد – البناء على مراحل – ممارسة جنائزية

Introduction

Of all the mastabas from the First Dynasty at Saqqara, tomb S3038 may be the most extraordinary. The tomb was excavated by Walter Bryan Emery in 1936–1937, who started the discussion about the distinct stepped form of the core of the superstructure and the apparent changes in the design of the tomb (Emery 1938a and 1938b). In his mind, the stepped core was the precursor of the later step pyramids (Emery 1949 and 1961). The background of the other features – *i.e.* two distinct platforms, openings in the outer wall and blocked stairs – in the tomb was hardly addressed and certainly not explained.

Eight decades after the initial discovery, it is easy to point out the obvious lack of a relationship with the later step pyramids. There is no evidence to support the idea of a (gradual) development towards a step pyramid (Kaiser 2008: 362). This does not mean that S3038 is no longer an interesting tomb. On the contrary, we would still like to explain the so-called radical changes. What was their meaning, why did the apparently competent and professional architects and engineers of the First Dynasty change their minds more than one time?

This study contains a re-evaluation of all the available information on this tomb; by using modern archaeological principles and techniques, and approached from a construction perspective. A careful analysis of all the relevant information shows a succession in construction phases, built with intent and part of a preconceived design. The function of some of the phases was clearly structural; in others, a connection with contemporary mortuary practices may be assumed. The aim is to look beyond the stepped core and discuss all aspects of this interesting tomb.

Primary sources and other reference material

The primary sources are Emery's excavation reports (1938a, 1938b and 1949). There is an additional body of unpublished material from the excavations at the Archaic cemetery at Saqqara, undertaken by Cecil Mallaby Firth and Walter Bryan Emery, in the so-called Emery Archive (Martin 2007: 121–126). These documents of variable character and style (comprising notes, sketches and photographs) are currently kept at the McDonald Institute for Archaeological Research at Cambridge and could be consulted by the present author with kind permission of Geoffrey Thorndike Martin. The archive could be accessed through digital copies funded by a grant from the Isaac Newton Trust, Cambridge University (Kate Spence and Barbora Janulíková).[1] Last, but not least, the area around S3038 was mentioned again in unpublished field notes from Emery's campaign in 1955–1956 (Emery 1946–1956)[2].

Publications and excavation reports

Firth (1931: 45–48) mentioned the discovery of the tomb briefly in 1931, without providing much information. Emery (1938a and 1938b) resumed excavations in 1936 and felt the need to publish his findings in two preliminary articles. The first brief description provides a clear picture of Emery's excavation strategy, how careful observations made him clear away successive stages of the structure (Emery 1938a: 243); and when the idea of a step pyramid was introduced. The second report (Emery 1938b: 455–459), still preliminary, provided more details of the stepped core around the substructure and the construction in stages, described as "radical changes in design", leading to different constructions in periods A–C (Emery 1938b: 455; Emery 1949: 82–83).

The third and final report was a chapter in Emery's first book on the tombs of the First Dynasty (Emery 1949: 82–84, chapter IV, plates 21–35). This report can be seen as a final report in the sense that it provides many details on architectural features and dimensions. Problematic are the discrepancies and contradictions between the second and third reports. For a thorough understanding of the structure, it is necessary to read the documents in combination for a better comparative analysis.

Unpublished documentation

Emery's archive (Martin 2007: 122–124) contains documents – in multiple folders – that are relevant to this study; the following sources were used.

1. Emery's excavation notes for tomb S3038, from 28th December 1936 to 16th January 1937; six handwritten pages from his notebook, a sketch of the entrance and one sketch with the situation for the area between tombs S3036 and S3038 (part of folder H; scans EA_H_001_001/040);
2. Hand written "proof print" for tombs S3038 and S3111 (part of folder D; scans EA_D_3038_009_001/008 and EA_D_3111_046–001/004);
3. Correspondence between Firth and Emery, ranging in date from September 1929 to February 1931, with a few undated letters (part of folder P; scans EA_P_001/070);
4. A set of aerial photographs (in total 137), taken by the Royal Air Force on 25th January 1946, showing a clear and detailed view of the plateau from Abusir to (central) Saqqara. The situation in January 1946, represented the pre-war excavations; most trenches were left exposed and the 1930s excavation activities are clearly visible, with only the effect of wind-blown sand fills noticeable (folder Q; scan EA_Q_001/141);
5. Most of the original photos used for the book Great Tombs of the First Dynasty part 1. Those of S3038 and S3111 are still of a good quality (folder R; scans EA_R_001/118);

[1] I would like to express my gratitude to Kate Spence for her kind cooperation during my visit to the McDonald Institute for Archaeological Research.

[2] Courtesy of the Egypt Exploration Society, London.

6. Photocopies of the aerial photo used by Emery for mapping the tombs he excavated (folder T; scans EA_T_001/024).

Although there are a large number of unmarked photographs in the archive (Martin 2007: 122–124, folders A, C, N and O), none could be identified as belonging to S3038 (or S3111).

The field notes and the written proof (nos. 1 and 2 above) are very helpful in this study. The notes provide an insight into Emery's methods and approach. The start and end of the notes are rather abrupt, without a clear note on the actual start or end of the work at this tomb. No entries were noted for 30th to 31st December and 3rd to 5th January, but the text and sketches on the pages between the third and the sixth suggest continuity in pages. All in all, the impression is given that the notes are complete for the work on this tomb. The notes also mention work around another large tomb of the First Dynasty, the later excavated S3111; on 15th January, Emery (1937) noted "Clearing area north east of 3038. We shall not clear the First Dynasty mastaba until this area is finished." Emery began work at the south side and found, already on 28th December, the southern outer wall with the entrance leading to the stepped construction around the burial pit. In the notes, only a distinction between periods A and B is used. The notes show the relatively short period that the tomb was excavated. It took 12 working days to excavate the tomb proper; another six working days were spent on "clearing" the east and north-east side of the tomb; from the activities of these days no details were recorded.

The hand written proof print for S3038 was probably an early draft version. The structure of the document reflects that of the publication (Emery 1949: chapter IV), but there are a few minor differences. In the draft, Emery ascribed the construction of the stepped structure and the stairs leading to the upper store room above the burial pit to a separate period; in his publication, they have been integrated into one. In the publication, the importance of the stepped construction was emphasised to a larger extent and paragraphs were added on the discovery and the finds (Emery 1949: 91–93). The date of this document is unknown; it could have been written directly after the excavations in 1937, but also later in 1945/1946, closer to the date of publication.

The correspondence (no. 3) provided no extra information about Firth's work at S3038. Firth mentioned in his letter of 22nd January 1931, that he found First Dynasty tombs in the cemetery where James Quibell (1923: pls. I–II) had worked previously. However, no further details were added.

The aerial photos (no. 4) are extremely helpful in investigating the surroundings of the tomb (and that of S3111). The photos were taken in "six runs" along a northwest-southeast axis, three runs in each direction. By comparing the area of S3038–S3111 from the different runs, a good impression is gained about the height (elevation) of features in that area and the tombs (see below).

The quality of the photographs in the archive (no. 5) is (still) very good and the scans have a better quality than the plates in the publication; they are very helpful in interpreting the excavation of S3038 and S3111 (and the area around them). The photocopies of Emery's map (no. 6) are in bad shape and are much more difficult to interpret. However, they were taken prior to Emery's excavation of S3038 (and S3111) as only the burial chamber of S3038 was exposed (Emery 1949: 91–92). There is no record of who took these aerial photographs.

In the first months of 1956 Emery excavated S3507, located at the south side of the Archaic cemetery. On 3rd March, work at S3507 was finished, and in preparation for his next season, Emery surveyed west and north of S3038 (see below).

Reference material

In 1961 Emery (1961: 144–146) presented his hypothesis about S3038 being the precursor of the Step Pyramid. The drawing used to support Emery's idea (*cf.* Emery 1961: 145, fig. 85) is flawed: the scale of the core of tomb S3038 is incorrect and the two later platforms (Emery's periods B and C) were neither explained nor shown. The argumentation for this hypothesis was weak at the time, and since then no additional evidence has been found or brought forward. Emery's visual presentation of the stepped core was (and still is) powerful, most notably in the photographs that were used in both publications (Emery 1938b: pl. LXXVII; Emery 1949: pl. 35A, 35B).

Emery's idea about the role of S3038 in the development toward the Step Pyramid was not widely accepted. His most ardent supporters were Iorwerth Edwards and Rainer Stadelmann (Edwards 1993: 24–26, figs. 3 and 4; Stadelmann 2005: 365–367), while most other scholars (*inter alia* Helck 1984: 387–400; Hendrickx 2008: 78; Kaiser 2008: 359–360; Lacher-Raschdorff 2014: 213; La Loggia 2012: 130–132; Lehner 1997: 81; Tavares 1999: 700; Verner 1997: 42–43) merely mention the concept of the core of tomb S3038 in some form or another. The extraordinary character of this tomb was widely understood, but appears to be focused on the stepped core (Lehner 1997: fig. on page 81; repeated by Hendrickx 2008: fig. 17). The staged construction and the possible function of these stages have received less attention; most scholars have accepted Emery's partition into three periods (*inter alia* Edwards 1993; Hendrickx 2008; Lacher-Raschdorff 2014; La Loggia 2012; Lehner 1997; Stadelmann 2005). Werner Kaiser (2008: 353–366) studied the structure of S3038 thoroughly. His focus was on the construction of mounds in the Lower Egyptian mastabas, an idea that – as he stated – goes back to Emery's excavations. Kaiser (2008: 359–360) accepted the stages introduced by Emery, which he saw as changes in design: "Die Gründe für diese mehrmaligen Planänderungen sind freilich umso schwerer mit einiger Sicherheit zu erfassen, als ….. keine vergleichbaren Befunde bekannt sind.". But he

argued that the stepped core was not a precursor to the step pyramids (Kaiser 2008: 362).

Edwards (1993: 24–26, figs. 3 and 4) proposed that the stepped core of S3038 represented a mound over the burial chamber. In earlier tombs the mound had probably been made of sand and rubble and these were not always interpreted correctly by the excavators. This latter remark reflected an earlier comment made by Emery (1958: 73)[3] when excavating S3507: "Traces of this earthen tumulus have been previously noted in other tombs at Sakkara, such as No. 3471; but owing to their ruined condition their real character was not recognized." The purpose of the construction in stages was not discussed.

Stadelmann (2005: 366) saw the stepped core of S3038 as "… an oblong step pyramid …" which was hidden in the mastaba under a fill of sand and rubble. Based on these observations and the size of the tomb at Abydos, he identified the tomb as the royal burial of king Adjib (Stadelmann 2005: 367). The stepped core was also identified as a tumulus over the burial chamber and he too referred to the idea that these tumuli were more common: "… not always properly observed …", also referring to Emery's remark (Stadelmann 2005: 365).

Both Edwards and Stadelmann failed to address a possible relationship between the stepped core and the later phases of the construction (Kaiser 2008: 360). Stadelmann's remark about the fill of the core – on top of the step pyramid – omits the careful construction of two platforms on different levels and doesn't explain the purpose of the two entrances on the short sides of the tomb.

Kaiser (2008: 362) questioned the strength and validity of Emery's observation, so long after the actual excavations. For him the changes may have been related to the sudden death of the owner (Kaiser 2008: 355) (see below).[4]

A re-evaluation of the information

The publications provided data of a mostly quantitative nature. Factual data on topics like the height or state of the mastaba walls, the height and state of the cross walls, the actual construction of the external stairway or the roofing of the subterranean chambers are missing from the texts. Also, the openings in the north and south walls of the mastaba were given little attention; despite the fact that it was the first time such features were found in an Early Dynastic tomb.[5] The bias of the reports lies with the structure in period A, rather than the later stages, Emery's periods B and C. From the successive publications (Emery 1938a, 1938b and 1949), it is clear that Emery found the stepped form of the core the most significant element of the tomb and this was reflected in his presentations. Very little attention was given to the possible background or purpose of the later stages. Emery (1949: 83) had no explanation for the changes, so he let it rest completely.

The drawings of the tomb (Emery 1949: pls. 21–26) show several inconsistencies, which the text does not clarify. The drawing of the section of the external staircases (Emery 1949: pl. 26, section CC) presents a situation that is different from every top-plan of the tomb (Emery 1949: pls. 21, 22, 23 and 25). Plate 26, section CC (probably based on a sketch in the notes, see above), shows how the staircase starts well beyond the outer wall, and how the wall "floats" without any support above the gap, while a portcullis stone appears in or under the brick wall. At first glance, it appears to be a proper external stairway providing access with the wall in place. However, none of these features were shown in any of the other drawings, plates 23, 24 or 25. The text specifically states (Emery 1938b: 459; Emery 1949: 88) that the east wall was built over the stairs and that access was from then on only possible from the top. My conclusion is, therefore, that plate 26, section CC, should be treated with caution because of its inconsistencies.[6]

Clear evidence for the construction of the roof over the subterranean rooms was apparently not found. The information provided in both reports is contradictory on essential points and should be treated as interpretative. In the preliminary report, traces of timber roofing for two storeys, on the east and west wall of the burial chamber were mentioned (Emery 1938b: 457). Nothing was said about any roof over the granary or the southern room. It is not clear what information Emery (1949) used to draw the roof constructions in plate 24. In the final report, the double storey in the burial chamber was merely mentioned but not explained. There were traces of wood on the ledge (*ca.* 3.1 m above the floor) in the granary (Emery 1949: 85). The top of the stepped structure was intact (Emery 1938b: 84), which led Emery to the conclusion that this feature did not function as a roof over the burial chamber. The roof over the southern room remained elusive; nothing was found and Emery even thought that the top of the wide platform could

[3] The field notes of Emery's excavations of tombs S3500–S3507 (1946–1956) contained no detailed recording of soil deposits (Ormeling 2017a: 10). Usually the deposits were called redime, without any further detail. If this methodology reflected the way Emery worked in the 1930s, as the notes on S3038 suggest, Emery's comment (from 1958) on what he may have found in earlier tombs was apparently based on memory only and not on contemporary notes.

[4] However, innovation and individuality have been proposed as alternative explanations (Lacher-Raschdorff 2014: 213; Ormeling, *forthcoming*: 620–622).

[5] Similar openings were found 10 years later in tomb S3503 (reign of Merneith). Although the details of the openings were different in both tombs, the similarities are interesting (see below).
Tombs S3038 and S3503 are the only tombs of the First Dynasty that have openings in the outer wall of the tomb body – that were sealed at some moment close to the burial – in the body of the superstructure.
The "royal tomb" at Naqada has similar openings in the inner core of the tomb body.

[6] Based on the aerial photos (see below), it appears that the stairway did not extend beyond the east wall of the mastaba. Despite the low resolution of the aerial photo, taken in in 1946, this tentative observation seems possible (see fig. 7).

have been used as roof support. However, no traces were found on the plaster of that shelf (Emery 1938b: 87).

Both platforms were carefully constructed, with a fill of sand and/or rubble between retaining walls and overlaid with a mud brick pavement. They required considerable effort to construct and were equipped with features that suggested they had different functions. For the lower (Emery period B) and higher platforms (Emery period C), the layout of the northern part differs from that of the southern part (Emery 1949: pls. 23 and 25). On top of the higher platform, brick walls were constructed, of which *ca.* 45 cm remained standing (Emery 1949: 90). There were stairs giving access to the higher platform which were flush with the top of the step construction. The stairs were described in detail in the final report, but nothing was said about them being open or closed (Emery 1949: 90). In the preliminary report, they were reported as open: "The central niches on the north and south sides were left open as doors to the stairways which ascended to the magazines. ….." (Emery1938b: 459). However, the situation in plate 31B (Emery 1949) shows that at least the southern staircase was found blocked.

Construction

My re-examination of the archaeological evidence starts with a thorough look at the stratigraphic relationships between the structural elements. The most likely relationships are presented in chart 1, in a way reminiscent of the so-called Harris matrix (Harris 1979) (which it is certainly not!) and inspired by Von Pilgrim's "stratigrammes" (Von Pilgrim 1996: 25–27). Each block in the diagram presents a set of construction activities. The logic of the construction practices dictated the order of a set: *i.e.* which (set/group of) activities came before the next. Caution is needed, as all this is based on old records without clear and factual data. The stratigraphic relationship between the lower platform and the mastaba walls is difficult to determine. The excavator was quite clear that he thought that the platform was first, but offered no explanation (Emery 1938b: 458; Emery 1949: 87–88). The section drawings of the lower platform (Emery 1949: pls. 24 and 26) do not provide conclusive evidence for Emery's premise.

The stratigraphic approach leads to a more systematic order in the construction activities and thus to a more logical phasing (tab. 1). The new proposed phasing presents a remarkable regular construction sequence. A sequence that is easy to explain, in contrast with the excavator's opinion (Emery 1938b: 455; Emery 1949: 82). It shows a singular design, ready before construction started and with all the features preconceived; the actual construction activities were executed in successive phases (*contra* Emery 1938a, 1938b and 1949; Kaiser 2008: 360).

The logical order of most of the activities is straightforward, but for three construction elements it was not. The time window of building the cross walls in the subterranean rooms and/or the roofing of these rooms is wide, varying from the middle of phase 1 to beyond phase 5 (tab. 1). More significant is the ambiguity over the construction of the mastaba walls. From the perspective of construction practices, it can be argued that the mastaba walls were constructed first and that the lower platform was later built inside these walls (see below). Although direct stratigraphic

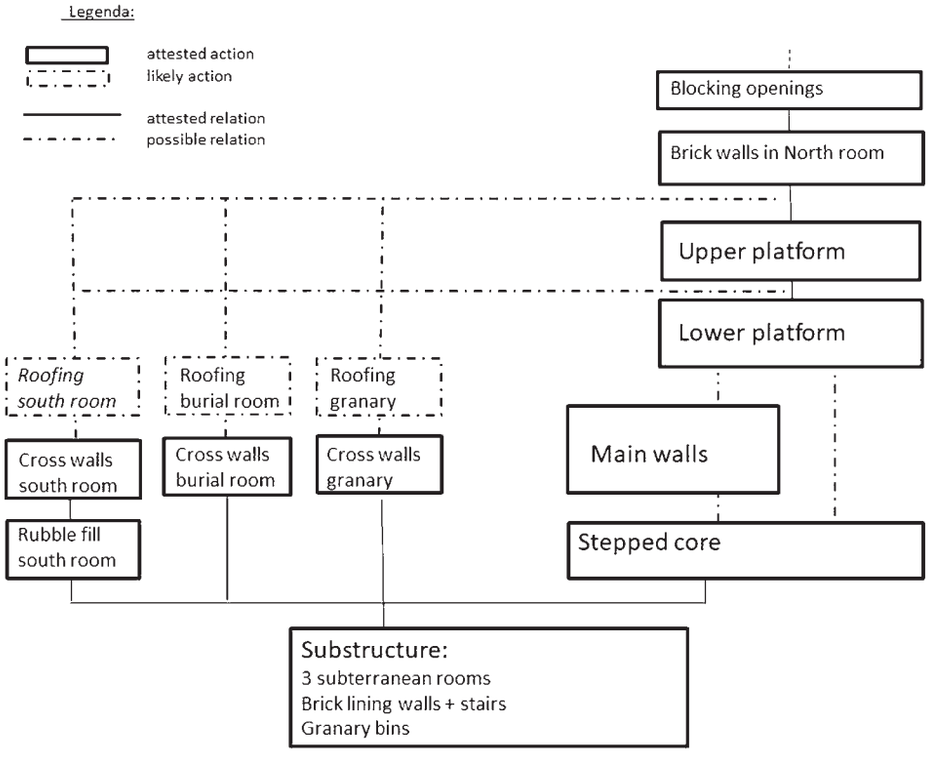

Chart 1 The stratigraphic relationships between construction elements of S3038. Note: in this matrix only the sequence of activities are shown; activities on the same horizontal axis were not necessarily concurrent

	Attested sequence in construction	Unattested elements
Phase 1	3 subterranean rooms, including inside brick walls: construction of granary bins	
Phase 2	Stepped construction against walls of substructure	
Phase 3	Mastaba walls, at correct distance around stepped core	Cross walls subterranean rooms Roof constructions
Phase 4	Construction of lower platform, between core and walls	
Phase 5	Construction of 2nd level platform inside mastaba walls	Ramifications (?)
Phase 6	Upper cross walls (north room), blockings	
[Phase 7]	Unknown construction parts	

Tab. 1 Proposed phasing of tomb S3038, based on the known stratigraphic relationships between the construction activities

evidence for both assertions is lacking, in this study the starting point for the new proposed phasing will be that the mastaba walls were constructed first.

The socio-political landscape

Access to the elite cemetery at Saqqara was strictly controlled and limited to the highest levels of society. At the time of construction of S3038, in the reign of Adjib, there were only 10–14 mastabas present in a vast space along the escarpment.[7] This fact alone leads to two basic assumptions: 1. the owner, as a high level official, had a free choice of design and 2. he had unlimited resources at his disposal for the construction of his tomb at this desolate location far away from such resources.

Tomb S3038 may be the only tomb from the Early Dynastic Period where a person's name – in this case Nebitka – can be tied to the structure instead of to a (movable) grave good (Emery 1938b: 455; Emery 1949: 82); which is a convincing argument for ownership (see below). Based on the seal impressions of kings Den and Adjib, it can be assumed that construction of the tomb was undertaken during the reign of the latter king.

Design

In its completed state, the tomb displayed all the essential features of a First Dynasty tomb: a spacious substructure resembling a house (a "Modellhaus": Lacher-Raschdorff 2014: 209), a tumulus (or primeval mound) over the burial chamber, store rooms to provide for life in the hereafter and a closed superstructure – with a niched palace façade – that segregated the realm of the dead from that of the world of the living. Although its form and execution were exceptional, the tomb also showed continuity, albeit in an innovative design.

Some features were part of a tradition in elite tomb construction; and not only at Saqqara. With hindsight,[8] features like the tumulus (S3507, reign of Den, and possibly S3471, S3503 and S3504), the openings in the short walls (S3503, reign of Merneith), additional mud brick walls in the burial chamber (S3506, reign of Den) and a double storey above the burial chamber (S3036 and S3506, reign of Den) had also been used in earlier tombs.

Features that were really innovative were the stepped form around the core, the platforms, the (visibility of the) successive phases in the construction and the detailed engineering of the features.

Tomb S3038 was also at the end of a tradition; it was one of the final elite tombs of the First Dynasty that showed architectural features like a tumulus, brick walls in the burial chamber and openings in the outer walls. The innovations of tomb S3038 had no follow-up, not in the reign of Adjib nor in later reigns.

Substructure

The depth of the subterranean rooms was relatively shallow, especially when compared to their predecessors in the direct vicinity like S3035 (*ca.* 12 m), S3036 (*ca.* 5 m) but more or less equal to S3111 (*ca.* 2.5 m), The storage rooms were above surface level, the brick retaining walls of the subterranean chambers stood *ca.* 2.25 m above the surface. Two staircases gave entry

[7] There are three or four mastabas assigned to the reign of Adjib (Hendrickx 2008: 62, tab. 1; Ormeling, *forthcoming*: fig. 8).

[8] In 1937, at the time of excavations, most of these attributes were completely new discoveries in Egyptology; as only a handful of Early Dynastic tombs had been excavated.

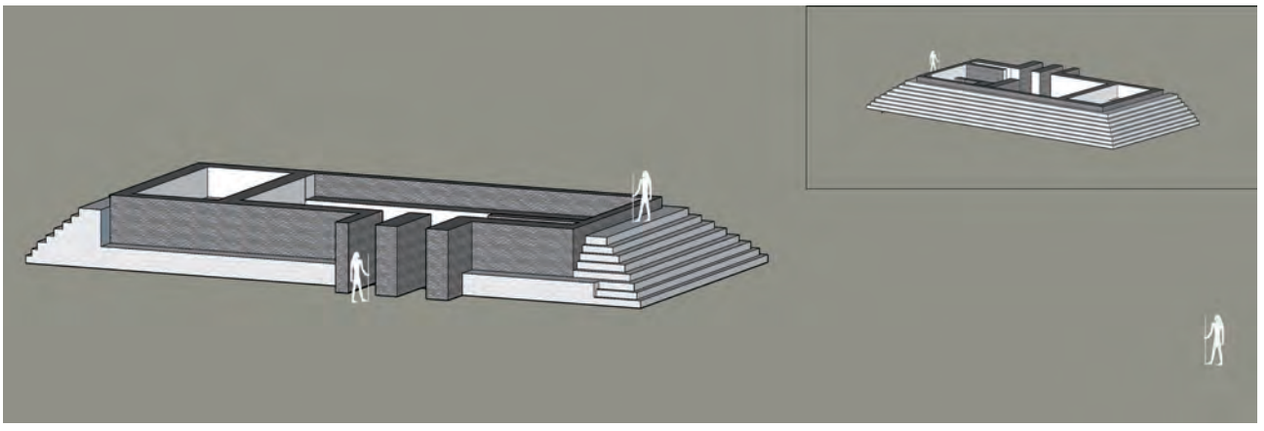

Fig. 1 The structure of S3038 at the end of phase 2: the substructure with its mud brick retaining wall and the stepped core construction built against it (main view is looking west, insert is looking east) (visualisation M. Ormeling)

to the substructure, as usual in an east-west direction. One stair went all the way down to the bottom of the burial chamber; the other one provided (probably) access to a room above this chamber (Emery 1949: 83).

The height of the brick walls of the substructure made a supporting structure at the surface necessary. The outer walls of the substructure were by themselves not sturdy enough to take the lateral forces created by the weight of the roof construction (see below).

There is no clear argument that allows us to place the construction of the cross walls inside the subterranean chambers to a precise time frame (tab. 1). However, it can be assumed that they could have been constructed in an earlier stage, prior to Emery's period C. Similar walls have been found in other tombs, for instance S3506 at Saqqara (Emery 1958: 39–40). Granaries in tombs were not unknown;[9] those of S3038 were a remarkable and innovative way to provide for cereals.

The details of the roof construction over the three subterranean chambers are unknown. However, the roofing of these subterranean chambers would not have been extraordinary or difficult for the constructors. Emery presented a possible solution in plate 22 (Emery 1949). The proposed solution is not supported by the evidence presented in the excavation photos: plates 28A and 28B (Emery 1949).

Superstructure

The most relevant observation regarding the superstructure may be the continuity in its construction, based on a singular design. There were no radical changes in the different periods leading to three different "buildings" (*contra* Emery 1938b: 455; Emery 1949: 82–83; Kaiser 2008: 360); the layers of mud plaster marked the successive steps in the construction process.

Modern tools enable a 3D reconstruction of the structure for each proposed phase. For each of the phases a virtual reconstruction was rendered, drawn by the author and based on the dimensions as provided by Emery (see fig. 1).[10] The figurations (an outline of Hesyre)[11] are inserted for scale (height 171 cm). The walls are shown in brickwork as a drawing convention to enhance visibility; in antiquity all walls and most surfaces were plastered and painted.

Against the retaining walls of the substructure, a stepped construction was built (fig. 1). The steps were 20 to 25 cm wide and high and consisted of bricks over rubble secured with a layer of plaster. A continuation of that form, to create a "step pyramid", as Emery (1961: 146, fig. 85), postulated, would have required an immense supportive construction over the substructure; of which nothing has survived. From a construction point of view, this concept seems unlikely.

Another scenario could have been that the steps were a support construction for the brick walls of the substructure. These walls rose to a height of 2.25 m above the surface and some form of support was necessary to deal with the lateral forces inflicted on them by the weight of the roof cover and the envisaged platforms. This would account for the lack of the stepped shape on the east side, where the side walls of the stairs and the bench took the strain (*contra* Kaiser 2008: 360).

It can be concluded that the stepped form of the core was a deliberate choice by the constructors, although its true purpose still eludes us. The problem with the height of the substructure walls could have been prevented by digging a deeper pit in the rock. It is unclear why the engineers did not go for this scenario; the similar depth of neighbouring tomb S3111 may indicate that the rock at that location was of a bad quality. However, given the situation, the chosen solution – a rubble mass, contained by a cover of bricks that were coated with a layer of plaster – was a practical and manageable one.

[9] Mastaba M12 – reign of Den – had four limestone granaries in its burial chamber (Tristant 2016: 161).

[10] The reconstructions are made in Sketchup Pro 2018; the dimensions are taken from Emery's reports (1938b and 1949).

[11] I would like to express my gratitude to Elaine Sullivan, director of the 3D Saqqara Project, for her permission to use the figurine.

The lower platform may be the most enigmatic construction element of the tomb; both for its function and for its place in the order of construction.

Emery underlined his view on the order of building with his section drawings: sections BB and CC in plate 24 and sections BB and CC in plate 26 (Emery 1949). These sections only showed the construction of the platform against the stepped core. The actual construction at places north or south of the core remains unknown. The excavator assumed that the mastaba walls had cut off the platform (Emery 1949: 87), but provided no evidence or explanation.

The construction as shown by Emery (1949: pl. 24) seems impractical for a free standing platform. At the west side of the core, the lower platform was basically nothing more than an extra "step" (Emery 1949: pl. 24, section CC): a practical construction solution would have been a solid fill of bricks alongside the stepped core. Also the construction of the steps in the south-west corner of the platform (Emery 1949: pl. 23) was awkward. From the perspective of a solid construction, the platform should – in a free standing form – have been given "more body". In a scenario where the mastaba walls were already there – even if only just the bottom courses – the construction as shown by Emery makes sense; the lateral load would have been absorbed by the mass of the walls; see sections BB and CC in plate 26 (Emery 1949).

It cannot be excluded that the lower platform was constructed first, as Emery proposed: as an intermediate and free standing element (fig. 2, equal to Emery period B). The construction was simple and quick to build prior to the outer walls (within a month; see tab. 2). A reversal of the order of construction – first mastaba walls and then lower platform – would not really have affected expenditure, but would – from a constructor's point of view – make more sense. As stated above, in my opinion the provided information in the drawings (Emery 1949: pls. 23 and 24) is ambiguous and support both sequences in construction.

The function of the lower platform could have been simply structural, to disperse the lateral loads on the high walls of the substructure. However, the layout and form of its outer ends strongly suggest another function of the platform as it offered a surface for (ceremonial) activities. The platform inside the walls would have provided a secluded, access controlled, and safe area to conduct activities or to perform rituals in connection with the funeral procession or with practices in the afterlife (fig. 3). On the south side, a series of steps allowed easy access to the platform and to the substructure. The north side consisted of a large raised working area – *ca*. 7 by 12 m on the platform – sided by a lower working area at ground level.

Should this situation be considered the aim of the architects and engineers? An accessible platform

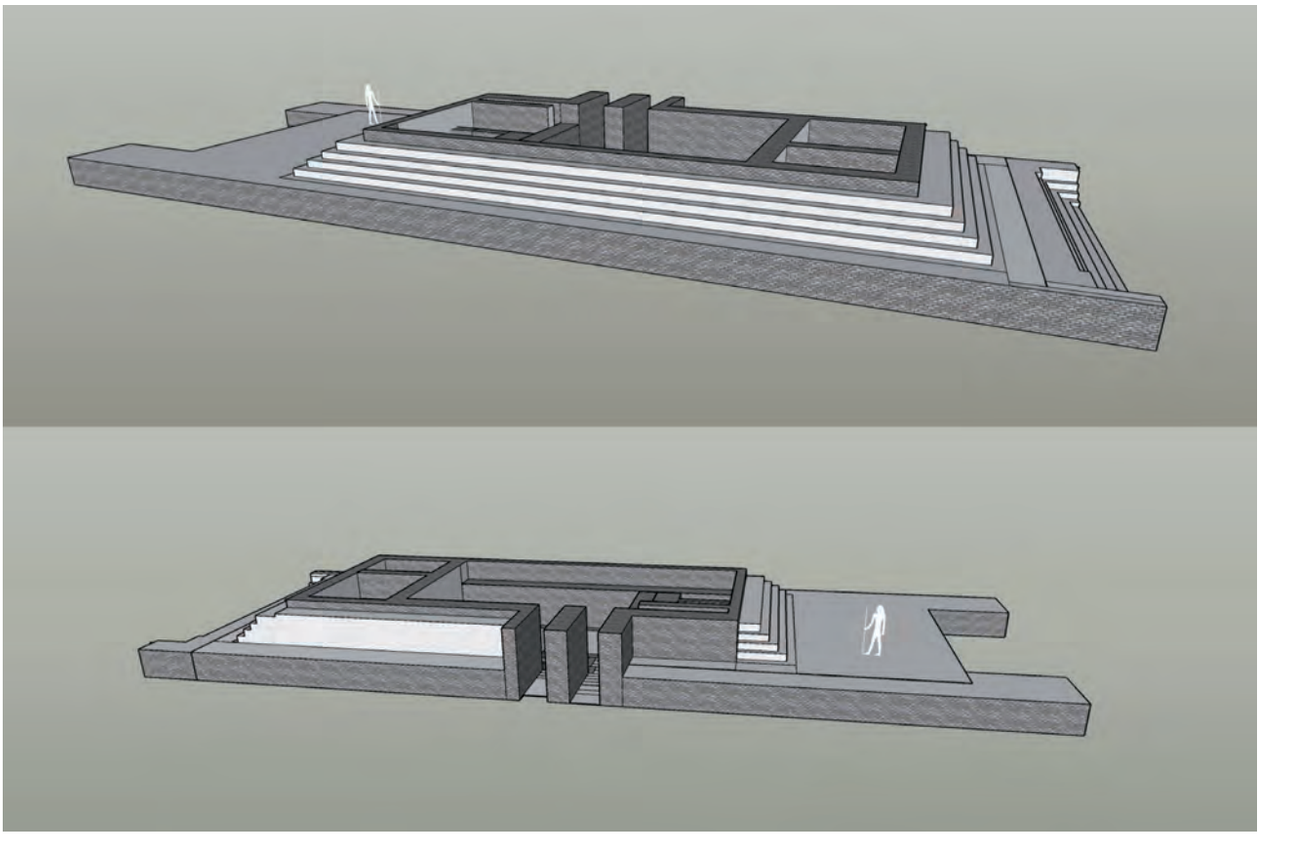

Fig. 2 The structure of S3038 at the end of phase 3, or Emery's period B. Note the "more" tumulus-like shape of the structure in this phase, but also the apparent "unfinished" state of the northern end. Upper view is looking north-east, the lower view is looking west (scale: height of Hesyre is 171 cm, courtesy of the 3D Saqqara Project)

Tab. 2 A summary of the reconstructed expenditure for tomb S3038

	Duration (calender days)	Workforce Skilled / unskilled	
Preparation	60	< 20	100 - 150
Phase 1: substructure	90	20 - 30	50
Phase 2: Stepped construction	30	20 - 30	50
Phase 3: mastaba walls	60	< 5	< 30
Phase 4: lower platform	20-25	20 - 30	50
Phase 5: upper platform	10	10	< 20
Ramifications	unknown	unknown	unknown
Post burial	~ 5-10	10	---

to work in the north and direct access to the burial chamber and storage rooms; this in preparation of the construction of the upper platform? In a free standing form (fig. 2), the layout and form would still be difficult to explain. Emery (1949: 87) had the same problem and even suggested that the ends of this platform were probably cut off by the outer walls of the mastaba; but he never explained how he came to this conclusion. The shape of the platform is unlike any known tomb of the First Dynasty. Even when one considers the innovative character of the tombs of the last part of the dynasty, it remains an enigma. The most logical explanation may be that it was a phase in the construction of a "regular" tomb (Kaiser 2008: 357).

With the platform projected within the erected mastaba walls (phase 4), the structure exhibits the characteristics of a mastaba tomb. The niched façade of the structure would fit with the general design of the large mastabas of the First Dynasty (fig. 3). The openings on the short sides, in preparation of the entrances to the later terraces inside the walls, were exceptional but not completely new. They are reminiscent of the openings in tomb S3503 (reign of Merneith). There is nothing in the data that refutes the situation presented in phase 4 (fig. 3). The height of the finished walls remains unknown; in the reconstruction, the height is set at 5 m.[12]

The situation presented in the next phase 5 – the completion of the upper platform – is again an intermediate stage between Emery's periods A and C (fig. 4). The earlier surface of the lower platform was buried under a layer of (clean) sand; on top was a new pavement of bricks to provide a clean and even surface. There was an elaborate entrance from the north and a second entrance south of the burial chamber, with dimensions fit for an elaborate funeral cortège.

Based on this image alone, one could postulate that the burial took place at this stage (see below). After the burial, the substructure would have been covered and the final construction activities of phase 6 would have been conducted: the erection of the walls in the northern part of the inside of the tomb and the closing of the tomb with mud brick blockings (fig. 5). The cross walls found on top of the pavement in the northern side (Emery 1949: 90) suggests that the space was further divided. The actual moment the openings in the northern and southern walls were closed remains unclear, but was probably directly after the burial.[13]

Ramifications and landscape

It is safe to assume that a large First Dynasty tomb complex at Saqqara North like S3038 was originally equipped with – at least some – ramifications[14] like an enclosure wall, a pavement, (probably) subsidiary graves or a boat grave (Ormeling, *forthcoming*: 622). They were not found during the excavation, probably because they were destroyed by the later structures.

The field notes state as much, but without any details (Emery 1937: January 10th–16th). A page from a sketch book shows the situation "between S3036 and S3038" (fig. 6). The sheet has no date or a clear legend; the northern direction can be deducted from the position of the offering niches (in the drawing, right), but it remains unclear whether the large structure to the right is actually tomb S3038. The sketch clearly represents a draft to be used for further work. It is to be hoped that more information on these tombs will be found in the other parts of Emery's archive (Martin 2007: 121–126). Based on the location of open pits in the aerial photo (fig. 7), and despite its legend, it cannot be excluded that the sketch represents the area between S3036 and S3111.

The impact of the intrusive tombs is clearly visible on plates 37A and 37B (Emery 1949) and on the aerial photos from 1946 (fig. 7). In 1946, the west and north side of S3038 had not been excavated or surveyed yet;

[12] The original height of the First Dynasty mastabas is unknown. The proposed height of five meters for S3038 is a premise; this would mean that the walls stood three meters over the upper platform.

[13] In the unlikely case that these stairs were left open, for instance as entrances in connection with post-burial rituals, it would have meant an open and unprotected entry to the core of the tomb; an unprecedented first in the history of Early Dynastic Egypt.

[14] The word "ramifications" was used by Emery to describe the additional features of tomb complexes in all of his publications.

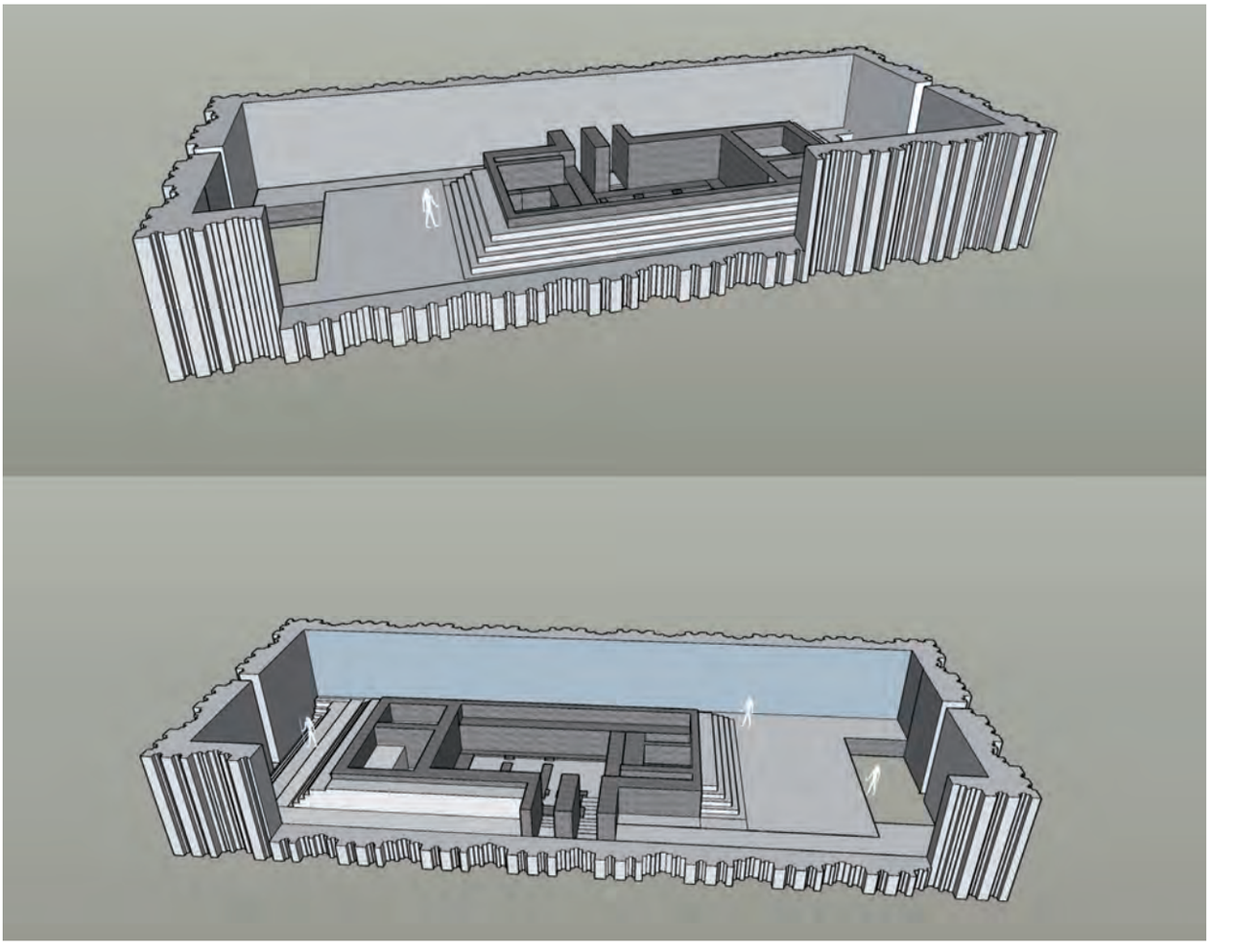

Fig. 3 The structure of S3038 at the end of phase 4, with the lower platform situated within the walls of the tomb; between Emery's periods B and C. Upper view is looking east, lower view is looking west. Note: the lowering of the east mastaba wall is a drawing convention to allow a view of the enclosed space (visualisation M. Ormeling)

this is visible on the aerial photo and confirmed by Emery's notes from 1956. On 3rd March 1956, work at S3507 was finished and, in preparation for his next season, Emery made some test pits in the north near S3038 and he surveyed the areas west and north of S3038: "Continued testing in areas K2 and J2. Nothing located but medium sized tombs of Dyn II and small tombs of Dyn III. The area of J2 is badly denuded and the superstructures appear to stand, on an average, not more than 50 cm above gebel." (Emery 1946–1956: notebook 1955–1956, March 8th).

Construction process

This section deals with the socio-economic implications of the construction process, the expenditure – manpower, materials and duration – needed to build the tomb. The details of the calculations, including an elaborate break down of the work, are given in the appendix; a summary is provided in tab. 2. The estimate is based on a reconstruction of ancient building processes and provides a tentative but valuable view on "the costs" (in a wider sense) of building this structure in antiquity.[15]

The architects and constructors of the First Dynasty were experienced professionals. It is safe to assume that the construction was prepared in advance. Estimates of material requirements, the size and composition of the labour force, and planning schedules would have been available before the start of the construction. The objective was a brick mastaba tomb, based on one singular design of mostly known features and at a familiar construction site.

Construction would have started during the life of the owner. The fine execution of the design and the apparent complete state in which S3038 was found, suggest that the tomb was ready at the time of the death of the owner (*contra* Kaiser 2008: 355). Obviously, it remains impossible to determine the length of time between termination of the work and the moment of the actual burial.

[15] For a discussion of possible constraints for limitations of a reconstruction model, see Ormeling (2017b: Appendix B).

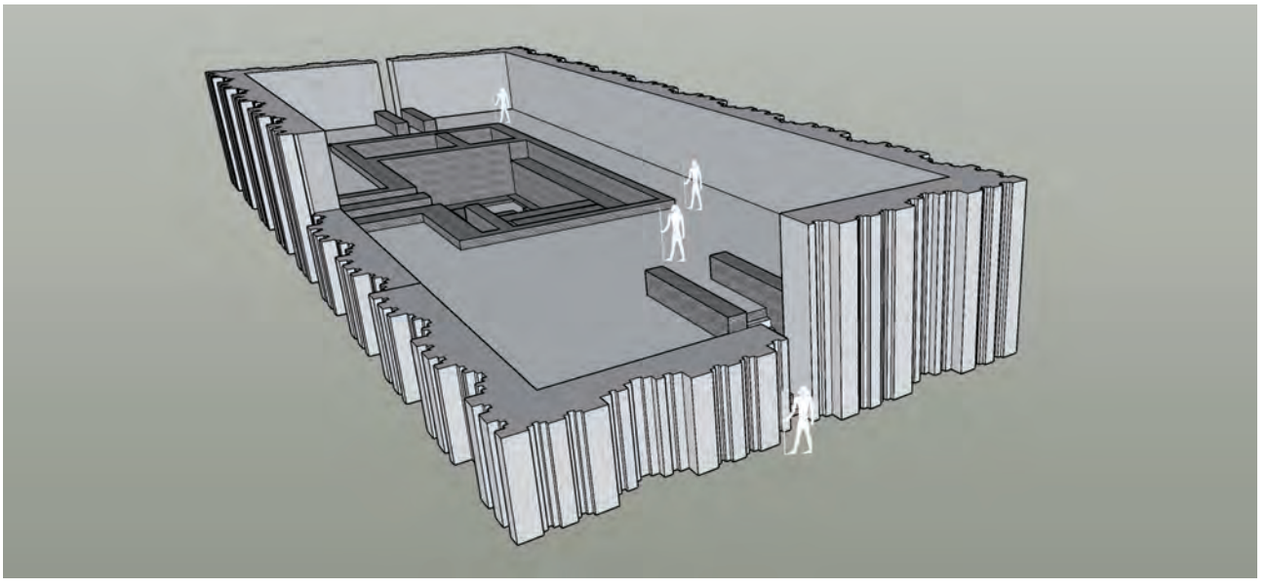

Fig. 4 The structure of S3038 with upper platform finished (phase 5, just prior to Emery's period C). Looking south-west, with artificial lowering of the eastern wall to allow a view of the enclosed space (visualisation M. Ormeling)

Construction would have stopped at a predefined stage when the tomb was considered fit for burial; most likely after completion of the upper platform and with the substructure still (partially) open; at the end of phase 5 (fig. 4). Materials for finishing the construction – like for the closing of the burial chamber, bricks for the latest activities and the sealing of the openings – would have been prepared and at hand in the immediate vicinity. Large parts of the ramifications would also have been completed; although this is mostly conjecture.

The actual construction of the tomb up to that state would have taken seven to nine months, of which *ca*. three months were required for the superstructure (tab. 2).[16] It would have taken a crew of *ca*. 30 skilled constructors, who were assisted by a group of 20–50 unskilled labourers. Only at the start would a larger group of 100–150 labourers have been required to collect the raw materials (mud, water, wood), to make the bricks and transport all materials to the construction site. This time line, even considering the potential margins in this reconstruction (note 15), contradicts

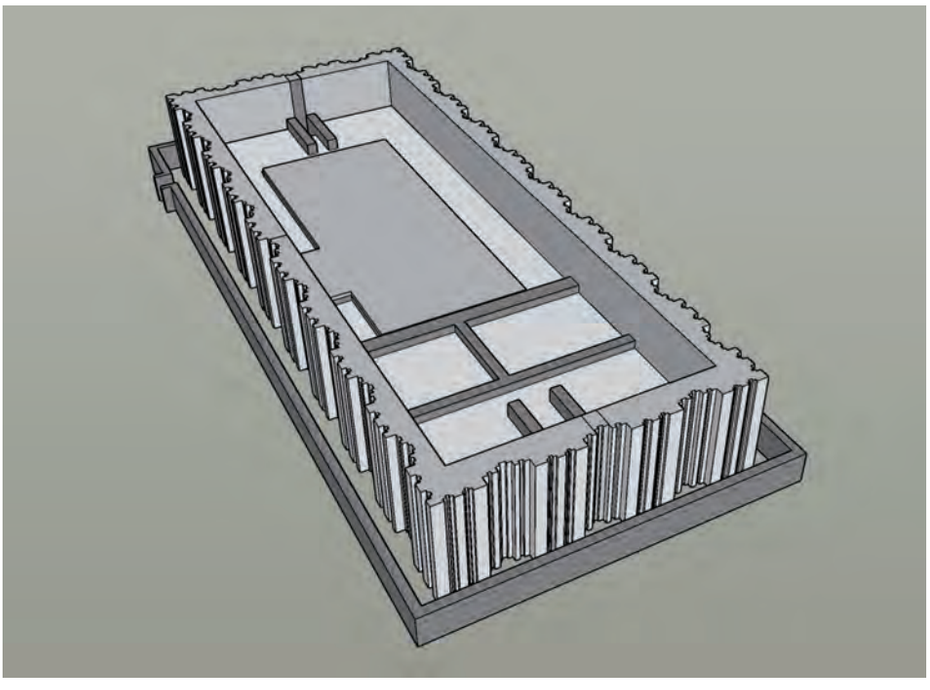

Fig. 5 An interpretation of tomb S3038 after the burial activities; substructure covered, openings sealed and – for perspective only – a basic reconstruction of an enclosure wall (visualisation M. Ormeling)

[16] La Loggia (2012: 258–259) estimates a construction time of *ca*. 15 months, with all activities successively.

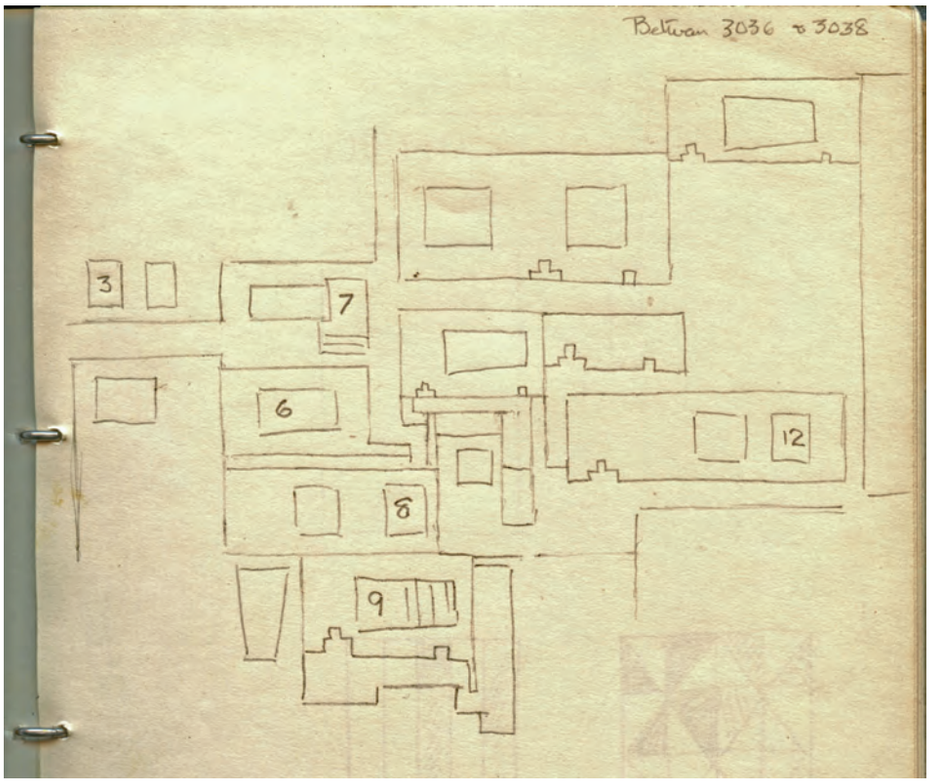

Fig. 6 A sketch, part of Emery's field notes, showing the situation between tombs S3038 and S3036. The niches in the mastabas show that east is down in the sketch. The larger tomb at the right may be S3038, although S3111 may be more likely. No references to the numbers next to the shafts have been found (courtesy of Isaac Newton Trust, Cambridge University; after scan EA_H_001_014; contrast and highlights have been adjusted by the author; the empty lower part of the original sheet was cropped by the author)

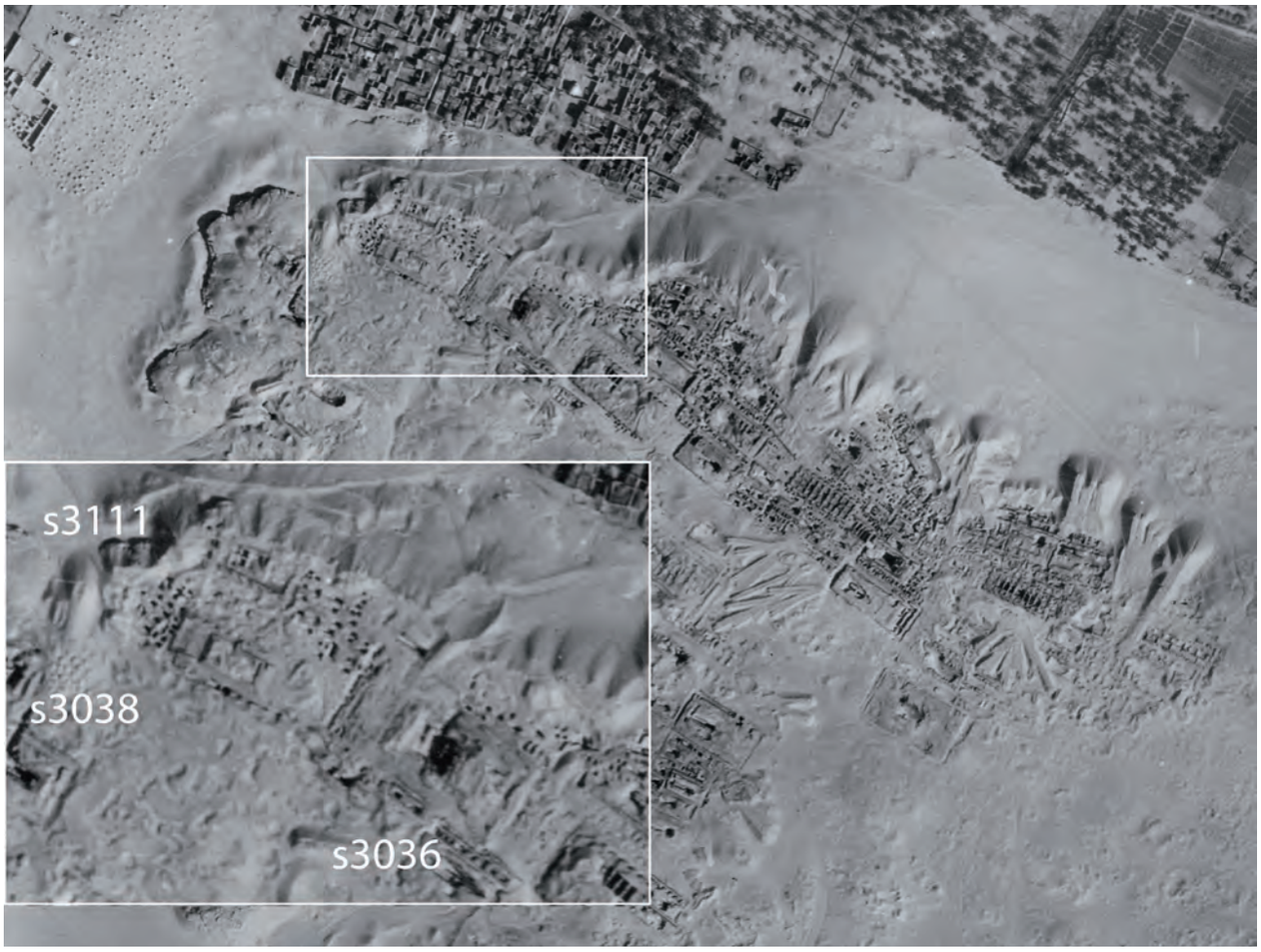

Fig. 7 Aerial photo of the northern part of the Saqqara plateau. Clearly visible is the situation in January, 1946, around tombs S3038 and S3111 (courtesy of Isaac Newton Trust, Cambridge University; after scan EA_Q_085; the aerial photo has been cropped and contrast and highlights were adjusted by the author)

the proposed ideas of radical changes in design (Emery 1938b: 455; Emery 1949: 82–83; Kaiser 2008: 356–361); an idea often correlated with an extended period of construction.

This time line shows a marked difference from the larger tombs from earlier reigns (Ormeling 2017b: 415–417, fig. 3). The design of S3038 was relatively simple and efficient; the dimensions were smaller, the brick walls were not very thick and the platforms were basically just sand and rubble. Besides the phasing and extra plastering, there were no complex construction elements; even the granary bins were made merely from bricks and then plastered. In modern terms: tomb S3038 was a (very) "cost-effective" construction.

With the expenditure estimates for each phase, it is possible to have a closer look at the decisions the owner and constructor would have faced in variable circumstances.

The burial could have taken place before the external staircases were closed off by the mastaba walls. Two arguments argue against this. The structure would hardly have looked like a tomb and the post-burial activities would have taken up another 100 days (tab. 2). The structure was at that time just a large mound on the surface (fig. 1). It is safe to assume that – in life – the owner, a member of the state's highest levels, would not have considered the situation lightly.[17]

Given the assertion that the external stairway was not used for the burial, why was it constructed at all? The lack of a reinforcement to support the mastaba wall above the gap of the entrance, clearly visible in tombs like S3500, S3505 or S3506, brought the excavator to the conclusion that the entrance was probably filled before the erection of the wall (Emery 1938b: 459; Emery 1949: 88). It can be ruled out that there was an opening in the eastern wall in front of the stairway like the two openings in the north and south walls; an experienced excavator like Emery would have noted that. Was it meant as a ritual entrance for the deceased or was this after all a "radical change"?

A change in design seems unlikely, when the situation in S3503 is considered. Already in the reign of Merneith, an entrance into the mastaba body was apparently acceptable. The layout of S3038 differed in details, like a raised platform and elaborately constructed stairs, but was in principle a copy of S3503. Such an elaborate construction to provide access for post-burial ceremonies, in case of an early burial, through the eastern staircase and after 100 days additional construction activities, seems unlikely. The logical conclusion is, therefore, that the stairway was probably a ritual passage way for the deceased.[18]

For a burial at a time after the lower platform was built within the mastaba walls, things could have been different. The tomb at the end of phase 4 would have had the characteristics of a "proper" tomb (fig. 3) and the post-burial activities would "only" have taken two weeks more than a burial after completion of the upper platform. This scenario may be less likely than the one involving the upper platform, but it cannot be ruled out.

Structure, function and practices

Although the precise nature of the funerary practices and rituals from the Early Dynastic Period is hardly known, the extraordinary construction of this tomb provides a unique opportunity to have a closer look at possible relationships between the tomb structure and the funerary elements. The successive steps in the construction were clearly defined and this allows a step by step interpretation of their function in either the funerary procession or as attributes to facilitate existence in the afterlife.

The process of mummification was probably already developed, although evidence is scarce for this period (Ikram – Dodson 1998: 107–108; Marshall 2014: 54–55). The ritual cleaning of the body and other treatments to prepare the body for the afterlife – like anointments – were mostly performed in temporary shelters; evidence seems to indicate that it was usually not performed within the limits of the tomb (Ikram – Dodson 1998: 107; Van Roode 2003: 2). The ceremonial Opening of the Mouth is associated with the tomb and was probably performed within the boundaries of the tomb complex.

A relationship between the upper platform and mortuary practices seems obvious, but remains speculative, as there is no clear proof. Also, the lower platform may have had a ceremonial role, but may be easier to explain as another attribute to aid the deceased in the afterlife.

The lower platform – with the top of the stepped core still visible – formed an extended primeval mound over the substructure (Stadelmann 2005: 366),[19] within the contours of the tomb body (figs. 3 and 4).

Besides this, the exceptional layout of the surface of the lower platform suggests another, more ritual purpose. Considering that shape and form represented real-life attributes in the afterlife, one could speculate about a similarity to the purpose of the so-called model estate associated with tomb S3357 (reign of Hor-Aha) (Emery 1954: 171–173, pls. LVII–LXVI). One could imagine a docking bay with a working and storage space on the north side, and an entrance to the owner's "mansion" on the south side. This premise has no comparable examples from the Early Dynastic Period. This construction element was then ritually buried under a layer of clean sand (Emery 1949: 88) and a pavement; this points to its importance in the tomb complex.

[17] Even in death, such an idea would have been inconceivable; why would an heir or successor have gone to such lengths to construct a tomb for his already dead predecessor?

[18] However, even in the unlikely situation that the entrance remained open below the wall of the mastaba, the questions about the purpose and function of the platforms still stand (see below).

[19] *Contra* Lacher-Raschdorff (2014: 212), who sees the mound in S3507 as a protection against robbers.

While the lower platform gives the impression of a working area, the arrangement of the upper platform provided a large, clean and secluded space within the mastaba walls. It can be assumed that the upper platform also symbolized a primeval mound over the burial chamber and other parts of the substructure.

It remains unclear whether the surface of the upper platform was used for ceremonies before or after the cross walls were erected on top. One possibility is that the open space on both sides of the burial chamber was used for ceremonies during the actual burial and that the north side was later divided into separate rooms/chambers. Alternatively, these rooms could have been part of the ceremonies and constructed before the actual burial. When, indeed, the walls formed rooms, they could have been additional storerooms, as the excavator postulated (Emery 1949: 88).

On the other hand, they may have been part of a more ceremonial installation. One could speculate that the space within the mastaba walls may have been used as a serdab or even as a kind of sanctuary – reminiscent to the chapel in the northern part of the later tomb S3505. However, none of these options are supported by the evidence.

The walls on top of the upper platform were probably not built to support the mastaba outer walls; such support walls would have been sturdier and would have been mirrored in the south. No evidence for a support structure was found in the south part of the tomb.

The wider stairs at the north side may suggest the importance of the northern side, also visible in tombs like S-X and S3338. All in all, it is hard not to assign a ceremonial function to the upper platform.

After the funeral, the substructure would have been closed. Given the importance of mounds in this tomb, it can be assumed that the roof construction of the substructure became part of the tumulus and was likely also equipped with a brick pavement. The lack of traces of a construction on top (Emery 1949: 84) suggests that no cross walls were erected on top of the roof of the substructure (Emery 1949: pl. 25). After the openings in the north and south mastaba walls had been closed by brickwork; it seems unlikely that the tomb body would have been accessible to the living (see note 13).

Armed with the data gained from the construction of tomb S3038, it is possible to re-evaluate features from other First Dynasty tombs at Saqqara.

A brick top mound was attested in the earlier tomb S3507 (reign of Den), and a mound or tumulus over the burial chamber can also be recognized in the extended walls of the burial chamber of tomb S3111. The shape of the tumulus in S3507 was clearly rounded, as opposed to the rectangular mounds in S3038 and S3111 (both reign of Adjib). The so-called "double storey" over the burial chamber of S3038 (Emery 1949: 85) shows similarities to the construction of tombs S3035, S3036 or S3500 and – tentatively, in the sense of a double cover – to the royal tombs at Abydos (Dreyer 1991: 93–104).

The openings in the northern and southern walls as an access to the burial chamber existed also in S3503, but were not seen in other tombs. It is tempting to speculate about a ceremonial use of the spaces inside the mastaba walls for this tomb as well (*contra* Emery 1954: 140).

The external staircases are generally understood as a means to finish the tomb in advance and to facilitate the burial. However, tomb S3038 was not the only tomb from the second half of the First Dynasty that demonstrated that other factors were at play: the burial chambers of tombs S3111 and S3338 could only be accessed through the roof (S3111) or before the outer walls were finished (S3338).

Discussion and conclusions

Tomb S3038 is truly unique and very much one of a kind. The structure combined remarkable design features with an extraordinary construction practice. The stepped core was – in all likelihood – not the precursor of the later step pyramids; the under-exposed platforms inside the mastaba walls – little understood at the time of excavation – are probably the relevant key to the tomb's exceptional nature.

A re-evaluation of all available information, based on modern archaeological methods and concepts, provides new insights into the tomb structure. In the eight decades since the tomb was excavated, much more information about the early dynasties has become available. The new insights, derived from "old" data, provide the opportunity to address other issues than those raised in the original publication by the excavator. With hindsight, we may comment on Emery's conclusions and interpretations. However, it should be remembered that in early 1937 – when tomb S3038 was excavated – little was known about the tombs of the Early Dynastic kings and high officials; almost every new discovery exposed new and unknown elements.

A study of the "stratigraphic" relationship between the construction elements shows that the tomb was constructed on the basis of one preconceived singular design; there were probably no "different buildings" as a consequence of "radical" changes in design.

The tomb showed design features that were quite common (for the First Dynasty): a tumulus over the burial chamber, an elaborate interior design of the burial chamber ("Modellhaus"), subterranean storerooms and a niched façade that secluded the inner tomb elements from the outside world. Rare but earlier used attributes, like the openings in the mastaba walls and the granaries, were re-introduced and these were fused with completely new features like the raised platforms.

All this was carefully constructed in brick and protected with intermediate plaster layers; which proved to be very advantageous for their preservation.

The phasing was probably not much more than a construction issue; building in successive steps has been a necessity for constructors of all times. The uniformity of the bricks in all phases of this tomb (Emery

1938b: 455; Emery 1949: 82–83) suggests that the bricks were made in one action: one mixture, one set of moulds, one original source of mud and a comprehensive labour organisation to fulfil one single objective: to build the tomb according to a preconceived design and schedule. A reconstruction of the expenditure factors demonstrated the relatively short time it would have taken to build the tomb. However, possible time intervals between the phases are momentarily impossible to reconstruct.

Although exceptional in design, the construction of the tomb is relatively simple in terms of materials and construction techniques; it was a very cost-effective tomb. It was not meant as a hasty construction due to time constraints, the professional construction crew made well-considered decisions on dimensions and materials (*contra* Kaiser 2008: 355).

The combination of unique architecture, outstanding construction practices and careful excavation, with attention to detail, provides us with an opportunity to study the possible relationships between tomb structure and mortuary practices. The layout and execution of the upper platform (fig. 6) indicates a function of this phase in the funerary ceremonies, especially when one considers the purpose of the openings in the outer walls of the mastaba body. One can speculate about a function reminiscent of the royal enclosures. In association, similar features in other tombs, less clear in design or excavation detail, can now be – tentatively – connected with such ceremonies.

The purpose and function of the lower platform (fig. 3) remain enigmatic. It was probably constructed after the mastaba walls were erected (*contra* Emery 1938b: 458; Emery 1949: 87–88). A construction purpose, to support the walls of the substructure, cannot be excluded. However, its exclusive layout suggests the platform had a purpose beyond merely structural. The ritual burial of this platform suggests a purpose for the afterlife of the deceased. One can speculate on a distant likeness to the Model Estate associated with S3357.

The unique and creative nature of the tomb did not become part of a tradition. Tombs dated to the same reign – S3111 and S3338 – or later reigns – S3120, S3121, S3500 and S3505 – were all very different. Creativity and individuality were apparently more important than tradition (Lacher-Raschdorff 2014: 213); every individual owner had a free choice in the commissioning of his (or her) tomb. The differences in size of the tombs should probably be read as constraints on the availability of resources, in combination with the status and accumulated wealth of the person. This suggests that the tomb was built for the official Nebitka, whose name and titles were found in the tomb (Emery 1938b: 455; Emery 1949: 82). The unique design and the efficient execution point to decisions made by an individual and a maximum use of resources. As Ellen Morris (2007: 178–179) pointed out, the name on a seal impression on a grave good attests mainly to the person responsible for the production and/or deliverance of that container. However, it is hard to imagine that in this case the seal impressions on the granary bins represent the sender of the cereals in the bins and not the owner of the tomb (*contra* Cervello-Autuori 2017: 222–223; Morris 2007: 178–179; Stadelmann 2005: 367).

The extraordinary construction of S3038 was not missed by the excavator, but it leads to the question what may have gone unnoticed in earlier excavations. In the first half of the twentieth century, most excavations of large tombs took often a matter of weeks. The body of tomb S3038 was excavated in 12 work days, with an additional six days to clear the surrounding area. The field notes were cursory, some days no notes were deemed necessary; the lack of information on the later stages in construction – excavated first – may be telling.

Maybe Emery was right with his reflection on earlier tumulus-like features, but the field notes that have survived the times – those of the excavations of tombs S3038 and S3500–S3507 – do not support this premise (Emery 1958: 73). The soil that was excavated was – almost without exception – described as "redime", without any further detail. It may be important to realise that the idea of 'primeval mounds' in the early excavated mastabas at Saqqara is not derived from meticulous excavation records (Kaiser 2008: 362).

Conclusions from these early reports should be treated with some caution, occasionally they are based on quickly executed excavations with very basic recording standards.

The excavation reports provided no information about the direct surroundings of the tomb, or features like an enclosure wall and/or subsidiary graves. The lack of evidence is probably caused by the many later intrusive tombs and should not be interpreted as "evidence of lack". Of these structures only a few glimpses remain: plates 37a and 37B (Emery 1949); the sketch from the notes (fig. 6) and the aerial photos (fig. 7) clearly show that this part of the Archaic cemetery was extensively (re-)used during the Second and Third Dynasties.

The history of the Archaic cemetery at Saqqara North needs a re-appraisal; a start can be made by "going back to the archives" on earlier excavations. At some point, renewed field work would be necessary, although much of the archaeological record sustained substantial damage; as the aerial photos from 1946 show (fig. 7).

Appendix: expenditure of S3038, a reconstruction

The reconstruction of the expenditure of large structures is no new phenomenon; multiple approaches have resulted in estimates of the time and labour required to build ancient Egyptian tombs (La Loggia 2012; Lacher-Raschdorff 2014: 103–136, 255–274; Ormeling 2016 and 2017b). A description of the considerations and production rates of mud brick construction practice already exists (Ormeling 2017b: 424–430); in this study, the specific building constraints of S3038 will be discussed.

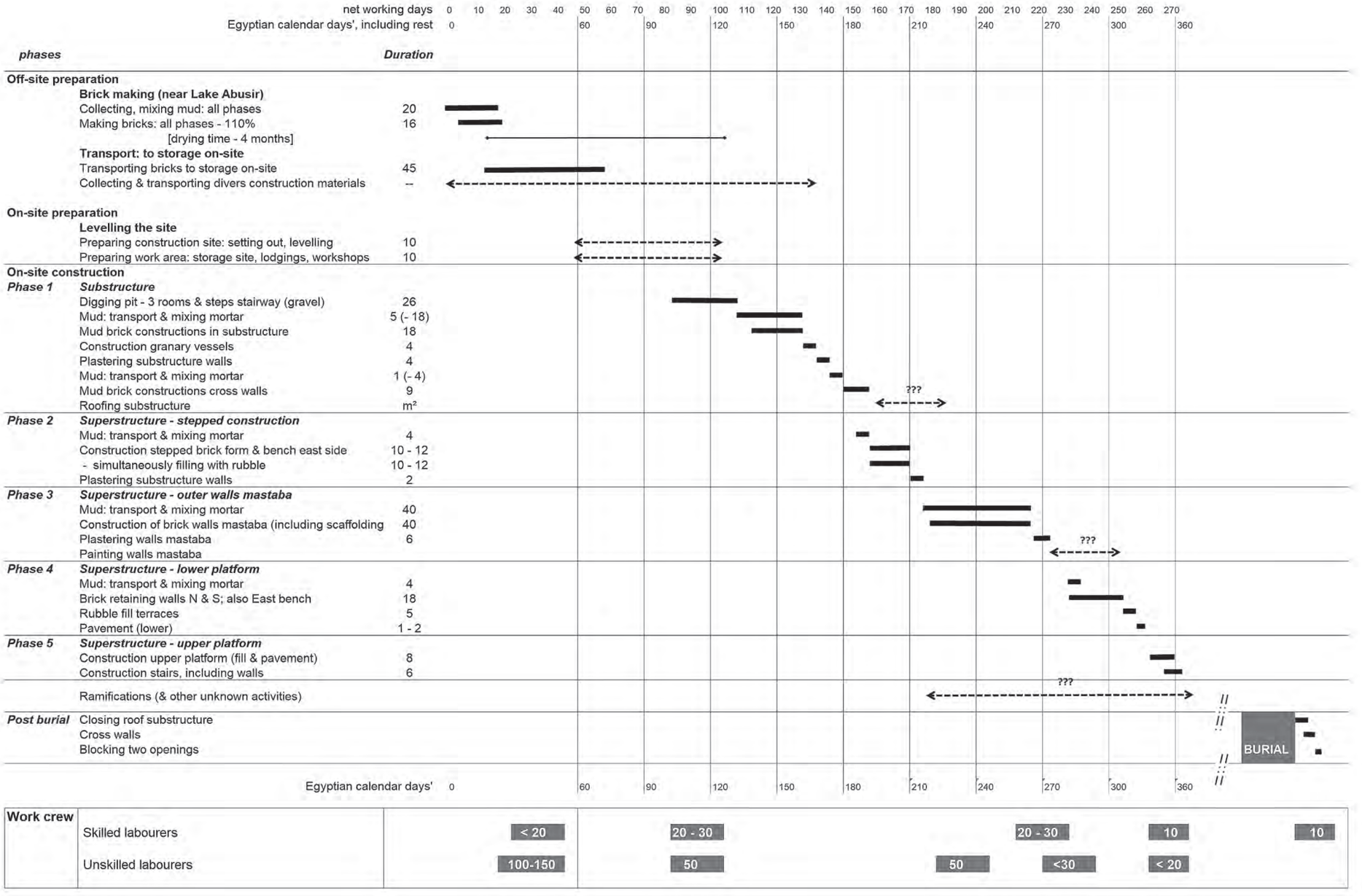

Chart 2 A work schedule for tomb S3038; the data from table B is scheduled in an effective and efficient order, based on common construction principles

phases	Function	units	volumes	Production men	production per day	Workforce skilled/ unskilled	# men	Duration # days
Off-site preparation								
	Brick making							
	Collecting & mixing mud	m³	979	4	5	unsk.	40	20
	Making bricks: all phases	bricks	448.370	4	2.800	unsk.	40	16
	Transport: to storage on-site							
	Transporting bricks to storage on-site	bricks	448.370	10	1.000	unsk.	100	45
	Collecting & transporting construction wood					unsk.	20	10
	Collecting & transporting beams for roofing					sk + unsk	10 + 20	25
On-site preparation								
	Levelling the site							
	Preparing construction site: setting out, levelling				set estimate	sk + unsk	4 + 10	10
	Preparing work area: storage site, workshops				set estimate	sk.	6	10
On-site construction								
Ph. 1	***Substructure***							
	Digging pit - 3 rooms & steps stairway (gravel)	m³	326	2	1	unsk.	5 + 20	26
	Transport mud to site for mortar	m³	26	4	1	unsk.	20	5
	Mixing mortar	m³	26	2	5	unsk.	2	5
	Mud brick constructions in substructure	bricks	68.557	4	800	sk	20	17
	Construction granary vessels				custom fit	sk	4	4
	Plastering substructure walls	m²	352	3	30	sk	10	4
	Transport mud to site for mortar cross walls	m³	7	4	1	unsk.	20	1
	Mixing mortar for cross walls	m³	7	2	5	unsk.	2	1
	Mud brick constructions cross walls	bricks	17.626	4	800	sk	10	9
	Preparing wood for roofing substructure	m²	155		set estimate	sk	10	5
Ph 2	***Superstructure - stepped construction***							
	Construction bench east side	bricks	4.904	4	800	sk	6	4
	Transport mud to site for mortar	m³	9	4	1	unsk.	10	3
	Mixing mortar	m³	9	2	5	unsk.	2	2
	Collecting rubble fill for stepped construction	m³	115		set estimate	unsk	10	10
	Construction of stepped structure (bricks & fill)	bricks	17.747		set estimate	sk	10	10
	Plastering substructure walls	m²	281	3	30	sk	12	2
Ph 3	***Superstructure - outer walls mastaba***							
	Transport mud to site for mastaba	m³	98,8	4	1	unsk.	10	40
	Mixing mortar for mastaba	m³	98,8	2	5	unsk.	2	20
	Brick mastaba walls	bricks	269.222	4	800	sk	40	34
	Scaffolding				set estimate	sk	10	5
	Plastering walls mastaba	m²	639	3	30	sk	12	5
	Painting walls mastaba	m²	639		set estimate	sk	20	20
Ph 4	***Superstructure - lower platform***							
	Transport mud to site for retaining walls N & S	m³	10	4	1	unsk.	10	4
	Mixing mortar for retaining walls N & S	m³	10	2	5	unsk.	2	2
	Brick retaining walls N & S: also East bench	bricks	26.446	4	1.000	sk	6	18
	Collecting rubble fill platform	m³	50		set estimate	unsk	10	5
	Construction of pavement N & S	bricks	7.482	4	1.600	sk	6	3
Ph 5	***Superstructure - upper platform***							
	Collecting sand/rubble fill platform	m³	556		set estimate	unsk	10	5
	Construction of pavement N & S	bricks	19.093	4	1.600	sk	6	8
	Construction walls of stairs	bricks	4.787	4	800	sk	4	6
	Transport mortar walls stairs & cross walls	m²	4	4	1	unsk.	10	2
	Mixing mortar	m²	4	2	5	unsk.	2	1
Ph 6	***Superstructure -post burial***							
	Closing substructure				set estimate	sk	15	2
	Cross walls on platform 2 north				set estimate	sk	4	2
	Blocking 2 openings				set estimate	sk	10	1
	Painting walls mastaba	m²	639		set estimate	sk	20	20

Tab. 3 Table of dimensions, production rates and expenditure for tomb S3038, according to proposed phasing

Expenditure tomb S3038

Emery was not very generous with the details of the dimensions of this tomb. When specified, his dimensions were applied (Emery 1949: 84–91; otherwise dimensions were measured in his drawings, see Emery 1949: pls. 21–26). Brick size was not recorded for S3038, the brick size of S3111 (26 × 12 × 7 cm) will be used (Emery 1949: 97).

Tab. 3 provides the data used in the reconstruction; the production rates applied were taken from table 1 in Ormeling (2017b: 427–430). The data is ordered according to the proposed phasing sequence (tab. 1). Based on these data, a principle construction schedule is constructed (chart 2). This schedule provides insight into a likely planning of the activities, based on common construction principles (and including regular days off).[20] Many variations would have been possible and would, most likely, have occurred.

The schedule shows that with a more or less constant workforce, slowly decreasing in size, the tomb could have been constructed in a matter of months. If and when a prolonged drying time was kept,[21] the construction took around one year; from the very first brick made till the moment the tomb was ready for the funeral.

The required crew was made up of about 20–30 skilled constructors and a variable group of unskilled labourers engaged with material collection and transport (chart 2). With a smaller workforce, the work would have lasted longer, while a substantial increase in labourers could have shortened the work.

Labour force prolegomena

One of the key issues in construction was probably the availability of personnel; it can be argued that the owner – as member of the state's high echelons – had access to larger groups of personnel to employ and had the means to provide for them (wages were paid in kind).

Skilled personnel would have been limited in numbers, only so many men could efficiently be employed for a structure of the size (*ca.* 37 × 12 m) and complexity as S3038. The same argument applies to the number of unskilled men.

Skilled construction personnel would have needed practical skills – working with bricks, stones, wood, carpentry, *etc.* – and know-how of and experience in organising manpower and materials.

The unskilled men were probably corvée labourers available in larger groups for variable periods of time. It would make sense to deploy a large number of men for menial tasks at the start of construction: collecting raw material (mud, water, and wood), making bricks, transporting bricks and other materials, or simple digging.

Note: Egyptian society of the era under consideration consisted of large groups of people used to manual labour in a rural agricultural setting, acquainted with working the fields. Most of the corvée labourers would have been familiar with the tasks required from them, collecting materials and transport were part of their daily work at the fields.

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[20] However, see note 15 for a different approach by La Loggia (2012: 258–259).
[21] Such a long period to dry the bricks is not undisputed; see Ormeling (2017b: 408–409, 424–425) for a discussion on the necessity of a prolonged drying time.

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