Report on the Excavations and Site Management at Elephantine by the German Archaeological Institute and the Swiss Institute from autumn 2019 to spring 2020

Martin Sählhof, Elshafaey Abdellatif, Bettina Bader, Michael Brandl, Sylwia Buławka, Aaron de Souza, Gersande Eschenbrenner-Diemer, Dagmar Fritzsch, Basem Gehad, Jiří Kmošek, Peter Kopp, Achim Krekeler, Ewa Laskowska-Krusztal, Manuela Lehmann, Martin Odler, Mary F. Ownby, Marie-Kristin-Schröder, Johanna Sigl, Cornelius von Pilgrim and Leslie A. Warden

Abstract

In the 2019-2020 season the German Archaeological Institute Cairo in cooperation with the Swiss Institute for Egyptian Building Archaeology and Antiquity Studies continued the research and fieldwork on the ancient town and temples of Elephantine. On site, the restoration of the Aswan Museum Elephantine continued with rehabilitation works of stone components on the outer shell of the old building, the anastylosis and reconstruction of the Temple of Osiris Nesmeti was continued and the archaeological site was resurveyed in order to create a revised and current site plan as the basis for a new site management concept. Archaeological fieldwork included the documentation of graffiti, minor finalising documentations and subsequent backfilling of excavated areas. Study work in the magazines was continued on objects from the excavations in the north-western town of the sub-project Realities of Life, on objects from the excavations of House 55, the town wall in Area XXXVI and pottery from the area south of the Temple of Khnum. Fragments of religious buildings dating to Ptolemaic and Roman periods were studied in the lapidaria.

Contents

1. Introduction

The works of the 49th campaign of German Archaeological Institute Cairo (DAIK) in cooperation with the Swiss Institute for Architectural and Archaeological Research on Ancient Egypt in Cairo (SI) on the site of Elephantine could only start late and with a special permit on November 27th 2019, work then had to be stopped early again on March 16th 2020 due to the pandemic situation. Nevertheless, during this short campaign, the on-site research could be advanced in many aspects[1].

On site, the restoration of the Aswan Museum Elephantine building has been continued. The wooden components of the old building, dating from 1906, have already been restored in spring and summer 2019. In the 49th campaign, the restoration of stone blocks of the facades was carried out, so that the conservation of the outer shell of the building has almost been completed.

Another heritage conservation project on the anastylosis and reconstruction of the Temple of Osiris-Nesmeti was continued by the Swiss Institute. Graffiti on stone blocks of the very same building were documented and some of the graffiti already documented in earlier seasons in the Temple of Khnum were collated. The previously excavated houses 55, 166, and 169 have been backfilled after supplementing documentations. Building fragments stored in the lapidaria of the Temple of Khnum commissioned by Nectanebo II and decorated during Ptolemaic-Roman times have been studied according to their decorations and architectural context. Finally, the archaeological site of Elephantine was resurveyed in spring 2020. The resulting plan served not only as latest documentation of the site, but also as a basis for the planning of a new site management concept, which could be created after the campaign was terminated.

Study works in the magazines were focusing on the objects found during the excavations of the archaeometric project ‘Realities of Life’ in the ancient north-western part of the town of Elephantine and in the SI-excavations of House 55.

(M. Sählhof)

2. Works of the German Archeological Institute

2.1 Heritage Conservation and Site Management

2.1.1 Restoration of the Aswan Museum Elephantine

In 2019 the German Archaeological Institute begun with special funding of the German Foreign Office to restore the outer shell of the Aswan Museum building at Elephantine. In that year the wooden components and roofs have been repaired and the original colour scheme of 1906 was restored[2]. In continuation of these heritage conservation measures, further damages of the stone components of the outer walls could be treated during the 49th campaign with support by Naglaa Fathy, Mohamed Gomaa, Mona Mohammed and Mohamed Saadallah of the Conservation Department of the Aswan Inspectorate. Mahmoud Fahmy was entrusted as project architect with the supervision of the realisation of the work.

Between 26th November and 16th December 2019, the surfaces of the stone walls have been cleaned manually with brushes and distilled water. Afterwards compresses have been fixed to the granite bases of the veranda walls, in order to reduce salt concentrations from the natural stone. In spring 2020 the manually cleaning of the stone components was continued by removal of stains from previous coats of paint with scalpels and ethanol (fig. 1). Simultaneously, old iron brackets of the door and window shutters were removed from the granite blocks. These brackets have already been cut off at an undetermined point back in time and could not be restored. As replacements, samples of the brackets in historic material and technique have been produced. The old mortar for fixing the brackets in the granite blocks was removed and the holes were cleaned in preparation for adding the new brackets. In addition, samples of supplementary mortar for the natural stone have been done to match the different colours and textures of the granite variations plus sustain a high durability. The rehabilitation of joints and cracks in the natural stone masonry could not be carried out due to the termination of the campaign.

(M. Sählhof)

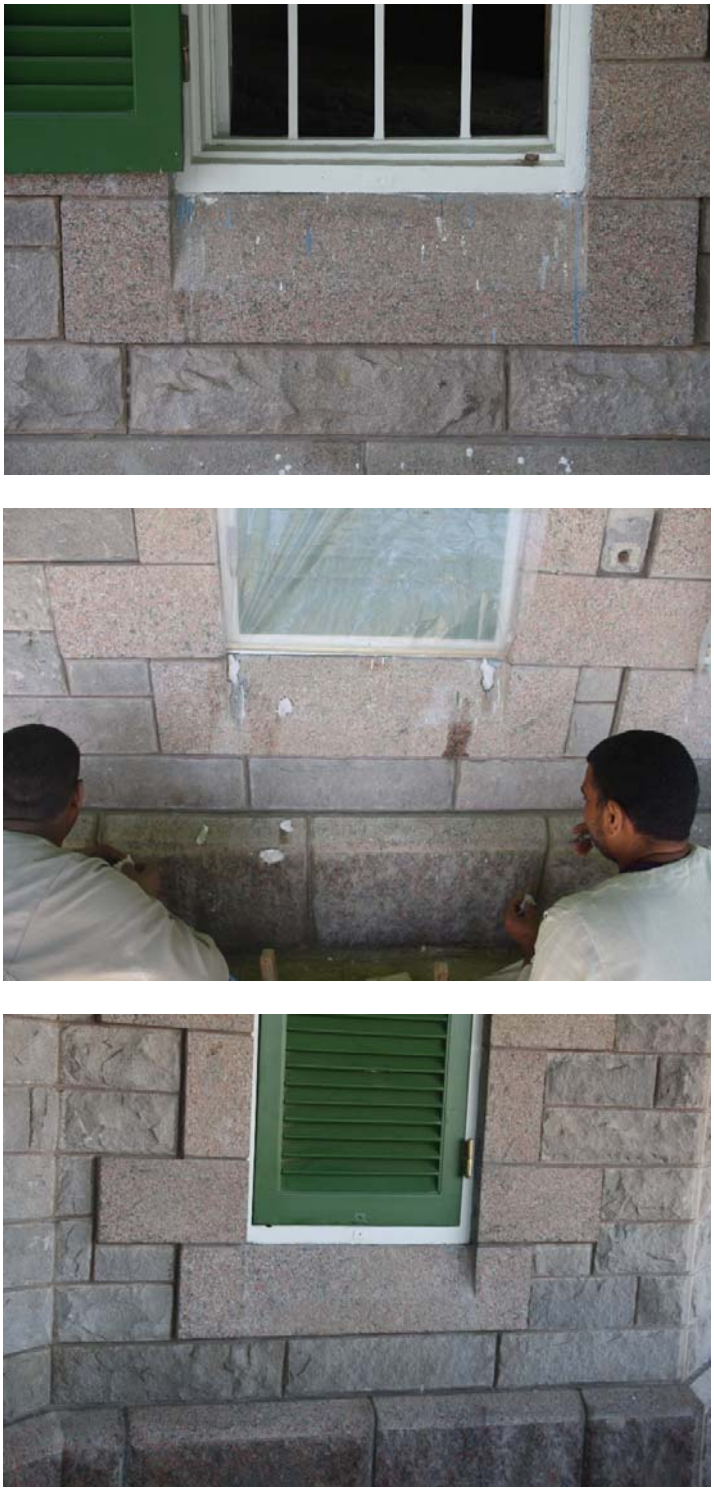


Fig. 1a, 1b and 1c: Aswan Museum Elephantine, granite blocks of the west elevation, varnish stains before (top), during (middle) and after cleaning (photos: M. Fahmy © DAI Cairo).

2.1.2 Resurveying of the Antiquities Area

For the further development of the site management a current plan of the antiquities area on Elephantine was created. The last complete plan of the southern end of the island was done in 1999. This plan showed mainly the topography at the time, some buildings, and only few archaeological features. Since that time a lot of changes took place in the area. Excavations at various spots did not only remove soil and walls that were displayed in older plans, but also caused lots of ground-off material[3]. Partly deeper holes and old trenches were filled with this material. At other places new spoil heaps emerged. This caused a new topography in some areas. Bigger changes took place in the area of the Aswan Museum and the so-called Annex Museum. After larger excavations, a new magazine was built here in between the existing buildings and a terrace in front of the Aswan Museum. A new reconstruction, the Osiris-Nesmeti temple, is under construction in the south of the island[4].While the main concept of the open-air museum was maintained, some details like pathways and their bordering changed. Additionally, nearly all stone objects were reorganized and moved to a new storage space during the last 20 years. One example is the foundation of the Satet temple of the 18th dynasty[5]. All of these changes that took place since 1999 were only partly documented.
Therefore, in February and March 2020 the antiquities area on the southern end of Elephantine was surveyed (fig. 3b). 2795 points were measured with a Leica TCR705 and transferred into a map with the local planar grid of the site (figs. 2 and 4). These points represent the following features:

- The fence around the antiquities area
- All modern paths, staircases and the viewing platform
- All wire rope cordons at pathways
- The outer corners both of reconstructions and modern buildings
- Terrace walls
- Floor coverings
- Vegetation like palms, trees and bushes
- Concrete slabs for the display of large exhibition objects
- Infrastructures like boxes for electricity and fire hoses
- Reference points in archaeological structures to check the position in the excavation drawings
- Topography

Fig. 2: Map of the antiquities area surveyed in spring 2020 (P. Kopp © DAI Cairo).

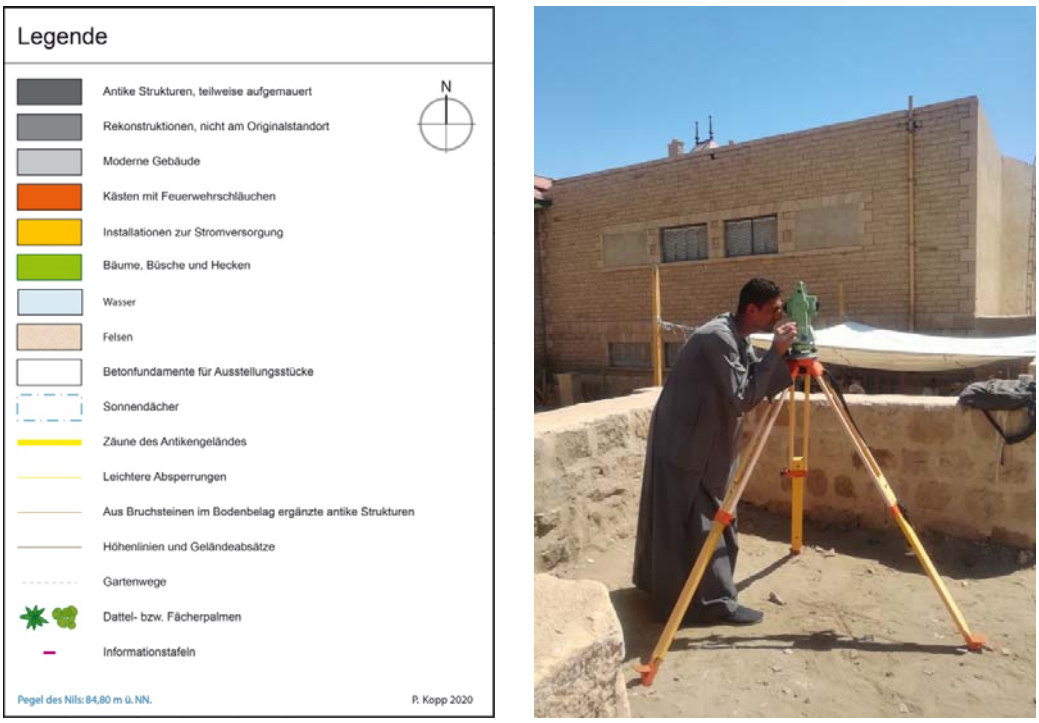


Fig. 3a: Legend to fig. 1 (P. Kopp, © DAI Cairo); fig. 3b: Surveying the museum's area (photo: M.-K. Schröder © DAI Cairo).

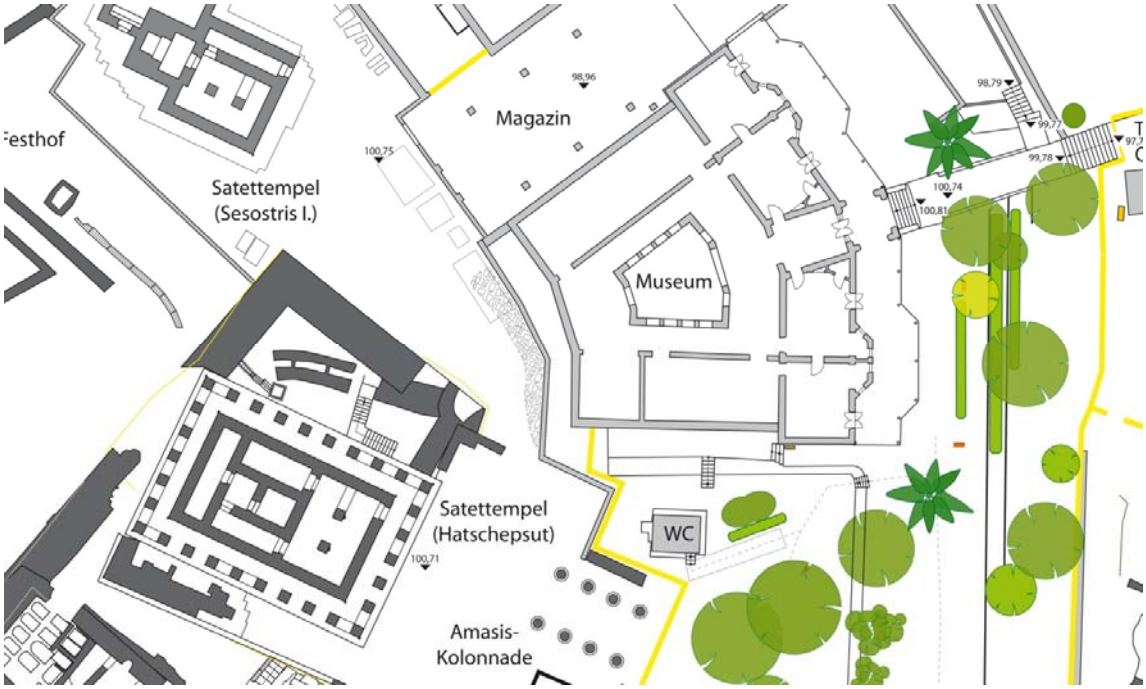


Fig. 4: Detail of map 1: The Satet temple of the 18th dynasty and the Aswan Museum (P. Kopp © DAI Cairo).

On the base of these data a map was created with all present features. All modern features were measured, while most of the antique walls were added by inserting the excavation plans. A colour code indicates the different kinds of natural and artificial features (fig. 2a). Three shadings of grey distinguish between antique walls, reconstructions not built on their antique location, and modern walls and buildings. The present topography is shown by contour lines with a contour interval of 1 m. These lines are only displayed in areas without archaeological features or modern buildings to avoid confusing overlapping. Moveable objects like blocks from temple walls or foundations were added by aerial photographs.

(P. Kopp)

2.1.3 Site Management Concept

Based on the new site plan, work has begun on developing a new site management concept in collaboration with Omar Kassab as project architect. The existing visitor facilities and information available on site will be revised and improved in the future. To this end, points of particular interest such as temple buildings and reconstructions are to be supplemented by new information boards with the latest scientific findings and research status and, if necessary, the routing is to be adapted. In addition, areas accessible and inaccessible to visitors must be defined and thematically processed. The objective of all measures is not only the didactic communication of a complex site to the interested public, but also the protection and preservation of the architectural and archaeological heritage.

In order to plan the new concept, first of all, mappings were drawn up that show the archaeological site from different perspectives. An as-built plan (fig. 5) shows all structures of the site, including museums, pathways, fences and facility buildings used for the excavations and inspectorate. For the structures dating from the Pharaonic Period to the Early Middle Ages, building materials were mapped, mainly mudbrick and stone masonry with further differentiation of natural stone varieties. In a next step, this mapping will be used to plan consolidation and restoration measures of the antiquity buildings, based on the materiality. A further mapping (fig. 6) of the site shows the current pathway network serving for the circulation for visitors. Moreover, this plan defines the points of particular interest to visitors, which will be illustrated with new explanatory panels.

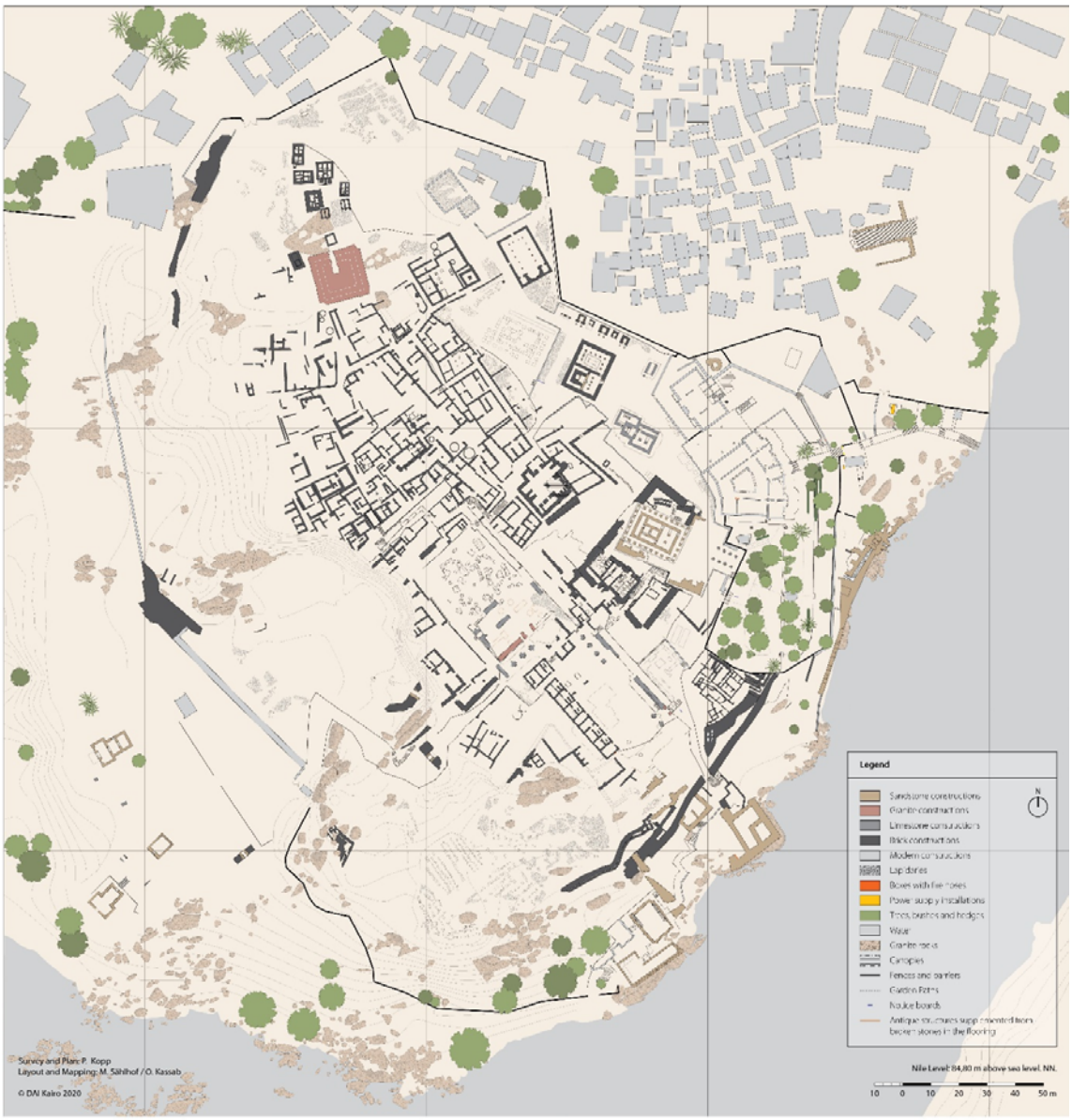


Fig. 5: Plan of the archaeological site of Elephantine, mapping of building materials (Survey and plan: P. Kopp, layout and mapping: M. Sählhof / O. Kassab © DAI Cairo).

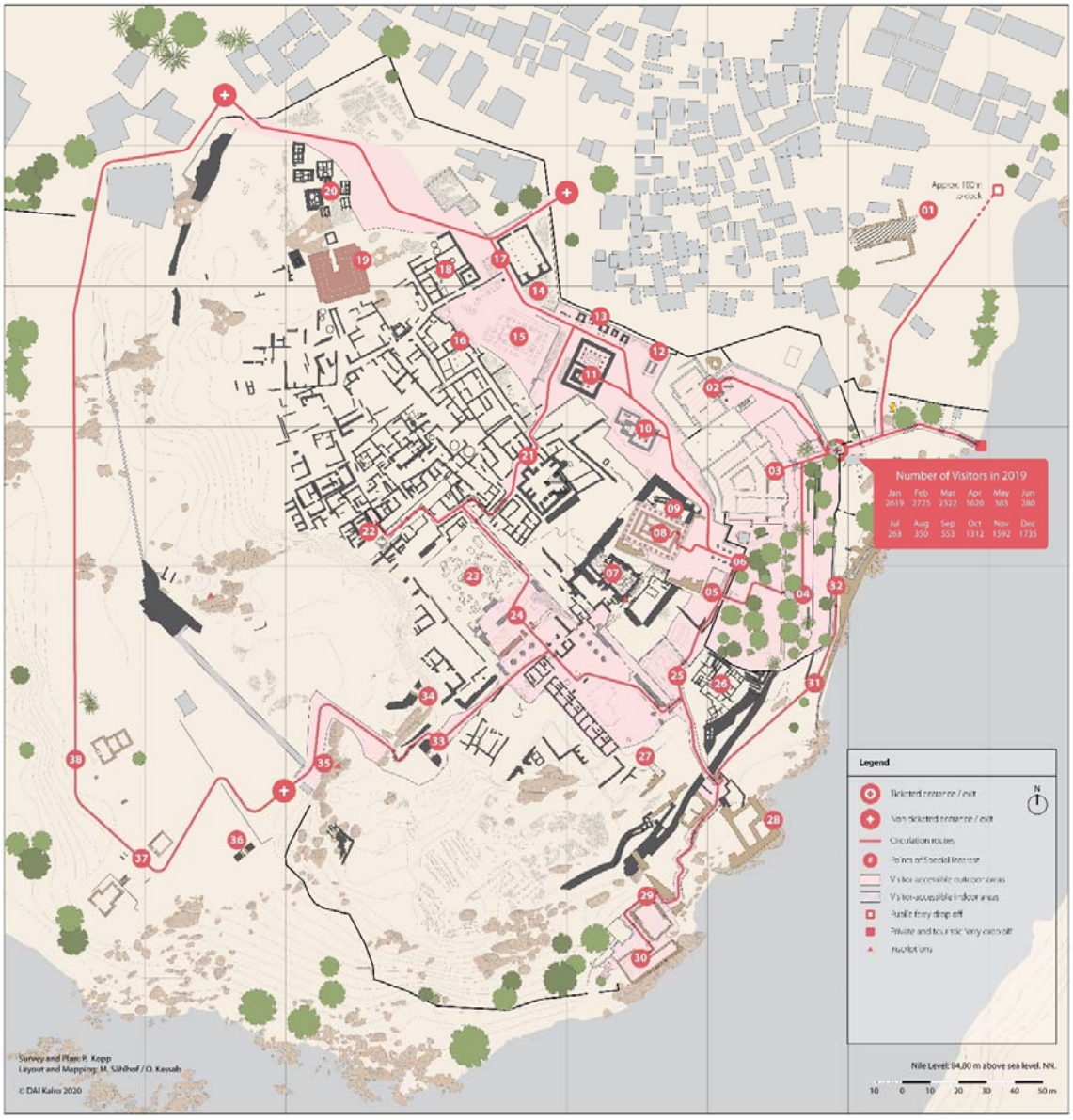


Fig. 6: Plan of the archaeological site of Elephantine, mapping of visitor paths and points of particular interest (Survey and plan: P. Kopp, layout and mapping: M. Sählhof / O. Kassab © DAI Cairo).

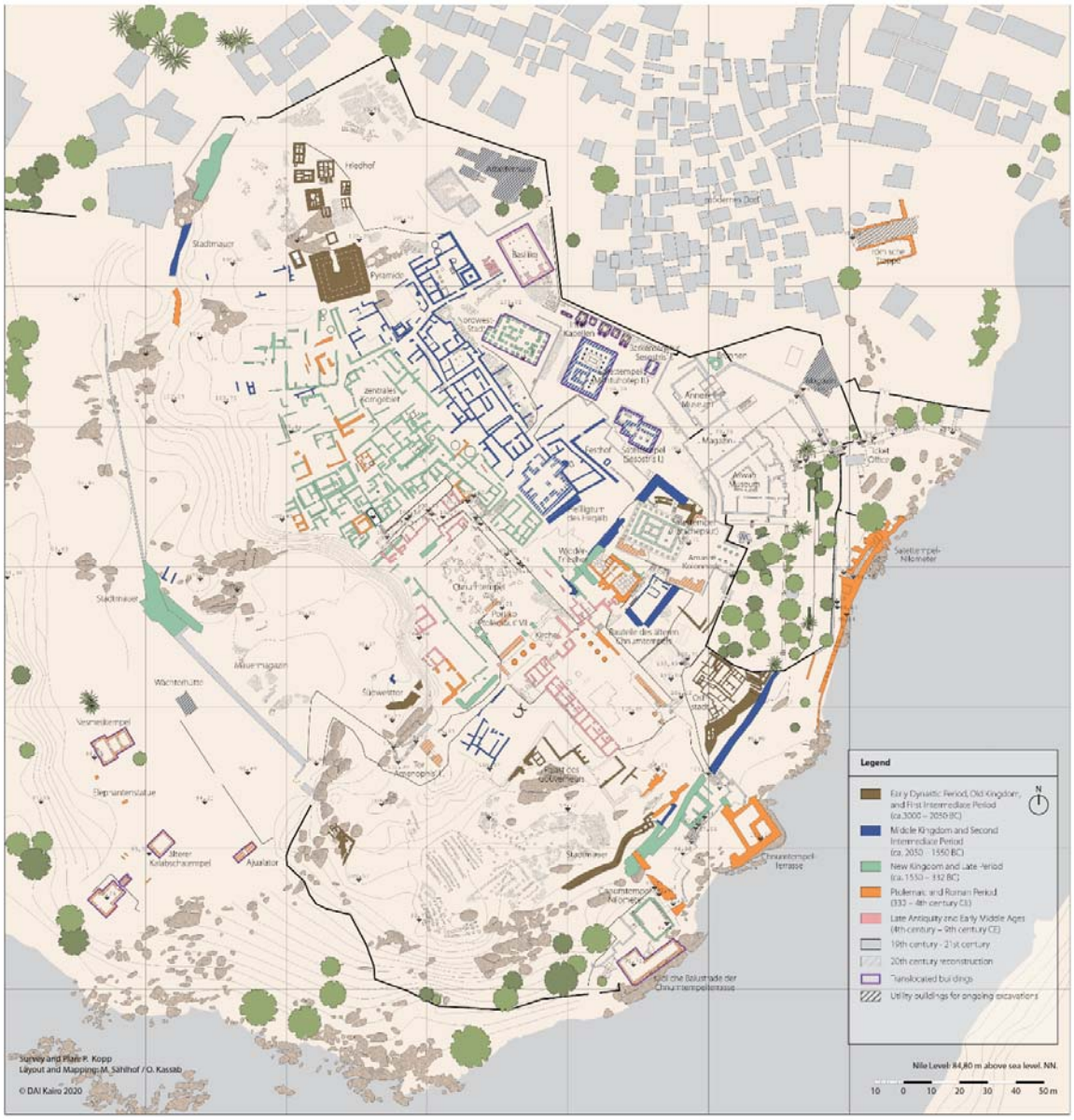


Fig. 7: Plan of the archaeological site of Elephantine, mapping of construction phases (Survey and plan: P. Kopp, layout and mapping: M. Sählhof / O. Kassab © DAI Cairo).

Together with a mapping of the construction phases of built structures dating from the Early Dynastic Period to the Early Middle Ages (fig. 7), it serves to define thematic zonings of related areas, which will be an integral part of the new concept. The mapping of the construction phases also classifies buildings that have been reconstructed or translocated.

(M. Sählhof)

2.2 The project ‘Realities of Life’ – excavations in the north-western part of the town of Elephantine

2.2.1 Overview

Between autumn 2013 and autumn 2018, the German Institute has been excavating in the north-western part of the ancient settlement on Elephantine Island in the scope of the ‘Realities of Life’ project (RoL).[6] Parallel to this work, but especially since spring 2019, after the finalisation of the work on the trench, the team of international researchers has continued to study the excavated finds and the retrieved samples from this area. So-called House 169 is currently in the focus of the work. With its undisturbed stratigraphic layers dating to the late Middle Kingdom/early Second Intermediate Period (mainly late 12th to late 13th dynasties, approx. 1800-1650 BCE), it provided rich find material and sampling ground to answer the project’s research questions.[7] In autumn 2019 and spring 2020 until the outbreak of the worldwide pandemic Fernanda da Silva Lozada, the project’s find database manager, concentrated on cleaning up the database as well as on sorting and inventorying finds in the storage rooms on site for future access by specialists. Thanks to this work the DAI was able to provide full lists of the storage location and identity of each item excavated in the scope of the RoL project to the local office of the Ministry of Antiquities. Apart from that, between summer 2019 and spring 2020 several find groups were examined in more detail by specialists in the team in the storage rooms on site as well as with the help and collaboration of our partners in the laboratories of the Centre of Research and Conservation of the Ministry of Antiquities, the Grand Egyptian Museum, the Institut français d'archéologie orientale in Cairo and the geological department of the University of Aswan

(J. Sigl)

2.2.2 Ceramics and use analysis

A short season, taking place in the beginning of March 2020, allowed for targeted data collection and recording of the ceramic corpus excavated from House 169 in the previous two seasons. The aim was to expand the corpus studied to include samples from all excavated rooms of the house. Collections that came from floor layers, or in some cases room fill layers, were

specifically selected as they were more likely closed contexts and could perhaps be studied to determine the use(s) of a given room (fig. 8). Previous samples recorded from H169 had focused on vertical exposure, and thus many of the ceramics derived from later-deposited fill layers, making the material recorded this season all the more important. To date, a total of 61,056 sherds have been carefully investigated and recorded for the Realities of Life Project, weighing a total of 509.111 kg**.**

Fig. 8: Ceramic study and recording, May 2020 (photo: Leslie A. Warden © DAI Cairo).

Ceramics were recorded using the same data collection forms employed (with only minor modifications) since 2015. The resultant data were then entered into a FileMaker database for later analyses. We are currently in the process of importing the data from FileMaker into a custom database and Business Intelligence dashboard called InfoArch[8] in order to allow to intra- and inter-site comparison of the ceramics. Though the development of InfoArch is still in process, it is currently set up to enable study of ceramic ware by location and/or by period, allowing us to identify and investigate any trends or oddities. Searches and basic analyses can be conducted by context numbers (fig. 9), period (fig. 10), room, or a combination of the three elements. As one example, figure 2 shows that 47501Z/d-1, Late Dynasty 12-Dynasty 13**,** was dominated by coarse wares, though by a small margin; the dominate surface treatment was

unslipped. Only unslipped, coarse ceramics show any sign of cooking ware (via blackening patterns). Figure 3 shows a different trend, with interior blackening (presumably, from food residues) being common for both unslipped and exterior red slipped sherds. These two charts demonstrate that individual contexts may be compared to trends defined by space or period. Currently, analysis is still in progress as the full 2020 data have not yet been incorporated into InfoArch due to COVID-19 pandemic-related delays, leaving it impossible to offer solid findings here. Full upload of the data is anticipated to occur by the beginning of Fall 2020.

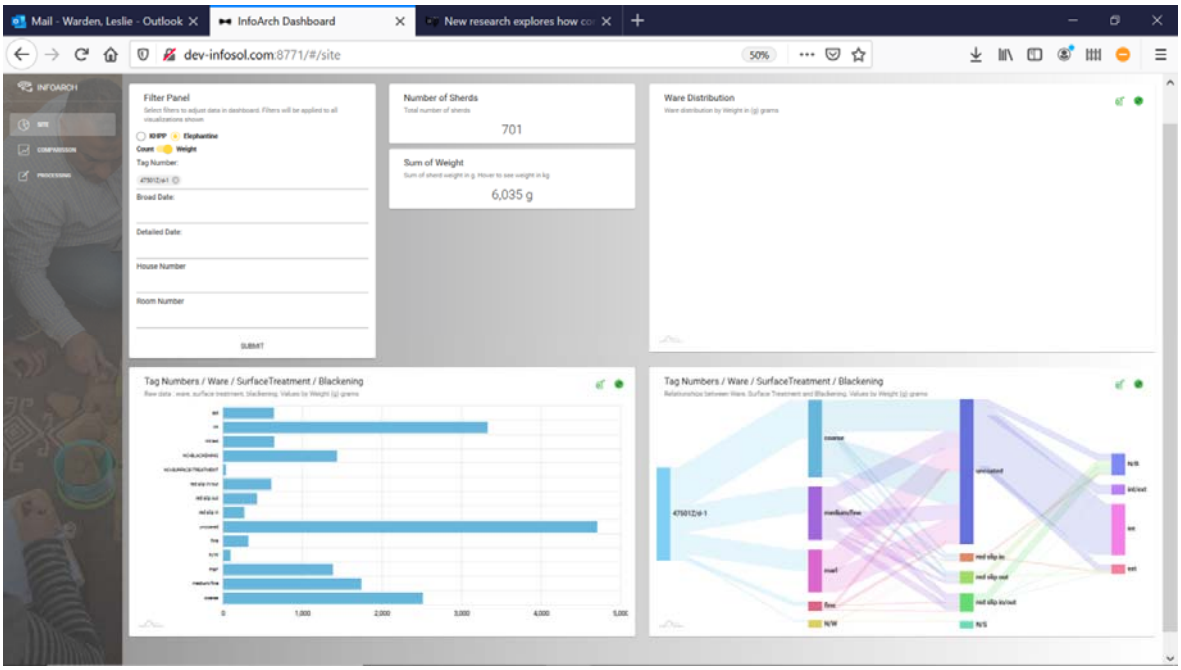


Fig. 9: Dashboard visualizations for 47501Z/d-1. Note that ware distribution chart for this search is in development as of June 2020. (InfoArch developed by InfoSol in collaboration with L. A. Warden; screen shot from L. A. Warden).

Next to the recording of excavated material, we also reconstructed and produced an ancient Egyptian beer. Beer reconstruction is part of the greater aims of the Realities of Life project: to understand how the villagers of Middle Kingdom Elephantine Island actually lived. Beer dominated Egyptian religious and daily life. While the mechanics of beer production have been well studied by Samuel,[9] the place and distribution of beer production across the Egyptian social landscape is still generally unknown, especially for the Old and Middle Kingdoms. We hoped that reconstruction would help us think about daily life activities, labor requirements and distribution, and the placement of activities within the landscape of mid-second millennium BC

Elephantine. Additionally, questions of how the beverage interacted with the material record, particularly pottery, remain open. To-date, there is no strong way to identify beer via residue analysis due to the absence of lipids in the final beverage.[10]

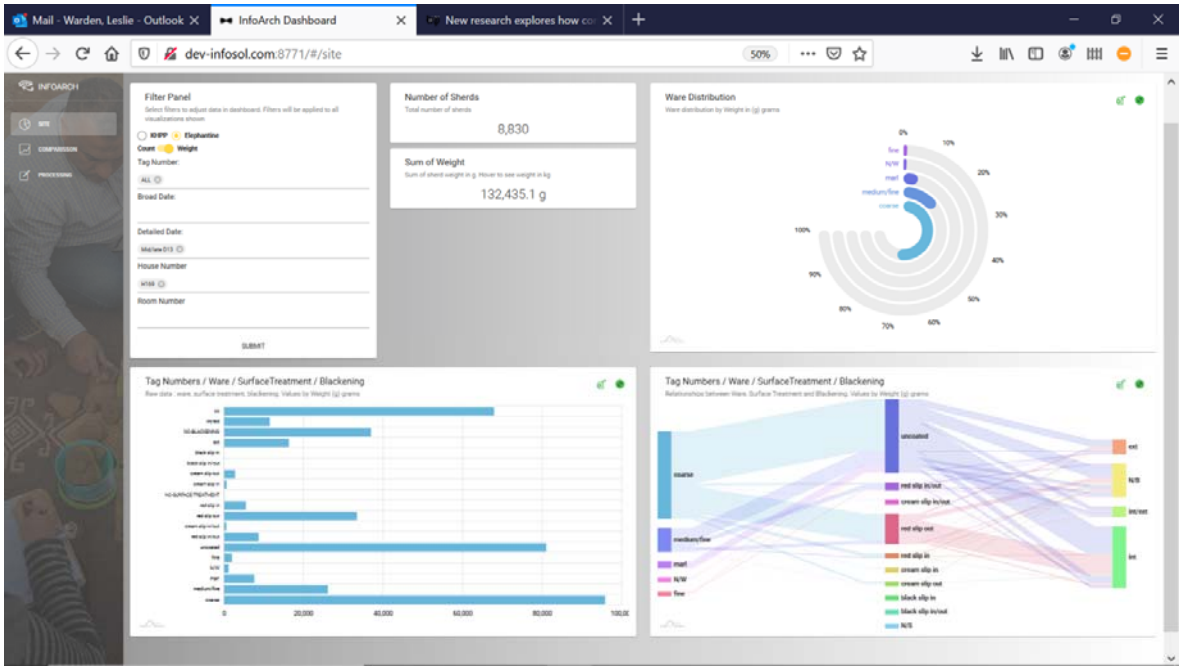


Fig. 10: Dashboard visualizations for mid/late Dynasty 13 material from H169, including sherds analyzed 2014-present. (InfoArch developed by InfoSol in collaboration with L. A. Warden; screen shot from L. A. Warden).

Beer production ties together many aspects of the RoL material record. It should, however, be noted that archaeological evidence for Egyptian beer production has a very odd gap in the Middle Kingdom. The Middle Kingdom also distinctly lacks a 'beer jar' – a settled, identifiable ceramic form used only for beer production and distribution. Beer production and consumption traditions appear to have shifted drastically during the First Intermediate Period.[11]

Grain was the key ingredient of beer, of course, and to this end it is interesting that the archaeobotanical record at Elephantine is rife with barley but shows low evidence for emmer.[12] The archaeobotanical remains would thus suggest that Elephantine's beer might have been a barley beer, unlike the emmer-majority beers known at (much) earlier Hierakonpolis,[13] Abydos,[14]and T ell el-Farkha.[15] Ground stone was used to mill malted grain, an important step that releases the sugars required for fermentation. But in many ways the pottery industry

dominates the material record of beer. Pottery was used to brew, ferment, distribute, and consume the beverage. Hence the reason beer reconstruction was headed by the ceramicist and is discussed in the ceramic section, though the whole team participated. We hope this reconstruction will enable future discussion across specialties through the process of making.

We followed the basic process and ingredients established by Samuel.[16] In terms of process, brewing can be simplified into a six-stage activity (fig. 11). First, grain is acquired from the fields, threshed but still in their hulls. Then, the grain is malted, meaning partially germinated. This step allows for the sugars in the grain to be accessible for fermentation and has been proved to be part of Egyptian brewing by Samuel, though it is not clear if 100% of grain in a given brew would have been malted. Germination must be ideally stopped while the sprout is along 80-100% of the seed body (i.e., still in the hull). This can be done by drying the grain, drying and kilning the grain, or simply using malt immediately when it is ready ("green malt"). The malt is then milled, exposing more kernel surface area for the sugars to seep out. As Samuel[17] has described, we followed a two stage mash ("mash in") process, where one half of the malted grain is seeped overnight in room temperature water ("cold mash") and the other half seeped for 1 hour in hot water ("hot mash"). The spent grain is then removed from the water ("mashing out") and the two batches joined to make the wort – the sugary liquid before fermentation. In pharaonic Egypt, this wort could have stood in open mouthed vats for a bit to begin fermentation, allowing the wort to attract wild yeast. Alternately, it could have been inoculated with older beer (containing live yeast) or yeast trapped in the ceramic walls of the vat or the final bottling vessel. Based on the ceramic evidence, I suspect the latter, as the coarse, utilitarian nature of the ceramic corpus would have ensured that pots held older food residues, making them an ideal repository for yeasts. In this case, yeast from the ceramics would begin to consume the sugar in the wort, causing fermentation.

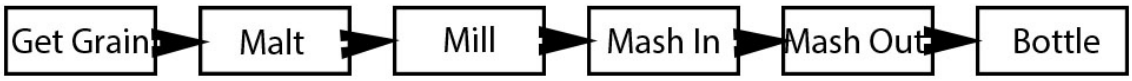


Fig. 11: Simplified workflow for beer production (illustration © L. A. Warden).

Beer in ancient Egypt was made of three main ingredients: grain (barley or emmer), water, and yeast (which the ancient Egyptians almost certainly could not identify). For the Elephantine brew, we were only broadly able to emulate the basics of the ancient beer. We attained barley

from the Aswan market (still in its hull) and used filtered water from the dig house itself rather than the Nile.[18] To date there is no DNA analysis for ancient yeast, so we cannot recreate that ingredient. Instead, we captured wild yeast from the surrounding environment, using fresh dates placed on the dig house roof. The presence of yeast on these dates was confirmed both microscopically and through simple visual evidence (e.g., the dates began to bubble a bit at the cracks in the skin). The grain was malted in the dig house's conference room for 3 days on metal baking sheets. Both cold and hot mashes took place in large metal pots. Bottling and fermentation, however, used a low-fired, unglazed ceramic vessel from a nearby village; the vessel was lightly lidded with a ceramic lid that still allowed oxygen to access the brew. This use of ceramic allowed us to investigate how a porous container might affect the brew, as well as how long a fermenting liquid might survive in such a vessel.[19] We did not have a hydrometer in the field so were unable to track how much sugar was in the wort nor how well it fermented. However, we did daily taste testing and description; mounting carbon dioxide bubbles after 3 days of fermentation were accepted as proof that our captured yeast was doing its job and fermentation was occurring.

Fig. 12 (left): Pellicle on top of our brew, Day 3; fig. 13 (right): Color of the brew, Day 1 (photos: L.A. Warden © DAI Cairo).

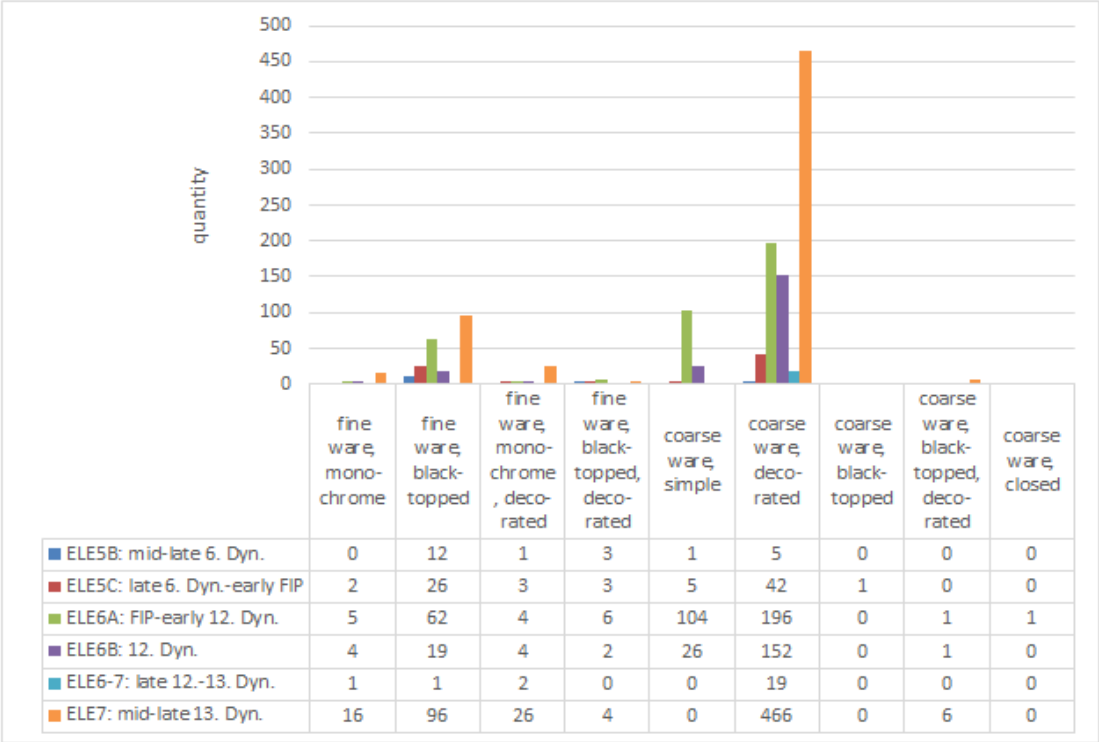
Our reconstructed brew was sour, with a pellicle of mold forming on the top presumably due to the action of bacteria from the ambient environment finding a home in our brew (fig. 12). A sweet, grassy taste was identified by two tasters while another likened it to sauerkraut juice. Hazy yellow in color (fig. 13), it seems to have fermented relatively quickly. The ceramic container held the liquid nicely, with only about a 5 cm drop in the top of the liquid occurring over the three days the liquid was allowed to ferment. However, this decline in volume would have magnified over the long term, suggesting that while the beer could ferment in the vessel effectively, it could not be stored in the vessel – or anywhere! – for any real length of time. When the technology is combined with the speed of fermentation, it suggests that Egyptian beers were drunk young.

Unfortunately, the beer had to be dumped after only three days due to the brevity of the season and COVID-19, so we cannot here discuss when fermentation was complete and how the beverage changed over time. Future work includes testing the modern ceramic vessel we used for this beer to see if residue analysis might glean any markers related to beer. Additional reconstruction brews (planned for the US, and like this reconstruction to be done with modern materials) will allow for more data to be acquired over Spring 2020-2021. This information will be used in discourse between all of the RoL specialists as we try to understand the material record – and relationships – entangled in the production of beer and other foodstuffs.

(L. A. Warden)

2.2.3 Nubian pottery from the north-western town

In the frame of the ‘Realities of Life’- project, the Nubian pottery assemblage from pharaonic settlement layers in the north-western town is being studied, as has been previously reported.[20] Due to the completion of the excavation work in the 48th season, the Nubian assemblage from the excavated trenches could be completely documented and final quantifications of the pottery fragments allow a better understanding of the distribution of the Nubian wares (fig. 14). The graph clearly shows the distribution of ware types through time.[21]



	fine ware, mono-chrome	fine ware, black-topped	fine ware, mono-chrome, deco-rated	fine ware, black-topped, deco-rated	coarse ware, simple	coarse ware, deco-rated	coarse ware, black-topped	coarse ware, black-topped, deco-rated	coarse ware, closed
ELE5B: mid-late 6. Dyn.	0	12	1	3	1	5	0	0	0
ELE5C: late 6. Dyn.-early FIP	2	26	3	3	5	42	1	0	0
ELE6A: FIP-early 12. Dyn.	5	62	4	6	104	196	0	1	1
ELE6B: 12. Dyn.	4	19	4	2	26	152	0	1	0
ELE6-7: late 12.-13. Dyn.	1	1	2	0	0	19	0	0	0
ELE7: mid-late 13. Dyn.	16	96	26	4	0	466	0	6	0

Fig. 14: Nubian pottery NW-town. Distribution of ware types through time (graphics: M.-K. Schröder © DAI Cairo).

Evident is the high amount of decorated coarse wares, especially in the Late Middle Kingdom (ELE7) with fragments of approx. 466 individual vessels in the appearance of Pan-Grave pottery (fig. 15:a),[22] followed by 196 fragments in ELE6A, reflecting C-Group coarse ware (fig. 15:b). Simple coarse wares, i.e. without any decoration, are mostly evident in the First Intermediate Period and early 12th Dynasty and do not occur after that (fig. 16:a). The large number of coarse wares stands in a high contrast to the relatively few fine wares. Most fine wares are represented by black-topped vessels, with their peak in the early 12th and 13th Dynasty (ELE6A: fig. 16:b and ELE7: fig. 16:c). These black-topped bowls are characteristic for ceramic assemblages of the Predynastic Period in Egypt and also for Nubian pottery since the Neolithic.[23] Likewise characteristic are the decorated fine wares, the incised bowls of the late Old Kingdom and Middle Kingdom which are commonly associated with the so-called C-Group culture of Lower Nubia.[24] These incised bowls are underrepresented in the settlement material and mainly known from the various Nubian cemeteries from Hierakonpolis in Upper Egypt to cemeteries along the Nile in Lower Nubia until the Second cataract and beyond. At

Elephantine, a few incised black-topped bowls exist. Here, especially early types appear with vertical comb impressions on a red exterior surface, while the black interior is often roughly wiped (fig. 16:e). Further incised bowls are represented by one small rim sherd with an interlaced rim band and hatched bands (fig. 16:d). The existence of this however small assemblage of elaborately decorated cups links the settlement well with contemporaneous Nubian cemeteries.

Fig. 15: Nubian pottery NW-town. Decorated coarse ware ELE5C: 44501M-q-1-1 Z5113; and ELE7:47501V/m-1-62 Z5263 (photos: J. Garzon © DAI Cairo).

The quantity of Nubian sherds embedded in the Egyptian ceramic inventory increases through time.[25] In the oldest phases of the excavated area, the Nubian pottery belongs to pottery formations ELE5B and ELE5C (2nd half 6th Dynasty to the early First Intermediate Period). In this time, Nubian pottery fragments are rare in the pottery inventory (0,46 % in 58 excavated features), although Egyptian pottery occurs en masse. Only in the First Intermediate Period and the early 12th Dynasty, the number of Nubian sherds within the Egyptian pottery increases significantly but does not reach more than 1,02 % of the ceramic assemblage and is found in 88 features. With one of the last phases of the excavated trench, namely House 169 dating to the 13th Dynasty, the number of Nubian sherds increases again and represents an average of 2,62 % in 181 features.

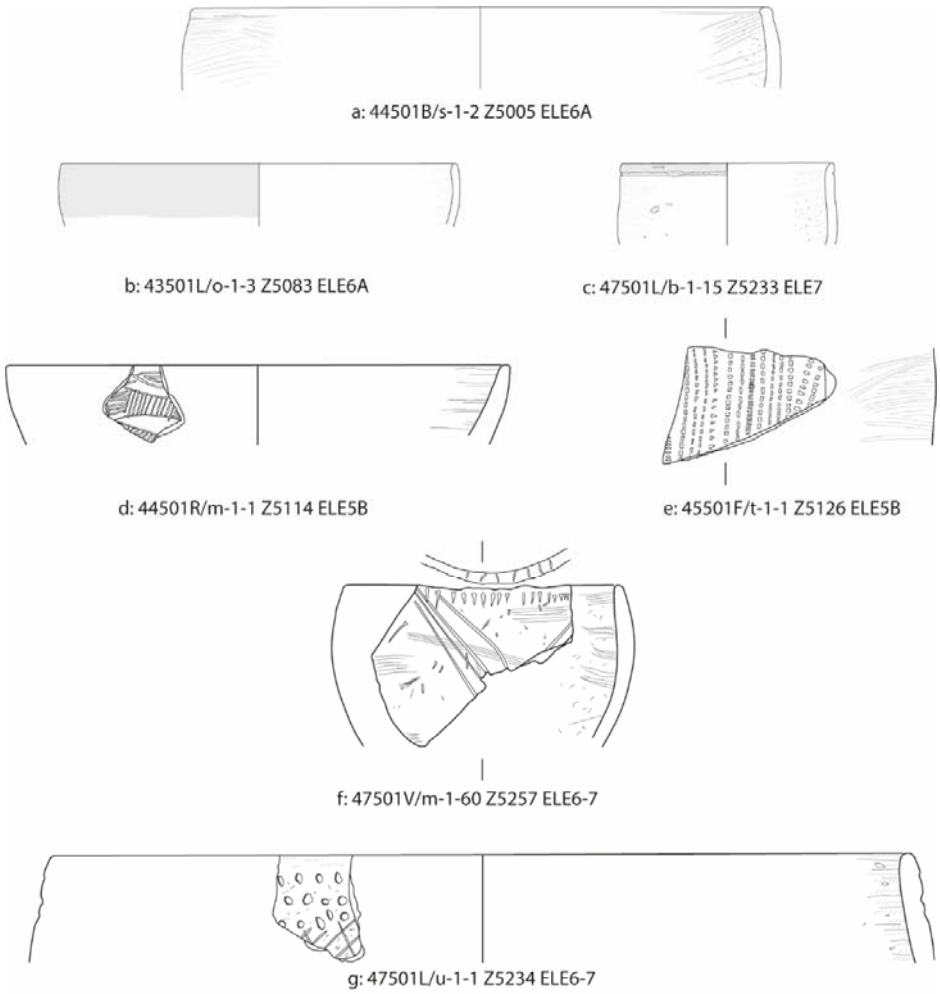


Fig. 16: Nubian pottery NW-town. a: simple coarse ware (M 1:4); b-c: black-topped bowls (M 1:2); d-e: decorated fine wares (M 1:2); f-g: hybrid vessels M 1:2 (drawings: M.-K. Schröder, inkings: J. Garzon © DAI Cairo).

An interesting feature are the so-called hybrid-vessels, which represent both characteristics of the C-Group and Pan-Grave pottery corpus. The first example is a cup with restricted orifice and wet wiped exterior and interior surfaces (fig. 16:f). The body is decorated with incised lines in a lattice pattern and the rim band as well as rim top are decorated with short lines. The incised lattice pattern is a typical motif of Pan-Grave pottery, but the rim band and - top decorations are clearly deriving from C-Group traditions. Also, the surface treatment of wet wiping refers rather to C-Group than Pan-Grave. The other example shows three rows of oval impressions on

the rim band and beneath an incised cross-hatched pattern (fig. 16:g). Again, the rim band decoration is uncommon in the Pan-Grave motives, but the incised pattern is clearly pointing toward Pan-Grave and is not present in the C-Group inventory. The Egyptian pottery of both features dates the find complexes to the mid-13th Dynasty and therefore after the C-Group presence in the trench. Consequently, these two small sherds represent a connecting evidence of two different Nubian ceramic traditions in the find material within the settlement at Elephantine, and thus shows an interaction of these two Nubian groups within an Egyptian settlement.

(M.-K. Schröder)

2.2.4 Ceramic petrography – methods, samples, and results

The petrographic analysis of Middle Kingdom pottery from Elephantine 'Realities of Life' project aimed to characterize the raw materials employed.[26] Examination of the on-site fabric groups was of importance to assess their consistency and relationship to each other. Of specific interest were several vessels of Nubian style.

Methods

The methods employed are those standards for ceramic petrography.[27] For each thin section examined, its colour in plane (PPL) and cross polarized (XPL) light was noted, an estimate was made for the frequency of inclusions relative to clay matrix, and the sorting of the inclusions was specified. The minerals identified in the thin section were listed by those that represent the main inclusions, and those that are less common. For the inclusions, both their general shape and size range were noted.

Thirty-five sherds were analyzed (tab. 1). They were selected by Leslie A. Warden and Marie-Kristin Schröder to cover most of the fabric classes utilized in pottery analysis at the site.[28] Some samples were also chosen as they had Nubian characteristics, while an earlier study of bread moulds had aimed to examine clay linings for these vessels.[29] Table 1 lists the samples and the petrographic group to which they belonged.[30] Five such groups were identified in the material, which are described below along with the samples and their fabric designations in each group.[31]

IFAO #	Vessel No.	Description	Fabric	Petrographic Group
11001	43501H/k-1-5	Sherd	NSI.b	Nile with OPL, <limestone
11002	43501H/k-1-6	Sherd	NSI.v	Nile with OPL
11004	43501H/k-1-8	Sherd	NSI.s	Nile with <OPL and limestone
11006	43501H/k-1-9	Sherd	NSI	Nile with OPL and ash, <limestone
11007	43501H/k-1-10	Sherd	NSI	Nile with OPL, <limestone
11010	43501H/q-1-3	Sherd	NSI.b	Nile with OPL
11011	43501H/q-1-4	Sherd	NSI.v	Nile with OPL
11012	43501H/q-1-5	Sherd	NSI.s	Nile with OPL
11013	43501H/q-1-6	Sherd	NSI	Nile with OPL and ash
11016	44501F/c-1-18	Sherd	NSI.v	Nile with OPL
11025	44501N/t-1-1	ELEN228	Fine ware	Nile with OPL and ash
11032	44501B/d-1-1	ELEN3	Fine ware	Nile with OPL and ash
11043	45502B/c-1-1	ELEN710	Cooking vessel?	Nile with OPL and ash
11045	45502G/b-1-1	ELEN856	Cooking vessel	Nile with sand
11095	43501H/k-1-11	Sherd	MIV	Nile+Marl
11098	43501H/k-1-14	Sherd	MI.b	Shale with sand and limestone
11100	43501H/k-1-16	Sherd	MI.b	Marl
11103	43501H/k-1-17	Sherd	MI.a	Nile+Marl
11108	43501H/l-1-5	Sherd	MI.a	Nile+kaolinite
11113	43501H/q-1-8	Sherd	MII.b	Shale with sand and limestone
11117	46501B/b-1-127	Sherd	MII.a	Shale with sand and limestone (Marl C)
11118	46501B/b-1-128	Sherd	MII.a	Shale with sand and limestone (Marl C)
11119	46501B/b-1-129	Sherd	MII.b	Shale with sand and limestone
11120	46501B/b-1-130	Sherd	MII.a	Marl
11124	46501F/b-2-2.1	Sherd	MIII	Nile with sand
11125	46501F/b-2-2.2	Sherd	MIII	Nile with sand
11132	43501H/k-1-25	Egyptian cooking pot in imitation of Nubian form - formal ID tentative	NSIII	Nile with sand
11159	46501B/b-1-134	Cylindrical bread mould	NSV	Nile with OPL
11160	46501B/b-1-135	Cylindrical bread mould	NSV	Nile with OPL, <limestone
11168	43501H/k-1-28	Bowl with direct rim, possibly carinated, with incised line ext	NSIII	Nile with OPL, <limestone
11171	43501H/k-1-29	Medium-coarse bowl	NSII	Nile with OPL, <limestone
11174	43501H/k-1-30	Bowl with direct rim	NSIV	Nile with <OPL
11179	43501H/q-1-12	Cooking pot with rolled slightly restricted rim	NSII	Nile with OPL, <limestone
11182	43501H/q-1-14	Hemispherical cup	NSIV	Nile with <OPL and <limestone
11186	43501H/s-1-8	Bowl with incised line, possibly carinated	NSIV.x	Nile with <OPL

Tab. 1: sample list.

Results

Nile clay with plant remains

Seventeen samples had a paste composed of Nile clay with plant remains. This included samples of Fabric NSI, NSI.b, NSI.s, NSI.v, NSII, NSIII, and NSV along with the fine ware fabric and a possible cooking vessel fabric. For those with determined vessel shape, cylindrical bread moulds, a possible carinated bowl with direct rim, a medium-coarse bowl, and a cooking pot with rolled slightly restricted rim all had this paste. In addition, were the forms ELEN3, ELEN228, and ELEN710. For a number of these samples minor limestone was present that is likely natural to the Nile clay. A few samples had likely ash along with the plant remains.

Three samples have a Nile clay with lesser and finer plant remains. These were of Fabric NSIV and NSIV.x. One was a bowl with a direct rim, one a possible carinated bowl with incised line, and the third a hemispherical cup. The latter sample also had minor limestone that was natural to the Nile clay.

Nile with sand

Four samples had a paste of Nile clay with sand as an addition. These included a cooking vessel of shape ELEN856, two sherds of Fabric MIII, and an Egyptian cooking pot (possibly imitating a Nubian form) of Fabric NSIII.

Nile Mixes

Three body sherds had a Nile clay mixed with another clay. A sample of Fabric MIV was a Nile clay with a calcareous marl clay and a high amount of silty quartz from the Nile clay. A sample of Fabric MI.a was pink marl clay with some Nile clay addition. In this case, the calcareous clay was dominant and the fabric was less silty. A second sherd of Fabric MI.a was a mix of the Aswan kaolinitic clay and Nile clay with some fine limestone dispersed throughout. Such a feature is not typical of Aswan clay, so may have been added and likely resulted in the white ‘scum’ surface noted on one side. The two Nile and marl mixes were fired between 800°C and 850°C, while the Aswan mixed fabric had a firing temperature probably below 800°C.

Marl

A sherd from Fabric MI.b was composed of a yellowish marl clay with some silty quartz. A sample of MII.a was also a yellow marl clay but with less silty quartz. Both were probably fired close to 850°C.

Shale

Five samples featured a shale-derived clay with sand and limestone. Two would be classified as Marl C in the Vienna System. In the site-based fabric system, they were categorized as MII.a. They were related to the two samples of Fabric MII.b, which have a lower firing temperature closer to 800°C and finer sand and limestone. A sample of Fabric MI.b is similar to the two samples of MII.b with a shale clay, added limestone and sand, and a firing temperature between 750°C and 800°C. However, the atmosphere was more reduced for this sample.

Discussion

Petrographic analysis of 35 samples from Elephantine aimed to clarify the on-site fabric classification system and examine the use of specific pastes. Many sherds were produced from a Nile clay with added plant remains. These included fabrics:

- NSI: one sherd with minor limestone, one with infrequent ash, and one with rare ash and limestone; all fired between 750°C and 800°C
- NSI.b: one sherd with minor limestone with a firing temperature between 750°C and 800°C, the other without limestone but fired slightly higher
- NSI.s: one sherd with lesser plant remains and rare limestone, one with common plant remains and no limestone and a firing temperature closer to 850°C
- NSI.v: three sherds with firing temperatures ranging from likely around 750°C up to probably 850°C
- NSII: a medium-coarse bowl sherd and a cooking pot with rolled slightly restricted rim with some plant remains and rare limestone; both with a low firing temperature
- NSIV(x): a bowl with direct rim, a hemispherical cup (with minor limestone), and a possible carinated bowl with incised line (more medium-sized inclusions) all with rare plant remains; the firing temperature was low for all three
- NSV: both cylinder bread moulds with coarse Nile clay and common plant remains, one also has rare limestone and a firing temperature closer to 850°C, while the other has a lower firing temperature
- NSV.b: four cylinder bread moulds with a coarse Nile clay and common plant remains, also with a high firing temperature[32]

Also, in this group is a fabric for fine ware of vessel forms ELEN228 and ELEN3. Both samples have a coarse Nile clay with some plant remains and ash, a likely firing temperature around 800°C, and a reduced atmosphere. Related is a cooking fabric for form ELEN710 with finer

inclusions and a slightly lower temperature for the firing. The other possible cooking fabric for form ELEN856 had no plant remains but sand temper and also a lower firing temperature. It is similar to the Egyptian cooking pot in imitation of Nubian form of Fabric NSIII. The latter is less silty with a firing temperature probably around 750°C, so even lower. The other sample of Fabric NSIII is a possible carinated bowl with direct rim that has a paste of Nile clay with plant remains, rare limestone, and was probably fired around 800°C.

Fabrics in the M classification were produced with Nile clay, marl clay, shale clay, or mixed pastes. Fabric MI.a included two samples, one of a pink marl with minor Nile clay (fired close to 850°C) and the other an Aswan kaolinitic clay with minor Nile clay (fired around 800°C). The two sherds from Fabric MI.b are quite different. One is a yellow marl with a high firing temperature, while the other is a shale clay with fine sand and limestone and a low firing temperature. Likewise, Fabric MII.a has two sherds with a similar paste that resembles Marl C; a shale clay with limestone and sand probably fired close to 850°C. The other is a yellow marl clay with a similar firing temperature. The two samples of Fabric MII.b are very similar with a shale clay, added limestone and sand, and a firing temperature between 750°C and 800°C. They are similar to the shale clay MI.b sample. Fabric MIII had two samples of Nile clay with sand that were probably fired around 800°C. The single sample of Fabric MIV was a mix of silty Nile clay and marl clay with a firing temperature between 800°C and 850°C.

Conclusions

Pottery made at Elephantine during the Middle Kingdom show several paste recipes. Many different forms had a Nile clay with plant remains, though the coarseness of the clay and size of the plant remains could vary. Such raw materials are locally available. A previous project in this area at Hisn al-Bab suggested the local Nile clay could have more notable zircon, epidote, sphene and/or garnet along with larger volcanic and plutonic rock fragments and fragments of shale and/or limestone.[33] Such features were not noted consistently for the Elephantine Nile clay samples, though did often appear for the bread mould pastes. It is unclear if this indicates variation in where the vessels were made or the selection of raw material.

Marl clay vessels and mixes of Nile and marl clay may not be local to Elephantine as calcareous deposits are not near the Nile in this area, though there could be areas where such formations are exposed.[34] Likewise, shale clay vessels may also not have been made in the area as shale is not readily present. However, there may be specific areas where shale clay could be acquired. Surprisingly, only a single vessel had the characteristic kaolinitic clay for this area, although it

was mixed with Nile clay. This could suggest that during the Middle Kingdom these clay sources were not heavily exploited.

(M. F. Ownby)

2.2.5 Brief report on pigments investigations in spring 2020

The third season of pigment studies in the scope of the DAI's project Realities of Life in March 2020 focused on the samples coming from House 169 excavated during the 47th and 48th campaigns mainly.[35] From the cultural material collected from the various contexts inside the excavated area, 89 samples were identified as pigment production by-products including raw materials, smelted ores, grinding stones with traces of pigments as well pigment samples.

Any samples that were not considered to be a pigment in the general sense (it has to be considered that raw white limestone was used to mix lighter hues of pigments, though the stone in itself is not considered a pigment) was reported in the excavation database. Based on the results of this season, all samples marked as pigments from H169 were investigated on site. The investigation took place using DAI's Zeiss polarizing microscope for the identification of the minerals. For further studies as thin sections using a polarizing microscope, by FTIR and XRD, sixteen samples were sub-sampled to be sent for laboratory analysis and investigation.

Most of the samples studied on site were red pigment with various hues and ores, few were yellowish material. Two samples consisted of blue and green. Through observations of the samples, their typology and their original context understanding was sought of these samples' function, whether or not they were real pigment or materials used in the production process.

Sample number 47501V/f-2-1 and -2 (pigment powder) found in room R08 of H169 in a feature that was covered by a floor (47501 S/i), and was found on the northern corner of the floor number (47501 V/h). Associated features with the one, in which the pigment powder had been discovered (47501V/f), were a fire place (47501V/e) and an ash layer (47501V/c) within this fire place. From the previous described cross relation of contexts and sample,[36]the heat of a fire must have been used for the treatment of the Nubian sandstone red ochre ore to produce deep and fine-grained synthetized hematite. The finding of sample 47501V/f-2-1/2 in the context of a fire place gives additional evidence for this procedure.

Aside from these samples one other item, which did not come from H169 was investigated. A Nile shell (Etheria elliptica) from an older excavation in the Middle Kingdom town of Elephantine (feature 17502M-5) with a spot of cemented grains of blue pigment was investigated. Microscopic analysis proved it as synthetic Egyptian blue pigment. This kind of pigment so far was rare among the studied samples of this and previous seasons.

(B. Gehad)

2.2.6 Archaeometallurgical samples from Elephantine

In the days from 12th to 21st November 2019, 12 archaeometallurgical samples from Elephantine 'Realities of Life' project, currently stored at the IFAO, were processed. The samples were firstly documented by photographs and drawings by Martin Odler. Cross sections were then prepared from the samples by Jiří Kmošek and the samples were then measured by the portable X-ray fluorescence machine Bruker Tracer III-SD and by the metallographic microscope present at IFAO archaeometric laboratory. The archaeometallurgical study enables us to classify individual metallurgical remains more precisely.

From the total amount of 12 analysed samples two were identified as iron minerals – hematite or goethite with admixtures of silica and manganese. These iron minerals can be used as fluxing agents in copper smelting, melting or alloying operations.[37] Six samples were identified as vitrified fragments of ceramic crucibles. In each of the crucible fragments of metallic copper alloy prills are still present, mostly indicating processing of alloy of arsenical copper and tin bronze, high in arsenic. One vitrified ceramic fragment from Dynasty 11 was newly classified as fragment of tuyère, used in processing of arsenical copper alloy rich in antimony. The rest of analysed material are fragments of different types of slags of mostly amorphous character with presence of arsenical copper prills.[38]

Thus, contrary to the assessment of M. Renzi, the material contains also slag fragments.[39] Due to the meticulous excavation techniques, the chronological ordering of the samples (selected by M. Renzi for further study at IFAO) enables us to observe the continuous use of the arsenical copper in the Dynasty 11 and 12 (with possible, but marginal occurrence of tin). Rather frequent occurrence of gold among the trace elements may indicate that the metallurgy at the site was connected to the well-documented jewellery production from semi-precious stones, found in

Dynasty-12 and Dynasty-13 houses.[40] But it could be a property of the used ore itself, trace elemental presence of gold was demonstrated for copper ore found at Old Kingdom Buhen in Lower Nubia.[41] Only further study of the material stored at Elephantine may demonstrate the validity of one or both of these hypotheses.

The introduction of tin bronze can be dated to the Dynasty 13 and Second Intermediate Period, which is in agreement with observations on other sites.[42] The corpus of Middle Kingdom and Second Intermediate Period metallurgical remains from Elephantine is not numerous, but significant, as it provides datable comparison to much larger assemblages from Dynasty-12 Ayn Soukhna and Dynasty-13 Tell el-Dabᶜa.[43] Of all the results obtained, it is most interesting the simultaneous occurrence of tin and arsenic in analysed fragments of ceramic crucibles. This is most possibly the consequence of the transition of arsenical copper metallurgy to the tin bronze metallurgy and applied recycling of older material as was also recently documented at C-Group Aniba, contemporary with Dynasty 12.[44]

(J. Kmošek and M. Odler)

2.2.7 Preliminary report on micro-botanical studies

As part of the 'Realities of life' project currently under progress on Elephantine (47th campaign, 2018), the study of plant micro-remains has begun in March 2018. An initial assessment was conducted during 3rd – 9th March 2018 on site in order to establish personal contact with the other team members, discuss sampling strategies and research aims especially concerning phytoliths from soil samples for micromorphology and phytoliths and starch from grinding stones and other stone tools.[45]

Sampling for phytoliths from 47 grinding stones (including smooth/fine, medium, and coarse surfaces) and associated soil was completed as a pilot study to determine if microbotanical remains were preserved on grinding stone surfaces and if any relationship exists between grinding surface texture and preserved crop microremains, using the methods of Piperno 2006.[46]

A separate analysis will be applied for:

(i) The materials retrieved from surficial cracks and crevices on the stones.

(ii) The materials retrieved from adhering and attached soils to the stones.

To avoid modern contamination, extraction and mounting were conducted in a clean environment in the laboratory of the Grand Egyptian Museum beginning in autumn 2018, where no modern material had been processed, dust monitored and blanks with mounting media were conducted on a regular base. Masks and starch-free gloves were worn at all times. Residue analysis was carried out in three different stages: selection of the sampling areas, residue extraction, and identification and quantification of the plant micro-debris.

Phytoliths were found on most of the tools. The main type was long smooth cell phytoliths, but these were also observed in small lumps of soil adhering to the tool, therefore they could be environmental in origin and therefore represent a possible source of ancient contamination. Dendritic Phyoliths, which are characteristic for grain husks, are also frequently represented.

Bilobate type phytoliths are also present in a number of tools. This type of phytoliths are common in C4 plants[47] and are found in variable numbers in the inflorescence and stems of a number of species in the Eragrostideae, Paniceae and Andropogonae tribes. These species, which were common in Egypt during the Mid-Holocene, and which we have examples of in the reference collection, have been found among the archaeological assemblage's macro-remains and the starch granules.

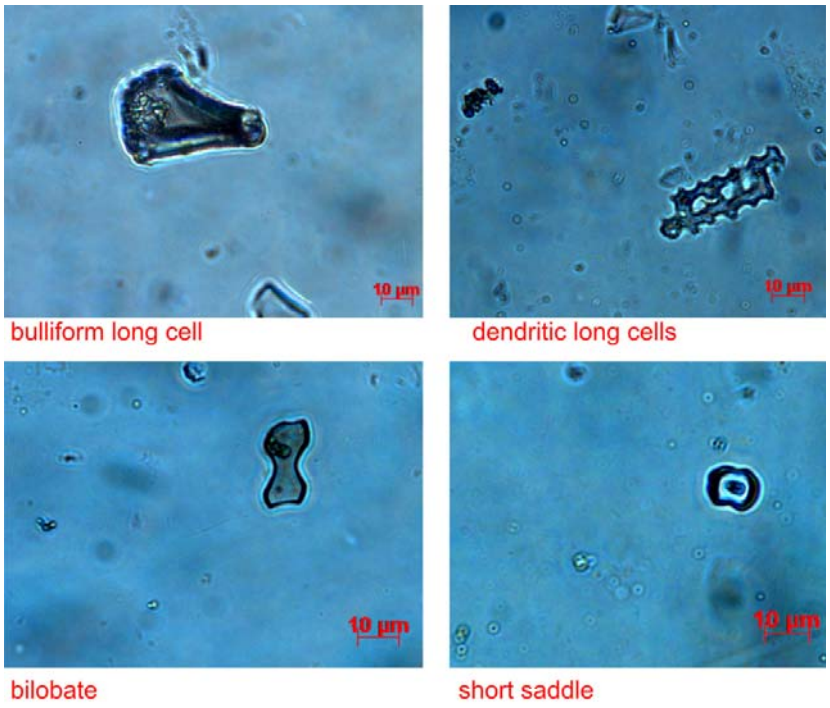


Fig. 17: Examples for various types of phytoliths found in the samples from Elephantine (Photos: E. Abdellatif © DAI Cairo).

A third type of phytoliths is saddle-shaped phytoliths that are the dominant class of the Chloridoideae subfamily.[48]

Saddle phytoliths are "battle-axes with double edges"[49], referring to the outline of the base when the body is oriented in top view.

The preliminary morphological results indicated that the recovery of phytoliths from grinding stones has been successful and that grasses are dominant in the samples. I anticipate that additional studying of larger numbers of grinding implements will assist in identifying plant remains to further supplement macrobotanical studies in progress.

(E. Abdellatif)

2.2.8 Burning experiments on modern botanical materials

Phytoliths are mineral plant components made of biogenic amorphous silicon dioxide (SiO_2), which are still visible after the decomposition of organic material.[50] Phytoliths can be altered by heat. These alterations allow conclusions to be drawn about firing temperatures and firing regimes.[51] In the scope of the 'Realities of Life' project the study of deformations of phytholiths through heat may help to understand the use of fireplaces found on site.

For understanding the heat deformation of phytholiths different materials were burned under mainly reductive (r) and under oxidised (o) conditions at different temperatures (tab. 2) in a muffle furnace. The materials that were burned are recent materials but can also be found in the sediments of the ancient settlement Elephantine. I have chosen different materials, such as Ficus bark and fruits, Phragmites stems, leaves and fruits, Acacia fruit and Imperata. Since manure is often found in fireplaces of the excavation site[52] and is up to today used as fuel plus contains many phytoliths, I have also burned modern sheep dung. The experimental work was carried out in the Soil Science Laboratory of the Goethe University Frankfurt, Institute of Physical Geography in collaboration with C. Langan and A. Röpke.

In this report the focus lies on the macroscopic characteristics of the burned materials.

Table 2 shows the remaining material in weight percentage after burning at different temperatures. We assume that the weight loss is due to the loss of organic material. There are hardly any differences in ashing under reduced or oxidised conditions detectible.

Material	Plant part	O_2-condition	250°C	450°C	600°C	800°C	1000°C
ficus	**bark**	r	57,99	18,39	15,24	10,19	12,01
ficus	**bark**	o	57,37	18,84	14,22	11,22	10,69
ficus	**fruit**	r	55,37	9,26	7,29	6,36	6,25
ficus	**fruit**	o	55,19	9,01	8,10	7,34	5,68
imperata		r	47,09	7,84	8,30	9,27	7,87
imperata		o	54,89	9,33	8,44	8,39	6,98
phragmites	**stem**	r	46,45	10,21	8,70	16,09	11,82
phragmites	**stem**	o	48,85	16,27	6,49	10,40	7,41
phragmites	**leaf**	r	51,34	19,85	22,78	21,74	20,20
phragmites	**leaf**	o	48,48	20,37	20,85	18,84	16,56
phragmites	**fruit**	r	47,71	16,76	16,15	16,03	15,58
phragmites	**fruit**	o	61,50	15,29	15,57	14,68	13,49
acacia	**fruit**	r	66,26	6,39	5,62	4,51	4,46
acacia	**fruit**	o	67,39	5,50	5,20	4,19	5,26
dung		r	52,61	14,79	15,67	15,87	15,53
dung		o	71,50	11,97	19,42	18,42	15,66

Tab. 2: Remaining material (% w/w) after combustion under different conditions (o=oxidised, r= reduced).

At 250°C between 46,45 % (phragmites stem) and 71,5 % (dung) of the samples remain. the next temperature step is 450°C, where only 10 – 20 % of material is left. In the case of Acacia, it is even only 5,5 %. The differences at 600°C, 800°C and even 1000°C are not big. Sometimes the loss of organic material is even higher at 600°C than at 800°C.

These minor differences can be easily explained. The loss on ignition is typically performed at 500°C (DIN 18128). All organic material is lost in the process. Therefore, it makes little difference whether the material was burned at 600 or 1000 degrees. However, the temperature levels were nevertheless chosen in order to investigate the alteration of the biogenic SiO_2 content of the plants - the phytoliths - under various temperatures.

If we look at the pictures (figs. 18-21) of the remains, big differences can be seen. The reduced burnt materials are shown as an example.

Fig. 18: remains of dung from 250°C on the left to 1000°C on the right (Ø of vessels = 30 mm; photo © D. Fritzsch).

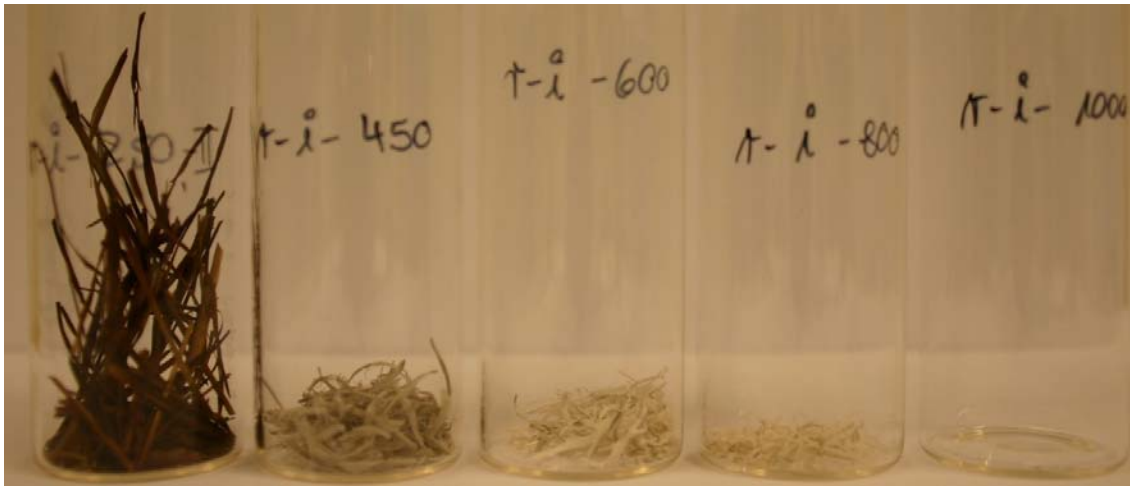


Fig. 19: remains of imperata from 250°C on the left to 1000°C on the right (Ø of vessels = 30 mm; photo © D. Fritzsch)

Fig. 20: remains of the leaves of phragmites from 250°C on the left to 1000°C on the right (Ø of vessels = 30 mm; photo © D. Fritzsch).

Fig. 21: remains of the stems of phragmites from 250°C on the left to 1000°C on the right (Ø of vessels = 30 mm; photo © D. Fritzsch).

After burning at 250°C, the plants and dung can still be easily recognized as such (Fig. 18-21). The coloration only indicates that the material has been burnt. In the following temperature levels from 450°C the rule is valid: the higher the temperature, the paler and more ashed the material looks. A phenomenon occurs with phragmites that has already been noticed in earlier research with cereals.[53] At the same temperature leaves (fig. 20) and stems (fig. 18) behave differently. The stems are more influenced by temperature. This is not only macroscopically visible but could already be seen on the back weighing (tab. 2), where the stems have higher weight losses.

For further investigations the phytoliths will be extracted. It will be interesting to see how many phytoliths the ashed material will still contain, and if the amount corresponds with the back weighing.

(D. Fritzsch)

2.2.9 Animal remains and dung

Identification work on animal remains was continued in autumn 2019 and spring 2020 by M. Adel William with a short supervision campaign in spring 2020 by myself. As in the previous season, material from House 169 was in the focus of the study.[54] Within this building finds from floors and walking horizons stood in the centre of attention. Next to this the examination of mollusc remains, ostrich eggshell fragments and dung from all seasons since autumn 2013 was completed. Due to the fact that the statistical values given in last season's report have not changed considerably with the work of this season, I will only highlight some interesting facts and finds in the following.

The RoL team studied the contents of the main fireplace of House 169 in the past seasons through various methods. Amongst them is a first microanalytical assessment, which was published in the previous report.[55] Fecal spherulites, which are mainly produced by ruminants during digestion, appeare darker and enlarged under crossed polarizers, a deformation which is due to heat. Dung of caprines has been confirmed macroscopically as one of the ingredients of ashes in any fireplace studied within the scope of the RoL project so far. Amongst the mammals found in House 169 (and in the overall studied material) the domesticated goat (Capra hircus) features predominantly.[56]A goat : sheep ratio at about 5 : 1can be calculated. It is therefore most likely that the caprine droppings from fireplaces (and out of other features) also can be attributed to this species. To confirm this assumption, metric values of completely preserved dung pellets were compared with reference data from the collection of Leuven University provided by V. Linseele. Figure 22 displays the 95 % confidence ellipses for the recent material, while dung from the RoL excavations is scatter-plotted. The dung pellets from the one liter dry-sieved soil sample (47501R/t-2-7) out of the fireplace in R07[57] as well as unburned dung extracted from a fill-layer in installation 606 (47502B/a-2)[58] fall into the range of juvenile goats both in size as well as in weight.[59] The fuel might have been collected from a kind of stable, in which the infantile and juvenile animals were kept at least during the night (with their mothers) to protect them from e. g. dogs and foxes, which might have roamed the town streets as they do it today, or from drowning in the Nile. However, if it came from a stable then only the loose pellets, which had been dumped shortly before the collection, were brushed up to be used for firing, because frequent trampling of the animals would have mashed the dung together and destroyed the pellets (fig. 23). Unfortunately, it is unknown where these stables might have been.[60]

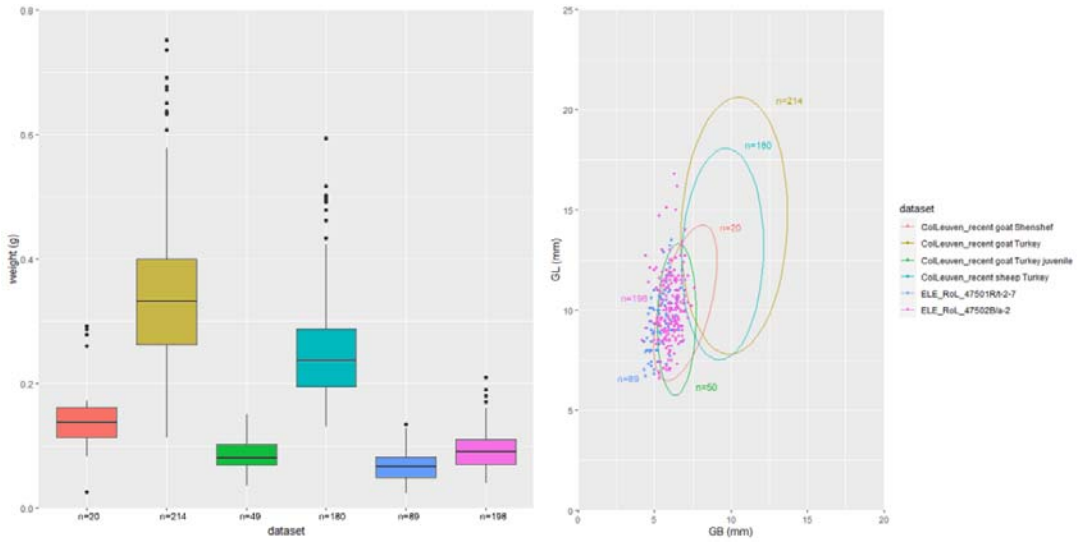


Fig. 22: Metric comparison of dung from House 169 and reference material from the collection of Leuven University (graphics and data: J. Sigl © DAI Cairo; Leuven data © V. Linseele with friendly permission).

Fig. 23: Dung and chaff as well as trampled packed droppings collected from a caprine stable in Koti village on Elephantine Island, used after burning as fertilizer by local farmers (photos: J. Sigl © DAI Cairo).

Fig. 24: Worked caprine premolar from a floor level in House 169, R08 (photos: J. Sigl © DAI Cairo).

A caprine also was the source of an unusual tool, which was found on a floor level in R08 in House 169. The object can most likely be identified as left fourth premolar of the mandible (P_4). It might have been drawn or fallen out of the jaw due to infections on its roots, which are still visible in form of deep irregular craters on the lingual surface (fig. 24: second from left). On the buccal side (fig. 24: far right) the uppermost part of the roots might still be discernible, however the roots themselves have been removed or were already pathologically deformed. The stumps of the roots have been rounded. Scratch marks on the buccal side just below the preserved remains of enamel might indicate that it had been mounted in a handle or derive from the use of the object. The occlusal surface has been worn or scraped down in a steep angle, forming a more or less straight surface dropping off from a sharp lingual edge towards the buccal root area. On the lingual side a small half-moon shaped area had been removed to counterpoint the occlusal abrasion, thus forming the mentioned sharp edge. The purpose of this tool can so far not yet be determined. Leather object fabrication or other fine slicing or chiselling work could be assumed.

(J. Sigl)

2.2.10 A brief note on the preliminary assessment of textile finds

This season a start was made to study cloth fragments and cords made of cloth or linen threads. Textiles have rarely been found during the excavations of the RoL project. Still, with 340 entries into the projects database, the detailed sampling work has produced quite a considerable amount of evidence. In spring 2020 only an overview of the amount and composition of material was sought for. The detailed study is planned for the next seasons under the supervision of A. Merat. Amongst the few finds which could be looked at more closely in this season, already a wide variety of finer and coarser woven cloth was registered. Unfortunately the original shape and use of most cloth fragments and thread remains could not be determined so far. The material excavated from House 169 (and House 166), on which the focus of the work currently lies, as well as from other features of the two trenches consists solely of torn and discarded weaves, rope remains, fibres and even some unspun flax or woolly material. The material gives the impression of having been reused several times until discard. Some woven fragments have been twined into ropes or cords.

The finds, which could be examined in spring 2020, were most likely made of flax fibres, which had generally been S spun. Woven threads showed a two ply spinning and were as thin as 0.5 mm, but could occasionally also be coarser.

While most of the material shows a greyish to brownish-beige colour, which probably derives from deposition as well as natural hue of the fibres, two fragments of dyed cloth were also found. The deep inclusion of the red colour particles into the flax fibres became visible under the stereo microscope already at 80x magnification, and was confirmed by B. Gehad under the polarising microscope of the DAI Cairo at 400x magnification.

(J. Sigl)

2.3 Works in the lapidaria

The work planned for March 2020 was intended to continue preparation of publication of selected fragments of the religious buildings erected on Elephantine in the Ptolemaic and Roman periods, collected in the lapidaria on the island after 1996. Its objective was to verify the list of distinctive fragments subjected to comprehensive architectural studies. These studies

should result in identification of the decoration of the pronaos from the temple of Khnum, help to explain doubts regarding possible later additions to the decoration of the inner part of the naos (Tempelhaus) of this temple commissioned by Nectanebo II and help to identify associated structures.

Description of the research on small scattered decorated fragments of Ptolemaic-Roman Elephantine temples presented at a conference in Cairo in March 2013 and published in 2020 in SDAIK 43 raised the issue of incomplete knowledge of the ritual topography of Elephantine in this period of Egyptian history.[61] It discussed questions of enlargement and decoration of religious structures which cannot be answered at this stage of research. Some of the presented issues could be solved by potential expansion of the area of archaeological exploration of the island and continued archaeological research at Aswan. This insufficiency of information is emphasized by confrontation of the fact that at least four cult enclosures functioned on the island, each consisting of a few religious structures, with the materials collected in the lapidaria.[62]

Regardless of plans of exploration of the island in the future, the limited number of fragments arriving at the lapidaria in recent years is an evident reason summarize the analyses conducted so far. The summary should definitely include the lapidarium of the temenos of the temple of Khnum and the lapidarium of the temple of Satet, which contains fewer artefacts. The Ptolemaic-Roman fragments associated with the temenos of the temple of Satet can now be confronted with the publication of the architecture of this temple in volume XXXVI of the Elephantine series.[63] On the other hand, the work finishing the research on the fragments of the temenos of the temple of Khnum should be coordinated with preparation of publication of its architecture in the final phase of its construction, completed under the Ptolemies and Roman emperors. The need to discuss selected fragments from the lapidaria as an *Addendum* to volume XV of Elephantine [64] was mentioned in earlier reports of work on the island, above all, in report from season 2018, when this final analysis was at a very advanced stage.

The subsequent season 2020 of work at the lapidaria was significantly shortened due to the corona virus pandemic. The planned activities included further work on the list of selected groups of most informative fragments from the lapidarium of the temenos of the temple of Khnum for the purposes of architectural analysis and professional photographic documentation. Discussion of these fragments in the *Addendum* should focus on several research issues mentioned in successive reports regarding the work in the lapidaria:

- verification of decoration phases at the temple of Khnum defined before, documented with decoration complexes displaying different styles;
- definition of the architectural form of the façade of the pronaos of the temple of Khnum and confrontation of fragments of columns, screens and doors with this definition (fig. 25 and 26a, b);
- identification of fragments of the inner row of columns in the pronaos of the temple;
- identification and hypothetical location of the fragments whose association with the temple of Khnum has not been justified (fig. 27);
- verification of the hypothesis concerning the existence of Ptolemaic decoration in the naos (Tempelhaus) of the temple of Khnum, with a particular focus on *wabet*;
- location of Domitian's decoration in raised relief, showing stylistic imitation of the decoration of Ptolemy VIII Euergetes II, associated with the pronaos. The studies on extremely fragmentary and dispersed material associated with both decoration groups created a new problem which is difficult to solve, namely, classification of fragments exclusively representing painted decoration used for emphasizing details. Its application is attested for marking details of hieroglyphs in Domitian's decoration.[65] This suggests its extensive use for emphasizing iconographic characters and other elements of decoration commissioned by this ruler (fig. 28). The research issue regards the use of painted decoration for rendering details practiced by Nectanebo's workshops, attested on the sandstone fragments from the naos (Tempelhaus) of the temple of Khnum.[66]

Fig: 25. Column decoration (fragment) from the pronaos of the temple of Khnum, dated to Ptolemy VIII Euergetes II (photo: A. Paasch © SIK).

Fig. 26 a (top), b. Door decoration (fragment) dated to Ptolemy Euergetes II, in the discussed location (Photos: A. Paasch © SIK).

Fig. 27: Column decoration (fragment) dated to Ptolemy Euergetes II, in the discussed location (photo: A. Paasch © SIK).

Fig. 28: Details of polychrome relief decoration dated to Domitian, in the discussed location (photo: E. Laskowska-Kusztal: © SIK).

Another verification of fragments discovered in the course of exploration of the presently reconstructed temple of Osiris Nesmeti, however, definitely not belonging to this temple, was an additional element of research activity in this short season. It seems reasonable that they should be included in the catalogue planned as the *Addendum*.

(E. Laskowska-Kuszta)

3. Works of the Swiss Institute

3.1 Fieldwork

The excavation work for a long-term research project of the Swiss Institute was completed in the previous season. It aimed at the diachronic investigation of the urban structures in the centre of the city, in particular in the district of the Khnum Temple east of the central main street of the city during the time of the New Kingdom and the Late Period.[67]

Archaeological fieldwork during the spring season was therefore limited to a few pieces of additional documentation. In House 55 the photo documentation of the walls was expanded. Subsequently, work began to backfill Room A with the debris from the excavation of the house (fig. 29). The backfilling is necessary for several reasons. First of all, it is intended to protect the exposed features of the oldest building phases of the house from the effects of the weather. Secondly, in the run-up to future restoration and consolidation measures, the floor level of this room has to be raised to the level of the most recent building phase in order to present a consistent state of the building.

In the Roman courtyard of the late temple of Khnum, some of the graffiti already documented in earlier seasons were collated. In the rebuilt Osiris-Nesmeti temple all visible graffiti were recorded and checked with regard to their original location, since after the destruction of the temple its blocks were used in a river terrace south of the Roman monumental staircase.[68] This made it essential to check which graffiti were incised in the standing temple and which were added later to the new construction. The results show that the vast majority of graffiti now visible in the temple (mainly graffiti of crosses and boats) were incised long after the demolition of the temple, when the blocks were reused in the construction of the river terrace. Only three carefully and deeply incised graffiti were definitely present in the temple, as they were not visible in the front wall of the river terrace. Two of them, six-pointed stars with a sunken triangle and a square in the centre, are the only graffiti on the outside of the temple. The third one, a Late Antique form of anch-sign, was incised on the inner jamb of the temple's main gate. These graffiti differ from the others in their style and careful execution. Moreover, it is remarkable that these graffiti were deliberately placed at the entrances to the temple. It can therefore be assumed that the building was still intact at that time, although it may by this time have been used in a different, possibly Christian context.

Fig. 29: Backfilling of Room A in House 55 (photo: C. von Pilgrim © SIK).

3.2. Study of objects

During the spring season, the major task of the Swiss Institute was to process the finds from recent excavations. The main foci were the small finds, lithics and wooden objects from House 55 (Area VIII), a residential building of the late 17th and early 18th Dynasty which had a long-lived workshop on its ground floor, and the finds from the excavations at the city wall in Area XXXVI. In addition, D. Aston continued studying the pottery from the Late Saite layer 4B from the area south of the Temple of Khnum. The extensive corpus of clay sealings from the same layer was also further sorted and documented.

(C. von Pilgrim)

3.2.1 The small finds from House 55

The work on documentation and analysis of small finds originating from House 55 in Elephantine (Area VIII) was continued in this season. The building was excavated by the Swiss Institute between 2014 and 2017 following work from several earlier field seasons campaign 18-19 (1989-1990), 26-27 (1997-1998) and 32 (2002).[69]

In total 4231 objects were discovered until 2017, the study begun in 2016-2017 and was continued in this season in February 2020.

House 55 is a building that continued to be used through five main building stages (a-e) that can be dated to the 17th and 18th Dynasty. It was probably used as a dwelling as well as a workshop and is located south of the Heqaib sanctuary. The objects were excavated within H 55 (building stage b-e) as well as in a rubble layer above the house (building stage a).

In addition to the documentation of the objects, the aim of this research is to gain additional information about room functions and different production types that took place in this building through the different building stages.

Most of the finds (48%) can be allocated to building stage b (see fig. 30) which was the latest use phase of house 55, followed by building stage d (13%) and c (6%). The fill layers above the house contained 24% of the finds from this assemblage.

By material the biggest group is formed by stone objects (36%, fig. 31) consisting of a large number of tools like hammerstones, quern stones, architectural fragments, whetstones, vessels and gaming stones or tokens. Objects made of former pottery vessels are found with 20% and contain mainly reused sherds for tools, especially scrapers, lids, palettes and weights used potentially as net-sinkers or for other purposes. This group also incorporates ostraca and crucibles. 14% of the objects were made of faience. These include mainly vessels, figurines, beads and some scarabs. Clay was used for 11% of the objects, this comprises fired and unfired clay. This material was mainly used for figurines, jar stoppers and sealings. Flint including tools and debitage still represent 10% of the find corpus while metal objects were probably collected and reused and are therefore only preserved with 3% in the assemblage. Organic objects are less well preserved, with wood taking up only 2% and bone and other organics each around 1%. On a similar level ostrich eggshell and other shells are found in equally low amounts and finds consisting of Egyptian blue and glass are attested in even less numbers.

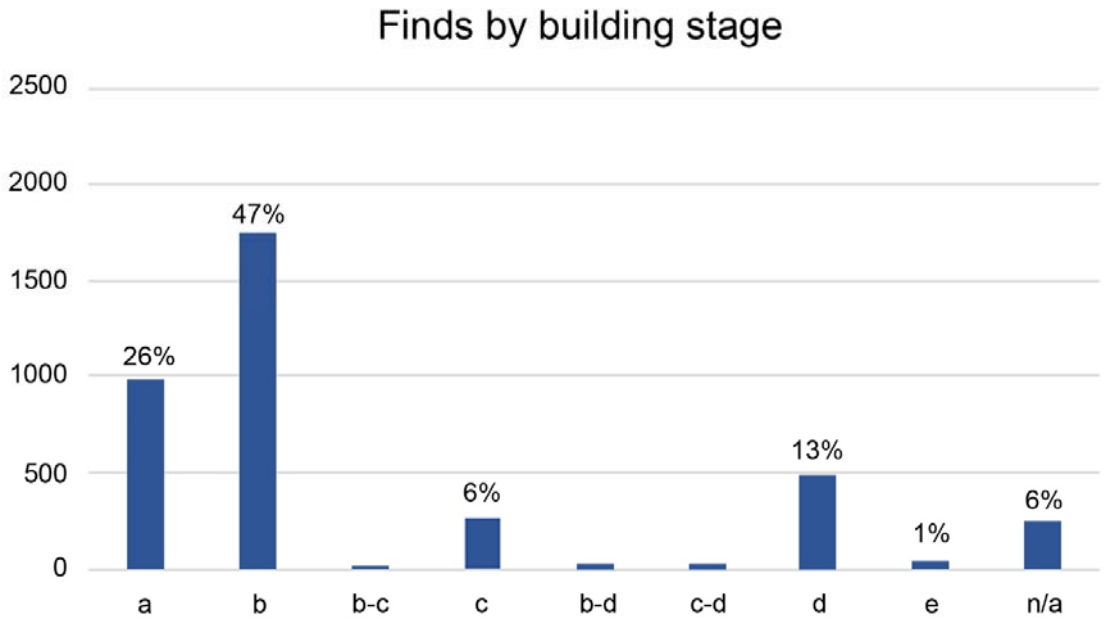


Fig. 30: The finds by building stage.

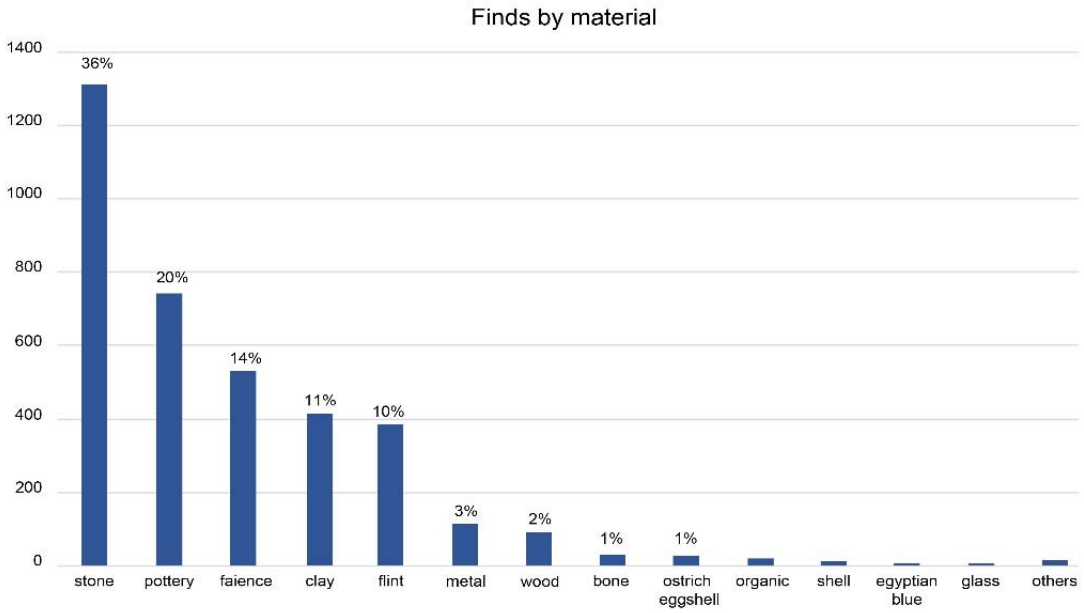


Fig. 31: Finds by material

The material selected for study in this season consisted of about 450 objects and focused on stone and faience vessels, other faience objects, jar sealings and some stone tools. The consisting documentation was checked and where possible and necessary photos and drawings were produced.

Faience vessels are represented with 58 fragments and most of the identifiable sherds were part of undecorated bowls (15x) or decorated bowls with lotus flower decoration (17x) typical of the 18th Dynasty.[70] The latter show a black band along the rim in some cases. A small cup and several fragments of a chalice – also both with lotus flower decoration - are preserved as well.

Faience vessels were only found in building stage b of the house and in the rubble layers above (building stage a). The faience of these vessels is mostly of high quality and often of a middle blue to turquoise colour, some fragments are faded to a lighter blue hue probably to chemical reactions in the soil. Some show signs of reuse with smoothened surfaces either as usage as tool or from grinding down the faience as reuse of the material.

All preserved 42 faience figurines are made from different moulds and show female human figures with a reconstructed height of about 6.5cm that might have been broken deliberately as head and feet are usually found separated. The quality of the faience as well as of the details varies as well as the colour of the objects showing quite a production range. Most of them derived from the rubble layer above the house and can probably be identified as votive figures from the temple of Khnum. Some of the figurines show signs of reuse with smoothened analogous to the faience vessels. Similar figurines are known from other sites in Egypt, also made in clay and stone.[71]

Similarly, 68 fragments of hollow faience beads are probably originally part of the votive sphere of the temple. They again originate from a range of different sizes and colours as well as quality and attention to details. These beads had two perforations for horizontal suspension and show black and blue coloured segments on the outside.[72] The inside reveals the production process, for most of them the objects were made of a core of plant material sometimes tied together with thin string or textile bands, leaving impressions on the inside of the faience beads. Few other examples show a smooth inner surface that was pressed against an object, probably of organic material.

Some of the fragments show small glazed particles on the inside of the object that usually was not glazed. This might be an indication for reused faience objects being ground down for reuse as was observed among some of the faience figurines.

Most of the fragments were found in building stage a but seven fragments derived from layers of house 55.

The 36 stone vessel fragments excavated in house 55 are mostly made of travertine (calcite alabaster) and include smaller kohl-pots as well as several bowl and jar fragments. The kohl pots show few examples with separate produced rims. In addition, 6 fragments of larger limestone bowls or basins were documented, that often show traces of chisel marks on the outer surfaces.

Similar to the above described faience objects several of the stone vessel fragments show signs of secondary usage as tools with smoothened surfaces, as is typically of material found within settlements.

Most stone vessels were excavated from layers belonging to building stage b (19x including most kohl-pots) and building stage d (6x) including mainly fragments reused as tools.

Jar stoppers made of clay are preserved with at least 100 examples, most of them in a conical or domed shape sitting on top of the vessel rim. The size varies between 1,7 and 16cm in diameter from very small to medium and large diameters. Some examples were secondarily trimmed along the edges, probably for a reuse as lid allowing an easier lifting of the object with one hand. Few others were secondarily fired, presumably to make the objects less friable and more suitable for a reuse.

About 50 of the jar stoppers can be allocated to building stage b with few examples from building stage d and another 50 to filling layers above the house.

About 220 hammer stones were identified among the stone tools found in house 55 with a wide range of materials such as dolerite, granite, granodiorite, quartz, quartzite, sandstone, tonalite and others. Many of them show typical signs of multiple uses such as grinding, smoothing/rubbing and hammering. In addition, several examples have remains of yellow or red ochre on the surface demonstrating that among others processing of pigments was a common part of the work process within the house.

Although the more detailed study of this assemblage is just at its beginning, already interesting details can be observed allowing us to gain an insight into different activity areas taking place within this building that was used as a dwelling and a workshop. While different object types seem to have been produced in this building next to each other (wooden objects, flint tools, metal objects) further study is necessary to see how these different production types are related to each other and how this changes over time within the different building stages.

(M. Lehmann)

3.2.2 Study of the woods found in House 55

The first season to study the wooden archaeological material discovered in House 55 took place in February 2020. The mission consisted in examining all the wooden material found in the different rooms of the house in order to identify anatomically the different types of wood used, to clarify the function of certain objects and to try to provide additional elements of understanding for the identification of the activities taking place in House 55.

A. State of preservation of woods

The wood found in House 55 has three types of preserves: perfectly preserved, burnt out, andpreserved in their form but whose anatomical structure is totally destroyed, making their identification impossible. The nature of the clay soil, whose composition will be analysed in the laboratory of the French Institute of Oriental Archaeology in Cairo, should enable us to understand the causes of this damage to the woods. The carbonized woods will have to be analysed with a reflected light optical microscopy.

B. Methods

Small samples (2 mm) were removed from every object whose anatomical structure has been preserved. Standard procedures were followed for the examination with an optical microscope and identification of these wood samples: rehydration of samples followed by preparation of thin slides for examination of the tangential, transverse and radial sections. Comparisons were made with thin sections of wood in the scientific reference collections at Jodrell Laboratory in Kew Royal Botanic Gardens and with Inside Woods database.[73]

C. Results

The wood identified in February 2020 in House 55 could be divided into several categories: fuel, waiting boards, furniture and tools. Many carbonized woods (boards, beams and various fragments) will have to be analysed with a reflected light optical microscopy to identify the species used. It is essential to bear in mind that wood is a precious commodity that is usually recovered for reuse as fuel, which probably deprives us of information about the variety of wood species that were used in House 55.

a. Branches

Four lots of branches of Ficussycomorus sp. (27605F/c-4 ; 45601H/b-5 ; 45601U/a-2 ; 45602F/b-29), all cut with a sharp tool (clean cut marks at the base of the branches), were probably stored for use as fuel. They could be twigs, about 50 branches preserved, cut off when preparing larger branches used for the manufacture of furniture parts. A thick piece of wood, which corresponds to a piece of board (45602 W/b-4) was identified as Ficussycomorus sp. This wood was probably used as lumber in House 55. The layers of ashes found indicate the permanent use of ovens (room F located south of the courtyard) but also in room C many fireplaces have been identified in the floor. The thin layers of ashes identified between the different floors indicate the use of small areas of fireplaces in this room of the house. The fuel was therefore essential for the proper functioning of the activities taking place in House 55.

b. Planks and Furniture

Several boards were discovered in House 55. These planks, worked, were found lying flat near the walls of room C (pictures: planks 45602E/h. UK.01 ; planks and logs 45603A/bd). Unfortunately, the nature of the soil has damaged the structure of the wood too much, making it impossible to identify them anatomically. In room E (picture 27605S/c-2 (DIA 5756)), a zoomorphic and composite furniture leg (27605S/e-7),[74] a seat or furniture leg (27605S/c-2) and a worked board with notches and fixing holes at each end (27605S/c-3) leaning against the wall of the room were discovered. These three elements had been analysed in 1998 by R. Neef, archaeobotanist from the German Archaeological Institute in Berlin, who had identified the wood used for these three elements as Acacia sp. However, for the composite furniture leg, only the wood of the lower part of the leg had been analysed and identified. The wood of the upper part of the leg, which was originally assembled with the frame of the bed or seat, had not been analysed. The analysis of this very dense wood could now be carried out and revealed the use of African ebony (diospyros mespiliformis Hochst. ex A.DC.) which grows in various African countries, including Sudan.[75] It should be noted that a second identical, zoomorphic and composite furniture leg (45602W/b-2-4) was discovered in another room of the House 55. This belongs to the same chronological phase as 27605S/e-7. On the composite legs 27605S/e-7 and 45602W/b-2-4, one last particularly interesting element was observed. The presence of red pigment at the joint between the upper part of the foot (made of African ebony wood) and the frame of the bed or chair. The use of the red colour as a prophylactic method to protect vulnerable areas of funerary furnishings has been identified and corresponds to a practice used

continuously since the Old Kingdom[76] especially on coffins. The colour red is applied to areas that may leave a gap with the outside (junction between the lid and the box, repairs made at the time of manufacture, at the joints (on the tenons, between the boards). This prophylactic practice, which is sometimes used with hidden texts,[77] is not reserved only for coffins but could be observed on other pieces of furniture, especially beds. The bed of Tutankhamun decorated with the heads of hippopotamuses and lion-feet (JE62012) uses this practice.[78] The presence of red on the feet 27605S/e-7 could support the hypothesis that this prophylactic practice was not exclusively reserved for funeral furnishings but was also used for the manufacture of everyday objects, in particular beds, since sleep is a phase subject to danger for its owner. Given the presence of this red colour at the joints of the two legs found in House 55, they could have come from a bed rather than a seat. Their presence also raises the question of their function in this room. Is this an area where furniture pieces were manufactured? The presence of a waiting worked board and two types of furniture legs could support this hypothesis.

Two small objects could also be analysed. This is a small box made of the elements 45601M/f- 18 and 45601M/g-8 in Lebanese cedar (cedruslibani) (fig. 32 and 33) and a small stick of very good quality in sidder (Ziziphusspina-christi) which is not a stick for kohl because its shape does not match, but whose function has yet to be determined.

c. Wooden tools

Two tools made of acacia wood, specifically Acaciatortilis (Forssk.) Hayne subsp. raddiana (Savi) Brenan wood (fig. 34) were identified in the material found in House 55.

The first one (45602F/c-3) (fig. 35) is a 10.4 cm long chisel. It is bevelled at one end, exactly the same way as a chisel made of metal or flint.[79]

The other end has traces of percussion, probably due to the use of a mallet. Wooden chisels are not common. However, several examples have been identified in the collections of the Petrie Museum.[80] Larger in size than the one found in House 55, they are identified as chisel for "excavating in gravel and marl".[81] A second tool (44603O-1) was discovered in the same room of the house (fig. 36). It is a rectangular object 10.3 cm long by 4.9 cm wide and 0.6 cm thick. The object is bevelled at each end. It has been compared in shape to several stone and copper adze and axe blades.[82]

Fig. 32: Part of wooden box 45601M/f-18 and 45601M/g-8 (photo: P. Mora Riudavets © SIK).

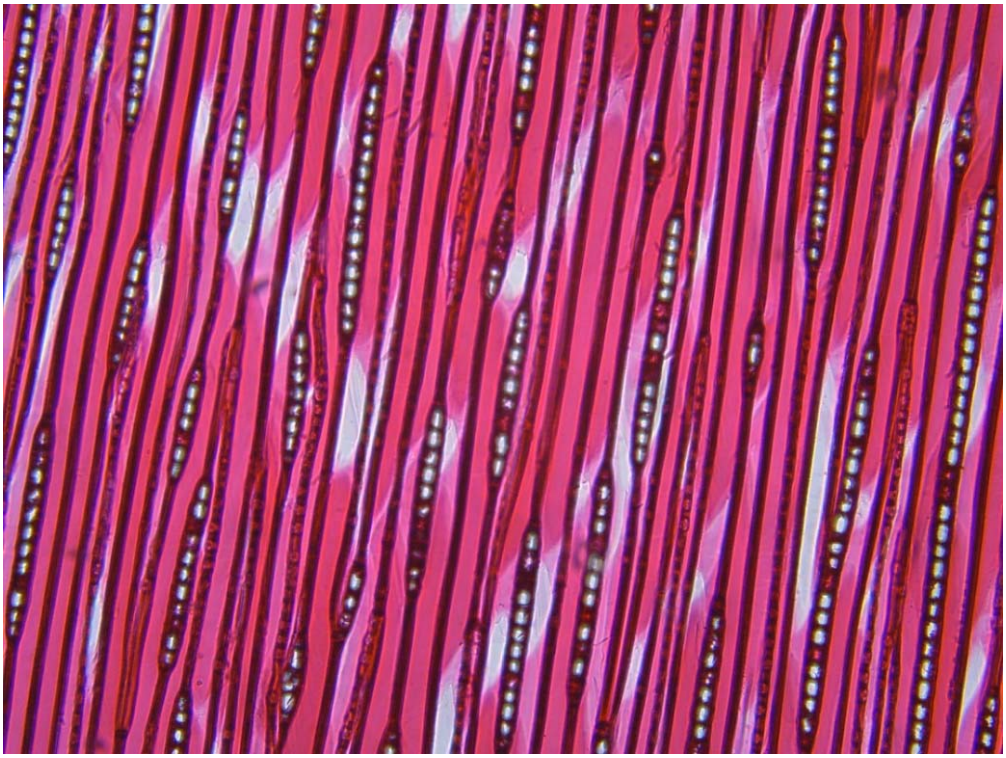


Fig. 33: CedrusLibani, tangential section (photo: © G. Eschenbrenner-Diemer).

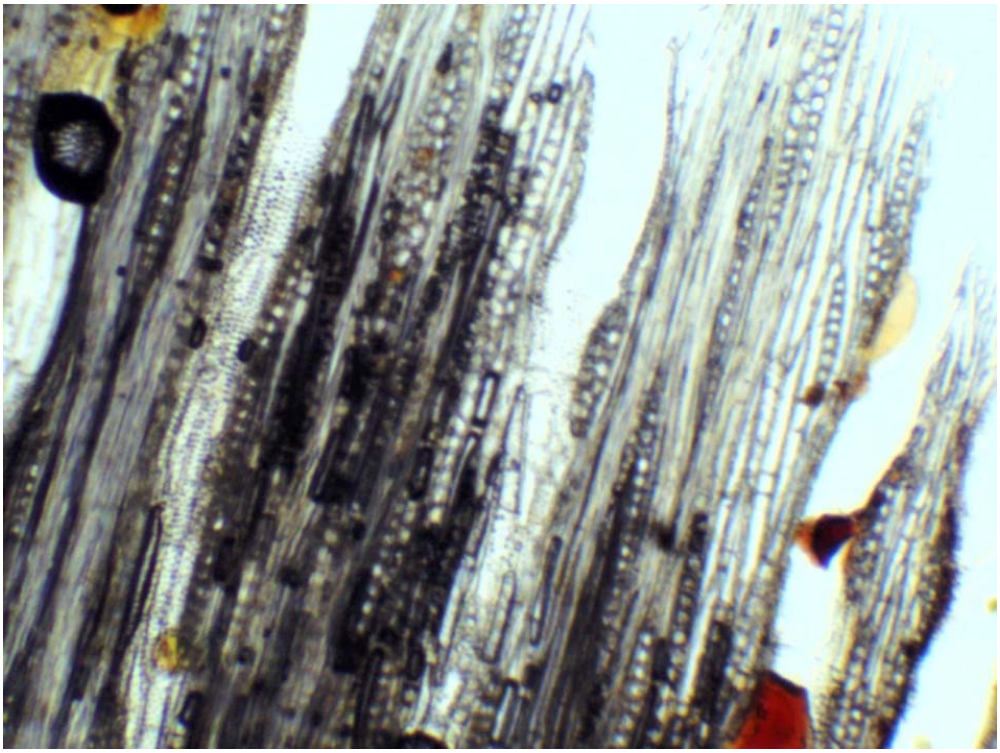


Fig. 34: Acacia raddiana, tangential section (photo: © G. Eschenbrenner-Diemer).

Fig. 35: Chise 45602F/c-3 (photo: G. Eschenbrenner-Diemer © SIK).

Fig. 36: Wooden tool 44603O-1 (photo: G. Eschenbrenner-Diemer © SIK).

The use of a wooden blade may seem surprising. However, associated with the use of the wood chisel, the two other bronze tools that were discovered in the House 55[83] and the context in which these tools were discovered, their function finds an explanation that could support the hypothesis that one of the main activities of the House 55 was the making of bows.[84]. These two wooden tools could have been used for three key stages of bow making. Indeed, the various experimental archaeological works for the manufacture of bows in medieval times in Europe highlight the major importance of three stages in the making of bows: debarking associated with the roughing of the wood and its drying. Debarking is a stage which, in an oceanic and continental climate, can be carried out before or after drying. Green wood is the easiest to work with, its debarking is easier to carry out. Debarking and roughing are delicate steps that should not damage the sapwood, which is particularly useful for its elasticity, which is beneficial to the back of the bow. The bark is usually removed from a branch with an adze[85], the wood is roughened with a chisel. The use of well-bevelled wood tools may prevent damage to the sapwood when debarking. Removing the bark from the wood protects against wood-boring insects. Roughening the wood allows it to be given the desired shape before the final finishing

touches are made. The numerous wood chips found on the floors of the House 55 could correspond to this roughing stage, since most of the wood scraps from this stage were probably immediately reused as fuel, which would explain the presence of only small chips[86]. After debarking the piece of wood, roughening it, it is necessary to dry it. Egypt has a hot and dry climate. The parameters for drying wood must take these extreme climatic factors into account. Wood that dries too quickly splits, making the piece of wood unusable for making a bow. It can be seen that Egyptian self-bows[87] use thin branches and are made from local species, acacia being the wood of choice for this use[88]. The thinner the branch, the quicker it will dry. So in our case, we have to be able to compensate for the heat of the Egyptian climate. The large amount of water in Room C could meet this need. After debarking the branches that will be used to make bows, they could be soaked in water to dry them out and thus replace the sap and starch in the wood with water. This process moistens the wood and protects it from attack by wood-eating insects that feed on the starch. These branches must then be dried. Drying the wood should normally be done in a ventilated room. This is the case in room C. The presence of numerous holes in the floors of room C and the circular water drop marks observed around these holes could be clues to this stage of drying the branches before they are bent into the desired shape as clearly represented in the tomb of the nomarch Amenemhat of Beni Hassan (BH2)[89]. The numerous traces of fire associated with the presence of flint fragments have led to the suggestion that this room of the house was used for the manufacture of bows and arrows. The presence of these two tools could support this hypothesis. In addition, the identification of a fragment of wood bark of dalbergia melanoxylon Guill. and Perr. within the branch lot 45602F/b-29 could also be related to the making of the arrows. This dense wood of the family Leguminosaepapilionoideae, also called pharaoh's ebony, native to the Horn of Africa, was used in House 55. It is known that this hard wood was used to make the foreshaft of the arrows[90] where the arrowhead was then attached. The presence of dalbergia melanoxylon bark allows us to understand that this wood was worked there, perhaps for this use but this remains hypothetical.

D. Conclusions and perspectives of research

The exceptional character of the House 55 is linked to the in situ conservation of all the wood used during the occupation and use of this space in an archaeological context perfectly dated: tools, pruning falls, pieces of furniture, fuel in bundles, roof beams. Remains from all this material has been preserved. This place, which most probably housed several activities related

to wood craftsmanship is a unique source of knowledge that offers new research perspectives for the knowledge of artisanal practices and economic networks related to the exploitation and use of wood in Egypt.

The study of the woods of House 55 must be continued, as the charcoals can provide important information for understanding that will complement these initial observations. In addition, experimental archaeology would be very useful to test the hypotheses concerning the use of wooden tools for making bows.

The scientific potential of the wooden material discovered in the town of Elephantine is exceptional and needs to be continued and extended. The analysis of the dozens of pruning falls discovered in a second workshop (H210) dated to Dynasty 30 and linked to one of the city's temples should provide, for example, unique information on the use of the wood species preserved throughout the stratigraphy of the period.

(G. Eschenbrenner-Diemer)

3.2.3 The lithic assemblage from House 55. Preliminary results

During the excavations of the Swiss Institute mission carried out in the previous seasons in House 55,[91] numerous lithic artefacts were collected. The artefacts were found in stratigraphic units dated to the Second Intermediate Period and the New Kingdom. The main aim during this season was to analyse the lithic assemblage discovered inside the house. Only part of the whole collection was studied this season – 1074 pieces of lithics, with a total weight of 7,1883 kg.

In the course of this season a detailed macroscopic analysis was undertaken with special attention to the chaîneopératoire for the identification of the lithic artefacts from raw material procurement through blanks and tools, up to their repair and reuse.[92] Raw material was studied macroscopically based on the results of previous studies from Elephantine.[93] In the following report, the raw material will be presented first, followed by an initial assessment of the artefacts in diachronic, spatial and functional terms. This will give a preliminary view of the character of usage of the lithic materials within House 55.

Raw materials

Five groups of the lithic raw materials inside House 55 have been noted: chert, carnelian, quartzite, limestone and quartz.

The largest group is represented by chert. The term “chert” is frequently used in literature interchangeably with “flint” or “silex”.[94] I will use the term “chert” here, because it has a broader meaning and because it is already well established at Elephantine. I will also refer to the group’s subdivision into smaller groups already established for the site in previous studies.[95] The criteria used for the classification of the chert groups are: lustre, texture, transparency, cortex (colour, thickness, smoothness) and colour (using Munsell Soil Color Charts).

Among the lithic artefacts from House 55 the most abundant is the group 1/1 with 777 pieces (72,35% of the total lithic assemblage). The cluster can be divided into further variants, but only with the use of a microscope. Characteristics of this group, depending on the variant, are: beige, greyish, light brown to brown colouration; smooth, weathered, whitish/light brown, thin cortex (in the range of 1-3 mm); rather inhomogeneous texture, mottled, light banded or structure with light inclusions; matt and non-transparent surface. Group 1/2 (11 pieces, 1,02%) is similar, but it has visible crystal inclusions. The raw material of these clusters, in the form of nodules, originates from the dry wadis or Nile gravels of the Lower Eocene Thebes Limestone Formation (TLF) located 50 km west of Aswan or the early Pleistocene Edfu Formation which can be found in the Kom Ombo area and in Nubia.[96]Group 1/3 (8 pieces, 0,75%) is characterized by dark brown/greyish-brown colouration; ca. 3 mm thick, light, smooth cortex; inhomogeneous texture; white spotted structure; matt and non-transparent surface. Cherts of the group 1/4 (9 pieces, 0,84%) have a pinkish-beige colour; thin, smooth cortex; inhomogeneous texture; mottled structure; matt and non-transparent surface. The cluster 1/5 (9 pieces; 0,84%) includes good quality beige-dark brown cherts; whitish, thin, smooth, weathered cortex; fine grained texture; small amounts of inclusions. The origin of these three groups is not known. Thirty-six pieces (3,35%) of chert do not fit any of these clusters. Two hundred and sixty-six chert pieces were burnt and in at least one hundred and forty-three cases it is not possible to recognize the raw material group.

Carnelian – group 2 (6 pieces; 0,56%). This is known from the Nile River terrace gravels from north Sudan and from the Western Desert near Elephantine Island.[97] Inside House 55 predominantly natural pieces and microchips were found.

Quartzite (silicified sandstone) – group 3 (10 pieces; 0,93%). This may originate from the Western Desert quarries at Gebel Gulab and Gebel Tingar on the west bank of Aswan or from Nile gravels.[98] It appears in House 55 in fragments, mostly burnt.

Limestone – group 5 (2 pieces; 0,19%). This commonly occurs in the Nile Valley from Cairo to Esna.[99]

Quartz – group 6 (rock crystal; 5 pieces, 0,46%). Deposits of this transparent and colourless raw material occur frequently across the Eastern Desert.[100] Only small pieces of rock crystal were discovered inside House 55.

Analysis of the lithic artefacts

House 55 was founded during the 17th Dynasty and developed over several building stages (H55a-e). The lithic artefacts from the house are indicated in fig. 37 and will be presented in diachronic order to show possible differences between these stages. The assemblage studied this season consists of 1074 pieces of lithics and can be divided into groups of cores, blanks, debitage, tools and natural chert fragments or nodules. Among the debitage pieces are flakes, blades, burin spalls, crested blades/flakes, chips (flakes less than 15mm) and waste pieces. There are no bladelets.

Because of the large quantity of flakes and blades with use-wear traces, this type of artefacts is classified as a tool. However, only microscopic use-wear analysis can confirm their use and function.

The lithic assemblage studied so far derives mainly from three building stages (b-d) of House 55. The earliest stages of the house (c, d and e), are linked with Bauschicht 11 in the northern part of the town. In the studied material only one chert artefact comes from building stage “e” (0,09% of the whole assemblage studied so far). This single platform blade core differs from the rest of the assemblage as its raw material is an unidentified tabular chert.

The stratigraphic units from phase “d” of House 55, dated preliminarily to the 17th Dynasty and partly to the early 18th Dynasty, consist of 454 lithic artefacts, which represent 42,27% of the whole collection. Lithics from this building stage were discovered in four rooms, A, B, C and E. Most were discovered in the courtyard C and in the entrance corridor B. The set contains 8 cores, 210 flakes, 2 blades, 2 crested blades, 2 burin spalls, 41 chips, 109 waste pieces, 49 flakes and 4 blades with use-wear traces, 3 chips and 2 waste pieces with use-wear traces, 4 retouched flakes, 1 retouched blade, 1 notched flake, 3 sickle blades, 2 perforators/borers, 3 pounders, 2 polishers and 6 natural fragments of chert. One of them has traces of hematite and two of a tar-like substance. Ninety-eight of the artefacts were burnt and five were heated.

Building stage	Room	Cores	Debitage						Tools																	Natural fragments/nodules	Substances		Heated artefact	Burnt artefact
			Flakes	Blades	Crested fl. /bl.	Burin spalls	Chips	Waste	Used flakes	Used blades	Used chips	Waste-traces of use	Retouched flakes	Retouched blades	Notched flakes	Sickle blades	Perforators	Scrapers	Knives	Polished knives	Hematite proc. tool	Grinder	Pounder	Pounder/grinder	Polisher		Hematite	Tar		
b	B	3	82	1			18	26	11	2		1		2	1								1			4		1	3	25
	C	5	33	1	1		15	14	10	2			2		1			1			1	1	2			11	3			34
	C-F													1																
	D	3	46				1	21	21			2				1		1		1			1	1		3	1		3	39
	K		5						4				1													1		3		1
	M																		1				1							1
bc	B		6																											2
c	A		1																											
	B	2	47				8	20	5	2	1															1	2			15
	C	4	53	3	1		21	22	12				1										2			1		1	5	44
d	A	1	10					5	9		1																		2	7
	B	2	106	2	1	2	17	42	30	3	1	2	3		1	1	1						3		2	4		1	1	41
	C	5	93		1		24	62	9	1	1		1	1		2	1									2	1	1	2	50
	E		1						1																					
e	E	1																												
below H55	(A)		5					5	1																			1		3
	(B)		5					6																						2
	(C)	3	8				1	3																						2
	(E)			1																										
SUM		29	501	8	4	2	105	226	113	10	4	5	8	4	3	4	2	2	1	1	1	1	10	1	2	27	7	8	16	266

Fig. 37: The lithic assemblage from House 55 in diachronic order.

The cores are mostly multiplatform. Six pieces are flake cores and two pieces are chip cores (microcores). All of them were extensively exploited and fragmented. Direct percussion by a hard hammer was the most common technique of production. The majority of flakes are not large-sized, many have cortex and most of them have a cortical, plain or broken (by hard hammer) butt. They were not standardized, neither were the blades. The glossy working edge of one of the sickle blades is denticulated, the opposite edge is blunted and both ends are broken (Fig. 10: 46603X/d-2_1). A second one is almost triangular (with a cut tip). It has use-wear traces on one edge (and gloss), a blunted opposite edge and two truncated ends (Fig. 10: 46604G/g-1_1). One of the perforators was made from a flake and may have been used to perforate or drill holes ca.2 mm in diameter, to make beads or drill holes in various materials such as textiles, leather, wood, scarab seals, etc. (Fig. 10: 46603X/c-1_11). Another could have been used for less precise work because of its width (9 mm).

The next building stage (c) of House 55 saw some changes in its western part. However, most of the lithic assemblage was found in the same rooms. The set contains 207 lithic artefacts, which represents the 19,27% of the whole collection. Artefacts from this phase were discovered in three rooms, A, B and C. The collection contains 6 cores, 101 flakes, 3 blades, 1 crested blade, 29 chips, 42 waste pieces, 17 flakes and 2 blades with use-wear traces and 1 chip with use-wear traces, 1 retouched flake, 2 pounders and 2 natural fragments of the chert. Two of

them have traces of hematite on the surfaces and one of a tar-like substance. Fifty-nine of the artefacts were burnt and five were heated.

The assemblage from this building stage contains 4 multiplatform flake cores and 2 chip cores. Cores were extensively exploited and fragmented. Flakes are not standardized and their butts are frequently broken. However, there are many other types of butts – e.g. cortical, plain, dihedral, linear and winged. Among the lithic assemblage collected within this layer only simple tools could be recognized.

Six flakes (0,56% of the whole lithic assemblage) were discovered in a mixed stratigraphic unit (building stages "bc") in the courtyard area. Five flakes were made of chert (2 of group 1/1, 2 of group 1/3, 1 of group 1/5) and one was of quartzite.

In the layers of building stage "b" 368 lithic artefacts were discovered, which represent 34,26% of the whole collection. Many modifications to the house were made during this period. Lithics from this period were found inside five rooms – B, C, D, K (a room separated from the rest of the building) and M (a room incorporated into a new neighbouring house 132). The set contains 11 cores, 166 flakes, 2 blades, 1 crested blade, 34 chips, 61 waste pieces, 46 flakes and 4 blades with use-wear traces, 3 waste pieces with use-wear traces, 3 retouched flakes, 3 retouched blades, 2 notched flakes, 1 sickle blade, 2 scrapers (46603K/b-1_1, see fig. 38), 1 bifacial knife, 1 polished bifacial knife, 1 hematite processing tool, 1 grinder, 5 pounders, 1 grinder-pounder and 19 natural chert fragments. Four of them have traces of hematite on the surfaces and four of a tar-like substance. One hundred and one of the artefacts were burnt and six were heated.

Cores are extremely exploited and fragmented. One of them was used as a pounder. Most of them are flake multiplatform core fragments. In the collection 2 splintered pieces were also found. Amongst the flakes, broken, cortical and plain butts predominate. A sickle blade was made of a flake. One of the edges is blunted, two ends are truncated. The sickle blade is barrel-shaped (fig. 38: 47601B/b-1_50). A burnt fragment of a bifacial knife was found inside Room M. The knife was extensively exploited and reduced in size. In addition to the appearance of the ochre processing tool, two of the pounders were used for crushing hematite (fig. 38: 46604F/a-1). In the collection, one fragment of the burnt polished bifacial knife is preserved (fig. 38: 47601K/a-1). This kind of artefact could be used as a model knife with a handle or as a blade from the set of model tools used for the "Opening of the Mouth" ritual.[101]

Thirty-eight of the studied lithic artefacts were found in a fill under House 55. The collection consists of 3 cores, 18 flakes, 1 blade, 1 chip, 14 waste pieces and 1 flake with use-wear traces.

Fig. 38: Examples of tools from House 55 (photo: S. Buławka © SIK).

Conclusions

The lithic finds show clearly that there was a chert workshop in House 55. The place of manufacture of chert blanks and tools was located in the courtyard (Rooms B, C) from the time of the foundation of the house and continued in use into later times. Some of the cores and debitage were recorded in the later stratigraphic units in Room D.

The most abundant raw material among the whole lithic assemblage is chert. At least 5 groups can be seen within this category of raw material. The most numerous is cluster 1/1 with an additional few variants. Chert occurs in the form of nodules and pebbles, originating from dry wadis or Nile gravels from the Lower Eocene Thebes Limestone Formation (TLF) in the Western Desert or the early Pleistocene Edfu Formation near Kom Ombo or in Nubia. Nodules are good quality raw material, despite the fact that they contain some inclusions or have an inhomogeneous structure. There are also other types of chert in House 55, as well as other stone raw materials including carnelian, quartzite, limestone and quartz.

The technology used for production was not sophisticated but rather simple, mostly flake technology, with little blade technology, and bipolar cores and microcores are used for the manufacture of small pieces. Bifacial technology is also present among the artefacts found.

However, the quantity of bifacially-chipped pieces (2 knives and 1 flake) indicates that this technique was not used by the knappers from House 55. On the surface of many chipped chert artefacts many mistakes and accidental damage caused by the craftsmen are visible – hinges, broken butts, plungings and breaks. However, there are many cortical, plain, winged and dihedral butts, which show the use of production techniques other than the simple direct use of the hard hammer. In the bipolar technology they used an anvil and in other cases the use of a punch is noticeable.

The collection studied so far does not show significant diachronic diversity. There is no production of standardized flakes or blades in this workshop. The majority of the chert artefacts are flakes or blades with use-wear traces, without intentional retouch. They were probably used for simple ad hoc activities. The assemblage consists of the following tools: retouched flakes (8), retouched blades (4), notched flakes (3), sickle blades (4), perforators/drills (2), scrapers (2), knives (2), hematite processing tool (1), pounders (10), grinder (1), pounder/grinder (1) and polishers (2). Sickle blades found in House 55 show use-wear traces (gloss). Similar examples are known from other archaeological sites in Egypt.[102] Perforators/drills could have been used to make holes in textiles, straps, leather, wood, beads and seals. The function of the pounders can be defined as a hard hammer or pigment/grain crusher, and they could have been used to form small objects, for example scarabs, and as grinders to shape them.[103] Above all, however, the workshop in House 55 was dedicated to the production of small flakes, perhaps used as simple tools or prepared for arrowheads. In Egypt many examples of arrowheads made from small chips or flakes as the tip of the arrow are known, with 1 or 3 pieces at the end.[104] Additionally, there is evidence on the surface of a few artefacts from House 55 of the use of a black tar-like substance. It may be a binder/mastic for composite tools or arrows. However, examples of the use of lime plaster as an adhesive are known from the New Kingdom (18. Dynasty) site of Tell el-Dab'a.[105] Nevertheless, only microscopic examination along with use-wear analysis, can confirm this interpretation of the function of the tools.

Regardless of the fact that the examination of the whole collection of lithic artefacts from House 55 is not yet completed, the results seem promising. Despite the occurrence of few examples of typical household tools for everyday use, the whole collection is obviously of a different character and may perhaps indicate a multifunctional workshop.

(S. Buławka)

3.2.4 Work on the small finds and pottery from the excavations at the town wall in Area BXXXVI

This season's work[106] concentrated on finds from Area B XXXVI, which was excavated by the Swiss Institute in the 41st and 42nd field campaign in 2011-2012. This area contained a stretch of the Middle Kingdom town wall, over which numerous archaeological layers probably of refuse were deposited in the period between the late Middle Kingdom and the beginning of the New Kingdom, Phases D and C with their various subdivisions.[107] The nature of that refuse was described as mainly derived from bakeries and other contexts, not necessarily purely domestic. This deposit seems to have been created, at least in part, intentionally to consolidate the town wall that was damaged by the waters of the Nile. The town wall had two distinct phases.[108] While this material (ceramic and small finds) allows observations on the nature of change between the end of the MK and the beginning of the NK, it is also possible to learn more about ancient waste management, as well as recycling things before they were considered completely unusable and were finally discarded.

The focus of this campaign was on chipped stone tool industries (M. Brandl) on the one hand and on the recording of the numerous ceramic material on the other (N. Ayers, B. Bader) with stress on pottery produced according to Nubian traditions and other pottery combining manufacturing traditions from both the Egyptian and the Nubian cultural spheres (see below, A. de Souza). The presence of specialists from other archaeological sites in Egypt (e.g. Edfu: N. Ayers, A. de Souza; Tell el-Daba, Ehnasya el-Medina, Deir el-Bersha, Thebes: B. Bader) enables a careful evaluation of regional aspects of the material found in Area B XXXVI, some of which have been mentioned in previous reports.

A. Egyptian Style Pottery

This season the two oldest contexts from local Phase F were fully recorded (42020M/b and 42020M/c, fig. 39) representing ceramic material deposited on the western side of the town wall, i.e. inside the wall. This material notably differs from that of contexts of Phase E (see last year's report) in that the ceramic material is dominated by dark red slipped and very fine table wares. There can be little doubt that this material dates to the Middle Kingdom, most probably its earlier part. As context 42020M/b is described as derived from a floor trodden down from mud brick refuse, there is the possibility that we are confronted with older material derived from the mud bricks in this case. However, 42020M/c was described as layer with limestone

fragments, so this material may not be per se considered as residual (see fig. 39) although some elements do belong to the Old Kingdom pottery tradition (e.g. “Meidum” bowl). But the presence of older sherds has been observed in almost all contexts analysed so far, and can be considered as normal feature of refuse deposits.[109]

All in all 15 contexts were fully drawn and analysed (ca 1700 sherds, 400 diagnostic sherds, 280 drawings), derived from local Phases E, D (and its subdivisions of D1e to c, D1a) and C (with its subdivisions C3a and C4b). The ultimate goal is to record sufficient contexts of these and other subdivisions to see whether a difference within these relative phases of the excavation that can be traced in the ceramic material. Hitherto, a fifth of the total number of the contexts was fully recorded.

Fig. 39: Sherds from context 42020M/c (photo: B. Bader © Austrian Academy of Sciences).

B. Pottery in secondary use

Of special interest were those sherds, which were used after the vessel had been broken in order to get insights into a more informal branch of tool production directly reflecting work practices conducted by the ancient inhabitants of Elephantine. Too little is known to make inferences about similarities and differences of such tools and the work that was undertaken with them regionally as well as diachronically. In addition to those, which were already recognised during the first processing of the material and registered as such, 15 more have been identified. Such

re-use seems to have several different forms, namely from the intentional forming of bases to be used as lids, to heavily abraded edges of various shapes of sherds to specialised tools with a very narrow blade-like tip for some very fine work (fig. 40 and 41). While the identification and intention is clear enough, the way such tools were used is less obvious. Thus, more research is necessary into craft- and handiwork to find out about possible applications of such tools.

Fig. 40: Re-used sherd (photo: B. Bader © Austrian Academy of Sciences).

Fig. 41: Re-used sherd, section (photo: B. Bader © Austrian Academy of Sciences).

C. Jar sealing

In addition, the only jar sealing/mud stopper preserved in this trashed material was also recorded and drawn from 41003P/e, belonging to local Phase D (see last year's report). Although it was damaged on the top the stopper was conical (preserved height of 6.2 cm), with a flattened 'base' that would presumably would have sat on top of the vessel (diameter ca 9.0 cm, thus the vessel diameter would have had to be slightly smaller). Remarkably the flat area on the bottom of the stopper lacks any impressions indicating either the rim of the vessel or any other items that could have closed a vessel (textile, sherds or other means of closing a vessel). The only observation is that at least one thin second layer of mud had been added to the 'base' of the stopper as it had in part peeled off. That more subtle traces may have eroded, either by exposure to air or water or manual stress, is of course possible. The base of the stopper/jar sealing is not exactly flat but does not show a protruding part that would have filled the neck of the vessel to be closed.[110] Finger modelling around the sides of the stopper were also observed.

(B. Bader)

D. Nubian Style Pottery

A limited sample of Nubian pottery from the refuse deposits associated with the Middle Kingdom town wall was studied during the 2020 Season. A. de Souza was able to draw certain comparisons between this assemblage and that from nearby Tell Edfu, where he also studies the Nubian style ceramics spanning a period from the late Old Kingdom until the early New Kingdom. Some preliminary observations can, thus, be made.

The majority of the material studied is consistent with coarse wares typically associated with the Pan-Grave pottery tradition based on the forming technologies, morphology, and surface treatments. The decorative motifs are especially indicative of the Pan-Grave tradition, namely the simple incised cross-hatched bands, undecorated rim zones, and the so-called 'spider-web' design on many base sherds. Aside from one body sherd (41003 R/a.53) of local Phase C2, fine wares such as those seen in mortuary contexts of the Pan-Grave tradition were not present, nor were wares that may be attributed to the C-Group or Kerma traditions, at least as far as the analysis proceeded. This pattern is consistent with the Nubian ceramic sequence at Tell Edfu from contemporary contexts, dating to the late Middle Kingdom and Second Intermediate Period.

Worthy of special note is the high proportion in the current sample of so-called ‘Late Middle Nubian Imitation’ wares (LaMNI, fig. 42 and fig. 43 on the right).[111] These vessels are wheelmade and appear to have been fired using Egyptian technology, i.e. in an oxidizing kiln atmosphere, but their form and incised decoration follows Nubian traditions. Of the nine contexts examined, five included at least one example of LaMNI ware. At an individual context level, LaMNI ware is most numerous in 41003 R/a (4/14 sherds) of local Phase C2 and 42020 F/a (5/10 sherds) of local Phase D1c. LaMNI is well attested at Tell Edfu and has also been recorded at Umm Mawagir in the Kharga Oasis.[112] The LaMNI examples from Elephantine are frequently red-slipped or have broad red-slipped bands around the upper body (e.g. 42020D/b.51), which is not attested in the assemblage from Tell Edfu and may thus indicate local production. However, the quantity of this pottery subdivision will need to be updated in future work.

Fig. 42 and fig. 43: ‘Late Middle Nubian Imitation’ ware (on the right) (photos: A. de Souza © Austrian Academy of Sciences).

Regarding function, many of the sherds show traces of secondary burning to their exterior surfaces consistent with use for cooking. In most of the analysed contexts, individual vessels were attested only as single sherds. The broken edges were all slightly worn suggesting that the vessels had been broken for some length of time before they were deposited. In no instance does it appear that any such sherds were used as tools (e.g. scrapers, palettes) perhaps because the softness of the material made them unsuitable for such use. This is in contrast to the observations above. The relatively low quantity of Nubian sherds in each context, together with the presence of single non-joining sherds is worth considering in relation to waste management in ancient Egyptian urban settings.

(A. de Souza)

E. Chipped stone assemblages

The chipped stone assemblage from Area BXXXVI was investigated for its raw material composition and lithic technology. This investigation was carried out through stereomicroscopic examination on-site. The majority of the raw materials used for the chipped stone assemblage comprises biogenic microcrystalline siliceous rocks, for which I will use the neutral term "chert" and avoid the controversial term "flint".[113] Since it was not possible to collect geological comparison material during this field season, the conclusions regarding lithic raw material provenance have to be considered very preliminary. It was however possible to link certain materials to a larger geological source region, which allows us to make inferences about lithic raw material economy.

Techno-morphological analyses are based on the chaîneopératoire concept and generally follow Hahn[114] and Floss,[115] and were adapted to the specific requirements of the investigated assemblage with the background of previous studies in Egypt and specifically Elephantine.[116] The focus of chipped stone tool analysis from Ancient Egypt was primarily placed on assemblages between the Predynastic Period and the Old Kingdom, while less attention was laid on later periods. An overview over general trends in lithic technology beyond this scope has been provided by Tillmann.[117]

For this study, all chipped stone tools were individually examined under the stereomicroscope in order to establish microscopically homogeneous raw material groups and investigate use-wear, for which presence or absence was recorded. Altogether, 171 lithic artefacts with a total weight of 1763 g were examined. This material is of specific interest since it holds the promise to provide insight into waste management strategies of a range of households on Elephantine during a time span of roughly 150 years, beginning with the Middle Kingdom and mainly from the Second Intermediate Period (SIP).

The results of this study (fig. 44) are presented according to archaeological phases (A-E)[118] to illustrate particularities as well as similarities from a diachronic viewpoint, and place them into the "bigger picture" of chipped stone economy in Ancient Egypt.

Results on (a) raw material sand (b) technology

(a) Through stereomicroscopic analyses, 12 chert varieties, carnelian, quartzite and silicified wood were determined in the chipped stone assemblage from Area BXXXVI. Results of the raw material composition from both phases – the Middle Kingdom and the Second Intermediate Period – are presented together due to the small number of samples in the assemblage of the first.

PHASE	RM	RM var	natural surface type(s)	fire influence			cores						blades			flakes			debris	tools	tool types	wgt. (g)
				1	2	3	bladelet	turned flake	bidirectional flake	bipolar	core on flake	indet. broken	unused	used	lat. retouched	unused	used	lat. retouched				
Middle Kingdom	1	1	D				1															8.8
	1	1a	C													1						5.5
	1	1b	A														1					31.6
	1	1f	D	1				1														166.5
SIP	1	1	A, B, C, D	2	3	3		3	1	2	6	1	1	1	1	9	2	1	2	3	2 sickle blades; 1 splintered piece (chisel)	362.7
	1	1a	A, B, C, D	1	1			7		3	6		1	1	1	20	4	1				626.7
	1	1b	A, B, C, D	1				1			1	2			1	6	1		1	3	1 splintered piece (chisel); 1 bifacially retouched chisel; 1 chisel on flake	137.7
	1	1c	A, B, C, D		1			1			1					3	1			1	notched and used flake	108.9
	1	1d	A, B, C, D							1	2					3	1	1				52.9
	1	1e	D																	1	drill	0.8
	1	1f	A, C, D		5											4	1		2			51.6
	1	1 s.l.	A, C, D, indet		5	1				1						3	1			1	sickle element (flake)	44.6
	1	2	D	1												4						11.5
	1	3	D																	1	sickle blade	3.7
	1	4	B					1								1						8.7
	1	5	C																	1	truncated flake and drill	1.8
	1	burnt	A, C, D, indet		3	27		1				2		1	2	13		1	7	3	2 sickle blades; 1 laterally ret. flake and perforator	93.1
	2	1	A, B					1								1						15.1
	3	1	B		1						1											27.2
	4	1	C													1						2
	indet	burnt	A			1													1			1.3

CODES	
	RM = raw material. 1: chert; 2: carnelian; 3: quartzite; 4: silicified wood
	RM var = raw material subvariety. 1 s.l.: sensu lato
	Natural surface types: A: "desert varnish"; B: river gravel; C: subprimary (chalky-weathered); D: Not preserved
	Fire influence: 1 – light; 2 – medium; 3 – heavy

Fig. 44: Raw material and technological composition of the lithic assemblage from Area BXXXVI according to phases.

Within the chert group, the vast majority can be assigned to the same geological source area. Considering the geological setting of the region in combination with the reconstruction of the depositional regime of the Proto-Nile,[119]this area most likely corresponds to the extensive Thebes Limestone Formation and correlated Edfu gravel deposits in the western desert. Closest deposits of these geological formations are known to be located between 50 and 100 km to the north, south and west of Elephantine.[120] If there exists chert-bearing Edfu gravel deposits closer to Elephantine can currently not be assessed, and we have to rely on the published data. If the few rare chert types 1/3-1/5 represent rarer types of TLF cherts or came into the settlement as

half-finished imports from sources further away can presently not be determined due to the small sample size and the lack of systematic geological surveys and provenance analyses. Therefore, the exact origin of the chert assemblage cannot be further narrowed down.

Without detailed source information, it is not possible to determine with certainty if raw material procurement was targeted or embedded into other activities. For such an assessment, at least the direction of exploited sources must be known. Based on the local geology it appears that chert was not available everywhere in primary/subprimary or secondary position. It is however possible to identify aspects of the mode of procurement based on the reduction degree of the worked pieces when introduced into the site for the SIP assemblage. Natural surface remains on all chert types except variety 1/3 reveal subprimary and secondary source contexts, while there is no indication for mining activities of primary sources for raw material acquisition. Consulting the volume of natural surface remains (51% on all cores and debitage) and minimum distance calculable for the potential raw material source regions, we can determine regional (and possibly local) direct procurement (i.e. self-sufficient supply) involving surface collection (possibly involving shallow digging) of suitable materials.

Other raw materials such as carnelian gravels, quartzite and silicified wood can be found on old river terraces on the banks of the river Nile in the western desertin the immediate vicinity of Elephantine Island.

(b) Due to the uneven distribution of samples in the investigated assemblages of the MK and the SIP from Area BXXXVI, a conclusive comparison cannot be undertaken. In a diachronic view however, a more curated core exploitation strategy is indicated in the small assemblage from the Middle Kingdom, which shifts towards more expedient and at the same time very distinct core exploitation strategies during the SIP predominantly relying on locally and regionally available raw materials.

This is in congruence with the observation of a general trend of the decrease of technological finesse from the Predynastic period to the late New Kingdom, and more specifically a decline of extra-local raw material supply and standardized lithic technology during the SIP.[121] In the SIP assemblage, we recognize a typical household oriented technology predominantly relying on three production strategies, 1) flakes from turned cores, 2) small expedient flakes and bladelets from bipolar cores set on an anvil, and 3) mini-debitage from “micro-cores” on flakes. Since the micro-cores were produced from unused flakes, this technological aspect has to be interpreted as targeted production of specific implements (e.g. blanks for composite tools, arrowheads, or microdrills) rather than recycling. Core curation is almost exclusively visible on

blades and only occasionally on flakes. In contrast to one bladelet core in the Middle Kingdom sample, blade cores are not present in the SIP assemblage. All except one of the 15 blades from this context are produced from the same material as the dominating flake industry and appear not to be standardized, indicating small on-site blade production. Exhausted blade cores could have been used for subsequent flake production in their later stages, which might explain their complete absence.

Only a small percentage of the debitage was used (13 flakes, 3 blades) and/or retouched (12 flakes, 10 blades), however, the majority represents unused production refuse. Tool types recorded in the SIP assemblage comprise laterally retouched blades and flakes (9 pieces), sickle implements (6 pieces), chisels (3 pieces), and drills/perforators (3 pieces), reflecting various domestic activities.[122]

Despite the preliminary character of this examination, the results of the current study fit well into the general diachronic framework identified for Ancient Egyptian chipped stone tool technology and production, adding evidence to the already existing dataset of 2nd mill BC chipped stone assemblages and contribute to the better understanding of lithic economy at Elephantine.

(M. Brandl)

3. Reconstruction of the temple of Osiris Nesmeti

After an interruption of one year, the Swiss Institute resumed the work at the rebuilt temple of Osiris Nesmeti.[123] This year's work was led by the restorers M. Fielauf, P. Karlstedt, S. Howahl and the architect A. Krekeler, actively supported by the inspector of the Restoration Department of the Ministry of Tourism and Antiquities Mohamed Saadallah.

During the preceding campaigns the existing original sandstone blocks were assembled and rebuilt according to the reconstruction drawings of Chr. Ubertini.[124] Wall areas, of which no original components were preserved, were replaced with sand-lime bricks. Since only a small part of the original blocks is still preserved, the temple is only rebuilt up to the height of the highest preserved original block.

The aim of this year's season was to plaster the brickwork of the temple. The modern masonry made of sand-lime bricks is to receive a plaster made of a construction site mixture (lime, white

cement, sand). The surfaces of the new plaster should visually match the surfaces of the original sandstone blocks.

Fig. 45: Coarse spray plaster on the front side of Osiris Nesmeti Temple (photo: © A. Krekeler).

Fig. 46: Levelling plaster and finishing plaster with incised joints on the backside of the temple (photo: © A. Krekeler)

The original sandstone blocks were carefully packed with building foils and cloths to protect them from contact with mortar. In a first step, the sand-lime brickwork was coated with a coarse-grained spray plaster (1st layer). In a second work step, a coarse levelling plaster (2nd layer) was applied in a thickness of 1 to 3 cm to compensate for the differences in height. The quality of this plaster layer is essential for the bearing capacity of the plaster. The final surface was applied with a finishing plaster in a thickness of 0.5 to 1 cm. The joint pattern was reconstructed by incised lines. Furthermore, the plaster surface was scratched to be visually adapted to the natural stone surface.

In this season all exterior surfaces of the temple were completed up to the levelling plaster (2nd layer). The finishing plaster (3rd layer) was exemplarily applied to the walls A, C and G. On the inner surfaces of the temple the spray plaster (1st layer) was completed. On wall K the levelling plaster (2nd layer) and the finishing plaster (3rd layer) were also completed.

The finished surfaces should primarily serve to receive samples of the colours and plaster surfaces. In the next campaign it is to be checked whether the quality of the surfaces is enough or whether corrections must be made.

(A. Krekeler)

[1] We thank the Ministry of Antiquities and all the members of the Aswan Inspectorate for their continued support, in particular the General Director of Aswan and Nubia Dr. Abd el-Moneim Said and the General Director of Aswan Shazli Ali Abdel Azim as well as the Chief Inspector of Elephantine Mahmoud Abdellah Abdallah and the season's inspectors Abeer Abd el-Razi, Agaibi Amai, Aliaa Abdelmethtaf, Yousouf Abdelsadi, Fatma Girgawi, Mohammed Saadallah, Fakhuri Yacoub, Eman Abu Hagag and Mohammed Saad. Members of the team were the building archaeologist M. Sählhof (Cairo), the egyptologists, M. Adel William (Cairo), D. Aston (Vienna), N. Ayers (Vienna), B. Bader (Vienna), P. Collet (Cairo), F. da Silva Lozada (Cairo), A. de Souza (Vienna), G. Eschenbrenner-Diemer (Lyon), B. Gehad (Cairo), M. Lehmann (London), M.-K. Schröder (Cairo), J. Sigl (Bonn), C. von Pilgrim (Cairo), and L. A. Warden (Salem), the archaeologists S. Bulawka (Warsaw), M. Brandl (Vienna), P. Kopp (Warsaw), and B. von Pilgrim (Cairo), the epigraphers J. Dijkstra (Ottawa), and E. Laskowska-,Krusztal (Warsaw), the conservators M. Fielauf (Potsdam), S. Howahl (Potsdam), and P. Karlstedt (Potsdam), the architects M. Fahmy (Cairo), and A. Krekeler (Brandenburg), and the photographer P. Mora Riudavets (Barcelona). The work would have been impossible to be done without the teams from Quft and Elephantine under the direction of Ahmed el-Amir acting for Rais El-Amir Sadiq.

[2]M. Sählhof, 'Aswan Museum Elephantine - Restoration of the 1906 Building, in J. Sigl et al., 'Report on the Excavations at Elephantine by the German Archaeological Institute and the Swiss Institute from autumn 2018 to summer 2019', 52-55: https://www.dainst.org/project/25953: Elephantine – Report on the 48th Season.

[3]G. Dreyer et al., 'Stadt und Tempel von Elephantine. 28./29./30. Grabungsbericht', *MDAIK* 58 (2002), 157-225, G. Dreyer et al., 'Stadt und Tempel von Elephantine. 31./32. Grabungsbericht', *MDAIK* 61 (2005), 13-138; G. Dreyer et al., 'Stadt und Tempel von Elephantine. 33./34./35. Grabungsbericht', *MDAIK* 64 (2008), 63-151; D. Raue et al., 'Stadt und Tempel von Elephantine. 36./37./38. Grabungsbericht', *MDAIK* 67 (2011), 181-207; St. J. Seidlmayer et al., 'Stadt und Tempel von Elephantine. 39./40./41. Grabungsbericht', *MDAIK* 72 (2016), 197-226; J. Sigl et al., 'Stadt und Tempel von Elephantine. Methodological Approach to the Project "Realities of Life" (Lebenswirklichkeiten) and its First Application During the 43rd and 44th Excavation Campaign on Elephantine Island', *MDAIK* 74 (2018), 161-175.

[4] E. g. M. Fielauf, 'Anastylosis of the Osiris-Nesmeti temple', in J. Sigl et al., 'Report on the Excavations at Elephantine by the German Archaeological Institute and the Swiss Institute from autumn 2017 to summer 2018', 28-31: https://www.dainst.org/project/25953: Elephantine - Report of the 47th season).

[5]F. Arnold, 'The foundation of the New Kingdom Satet Temple', in P. Kopp, et al., 'Report of the 40th Season of Excavation and Restoration on the Island of Elephantine', 9-11: https://www.dainst.org/project/25953: Elephantine – Report of the 40th season.

[6] See as well F. Arnold et al., 'Report on the Excavations at Elephantine by the German Archaeological Institute and the Swiss Institute from autumn 2013 to spring 2014', 2-6: https://www.dainst.org/project/25953: Elephantine – Report on the 43rd Season; J. Sigl et al., 'Stadt und Tempel von Elephantine. Methodological Approach to the Project "Realities of Life" (Lebenswirklichkeiten) and its First Application During the 43rd and 44th Excavation Campaign on Elephantine Island', *MDAIK* 74 (2018), 161-175; L. A. Warden et al., 'Stadt und Tempel von Elephantine. Pottery studies in course of the project "Realities of Life" (Lebenswirklichkeiten) – a methodological summary and pilot project', *MDAIK* 74 (2018), 193-195; S. Seidlmayer et al., 'Report on the Excavations at Elephantine by the German Archaeological Institute and the Swiss Institute from autumn 2014 to spring 2015', 2-10, 17 and 21-22: https://www.dainst.org/project/25953: Elephantine – Report on the 44th Season; S. Seidlmayer et al., 'Report on the Excavations at Elephantine by the German Archaeological Institute and the Swiss Institute from autumn 2015 to summer 2016', 2-22: https://www.dainst.org/project/25953: Elephantine – Report on the 45th Season ; J. Sigl et al., 'Report on the Excavations at Elephantine by the German Archaeological Institute and the Swiss Institute from autumn 2016 to summer 2017', 2-27, https://www.dainst.org/project/25953: Elephantine – Report on the 46th Season; J. Sigl et al., Report on the Excavations at Elephantine by the German Archaeological Institute and the Swiss Institute from autumn 2017 to summer 2018, 2-16: https://www.dainst.org/project/25953: Elephantine – Report on the 47th Season; J. Sigl et al., 'Report on the Excavations at Elephantine by the German Archaeological Institute and the Swiss Institute from autumn 2018 to summer 2019', 2-42, https://www.dainst.org/project/25953: Elephantine – Report on the 48th Season. Online reports also available in Arabic through the same weblink.

During summer and autumn 2019 as well as in spring 2020 several laboratory works could be done by the respective specialists. Apart from the authors of the following chapters, H. Khozeym from Aswan University, D. el-Meliegy and A. Nageh of the Centre of Research and Conservation of the Ministry of Antiquities, A. Yahia and A. Omar of the laboratories of the Grand Egyptian Museum in Cairo and N. Mounir as well as A. Quiles of the laboratory of the *Institut français d'archéologie orientale* in Cairo collaborated with the project during this

season. We are sincerely grateful for the administrative work for this season and the hosting in the German Institute's excavation work under the supervision of M. Sählhof. We thank St. Seidlmayer for the continuation of the financial support of the project. For their assistance of our work on site and in the excavation house we thank the workmen A. El-Amir, A. Abu el-Hamed, A. Kher, K. Serag and the house staff H. Ahmed, M. Saleh, O. Mohamed and R. Abd el-Hafiz. We are grateful for the support by the local inspectors of the Ministry of Antiquities, especially by A. Said and M. Abdellah.

[7] Dates after E. Hornung et al., *Ancient Egyptian Chronology, Handbuch der Orientalistik* 83 (Leiden, 2006), 491-492.

[8] Developed and supported by InfoSol, a leader in business intelligence.

[9]D. Samuel, 'Archaeology of Ancient Egyptian beer.', *Journal of the American Society of Brewing Chemists* 54 (1996), 3-12; D. Samuel, 'Brewing and Baking', in P. T. Nicholson and I. Shaw (eds.), *Ancient Egyptian Materials and Technology* (Cambridge, 2000), 537-578.

[10] V. Steele, personal communication. For a novel approach, see A. G. Hiess et al., 'Mashes to Mashes, Crust to Crust. Presenting a Novel Microstructural Marker for Malting in the Archaeological Record', *PLoS ONE* 15 no.5 (2020), https://pubmed.ncbi.nlm.nih.gov/32379784/.

[11] L. A. Warden, 'Where Did All the Beer Jars Go?,' Festschrift volume (Prague, in press).

[12]C. J. Malleson in Sigl et al., 'Report autumn 2016 to summer 2017', 24: https://www.dainst.org/project/25953: Elephantine – Report on the 46th Season.

[13]E. A. E. Attia et al., 'Archaeobotanical Studies from Hierakonpolis: Evidence for Food Processing During the Predynastic Period in Egypt', in A. M. Mercuri, A. C. D'Andrea, R. Fornaciari, and A. Höhn (eds.), *Plants and People in the African Past: progress in African archaeobotany* (Cham, 2018), 84.

[14] Samuel, in Nicholson and Shaw, *Ancient Egyptian Materials and Technology*, 540.

[15]B. Adamski and K. Rosińska-Balik, 'Brewing technology in early Egypt: invention of Upper or Lower Egyptians?', in A. Mączyńska (ed.), *The Nile Delta as a centre of cultural interactions between Upper Egypt and the Southern Levant in the 4th millennium BC* (Poznań, 2014), 27.

[16] Samuel, in Nicholson and Shaw, *Ancient Egyptian Materials and Technology*, 551-556, 22.1b.

[17] Samuel, in Nicholson and Shaw, *Ancient Egyptian Materials and Technology*.

[18] Even had we used Nile water, the chemical make-up of the modern versus ancient Nile would have been different, resulting in different brews with different flavors.

[19] As the vessel is modern in manufacture and different in form and fabric to anything from the pharaonic period, it provides an approximation only, an analogue for thinking about what might have occurred.

[20] See M.-K. Schröder, Studies on Middle Kingdom Pottery – Nubian Ceramics, in Sigl et al., 'Report autumn 2016 to summer 2017', 15-18, https://www.dainst.org/project/25953: Elephantine – Report on the 46th Season; M.-K. Schröder, Studies on Nubian pottery, in Sigl et al., 'Report autumn 2017 to summer 2018', 7-9, https://www.dainst.org/project/25953: Elephantine – Report on the 47th Season.

[21] The terms ELE5B, ELE5C etc. label pottery formations of Nubian pottery and are cited from D. Raue, *Elephantine und Nubien vom 4.-2. Jahrtausend v. Chr.*, *SDAIK* 40 (Cairo, 2018), 33-34, tab. 1.

[22] See recently A. de Souza, 'New Horizons: The Pan-Grave ceramic tradition in context'. *MKS* 9 (London, 2019).

[23] Compare for the Nubian Neolithic H.-A. Nordström, *Neolithic and A_Group Sites*, *SJE* 3 (Uppsala, 1972).

[24] See for incised fine ware of the C-Group culture: G. Steindorff, *Aniba* I (Leipzig, 1935); M. Bietak, *Studien zur Chronologie der nubischen C-Gruppe: ein Beitrag zur Frühgeschichte Unternubiens zwischen 2200 und 1500 v. Chr.*, *DÖAW* 97 (Wien, 1968); T. Säve-Söderbergh, *Middle Nubian Sites*, *SJE* 4 (Uppsala 1989); Raue, *SDAIK* 40 (Cairo, 2018); M.-K. Schröder, 'Nubian pottery assemblage from the C-Group cemetery HK27C at Hierakonpolis', in: M. Honegger (ed.), *Nubian Archaeology in the XXIst century. Proceedings of the Thirteenth International Conference for Nubian Studies, Neuchâtel, 1st-6th September 2014*, *OLA* 273 (Leuven-Paris-Bristol, CT 2018), 243-250.

[25] Although the quantities never reach the high amount of Nubian sherds as was evident in the 2nd Dynasty (Raue, *SDAIK* 40, 114).

[26] This project was possible through the support of the MoA and the DAI Cairo. It was conducted at the laboratory of the *Institut Francise d'Archeologie Orientale* with assistance provided by Nadine Mounir and Anita Quiles. Johanna Sigl and Leslie A. Warden ensured the material was available and selected the samples.

[27] See J. Bourriau and P. Nicholson, 'Marl Clay Pottery Fabrics of the New Kingdom from Memphis, Saqqara and Amarna', *JEA* 78 (1992), 29-91; M.F. Ownby, *Canaanite Jars from Memphis as Evidence for Trade and Political Relationships in the Middle Bronze Age* (Ph. D. diss.,University of Cambridge, 2010); I. Whitbread, *Greek transport amphorae: a petrological and archaeological study* (Athens, 1995).

[28] Developed based on the so-called Vienna System, see H.-Å. Nordström and J. Bourriau, 'Fascicle 2. Ceramic Technology: Clays and Fabrics', in D. Arnold and J. Bourriau (eds), *An Introduction to Ancient Egyptian Pottery*, SDAIK 17 (Mainz am Rhein, 1992), 147-190.

[29] M. F. Ownby, *Petrographic Analysis of Bread Moulds from Elephantine* (Unpublished petrographic report submitted to J. Sigl, 2018).

[30] The full petrographic descriptions are in M.F. Ownby, *Petrographic Analysis of Middle Kingdom Pottery from Elephantine* (Unpublished petrographic report submitted to J. Sigl, 2019).

[31] A recent publication has summarized the principal petrographic groups for Egypt, i.e. petrofabrics. See M. F. Ownby and M. Brand, 'Advances in Egyptian Ceramic Petrography', *BCE* 29 (2019), 371-390.

[32] This fabric was examined in the earlier study, Ownby, *Petro Analysis of Bread Moulds*.

[33] M. F. Ownby, *Petrographic Analysis of Egyptian and Nubian Pottery from Hisn al-Bab, Aswan* (Unpublished petrographic report submitted to P. Rose, 2016).

[34]*Geologic Map of Egypt 1:2,000,000* (Cairo: 1981).

[35] B. Gehad, Report on pigment investigation and analysis from DAI excavation mission at the Elephantine Island in 2018 and 2019, in Sigl et al., 'Report autumn 2018 to summer 2019', 13-28: https://www.dainst.org/project/25953: Elephantine – Report on the 48th Season.

[36] B. Gehad, in Sigl et al, 'Report autumn 2018 to summer 2019', 17.

[37] J. Ogden, 'Metals', in P. T. Nicholson and I. Shaw, *Ancient Egyptian Materials and Technology,* (Cambridge, 2000), 166–168.

[38] For more details see J. Kmošek and M. Odler, 'Report on the processing of archaeometallurgical samples from Elephantine at the Institut Français d'Archéologie Orientale (IFAO)', April 2020.

[39] M. Renzi in Seidlmayer et al., 'Report autumn 2015 to summer 2016', 18-20.

[40]J. Sigl, and P. Kopp. 'Working from Home: Middle Kingdom Daily Life on Elephantine Island, Egypt',in A. K. Hodgkinson and C. L. Tvetmarken(eds.), *Approaches to the Analysis of Production Activity at Archaeological Sites*, (Oxford, 2020), 20-22.

[41]El-S. el-Gayar and M. P. Jones, 'A Possible Source of Copper Ore Fragments Found at the Old Kingdom Town of Buhen', *JEA* 75 (1989), 31-34.

[42]G. R. Gilmore, 'The Chemical Analysis of the Kahun Metals', in R. David (ed.), *The Pyramid Builders of Ancient Egypt: A Modern Investigation of Pharaoh's Workforce* (London, 1986), 215–225.

[43]M. Abd El-Raziq, Mahmud, G. Castel, P. Tallet, and P. Fluzin, *Ayn Soukhna II: les ateliers métallurgiques du moyen empire*, *FIFAO* 66 (Cairo 2011). G. Philip and M. J. Cowell. 'Metallurgy at Tell El-Dab'a', in G. Philip (ed.), *Tell El-Dab'a XV: Metalwork and Metalworking Evidence of the Late Middle Kingdom and the Second Intermediate Period*., *Untersuchungen der Zweigstelle Kairo des Österreichischen Archäologischen Institutes 26; Österreichische Akademie der Wissenschaften, Denkschriften der Gesamtakademie 36* (Wien, 2006), 169–216.

[44] M. Odler and J. Kmošek, *Invisible Connections: Analysed Metalwork from the Egyptian Museum of Leipzig University* (Oxford: in press).

[45]Several of these instruments have additionally been studied use wear traces by G. Mutri. Additionally this specialist sampled further tools for organic residues. However, both the use wear and residue analyses, which was planned for this season, had to be postponed to 2021 due to the worldwide crisis. Nevertheless, a more detailed description, first drawings and a macroscopic study of the full set of excavated stone tools other than silices was started by P. Collet. Thanks to his work not only the descriptive details on these tools can be added to the database of the project, but G. Mutri, who will be responsible for the archaeological study of the material in collaboration with P. Collet, will thus be able to pinpoint certain items to focus on for her next field stay.

[46] D. R. Piperno, *Phytoliths. A Comprehensive Guide for Archaeologists and Paleoecologists* (Lanham, New York, Toronto, Oxford, 2006).

[47] Piperno, *Phytoliths.*

[48] Piperno, *Phytoliths.*

[49] H. Prat, 'La systematique des Graminees'. *Annals des Sciences Naturelles, Botanique, Series* 10.18 (1936), 165-258.

[50] Piperno, *Phytoliths.*

[51] D. Fritzsch, C. Langan and A. Röpke, 'Geschmolzenes Stroh – Brennexperimente an Getreide und seine Bedeutung für die Interpretation von erhitzten archäologischen Sedimenten', in *Arch. Ber*. 30 (2019), 165-175.

[52] See as well contribution by J. Sigl on this topic in this report.

[53] D. Fritzsch, C. Langan and A. Röpke, 'Geschmolzenes Stroh – Brennexperimente an Getreide und seine Bedeutung für die Interpretation von erhitzten archäologischen Sedimenten', in *Arch. Ber.* 30 (2019), 165-175.

[54] J. Sigl, Preliminary report on animal remains and some special faunal finds, in Sigl et al., 'Report autumn 2018 to summer 2019', 30-41.

[55]D. Fritzsch, First preliminary report on archaeological soil micromorphology and phytolith Studies, in Sigl et al., 'Report autumn 2018 to summer 2019', 5-6.

[56] J. Sigl, Preliminary report on animal remains and some special faunal finds, in Sigl et al., 'Report autumn 2018 to summer 2019', figs. 42-43.

[57]Sample 47501R/t-2-7 was especially rich in charred dung remains mixed with a lot of plant remains and charcoal, while most other ash layers contained single pellets or no identifiable material. Feature 47501R/t is one of the lowest (=earliest) layers of ashy material in R07, close to the north-eastern wall of H169.

[58]Like the last mentioned sample, 47502B/a-2 is a one liter dry-sieved soil sample consisting of a lot of unburned plant remains and dung pellets.

[59] My sincere thanks to V. Linseele for giving access to the raw data of the dung from the Leuven University collection to use in my own graphs.

[60]The RoL team doubts that rooms within the houses of the town were generally used as stables: C. von Pilgrim, *Elephantine XVIII. Untersuchungen zur Stadt Elephantine im Mittleren Reich und der 2. Zwischenzeit, AV* 91 (Mainz, 1996); cf. J. Sigl and P. Kopp, 'Working from home – Middle Kingdom daily life on Elephantine Island, Egypt', in A. Hodgkinson and C.L. Tvetmarken (eds.), *Approaches in the analysis of production activity at archaeological sites*(Oxford, 2020), 15.

[61] E. Laskowska-Kusztal, 'Tightrope dancing. Research on religious building decorations on Ptolemaic-Roman Elephantine', in: S.C. Dirksen, L.S. Krastel (eds), *Epigraphy through five millenia. Texts and images in context, SDAIK* 43 (Wiesbaden, 2020), 195-210.

[62] E. Laskowska-Kusztal, 'The Contribution of Graeco-Roman Elephantine to the Theology of the First Cataract Region', in D. Raue, S.J. Seidlmayer, Ph. Speiser (eds), *The First Cataract of the Nile. One Region -Diverse Perspectives, SDAIK* 36 (Berlin, 2013),103-104.

[63] W. Niederberger in H. Jaritz, E. Laskowska-Kusztal, W. Niederberger, *Elephantine* XXXVI. *Der ptolemäische Satettempel mit seinen Nebenanlagen und die Treppenanlage des nördlichen Sakralbezirks. Mit Beiträgen von Horst Beinlich und Karl-Theodor Zauzich*, *AV* 127, (Wiesbaden, 2020), 25-76.

[64] E. Laskowska-Kusztal, *Elephantine* XV. *Die Dekorfragmente der ptolemäisch-römischen Tempel von Elephantine, AV* 73 (Mainz, 1996), 115-121.

[65] Laskowska-Kusztal, SDAIK 43 (2020), Fig. 15.

[66] H. Jenni, *Elephantine* XVII. *Die Dekoration des Chnumtempels auf Elephantine durch Nektanebos II, AV* 90 (Mainz, 1998), Taf. 115-117.

[67] See C. von Pilgrim, 'Archaeological investigations in the centre of the town', in Sigl et al., 'Report autumn 2017 to summer 2018', 16-22: https://www.dainst.org/project/25953: Elephantine – Report on the 47th Season.

[68] S. Schönenberger, 'Untersuchung im Südosten der Monumentaltreppe', in G. Dreyer et al., 'Stadt und Tempel von Elephantine. 28./29./30. Grabungsbericht', *MDAIK* 58 (2002), 200-210.

[69] C. von Pilgrim, 'House 55: A workshop of the late 17th and early 18th Dynasty (Area VIII)', in Sigl et al. 'Report autumn 2016 to summer 2017', 27-35: https://www.dainst.org/en/projekt/-/project-display/25953: Elephantine - Report on the 46th season.

[70] E.-C. Strauß, *Die Nunschale – Eine Gefäßgruppe des Neuen Reiches, Münchener Ägyptologische Studien* 30, München (Berlin, 1974); S. Tschorn, 'Nun-Schalen aus der Stadt des Neuen Reiches auf der Insel Sai', *Egypt & Levant* 27 (2017), 431-446.

[71] E. Teeter, *Baked clay figurines and votive beds from Medinet Habu, OIP* 133, (Chicago 2010).

[72] G. Pinch, *Votive Offerings to Hathor* (Oxford, 1993), 40; F.D. Friedman, *Gifts of the Nile: Ancient Egyptian Faience* (New York, 1998), 212, 259.

[73] https://insidewood.lib.ncsu.edu/

[74] G. Killen, *Ancient Egyptian Furniture 1. 4000-1300 BC,* Second Edition, (Oxford, 2017).

[75] http://www.catalogueoflife.org/col/details/species/id/dd68ca7771fd26f2dc94b6be0974fa3f

[76] G. Eschenbrenner-Diemer, A. Jimenez Serrano, 'Middle Kingdom Coffins from Qubbet el-Hawa: Manufacturing Techniques Investigated' in *Proceedings of the Second Vatican Coffin Conference,* Vatican Museum, Vatican 6-9 June 2017(forthcoming 2020); A-H.Perrot, 'Valeurs techniques, valeur magique. Le cercueil rectangulaire égyptien.', *Égypte* 57 (2010), 15-23.

[77] The use of hidden text on coffins has been mentioned by different colleagues, see Ch. Barbotin, 'Uneformulecachée des Textes des Sarcophages: les plaquettes E 10779 (?) C-D du musée du Louvre' in F. Albert, A. Gasse (eds), *Étude de documentshiératiquesinédits. Les ostraca de Deir el-Medina en regard des productions de la Vallée des Rois et du Ramesseum Travaux de la première Académie hiératique – Ifao (27 septembre – 1er octobre 2015),* (Cairo, 2019), 37-50; S. Grallert, 'Mitre Inscriptions on Coffins of the Middle Kingdom: A New Set of Texts for Rectangular Coffins?' in S. Grallert, W. Grajetzki, *Life and afterlife in Ancient Egypt during the Middle Kingdom and Second Intermediate Period*, *GHP Egyptology* 7, (London, 2007), 35-80; Online conference of N. R. Brown, 'Raise Me Up and Repel My Weariness! A Study of Thutmose III's Coffin (CG 61014)', ARCE 2020 Annual Meeting. However, the use of the colour red associated with hidden text is never mentioned although it is present in the majority of cases, for example on Thutmose III's coffin. On the use of the colour red as a prophylactic process associated or not with hidden texts and used in wood craftsmanship in ancient Egypt, see G. Eschenbrenner-Diemer, 'The red colour and wood: activating a raw material', paper in preparation.

[78] The presence of the red colour was mentioned to me by Mohamed Moustafa, wood conservator at Grand Egyptian Museum.

[79]The shape of this object is perfectly similar to several stone or metal chisels. W.F. Petrie, *Tools and Weapons* (London, 1917), 20, pl. XIII C18-20-22.

[80] Petrie Museum: UC 7780 from Gurob – 18th dynasty ; UC 7293 ii, iv from Lahun – Late Middle Kingdom; UC 31177 from Deshasheh Tumb 86 – 6th dynasty. A wooden chisel was also discovered in tomb 288 in Tarkhan, see W.F. Petrie, G.A. Wainwright and A. Gardiner, *Tarkhan I and Memphis V* (London: 1913), pl. X5.

[81] This identification proposed by Petrie could be reviewed in the light of the results obtained on the tools discovered in House 55. Analysing the wood used to make the wooden chisels kept in the Petrie Museum would be particularly useful to compare the type of species used and perhaps clarify the function of these tools.

[82] Several thin stone or copper axe blades have a similar shape to tool 44603O-1. W.F. Petrie, *Tools and Weapons*, (London, 1917), 6, pl. I A7-8-9 from Tarkhan and pl. III A101-102.

[83] von Pilgrim in Sigl et al., 'Report from autumn 2016 to summer 2017', 34-35: https://www.dainst.org/project/25953: Elephantine - Report on the 46th season.

[84] von Pilgrim in Sigl et al., 'Report from autumn 2016 to summer 2017', 34: https://www.dainst.org/project/25953: Elephantine - Report on the 46th season.

[85] Work of a branch represented in the mastaba of Mereruka in Sakkara, chamber A3, East wall. P. Duell et al., *The Mastaba of Mereruka, Part I, chambers A1-10*, *OIP* 31, (Chicago, 1938), 85-87, pl. 30-31.

[86] The nature of the soil deteriorated the anatomical structure of the wood chips which could not be analysed.

[87] C. Cartwright, J. H. Taylor, 'Wooden Egyptian Archery Bows in the Collections of the British Museum', *The British Museum Technical Research Bulletin* 2 (2008), 77-83; A.C. Western and W. McLeod, 'Woods used in Egyptian Bows and Arrows', *JEA* 81 (1995), 77-94 ; J.D. Clark, J.L. Phillips, P.S. Staley, 'Interpretations of Prehistoric Technology from Ancient Egyptian and other Sources: Part I: Ancient Egyptian Bows and Arrows

and their relevance for African Prehistory', Paléorient, 1974, vol. 2, n°2, 323-388 ; W.F. Petrie, *Tools and Weapons*, *British School of Archaeology in Egypt and Egyptian research account: 22nd year*, 1916), (London, 1917), 36, pl. XLVIII – LXIX.

[88]"These woods have a high proportion of the properties needed for optimum functioning as archery bows, i.e. resilience, flexibility, elasticity and strength." C. Cartwright, J. H. Taylor, 'Wooden Egyptian Archery Bows in the Collections of the British Museum', *The British Museum Technical Research Bulletin* 2 (2008), 77.

[89] P.E. Newberry, *Beni Hasan,* Archaeological Survey of Egypt, First Memoir, The Egypt Exploration Fund, (London, 1893) 31, pl. XI (row 2).

[90]J.D. Clark, J.L. Phillips, and P.S. Staley, 'Interpretations of Prehistoric Technology from Ancient Egyptian and other Sources: Part I: Ancient Egyptian Bows and Arrows and their relevance for African Prehistory', in *Paléorient*, 1974, vol. 2, n°2, 338-342.

[91] D. Fritsch 'Micromorphology – Method, Aims and Sampling Strategy', in Seidlmayer et al., 'Report from autumn 2015 to summer 2016', 10-12 and 22-26: https://www.dainst.org/project/25953: Elephantine – Report on the 45th Season; in Sigl, et al., 'Report autumn 2016 to summer 2017', 27-35: https://www.dainst.org/project/25953: Elephantine - Report on the 46th season.

[92] A. Leroi-Gurhan, *Le Geste at la Parole* (Paris, 1964); J. Pélegrin, C. Karlin , P. Bodu, *'Chaîneopératoire: un outil pour le préhistorien',* in J. Tixier (ed.), *Journéed'ÈtudesTechnologiques en Préhistoire, Notes et Mongraphies techniques* 25 (Paris, 1988), 25, 55–62.

[93] M. Brandl, Preliminary assessment of the chipped stone assemblages from excavation area 36, Elephantine Island - in this report (Special acknowledgements for the consults on the raw material); C. Jeuthe, M. Hamdan, The cherts of Elephantine Island – an insight into the economic networks, *MDAIK* 74 (2019), 38–54; T. Hikade, T., *Elephantine XXXV. The Lithic Industries on Elephantine Island during the 3rd Millennium BC, AVDAIK* 121 (Wiesbaden 2013).

[94] C. Delage, *Siliceous Rocks and Prehistory: Bibliography on Geo-Archaeological Approaches to Chert Sourcing and Prehistoric Exploitation, BAR International Series* (Oxford, 2003), 1168.

[95] e. g. M. Brandl, Preliminary assessment of the chipped stone assemblages from excavation area 36, Elephantine Island –s.b. in this report; C. Jeuthe, M. Hamdan, MDAIK 74 (2019), 38–54.

[96] M. Brandl, Preliminary assessment of the chipped stone assemblages from excavation area 36, Elephantine Island – s.b. in this report; C. Jeuthe, M. Hamdan, *MDAIK* 74 (2019), 103, 108, 110; R. Said, *The Geology of Egypt* (New York 1962); R. Said, *The Geological evolution of the River Nile* (Berlin 1981); P. M. Vermeersch, *Palaeolithic Quarrying Sites in Upper and Middle Egypt, Egyptian Prehistory Monographs* (Leuven, 2002).

[97] J.A. Harrell, 'Gemstones', in W. Wendrich (ed.), *UCLA Encyclopedia of Egyptology* (Los Angeles, 2012). http://digital2.library.ucla.edu/viewItem.do?ark=21198/zz002czx1r accessed 20.03.2020.

[98] T. Heldal, E. G. Bloxam, P. Storemyr and A. Kelany, 'The geology and archaeology of the ancient silicified sandstone quarries at Gebel Gulab and Gebel Tingar, Aswan', *Marmora: International Journal for Archaeology, History and Archaeometry of Marbles and Stones* 1 (2005), 11-35.

[99] P.T. Nicholson, I. Shaw, *Ancient Egyptian Materials and Technology* (Cambridge, 2000), 40-42.

[100] J.A. Harrell, 'Gemstones', in W. Wendrich (ed.), *UCLA Encyclopedia of Egyptology* (Los Angeles, 2012).. http://digital2.library.ucla.edu/viewItem.do?ark=21198/zz002czx1r accessed 20.03.2020.

[101] A.M. Roth, 'The *psš-kf* and the 'Opening of the Mouth' ceremony: a ritual of birth and rebirth', *JEA* 78 (1992), 113-147.

[102] B. Bruyère, *Rapport sur les Fouilles de Deir el Médineh, (1934-1935) BIFAO* 16 (Cairo, 1939), pl. XLII; J. Spencer, *Excavations at el-Ashmunein III. The Town* (London, 1993), pls. 27, 28, 96; L. Giddy, *Kom Rabi'a: The New Kingdom and Post-New Kingdom Objects* (London, 1999), 226-243, pls. 51–52, 89-90; A. Tillmann, *Neolithikum in der späten Bronzezeit. Steingeräte des 2. Jahrtausend au sAuaris-Piramesse, FoRa* 4 (Mainz, 2007), 70-73; S. Buławka, 'Flint Artefacts from Tell el-Retaba Polish-Slovak Archaeological Mission, Seasons 2010-2016', (2017), Pl. 1.

[103] V. Boschloos, 'From Egypt to Byblos…and back again: the production and distribution of Green Jasper seals in Egypt and the levant during the early 2nd millennium BCE', in J. Mynárova, P. Onderka, P. Pavúk, *There and Back Again. The Crossroads II* (Prague, 2015), 297-314.

[104] J.D. Clark, J.L. Phillips and P.S. Staley, 'Interpretations of Prehistoric Technology from Ancient Egyptian and other Sources. Part I : Ancient Egyptian Bows and Arrows and their relevance for African Prehistory', *Paleorient* 2/2 (1974), 323.

[105] G. Endlicher and A. Tillmann, 'Lime plaster as an adhesive for hafting Eighteenth-Dynasty flint sickles from Tell El Dab'a, Eastern Nile Delta (Egypt)', *Archaeometry* 39 (1997), 333-342.

[106] The participants of the co-operation project with the Institute for Oriental and European Archaeology, Austrian Academy of Sciences financed by the FWF START Project Y754-G19: Beyond Politics. Material Culture in Second Intermediate Period Egypt and Nubia were B. Bader (11.02.-01.03.2020) and N. Ayers (21.02.-26.02.020). A. de Souza (21.02.-01.03.2020) was funded by MSCA grant agreement no 796050 In between, and M. Brandl (24.02.-01.03.2020), head of the *Raw Material Laboratory*, by OREA/ÖAW.

[107] Cf. C. von Pilgrim, 'Die Stadtmauer des Mittleren Reiches', in S. Seidlmayer et al., 'Stadt und Tempel von Elephantine, 39./40./41. Grabungsbericht', *MDAIK* 72 (2016), 207-212.

[108]C. v. Pilgrim, *MDAIK* 72 (2016), 207-208.

[109] Cf. Seiler, 'Zur Formentwicklung der Keramik der 2. Zwischenzeit und der frühen 18. Dynastie', in W. Kaiser et al., 'Stadt und Tempel von Elephantine 25./26./27. Grabungsbericht', *MDAIK* 55 (1999), 207.

[110]J. Kuckertz, *Gefäßverschlüsse aus Tell el-Amarna, Grabungen der Deutschen Orientgesellschaft 1911-1914, sozioökonomische Aspekte einer Fundgattung des Neuen Reiches* (Saarbrücken, 2003) 68 forexample; 102 „mit stöpselartiger Verdickung unten". Cf. also E.M. Engel and V. Müller, 'Verschlüsse der Frühzeit: Erstellung einer Typologie', *Göttinger Miszellen* 178 (2000), 31-44 for a typology of similar artefacts but of a much earlier period.

[111] D. Raue, 'Medja vs. Kerma at the First Cataract – Terminological Problems', in I. Forstner-Müller and P. Rose (eds), *Nubian Pottery from Egyptian Cultural Contexts of the Middle and Early New Kingdom. Proceedings of a Workshop held at the Austrian Archaeological Institute at Cairo. 1–12 December 2010* (Vienna, 2012), 55.

[112] C. Manassa, 'Middle Nubian Ceramics from Umm Mawagir, Kharga Oasis', in I. Forstner-Müller and P. Rose (eds), *Nubian Pottery from Egyptian Cultural Contexts of the Middle and Early New Kingdom. Proceedings of a Workshop held at the Austrian Archaeological Institute at Cairo. 1–12 December 2010* (Vienna, 2012), 141-142.

[113] See A. Přichystal, *Lithic Raw Materials in Prehistoric Times of Eastern Central Europe*, *Masarykova univerzita*, (Brno, 2013), 49-50; M. Brandl, 'Genesis, Provenance and Classification of Rocks within the Chert Group in Central Europe', *Archaeologia Austriaca* 97-98 (2013/2014), 33-58.

[114] J. Hahn, *Erkennen und Bestimmen von Stein- und Knochenartefakten*, *ArchaeologiaVenatoria* 10, (Tübingen, 1993).

[115] H. Floss (ed.), *Steinartefakte vom Altpaläolithikum bis in die Neuzeit. Tübingen Publications in Prehistory*, (Tübingen, 2013).

[116] T. Hikade, 'Die lithischen Industrien des Alten Reiches auf Elephantine',*MDAIK* 58 (2002), 305-322. T. Hikade, 'Lithic studies' in D. Raue et al., 'Report on the 33rd Season of Excavation and Restoration on the Island of Elephantine' (2004), 13-15. T. Hikade, 'Lithic studies', in D. Raue, et al., 'Report on the 34th Season of Excavation and Restoration on the Island of Elephantine' (2005), 7-10. T. Hikade, *Elephantine XXXV: The Lithic Industries on Elephantine Island during the 3rd Millennium BC, AV* 121 (Wiesbaden, 2013). C. Jeuthe and R. Colman (2015).'Silex Studies', in S. Seidlmayer et al., 'Report on the Excavations at Elephantine by the German Archaeological Institute and the Swiss Institute from autumn 2014 to spring 2015 (44th season) (2015), 19-21. C. Jeuthe and R. Colman, 'Lithic studies', in S. Seidlmayer et al., 'Report on the Excavations at Elephantine by the German Archaeological Institute and the Swiss Institute from autumn 2015 to summer 2016 (45th season)' (2016), 41-42. C. Jeuthe and M. Hamdan, 'The cherts of Elephantine Island – an insight into the economic networks', *MDAIK* 74 (2018), 38-54. A. Tillmann, 'Dynastic stonetools', in K.A. Bard and S.B. Shubert (eds.), *Encyclopedia of the Archaeology of Ancient Egypt*, (London – New York, 1999), 310-314.

[117]Tillmann in K.A. Bard and S.B. Shubert (eds.), *Encyclopedia of the Archaeology of Ancient Egypt*, 311-313.

[118] C. v. Pilgrim, *MDAIK* 72 (2016), 207-210.

[119] C.C. King et al., 'Anatomy of a mountain: The Thebes Limestone Formation (Lower Eocene) at Gebel Gurnah, Luxor, Nile Valley, Upper Egypt', *Journal of African Earth Sciences* 136 (2017), 61-108; R. Said, 'The geological evolution of the River Nile', in F. Wendorf and A.E. Marks. (eds.), *Problems in Prehistory Northern Africa and the Levant*, (Dallas, 1975), 1-44; A. Wysocka, F. Welc and U. Czarniecka, 'Sedimentary

Environment of the Early Pleistocene Gravels of the Edfu formation from the Saqqara Archaeological Site (Egypt) – Preliminary Results', *Studia Quaternaria* 33/1 (2016), 69-78.

[120] King et al., *Journal of African Earth Sciences* 136 (2017); Wysocka et al., *Studia Quaternaria* 33/1 (2016).

[121]Hikade, *MDAIK* 58 (2002); Hikade, in D. Raue, et al., 'Report on the 34th Season' (2005); Jeuthe and Hamdan *MDAIK* 74 (2019); Tillmann, in K.A. Bard, S.B. Shubert (eds.), *Encyclopedia of the Archaeology of Ancient Egypt*.

[122] Cf. Tillmann, in K.A. Bard, S.B. Shubert (eds.), *Encyclopedia of the Archaeology of Ancient Egypt*, 313.

[123] Cf. M. Fielauf, 'Anastylosis of the Osiris-Nesmeti temple, in J. Sigl et al., 'Report on the Excavations at Elephantine by the German Archaeological Institute and the Swiss Institute from autumn 2017 to summer 2018', 28-31: www.dainst.org/projekt/-/project-display/25953: Elephantine - Report on the 47th Season.

[124]Chr. Ubertini, 'Restitution Architecturale du "Temple Y"', in G. Dreyer et al., 'Stadt und Tempel von Elephantine. 31./32. Grabungsbericht', *MDAIK* 61 (2005), 64-75.