

Saqqara: research 2020



Abstract: Fieldwork of the Polish–Egyptian Mission to Saqqara in the 2020 season continued on the eastern bank of the Dry Moat, resulting in the discovery of a rock-cut structure directly south of Corridor 1. Fieldwork also included exploration of a rock-cut chapel adjacent to the tomb of Merefnebef, part of the Sixth Dynasty funerary complex located south of the tomb. Both areas yielded new burials belonging to the so-called Upper Necropolis, which overlies the remains of late Old Kingdom funerary structures. Conservation work constituted an important part of the 2020 fieldwork program.

Key words: West Saqqara, Old Kingdom, Lower Necropolis, Third Dynasty, Netjerykhet, Djoser, Dry Moat, Step Pyramid, rock-hewn tombs, Upper Necropolis, mummies

I. ARCHAEOLOGICAL RESEARCH

Previous research at the site had focused on the earliest phases of use attested to date (Kuraszkiewicz 2019). The archaeological excavation in the present season of fieldwork was conducted in two areas between the Dry Moat and the Step Pyramid enclosure [Fig. 1]:

- a) area along the eastern bank of the Dry Moat in grid squares 2010 and 2110;
- b) area south of the tomb of Merefnebef in grid squares 2106 and 2206.

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OLD KINGDOM STRATA

Western section

A 20-m-long section of the eastern bank of the western channel of the Dry Moat was unearthed during fieldwork in 2018 (Kuraszkiewicz 2019). An earlier assumption concerning the alignment of the feature was thus verified, namely, that it originally formed a distinctly straight line (conforming in its alignment to the Step Pyramid complex, that is, $4^{\circ}2'55''$ east of true north, see Lauer 1936: 68), with a markedly angular upper edge [see Fig. 1]. Another assumption that was verified was that, unlike the southern channel (Swelim 1988; 2006), it was inclined at an angle of approximately 30° rather than being vertical.

While the uppermost rock stratum in the area directly east of the Dry Moat is relatively hard and compact, although criss-crossed by intersecting clefs and fractures (Welc 2011), the underlying layer is much softer making it much more prone to erosion. These factors contributed to the collapse of two large rock fragments from the edge of the Moat. This is likely to have occurred before the Upper Necropolis was established in this area, as numerous intact burials have been found in the sand layer that accumulated over these two rocks. Their removal was essential in order to proceed with the exploration of rock-cut structures that were anticipated in the side of the Dry Moat (Kuraszkiewicz 2019). In 2020, the smaller, southern block (estimated weight 25 tons; the other block was estimated at 40 tons)

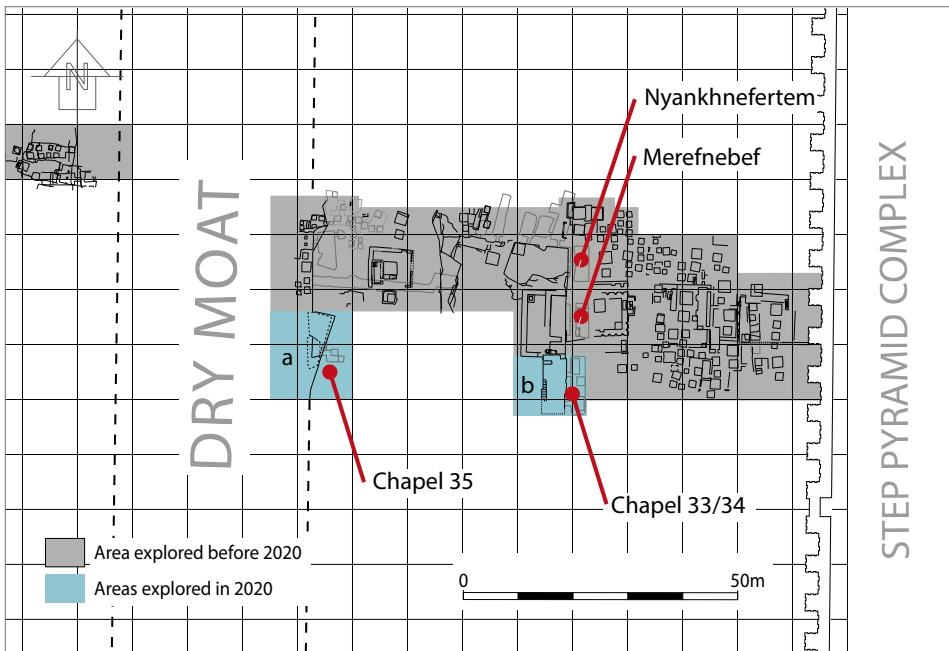


Fig. 1. General plan showing areas excavated in 2020 (University of Warsaw West Saqqara Project | drawing K.O. Kuraszkiewicz)



Fig. 2. Eastern bank of the western channel of the Dry Moat, looking south (University of Warsaw West Saqqara Project | photo J. Dąbrowski)

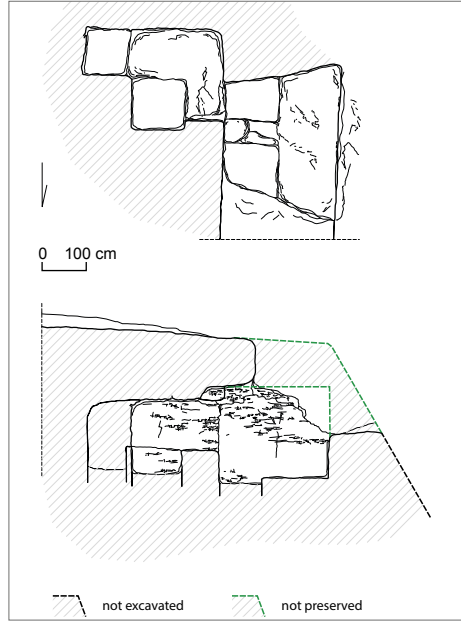


Fig. 3. Chapel 35 in the east bank of the Dry Moat: plan and east–west cross-section, with a reconstruction of the collapsed part (University of Warsaw West Saqqara Project | drawing K. Kocyla, modified K. Kuraszkiwicz)



Fig. 4. Chapel 35: view from the southwest (University of Warsaw West Saqqara Project | photo J. Dąbrowski)



Fig. 5. Chapel 35: western part viewed from the northeast (University of Warsaw West Saqqara Project | photo J. Dąbrowski)



Fig. 6. Chapel 35: eastern part viewed from the northwest (University of Warsaw West Saqqara Project | photo J. Dąbrowski)

Eastern section

Exploration continued in a funerary complex situated south of that of Merefnebef. In 2018, a rectangular sunken courtyard (measuring at least 10 m N–S, its southern limit lying outside the excavated area, and approximately 4 m E–W) was partly cleared of sand. Similarly to the inner court of the tomb of Merefnebef (Kuraszkiewicz 2004: 61–63), the courtyard was hewn in bedrock in its lower part, and built of recycled mud brick and rough stones in the part rising above the bedrock surface. The floor is irregular with at least five different levels [Fig. 7].

Access from the upper level was by means of a narrow stairway in the south-western corner of the courtyard. The steps were built of irregular stones and plastered with *tafl* mortar. Two entrances in the rock shelf forming the eastern side of the courtyard lead to a single rock-cut room (Chapel 33/34). Remains of three lines of inscription are visible above the northern one of the entrances, running approximately from the door axis in both directions [Fig. 8A–B].

The northern part of the lintel reads:

1. [...] 2. [*hṭp ḏj(w) njswt hṭp ḏj(w)*] *Jnpw [...qrs.tj=f ...] m zmjt jmntt m jm3ḥw hr ntr 3 hrj h3bt zh3 [gs-dpt ...]*
3. *jnk zḥ mn[h ... ḥzjjw] ntr jnk 3ḥ jqr ʿpr Ppji [...]*

1. [...] 2. [An offering that the king gives and an offering that] Anubis [gives ... that he may be buried...] in the western desert as an honoured one by the great god, lector-priest, scribe [of (magic) protection (Fischer 1992: 59–63; Jones 2000: 877 [3212]) ...]
3. I am a potent dignitary [... favoured of the] god. I am an excellent and prepared akh, Pepy[-...]

The royal name, clear traces of which are visible in the third line, seems to be part of the owner's name or a title associated with the royal funerary complex (of Pepy I or II) rather than a part of the preceding phrase (see Kloth 2002: 116–118). Even if its exact function in the text cannot be established, it sets the reign of Pepy I as *terminus ante quem non* for the inscription.

The southern part of the lintel reads:

1. [*hṭp ḏj(w) njswt hṭp ḏj(w)*] *Jnpw [...] jmj-wt nb t3-dsr qrs.tj=f nfr m jz pn hrjt-ntr smr wʿtj [...]*
 2. [*hṭp ḏj(w) njswt*] *ḏj(w) Wsjr nb ḏdw ḥntj jmntjw m 3bdw Wsjr ḥp=f hr w3wt nfrt [...]*
 3. *prj hrw n=f jm=f j3jw nfr wrt m wpt-rnpt ḏḥwtjt tpj-rnpt w3g m ḥ3b Zkr [...]*
1. [An offering that the king gives and an offering that] Anubis gives, who is in the embalming place,



Fig. 8B. Inscription on the façade of Chapel 33/34, southern part (northern part in Fig. 8A) (University of Warsaw West Saqqara Project | set by K. Kuraszkiewicz using JSesh software)

- lord of the sacred land, (namely) that he may be perfectly buried in this tomb (in) the necropolis (Lapp 1986: 46–47), sole companion [...]
2. An offering that the king gives and an offering that] Osiris gives, lord of Busiris, foremost of the Westerners in Abydos, Osiris, that he may travel upon perfect ways [...]
 3. May an invocation offering may be made for him in it (i.e., the tomb, Lapp 1986: 102) after he grows old perfectly, in the Opening of the Year festival, the festival of Thoth, the first day of the year festival, the Wag festival, the festival of Sokar [...]

Upon discovery, the chapel was almost completely filled with sand that had accumulated naturally, confirming that the chamber must have remained open for a prolonged period of time [Fig. 9]. The uppermost layer of the fill consisted of small fragments of rock detached from the

chapel ceiling. In the southeastern corner of the room, there was a small depression in the surface of the fill. Numerous animal bones were found within the depression and in its immediate surroundings. Animal feces found next to the depression suggest an animal den, possibly of a dog, jackal or fox [Fig. 10]. The faunal assemblage recovered from this area will be examined in the next campaign, but its contents is strikingly similar to that found in Corridor 1 (Ikram 2001: 128–132; Ikram 2004), both including the frontal parts of at least four catfish beside the mammal bones. As said above, a similar, but smaller assemblage was found behind one of the collapsed rocks in the Dry Moat. Such a considerable number of catfish remains found in the funerary structures is puzzling, considering their natural environment is nowhere near the cemetery and catfish was not traditionally part of funerary offerings. Therefore,



Fig. 9. Chapel 33/34: fill of the chamber looking north (University of Warsaw West Saqqara Project | photo J. Dąbrowski)

there must have been a source of catfish leftovers somewhere nearby, accessible to animal scavengers. The refuse dumps of the nearby monastery of Apa Jeremias is a likely candidate (Clackson 2002; Brooks Hedstrom 2017: 192–193; Mossakowska-Gaubert and Wipszycka 2019: 162).¹ If the monastery was indeed the source of animal remains, it would mean that the presently excavated area was deserted at this time and that the upper part of the façade of Chapel 33/34 was still visible at some point between the late 5th and early 9th century when the monastic community was active (Quibell 1912: I–II).

The chapel itself is a large, rectangular room measuring 10.61 m (N–S) by 2.58 m (E–W), and 1.74 m high [Fig. 11]. Interestingly, there is a striking difference in the

quality of execution between the northern and southern sides of the room; while the northern and middle parts have regular, levelled walls and floor, with straight edges and right angles [see Fig. 9], the southern part (starting approximately a meter north of the southern entrance) is distinctly irregular [see Fig. 10].

False doors are hewn directly in the rock on both sides of the northern entrance in the west wall of the chapel. They are of similar size and layout (both being composed of two pairs of jambs flanking a wide niche, framed with a torus molding and crowned with a cornice) and both represent relatively good craftsmanship. The poor state of preservation is due to mediocre rock quality and severe erosion. The southern false



Fig. 10. Chapel 33/34: assemblage of animal bones on top of the fill in the southeastern corner of the chapel (University of Warsaw West Saqqara Project | photo J. Dąbrowski)

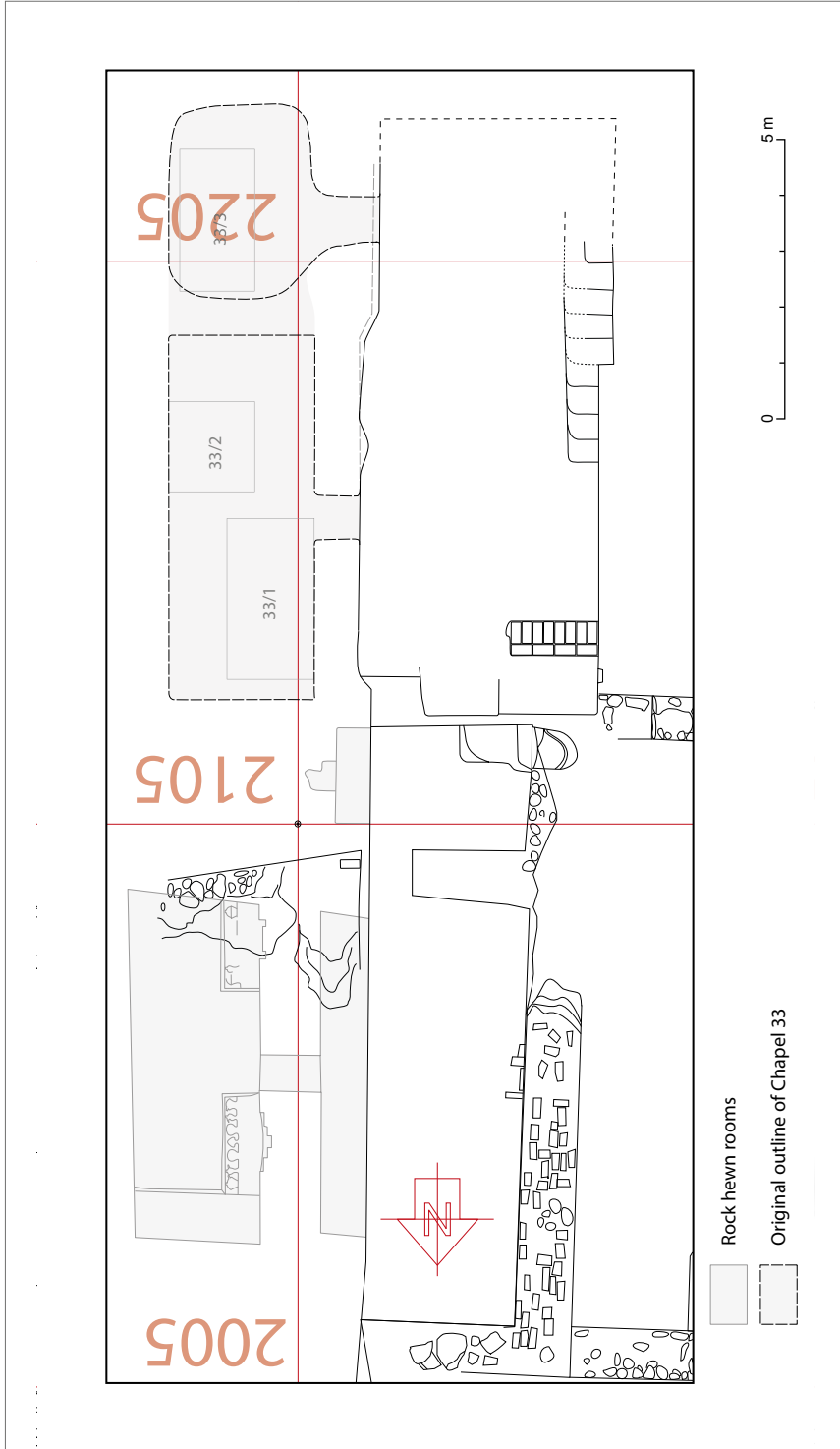


Fig. 11. Funerary complexes of Merefnebef (left) and Ptahhotep Ipi (right) with the proposed reconstruction of the original layout of the latter (University of Warsaw West Saqqara Project | drawing K. Kuraszkiwicz)

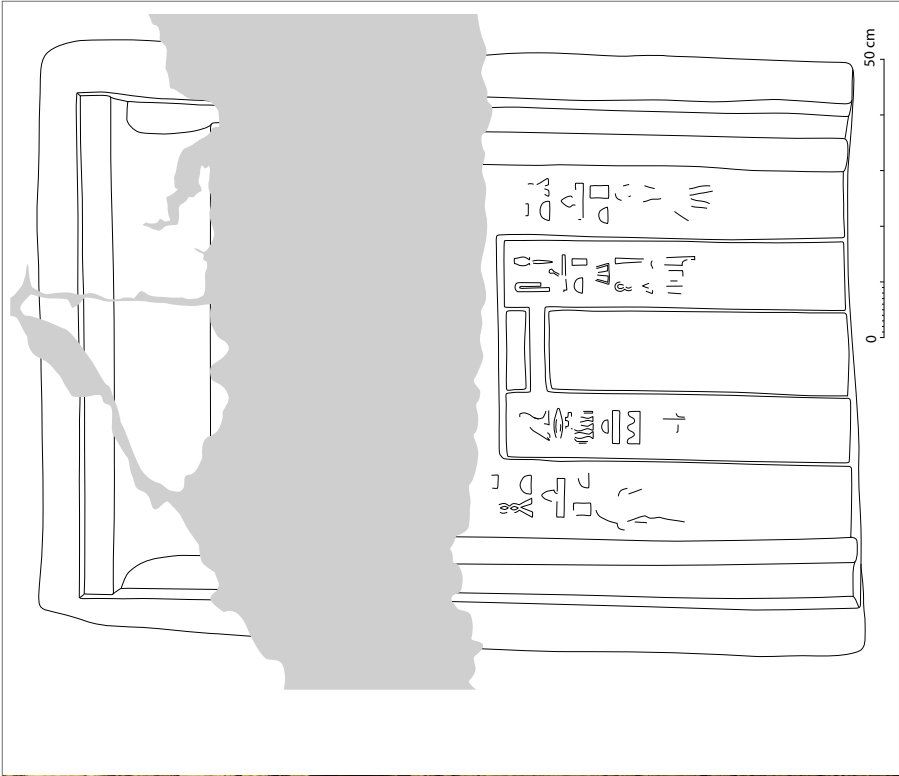


Fig. 12. False door of Prahotept Ipi (University of Warsaw West Saqqara Project | drawing K. Kuraszkiwicz; photo J. Dąbrowski)

door shows no traces of any decoration, while the northern one was inscribed with the names and titles of the owner [Fig. 12]. Each outer jamb bears a single column of text above a standing male figure depicted in a larger scale, facing the false-door axis: [...] *Pth-ḥtpw*, Ptah-hotep (Scheele-Schweitzer 2014: [233] 228–230). Although the preserved part might suggest an identical decoration on both outer jambs, the length of the lacunae in their upper parts indicates that the inscription on the right jamb was approximately one square longer than that on its left counterpart.

The full height of the inner jambs has been preserved; surface erosion has affected some of the signs, but the surviving traces enable a full reconstruction of the inscriptions:

1. Left inner jamb

jmj-r3 ḥntj(w)-š Jpj – Overseer of *khentyw-she* (Jones 2000: [709] 189) Ipi (Scheele-Schweitzer 2014: [2566] 228–230).

2. Right inner jamb:

smr w'tj ḥrj-ḥ3bt Jpj – Sole companion (Jones 2000: [3268] 892), lector-priest (Jones 2000: [2848] 781) Ipi.

The names and titles found on the false door were both quite popular in the Old Kingdom, and are attested in connection with numerous individuals, precluding a closer identification of the owner.

Three shafts are hewn in the chapel floor; upon exploration the middle (33/2) and southern (33/3) shafts turned out to be unfinished and empty. The premature termination of the campaign due to the Covid-19 pandemic prevented the exploration of the northern shaft (33/1).

While there are no direct dating criteria, the chronology of the tomb is suggested by several elements. The overall impression is of a project abandoned in the course of the work: the uneven surface of the courtyard and the irregular shape of the chapel are both telling in this respect. Taking into consideration the available evidence, it may be assumed that the chapel in its present form is an unfinished project to enlarge an existing tomb. The architectural features that can be seen attest to at least three stages of construction:

- A. The northern part of the present structure [Fig. 11; see also Fig. 9] was the original Chapel 33, with the entrance in the middle of the west wall; in size and layout, it resembled the chapels of Merefnebef and Nyankhnefertem (Kuraszkiewicz 2004: 60–61; Myśliwiec and Kuraszkiewicz 2010: 85–87). The chapel was cut in the rock, the walls roughly smoothed and made ready to receive the decoration.
- B. Work commenced in the smaller Chapel 34, but was abandoned before any regular form was achieved. The combination of a large main chapel and a smaller one added on the south finds a parallel in the funerary complex of Merefnebef (Kuraszkiewicz 2004: 60–61).
- C. The two chapels were connected, but the larger chamber thus created was never finished.

Considering the location of Chapel 33 in the cemetery, as well as the similarity of its design to that of the complex of Merefnebef, one should see it as roughly contemporary or even slightly earlier

than the later tomb which is dated to Phase Fa of the Sixth Dynasty cemetery (Kuraszkiewicz 2013a: 273–276). However, the name of Pepy attested in the inscription on the façade excludes the attribution. During the early years of Pepy I (Phase Fb), the importance of the cemetery decreased significantly, and the scale of Chapel 33 is inconsistent with the size and quality of the few small tombs that were built here during that period. Large tombs started to be built here again in the late part of the reign of Pepy I (Phase Fc). However, they have a markedly different orientation (Kuraszkiewicz 2013b). Thus, it seems that from an architectural point of view, Chapel 33 belongs to Phase Fa, while the inscription on its façade can be dated to Phase Fc or later.

It is not certain whether the inscription on the façade is to be attributed to the owner of the false door inside the chapel; that is, whether the modifications were made for the same owner or the tomb had changed hands. No name can be confidently identified on the façade, and the only titles that occur in both places (*smr w^ctj* and *hrj-h3bt*) were too common in the late Old Kingdom to have any diagnostic value. However, it might be expected that the other functional titles on the façade, that is, *zh3 gs-dpt*, possibly of a member of the staff of a royal funerary complex, and the title *hntj-š* (although without attribution to any particular establishment) on the false door, were mentioned in both places. It should also be considered that the royal name on the façade was part of the owner's name. If so, the basilophorous name would be the third one

(beside Ptahhotep and Ipi) to be identified as belonging to the tomb owner. While three names for a single individual are attested, such cases were relatively rare (Junker 1928: 59–61; Scheele Schweitzer 2014: 20 and Note 7). Considering the above, it seems that the façade and the false door were inscribed for two different individuals, but none of them was the original owner of Chapel 33. Thus, it seems that the funerary complex including Chapel 33/34 had at least three subsequent owners:

1. An anonymous courtier, a contemporary of Merefnebef.
2. An official (perhaps named Pepy-[...]) bearing the title of *zh3 gs-dpt*, who lived not earlier than in the time of Pepy I. The title (scribe of (magic) protection) is of particular interest, because it assigns its bearer to relatively high-ranking, specialised staff, such as, for example, Ikhi Mery (Kuraszkiewicz, forthcoming). A connection to the latter, who participated in expedition(s) commissioned by Pepy I (Kuraszkiewicz 2014) should not be excluded, as magical protection must have played an important role during such dangerous undertakings (Fischer 1992: 59–63; Eichler 1993: 255–257).
3. Ptahhotep Ipi, whose apparently modest position in the administrative hierarchy seems to correspond to that of persons who buried here in the last phases (Fe–Fg) of cemetery use (Kuraszkiewicz 2013a: 276–284).

The exploration of Shaft 33/1, planned for the next excavation campaign, may shed further light on the identity of the ultimate tomb owner.

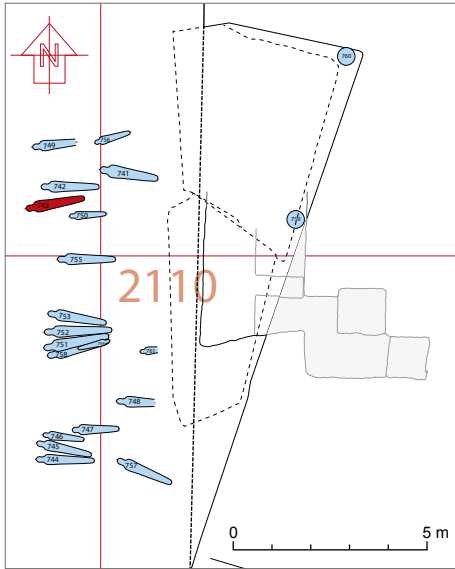


Fig. 13. Burials of the Upper Necropolis in the section of the Dry Moat explored in 2020 (University of Warsaw West Saqqara Project | drawing K. Kuraszkiewicz)

POST-OLD KINGDOM STRATA – UPPER NECROPOLIS

Both areas under investigation yielded further burials from the Late and Ptolemaic Periods, thus extending the recorded extent of the so-called Upper Necropolis. In total, 23 burials were excavated [Fig. 13], documented and examined (see below, section on human remains).

The east–west orientation of these burials, with the head toward the west, conforms to the predominant pattern of the later phase of the cemetery (Radowska et al. 2008: Figs 1–13). Most of the burials were deposited directly in the sand, without coffins or any funerary goods [Fig. 14]. Only one burial (No. 743) contained remains of the outer decoration consisting of a mask [Fig. 15], openwork collar, panel with a winged goddess



Fig. 14. Burials 751–754 of the Upper Necropolis (University of Warsaw West Saqqara Project | photo J. Dąbrowski)



Fig. 15. Head end of Burial 743 with remains of a gilded mask (University of Warsaw West Saqqara Project | photo J. Dąbrowski)

and a rectangular shin panel. Imitating a cartonnage, the decorative elements did not have any underlying fabric layer, but were modelled instead in a very thin layer of plaster, applied directly onto the bandages, partly painted and partly covered with golden foil.

The location of the burials within the Dry Moat indicates that the feature was extensively used as a burial ground in the last centuries before the common era, without any concentration(s) that would suggest a preference for a specific area or structure. [KOK]

II. HUMAN REMAINS

The 2020 excavation campaign yielded a further 23 human burials at the so-called Upper Necropolis of predominantly Ptolemaic date, bringing the total of unearthed inhumations at the site to 761 (the Upper and Lower Necropoleis combined).

Based on the initial *in situ* examination of the burials it was determined that all inhumations took place directly in the sand with the bodies laid in extended and supine (face-up) position, with their arms

either (a) extended and hands placed flat below the pelvis or on the thighs, or (b) crossed on the chest, with one exception. Burial 749 was found to demonstrate an unusual arrangement where the arms of the deceased (adult male) were fully flexed and the hands placed on the respective shoulders [Fig. 16]. All inhumations were found skeletonised and generally demonstrated a very good—often exceptional—state of preservation and



Fig. 16. Burial 749 of an adult male with an unusual arrangement of the arms (University of Warsaw West Saqqara Project | photo J. Dąbrowski)

completeness, which greatly aided the reconstruction of a biological profile of the individuals. The few exceptions included Burials 740 and 759, which were severely disturbed and found to contain only loose and fragmentarily preserved human remains; as well as four, most likely truncated burials with only partly preserved skeletons (Burial 761 missing the legs; Burial 748 and Burial 749 missing the lower legs; Burial 739 missing the feet).

Fragments of linen—often just traces or imprints—found on the skeletal remains indicated that the bodies were wrapped prior to their inhumation. The quantity and quality of the linen used was often impossible to determine due to its poor state of preservation and fragility; however, in the case of Burial 744, it was possible to observe multiple layers of wrappings and differentiate between the coarse and fine weave fabric [Fig. 17]. The use of resin was evident in several burials,

mostly as a coating and adhesive agent on the wrappings (e.g., Burial 758) but in some cases also directly on the body. Burial 743 presented a case where molten resin was used quite liberally inside the body cavities as well as externally; although the intention was to preserve the body, the excessive application of resin made the remains brittle and prone to breakage.

Perforation of the ethmoid bone with occasional presence of resin residue inside the cranium (e.g., Burial 744) were indicative of brain removal as part of the post-mortem body treatment. Evisceration, or removal of the internal organs, was confidently ascertained in the mummified body in Burial 743; the empty chest and abdominal cavities were found heavily coated in resin and filled with resin-soaked scraps of linen. Similar treatment with the internal use of resin was also observed in Burial 753, which delivered another interesting finding.



Fig. 17. Burial 744: fragmentarily preserved mummy wrappings; note coarser and finer weave (University of Warsaw West Saqqara Project | photo I. Kozieradzka-Ogunmakin)



Fig. 18. Burial 758 with a palm leaf rib inserted into the spinal cavity of the upper thoracic vertebrae (University of Warsaw West Saqqara Project | photo I. Kozieradzka-Ogunmakin)



Fig. 19. Burial 745 (center) of a young adult male with non-anatomical skeletal order (University of Warsaw West Saqqara Project | photo I. Kozieradzka-Ogunmakin)

The skull of a young (15–17 years old) female in Burial 753 revealed a linen bundle placed inside her mouth cavity, as well as a fragment of a palm leaf rib wrapped in resin-soaked linen that was recovered from the cranial cavity. The latter was most likely part of a longer palm leaf rib that extended down to the neck and fragments of which were found inside the spinal canal of the cervical vertebrae of the skeleton; it was most likely used to reattach the previously disarticulated head to the body. The question as to why the head would have become disarticulated in the first place remains speculative; it could have been (a) accidental during the preparation of the body for burial and following a lengthy period of desiccation, which would have made the body more prone to damage; (b) intentional, to gain access to the cranial cavity via the foramen magnum at the base of the skull to remove the brain (an alternative method of excerebration to the one performed via the ethmoid bone); and (c) the result of natural decomposition. Burial 753 contained only skeletonised remains

of the deceased; it is, therefore, impossible to determine whether the separation of the head from the body occurred due to soft tissue decomposition (no evidence of larvae or insects found) or intentional human intervention (no evidence of cut marks on the cranial base or the vertebrae). Extensive post-depositional damage to the craniofacial aspect of the skull precluded examination of the ethmoid bone to verify the method of excerebration. The insertion of palm leaf ribs could be understood as part of the process of reinstating the body's physical integrity by providing stability for the remains during the wrapping process in preparation for burial. Similar findings were also recorded in Burial 758 (a palm leaf rib was inserted into the cranium and spinal cavity down to the level of the lower thoracic vertebrae) [Fig. 18] and Burial 760, as well as several other burials (e.g., Burials 415 and 563) previously excavated at the site (e.g., Kaczmarek 2008: 468). Future in-depth examination of all such cases recorded at the cemetery may yet provide more clues as to the nature of this practice.

Table 1. Age estimations for subadults based on dental development and diaphyseal length of the long bones (Processing I. Kozieradzka-Ogunmakin)

Burial ID	Dental age estimation	Diaphyseal length age estimation	Health Stressors
746	4–4.5 years	2.5–3 y	<i>cribra orbitalia</i> ; sinusitis; trauma
750	4–4.5 years	2.5 y	-
754	4–4.5 years	2–2.5 y	sinusitis; non-specific infection; malaria? (skeletal evidence)
757	-	4.5–5 y	-
759	-	4.5–5 y	-
761	5–6 years	3–3.5 y	<i>cribra orbitalia</i> ; sinusitis; non-specific infection

The inhumations were predominantly singular, although their stratigraphic density and spatial proximity would often give the impression that they were part of a larger contemporaneous group of burials. However, two such groups were indeed identified: Burials 744–746 and Burials 751–754. Burial 745 was found to contain skeletal remains of a young adult male. The bones were found in a non-anatomical order, but superficially arranged to resemble a human body in an extended position [Fig. 19]. It is possible that the inhumation was naturally or accidentally exposed and the skeleton disturbed, and the remains were later collected and reburied. The two other burials in this group contained intact inhumations of an adult female (Burial 744) and a young child (Burial 746). Similarly to Burial 745, a nearby Burial 747 was also found to contain skeletal remains in non-anatomical order. These and other remaining inhumations of adult individuals will be examined in detail during the next excavation campaign.

Adult individuals (18 years or over at the time of death) constituted the majority ($n=15$; $\%=65.2$) of the 23 burials excavated in 2020. A total of six inhumations ($\%=26.1$) contained the remains of children aged between 4 and 6 years at the time of death, and a further two individuals ($\%=8.7$) were aged between 12 and 17 years at the time of death. The osteological examination focused primarily on the remains of subadult individuals (18 years or over at the time of death) and included age estimation and skeletal health assessment. Sex estimation was not attempted in individuals younger than 15 years of age due to the lack of

currently accepted methods. In individuals approaching physical maturity (15–19 years), typically female characteristics of the bony pelvis could be confidently assessed as ‘female’; however, ‘male’ features of the adolescent bony pelvis should be considered inconclusive, because at this period of skeletal development the female features might not be present. The skull may retain a more feminine and gracile appearance during adolescence; therefore, only the skull presenting masculine characteristics could be confidently assessed as ‘male’ (Buikstra and Ubelaker 1994). Methods used in subadult age estimation included dental development and eruption (Al Qahtani 2009) and skeletal developmental timing and maturation stages (Schaefer, Black, and Scheuer 2008).

Out of a total of eight subadult individuals recovered in 2020, six were children aged between 4 and 6 years at the time of death. Due to skeletal incompleteness of Burials 757 and 759, age estimation was only possible using the diaphyseal lengths of the long bones present; in the remaining four burials (746, 750, 754 and 761) the preservation and completeness of the remains allowed for both dental (Al Qahtani 2009) and skeletal age estimation methods (Schaefer, Black, and Scheuer 2008) to be applied. The latter included assessment of skeletal development and maturation stages (e.g., epiphyseal fusion) in conjunction with the metric age estimation from the long bone lengths. All four cases demonstrated discrepancy in their age estimations, showing on average 1.5–2 years difference between their dental and skeletal ages [Table 1]. A similar observation was made in other subadult skeletons previously

excavated at Saqqara and other ancient Egyptian sites (e.g., Jerome Rose, personal communication; Rose 2006). In the Saqqara subadult individuals, dental age estimations corresponded to stages of skeletal maturation (e.g., union times).

Age-at-death estimation in subadults is considered more accurate when based on dental development and eruption versus skeletal indicators, because the former is less affected by potential environmental and health stressors, which can cause delayed growth in long bones, resulting in an age estimate that is younger than the individual's biological age (e.g., Ubelaker 2005; Cardoso 2007).

Three out of four subadults at Saqqara, whose age at death was estimated using both dental development and diaphyseal lengths of long bones, showed evidence of physiological stress likely caused by nutritional deficiency, infection, and/or environmental conditions [see *Table 1*].

One of the individuals (Burial 750), however, showed no such evidence yet still demonstrated a similar discrepancy in age estimations. It is, therefore, evident that biological age estimation based on diaphyseal length of long bones alone is likely to result in underestimation of age in ancient Egyptian subadults (particularly children <12 years of age at the time of death). This could be the case for the individuals from Burials 757 and 759 at Saqqara, whose biological age is likely to be slightly higher than estimated based on the diaphyseal length of the long bones.

The issue of chronological age estimation discrepancy observed in the ancient Egyptian subadult population warrants further investigation. Currently available age estimation methods need to be broadly tested on the ancient Egyptian population to determine their suitability, and new population-specific methods developed. [IKO]

III. CONSERVATION WORK

The first task at the beginning of the campaign was to evaluate the state of preservation of the funerary chapels, focusing on the carved and painted wall decorations. The initial inspection, on February 18, revealed surface damage caused by salt efflorescence; the affected areas were subsequently treated to remove the salts and repair the damage.

FUNERARY CHAPEL OF MEREFNEBEF

Abundant salt efflorescence, resembling a soft fluff, found on the surfaces of the lintel, lateral walls of the façade and on the

walls of the unfinished southern room, were removed using soft brushes. Below the architrave, similar salt efflorescence occurred on areas without polychrome decorations. Also noticeable were the effects of salt concentration—in the form of small cracked bulges—that formed under the paint surface that was consolidated as a result of the longstanding conservation treatment.

Inside the chapel itself, the salt concentrations were sparse; for example, occurring on the false door in the northern part of the west wall. Noticeable were



Fig. 20. Conservation of cartonnage panels during exploration of the burial (University of Warsaw West Saqqara Project | photo J. Dąbrowski)



Fig. 21. Conservation of the wooden coffin of Burial 732 (University of Warsaw West Saqqara Project | photo J. Dąbrowski)

detachments of the paint together with a thin layer of rock, caused by under-surface salt crystallization (visible on the northern part of the east wall). This type of salt concentration does not cause damage to the decoration itself (such as detachments and cracks), but it is not always possible to correct the deformation caused to its surface.

Numerous, but not extensive detachments of the paint layer (on the façade, in the entrance and inside the chapel) were mounted using Primal E330 (water dispersion, about 7%) applied with syringes or small brushes. Prior to that, the affected areas were softened with a 1:1 mixture of ethyl alcohol with water, to lessen the surface tension and to facilitate the penetration of the binding solution. Following the removal (where possible) of salt efflorescence, partly detached fragments were mounted with a putty based on Primal AC33 (water dispersion 7–8%) with fillers: Remmers Fungosil KSE Füllstoff A and B; desalted, sifted fine sand and pigments (to obtain a color consistent with the local rock). This way, partly detached fragments of different sizes, as well as cracks and suspended edges of paint layer, were secured (without filling the empty spaces), to prevent their complete detachment from the rock surface.

FUNERARY CHAPEL OF NYANKHNEFERTEM

The conservation procedures applied herein were similar to those described above. The salt concentrations, however, were slightly different in nature. On the lintel, hard salt efflorescence was found, which had to be removed using a hard

brush. Inside the chapel, similar efflorescence formations were found on the southern part of the west wall and on the western part of the south wall. On the east wall, a new type of salt efflorescence was observed: small groups of hard, ramose structures resembling sea anemones. These were found in a single layer, approximately 150 cm above the floor level. Ferruginous veins that are visible in that wall were also covered with salt concentrations. It was possible to remove most of the salt concentrations using hard brushes, except for those on the east wall, where a scalpel had to be used. Numerous detachments and cracks of the pink, coarse-grained putty (that was originally used to fill cavities in the rock surface) and of the thin cream-coloured coating (whitewash?) on the southern part of the west wall and on the south wall at the southwestern corner were treated with Primal E330 (as in the chapel of Merefnebef), while larger cracks and detachments were filled with a putty based on Primal AC33 (as described above). In a similar way, a crack (resulting from a detachment of the rock layer) was filled on the northern side of the entrance.

It was not possible to complete the work in the funerary chapel of Nyankhnefertem; recent long-lasting intensive rainfall resulted in the flooding of the chapel, which left a layer of mud, up to 10 cm in thickness. Although the mud was removed, the rainwater had soaked into the bedrock which forms the chapel floor, the bottom parts of the walls and the offering table. In the tomb of Merefnebef, rainwater had not penetrated into the chapel. A large natural fissure running

diagonally through the courtyard prevented it from reaching the façade, and only its northern extremity was affected to some degree.

Due to unexpected, external circumstances (Covid 19 pandemia), fieldwork ended much earlier than planned. The massive rainwater influx and the fact that the chapels could not be dehumidified thoroughly before their closing is likely to have a significant impact on the condition of the monuments. The impact will be evaluated during the next campaign.

THE FUNERARY CHAPEL OF IKHI-MERY

The enormous pressure exerted by the rock above the chapel caused delamination and numerous cracks in the limestone blocks of the façade. The detached fragments of whitewash, plaster and paint were mounted using Primal E330 (as described above). Some detached fragments of stone were fixed using a solution of Mowilith 50 in acetone with chalk filler. This work, however, could not be completed due to the unexpected shortening of the season. In front of the façade, an additional construction was installed to support the rock ceiling. The construction should inhibit the rock from settling and thus prevent further damage. An additional, unexpected threat was posed by the huge amount of rainwater that soaked into the rock ceiling as a result of the unprecedented rainfall that occurred in mid-March 2020.

BURIAL 743: CARTONNAGE DECORATION

The decoration of the mummy consisted of a very thin (1–2 mm) layer of plaster, applied directly onto the bandages

(which were completely decayed upon discovery), partly painted and partly modelled and covered with golden foil. A severe deterioration of all technological layers of the decoration necessitated protective measures to be taken immediately [Fig. 20]. As the exploration progressed, the cartonnage was structurally reinforced by soaking it with a mixture (<5%) of Paraloid B82 in ethyl alcohol with a small addition of water (about 10%). This way, the layers of decoration were consolidated, and its form was preserved, including all the existing deformations (above all in the area of the mask and headdress). Following that, the decorative elements were coated with a solution of Paraloid B72 in acetone (<10%) and protected with Japanese paper glued with vinyl polyalcohol. Finally, the decoration was removed from the mummy. It will be placed on a new backing and the protective paper removed during the next campaign.

BURIAL 732: PAINTED WOODEN COFFIN

Conservation work on the coffin excavated in 2018 continued during the 2020 fieldwork season. The surface of the coffin was cleaned of dust and sand, and the technological layers were reinforced with a solution of Paraloid B82 in ethyl alcohol (up to 5%). Delamination and numerous detached fragments of whitewash were fixed with Primal AC33 (water dispersion, about 10%). A provisional protective layer of Japanese paper, applied in 2018 on the lid and sides of the coffin, was removed using hot water. The foot box was dismantled and the individual elements were cleaned using brushes, scalpels and

blowers, and additionally impregnated with the solution described above. The protective Japanese paper was removed from the side elements, but left on the plank decorated with two painted jackals. Having secured the sides of the coffin, the top elements of the lid were then removed. The lid, which consisted of relatively thin wooden planks

(compared to those used for side walls) attached with wooden pegs, survived in two severely cracked and deformed fragments. A significant amount of sand that accumulated inside the coffin was removed [Fig. 21]. The scope and schedule of further work on the object can be determined only after the mummy is removed from the coffin. ZG]

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